Product documentation

Smart Control
Art. No. SC 1000 KNX

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Issue: 05.12.2013
14505800 1v5.2

Contents

1 Product definition

1.1 Product catalogue

Product name:	Smart Control
Use:	Sensor / Display
Design:	FM (flush-mounted)
Art. No.	SC 1000 KNX

1.2 Function

The Smart Control is a control and display unit for controlling and visualising building functions. The device has a TFT graphic colour screen (10.9 cm, 800 x 480 pixels, 16.7 million colours) with a touchscreen sensor surface. The display elements are operated by simply touching the glass surface directly.
The Smart Control can be integrated into the KNX building systems with the aid of the KNX communication module. This device then combines the functions of a KNX/EIB bus coupling unit, push button sensor, room temperature controller, timer and display unit in just one bus subscriber. The combination of these functions makes it possible, for example, to control the light, the blinds, and the room temperature centrally from the entry area of a room.
This product documentation describes the device functionality in combination with the KNX communication module.

In order to make optimum use of the wide range of operating and display functions, the device has a user interface that is clearly and logically structured according to functions, rooms and favourites. This ensures intuitive handling of the building control system. Up to 30 KNX controllable channels (switching, dimming, blind, ...) can be subdivided in up to 8 different rooms. The individual rooms are recalled via a room page in which the functions of each room can be controlled centrally and efficiently.
In addition, the controllable channels are also allocated to function units (light, shading, heating, ...). Up to 8 function units, whose names can be specified in the plug-in, are available for assignment. Function units can be recalled via a function page in which room-independent and function-oriented control of the building functions is possible.
On the room temperature controller page, the functions "Operating mode switchover", "Setpoint shift" and "Fan controller" of the integrated room temperature controller are combined on the view page of the device display. This allows easy operation of the functions of the room temperature controller.
The control and display elements on the graphic interface are arranged in a standardized designed so that the display is identical on all display pages and operating steps are simplified considerably. Frequently used operating functions or central functions can be stored on the start or favourite display page, which can thus be operated quickly and easily.
All controllable functions are configured using the ETS.

Optionally, the number of control elements can be expanded by connecting a pushbutton extension module to the Smart Control. The extension module extends the device to include up to 4 mechanical control surfaces. Configuration and commissioning of the extension module is clearly structured and easy to perform using the application program of the Smart Control.

Push button functionality:
When an operating element on the touchscreen or extension module is pressed, the device sends telegrams to the KNX depending on the ETS parameter setting. These can be, for instance, telegrams for switching or push button control, for dimming or for controlling blinds. It is also possible to program value transmitter functions, such as dimming value transmitters, light scene extensions, temperature value transmitters or brightness value transmitters.

The operation concept of elements on the touch surface provides selection operation for the room view or function view. Functions must first be selected. Afterwards, operations are performed by means of the control command (switch on or off, move up or down, ...).
Alternatively, direct operation for the start and favourite display pages is available. In this case, the control command is also executed simultaneously time by touching the operating element.
Operating elements on the touch surface can - depending on the underlying function - be evaluated as a rocker switch (double-surface principle) or as a button (single surface principle).

The operation concept of an operating element on the push-button extension module can be configured optionally in the ETS either as a rocker function or alternatively as a push-button function. With the rocker function and the double-surface push-button function, the button arrangement can be set either as "vertical" (top-bottom operation) or as "horizontal" (left-right operation) for each control surface.

The device has a master button on the touch sensor surface outside the display area. The master button can be linked to any existing KNX channel. In this way, a function, such as the switching of room lighting, can be executed quickly and easily without touch operation of the display pages. Two other sensor buttons make it easier to navigate through the display pages (scrolling and returning to the start page) and can be used alternatively for finger operation of the graphic interface.

Room temperature controller functionality:
The device can be used for single-room temperature control. Depending on the operating mode, current temperature setpoint and room temperature, a variable for heating or cooling control can be transmitted to the KNX for a control circuit. In addition to the heating or cooling basic level, activating an additional heater and/or cooling unit means that an additional heating or cooling unit can be used. In this connection, you can set the temperature setpoint difference between the basic and the additional level by a parameter in the ETS. For major deviations between the temperature setpoint and the actual temperature, you can activate this additional level to heat up or cool down the room faster. You can assign different control algorithms to the basic and additional stages.
For heating and cooling functions, you can select continuous or switching PI or switching 2-point feedback control algorithms.
The room temperature can be recorded either by the internal or by an external KNX temperature sensor (Temperature value via the bus). Combined temperature recording by both sensors can also be configured.
The controller distinguishes between different operating modes (comfort, standby, night, frost/heat protection) each with their own temperature setpoints for heating or cooling.

Display functionality:
Each operating element on the graphic screen can contain status elements. Status elements can indicate, for example, whether a lighting system is switched on, which dimming value a lighting system has or which height is set on a blind. Status elements can be displayed in textual form (caption, value) as well as in symbolic form.
A header is arranged in the upper area (graphic horizon) in the device display. The current date and room temperature of the location can be displayed in the header. On the start page, the current time is also indicated in the display area. This display information can be hidden separately if required.
The pushbutton extension module has two status LEDs, which, depending on the function of the rocker or pushbutton, can be internally connected to the operating function or have its own objects for controlling via the bus.

The graphic display lighting can be controlled. It can be switched on by means of an operation or communication object. Switching off is possible either via the object or time-controlled.

Measured values of a KNX weather station can optionally be displayed on a separate display page. Displayable values in this case are the wind speed, twilight threshold, external brightness and temperature, precipitation situation, angle of the sun and up to any 4 different additional external 2-byte values that can be formatted for display. The measured values are displayed by symbols and text in a form adapted to the display concept.

Through the "ASCII Text" channel function, the device offers the possibility to output texts received via the KNX Bus. For example, alarm messages or welcome messages can be shown in the display.

General:
The device has a brightness sensor that measures the ambient lighting locally. The determined brightness value can be compared with a configured limiting value. If values fall below or exceed the limiting value, it is possible to transmit a switching telegram to the bus allowing lighting to be triggered, for example.
A timer can optionally be activated. The timer, which is integrated in the device and can be

configured using the ETS and via a special timer display page, has up to 8 switching times. The switching times affect KNX channels (1...30) configured in the device and can handle the data formats switching (1 bit), Value 1 byte (incl. brightness value and position setting) and Value 2 byte and similarly transmit telegrams to the bus.

Different settings can be made available to the Administrator via a password-protected system page (setting of time and date, password assignment, activation of KNX programming mode). A bus coupling unit is already permanently integrated in the device, allowing the device to be connected directly to the bus cable during commissioning.

The Smart Control needs an external DC power supply for supplying the device electronics (see chapter 3. Technical data). It is not possible to use the unchoked output of KNX power supplies as device power supply! The power supply must be provided by an additional device (e.g. RMD or UP DC power supply) (see accessories).

1.3 Accessories

KNX module	Art. No. MSC 1000 KNX
Push-button extension module, 1-gang	Art. No. 4091 TSEM
Push-button extension module, 2-gang	Art. No. 4092 TSEM
Push-button extension module, 3-gang	Art. No. 4093 TSEM
Push-button extension module, 4gang	Art. No. 4094 TSEM
Power supply 24 V, flush-mounted	Art. No. NT 2405 VDC
Power supply 24 V, for rail mounting	Art. No. NT 2415 REG VDC

2 Installation, electrical connection and operation

2.1 Safety instructions

Electrical equipment may only be installed and fitted by electrically skilled persons. The applicable accident prevention regulations must be observed.

Failure to observe the instructions may cause damage to the device and result in fire and other hazards.

Make sure during the installation that there is always sufficient insulation between the mains voltage and the bus. A minimum distance of at least 4 mm must be maintained between bus conductors and mains voltage cores.

Do not operate the screen with sharp or pointed objects. The touch-sensitive surface could be damaged.

Do not use sharp objects for cleaning. Do not use sharp cleaning agents, acids or organic solvents.

The device may not be opened or operated outside the technical specifications.

2.2 Device components

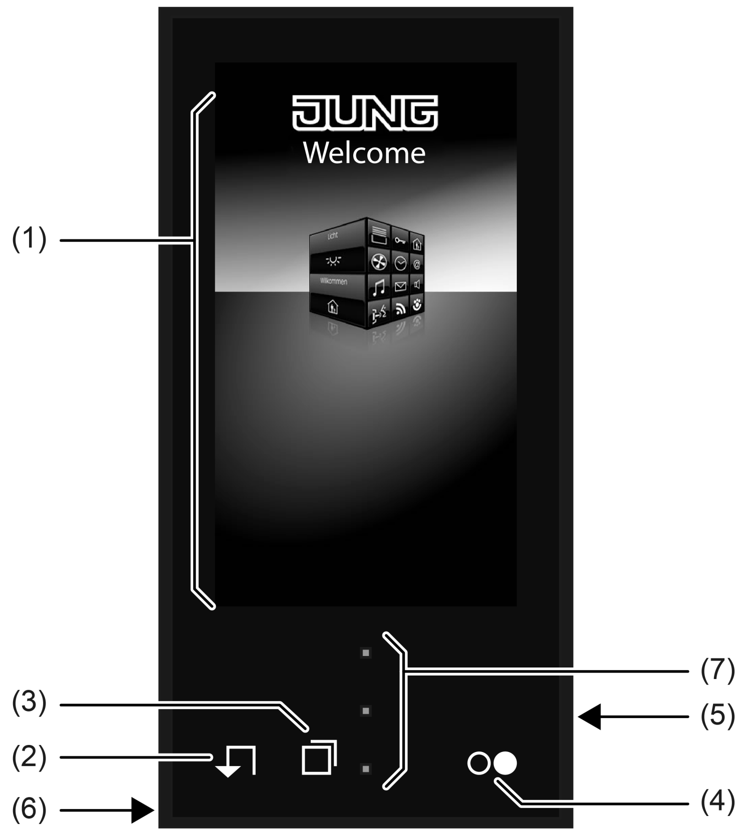


Figure 1: Device components front side

(1) The device has a TFT graphic colour screen (10.9 cm, 800 x 480 pixels) with a touchscreen sensor surface
(2) Button ↵ "Return" to the start page
(3) Button "Scroll" ❐ in the main menu level
(4) Master button ○●
(5) Slot for micro SD card
(6) Internal loudspeaker
(7) Operation LED (above), brightness sensor (middle), status LED (below - reserved for future applications)

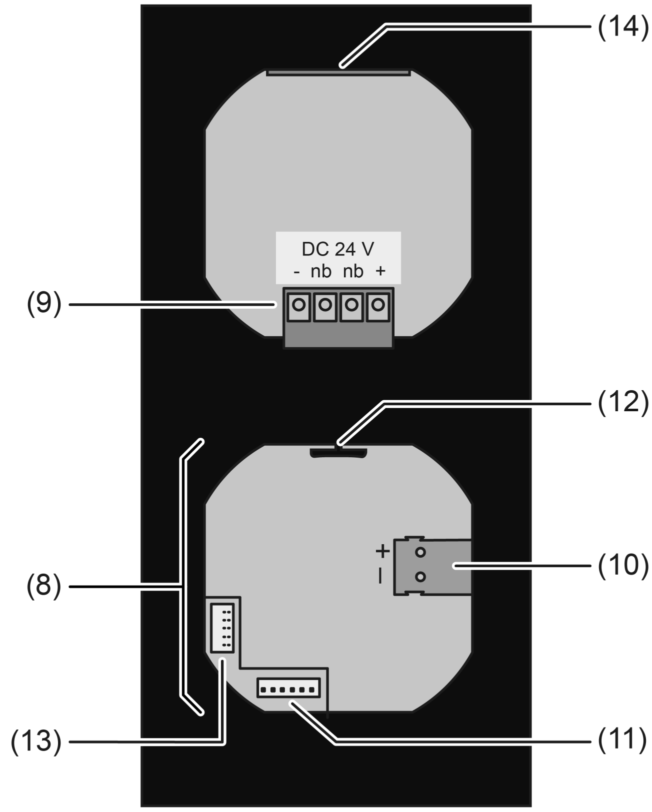


Figure 2: Device components at the back (with attached KNX communication module)

(8) KNX communication module
(9) Connection terminals for power supply DC 24 V (- / +)
nb: Reserved for future use
(10) Connection for KNX bus cable
(11) Connector socket for push-button extension module
(12) Guide to the connection for future extension
(13) Connector socket (reserved for future use)
(14) Module slot (reserved for future use)

2.3 Fitting and electrical connection

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

Mounting and connecting the device

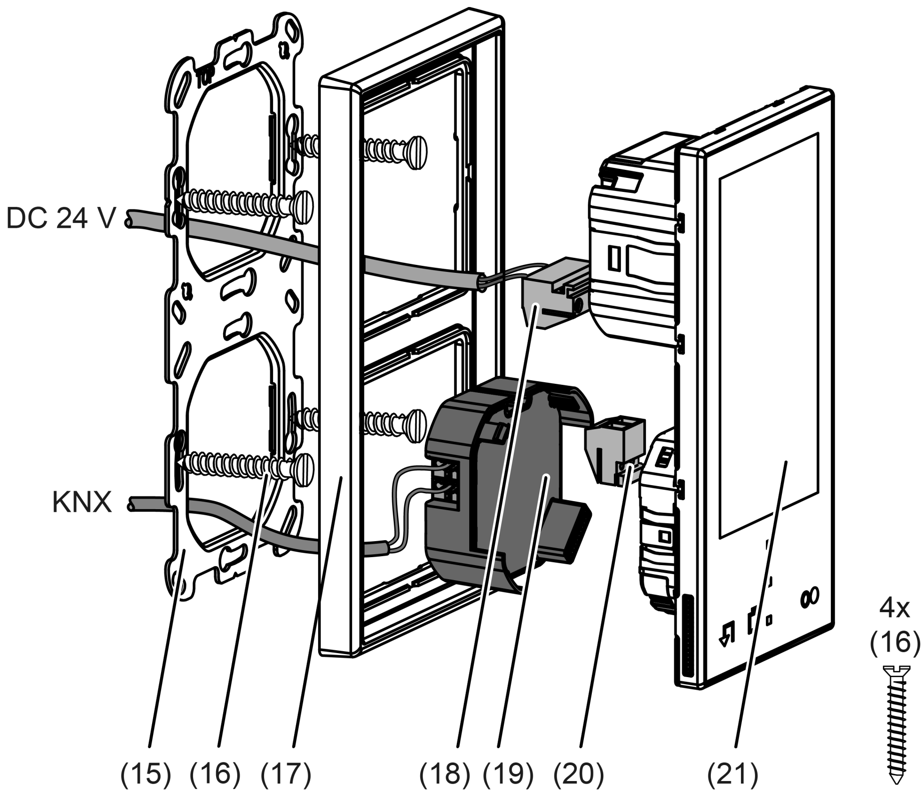


Figure 3: Device fitting with 2-gang supporting frame

(15) Supporting frame 2-gang
(16) Box screws
(17) Design frame
(18) Connection terminals for external power supply
(19) KNX communication module
(20) Terminals for future extension
(21) Smart Control

Recommended installation height: 1.40 m

Installation in two flush-mounted appliance boxes or in double appliance box. Use 2-gang supporting frame from the scope of supply of the Smart Control.

Installation solely with frame from the LS ranges or FD design.

- Mount supporting ring (15) in the right orientation on the appliance boxes. Note marking **TOP**. Use the enclosed box screws (16).

- Position the decorative frame (17) on the supporting ring.

Connect the external power supply...
The Smart Control needs an external DC power supply for supplying the device electronics (figure 4). It is not possible to use the unchoked output of KNX power supplies as device power supply! The power supply must be provided by an additional device (e.g. RMD or UP DC power supply) (see accessories).

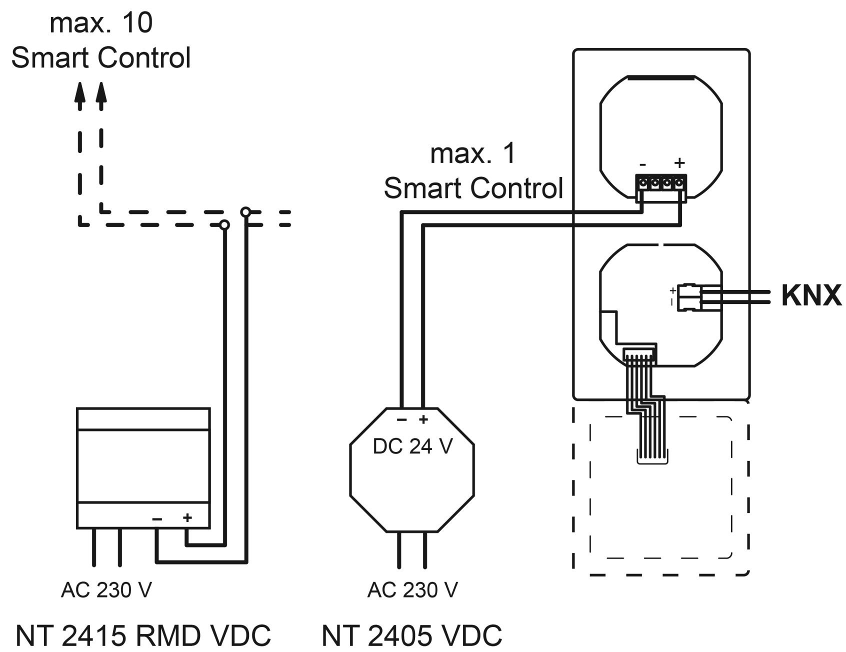


Figure 4: Connecting diagram for external DC power supply

- Connect power supply to terminal (18) and insert into connection (9) (figure 2). Comply with the polarity!

Completing installation...

- Connect the KNX bus cable to the bus connection of the communication module.
- Insert the Smart Control with the communication module carefully into the supporting frame and lock into place. Ensure that no cables are squashed.

Assembling and connecting device with push-button extension module

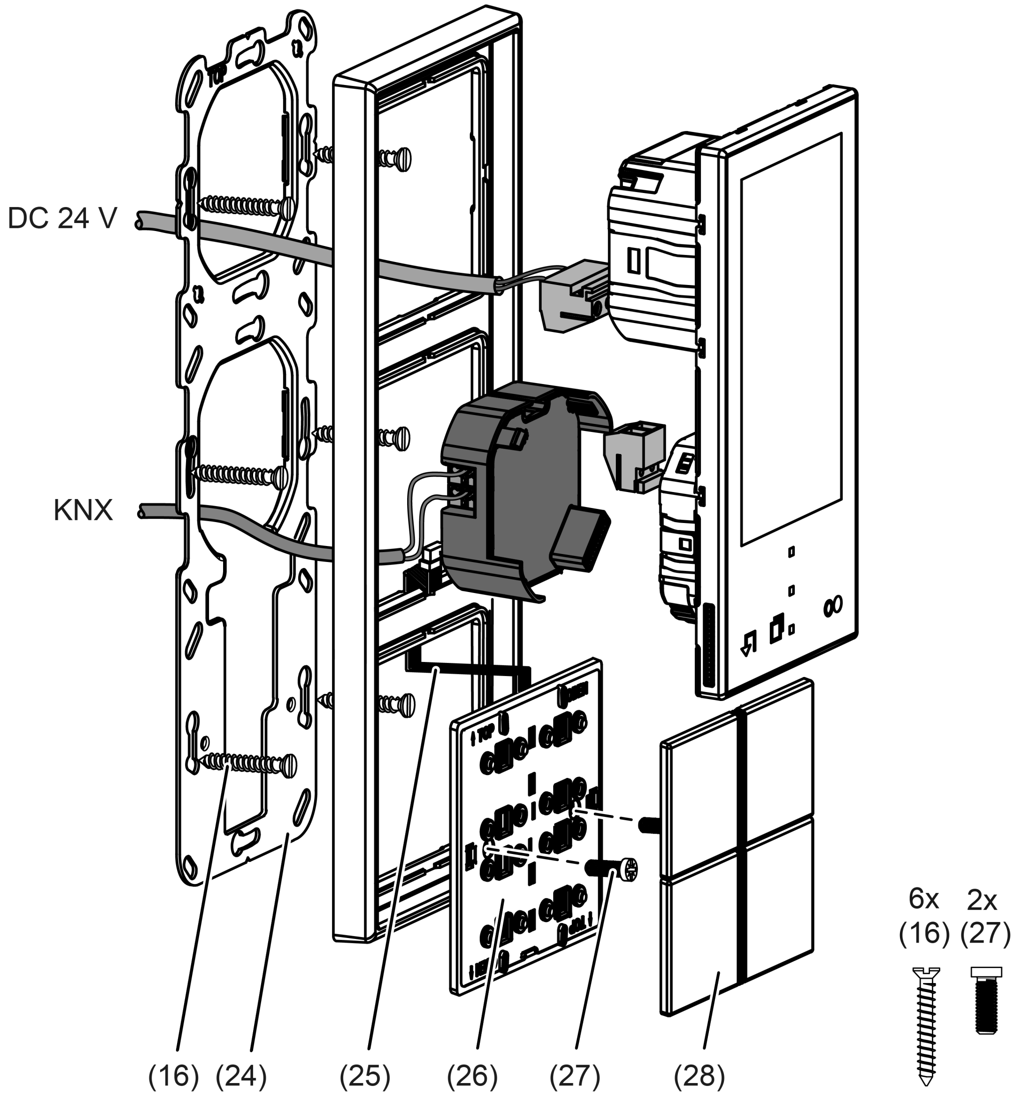


Figure 5: Device fitting with push-button extension module with 3-gang supporting frame

(16) Box screws
(24) Supporting frame 3-gang
(25) Connecting cable for push-button sensor extension module with plug
(26) Push-button extension module
(27) Fastening screws
(28) Design control surfaces for the extension module

Recommended installation height for the Smart Control: 1.40 m

One push-button extension module can be connected to each Smart Control.

Installation in three flush-mounted appliance boxes. Use 3-gang supporting frame from the scope of supply of the Smart Control. Alternatively, no separate appliance box is necessary for the push-button extension module. In this case, countersink the screws (27) into the wall, e.g. with a ø 6 x10 mm hole. Use supporting frame as template.

Installation solely with frame from the LS ranges or FD design.

- Mount supporting ring (24) in the right orientation on the appliance boxes. Note marking **TOP**. Use the enclosed box screws (16).

- Position the decorative frame (17) on the supporting ring.

Assembling and connecting push-button extension module...

- Guide the connection cable of the push-button extension module (25) between the supporting frame and frame.
- Fix push-button extension module (26) to supporting frame using the plastic screws (27) enclosed. Tighten the screws only lightly.
- Insert the pushbutton extension module connecting cable in correct position into the connection point of the communication module on the Smart Control (11) (figure 2). When doing so, ensure that the connecting cable is not pinched.
- Mount the module control surfaces on the push-button extension module.

Connect the external power supply...
The Smart Control needs an external DC power supply for supplying the device electronics (figure 4). It is <u>not</u> possible to use the unchoked output of KNX power supplies as device power supply! The power supply must be provided by an additional device (e.g. RMD or UP DC power supply) (see accessories).

- Connect power supply to terminal (18) and insert into connection (9) (figure 2). Comply with the polarity!

Completing installation...

- Connect the KNX bus cable to the bus connection of the communication module.
- Insert the Smart Control with the communication module carefully into the supporting frame and lock into place. Ensure that no cables are squashed.

2.4 Commissioning

After the device has been connected to the power supply and to the bus and mounted on the wall, it can be put into operation. The commissioning is essentially confined to the programming of the actuator via the ETS.

Assignment of the physical address

The device has an integrated bus coupling unit. It does not have a separate programming button or LED. The programming mode is activated and deactivated via an operation of the device display. To program the physical address, the device must be connected properly and switched on.
In the unprogrammed delivery state, the device displays a start page after booting has been completed. On this display page, the "Programming mode" button is visible. On pressing the button, the KNX programming mode can be activated (figure 6) immediately and the physical address is programmed using the ETS.
Alternatively, the programming mode can be activated via the administrator area of the user interface. On a device that has already been put into operation by the ETS, the system page must be recalled. In the delivery state of the device, the demo project can be started for this purpose. The programming mode must be activated via the administrator area as described below…

- Navigate to the function page by navigation in the main menu level (touch operation or pressing the navigation button "❐").
- Switch to the Admin area by touching the display surface with the "☼" symbol.
- Enter the password and confirm.

i The password protection when accessing the system page can be deactivated or activated in the ETS. In the as-delivered state, the password protection is active and the password is defined as "0000".

- Activate the programming mode by touching the display surface "programming mode".

  Programming mode is activated. The device display displays the programming screen (figure 6).

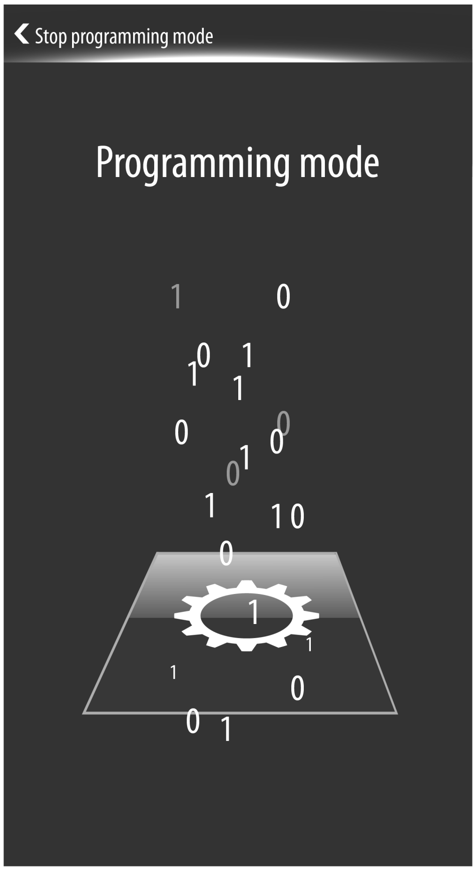


Figure 6: Programming screen

The programming status is terminated automatically after successfully programming the physical address by the ETS. The device returns to the administrator page or branches to the main menu level once the return time to the start page has elapsed since activating the programming mode. If the programming mode was activated via the start page in the as-delivered state, the display then returns to the start page.
Optionally, the programming mode can also be terminated manually by touching the sensor surface "Stop programming mode" in the header of the programming screen.

i The push-button extension module does not receive any physical address of its own. It is activated by the application program loaded in the Smart Control.

Programming the application

ETS3.0version f or ETS4.0.6 or higher is required for commissioning the device. After assigning the physical address, the application must be programmed into the device using the ETS. The aforementioned ETS versions detect automatically whether a valid application has already been previously programmed into the device. To reduce the download time, the whole application is programmed only if the device was programmed beforehand with another application or with no application at all. In all other cases, the ETS makes a time-optimised partial download in which only the modified data is loaded into the device.
During programming of the application data, the device display shows the programming screen (figure 6).

i After completion of the programming operation, the device stores the new configuration into the device memory. This operation takes some time. In this state, the device still displays the programming screen. After this, the device initialises the control and display elements. In this state, the start screen (figure 8) is displayed. Afterwards, the device is immediately ready again for operation.

i The device coupling unit is already functional immediately after completion of the ETS programming operation. Therefore, it is possible that telegrams might be transmitted to the bus even during the initialization state (e.g. from the integrated room temperature controller).

2.5 Operation

The Smart Control is a control and display unit for controlling and visualising building functions. The device has a TFT graphic colour screen (10.9 cm, 800 x 480 pixels, 16.7 million colours) with a touchscreen sensor surface. The display elements are operated by simply touching the glass surface directly.
In order to make optimum use of the wide range of operating and display functions, the device has a user interface that is clearly and logically structured according to functions, rooms and favourites. This ensures intuitive handling of the building control system.

After switching on the device, the display first displays the main menu level. The main menu level contains up to four display pages (start page, favourite page, room page, function page). From the main menu level, the lower level menus can be accessed by touch operation (room control, function control, system settings). The display pages of the main menu level can be selected in sequence and thus displayed. The display sequence is fixed.

It is possible to navigate between the display pages of the main menu level by finger-touch-screen operation by pressing and pulling. Alternatively, it is also possible to navigate through the display pages using two sensor buttons (/) located outside the display area (figure 7).

Additionally, the device has a master button ○●. The master button can be linked to any existing KNX channel. In this way, a function, such as the switching of room lighting, can be executed quickly and easily without touch operation of the display pages. A KNX channel can be configured as a rocker function (two button operation - the sensor surfaces execute separate operating functions) or as a push button function (single-surface operation - both sensor surfaces execute the same operating function). The master button always executes push-button functions for channel functions that work as rocker functions (see page 118).

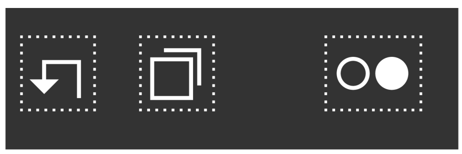


Figure 7: Sensor buttons on the device for navigating the display pages of the main menu level and master button

- Return to the start page or to the first display page (if no start page is available)
- Scrolling in the main menu level
- ○● Master button (when pressed, it executes the KNX channel function configured in the ETS)

The elements available on the user interface depend on the configuration of the device in the ETS. In addition, the operation concept and sensor evaluation can be configured individually. In the chapter entitled "Display functions" in this documentation you can read about which functional characteristics the operating elements of the device can have. We ask at this point that you refer to the further chapters. (see page 62).

If a push-button extension module is connected to the device, it is possible to additionally operate the mechanical control surfaces on the extension. The operation concept and button arrangement is also dependent on the ETS configuration. We also ask at this point that you refer to the further chapters. (see page 141).

i As long as the device has not yet been programmed with application data in the ETS, a demo project is present in the device. The demo project can be recalled by pressing the "Demo" button with your finger, which is visible in the delivery state in the start screen after booting. The demo project displays various control and display elements and enables navigation through different display pages. With the demo project, configurable device functions can be clearly displayed for presentation purposes.

3 Technical data

Ambient conditions	
Storage/transport temperature	-25 ... +60 °C
Ambient temperature	0 ... +35 °C
Protection class	III
Relative humidity	10 ... 90 % rel. humidity (No moisture condensation)
Storage/transport humidity	5 ... 90 % rel. humidity
Dimensions	
Dimensions W×H	71×142 mm
Dimensions screen W×H	56× 93 mm
diagonal	10.9 cm
Installation depth	32 mm
KNX communication module	
Mark of approval	KNX/EIB
KNX medium	TP 1
Commissioning mode	S-mode
Rated voltage KNX	DC 21 ... 32 V SELV
Current consumption KNX	max. 6 mA
Connection mode KNX	Standard terminal
External supply	
Rated voltage	DC 24 V SELV
Current consumption	max. 220 mA
single stranded	0.14 ... 2.5 mm²
finely stranded with conductor sleeve	0.14 ... 1.5 mm²
finely stranded without conductor sleeve	0.14 ... 1.5 mm²
System	
Processor	TI OMAP 3530
Mass storage	256 MB Flash EEPROM
RAM	256 MB RAM
Memory card	Micro-SD-/SDHC, 2...8 GB
Display	
Touchscreen	capacitive
Type	TFT 10.9 cm [4.3"] WVGA
Resolution	800×480 pixels
Number of colours	16.7 millions
Observation angle	± 80 °
Internal loudspeaker	
Frequency range	60 ... 12000 Hz
Power consumption	max. 1 W
Loudspeaker output (future use)	
Impedance	4 ... 8 Ω
Power output	max. 2 VA
Cable length	max. 3 m
Internal clock	
Power reserve	min. 2 h
Internal temperature sensor	
Measuring range	0 ... +45 °C

4 Software description

4.1 Software specification

ETS search paths:	- Push button / Push button, general / Smart Control
BAU used:	TP-UART + µC
KNX type class:	3b device with cert. Physical layer + stack
Configuration:	S-mode standard
AST type:	"00"$_{Hex}$ / "0" $_{Dec}$
PEI connector:	no connector

Application program:

No.	Short description	Name	Version	from mask version
1	Multifunctional application program incl. touch sensor/pushbutton sensor function, display function, room temperature controller and timer. Can be expanded to include 4 additional control surfaces using a mechanical push-button extension module. Replaces application version 1.1 (extended scope of functions).	Smart Control 501512	1.2 for ETS3.0 Version f and ETS 4	705

4.2 Software "Smart Control 501511"

4.2.1 Scope of functions

Functions of the display and touch sensor surface

- The Smart Control is a control and display unit for controlling and visualising building functions. The device has a TFT graphic colour screen (10.9 cm, 800 x 480 pixels, 16.7 million colours) with a touchscreen sensor surface.
- Up to 30 KNX controllable channels (switching, dimming, blind, ...) can be subdivided in up to 8 different rooms. In addition, the channels are also allocated to function units (light, shading, heating, ...). Up to 8 function units are available for assignment.
- The device has a user interface that is clearly and logically structured according to functions, rooms and favourites. The individual rooms are recalled via a room page in which the functions of each room can be controlled centrally and efficiently. Function units can be recalled via a function page in which room-independent and function-oriented control of the building functions is possible. In addition, it is possible to recall frequently used KNX functions via start and favourite pages.
- The KNX channels can be configured to the functions "switching", "dimming (Start/Stop)", "dimming (brightness value)", "Venetian blind' (Step/Move/Step)", "Venetian blind (position)", "scene extension", "1-byte value transmitter" and "2-byte value transmitter". In addition, the functions "Operating mode switchover, internal", "Setpoint shift, internal" and "Fan controller, internal" are used to operate the integrated room temperature controller. The "ASCII Text" channel function is purely a display function and is used to display running texts, whose contents are determined by data from the KNX bus.
- Two operation concepts for elements on the touch surface: Selection operation (separate display and operating areas / operation requires the selection of an element that can then be operated) and direct operation (shared display and operating area / touching of the sensor surface causes the immediate execution of the function).
- Operating elements on the touch surface can - depending on the function - be evaluated as a rocker switch (double-surface principle) or as a button (single surface principle).
- KNX channels have - depending on the function - up to three status elements: Status text or value, status icon and bar graph displays. Consequently, a visualization of the KNX system can also take place in addition to the control.
- Display of room temperature and date at a central point in the display.
- Measured values of a KNX weather station can optionally be displayed on a separate display page. Displayable values are the wind speed, twilight threshold, external brightness and temperature, precipitation, angle of the sun and up to any 4 different additional external 2-byte values that can be formatted for display. The measured values are displayed by symbols and text in a form adapted to the display concept.
- Controllable display lighting. Switching on by means of an operation or communication object. Switching off is possible via the object or time-controlled.

Functions of the push-button extension module (optional)

- Each operating area can either be used as a single rocker or as two independent buttons.
- For push button function either double-surface or single-surface principle.
- Each rocker can be used for the functions 'switching', 'dimming', 'Venetian blind', '1 byte value transmitter', '2-byte value transmitter', 'scene extension' and '2-channel operation'.
- Each button can be used for the functions "switching", "dimming", "Venetian blind", "1 byte value transmitter", "2-byte value transmitter", "scene extension" and "2-channel operation", "operating mode switchover, internal" and "setpoint shift, internal".
- Each operating area has two status LEDs. When a status LED is internally connected with the rocker or the button, it can signal a button-press or the current status of a communication object. The status indication can also be in inverted form. When a status LED is not dependent on the rocker or button, it can be permanently on or off, indicate the status of an independent communication object, the operating state of a room temperature controller or the result of a comparison between signed or unsigned 1 byte values.
- The rockers or buttons can be disabled via a 1-bit object.
- All LEDs of the push-button extension module can flash simultaneously in the event of an alarm message.

Functions of the integrated room temperature controller

- Various operating modes can be activated: Comfort, Standby, Night and Frost/heat protection
- Each operating mode can be assigned its own temperature-setpoints (for heating and/or cooling).
- Comfort extension possible using presence button in Night or Frost/heat protection mode. Configurable duration of the comfort extension. Display of the time still remaining in comfort mode, after comfort extension through the presence button, on the room temperature controller page.
- Operating mode switchover via 1-byte objects according to the KNX specification or using up to four individual 1-bit objects.
- Status feedback telegrams (also KNX compliant) can be configured.
- Frost/heat protection switchover via window status or by automatic frost protection.
- Operating modes "Heating", "Cooling", "Heating and cooling" each with or without additional level. The temperature setpoints for the additional level are derived via a configurable level offset from the values of the basic level.
- Various control types can be configured for each heating or cooling level: PI control (permanent or switching PWM) or 2-point feedback control (switching).
- Control parameter for PI controller (if desired: proportional range, reset time) and 2-point controller (hysteresis) adjustable.
- Automatic or object oriented switch-over between "heating" and "cooling".
- Deactivating the feedback control or the additional level possible using separate 1-bit objects.
- Internal and external temperature sensor for room temperature measurement possible. Configurable internal to external determination of measured value and external sensors for room temperature measurement. Request time of the externally received temperature value can be set. The room temperature measurement (actual value) can be adjusted separately for the internal and external sensor using parameters.
- The actual and setpoint temperatures can be output on the bus if a configurable deviation is detected (also periodically).
- Separate or shared command value output in heating and cooling mode. This produces one or two command value objects for each level.
- Normal or inverted command value output configurable
- Automatic transmission and cycle-time for actuating output configurable
- Command value limit possible.
- Clipping mode (response of the controller to command values = 100 %) can be set.
- Setpoint temperature limit possible in cooling mode. If necessary, the controller limits the setpoint temperature to specific values and prevents an adjustment beyond statutory limits.
- Fan controller can be operated with up to 8 fan levels.

General functions

- The device has a master button on the touch sensor surface outside the display area ○●. The master button can be linked to any KNX channel. In this way, a function, such as the switching of room lighting, can be executed quickly and easily without touch operation of the display pages. Two other sensor buttons ↵ (scroll) / ❐ (return to the start page) make it easier to navigate through the display pages and can be used alternatively for finger operation of the graphic interface.
- The device has a brightness sensor that measures the ambient lighting locally. The determined brightness value can be compared with a configured limiting value. If values fall below or exceed the limiting value, it is possible to transmit a switching telegram to the bus.
- A timer can optionally be activated. The timer, which is integrated in the device and can be configured using the ETS and via a special timer display page, has up to 8 switching times. The switching times affect KNX channels (1...30) configured in the device and can handle the data formats switching (1 bit), value 1 byte (incl. brightness value and position setting) and value 2 byte and similarly transmit telegrams to the bus.
- Different settings can be made available to the Administrator via a password-protected system page (setting of time and date, password assignment, activation of KNX programming mode).

- Integrated scene control. Internal storage of up to eight scenes with eight output channels, recall of internal scenes by means of a presettable scene number, selection of object types for the output channels; for each scene, the storage of the individual output values and the transmission of the output values can be permitted or inhibited; the individual channels can be delayed during scene recall; as scene extension, 64 scenes can be recalled and stored.
- A bus coupling unit is already permanently integrated in the device, allowing the device to be connected directly to the bus cable during commissioning.

4.2.2 Notes on software

ETS configuration and commissioning

For configuration and commissioning of the device, ETS3.0 Version f or ETS4.0.6 or higher is required. Advantages with regard to downloading (significantly shorter loading times) and parameter programming using the integrated database plug-in can be expected only if this ETS versions are used.
The necessary product database is offered in the *.VD5 format. No product database is available for ETS2 and older versions of ETS3.

4.2.3 Object table

Number of communication objects:	200 (max. object number 254 - gaps in between)
Number of addresses (max):	254
Number of assignments (max):	255

4.2.3.1 Push-button extension module

Objects for rocker or button functions

Function: Switching

Object	Function	Name	Type	DPT	Flag
0	Switching	B.Module rocker/ B.Module button 1 [1,2]	1-bit	1.xxx	C, W, T, (R) [3]

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

Function: Dimming

Object	Function	Name	Type	DPT	Flag
0	Switching	B.Module rocker/ B.Module button 1 [1,2]	1-bit	1.xxx	C, W, T, (R) [3]

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

Function: Dimming

Object	Function	Name	Type	DPT	Flag
18	Dimming	B.Module rocker/ B.Module button 1 [1,2]	4-bit	3.007	C, W, T, (R) [3]

Description 4-bit object for the transmission of relative dimming telegrams.

1: The number of rockers or buttons depends on the planned device variant.

2: The objects have been described for rocker 1 or button 1 as an example. The objects for the other rockers/buttons are defined in the same way by shifting the object number and changing the object name.

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

Function: Venetian blind

Object	Function	Name	Type	DPT	Flag
0	Short time operation	B.Module rocker/ B.Module button 1 [1,2]	1-bit	1.007	C, -, T, (R) [3]

Description 1-bit object for the transmission of telegrams with which a Venetian blind or shutter drive motor can be stopped or with which the blind slats can be adjusted by short time operation.

Function: Venetian blind

Object	Function	Name	Type	DPT	Flag
18	Long-time operation	B.Module rocker/ B.Module button 1 [1,2]	1-bit	1.008	C, W, T, (R) [3]

Description 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: 1-byte value transmitter

Object	Function	Name	Type	DPT	Flag
0	Value	B.Module rocker/ B.Module button 1 [1,2]	1 byte	5.xxx	C, W, T, (R) [3]

Description 1-byte object for the transmission of values from 0 to 255 (corresponding to values from 0 % to 100 %). If the adjustment of the value is enabled, the object can transmit telegrams cyclically after long actuation with which the value can be reduced or increased by a presettable amount.

Function: 2-byte value transmitter

Object	Function	Name	Type	DPT	Flag
0	Value	B.Module rocker/ B.Module button 1 [1,2]	2 byte	7.xxx	C, W, T, (R) [3]

Description 2-byte object for the transmission of values from 0 to 65535. If the adjustment of the value is enabled, the object can transmit cyclical telegrams after a long press with which the value can be reduced or increased by an adjustable amount.

1: The number of rockers or buttons depends on the planned device variant.

2: The objects have been described for rocker 1 or button 1 as an example. The objects for the other rockers/buttons are defined in the same way by shifting the object number and changing the object name.

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

Function: 2-byte value transmitter

Object	Function	Name	Type	DPT	Flag
0	Temperature value	B.Module rocker/ B.Module button 1 [1,2]	2 byte	9.001	C, W, T, (R) [3]

Description 2 -byte object for the transmission of a temperature value from 0 °C to 40 °C. If the adjustment of the value is enabled, the object can transmit telegrams cyclically after a long press with which the value can be reduced or increased by 1 K.

Function: 2-byte value transmitter

Object	Function	Name	Type	DPT	Flag
0	Brightness value	B.Module rocker/ B.Module button 1 [1,2]	2 byte	9.004	C, W, T, (R) [3]

Description 2-byte object for the transmission of a brightness level value from 0 to 1500 lux. If the adjustment of the value is enabled, the object can transmit cyclical telegrams after a long press with which the value can be reduced or increased by 50 lux.

Function: Scene extension

Object	Function	Name	Type	DPT	Flag
0	Scene extension	B.Module rocker/ B.Module button 1 [1,2]	1 byte	18.001	C, -, T, (R) [3]

Description 1-byte object for recalling or for storing one of 64 scenes max. from a scene push button sensor.

Function: 2-channel operation

Object	Function	Name	Type	DPT	Flag
0	Channel 1 switching	B.Module rocker/ B.Module button 1 [1,2]	1-bit	1.xxx	C, W, T, (R) [3]

Description 1-bit object for the transmission of switching telegrams, if 2-channel operation is activated.

1: The number of rockers or buttons depends on the planned device variant.

2: The objects have been described for rocker 1 or button 1 as an example. The objects for the other rockers/buttons are defined in the same way by shifting the object number and changing the object name.

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

Function: 2-channel operation

Object	Function	Name	Type	DPT	Flag
0	Channel 1 value	B.Module rocker/ B.Module button 1 [1,2]	1 byte	5.xxx	C, -, T, (R) [3]

Description 1-byte object for the transmission of value telegrams, if 2-channel operation is activated.

Function: 2-channel operation

Object	Function	Name	Type	DPT	Flag
0	Channel 1 value	B.Module rocker/ B.Module button 1 [1,2]	2 byte	9.001	C, -, T, (R) [3]

Description 2-byte object for the transmission of value telegrams, if 2-channel operation is activated.

Function: 2-channel operation

Object	Function	Name	Type	DPT	Flag
18	Channel 2 switching	B.Module rocker/ B.Module button 1 [1,2]	1-bit	1.xxx	C, W, T, (R) [3]

Description 1-bit object for the transmission of switching telegrams, if 2-channel operation is activated.

Function: 2-channel operation

Object	Function	Name	Type	DPT	Flag
18	Channel 2 value	B.Module rocker/ B.Module button 1 [1,2]	1 byte	5.xxx	C, -, T, (R) [3]

Description 1-byte object for the transmission of value telegrams, if 2-channel operation is activated.

1: The number of rockers or buttons depends on the planned device variant.

2: The objects have been described for rocker 1 or button 1 as an example. The objects for the other rockers/buttons are defined in the same way by shifting the object number and changing the object name.

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

Function: 2-channel operation

Object	Function	Name	Type	DPT	Flag
18	Channel 2 value	B.Module rocker/ B.Module button 1 [1,2]	2 byte	9.001	C, -, T, (R) [3]

Description 2-byte object for the transmission of value telegrams, if 2-channel operation is activated.

Objects for full-surface operation with rocker function (with dimming, venetian blind and 2-channel operation)

Function: Full-surface operation

Object	Function	Name	Type	DPT	Flag
1	Switching	B.Module rocker 1 Full-surface actuation [1,2]	1-bit	1.xxx	C, W, T, (R) [3]

Description 1-bit object for the transmission of switching telegrams (ON, OFF) when there is full-surface operation of an operating area.

Function: Full-surface operation

Object	Function	Name	Type	DPT	Flag
1	Scene extension	B.Module rocker 1 Full-surface actuation [1,2]	1 byte	18.001	C, -, T, (R) [3]

Description 1-byte object for recalling or for storing one of 64 scenes max. from a scene push button sensor in case of full-surface operation of an operating area.

1: The number of rockers or buttons depends on the planned device variant.

2: The objects have been described for rocker 1 or button 1 as an example. The objects for the other rockers/buttons are defined in the same way by shifting the object number and changing the object name.

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

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

Objects for status LED

Function: Status LED in case of rocker function

Object	Function	Name	Type	DPT	Flag
36	Status LED top	B.Module rocker 1[1,2]	1-bit	1.xxx	C, W, -, (R)[3]

Description 1-bit object for activation of the status LED.

Function: Status LED in case of rocker function

Object	Function	Name	Type	DPT	Flag
36	Status LED top	B.Module rocker 1[1,2]	1 byte	5.xxx, 6.xxx, 20.102	C, W, -, (R)[3]

Description 1-byte object for activation of the status LED.

Function: Status LED in case of rocker function

Object	Function	Name	Type	DPT	Flag
37	Status LED bottom	B.Module rocker 1[1,2]	1-bit	1.xxx	C, W, -, (R)[3]

Description 1-bit object for activation of the status LED.

Function: Status LED in case of rocker function

Object	Function	Name	Type	DPT	Flag
37	Status LED bottom	B.Module rocker 1[1,2]	1 byte	5.xxx, 6.xxx, 20.102	C, W, -, (R)[3]

Description 1-byte object for activation of the status LED.

Function: Status LED in case of push button function

Object	Function	Name	Type	DPT	Flag
36	Status LED	B.Module button 1[1,2]	1-bit	1.xxx	C, W, -, (R)[3]

Description 1-bit object for activation of the status LED.

1: The number of rockers or buttons depends on the planned device variant.

2: The objects have been described for rocker 1 or button 1 as an example. The objects for the other rockers/buttons are defined in the same way by shifting the object number and changing the object name.

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

Function: Status LED in case of push button function

Object	Function	Name	Type	DPT	Flag
36	Status LED	B.Module button 1[1,2]	1 byte	5.xxx, 6.xxx, 20.102	C, W, -, (R)[3]

Description 1-byte object for activation of the status LED.

Objects for alarm message

Function: Alarm signal

Object	Function	Name	Type	DPT	Flag
56	Switching	B.Alarm message	1-bit	1.xxx	C, W, -, (R)[3]

Description 1-bit object for the reception of an alarm signalling (polarity configurable).

Function: Alarm signal

Object	Function	Name	Type	DPT	Flag
57	Switching	B.Alarm message acknowledge	1-bit	1.xxx	C, -, T, (R)[4]

Description 1-bit object for transmitting the acknowledgement of an alarm signalling (polarity configurable).

1: The number of rockers or buttons depends on the planned device variant.

2: The objects have been described for rocker 1 or button 1 as an example. The objects for the other rockers/buttons are defined in the same way by shifting the object number and changing the object name.

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

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

4.2.3.2 Light scene function

Object for light scene function

Function: Light scene function

Object	Function	Name	Type	DPT	Flag
66...73	Switching	B.Scene-output 1 [1]	1-bit	1.001	C, W, T, (R) [2]

Description 1-bit objects for controlling up to eight actuator groups (ON, OFF).

Function: Light scene function

Object	Function	Name	Type	DPT	Flag
66...73	Value	B.Scene-output 1 [1]	1 byte	5.001	C, W, T, (R) [2]

Description 1-byte objects for controlling up to eight actuator groups (0…255).

Function: Light scene function

Object	Function	Name	Type	DPT	Flag
74	Extension unit input	B.Scene	1 byte	18.001	C, W, -, (R) [3]

Description 1-byte object with which one of the eight internally stored scenes can be recalled or stored again.

1: Scene outputs 2 … 8 see scene output 1, shift of the object number (66 + number of scene output - 1).

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

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

4.2.3.3 Room temperature controller

Objects for room temperature measurement

Function: Room temperature measurement

Object	Function	Name	Type	DPT	Flag
64	Actual-temperature	C.Output	2 byte	9.001	C, -, T, R

Description 2-byte object for the display of the actual temperature (room temperature), which is determined by the controller. Possible value range:
-99.9 °C to +99.9 °C / Measurement range of internal temperature sensor:
0 °C to +40 °C.
The temperature value is always output in the format "°C".

Function: Room temperature measurement

Object	Function	Name	Type	DPT	Flag
65	Received temperature	C.Input	2 byte	9.001	C, W, -, (R) [1]

Description 2-byte object for coupling an external KNX/EIB room temperature sensor. 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".

Object for setpoint temperature specification

Function: Setpoint temperature specification

Object	Function	Name	Type	DPT	Flag
80	Basic setpoint	C.Input	2 byte	9.001	C, W, -, (R) [1]

Description 2-byte object for external setting of basic 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 must always be specified in the format "°C".

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

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

Objects for operating mode change-over

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
82	Operating mode switchover	C.Input	1 byte	20.102	C, W, T, (R) [1]

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

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
82	Comfort mode	C.Input	1-bit	1.001	C, W, T, (R) [1]

Description 1-bit object for change-over to the "Comfort" operating mode. This object is only available in this way when the operating mode change-over is to take place over 4 x 1 bit (parameter-dependent).

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
83	Standby mode	C.Input	1-bit	1.001	C, W, T, (R) [1]

Description 1-bit object for change-over to the "Standby" operating mode. This object is only available in this way when the operating mode change-over is to take place over 4 x 1 bit (parameter-dependent).

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
84	Night operation	C.Input	1-bit	1.001	C, W, T, (R) [1]

Description 1-bit object for change-over to the "Night" operating mode. This object is only available in this way when the operating mode change-over is to take place over 4 x 1 bit (parameter-dependent).

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
85	Frost/ heat protection	C.Input	1-bit	1.001	C, W, T, (R) [1]

Description 1-bit object for change-over to the "Frost / heat protection" operating mode. This object is only available in this way when the operating mode change-over is to take place over 4 x 1 bit (parameter-dependent).

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

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
86	Operating mode forced-control	C.Input	1 byte	20.102	C, W, T, (R) [1]

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

Function: Operating mode change-over presence detection

Object	Function	Name	Type	DPT	Flag
87	Presence object	C.Input / Output	1-bit	1.001	C, W, T, (R) [1]

Description 1-bit object through which a motion detector or an external presence button (e. g. from a controller extension) can be linked to the controller. The object also transmits the state of a presence button of the device to the bus.
Polarity: presence detected = "1", presence not detected = "0".

Function: Operating mode change-over window status

Object	Function	Name	Type	DPT	Flag
88	Windows status	C.Input	1-bit	1.019	C, W, -, (R) [2]

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

Object for operating mode change-over

Function: Operating mode change-over

Object	Function	Name	Type	DPT	Flag
89	Heating / cooling change-over	C.Input	1-bit	1.100	C, (W), T, (R) [1]

Description 1-bit object to transmit the automatically set operating mode of the controller to specify the operating mode ("Heating" or "Cooling").
Object value "1" = Heating; Object value "0" = Cooling.

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

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

Objects for controller status

Function: Controller status

Object	Function	Name	Type	DPT	Flag
90	Controller status	C.Output	1-bit	1.001	C, -, T, (R) [1]

Description: 1-bit object for single status feedback of configured controller functions. This object is only available in this way when a part of the controller status is to be transmitted singly as 1-bit information (parameter-dependent).

Function: Controller status

Object	Function	Name	Type	DPT	Flag
90	Controller status	C.Output	1 byte	--- [2]	C, -, T, (R) [1]

Description: 1-byte object used by the controller to output the current state of operation. Only when "Controller status" = "Controller general".

Function: Controller status

Object	Function	Name	Type	DPT	Flag
90	KNX status operating mode	C.Output	1 byte	20.102	C, -, T, (R) [1]

Description: 1-byte object used by the controller to output the current operating mode. Only when "Controller status" = "KNX compliant".

Function: Controller status

Object	Function	Name	Type	DPT	Flag
108	Status signal addition	C.Output	1 byte	--- [3]	C, -, T, (R) [1]

Description: 1-byte object used by the controller to output the current enlarged state of operation.
Only when "Controller status" = "Controller general".

Function: Controller status

Object	Function	Name	Type	DPT	Flag
109	KNX status	C.Output	2 byte	22.101	C, -, T, (R) [1]

Description: 1-byte object that the controller uses to display elementary basic functions in a KNX-harmonised manner.
Only when "Controller status" = "KNX compliant".

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

2: Non-standardised DP type (in accordance with KNX AN 097/07 rev 3).

3: Non-standardised DP type.

Function: Controller status

Object	Function	Name	Type	DPT	Flag
90	KNX status operating mode	C.Output	1 byte	20.102	C, -, T, (R) [1]

Description 1-byte object used by the controller to output the operating mode in the event of forced position.
Only when "Controller status" = "KNX compliant".

Objects for heating / cooling signal functions

Function: Heating energy message

Object	Function	Name	Type	DPT	Flag
91	Heating indication	C.Output	1-bit	1.001	C, -, T, (R) [1]

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

Function: Cooling energy message

Object	Function	Name	Type	DPT	Flag
92	Cooling indication	C.Output	1-bit	1.001	C, -, T, (R) [1]

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

Objects for controller disabling functions

Function: Disable controller

Object	Function	Name	Type	DPT	Flag
94	Disable controller	C.Input	1-bit	1.001	C, W, -, (R) [2]

Description 1-bit object for deactivating the controller (activating dew point operation).
Polarity: Controller deactivated = "1", controller activated = "0".

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

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

Function: Disable controller

Object	Function	Name	Type	DPT	Flag
95	Disable additional level	C.Input	1-bit	1.001	C, W, -, (R) [1]

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

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

Function: Command value

Object	Function	Name	Type	DPT	Flag
96	Command value for heating / command value, basic heating	C.Output	1 byte	5.001	C, -, T, (R) [2]

Description 1-byte object to output the continuous command value of the heating mode. In two-level heating mode, command value output for the basic heating. This object is only available in this way if the type of feedback control is configured to "Continuous PI control".

Function: Command value

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

Description 1-bit object to output the PWM command value of the heating mode. In two-level heating mode, command value output for the basic heating. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)".

Function: Command value

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

Description 1-bit object to output the switching command value of the heating mode. In two-level heating mode, command value output for the basic heating. This object is only available in this way if the type of feedback control is configured to "Switching 2-point feedback control".

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

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

Function: Command value

Object	Function	Name	Type	DPT	Flag
96	Command value for heating/ cooling / command value, basic level	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description 1-byte object to output the combined continuous command value of the heating and cooling mode. In two-level heating/cooling mode, command value output for the basic level This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Continuous PI control".

Function: Command value

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

Description 1-bit object to output the combined PWM command value of the heating and cooling mode. In two-level heating/cooling mode, command value output for the basic level This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching PI control (PWM)".

Function: Command value

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

Description 1-bit object to output the combined switching command value of the heating and cooling mode. In two-level heating/cooling mode, command value output for the basic level This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching 2-point feedback control".

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

Function: Command value

Object	Function	Name	Type	DPT	Flag
97	Cmd. value, additional heating	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description 1-byte object to output the continuous command value for additional heating in two-level operation. This object is only available in this way if the type of feedback control is configured to "Continuous PI control".

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

Function: Command value

Object	Function	Name	Type	DPT	Flag
97	Cmd. value, add. heating (PWM)	C.Output	1-bit	1.001	C, -, T, (R) [1]

Description 1-bit object to output the continuous PWM command value for additional heating in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)".

Function: Command value

Object	Function	Name	Type	DPT	Flag
97	Cmd. value, additional heating	C.Output	1-bit	1.001	C, -, T, (R) [1]

Description 1-byte object to output the switching command value for additional heating in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching 2-point feedback control".

Function: Command value

Object	Function	Name	Type	DPT	Flag
97	Cmd. value, add. level	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description 1-byte object to output the combined continuous command value for additional level in two-level operation. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Continuous PI control".

Function: Command value

Object	Function	Name	Type	DPT	Flag
97	Cmd. value, add. level (PWM)	C.Output	1-bit	1.001	C, -, T, (R) [1]

Description 1-bit object to output the combined switching PWM command value for additional level in two-level operation. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching PI control (PWM)".

Function: Command value

Object	Function	Name	Type	DPT	Flag
97	Cmd. value, add. level	C.Output	1-bit	1.001	C, -, T, (R) [1]

Description 1-bit object to output the combined switching command value for additional level in two-level operation. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching 2-point feedback control".

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

Object for command value output, cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
98	Command value for cooling / command value, basic cooling	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description: 1-byte object to output the continuous command value of the cooling mode. In two-level cooling mode, command value output for the basic cooling. This object is only available in this way if the type of feedback control is configured to "Continuous PI control".

Function: Command value

Object	Function	Name	Type	DPT	Flag
98	Command value for cooling (PWM) / command value, basic cooling (PWM)	C.Output	1-bit	1.001	C, -, T, (R) [1]

Description: 1-bit object to output the PWM command value of the cooling mode. In two-level cooling mode, command value output for the basic cooling. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)".

Function: Command value

Object	Function	Name	Type	DPT	Flag
98	Command value for cooling / command value, basic cooling	C.Output	1-bit	1.001	C, -, T, (R) [1]

Description: 1-bit object to output the switching command value of the cooling mode. In two-level cooling mode, command value output for the basic cooling. This object is only available in this way if the type of feedback control is configured to "Switching 2-point feedback control".

Object for command value output, additional cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
99	Cmd. value, additional cooling	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description: 1-byte object to output the continuous command value for additional cooling in two-level operation. This object is only available in this way if the type of feedback control is configured to "Continuous PI control".

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

Function: Command value

Object	Function	Name	Type	DPT	Flag
99	Cmd. value, add. cooling (PWM)	C.Output	1-bit	1.001	C, -, T, (R) 1

Description 1-bit object to output the continuous PWM command value for additional cooling in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)".

Function: Command value

Object	Function	Name	Type	DPT	Flag
99	Cmd. value, additional cooling	C.Output	1-bit	1.001	C, -, T, (R) 1

Description 1-byte object to output the switching command value for additional cooling in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching 2-point feedback control".

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

Function: Command value

Object	Function	Name	Type	DPT	Flag
100	PWM command value for heating / PWM command value, basic heating	C.Output	1 byte	5.001	C, -, T, (R) 1

Description 1-byte object to output the internal continuous command value of a PWM controller of the heating mode. In two-level heating mode, command value output for the basic heating. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

Function: Command value

Object	Function	Name	Type	DPT	Flag
100	PWM command value for heating/cooling / PWM command value, basic level	C.Output	1 byte	5.001	C, -, T, (R) 1

Description 1-byte object to output the combined continuous command value of a PWM controller of the heating and cooling mode. In two-level heating/cooling mode, command value output for the basic level This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching PI control (PWM)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

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

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

Function: Command value

Object		Function	Name	Type	DPT	Flag
□↤	101	PWM cmd. value, add. heating	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description: 1-byte object to output the internal continuous command value of a PWM controller for additional heating in two-level operation. This object is only available in this way if the type of feedback control is configured to "Continuous PI control". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

Function: Command value

Object		Function	Name	Type	DPT	Flag
□↤	101	PWM comm. value, add. level	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description: 1-byte object to output the combined continuous command value of a PWM feedback controller for additional level in two-level operation. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching PI control (PWM)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

Object for additional command value output, PWM cooling

Function: Command value

Object		Function	Name	Type	DPT	Flag
□↤	102	PWM command value for cooling / PWM command value, basic cooling	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description: 1-byte object to output the internal continuous command value of a PWM feedback controller of the cooling mode. In two-level cooling mode, command value output for the basic cooling. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

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

Object for additional command value output, PWM additional cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
103	PWM cmd. value, add. cooling	C.Output	1 byte	5.001	C, -, T, (R) [1]

Description 1-byte object to output the internal continuous command value of a PWM feedback controller for additional cooling in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

Object for outputting the setpoint temperature

Function: Set temperature

Object	Function	Name	Type	DPT	Flag
104	Set temperature	C.Output	2 byte	9.001	C, -, T, R

Description 2-byte object for the output of the current temperature setpoint. Depending on the operating mode, the possible range of values is limited by the configured frost protection and/or heat protection temperature.
The temperature value is always output in the format "°C".

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

Function: Basic setpoint shifting

Object	Function	Name	Type	DPT	Flag
106	Current setpoint shifting	C.Output	1 byte	6.010	C, -, T, R

Description 1-byte object for giving feedback on the current setpoint shifting, e.g., to a controller extension. The value of a counter value in the communication object is 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.
This object is only available in this way if relative setpoint presetting is configured.

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

Function: Basic setpoint shifting

Object	Function	Name	Type	DPT	Flag
107	Preset setpoint shifting	C.Input	1 byte	6.010	C, W, -, (R) [1]

Description: 1-byte object for setting a basic setpoint shifting, e.g. of a controller extension. The value of a counter value in the communication object is 0.5 K. The value "0" means that no shift is active. The value is depicted in a double complement in the positive and negative direction.
In case the limits of the value range are exceeded by the preset external value, the controller will automatically reset the received value to the minimum and maximum limits.
This object is only available in this way if relative setpoint presetting is configured.

Object for command value limit

Function: Command value limit

Object	Function	Name	Type	DPT	Flag
111	Command value limit	C.Input	1-bit	1.001	C, W, -, (R) [1]

Description: 1-bit object for activating or deactivating the command value limit.
Polarity: Limitation activated ="1", Limitation deactivated = "0".

Objects for fan control

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
114	Ventilation, automatic/manual	C.Input	1-bit	1.001	C, W, T, (R)[2]

Description: 1-bit object to change-over the operating mode of the fan controller (configurable polarity). When the operating mode is changed over using a push-button function, a telegram matching the current status is transmitted to the bus.

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
115	Ventilation, fan level 1-8	C.Output	1 byte	5.010	C, -, T, R

Description: 1-byte object for value-guided activation of the fan levels. This object is only available in this way when the fan control is to take place over 1 byte (parameter-dependent).

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

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

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
115	Ventilation, fan level 1	C.Output	1-bit	1.001	C, -, T, R

Description 1-bit object for switching activation of the first fan level. This object is only available in this way when the fan control is to take place over 8 x 1 bit and at least one fan level is enabled (parameter-dependent).

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
116	Ventilation, fan level 2	C.Output	1-bit	1.001	C, -, T, R

Description 1-bit object for switching activation of the second fan level. This object is only available when the fan control is to take place over 8 x 1 bit and at least two fan levels are enabled (parameter-dependent).

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
117	Ventilation, fan level 3	C.Output	1-bit	1.001	C, -, T, R

Description 1-bit object for switching activation of the third fan level. This object is only available when the fan control is to take place over 8 x 1 bit and at least three fan levels are enabled (parameter-dependent).

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
118	Ventilation, fan level 4	C.Output	1-bit	1.001	C, -, T, R

Description 1-bit object for switching activation of the fourth fan level. This object is only available when the fan control is to take place over 8 x 1 bit and at least four fan levels are enabled (parameter-dependent).

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
119	Ventilation, fan level 5	C.Output	1-bit	1.001	C, -, T, R

Description 1-bit object for switching activation of the fifth fan level. This object is only available when the fan control is to take place over 8 x 1 bit and at least five fan levels are enabled (parameter-dependent).

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
120	Ventilation, fan level 6	C.Output	1-bit	1.001	C, -, T, R

Description 1-bit object for switching activation of the sixth fan level. This object is only available when the fan control is to take place over 8 x 1 bit and at least six fan levels are enabled (parameter-dependent).

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
121	Ventilation, fan level 7	C.Output	1-bit	1.001	C, -, T, R

Description: 1-bit object for switching activation of the seventh fan level. This object is only available when the fan control is to take place over 8 x 1 bit and at least seven fan levels are enabled (parameter-dependent).

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
122	Ventilation, fan level 8	C.Output	1-bit	1.001	C, -, T, R

Description: 1-bit object for switching activation of the eighth fan level. This object is only available when the fan control is to take place over 8 x 1 bit and at least eight fan levels are enabled (parameter-dependent).

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
123	Ventilation, forced position	C.Input	1-bit	1.001	C, W, -, (R) [1]

Description: 1-bit object for activation of the fan forced position. Polarity: Forced position ON = "1"; Forced position OFF = "0".

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
124	Ventilation, level limit	C.Input	1-bit	1.001	C, W, -, (R) [1]

Description: 1-bit object for activation of the fan level limitation. Polarity: Fan level limitation ON = "1"; Fan level limitation OFF = "0".

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
125	Ventilation, fan protection	C.Input	1-bit	1.001	C, W, -, (R) [1]

Description: 1-bit object for activating the fan protection. Polarity: Fan protection ON = "1" / Fan protection OFF = "0".

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

Function: Fan controller

Object	Function	Name	Type	DPT	Flag
129	Ventilation visualisation	C.Output	1 byte	5.010	C, -, T, R

Description 1-byte object for additional value-guided acknowledgement of the active fan level. Value meaning: "0" = Fan OFF, "1" = level 1 active, "2" = level 2 active, ..., "8" = level 8 active.

Object for determining the outdoor temperature

Function: Determination of the outdoor temperature

Object	Function	Name	Type	DPT	Flag
126	Outdoor temperature	C.Input	2 byte	9.001	C, W, -, (R) [1]

Description 2-byte object for detecting the outdoor temperature Possible range of values: -99.9 °C to +99.9 °C.
The temperature value must always be specified in the format "°C".

Object for limiting the setpoint temperature

Function: Setpoint temperature limit

Object	Function	Name	Type	DPT	Flag
127	Limit of cooling setpoint temperature	C.Input	1-bit	1.001	C, W, -, (R) [1]

Description 1-bit object for activating the setpoint temperature limit for the cooling operating mode. Polarity:
Setpoint temperature limit ON = "1"; Setpoint temperature limit OFF = "0".

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

4.2.3.4 Display

Objects for date and time

Function: Setting time

Object	Function	Name	Type	DPT	Flag
130	Time	D.Input	3 byte	10.001	C, W, -, (R) [1]

Description 3-byte object for setting the time of the internal system clock. The system clock controls the display of the time in the device display and timer.
The real time clock has a calendar function. Depending on the date set (see object 131), the day is determined automatically by means of the internal calendar which is necessary for processing the timer. The day transmitted in the KNX time telegram in compliance with DPT 10.001 is irrelevant and is discarded by the device.
The device handles times via the bus or locally on the device in the administrator area equally. The last presetting sets the system clock

Function: Setting the date

Object	Function	Name	Type	DPT	Flag
131	Date	D.Input	3 byte	11.001	C, W, -, (R) [1]

Description 3-byte object for setting the date of the internal system clock. The system clock controls the display of the date in the device display and timer.
The real time clock has a calendar function. Depending on the date set, the day is determined automatically by means of the internal calendar which is necessary for processing the timer.
The device handles dates via the bus or locally on the device in the administrator area equally. The last presetting sets the system clock

Function: Request time

Object	Function	Name	Type	DPT	Flag
131	Request time	D.Output	1-bit	1.001	C, -, T, (R) [2]

Description 1-bit object for requesting a time synchronization. The request object of a KNX system clock can optionally be activated by this object. If the existing KNX clock supports this function, it sends back a time telegram to the device as a response to the request, which ensures that a valid time is set immediately after a device reset.

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

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

Object for activating the display background light

Function: Switching backlighting

Object	Function	Name	Type	DPT	Flag
133	Backlighting On/Off	D.Input	1-bit	1.001	C, W, -, (R) [1]

Description 1-bit object to switch the backillumination of the LC display (polarity configurable).

Object to evaluate the internal brightness sensor

Function: Evaluation of the brightness sensor

Object	Function	Name	Type	DPT	Flag
134	Lim. val. of brightness sensor	D.Output	1-bit	1.001	C, -, T, R

Description 1-bit object for transmitting a switching telegram if values fall below or exceed the configured brightness limiting value. If the preset limiting value is exceeded, a "1" telegram is transmitted. As soon as values fall below the limiting value less the set hysteresis, the object transmits a "0" telegram.

Objects of the KNX channels

Function: Channel function "switching"

Object	Function	Name	Type	DPT	Flag
135	Switching	D.Output Channel 1 [2]	1-bit	1.xxx	C, W, T, (R) [3]

Description 1-bit object for transmitting a switching telegram (ON, OFF) if the sensor element is touched. This can cause a switching channel of a KNX switch actuator to be activated immediately, for example.

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

2: The objects have been described for channel 1 as an example. The objects for the other channels are defined in the same way by shifting the object number and changing the object name.

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

Function: Channel function "switching"

Object		Function	Name	Type	DPT	Flag
□↤	137	Switching feedback	D.Output Channel 1 [1]	1-bit	1.xxx	C, W, T, (R) [2]

Description 1-bit object for giving feedback on a switching state to the device. This influences the status text and status icon that can be displayed in the display area of the channel element. The feedback of the switching status must be transmitted by the "actively transmitting" actuator. If the activated KNX switch actuator does not have a separate status feedback, this object can be linked with the object "D.Output channel x - switching" via an identical group address.

Function: Channel function "Dimming (Start/Stop)"

Object		Function	Name	Type	DPT	Flag
□↤	135	Dimming (Switching)	D.Output Channel 1 [1]	1-bit	1.xxx	C, W, T, (R) [2]

Description 1-bit object for transmitting a switching telegram (ON, OFF) after a short touch of the sensor element. This can cause a switching channel of a KNX switch actuator to be activated immediately, for example.

Function: Channel function "Dimming (Start/Stop)"

Object		Function	Name	Type	DPT	Flag
□↤	136	Dimming (Start/Stop)	D.Output Channel 1 [1]	4-bit	3.007	C, W, T, (R) [2]

Description 4-bit object for transmitting dimming telegrams (step width: 100%) if the sensor element is touched for a long time. A connected lighting system is dimmed as a result. A stop telegram is triggered via this object by releasing the sensor element.

Function: Channel function "Dimming (Start/Stop)"

Object		Function	Name	Type	DPT	Flag
□↤	137	Dimming Feedb. Brightness value	D.Output Channel 1 [1]	1 byte	5.001	C, W, T, (R) [2]

Description 1-byte object for receiving brightness value telegrams that a dimmer actuator transmits, for example. The status value, status icon and bar graph are influenced as a result. The feedback of the brightness value must be transmitted by the "actively transmitting" actuator.
The decimal data values 0...255 are evaluated as percentages 0...100 % and displayed in the device display.

1: The objects have been described for channel 1 as an example. The objects for the other channels are defined in the same way by shifting the object number and changing the object name.

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

Function: Channel function "Dimming (Brightness value)"

Object	Function	Name	Type	DPT	Flag
135	Dimming (Brightness value)	D.Output Channel 1 [1]	1 byte	5.001	C, W, T, (R) [2]

Description 1-bit object for transmitting brightness value telegrams (0...255) if the sensor element is touched. This can cause a dimmer actuator to be activated.
The transmitted decimal data values 0...255 must be evaluated by the actuator as percentages 0...100 %.

Function: Channel function "Dimming (Brightness value)"

Object	Function	Name	Type	DPT	Flag
137	Dimming Feedb. Brightness value	D.Output Channel 1 [1]	1 byte	5.001	C, W, T, (R) [2]

Description 1-byte object for receiving brightness value telegrams that a dimmer actuator transmits, for example. The status value, status icon and bar graph are influenced as a result. The feedback of the brightness value must be transmitted by the "actively transmitting" actuator. If the activated KNX dimmer actuator does not have a separate brightness value feedback, this object can be linked with the object "D.Output channel x - dimming (brightness value)" via an identical group address.
The decimal data values 0...255 are evaluated as percentages 0...100 %.

Function: Channel function "Venetian blind (Step/Move/Step)

Object	Function	Name	Type	DPT	Flag
135	Venetian blind (Step)	D.Output Channel 1 [1]	1-bit	1.007	C, -, T, (R) [2]

Description 1-bit object for the transmission of telegrams with which a Venetian blind or shutter drive motor can be stopped or the blind slats can be adjusted by short time operation after a short touch of the sensor element.

Function: Channel function "Venetian blind (Step/Move/Step)

Object	Function	Name	Type	DPT	Flag
136	Venetian blind (Move)	D.Output Channel 1 [1]	1-bit	1.008	C, W, T, (R) [2]

Description 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 after a long press of the sensor element.

1: The objects have been described for channel 1 as an example. The objects for the other channels are defined in the same way by shifting the object number and changing the object name.

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

Function: Channel function "Venetian blind (Step/Move/Step)

Object	Function	Name	Type	DPT	Flag
137	Dimming Feedb. Blind/shutter height	D.Output Channel 1 [1]	1 byte	5.001	C, W, -, (R) [2]

Description 1-byte object for receiving position feedback telegrams for the blind/shutter height, which a blind or rolling shutter actuator transmits, for example. The status value, status icon and bar graph for the blind/shutter height visualisation are influenced as a result. The feedback of the position value must be transmitted by the "actively transmitting" actuator.
The decimal data values 0...255 are evaluated as percentages 0...100 % and displayed in the device display.

Function: Channel function "Venetian blind (Step/Move/Step)

Object	Function	Name	Type	DPT	Flag
138	Dimming Feedb. Slat pos.	D.Output Channel 1 [1]	1 byte	5.001	C, W, -, (R) [2]

Description 1-byte object for receiving position feedback telegrams for the slat position, which a shutter actuator transmits, for example. The status value, status icon and bar graph for the slat visualisation are influenced as a result. The feedback of the position value must be transmitted by the "actively transmitting" actuator.
The decimal data values 0...255 are evaluated as percentages 0...100 % and displayed in the device display.

Function: Channel function "Blind (position)"

Object	Function	Name	Type	DPT	Flag
135	Position of blind	D.Output Channel 1 [1]	1 byte	5.001	C, -, T, (R) [3]

Description 1 byte object to transmit value telegrams (0 ...255) for the blind/shutter height setting. This can cause a blind position object (e.g. "Position Venetian blind", "Position rolling shutter/awning", "Position venting louver"...) of a blind or shutter actuator to be activated.
The transmitted decimal data values 0...255 must be evaluated by the actuator as percentages 0...100 %.

Function: Channel function "Blind (position)"

Object	Function	Name	Type	DPT	Flag
136	Venetian blind slat position	D.Output Channel 1 [1]	1 byte	5.001	C, -, T, (R) [3]

Description 1 byte object to transmit value telegrams (0 ...255) for the slat position setting. This can cause a slat position object of a shutter actuator to be activated.
The transmitted decimal data values 0...255 must be evaluated by the actuator as percentages 0...100 %.

1: The objects have been described for channel 1 as an example. The objects for the other channels are defined in the same way by shifting the object number and changing the object name.

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

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

Function: Channel function "Blind (position)"

Object	Function	Name	Type	DPT	Flag
137	Dimming Feedb. Blind/shutter height	D.Output Channel 1 [1]	1 byte	5.001	C, W, -, (R) [2]

Description: 1-byte object for receiving position feedback telegrams for the blind/shutter height, which a blind or rolling shutter actuator transmits, for example. The status value, status icon and bar graph for the blind/shutter height visualisation are influenced as a result. The feedback of the position value must be transmitted by the "actively transmitting" actuator.
The decimal data values 0...255 are evaluated as percentages 0...100 % and displayed in the device display.

Function: Channel function "Blind (position)"

Object	Function	Name	Type	DPT	Flag
138	Dimming Feedb. Slat pos.	D.Output Channel 1 [1]	1 byte	5.001	C, W, -, (R) [2]

Description: 1-byte object for receiving position feedback telegrams for the slat position, which a shutter actuator transmits, for example. The status value, status icon and bar graph for the slat visualisation are influenced as a result. The feedback of the position value must be transmitted by the "actively transmitting" actuator.
The decimal data values 0...255 are evaluated as percentages 0...100 % and displayed in the device display.

Function: Channel function "Scene extension"

Object	Function	Name	Type	DPT	Flag
135	Scene extension	D.Output Channel 1 [1]	1 byte	18.001	C, -, T, (R) [3]

Description: 1-byte object for recalling or for storing one of 64 scenes max. from a scene push button sensor.

Function: Channel function "1-byte value transmitter"

Object	Function	Name	Type	DPT	Flag
135	1-byte value transmitter	D.Output Channel 1 [1]	1 byte	5.001, 5.010	C, -, T, (R) [3]

Description: 1 byte object to transmit value telegrams (0 ...255). This can cause, for example, a limiting value object, brightness value object or blind position object to be activated.
The configured "function" in the ETS defines how the transmitted or received values of this area are to be interpreted.

1: The objects have been described for channel 1 as an example. The objects for the other channels are defined in the same way by shifting the object number and changing the object name.

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

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

Function: Channel function "1-byte value transmitter"

Object	Function	Name	Type	DPT	Flag
137	1-byte value transm. feedback	D.Output Channel 1 [1]	1 byte	5.001, 5.010	C, W, T, (R) [2]

Description: 1-byte object for receiving brightness value feedbacks that an activated actuator transmits, for example. The status value, status icon and bar graph for the value visualization are influenced as a result. The feedback of the value must be transmitted by the "actively transmitting" actuator.
If the activated bus device does not have a feedback function, this object can be linked with the object "D.Output channel x - 1-byte value transmitter" via an identical group address.

Function: Channel function "2-byte value transmitter"

Object	Function	Name	Type	DPT	Flag
135	2-byte value transmitter	D.Output Channel 1 [1]	2 byte	9.0xx	C, -, T, (R) [2]

Description: 2 byte object to transmit value telegrams. This can cause, for example, a temperature object, brightness value object or an object with similar functionality in compliance with KNX DPT 9.0xx to be activated.

Function: Channel function "2-byte value transmitter"

Object	Function	Name	Type	DPT	Flag
137	2-byte value transm. feedback	D.Output Channel 1 [1]	2 byte	9.0xx	C, W, T, (R) [2]

Description: 2-byte object for receiving brightness value feedbacks that an activated actuator transmits, for example. The status value, status icon and bar graph for the value visualization are influenced as a result. The feedback of the value must be transmitted by the "actively transmitting" actuator.
If the activated bus device does not have a feedback function, this object can be linked with the object "D.Output channel x - 2-byte value transmitter" via an identical group address.

Function: Channel function "ASCII Text"

Object	Function	Name	Type	DPT	Flag
137	ASCII text 1	D.Input Channel 1[1]	14 byte	16.000	C, W, T, (R) [2]

Description: 14-byte object, which can receive ASCII character chains of maximum 14 characters to show a running text on the display.

1: The objects have been described for channel 1 as an example. The objects for the other channels are defined in the same way by shifting the object number and changing the object name.

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

Function: Channel function "ASCII Text"

Object	Function	Name	Type	DPT	Flag
138	ASCII text 2	D.Input Channel 1[1]	14 byte	16.000	C, W, T, (R) [2]

Description 14-byte object, which can receive ASCII character chains of maximum 14 characters to show a running text on the display (Part 2 of the running text).

Objects for weather stations display page (alternative to KNX channels 24...30)

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
227	Visual. Wind speed	W.Wind speed	2 byte	9.005	C, W, -, (R) [3]

Description 2-byte object to receive a value telegram for the determined wind speed of a KNX weather station. The measured value must be made available to the device via the bus in "m/s" in compliance with KNX DPT 9.005. According to the parameter setting of the measured value, a conversion and display in the formats "m/s", "km/h" or "Bft (Beaufort)" takes place if necessary.

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
228	Visualization of precipitation	W.Precipitation	1-bit	1.xxx	C, W, -, (R) [3]

Description 1 bit object to receive a switching telegram with which the precipitation situation ("0" = no rain / "1" = rain) can be visualized.

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
229	Visual. Brightness sensor 1	W.Brightness sensor 1	2 byte	9.004	C, W, -, (R) [3]

Description 2-byte object to receive a value telegram for any brightness value (e.g. "Sun East" of a KNX weather station). The measured value must be made available to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The brightness measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The measured value is converted by the device so that it is displayed in "kLux".

1: The objects have been described for channel 1 as an example. The objects for the other channels are defined in the same way by shifting the object number and changing the object name.

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

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

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
230	Visual. Brightness sensor 2	W.Brightness sensor 2	2 byte	9.004	C, W, -, (R) [1]

Description 2-byte object to receive a value telegram for any brightness value (e.g. "Sun South" of a KNX weather station). The measured value must be made available to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The brightness measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The measured value is converted by the device so that it is displayed in "kLux".

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
231	Visual. Brightness sensor 3	W.Brightness sensor 3	2 byte	9.004	C, W, -, (R) [1]

Description 2-byte object to receive a value telegram for any brightness value (e.g. "Sun West" of a KNX weather station). The measured value must be made available to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The brightness measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The measured value is converted by the device so that it is displayed in "kLux".

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
232	Visual. Max. brightness	W.Max. brightness	2 byte	9.004	C, W, -, (R) [1]

Description 2-byte object to receive a value telegram for any brightness value (e.g. "Maximum brightness" of a KNX weather station). The measured value must be made available to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The brightness measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The measured value is converted by the device so that it is displayed in "kLux".

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
233	Visual. Twilight	W.Twilight	2 byte	9.004	C, W, -, (R) [1]

Description 2-byte object to receive a value telegram for a twilight measured value of a KNX weather station. The measured value must be made available to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The display is in the same format.

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

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
234	Azimuth visualisation	W.Azimuth	1 byte	5.003	C, W, -, (R) 1

Description 1-byte object to receive a value telegram for the current sun status (azimuth angle). The measured value must be made available to the device via the bus in the format "°" (0...360) in compliance with KNX DPT 5.003. The display is in the same format.

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
235	Elevation visualization	W.Elevation	1 byte	5.003	C, W, -, (R) 1

Description 1-byte object to receive a value telegram for the current sun status (elevation angle). The measured value must be made available to the device via the bus in the format "°" (0...360) in compliance with KNX DPT 5.003. The display is in the same format.

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
236	Outdoor temp. visualization	W.Outdoor temperature	2 byte	9.001	C, W, -, (R) 1

Description 2-byte object to receive a value telegram for the outdoor temperature of a KNX weather station. The measured value must be made available to the device via the bus in the format "°C" in compliance with KNX DPT 9.001. According to the parameter setting of the measured value, a conversion and display in the formats "°C" or "°F" takes place if necessary.

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
237	Visualization external value 1	W.External value 1	2 byte	9.xxx	C, W, -, (R) 1

Description 2-byte object to receive and display any value telegram in compliance with KNX DPT 9.xxx. The display format of the external value can be adapted by gain, offset, and by the number of places before and after the decimal point.

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
238	Visualization external value 2	W.External value 2	2 byte	9.xxx	C, W, -, (R) 1

Description 2-byte object to receive and display any value telegram in compliance with KNX DPT 9.xxx. The display format of the external value can be adapted by gain, offset, and by the number of places before and after the decimal point.

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

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
239	Visualization external value 3	W.External value 3	2 byte	9.xxx	C, W, -, (R) [1]

Description 2-byte object to receive and display any value telegram in compliance with KNX DPT 9.xxx. The display format of the external value can be adapted by gain, offset, and by the number of places before and after the decimal point.

Function: Weather station display

Object	Function	Name	Type	DPT	Flag
240	Visualization external value 4	W.External value 4	2 byte	9.xxx	C, W, -, (R) [1]

Description 2-byte object to receive and display any value telegram in compliance with KNX DPT 9.xxx. The display format of the external value can be adapted by gain, offset, and by the number of places before and after the decimal point.

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
241	Limiting value Wind speed	W.Lim. value wind speed	1-bit	1.xxx	C, W, -, (R) [1]

Description 1-bit object to receive a limiting value telegram for the wind speed.
"0" = limiting value inactive, "1" = limiting value active

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
242	Limiting value Brightness sensor 1	W.Lim. value brightness sensor 1	1-bit	1.xxx	C, W, -, (R) [1]

Description 1-bit object to receive a limiting value telegram for the first brightness value.
"0" = limiting value inactive, "1" = limiting value active

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
243	Limiting value Brightness sensor 2	W.Lim. value brightness sensor 2	1-bit	1.xxx	C, W, -, (R) [1]

Description 1-bit object to receive a limiting value telegram for the second brightness value.
"0" = limiting value inactive, "1" = limiting value active

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

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
244	Limiting value Brightness sensor 3	W.Lim. value brightness sensor 3	1-bit	1.xxx	C, W, -, (R) 1

Description 1-bit object to receive a limiting value telegram for the third brightness value.
"0" = limiting value inactive, "1" = limiting value active

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
245	Limiting value max. brightness	W.Limiting value MaxBrightness	1-bit	1.xxx	C, W, -, (R) 1

Description 1-bit object to receive a limiting value telegram for the measured value of the maximum brightness.
"0" = limiting value inactive, "1" = limiting value active

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
246	Limiting value twilight	W.Limiting value twilight	1-bit	1.xxx	C, W, -, (R) 1

Description 1-bit object to receive a limiting value telegram for the twilight measured value.
"0" = limiting value inactive, "1" = limiting value active

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
247	Lim. val. outdoor temperature	W.Limiting value outdoor temperature	1-bit	1.xxx	C, W, -, (R) 1

Description 1-bit object to receive a limiting value telegram for the measured value of the outdoor temperature.
"0" = limiting value inactive, "1" = limiting value active

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
248	Limiting value ext. value 1	W.Limiting value external value 1	1-bit	1.xxx	C, W, -, (R) 1

Description 1-bit object to receive a limiting value telegram for the first external measured value.
"0" = limiting value inactive, "1" = limiting value active

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

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
249	Limiting value ext. value 2	W.Limiting value external value 2	1-bit	1.xxx	C, W, -, (R) [1]

Description 1-bit object to receive a limiting value telegram for the second external measured value.
"0" = limiting value inactive, "1" = limiting value active

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
250	Limiting value ext. value 3	W.Limiting value external value 3	1-bit	1.xxx	C, W, -, (R) [1]

Description 1-bit object to receive a limiting value telegram for the third external measured value.
"0" = limiting value inactive, "1" = limiting value active

Function: Limiting value monitoring for weather station display

Object	Function	Name	Type	DPT	Flag
251	Limiting value ext. value 4	W.Limiting value external value 4	1-bit	1.xxx	C, W, -, (R) [1]

Description 1-bit object to receive a limiting value telegram for the fourth external measured value.
"0" = limiting value inactive, "1" = limiting value active

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

4.2.4 Functional description

4.2.4.1 Display functions

The Smart Control is a control and display unit for controlling and visualising building functions. The device has a TFT graphic colour screen (10.9 cm, 800 x 480 pixels, 16.7 million colours) with a touchscreen sensor surface. The display elements are operated by simply touching the glass surface directly.

4.2.4.1.1 Display structure

Start screen

The Smart Control has a powerful processor with an integrated Linux operating system. After switching on the device power supply, the processor automatically starts a booting process. During this process, the device starts the operating system and all required software packages and executes an initialization of the data configuration.
The booting process needs some time. During the booting process, a start screen is displayed with a progression bar to indicate that the device will soon be ready for operation (figure 8). In this state, the display and any push-button extension module that is possibly connected cannot be operated. The device display first displays the configured display pages after the booting process has been completed. An operation is only possible then as well.

Figure 8: Start screen

ⓘ The display shows programming screen during an ETS programming operation (see page 15-16). After completion of the programming operation, the device stores the new configuration into the device memory. This operation takes some time. In this state, the device still displays the programming screen. After this, the device initialises the control and display elements. In this state, the start screen is displayed. Afterwards, the device is immediately ready again for operation.

ⓘ As long as the device has not yet been programmed with application data in the ETS, a demo project is present in the device. The demo project can be recalled by pressing the "Demo" button with your finger, which is visible in the delivery state in the start screen. The demo project displays various control and display elements as an example and enables navigation through different display pages. With the demo project, configurable device functions can be clearly displayed for presentation purposes.

ⓘ In the unprogrammed delivery state, the "programming mode" button is visible in the start screen after booting. After pressing this button, the KNX programming mode can be activated immediately, in order to program the physical address, for example.

Main menu level, rooms and function units

In order to make optimum use of the wide range of operating and display functions, the device has a user interface that is clearly and logically structured according to functions, rooms and favourites. This ensures intuitive handling of the building control system. Up to 30 KNX controllable channels (switching, dimming, blind, ...) can be subdivided in up to 8 different rooms. The individual rooms are recalled via a room page in which the functions of each room can be controlled centrally and efficiently.
In addition, the controllable channels are also allocated to function units (light, shading, heating, ...). Up to 8 function units, whose names can be specified in the plug-in, are available for assignment. Function units can be recalled via a function page in which room-independent and function-oriented control of the building functions is possible.
Names can be assigned to rooms and function units to be created in the plug-in. These are applied at points at which room and function unit allocations can be made, and displayed.
The control and display elements on the graphic interface are arranged in a standardized designed so that the display is identical on all display pages and operating steps are simplified considerably.

After switching on the device, the display first displays the main menu level. The main menu level contains up to four display pages...

- Start page
- Favourite page
- Room page
- Function page

The start page and favourite page can be hidden via parameters in the ETS if required. In this case, the number of available display pages in the main menu level will be limited accordingly.
From the main menu level, the lower level menus can be accessed by touch operation (room control, function control, system settings).
If no operation takes place anymore in the lower level menus, the display returns time-controlled to the main menu level. The time after which this return takes place can be configured in the ETS. If the start page is available, the return is always to the start page. If the start page should not be available by definition, the return is always to the favourite page, or - if the favourites are not available either - to the room page.
Thus, the display pages of the main menu level always characterise the basic display of the Smart Control provided that the device was not operated for some time.

<u>The start page</u>
Frequently used operating functions or central functions can be stored on the start page. The start page has a defined display grid. The functions can be operated either by selection operation or direct operation (see page 76-77). Depending on this operation concept, one, two or even four KNX controllable channels in the ETS can be linked to the start page. If a channel is linked, the operating and display elements of the corresponding channel appear as a function on the start page (figure 9).

The maximum of 4 operational functions ensure that the start page is very clearly structured. There are no submenus or additional navigation elements either. Thus, the channels can be operated quickly and clearly and their status can be read at a glance.

The current time is displayed on the start page in the upper display area provided that the time display is enabled in the ETS. The start page can be completely hidden optionally in the ETS. If the start page is available, a time-controlled return to this display page takes place. The start page thus corresponds to the basic display of the Smart Control.

Figure 9: Example of a start page (2-gang display grid with direct operation)

<u>The favourite page</u>
The favourite page can be used to concentrate essential operating and display functions at a central place in the device. The favourite page has a defined display grid. The functions on the favourite page can be operated either by selection operation or direct operation (see page 76-77). Depending on this operation concept, one, two or even four KNX controllable channels in the ETS can be linked to the favourite page. If a channel is linked, the operating and display elements of the corresponding channel appear as a function on the favourite page (figure 10).

The maximum of 4 operational functions ensure that the favourite page is very clearly structured as well. Since there are no submenus or additional navigation elements, the channels can be operated quickly and clearly and their status can be read at a glance.
The favourite page can be completely hidden optionally in the ETS.

Figure 10: Example of a favourite page (4-gang display grid with selection operation)

<u>The room page</u>
Each KNX channel must be allocated to a room (area of operation). Channels can be operated and visualized room-oriented via the room page. All rooms (1...8) that were created in the ETS PlugIn are available on the room page. Each room has a sensor surface that can be touched. The room-oriented submenus are recalled by touching the sensor surface (see page 70). The rooms are each identified in the sensor surface by the name that was entered individually in the ETS (e.g. "living", "sleeping" "bath").

4 rooms are always displayed simultaneously on the room page. If more than 4 rooms are configured, the room list can be switched by the sensor surfaces ﹀ / ︿ or alternatively by a vertical movement of your finger. If there are less than 4 rooms, placeholder surfaces without names are displayed for the rooms that have not been created. These placeholder surfaces have no function.

The room page is always visible in the main menu level. At least one room has always been created.

ⓘ A KNX channel is allocated to a room in the parameter node of the corresponding channel. The channels can normally be allocated to one of the maximum 8 rooms. Hence, it is also possible to allocate a channel to a room which is not visible on the room page, because it was not created in the configuration of the rooms in the parameter node "Display -> Rooms". In this case, the KNX channel concerned cannot be accessed via the room page! It is generally recommendable to assign KNX channels only to rooms that are also available in the room configuration.

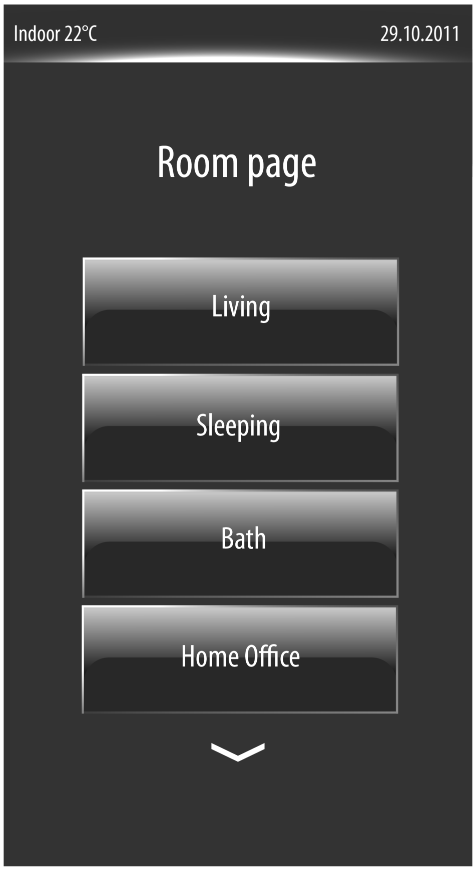


Figure 11: Example of a room page

The function page
Each controllable KNX channel is allocated to a function unit (light, shading, heating, ...). Up to 8 function units are available for assignment. The first 4 function units are enabled as standard and defined as follows: Function unit 1 = "Light", Function unit 2 = "Venetian blind", Function unit 3 = "Temperature", Function unit 4 = "Scenes". The designation and the symbol of the function unit can be adapted according to the user. It is possible to plan 4 additional function units as an option and configure them with freely definable names in the ETS. A display icon must be assigned to each user-defined function unit. A collection of 20 symbols is available in the ETS for this purpose (figure 12).

Figure 12: Assignable symbols for the function units

Furthermore, the device has 5 additional functions in special menu environments which are independent of the function units. A separate display symbol is assigned to each function. The available functions include the timer (optionally visible), the display page of the weather station (optionally visible), the room temperature controller page (optionally visible), the administrator area for settings (always visible) and the disabling function for cleaning the sensor surface (always visible).
All the different function units and aforementioned functions are available on the function page.

The function page contains display elements in the form of square or rectangular tiles. Each function unit and function has its own tile. The tile bears the function unit or function symbol for identification. The function-oriented submenus are recalled by touching the sensor surface of a tile (see page 74-75).
The function page is always visible in the main menu level.

i The number and form of the visible tiles and the arrangement of the icons on the tiles depends on the number of configured function units and functions. The icons, and consequently, the function units are assigned automatically to the tiles. Visible tiles without assignment have no icon and no function.

Figure 13: Example of a function page with 3 function units (, ,) and administrator area and disabling function for cleaning

ⓘ A KNX channel is allocated to a function unit in the parameter node of the corresponding channel. The channels can normally be allocated to one of the maximum 8 function units. Hence, it is also possible to allocate a channel to a function unit which is not visible on the function page, because it was not created in the configuration of the function units in the parameter node "Display -> Function units". In this case, the KNX channel concerned cannot be accessed via the function page!
It is generally recommendable to assign KNX channels only to function units that are also available in the function unit configuration.

Navigation in the main menu level

The display pages of the main menu level can be selected in sequence and thus displayed. The display sequence is fixed:
Start page (if available) -> favourite page (if available) -> room page -> function page -> ... (figure 14).

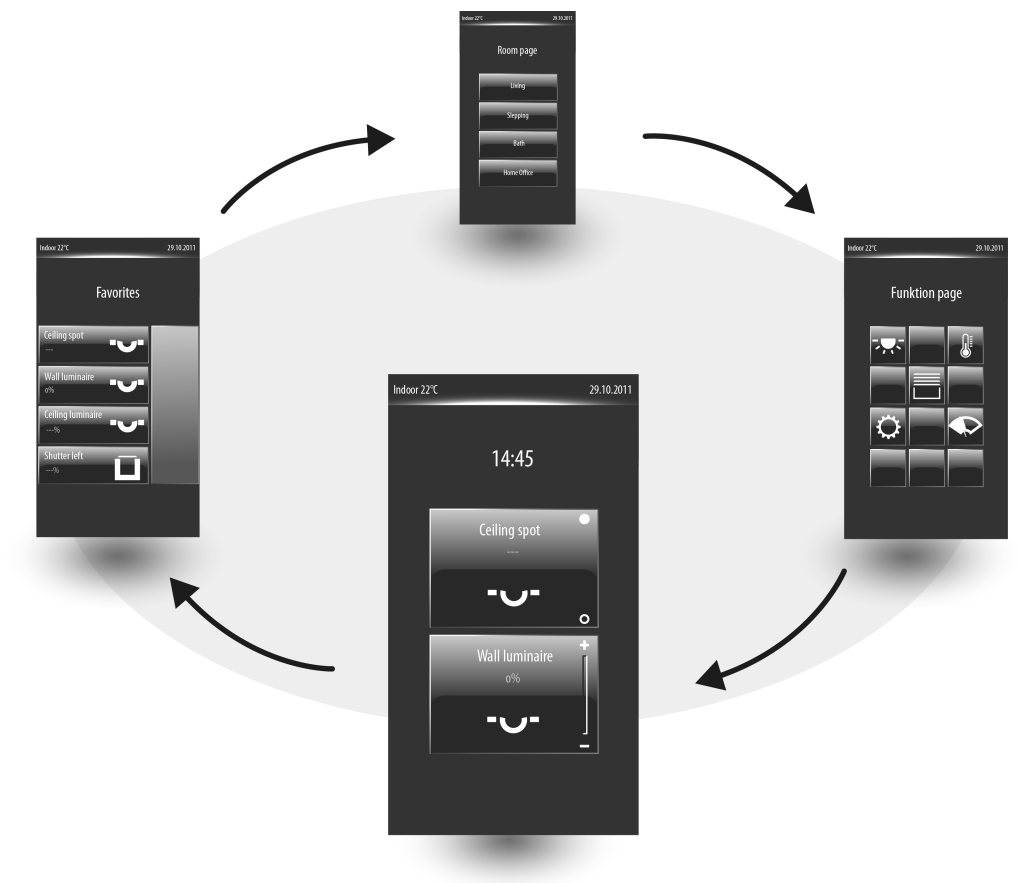


Figure 14: Main menu navigation

It is possible to navigate between the pages by finger-touch-screen operation by pressing and pulling (just like with many smart phones). This ensures intuitive operation of the display pages. To switch-over a display page, position your finger with slight pressure on the middle axis of the display (1.) and then move it immediately left or right (2.) (figure 15). The direction of your finger movement after positioning specifies the switch-over direction of the display page. The display page moves synchronously to the movement of your finger. The page will first switch over when your finger leaves the display sideways or is lifted from the glass surface on the edge of the display.

- You must not move your finger to hastily to switch over a display page. When positioning your finger on the glass surface, no areas containing operating elements should be touched if possible. This can cause operating commands to be executed if you keep your finger pressed down without moving it left or right. The lower edge of the display normally allows you to switch over display pages.
- Not only can display pages of the main menu level be switched over by finger-touch-screen operation. Is is also possible to switch over on many lower level display pages by finger-touch-screen operation (e.g. room operation).

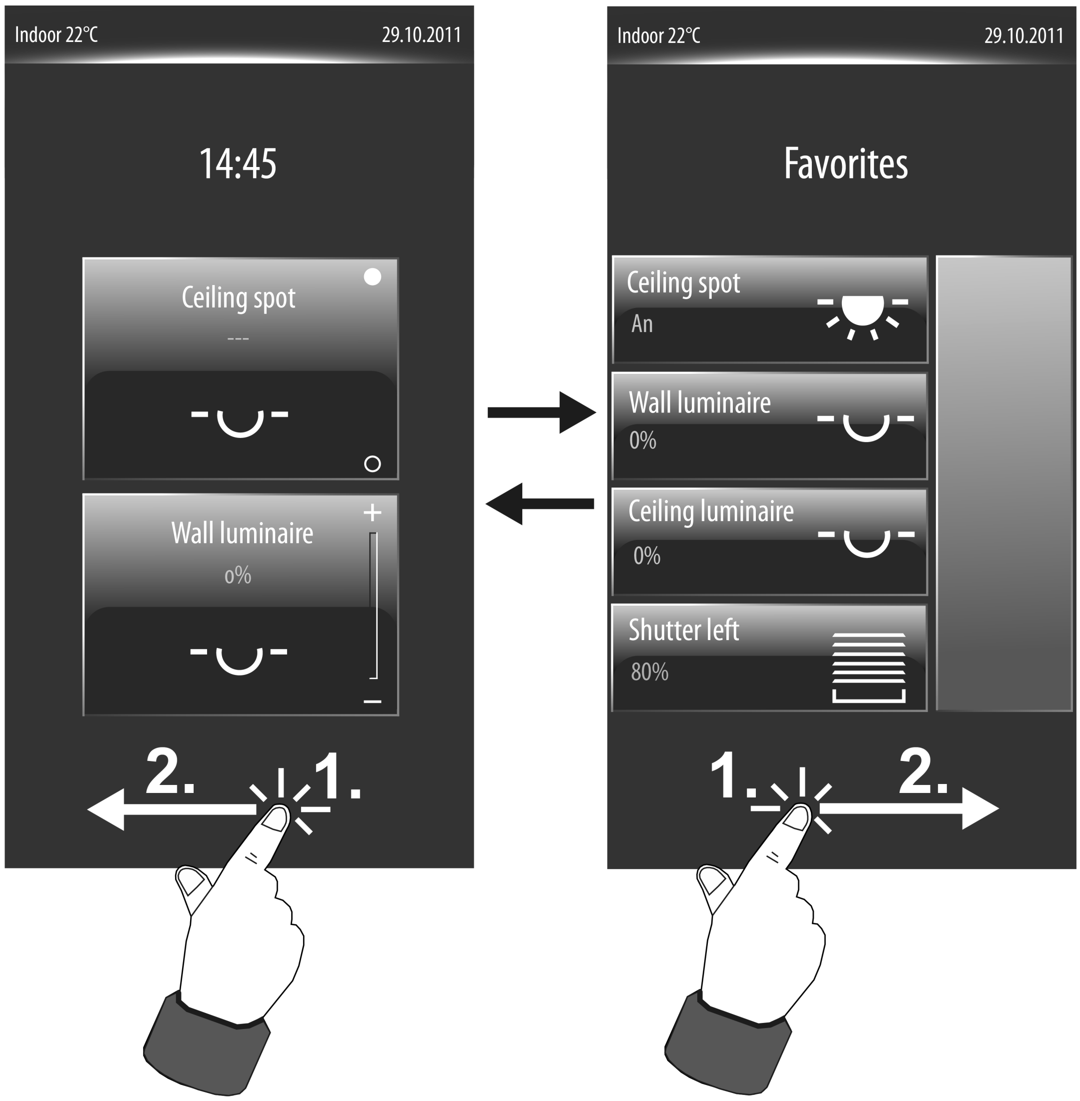


Figure 15: Example of switching over display pages by finger-touch-screen operation (switching over between start screen and favourite screen)

Alternatively, it is also possible to navigate through the display pages of the main menu level using two sensor buttons located outside the display area.
The sensor buttons...

Return to the start page or to the first display page (if no start page is available)

and

(Scrolling in the main menu level)

...make it easier to navigate through the display pages and can be used alternatively for finger operation of the graphic interface (figure 16).

[i] In contrast to switching over pages by finger-touch-screen operation, which can be applied on all switchable display pages, the sensor buttons only relate to the main menu level. As long as the display is displaying the page of a lower level menu navigation (e.g. operation in the function pages), you will always return to the main menu level by touching a sensor button.

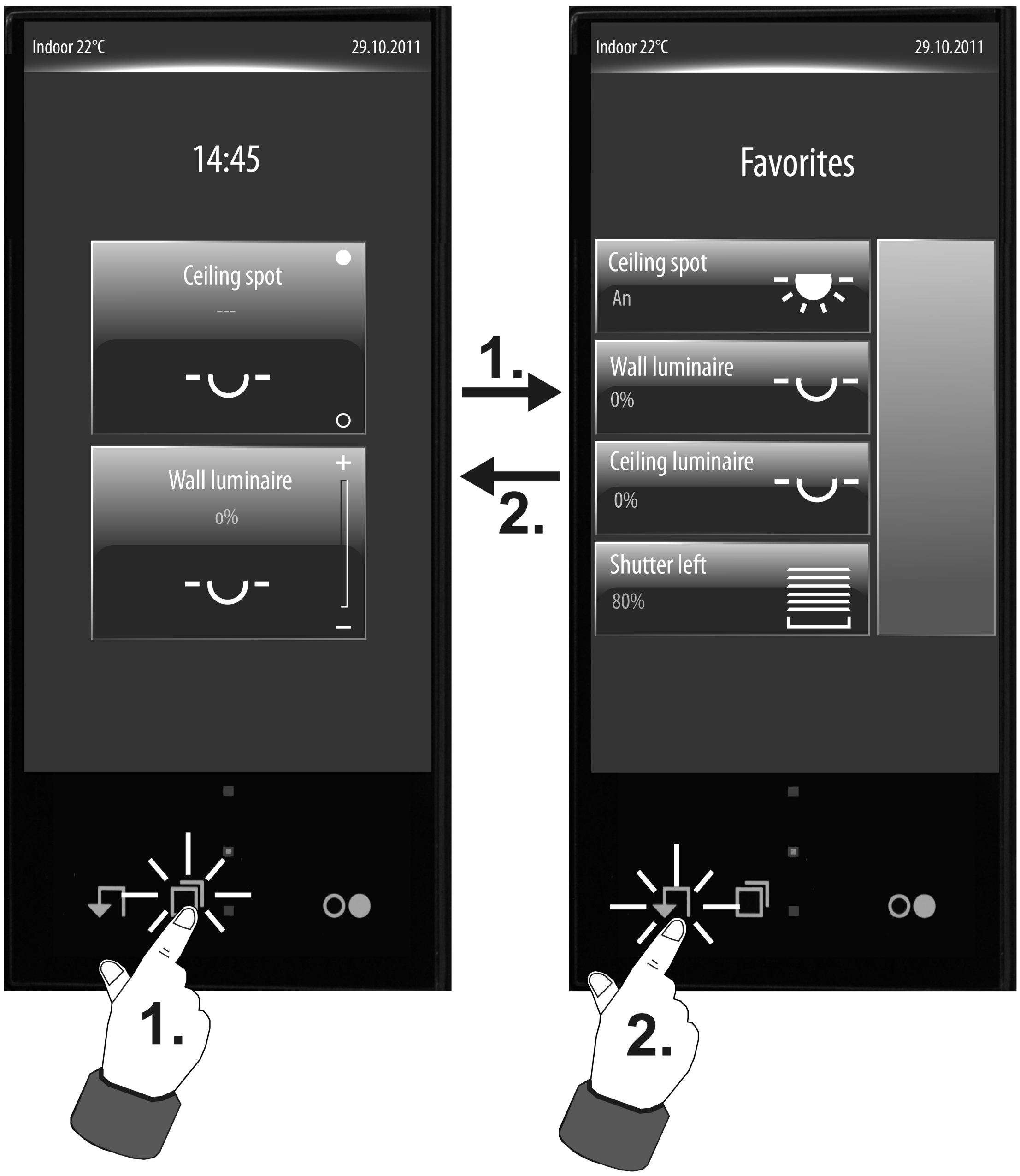


Figure 16: Example of switching over display pages using the sensor buttons.
↲: Return to the start page / ⧉: Scroll

Submenu level - Room view

KNX channels, such as switching or dimming functions of a lighting system or control functions of a blind, can each be allocated to a room. As a result, it is possible to control all functions of a room centrally and clearly. The room-oriented submenu, Room view, can be recalled (figure 17) for each room created in the ETS. This recall takes place via the room page of the main menu

level (1.).
Once the page of the selected room is opened, all KNX channels allocated to the room appear in the display. Each channel has a sensor surface that can be touched in order to operate this channel. The channels are each identified in the sensor surface by their name, which can be entered individually in the ETS (e.g. "Ceiling spot", "wall luminaire", "Venetian blind left").

Up to 4 channels are displayed simultaneously in a room view. If more than 4 channels are allocated, the channel list can be switched by the sensor surfaces ﹀ / ︿ or alternatively by a vertical movement of your finger. if only one or two channels are allocated to a room, the display grid is adapted automatically so that larger sensor surfaces are displayed. In the case of 3 allocated channels, a placeholder surface without a text name is displayed for the fourth unallocated channel. This placeholder surface has no function. Placeholders are only displayed if no channels at all have been allocated to a room.

To return to the main menu level, press the "❬ Room page" icon (2.) in the Room view in the status line at the top edge of the screen.

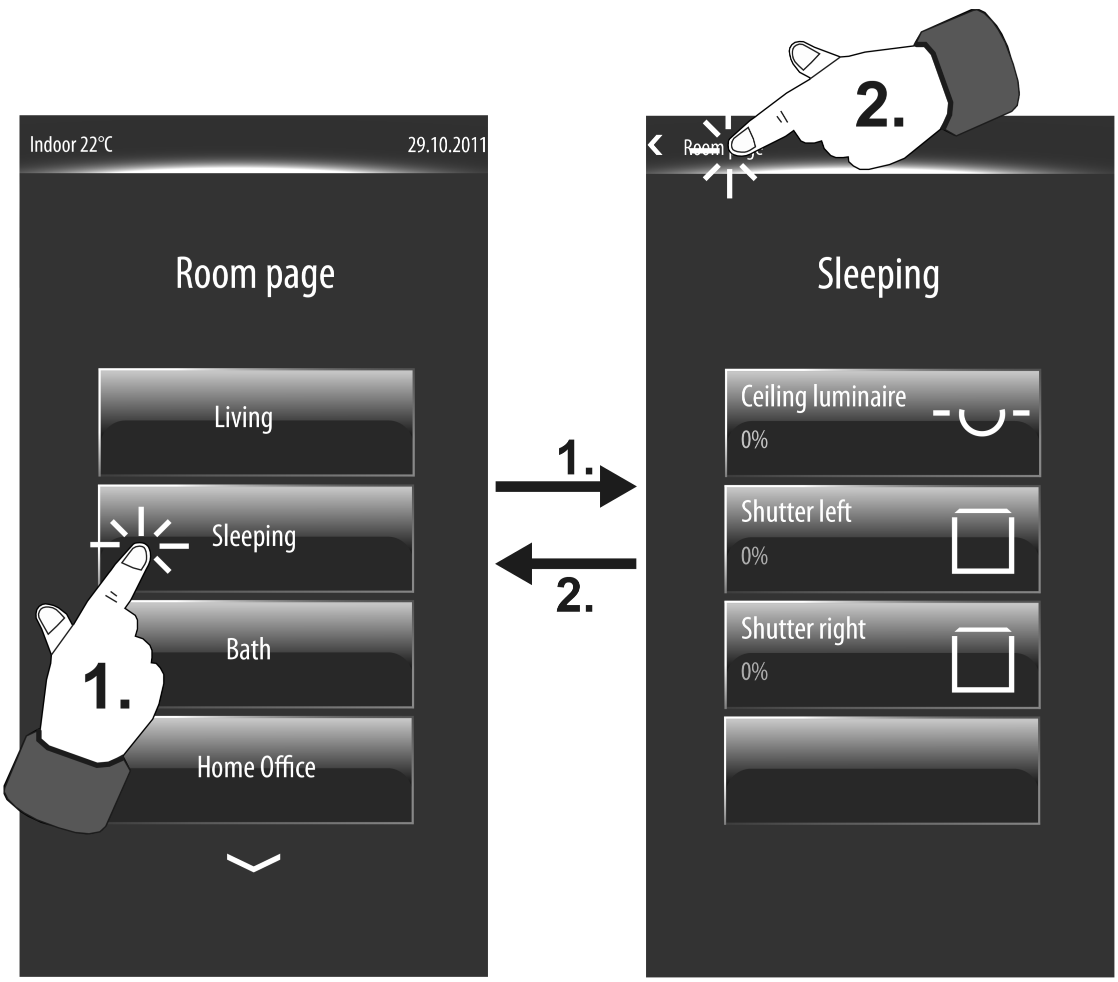


Figure 17: Example of a room view (right) - 3 KNX channels are allocated

i A KNX channel is allocated to a room in the parameter node of the corresponding channel. The channels can normally be allocated to one of the maximum 8 rooms. Hence, it is also possible to allocate a channel to a room which is not visible on the room page, because it was not created in the configuration of the rooms in the parameter node "Display -> Rooms". In this case, the KNX channel concerned cannot be accessed via the room page! It is generally recommendable to assign KNX channels only to rooms that are also available in the room configuration.

When you touch the sensor surface of a channel with your finger, the device branches to the submenu of the channel control (figure 18). All channels within the room view are activated by selection operation. Functions must first be selected (1.). Afterwards, operations are performed by means of the control command (2.).

To return to the room view, press the "〈 <Room name>" icon (3.) in the status line at the top edge of the screen.

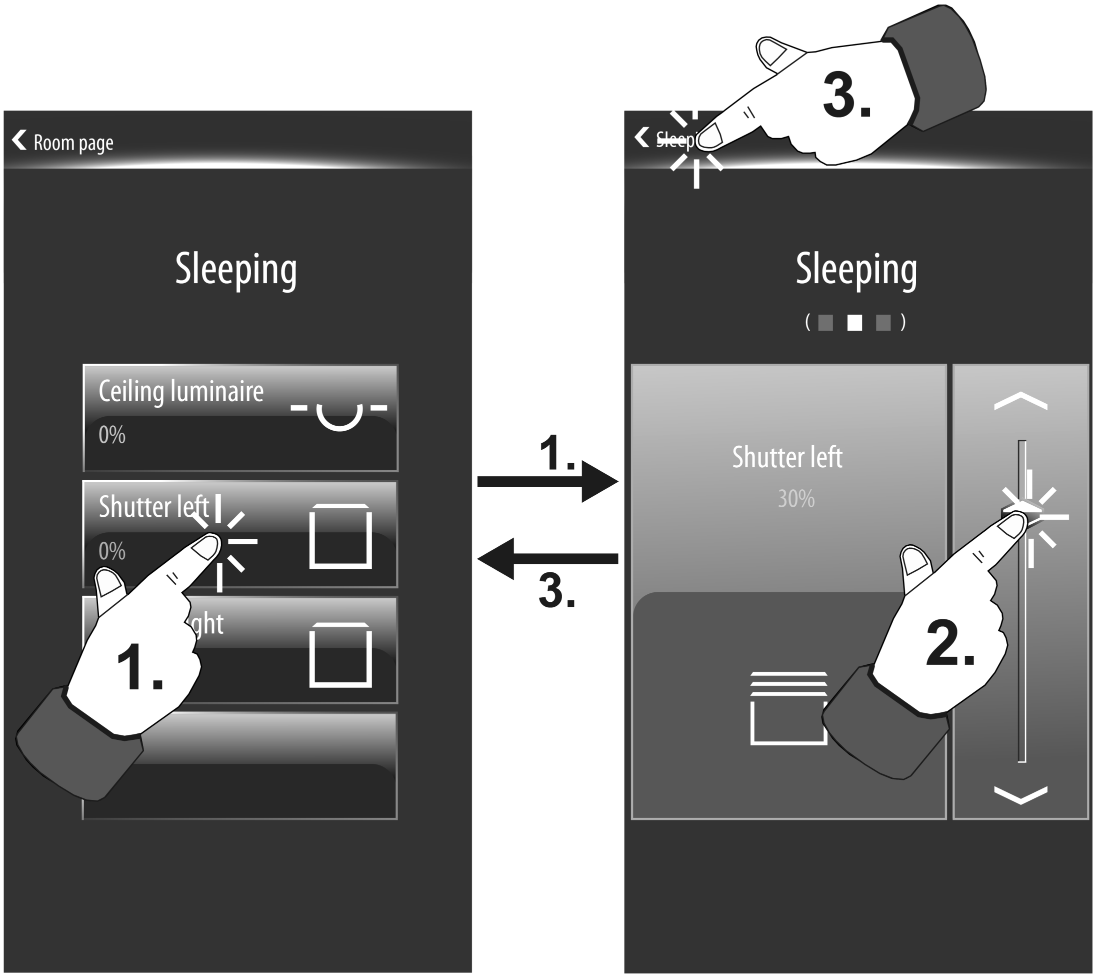


Figure 18: Example of a selection operation in the room view - operating view (right)

Provided that a channel has been selected in the room by selection operation and the operating view is displayed, it is possible to switch over to the other channels in the room by pressing and pulling with your finger. After selecting a channel, it is therefore possible to switch over to the other available channels in a room without having to make a detour to the room overview (figure 19).

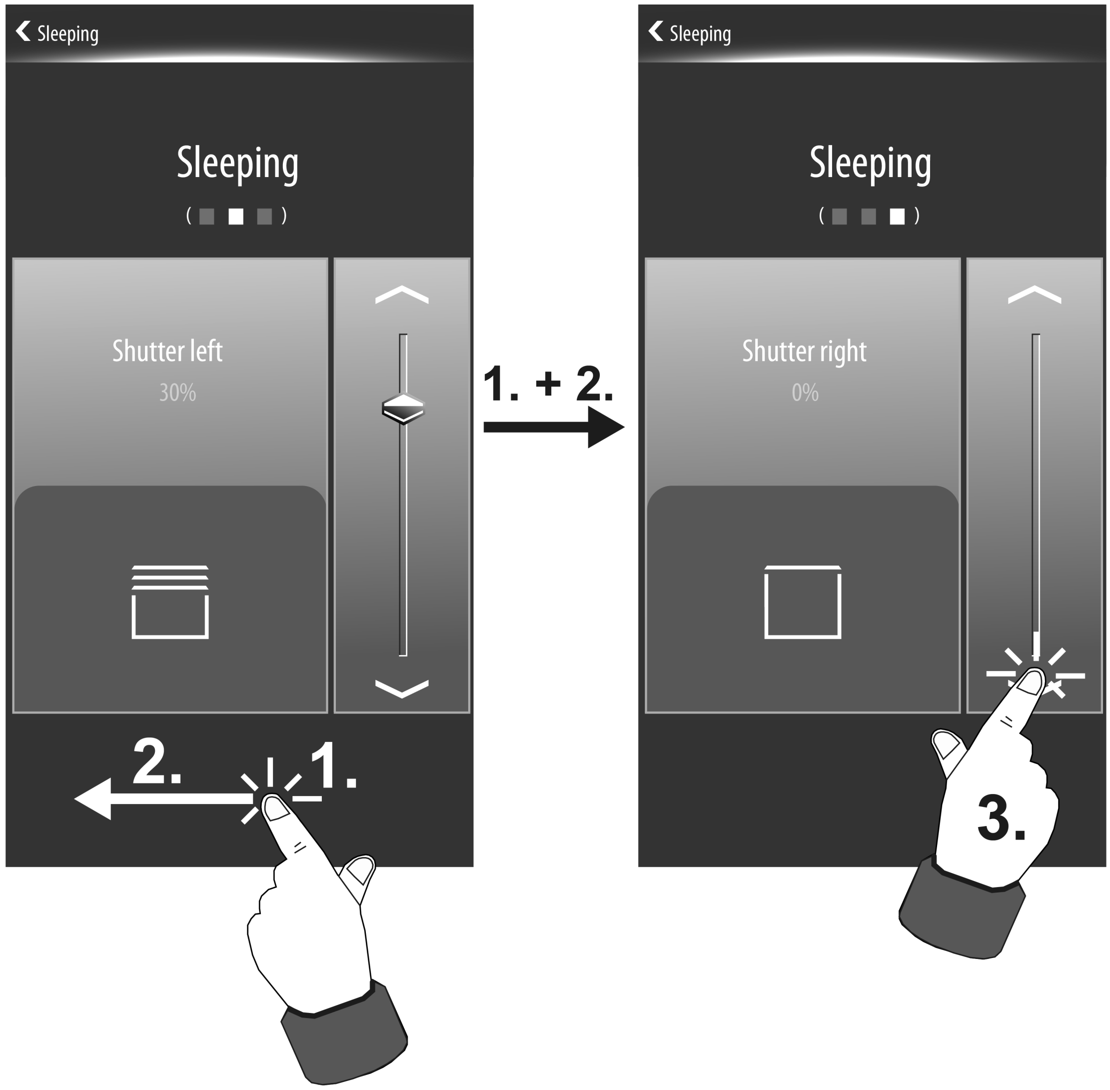


Figure 19: Example of a channel selection in the selection operation of a room - channel selection by pressing and pulling (1. + 2.)

Each controllable channel has its own display page for operation. The display page on which you are on and the number of display pages normally available for the channel operation in the room is indicated in the display by a small square box below the room number (figure 20). The white illuminated box indicates the current position.

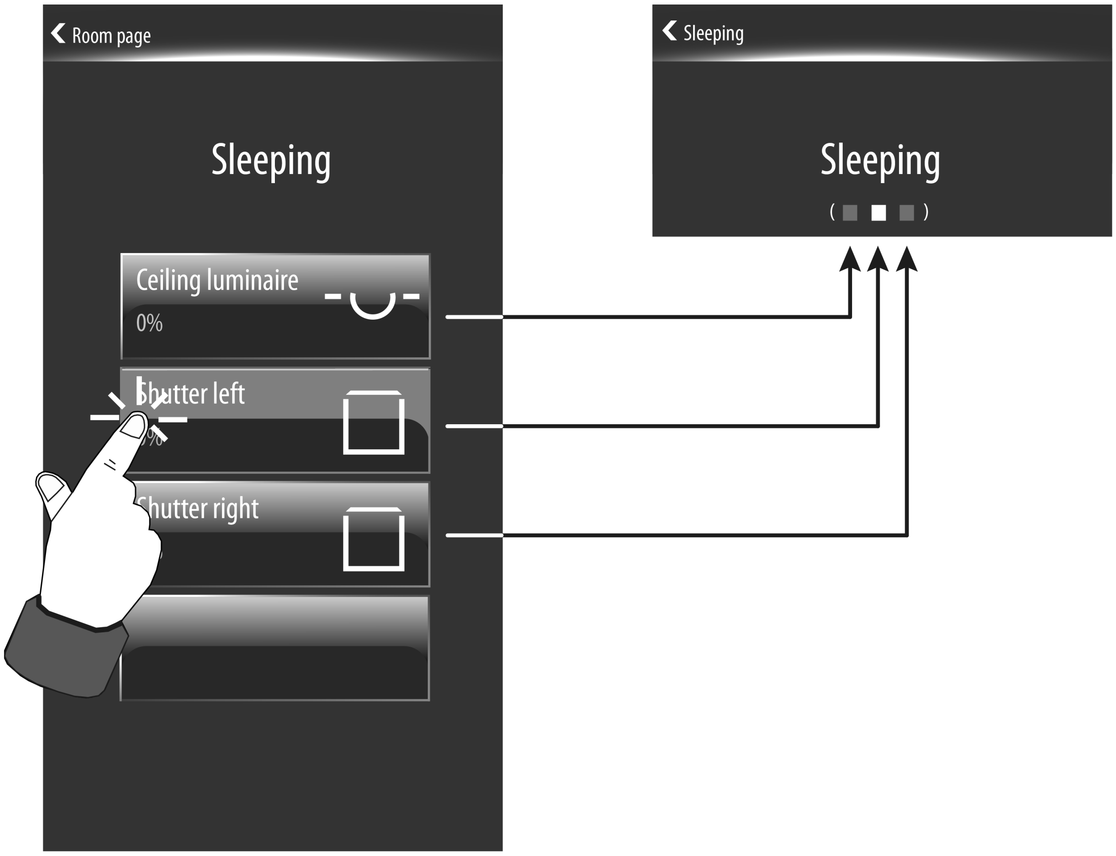


Figure 20: Example of a position marking by small square box at the channel control of a room

Submenu level - Function view

All KNX channels created in the ETS must be allocated to a function unit, in which room-independent and function-oriented control of the building functions is possible. Up to 8 function units are available for assignment. The function-oriented submenu, the function view, can be recalled for each function unit (figure 21). This recall takes place via the function page of the main menu level (1.).
Once the page of the function unit is opened, all KNX channels allocated to the function unit appear in the display. Each channel has a sensor surface that can be touched in order to operate this channel. The channels are each identified in the sensor surface - as in the room view - by their name, which can be entered individually in the ETS (e.g. "ceiling spot", "wall luminaire", "ceiling luminaire").

i In a function view, all channels of a function unit are listed room independent. For this reason, two channels from different rooms might have the same text name (e.g. "ceiling luminaire"). In order to distinguish different areas of operation even in the function view, it is advisable in such cases to also enter a room abbreviation in the channel name (e.g.. "LR ceiling luminaire" and "KI ceiling luminaire").

Up to 4 channels are displayed simultaneously in a function view. If more than 4 channels are allocated, the channel list can be switched by the sensor surfaces ﹀ / ︿ or alternatively by a vertical movement of your finger. If only one or two channels are allocated to a function unit, the display grid is adapted automatically so that larger sensor surfaces are displayed. In the case of 3 allocated channels, a placeholder surface without a text name is displayed for the fourth unallocated channel. This placeholder surface has no function. Placeholders are only displayed if no channels at all have been allocated to a function unit.

To return to the main menu level, press the "‹ Functions" icon (2.) in the Room view in the status line at the top edge of the screen.

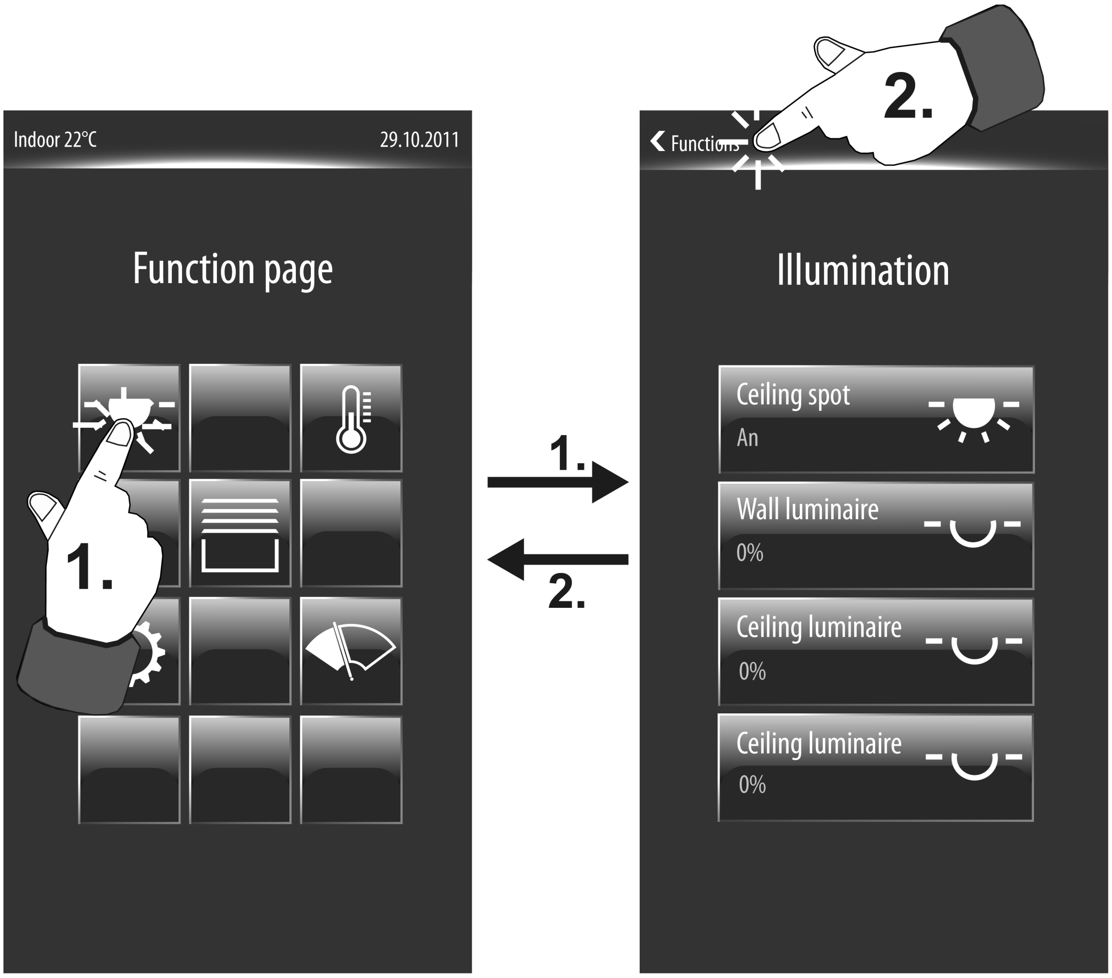


Figure 21: Example of a function view (right) - 4 KNX channels are allocated

If you touch the sensor surface of a channel with your finger, the device branches to the submenu of the channel control. All channels within the function view are activated - just like in the room view - by selection operation. Functions must first be selected. Afterwards, operations are performed by means of the control command.
The functions of a function unit are operated in a similar way as in the room view. For this reason a detailed description will not be necessary here and we ask you to refer to the chapter on the room view (see page 72).

i A KNX channel is allocated to a function unit in the parameter node of the corresponding channel. The channels can normally be allocated to one of the maximum 8 function units. Hence, it is also possible to allocate a channel to a function unit which is not visible on the function page, because it was not created in the configuration of the function units in the parameter node "Display -> Function units". In this case, the KNX channel concerned cannot be accessed via the function page!
It is generally recommendable to assign KNX channels only to function units that are also available in the function unit configuration.

4.2.4.1.2 Operation concept and sensor evaluation

Direct operation / Selection operation

The operation concept for elements on the touch surface is distinguished between selection operation and direct operation. The selection operation is normally intended for the room or function view. Functions, i.e. controllable KNX channels, must first be selected. Afterwards, operations are performed by means of the control command (switch on or off, move up or down, ...). Alternatively, direct operation for the start and favourite display page is available. In this case, the control command is also executed simultaneously time by touching the operating element. This operation concept is the same as the operation of a push-button sensor. It can be used in particular on the start page for purposefully executing central functions quickly and clearly (e.g. "All ON / All OFF", "room lighting ON / OFF").
In the ETS you can configure which operation concept is used on the start and favourite page.

Operating elements on the touch surface can - depending on the underlying function - be evaluated as a rocker switch (double-surface principle) or as a button (single surface principle) (see page 78). The function as rocker or button does not depend on the configured operation concept and can therefore be used individually for a selection operation as well as for a direct operation.

For a direct operation, the display surface of an element also corresponds to the sensor surface at the same time, i.e. the function operational area (figure 22). The underlying function is executed immediately by touching the sensor surface with your finger (1.).
This is different in the case of a selection operation. In this case, an operating area is also displayed in the device display next to the display surface of the element. The display of the selection operation depends on the page on which the operation is executed. On the start or favourite page all controllable functions are displayed one above the other (figure 23). Operation requires the selection of an element (1) that can then be operated (2.). The unselected elements on the page remain visible in the display but are greyed out and can therefore not be linked to the control surface. It is possible to change the controllable function at any time by touching another display element with your finger.
In the room or function control only one controllable function is ever visible in the display for the selection operation. You must select beforehand in the relevant submenu which KNX channel of a room or function unit is operated. If a channel only contains one controllable function (e.g. switching ON/OFF or rolling shutter height), an activation can take place immediately in the operating area. If a channel contains two operating functions (e.g. Venetian blind with blind/ shutter height and slat position), the controllable function must first be selected in the display area (1.) and then activated in the operating area (2.) (figure 24).

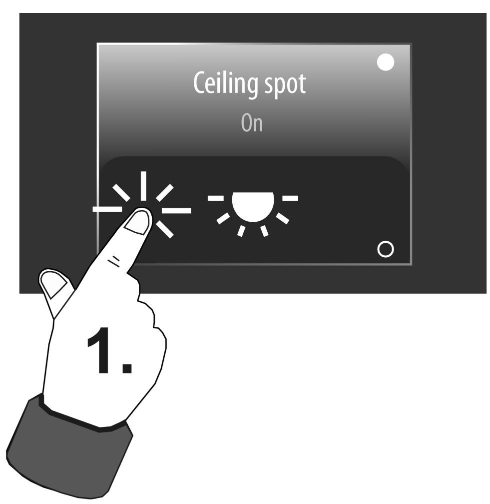


Figure 22: Example of a direction operation (here: Channel function "switching")

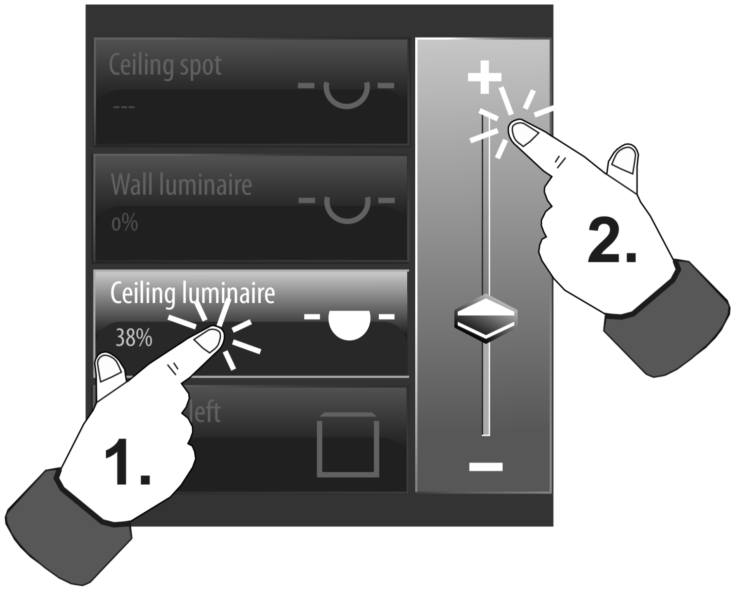


Figure 23: Example of a selection operation on the start or favourite page
(here: Channel function "dimming (brightness value)")

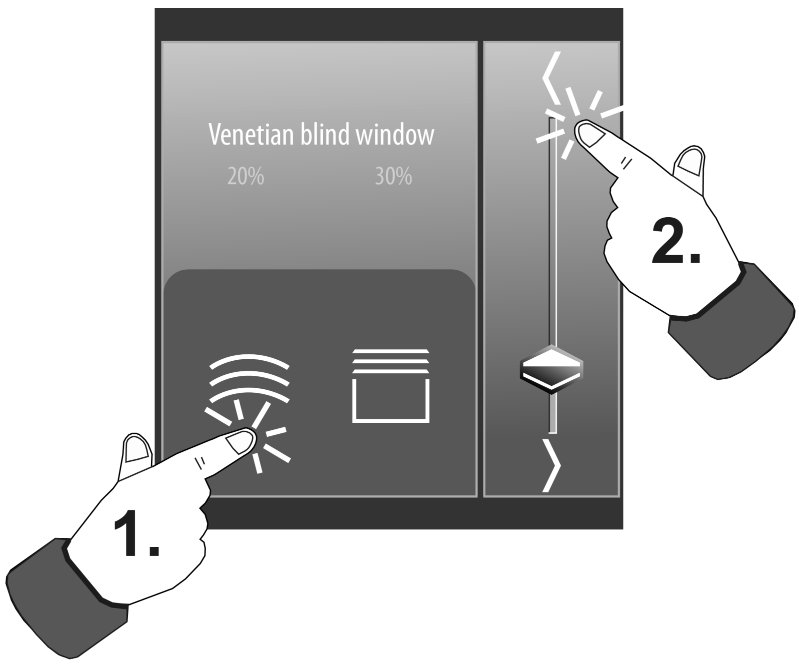


Figure 24: Example of a selection operation on the room or function page
(here: Channel function "Venetian blind/shutter (position)")

ⓘ A KNX channel, for example, can be visible on the start page and on a room page. It is quite possible to activated such a channel on the start page by direct operation and on the room page by selection operation. The configured KNX function, i.e. the actual control command, thus remains unchanged.

ⓘ For the channel functions "dimming (brightness value)" and "Venetian blind/shutter (position)" the brightness value or blind/slat position can be changed continuously in the selection operation by a value slider. It should be noted here that for a direct operation no slider is available for continuously changing the value or position! Here, a value can be adjusted to the value transmitter levels configured in the ETS by means of a long top-bottom operation (rocker function) of the sensor surfaces.

Sensor evaluation

Operating elements on the touch surface can - depending on the underlying function - be evaluated as a rocker switch (double-surface principle) or as a button (single surface principle). A rocker or button evaluation can be configured for the following KNX functions...

- Switching
- Dimming (Start/Stop)
- Venetian blind/shutter (Step/Move/Step)

The following functions are always executed as a rocker function...

- Dimming (Brightness value)
- Venetian blind/shutter (Position)
- Operating mode switchover, internal
- Setpoint shift, internal
- Fan controller, internal

Since the functions listed below only implement simple commands, only a push-button function is provided for this purpose...

- Scene extension
- 1-byte value transmitter
- 2-byte value transmitter

The function as rocker or button does not depend on the configured operation concept (see page 76-77) d can therefore be used individually for a selection operation as well as for a direct operation. Only the operating areas differ for buttons or rockers depending on the operation concept. With the direct operation, the display area is also the operating area of the buttons or rockers as well. With the selection operation, the buttons or rockers are arranged in a separate operating area next to the display area.
With the function as a button, the operating element can be touched anywhere. The preset push-button function will then always be executed (figure 25). With the rocker function, the operating element is divided into two sensor areas. These sensor areas are one above the other and must be operated separate from each other (figure 26). It is not permissible to operate both sensor areas of a rocker simultaneously.

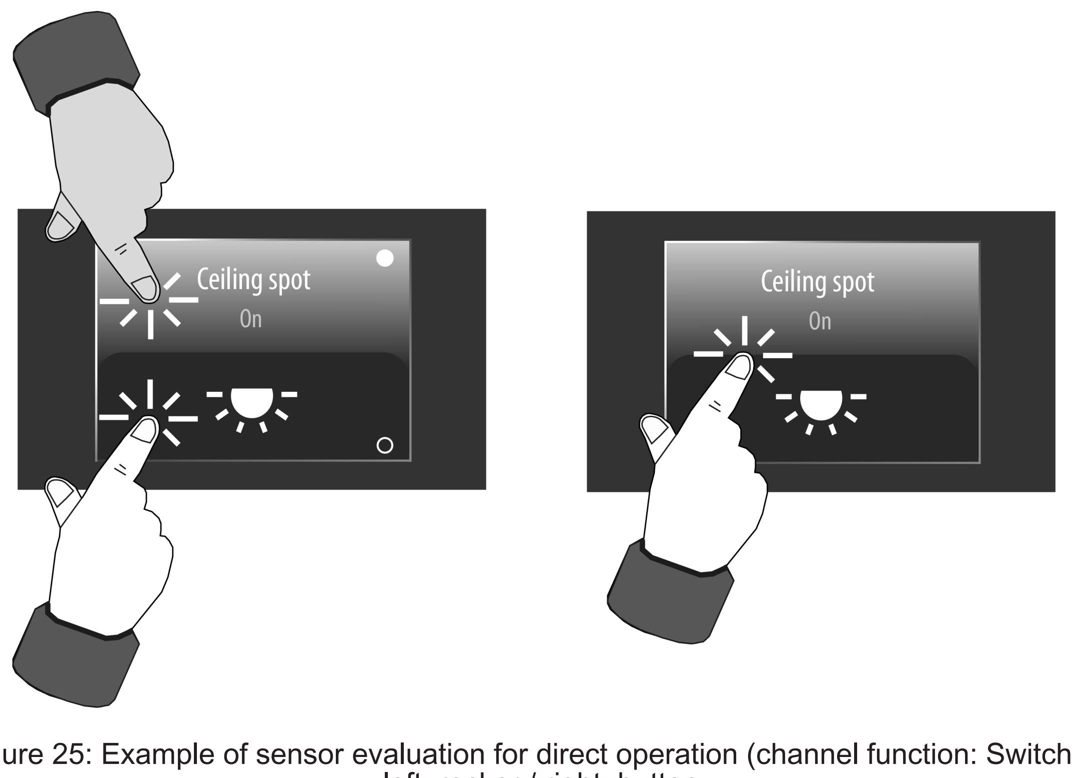


Figure 25: Example of sensor evaluation for direct operation (channel function: Switching)
left: rocker / right: button

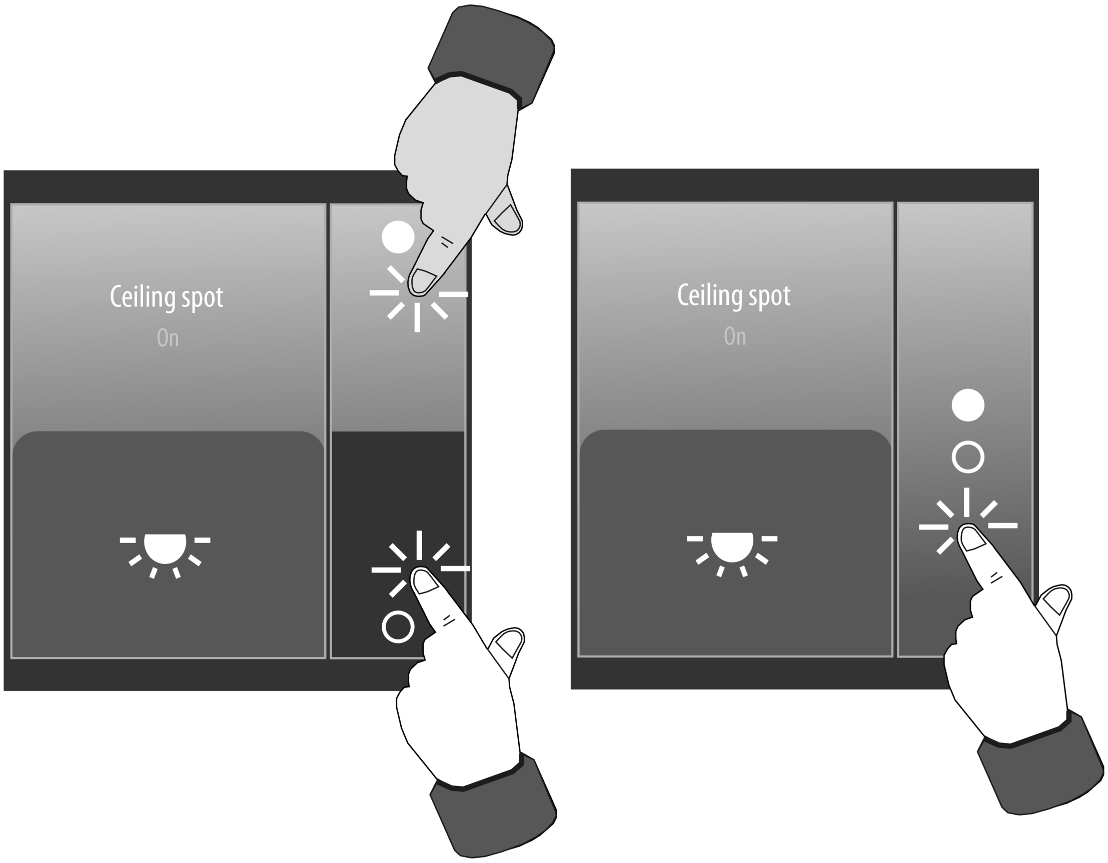


Figure 26: Example of sensor evaluation for selection operation (channel function: Switching)
left: rocker / right: button

i The sensor areas of a button or rocker are labelled with icons that indicate the command executed when touched. These operating icons are dependent on the configured channel function. Both figures above show the operating icons of the Switching channel function as a example (● = ON / ○ = OFF). These icons are also used to identify an operation of other channel functions that execute a definite command as a push-button function (e.g. recall a light scene or value).
Other channel functions display varying operating icons (Dimming / Setpoint shift / Fan controller: 〈 / 〉, Venetian blind: **<** / **>**, Slat: ︿ / ﹀).

i Operating icons always indicate the two operational sensor areas of a rocker switch (top / bottom). Consequently, two icons are then always visible. For a button the visibility of the operating icons is dependent on the operation concept (direct operation / selection operation) and on the configured channel function. Thus, two operating icons at the top and bottom in the sensor surface of a button can quite possibly be visible (e.g. Dimming Start/ Stop with **+**/**-**), touching this sensor surface indicates the button response, however (e.g. TOGGLE).

The commands transmitted to the bus during operation of a button or rocker switch are predefined for some functions, for other functions the command can be configured in the ETS (figure 27).

Function	Command with button	Command with rocker
Switching	TOGGLE (On/Off Toggle)	top = ON bottom = OFF
Dimming (Start/Stop)	TOGGLE (ON-brighter/OFF-darker Toggle)	top = ON/brighter bottom = OFF/darker
Dimming (Brightness value)	---	top = Increase value bottom = Reduce value Slider = Continuous value change
Venetian blind/shutter (Step/Move/Step)	TOGGLE (Up/down Toggle, Stop)	top = Up/Stop bottom = Down/Stop
Venetian blind/shutter (Position)	---	Curtain: top = Reduce position (Up) bottom = Increase position (Down) Slat: top = Increase position (Closed slats) bottom = Reduce position (Opened slats) Slider = Continuous position change
Scene extension	Transmit scene number (1...64) or recall internal scene (1...8) Can be configured in the ETS.	---
Value transm. 1-byte	Transmit value Can be configured in the ETS.	---
Value transm. 2-bytes	Transmit value Can be configured in the ETS.	---
Operating mode switchover, internal	---	Changing the operating mode
Setpoint shift, internal	---	top = Increase setpoint bottom = Reduce setpoint
Fan controller, internal	---	top = Increase fan level bottom = Reduce fan level
ASCII-Text	---	---

Figure 27: Button/rocker command depending on the configured function

i With the rocker functions "dimming (brightness value)" and "Venetian blind/shutter (position)" no slider is available on the start or favourite page for continuously changing the value or position during a direct operation! Here, a value can be adjusted to the value transmitter levels configured in the ETS by means of a long top-bottom operation of the sensor surfaces.

i With the functions "dimming (Start/Stop)" and "Venetian blind/shutter (Step/Move/Step)" a distinction is made between a short and long press of a sensor surface. This is necessary in order to distinguish between the commands for switching and dimming and for short and long time operation. The actuation times can be configured in the ETS. With the functions "dimming (brightness value)" and "Venetian blind/shutter (position)" the sensor surfaces can be pressed long for value adjustment.

i With the functions "1-byte value transmitter" and "2-byte value transmitter" it is possible to switch off the operating function completely. In this case, the channel concerned only works as a display function. Consequently, touching the display element does not induce any response.

i If the device's own timer is used, telegrams of the timer are transmitted to the bus for the switching times via the objects of the KNX channels. The timer commands do not influence the individually set button/rocker commands (transmission values) of the KNX channels, however.
Example "value transmitter": The channel is set to the value "50" (button/rocker command) in the ETS or by local operation on the device. The timer executes a switching command with the value "75" and then transmits a telegram with this value via the channel object. The actual transmission value of the channel ("50") is not affected by this. In the case of a subsequent operation of the channel, the value "50" is transmitted to the bus.

4.2.4.1.3 Channel function "switching"

1-bit switching telegrams (ON, OFF) can be transmitted to the bus by using the channel function "switching". In this way, it is possible to actuate lighting systems in combination with switch actuators. Furthermore, the switching telegram can also be used in anther way for executing other control tasks in the KNX system that match the 1-bit data format.

A KNX channel for switching has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation).

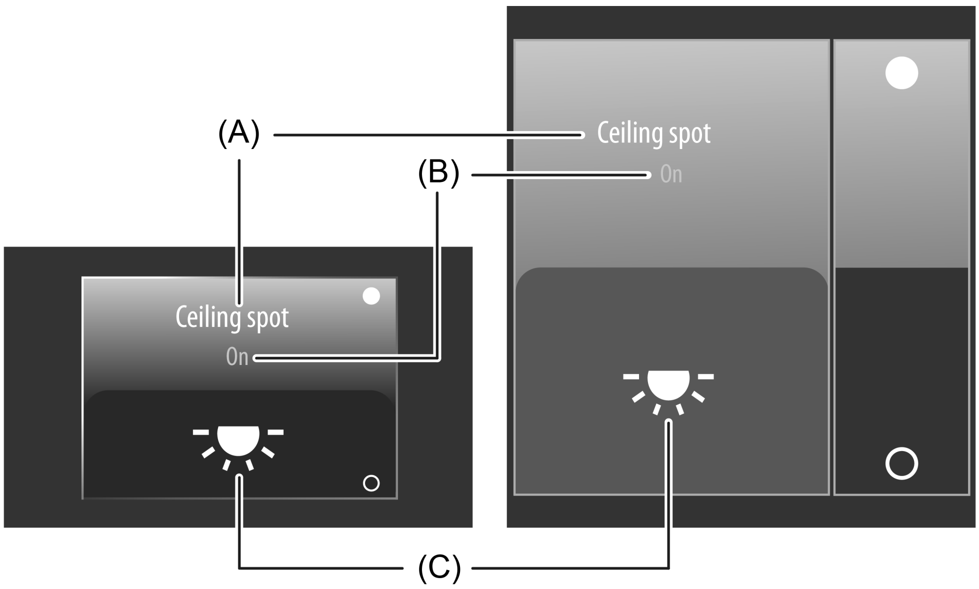


Figure 28: Example of an operating and display element of the channel function "switching"
left: direct operation / right: selection operation

(A) Text name

(B) Status text

(C) Status icon

ℹ The channel function "switching" can be executed as a rocker or push-button function depending on the ETS parameterisation. The figure shows the rocker configuration as an example.

Status elements

The display area contains different display elements (figure 28) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "ceiling spot"). In addition, a status text (B) can be displayed below the name, which visualises different texts (e.g. "Off" / "On" or "Absent" / "Present") in the display depending on the object value of the switching status feedback ("0" / "1"). After a device reset, the display shows "---" until a feedback object value of the status text is received.
Similarly to the status text, a symbol (C) can be displayed in the lower display area. A parameter in the ETS defines which type of status icon is used in the display element (figure 29). This makes it possible to adapt the icon display to the activated function (e.g. switching of lighting). The configured status icon changes depending on the switching state thereby enabling the state of the controlled KNX channel to be read clearly (e.g. : Lighting OFF, : Lighting ON).
The status text and icon can be omitted optionally.

Figure 29: Status icon for the channel function "switching"

1 Status
2 Lighting
3 Present / Absent
4 Disabled / enabled

Objects

A channel of the function "switching" has 2 KNX communication objects...

- "D.Output channel x - switching" (1-bit transmitting):
  Switching telegrams are transmitted to the bus via this object after pressing the sensor element. This can cause a switching channel of a KNX switch actuator to be activated immediately, for example.

- "D.Input channel x - Switching feedback" (1-bit receiving):
  Through this object the device can receive a switching status feedback that a switch actuator transmits, for example. This influences the status text and status icon that can be displayed in the display area of the channel element. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly.
  The feedback of the switching status must be transmitted by the "actively transmitting" actuator.
  If the activated KNX switch actuator does not have a separate status feedback, this object "D.Input channel x - Switching feedback" can be linked with the object "D.Output channel x - switching" via an identical group address.

i If the channel function works as a "push-button function" (switching command: UM), it is not absolutely essential to configure the feedback object in order to toggle the object value. The toggle will also work reliably if just the switching object is configured. The status elements also then indicate the correct status. If the feedback object is used, the device also transfers the status of the feedback automatically to the switching object.

4.2.4.1.4 Channel function "Dimming (Start/Stop)"

1-bit switching telegrams (ON, OFF) and 4-bit dimming telegrams (relative dimming: dimming up or dimming down by a dimming increment and stop telegram) can be transmitted to the bus by using the channel function "Dimming (Start/Stop)" . In this way, it is possible to actuate lighting systems in combination with dimmer actuators. Likewise, KNX speed controllers can be addressed whereby motors can be switched on and off and the speed changed.

A KNX channel "dimming (Start/Stop)" has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation). The sensor element distinguishes between short and long operations.
A short sensor operation triggers switching telegrams. Dimming telegrams are transmitted to the bus by means of long operations of the sensor surfaces. A stop telegram is triggered automatically by releasing a long pressed sensor element whereby a dimming process is stopped at the current brightness value.
The time for short and long operations can be adjusted in the ETS.

ℹ The relative dimming increment is unalterably set to 100 % (maximum increment) in the channel function "dimming". In this way, the entire brightness range of a lighting system can be controlled simply by a long button-press. The stop telegram when releasing is also predefined.

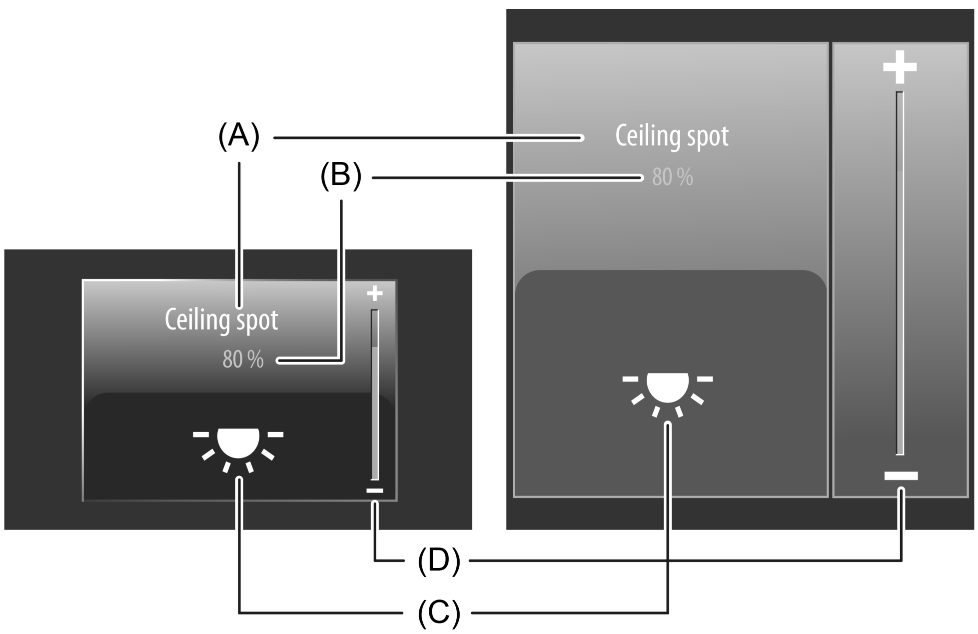


Figure 30: Example of an operating and display element of the channel function "switching" "dimming (Start/Stop)"
left: direct operation / right: selection operation

(A) Text name
(B) Status value
(C) Status icon
(D) Bar graph in the sensor area

ℹ The channel function "dimming (Start/Stop)" can be executed as a rocker or push-button function depending on the ETS parameterisation. The figure shows the rocker configuration as an example.

Status elements

The display area contains different display elements (figure 30) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "ceiling spot"). In addition, a status value (B) can be displayed below the name, which displays brightness values in plain text ("0...100 %") depending on the object value of the dimming value feedback of the dimmer actuator addressed. After a device reset, the display shows "---%" until a feedback object value of the status text is received.
Similarly to the status value, a symbol (C) can be displayed in the lower display area. The "Lighting" icon is always used. The characteristic of the status icon, in which the brightness state of the controlled KNX channel can be clearly read (, changes depending on the dimming status: Lighting OFF or low brightness, : Lighting maximum brightness, interim values by symbol with fewer light beams).
The status value and icon can be omitted optionally.

In the channel function "dimming (Start/Stop)", a bar graph (D) is displayed in the sensor element. This bar graph displays brightness values in graphic form based on the object value of the dimming value feedback of the dimmer actuator addressed. The bar graph rises when the brightness of the activated lighting becomes greater. Similarly, the bar graph falls when the brightness decreases. At full deflection, the maximum brightness is set. If the bar graph shows no deflection, the lighting is switched off.
The bar graphs is always visible and normally supplements the status indication by status value and status icon.

Objects

A channel of the function "dimming (Start/Stop)" has 3 KNX communication objects...

- "D.Output channel x - Dimming (Switching)" (1-bit transmitting):
  Switching telegrams are transmitted to the bus via this object after a short touch of the sensor element. A connected lighting system, for example, is switched on as a result. KNX dimmer actuators then normally set the configured switch-on brightness.

- "D.Output channel x - Dimming (Start/Stop)" (4-bit transmitting):
  Dimming telegrams are transmitted to the bus via this object after a long press of the sensor element (increment 100%). A connected lighting system is dimmed as a result. A stop telegram is triggered via this object by releasing the sensor element.

- "D.Input channel x Dimming (Feedb. brightness value)" (1-byte receiving):
  Through this object the device can receive a brightness value feedback that a dimmer actuator transmits, for example. The status value, status icon and bar graph are influenced as a result. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly.
  The feedback of the brightness value must be transmitted by the "actively transmitting" actuator.

i The object "D.Output channel x Dimming (Feedb. brightness value)" interprets received values on the basis of the KNX data point type 5.001 (Scaling). The decimal data values 0...255 are evaluated as percentages 0...100 % and displayed in the device display.

ℹ Dimmer actuators normally transmit brightness values as feedback when the dimming processes have been completed, i.e. when dimmed or started brightness values have been set valid. For this reason, status indications of the channel element concerned do not normally change during a press of the sensor surface, but only when the buttons are released and the dimming processes are stopped. By contrast, a displayed status value can already change even during an operation if the dimmer actuator has set a minimum or maximum brightness or cannot pass through the entire brightness range due to disabling functions.
The feedback of a brightness value is returned with a delay after switching on or off based on the dimming speed set in the dimmer actuator. As a result, the status indications of the channel element update themselves with a slight delay after releasing the sensor surface.

4.2.4.1.5 Channel function "Dimming (Brightness value)"

1-byte brightness value telegrams (absolute dimming via 1-byte values in compliance with KNX DPT 5.001 scaling) can be transmitted to the bus by using the channel function "dimming (brightness value)". In this way, it is possible to actuate lighting systems in combination with dimmer actuators. Similarly, KNX speed controllers can be addressed whereby motors can be switched on and off and the speed changed.
The difference between the channel functions "dimming (Start/Stop)" and "dimming (brightness value)" is in the data formats of the communication objects.

A KNX channel "dimming (brightness value)" has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation). The sensor element is always executed as a rocker function and distinguishes between short and long operations.
A short sensor operation triggers value telegrams "100 %" or "0 %", depending on the operated sensor surface **+** or **-**. In this way, as with a switching operation, the activated load is switched on and off. Brightness value telegrams are transmitted to the bus gradually in a defined time interval by means of long operations of the sensor surfaces **+** or **-**. The device then increases or decreases the value cyclically during the operation depending on the value transmitter level configured in the ETS and transmits the values as a brightness setting. The value sequence generated in this way is converted to a dimming process by the activated dimmer actuator. The time between two value telegrams can be configured in the ETS and must be attuned to the dimming speed of the dimmer actuator as much as possible in order to attain a constant and interruption-free dimming process.
The value transmitter level can be configured in the ETS to "not to be transmitted during adjustment". In this case, the value adjustment is deactivated by a long button-press.
The time for short and long operations can be adjusted in the ETS as "Time between switching and dimming".

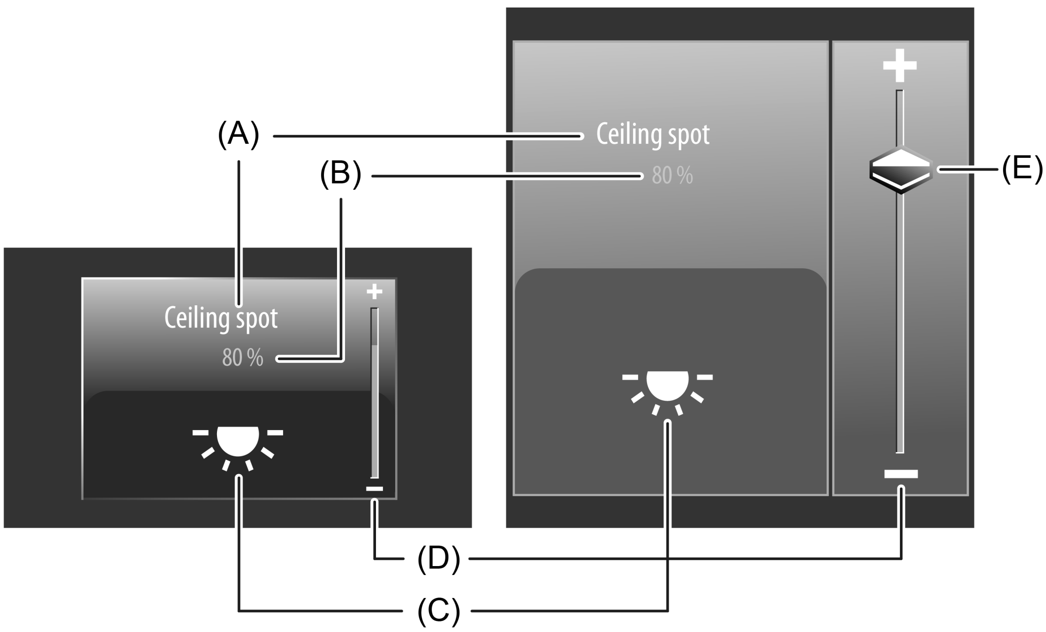


Figure 31: Example of an operating and display element of the channel function "dimming (brightness value)"
left: direct operation / right: selection operation

(A) Text name
(B) Status value
(C) Status icon
(D) Bar graph in the sensor area
(E) Slider in the sensor area

Slider

In the selection operation, a slider (E) is available in addition to the sensor surfaces **+** or **-** for operating switching or continuous dimming processes (figure 31). It is possible to specify brightness values directly with graphic support using the slider. For this purpose, the slider can be set by finger pressure or continuously moved. To set the slider, you must touch the slider area at the required brightness level with your finger. The slider then jumps immediately to the required position. At the same time, the device transmits the brightness value specified thus as a presetting to the bus.
Alternatively, the slider can be moved continuously in the slider area with your finger. During the movement of the slider, the device transmits values according to the set value transmitter level in the ETS time-controlled and gradually. As a result, the brightness of the activated lighting already changes, for example, during the slider adjustment whereby the operator immediately receives a visual brightness feedback. The time that must elapse before the device outputs a new brightness level during an adjustment is defined in the ETS by the parameter "Time between two value telegrams". Thus, the configured time of the value adjustment and the value transmitter level have the same effect on the control speed of the slider.
In order for dimming processes to take place continuously and interruption-free when moving the slider, times as small as possible (e.g. 500 ms) and larger increments (e.g. 20...25%) should be configured if the slider is moved rather quickly. If, however, the slider is normally moved slowly, longer times between value telegrams (e.g. 1...2s) and smaller increments (e.g. 10...15%) are advisable.
If the parameter for the value transmitter level is set to "not to be transmitted during adjustment", the device does not transmit intermediate levels to the bus when moving the slider. In this case, only the final value of the slider adjustment is transmitted.

ⓘ The current brightness value of the activated dimming channel is indicated in the sensor element as a bar graph (see Functional description of the display elements below). The slider is located graphically before the bar graph and is adapted to the position of the bar graph if no slider operation occurs. Thus, the slider responds to the feedback telegrams of the dimmer actuator similarly to the bar graph.
It is generally recommended to move the slider as slowly as possible and to leave your finger briefly (approx. 1s) on the operating element after reaching the setpoint so that the status indicator in the bar graph matches the current slider position and ideally no position correction takes place at the end of the operation.

ⓘ It should be noted that for a direct operation no slider is available for continuously changing the value! Here, a value can be adjusted to the value transmitter levels configured in the ETS by means of a long top-bottom operation of the sensor surfaces.

Status elements

The display area contains different display elements (figure 31) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "ceiling spot"). In addition, a status value (B) can be displayed below the name, which displays brightness values in plain text ("0...100 %") depending on the object value of the dimming value feedback of the dimmer actuator addressed. After a device reset, the display shows "---%" until a feedback object value of the status text is received.
Similarly to the status value, a symbol (C) can be displayed in the lower display area. The "Lighting" icon is always used. The characteristic of the status icon, in which the brightness state of the controlled KNX channel can be clearly read (, changes depending on the dimming status: Lighting OFF or low brightness, : Lighting maximum brightness, interim values by symbol with fewer light beams).
The status value and icon can be omitted optionally.

In the channel function "dimming (brightness value)", a bar graph (D) is displayed in the sensor element. This bar graph displays brightness values in graphic form based on the object value of the dimming value feedback of the dimmer actuator addressed. The bar graph rises when the brightness of the activated lighting becomes greater. Similarly, the bar graph falls when the brightness decreases. At full deflection, the maximum brightness is set. If the bar graph shows no deflection, the lighting is switched off.
The bar graphs is always visible and normally supplements the status indication by status value and status icon. The bar graph is located graphically behind the slider.

Keyboard for entering values

In addition to the possibilities of specifying a brightness value using the sensor surfaces **+** / **-** or slider, a keyboard can optionally be shown in the display. It is possible to specify a brightness value directly using the keyboard. The keyboard becomes visible by pressing the display area for a long time with your finger (approx. 1s) if this was enabled by parameter configuration in the ETS. Using the keyboard, any brightness value ranging from 0...100% can be entered numerically and applied by pressing the ✓ button. After applying the value, it is accepted as a preset value and transmitted to the bus.
The entry can be terminated without applying any value by touching the sensor surface **x** in the keyboard.

ℹ It is only possible to specify a brightness value via the keyboard in selection operation on the room or function pages.

Objects

A channel of the function "dimming (brightness value)" has 2 KNX communication objects...

- "D.Output channel x - Dimming (brightness value)" (1-byte transmitting):
  Value telegrams (0...255) are transmitted to the bus via this object after pressing the sensor elements. This can cause a dimmer actuator to be activated.

- "D.Input channel x Dimming (Feedb. brightness value)" (1-byte receiving):
  Through this object the device can receive a brightness value feedback that a dimmer actuator transmits, for example. The status value, status icon and bar graph are influenced as a result. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly.
  The feedback of the brightness value must be transmitted by the "actively transmitting" actuator.
  If the activated KNX dimmer actuator does not have a separate brightness value feedback, the object "D.Input channel x - dimming (Feedb. brightness value)" can be linked to the object "D.output channel x - dimming (brightness value)" via an identical group address.

ℹ The objects interpret values to be sent or received on the basis of the KNX data point type 5.001 (Scaling). The decimal data values 0...255 are evaluated as percentages 0...100 %.

ℹ During an operation, the value of the object "D.Input channel x Dimming (Feedb. brightness value)" is not evaluated. With a long press of the sensor elements **+** / **-** or when moving the slider, a continuous value adjustment can take place on the bus. During this value adjustment, all status elements of the channel element are updated continuously by value simulation. The display elements first react again to the feedback object value of the dimmer actuator after the operation has been completed.

4.2.4.1.6 Channel function "Venetian blind/shutter (Step/Move/Step)"

1-bit switching telegrams in compliance with the KNX data point types 1.007 (Step) and 1.008 (UpDown) can be transmitted to the bus by using the channel function "Venetian blind/shutter (Step/Move/Step)". In this way, it is possible to activate Venetian blinds (incl. slats) and roller shutters by means of short time and long time telegrams in combination with appropriate actuators. Similarly, other shading systems, such as roof windows, vertical slats and awnings can also be controlled by individual characteristics of the status indicators.

The sensor element distinguishes between short and long operations. Depending on this, different telegrams are transmitted to the bus...

- Immediately on pressing a sensor surface the device transmits a short time telegram to the bus (figure 32), whereupon a running drive is stopped and the "time between short time and long time command" T1 is started internally. If the pressed sensor element is released again within T 1, the device transmits no further telegram. This short time serves the purpose of stopping a continuous movement.
  The "time between short time and long time command" is configured in the ETS and should be selected shorter than the short time operation of the actuator to avoid any jerky movement of the activated drive.
- If the sensor element 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 internally.
- If the sensor element is released again within the slat adjusting time, the device transmits 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" to be configured in the ETS should be chosen as required by the drive for a complete rotation of the slats. If T2 is selected longer than the complete running time of the drive, a pushbutton function is possible as well. In this case, the drive only remains on while the sensor element is kept depressed.
- If the sensor element is kept depressed longer than the "slat adjusting time", the device transmits no further telegram. The drive remains on until the end position is reached.

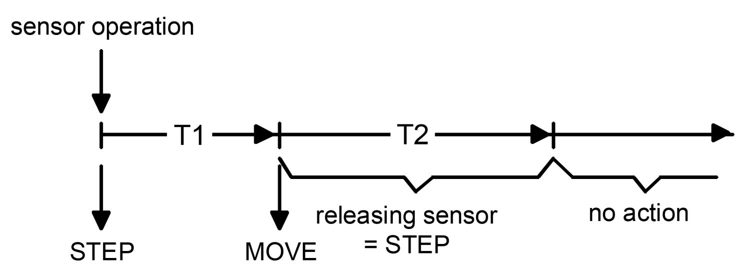


Figure 32: Telegram concept when a sensor surface of the channel function is touched "Venetian blind/shutter (Step/Move/Step)"

ℹ In the display area, the channel has up to two status icons (slat status and blind/shutter status). Finger pressure on the status icons influences the display of the bar graph. In both cases, short time and long time commands are transmitted in a similar manner to the bus during a sensor operation. The "slat adjusting time" of the KNX channel must be adjusted to the actual travelling time of the activated slat in order for a slat operation to be reasonably possible!

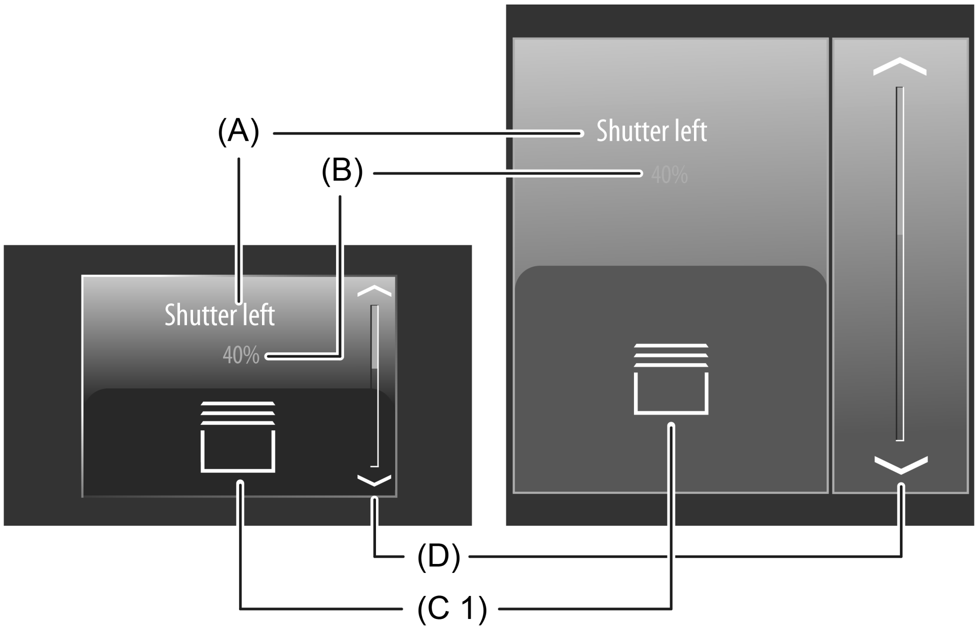


Figure 33: Example of an operating and display element of the channel function "Venetian blind/shutter (Step/Move/Step)" and the "rolling shutter" shading method
left: direct operation / right: selection operation

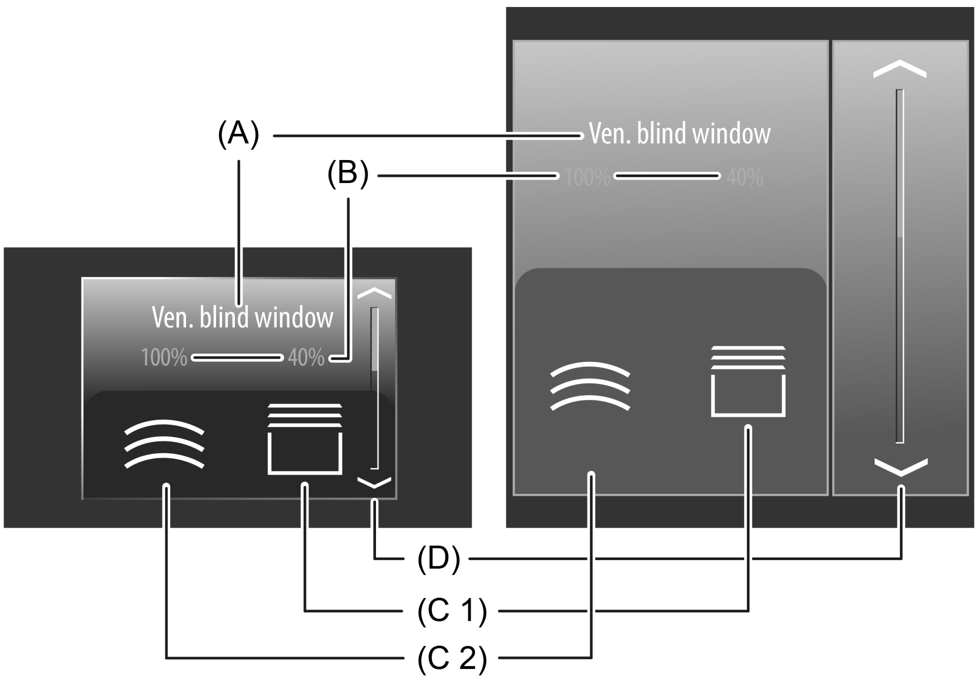


Figure 34: Example of an operating and display element of the channel function "Venetian blind/shutter (Step/Move/Step)" and the "rolling shutter" shading method
left: direct operation / right: selection operation

(A) Text name
(B) Status value
(C1) Status icon blind (configurable)
(C2) Status icon slat (only with Venetian blind)
(D) Bar graph in the sensor area

- The channel function "Venetian blind/shutter (Step/Move/Step)" can be executed as a rocker or push-button function depending on the ETS parameterisation. The figure shows the rocker configuration as an example.
- The representation of the bar graph in the sensor area changes depending on whether or not slat position or blind/shutter height should be displayed. You can select which position of the bar graph is displayed by touching a symbol in the display area (slat status and blind status). The figure shows a bar graph with blind/shutter height display as an example.

A KNX channel "Venetian blind/shutter (Step/Move/Step)" can be adapted to the shading system type by the ETS parameter "Shading". It is possible to configure "Venetian blinds" incl. slat control whereby vertical slat systems are also controllable, or alternatively, "roller shutters" whereby window drives or awnings are also controllable. To simplify the control, no slat functions are available in the rolling shutter shading method, which is why the slat adjusting time, among other things, is omitted. In this case, the selectable status icons are also adapted.

A channel "Venetian blind/shutter (Step/Move/Step)" for switching has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation).

Status elements

The display area contains different display elements (figure 34) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "Venetian blind window"). In addition, a status value (B) can be displayed below the name, which displays position values in plain text ("0...100 %") depending on the object value of the position feedback of the Venetian blind or shutter actuator addressed. After a device reset, the display shows "---%" until a feedback object value of the status text is received.
Similarly to the status value, symbols (C1 & C2) can be displayed in the lower display area. In the Venetian blind shading method, status icons with status values for each slat position and blind height (Venetian blind height, position vertical system) are displayed in the display surface. In the rolling shutter shading method, however, only one status icon with status value for the shutter height (rolling shutter height, awning position, roof window opening) is visible.
The symbol displayed for the blind/shutter height can be configured in the ETS depending on the shading method (figure 35). The status icon for the slat position is predefined.

Figure 35: Status icons for the channel function "Venetian blind/shutter (Step/Move/Step)"

1.1 "Venetian blind" shading method: Position of Venetian blind (configurable)
1.2 "Venetian blind" shading method: Position of vertical slats (configurable)
1.3 "Venetian blind" shading method: Position of slats (predefined)
2.1 "Rolling shutter" shading method: Position of rolling shutter (configurable)
2.2 "Rolling shutter" shading method: Position of roof window (configurable)
2.3 "Rolling shutter" shading method: Position of awning (configurable)

The character of the status icons change depending on the position thereby enabling all current positions of the activated KNX channel to be clearly read. The status value and icon can be omitted optionally.

In the channel function "Venetian blind/shutter (Step/Move/Step)", a bar graph (D) is displayed in the sensor element (figure 34). The bar graph displays position values in graphical form

based on the position feedback of the Venetian blind or rolling shutter actuator. In selection operation, the bar graph visualises the blind/shutter height or alternatively the slat position depending on which element was last selected for operation in the display area. In direct operation the bar graph always displays the blind/shutter position only.
The position orientation of the bar graph (ascending, descending) depends on whether the slat control or blind/shutter control was selected. In the shutter/blind control, the bar graph falls from the top to the bottom when the position of the activated shading system becomes greater. Similarly, the bar graph rises when the position becomes less. In the slat control, the bar graph orientates itself from the bottom to the top. In this case, the bar graph rises when the position of the activated slats becomes greater. Similarly, the bar graph falls when the position decreases. At full-scale deflection of the bar graph, the maximum shutter/blind position has been reached or the slats are completely closed. If the bar graph does not show any deflection, the shutter/ blind is completely retracted or the slats are completely opened.
The bar graph is always visible and normally supplements the status indication by status value and status icon.

Objects

A channel of the function Venetian blind/shutter (Step/Move/Step)" has up to 4 communication objects depending on the type of configuration blind/rolling shutter etc...

- "D.Output channel x - Venetian blind (Step)" (1-bit transmitting):
  Short-time telegrams are transmitted to the bus via this object after a short touch of the sensor element. This causes any ongoing drive runs to be stopped. Alternatively, blinds/ shutters or slats are activated briefly since the drive is being activated from the "Stop" state. KNX blind or shutter actuators then execute the configured short-time operation (Step).

- "D.Output channel x - Venetian blind (Move)" (1-bit transmitting):
  Long time telegrams (up, down) are transmitted to the bus via this object after a long press of the sensor element. This enables activated blinds/shutters of shading systems to be controlled until the end positions. KNX blind or shutter actuators additionally execute the configured long-time operation (Move).
  A short time telegram (see object "D.Output channel x - Venetian blind (Step)") can interrupt ongoing drive runs of the long time operation (Stop) thereby enabling a blind/ shutter to be stopped at any desired point.

- "D.Input channel x Venetian blind feedb. blind/shutter height" (1-byte receiving):
  Through this object the device can receive a position feedback for the blind/shutter height that a Venetian blind or shutter actuator transmits, for example. The status value, status icon and bar graph for the blind/shutter height visualisation are influenced as a result. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly.
  The feedback of the position value must be transmitted by the "actively transmitting" actuator.

- "D.Input channel x Venetian blind feedb. Slat pos." (1-byte receiving):
  Through this object the device can receive a position feedback for the slat position that a Venetian blind actuator transmits, for example. The status value, status icon and bar graph for the slat visualisation are influenced as a result. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly.
  The feedback of the position value must also be transmitted by the "actively transmitting" actuator here.

ⓘ The objects "D.Input channel x Venetian blind feedb. Blind/shutter height and "D.Input channel x Venetian blind feedb. Slat pos." interpret values to be sent or received on the basis of the KNX data point type 5.001 (Scaling). The decimal data values 0...255 are evaluated as percentages 0...100 % and displayed in the device display.

ⓘ Since Venetian blind or shutter actuators normally transmit position values as feedback, the activated motors stop when driver runs have been completed. For this reason, status indications of the channel element concerned do not normally change during a press of the sensor surface, but only when the buttons are released and the drive runs are stopped. By contrast, a displayed status value can already change even during an operation if the drive is already in the end position or cannot pass through the entire position range due to disabling functions.

4.2.4.1.7 Channel function "Venetian blind/shutter (Position)"

With the channel function "Venetian blind/shutter (position)" it is possible to transmit 1-byte position telegrams (values in compliance with KNX DPT 5.001 Scaling) to the bus. In this way, it is possible to activate Venetian blinds (incl. slats) and roller shutters by means of position values in combination with Venetian blind or shutter actuators. Similarly, other shading systems, such as roof windows, vertical slats and awnings can also be controlled by individual characteristics of the status indicators.
The difference between the channel functions "Venetian blind/shutter (Step/Move/Step)" and "Venetian blind/shutter (position)" is in the data formats of the communication objects.

Just like a channel of the function "Venetian blind/shutter (Step/Move/Step)", a KNX channel "Venetian blind/shutter (position)" can also be adapted to the type of shading system by the ETS parameter "Shading". It is possible to configure "Venetian blinds" incl. slat control whereby vertical slat systems are also controllable or alternatively "roller shutters" whereby window drives or awnings are also controllable. To simplify the control, no slat functions are available in the rolling shutter shading method. In this case, the selectable status icons are also adapted.

A KNX channel "Venetian blind/shutter (position)" for switching has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation). The sensor element is always executed as a rocker function and distinguishes between short and long operations.
A short sensor operation depending on the sensor surface ︿ / ﹀ (for a shutter/blind control) or 〈 / 〉 (for slat control) triggers value telegrams "100 %" or "0 %". In this way, the activated blind/shutter or slats can be moved to the end position. Position value telegrams are transmitted to the bus gradually in a defined time interval by means of long operations of the sensor surfaces. The device then increases or decreases the value cyclically during the operation depending on the value transmitter level configured in the ETS and transmits the values as a position setting. The value sequence generated in this way is converted to a movement by the activated Venetian blind or shutter actuator. The time between two value telegrams can be configured in the ETS and must be attuned to the travelling time of the actuator channel as much as possible in order to attain a movement operation as constant and interruption-free as possible.
The value transmitter level can be configured in the ETS to "not to be transmitted during adjustment". In this case, the value adjustment is deactivated by a long button-press.
The time for short and long operations can be adjusted in the ETS as "time between short time and long time command".

ℹ In the display area, the channel in the "Venetian blind" shading method has up to two status icons (slat status and blind/shutter status). Finger pressure on the status icons influences the operation via the sensor surfaces and the representation of the operating icons. If the slat icon was last pressed, the operating icons 〈 and 〉 are displayed. This should indicate the adjustment possibility of the slats by means of position setting. If the Venetian blind/shutter icon was last pressed in the display area, the operating icons ︿ and ﹀ are displayed. This indicates the adjustment possibility of the blind/shutter height by means of position setting. Depending on this selection, position telegrams are either transmitted to the bus via the object "Venetian blind slat position" or via the object "Venetian blind position". The selection of the operating icons therefore influences the bus telegrams.

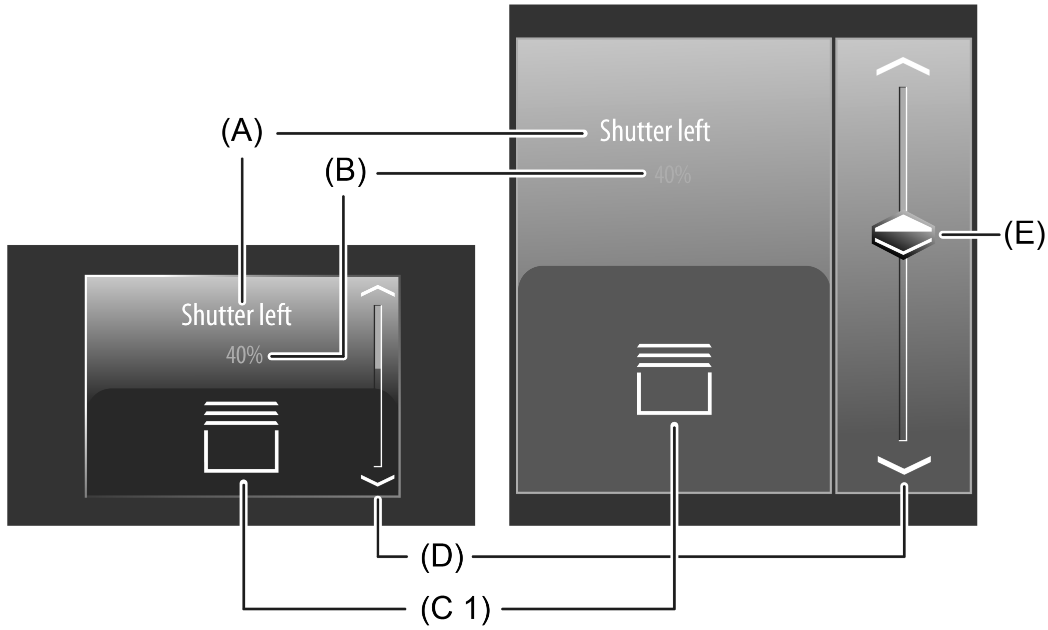


Figure 36: Example of an operating and display element of the channel function "Venetian blind/shutter (position)" and the "Rolling shutter" shading method
left: direct operation / right: selection operation

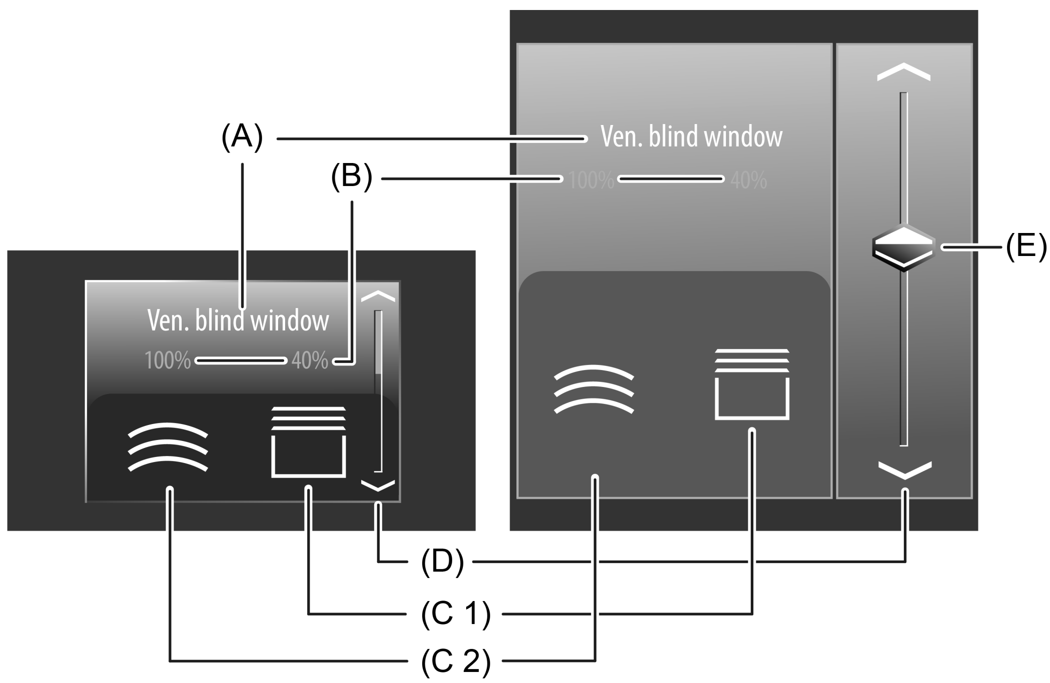


Figure 37: Example of an operating and display element of the channel function "Venetian blind/shutter (position)" and the "Venetian blind" shading method
left: direct operation / right: selection operation

(A) Text name
(B) Status value
(C1) Status icon blind (configurable)
(C2) Status icon slat (only with Venetian blind)
(D) Bar graph in the sensor area
(E) Slider in the sensor area

ⓘ The representation of the bar graph in the sensor area changes depending on whether or not slat or blind/shutter height are controlled. The figure shows a bar graph with blind/shutter height display as an example.

Slider

In the selection operation, a slider (E) is also available in addition to the sensor surfaces ︿ / ﹀ or 〈 / 〉 for positioning in the end positions or for value adjustment (figure 37). It is possible to specify positions for slat or blind/shutter heights directly with graphic support using the slider via the status icon depending on the selection. For this purpose, the slider can be set by finger pressure or continuously moved. To set the slider, you must touch the slider area at the required position with your finger. The slider then jumps immediately to the required position. At the same time, the device transmits the position value specified thus as a setting to the bus. Alternatively, you can move the slider continuously in the slider area with your finger. During the movement of the slider, the device transmits values according to the set value transmitter level in the ETS time-controlled and gradually. As a result, the slat or blind/shutter position of the activated system already changes during the slider adjustment, for example, whereby in the ideal case the operator immediately receives a visual feedback on the drive movement and position. The time that must elapse before the device outputs a new position level during an adjustment is defined in the ETS by the parameter "Time between two value telegrams". Consequently, the configured time of the value adjustment and the value transmitter level affect the control speed of the slider.
In order for drive runs to take place continuously and interruption-free when moving the slider, times as small as possible (e.g. 500 ms) and larger increments (e.g. 20...25%) should be configured if the slider is moved rather quickly. If, however, the slider is normally moved slowly, longer times between value telegrams (e.g. 1...2s) and smaller increments (e.g. 10...15%) are advisable.
If the parameter for the value transmitter level is set to "not to be transmitted during adjustment", the device does not transmit intermediate levels to the bus when moving the slider. In this case, only the final value of the slider adjustment is transmitted.

ⓘ The current position of the selected element (slat or blind/shutter) is indicated in the sensor element as a bar graph (see Functional description of the display elements below). The slider is located graphically before the bar graph and is adapted to the position of the bar graph if no slider operation occurs. Therefore, the slider responds to the feedback telegrams of the Venetian blind or shutter actuator similarly to the bar graph.
It is generally recommended to move the slider as slowly as possible and to leave your finger briefly (approx. 1s) on the operating element after reaching the setpoint so that the status indicator in the bar graph matches the current slider position and ideally no position correction takes place at the end of the operation.

ⓘ It should be noted that for a direct operation no slider is available for continuously changing the value! Here, a value can be adjusted to the value transmitter levels configured in the ETS by means of a long top-bottom operation of the sensor surfaces.

Status elements

The display area contains different display elements (figure 37) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "Venetian blind window"). In addition, a status value (B) can be displayed below the name, which displays position values in plain text ("0...100 %") depending on the object value of the position feedback of the Venetian blind or shutter actuator addressed. After a device reset, the display shows "---%" until a feedback object value of the status text is received.
Similarly to the status value, symbols (C1 & C2) can be displayed in the lower display area. In the Venetian blind shading method, status icons with status values for each slat position and blind height (Venetian blind height, position vertical system) are displayed in the display surface. In the rolling shutter shading method, however, only one status icon with status value for the shutter height (rolling shutter height, awning position, roof window opening) is visible.
The symbol displayed for the blind/shutter height can be configured in the ETS depending on the shading method. The symbols that can be selected for this correspond to the symbol

selection of the channel function "Venetian blind/shutter (Step/Move/Step)" (figure 35). The status icon for the slat position is predefined.
The character of the status icons change depending on the position thereby enabling all current positions of the activated KNX channel to be clearly read. The status value and icon can be omitted optionally.

In the channel function "Venetian blind/shutter (position)", a bar graph (D) is displayed in the sensor element. The bar graph displays position values in graphical form based on the position feedback of the Venetian blind or rolling shutter actuator. In selection operation, the bar graph visualises the blind/shutter height or alternatively the slat position depending on which element was last selected for operation in the display area. In direct operation the bar graph always displays the blind/shutter position only.
The position orientation of the bar graph (ascending, descending) depends on whether the slat control or blind/shutter control was selected. In the shutter/blind control, the bar graph falls from the top to the bottom when the position of the activated shading system becomes greater. Similarly, the bar graph rises when the position becomes less. In the slat control, the bar graph orientates itself from the bottom to the top. In this case, the bar graph rises when the position of the activated slat becomes greater. Similarly, the bar graph falls when the position decreases. At full-scale deflection of the bar graph, the maximum shutter/blind position has been reached or the slats are completely closed. If the bar graph does not show any deflection, the shutter/blind is completely retracted or the slats are completely opened.
The bar graphs is always visible and normally supplements the status indication by status value and status icon. The bar graph is located graphically behind the slider.

Keyboard for entering values

In addition to the possibilities of specifying position values using the sensor surfaces ︿ / ﹀ or 〈 / 〉 or slider, a keyboard can optionally be shown in the display. It is possible to specify a position value directly using the keyboard. The keyboard becomes visible by pressing a display area of the status icon for slat or blind/shutter for a long time with your finger (approx. 1s) if this was enabled by parameter configuration in the ETS. Using the keyboard, any position value ranging from 0...100% can be entered numerically and applied by pressing the ✓ button. After applying the value, it is accepted as a preset value and transmitted to the bus.
The entry can be terminated without applying any value by touching the sensor surface **x** in the keyboard.

ℹ It is only possible to preset a position value via the keyboard in selection operation on the room or function pages.

Objects

A channel of the function Venetian blind/shutter (position)" has up to 4 communication objects depending on the type of configuration blind/rolling shutter etc...

- "D.Output channel x - Venetian blind Position" (1-byte transmitting):
  Value telegrams (0...255) for the blind/shutter height setting are transmitted to the bus via this object after pressing the sensor elements. This can cause a blind position object (e.g. "Position Venetian blind", "Position rolling shutter/awning", "Position venting louver"...) of a blind or shutter actuator to be activated.

- "D.Output channel x - Venetian blind slat position" (1-byte transmitting):
  Value telegrams (0...255) for the slat position setting are transmitted to the bus via this object after pressing the sensor elements. This can cause a slat position object of a shutter actuator to be activated.

- "D.Input channel x Venetian blind feedb. blind/shutter height" (1-byte receiving):
  Through this object the device can receive a position feedback for the blind/shutter height that a shutter actuator transmits, for example. The status value, status icon and bar graph for the blind/shutter height visualisation are influenced as a result. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly.
  The feedback of the position value must be transmitted by the "actively transmitting" actuator.

- "D.Input channel x Venetian blind feedb. Slat pos." (1-byte receiving):
  Through this object the device can receive a position feedback for the slat position that a Venetian blind actuator transmits, for example. The status value, status icon and bar graph for the slat visualisation are influenced as a result. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly.
  The feedback of the position value must also be transmitted here by the "actively transmitting" actuator.

ⓘ The objects interpret values to be sent or received on the basis of the KNX data point type 5.001 (Scaling). The decimal data values 0...255 are evaluated as percentages 0...100 %.

ⓘ During an operation, the values of the objects "D.Input channel x Venetian blind feedb. blind/shutter height and "D.Input channel x Venetian blind feedb. slat pos." not evaluated. With a long press of the sensor elements ︿ / ﹀ or 〈 / 〉 or when moving the slider, a continuous value adjustment can take place on the bus. During this value adjustment, all status elements of the channel element are updated continuously by value simulation. The display elements first react again to the feedback object value of the Venetian blind or shutter actuator after the operation has been completed.

Slat correction

A KNX channel of the function "Venetian blind/shutter (position)" supports the supplementary function of the slat correction. Many KNX shutter actuators track the slat position when the shutter height changes due to a position setting. These actuators also reposition the slats when the blind position is preset to 0%, i.e. to the upper end position. This repositioning of the slats is often undesirable in the upper end position of the blind since the returned blind height also changes again due to the movement of the slats (position of blind unequal 0%). To prevent the slat from being repositioned in the upper blind end position, the automatic slat correction can be activated in a KNX channel "Venetian blind/shutter (position)". It can be activated by parameter in the ETS.
If the slat correction has been activated, the device always transmits a slat position of 0% for a blind height presetting of 0%. As a result, the slat is not repositioned when the upper end position is reached since this is already in the 0% position after the upward movement. It does not matter which operation performs the 0% presetting. Consequently, the slat correction will only function after short or long operations of the sensor surfaces or when changing the slider if a 0% blind position is set.
The automatic slat correction does not apply to position presettings for the blind within the range 1...100%. In such cases, the device only transmits slat positions when a slat operation is performed using the sensor surfaces or the slider.

ⓘ The slat correction is available only in the "Venetian" blind' shading method.

4.2.4.1.8 Channel function "Scene extension"

1-byte brightness value telegrams in compliance with the KNX data point type 18.001 (SceneControl) can be transmitted to the bus by using the channel function "scene extension". In this way, it is possible to control different KNX function units and thus, for example, set lighting and shading systems situationally in combination with scene push button sensors or actuators that have a scene function themselves. Furthermore, a scene of the scene function internally stored in the Smart Control can be recalled or saved by means of this channel function.
The channel function is always executed as a push-button function.

The "Function" parameter specifies how the scene extension works. This parameter has the following settings...

- "Scene extension without storage function",
- "Scene extension with storage function",
- "Recall of internal scene without storage function",
- "Recall of internal scene extension with storage function".

In the scene extension function, the device transmits a preset scene number (1…64) via a separate communication object to the bus during a sensor surface operation. This feature permits recalling scenes stored in other devices and also storing them, if the storage function is used.

The recall of an internal scene does not result in a telegram being transmitted to the bus. This function can be used to recall or – with the storage function – to store the up to 8 scenes stored internally in the local device as well.

The channel function "scene extension" distinguishes between short and long operations of the sensor surface. In the setting "... without storage function", an operation triggers the simple recall of a scene. A long operation has no additional effect.

In the setting "... with storage function", the device monitors the length of the actuation. A sensor surface operation of less than five seconds results in a simple recall of the scene as mentioned above. After an operation of more than five seconds, the device generates a storage instruction. In the scene extension function, a storage telegram is in this case transmitted to the bus. If configured for the recall of an internal scene, the sensor will store the internal scene. The internal scene control module will then request the current scene values for the actuator groups used from the bus.

The parameter "scene number on pressing the button" specifies which of the maximum of 8 internal or 64 external scenes is to be used during an operation.

ⓘ It should be noted that in the setting "Internal scene recall..." the scene function of the device must be enabled. This is done on the parameter page "scenes". If the scene function is not enabled, no reaction occurs when a sensor surface is touched in this configuration.

A KNX channel "scene extension" has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation).

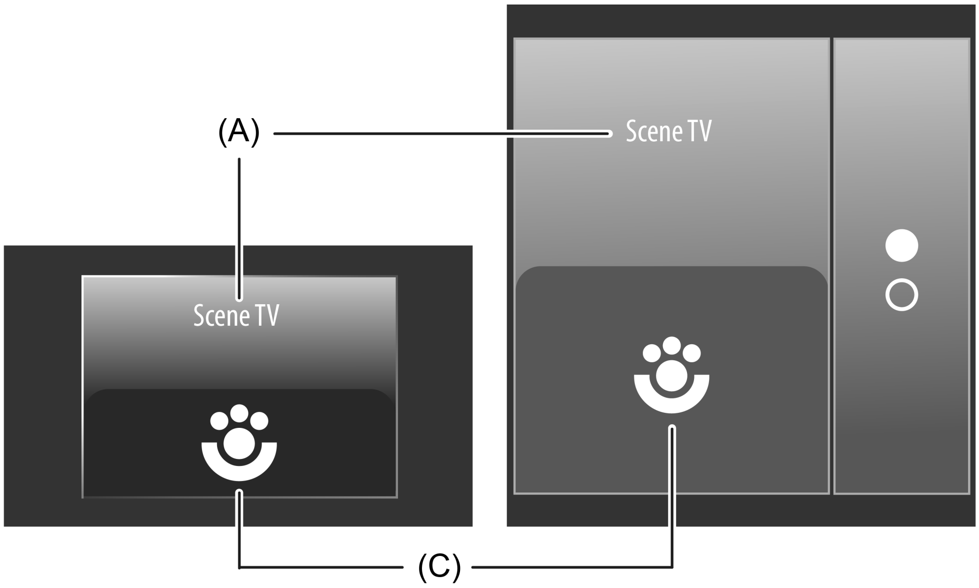


Figure 38: Example of an operating and display element of the channel function "scene extension"
left: direct operation / right: selection operation

(A) Text name
(C) Status icon

Status elements

The display area contains different display elements (figure 38) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "scene TV").
A symbol (C) can optionally be displayed in the lower display area. A parameter in the ETS defines whether the status icon in the display element is used. The scene function icon is static and preset (figure 39). Consequently, the icon does not change the display status for a scene recall or scene storage function.
A status text or status value cannot be configured in the channel function "scene extension".

Figure 39: Status icon of the scene extension

Objects

A channel of the function "scene extension" only has one KNX communication object...

- "D.Output channel x - Scene extension" (1-byte transmitting):
  Scene extension telegrams (values in compliance with KNX DPT 18.001) are transmitted to the bus via this object after pressing the sensor element. This can cause, for example, a scene push button sensor, scene controller or an actuator with its own scene function to be activated via the extension object on these devices. It is possible to transmit call telegrams or storage telegrams.
  The object is only available when the function of the channel is configured to "scene extension".

i Status objects are not available because a KNX channel of the function "scene extension" has no dynamic status elements.

4.2.4.1.9 Channel function "1-byte value transmitter"

With the channel function "1-byte value transmitter" telegrams in compliance with the KNX data types 5.010 (unformatted / 0...255) and 5.001 (Scaling / 0...100%) can be transmitted to the bus. The activation of other bus devices enables the user, for example, to execute limiting value presettings or presettings for current counter statuses.
Since the data format is identical, it is also possible as an alternative or supplement to the channel function "dimming (brightness value)" or "Venetian blind/shutter (position)" to activate dimmer actuators more easily (via brightness value specification) or blind and shutter actuators (via position value specifications). Here - as an example - static brightness or position values can be configured and recalled by sensor surface operation. Such an operation is appropriate when slider, value adjustment by a long button-press or visualizations of slat positions are not required. The character of the status icons support such use of the channels and make it possible to adapt to the activated KNX actuator.

A KNX channel "1-byte value transmitter" has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation). The sensor element is always executed as a push-button function and does not distinguish between any short and long operations.
A sensor operation triggers the value telegram configured in the ETS. The ETS "Function" parameter determines the data format of the object and defines which value range the channel function uses. The channel can optionally process integers from 0…255 or values within a range of 0…100%. The scaling of the status indications also adapts itself depending on this setting.
In addition to recalling values by operation of the sensor surface, it is possible to use a keyboard for presetting the value . As a result, it is possible optionally to permanently change the value that was originally preset in the ETS and thus adapt it at any time.

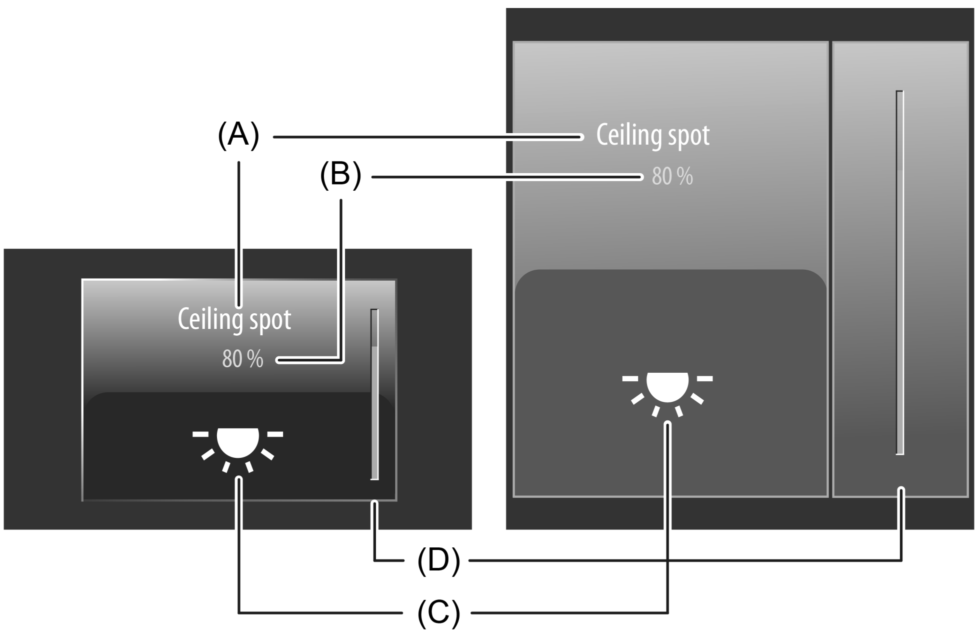


Figure 40: Example of an operating and display element of the channel function "1-byte value transmitter"
left: direct operation / right: selection operation

(A) Text name
(B) Status value
(C) Status icon (configurable)
(D) Bar graph in the sensor area

With the function "1-byte value transmitter" it is possible to switch off the operating function completely in the ETS. In this case, the channel concerned only works as a display function for value visualization. Consequently, touching the sensor or display elements does not induce any response.

Status elements

The display area contains different display elements (figure 40) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "ceiling spot"). In addition, a status value (B) can be displayed below the name, which displays values in plain text ("0...255" / "0...100 %") depending on the object value of the value feedback of an actuator. The data format of this status value indicator is determined by the ETS "Function" parameter. In the function as "Value transmitter 0%...100%", the displayed value is supplemented automatically by the unit "%". After a device reset, the display shows "---" "---%" until a feedback object value of the status text is received.
Similarly to the status value, a symbol (C) can be displayed in the lower display area. The symbol displayed is configured in the ETS (figure 41).
The character of the status icon changes depending on the feedback value thereby enabling the value status (e.g. brightness value or blind/shutter position) of the activated KNX channel to be read clearly. The status value and icon can be omitted optionally.

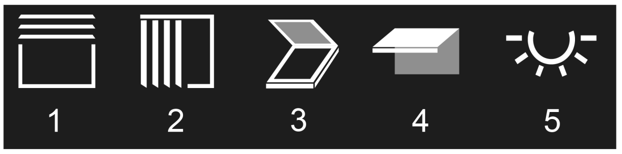


Figure 41: Status icon for the channel function "1-byte value transmitter"

1 Venetian blind/shutter
2 Vertical slat
3 Roof window
4 Awning
5 Brightness value/dimming value

In the channel function "1-byte value transmitter", a bar graph (D) is displayed in the sensor element. The bar graph displays values in graphic form on the basis of the value feedback values. The bar graph rises when the value becomes greater. Similarly, the bar graph falls when the value becomes less.
The scaling of the bar graph adjusts itself ("0...255" / "0...100%") depending on the ETS "Function" parameter. At full-scale deflection, the maximum value for the value range is set. If the bar graph shows no deflection, the value is "0".
The bar graphs is always visible and normally supplements the status indication by status value and status icon.

ℹ With the function "1-byte value transmitter" it is possible to switch off the operating function completely in the ETS. In this case, the channel concerned only works as a display function for value visualization. Consequently, touching the sensor or display elements does not induce any response. Only the status value, status icon and bar graph are visible.

Keyboard for entering values

In addition to the possibility of recalling values via the sensor surface and thus transmitting them to the bus, a keyboard can optionally be shown in the display. It is possible to specify a value directly using the keyboard and thus to permanently vary from the value configured in the ETS. The keyboard becomes visible by pressing the display area for a long time with your finger

(approx. 1s) if this was enabled by parameter configuration in the ETS. Using the keyboard, any value defined by the "Function" parameter within the range (0...255" / "0...100%") can be entered numerically and applied by pressing the ✓ button. After applying the value, it is transmitted to the bus and saved permanently in the device memory. Only an ETS programming operation resets the value to the ETS configuration.
The entry can be terminated without transmitting any value by touching the sensor surface **x** in the keyboard.

ℹ It is only possible to specify a value via the keyboard in selection operation on the room or function pages.

Objects

A channel of the function "1-byte value transmitter" has up to 2 KNX communication objects...

- "D.Output channel x - value transmitter 1-byte" (1-byte transmitting):
  Value telegrams (0...255) are transmitted to the bus via this object after pressing the sensor element. This can cause, for example, a limiting value object, brightness value object or blind position object to be activated.
  This object is not visible when the KNX channel only works as a display function.

- "D.Input channel x 1-byte value transmitter feedb." (1-byte receiving):
  Through this object the device can receive a value feedback that an activated actuator transmits, for example. The status value, status icon and bar graph for the value visualization are influenced as a result. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly. The feedback of the value must be transmitted by the "actively transmitting" actuator.
  If the activated bus device does not have a feedback function, the object "D.Input channel x - 1-byte value transmitter feedb." can be linked to the object "D.output channel x - 1-byte value transmitter" via an identical group address.

ℹ The objects always handle the value range "0...255". The configured "function" in the ETS defines how the transmitted or received values of this area are to be interpreted. In the setting "Value transmitter 0%...100%", the values are interpreted on the basis of the KNX data point type 5.001 (Scaling). The decimal data values 0...255 are then evaluated as percentages 0...100 %. In the case of "Value transmitter 0...255", no particular interpretation takes place. In this case, the received feedback values are evaluated directly in the decimal value range 0...255 in compliance with KNX data type format 5.010 (ValueUcount).

ℹ The status elements of the channel are influenced by the object "D.Input channel x 1-byte value transmitter feedb." . In addition, a value recall by sensor operation or by entry via keyboard also influences the status elements. During a value recall, the status elements are updated according to the recalled value regardless of the current feedback value. The display elements first react again to the feedback object value after a value recall by operation. As a result, this may cause a leap in value in the status indication when returned values vary from the preset value.

4.2.4.1.10 Channel function "2-byte value transmitter"

With the channel function "2-byte value transmitter", telegrams in compliance with the KNX data types 9.0xx (floating-point numbers) can be transmitted to the bus. The activation of other bus devices enables the user, for example, to specify temperature or brightness values or to generate any preset values for other physical sizes with negative or positive signs.

A KNX channel "2-byte value transmitter" has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation). The sensor element is always executed as a push-button function and does not distinguish between any short and long operations.
A sensor operation triggers the value telegram configured in the ETS. In addition to recalling values by operation of the sensor surface, it is possible to use a keyboard for presetting the value (see page 106-107). As a result, it is possible optionally to permanently change the value that was originally preset in the ETS and thus to adapt it at any time.

i The value transmitted via the communication object of the channel can vary from the preset value during a sensor surface operation (ETS or keyboard specification) because a gain factor and value offset can be configured optionally (see "Objects" below).

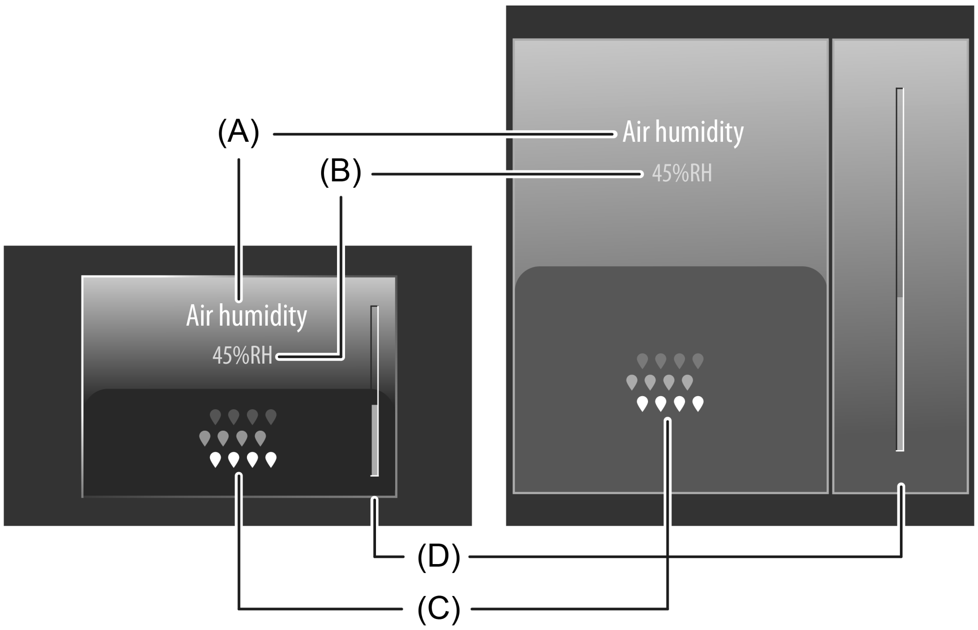


Figure 42: Example of an operating and display element of the channel function "2-byte value transmitter"
left: direct operation / right: selection operation

(A) Text name
(B) Status value
(C) Status icon (configurable)
(D) Bar graph in the sensor area

With the function "2-byte value transmitter", it is possible to switch off the operating function completely in the ETS. In this case, the channel concerned only works as a display function for value visualization. Consequently, touching the sensor or display elements does not induce any response.

Status elements

The display area contains different display elements (figure 42) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "Air humidity"). In addition, a status value (B) is displayed below the name, which displays values in plain text (e.g."45%rF") depending on the object value of the value feedback of an actuator. The value displayed can be supplemented by a unit. The text for the value unit ("%rF" in the example) is configured in the ETS. After a device reset, the display shows "---" (supplemented by the unit) until a feedback object value of the status text is received. The display of the floating-point value received by the value feedback object can be formatted by ETS parameters. Hence, it is possible to set the number of places after the decimal point and optionally configure gain factors and value offsets (see "Objects" below).
Similarly to the status value, a symbol (C) can be displayed in the lower display area. The symbol displayed is configured in the ETS (figure 43).
The icons of the 2-byte value transmitter are static and do not change their appearance. The icon can be omitted optionally. The status value is always visible.

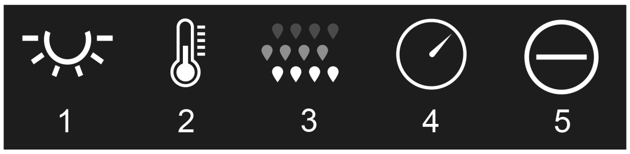


Figure 43: Status icon for the channel function "2-byte value transmitter"

1 Brightness
2 Temperature
3 Air humidity
4 Air pressure
5 Limit value

In the channel function "2-byte value transmitter", a bar graph (D) is displayed in the sensor element. The bar graph displays values in graphic form on the basis of the value feedback values. The bar graph rises when the value becomes greater. Similarly, the bar graph falls when the value becomes less.
The ETS parameters "Minimum value" and "Maximum value" scale the bar graph and thus define the minimum and maximum displayable value. At full-scale deflection, the maximum value for the value range is set. If the bar graph shows no deflection, the minimum value is set. The bar graphs is always visible and normally supplements the status indication by status value and status icon.

ℹ With the function "2-byte value transmitter", it is possible to switch off the operating function completely in the ETS. In this case, the channel concerned only works as a display function for value visualization. Consequently, touching the sensor or display elements does not induce any response. Only the status value, status icon and bar graph are visible.

Keyboard for entering values

In addition to the possibility of recalling values via the sensor surface and thus transmitting them to the bus, a keyboard can optionally be shown in the display. It is possible to specify a value directly using the keyboard and thus to permanently vary from the value configured in the ETS. The keyboard becomes visible by pressing the display area for a long time with your finger (approx. 1s) if this was enabled by parameter configuration in the ETS. Using the keyboard, a value can be entered numerically and applied by pressing the ✓ button. After applying the value, it is transmitted to the bus and saved permanently in the device memory. Only an ETS programming operation resets the value to the ETS configuration. It should be noted that only values within the "Minimum value" and "Maximum value" limits defined by the ETS parameters can be entered.
The entry can be terminated without transmitting any value by touching the sensor surface **x** in

the keyboard.

- ⓘ The value transmitted via the communication object of the channel can vary from the preset value via the keyboard because a gain factor and value offset can be configured optionally (see "Objects" below).
- ⓘ The ETS parameter "Number of integer digits" influences the values entered via the keyboard. The parameter specifies how many numbers can be preset before the decimal point via the keyboard and thus defines the value range that can be preset in this way.
- ⓘ It is only possible to specify a value via the keyboard in selection operation on the room or function pages.

Objects

A channel of the function "2-byte value transmitter" has up to 2 KNX communication objects...

- "D.Output channel x - value transmitter 2-byte" (2-byte transmitting):
  Value telegrams are transmitted to the bus via this object after pressing the sensor element. This can cause, for example, a temperature object, brightness value object or an object with similar functionality in compliance with KNX DPT 9.0xx to be activated.
  This object is not visible when the KNX channel only works as a display function.

- "D.Input channel x 2-byte value transmitter feedb." (2-byte receiving):
  Through this object the device can receive a value feedback that an activated actuator transmits, for example. The status value, status icon and bar graph for the value visualization are influenced as a result. Consequently, the feedback object must always be configured properly so that the status indications of the channel element work correctly. The feedback of the value must be transmitted by the "actively transmitting" actuator.
  If the activated bus device does not have a feedback function, the object "D.Input channel x - 2-byte value transmitter feedb." can be linked to the object "D.output channel x - 2-byte value transmitter" via an identical group address.

- ⓘ The status elements of the channel are influenced by the object "D.Input channel x 2-byte value transmitter feedb." . In addition, a value recall by sensor operation or by entry via keyboard also influences the status elements. During a value recall, the status elements are updated according to the recalled value regardless of the current feedback value. The display elements first react again to the feedback object value after a value recall by operation. As a result, this may cause a leap in value in the status indication when returned values vary from the preset value.

ⓘ The gain factor and value offset can optionally be configured in the ETS. Before a value is transmitted to the bus via the object "D.output channel x - 2-byte value transmitter" during an operation, the device calculates the value to be transmitted based on the gain factor and value offset. The same applies to the value display. The value received from the bus via the object "D.Input channel x 2-byte value transmitter feedb." is influenced - in the opposite way than during transmission - by the gain factor and value offset and only displayed afterwards.
As a general rule: "$\text{Value}_{\text{Display/Operation}}$ = $\text{Value}_{\text{Bus}}$ x Gain + Offset"
or
"$\text{Value}_{\text{Bus}}$ = ($\text{Value}_{\text{Display/Operation}}$ - Offset) : Gain".

Example (Conversion $°C_{\text{Bus}}$ -> $°F_{\text{Display/Operation}}$)...
Gain: "1.8" / Offset: "+32" ->
Transmitting: During an operation, the value "77°F" is preset by the user. -> The value "25° C" is transmitted to the bus ((77 - 32 [Offset]) : 1.8 [Gain] = 25).
Receiving: The value "20°C" is received via the bus. -> The value "68°F" is displayed in the display (20 x 1.8 [Gain] + 32 [Offset] = 68).

Gain factors can be smaller or greater than 1. Offsets can be negative and positive. In the default configuration, the gain factor is "1" and the value offset "0" so that no value conversion takes place.
With the 2-byte value transmitter, values within the defined value range (-671088.64...670760.96) can be processed by the KNX DPT 9.0xx (floating-point numbers). If a greater or smaller value than the value range limits should result in purely mathematical terms due to the value conversion by gain and offset, the device adapts the converted values to the maximum or minimum possible limiting value range.

4.2.4.1.11 Channel function "operating mode switchover, internal"

With the channel function "operating mode switchover, internal", the room temperature controller integrated in the device can be activated, whereupon it is possible to switch over to the controller operating mode by sensor operation. No direct bus telegrams are generated by this channel function. Status messages of the controller can only trigger bus telegrams.
If this channel function is used, the user can influence the room temperature control on the control section in the room and thereby specify the temperature setpoint.

A KNX channel "operating mode switchover, internal" has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation). The sensor element is always executed as a rocker function and does not distinguish between any short and long operations.
An operation of the sensor surfaces 〈 or 〉 switches over the possible operating modes (Comfort, Standby, Night reduction, Frost/heat protection) as well as the Presence function (presence button) successively.

The presence function makes it possible to switch the operating mode to the comfort extension or to deactivate it prematurely if Night or Frost/heat protection mode (not activated by the "Window status" controller object) has been activated. After the comfort extension has been activated using the presence button, the currently remaining extension time is displayed on the room temperature controller page. The remaining length of the comfort extension is output in minutes in the display and operating element of the operating mode switchover. The extension will automatically be deactivated as soon as the "Length of comfort extension" time, configured in the controller, has elapsed. If you recall the presence function once more, you can deactivate the comfort prolongation earlier. You cannot re-trigger such extension time.
If the standby mode is active, it is possible to switch over to the comfort mode by recalling the presence function. The comfort mode will remain active as long as the presence function remains active by the channel function, or until another operating mode comes into effect.

- ℹ The operating mode or presence function selected by the sensor surfaces is first accepted as valid by the internal controller approx. 2 seconds after completion of the operation.
- ℹ The controller function must be switched on in the "Room temperature control (RTC)" parameter node in order to use the channel function "operating mode switchover, internal".

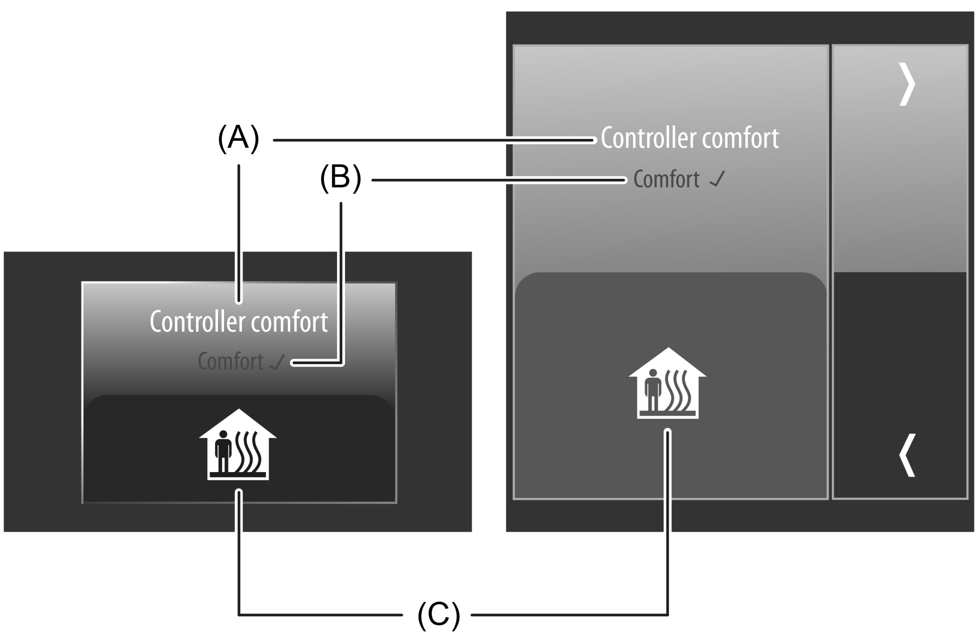


Figure 44: Example of an operating and display element of the channel function "operating mode switchover, internal"
left: direct operation / right: selection operation

(A) Text name
(B) Status text

(C) Status icon (displays current controller operating mode)

Status elements

The display area contains different display elements (figure 44) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user. The name should be selected in such a way that the user knows clearly which operating mode is recalled after executing an operation on the controller (e.g. "Controller comfort").
In addition, a status text (B) can be displayed below the name, which visualises different texts ("Comfort", "Standby", "Night", "Frost/heat protection", "Presence button") in the display depending on the operating mode of the integrated room temperature controller. Once the controller has accepted the operating mode selected and preset by the sensor surfaces as valid, the display element displays a ✓ immediately after the status text. In this way, the user can identify whether the operating mode he desired was actually set. If ✓ still does not appear approx. 2 seconds after the last operation, the controller has not accepted the presetting directly. It then normally works in an operating mode with a higher priority (e.g. window status or KNX forced operating mode).

A symbol (C) can optionally be displayed in the lower display area. A parameter in the ETS defines whether the status icon in the display element is used. The displayed icon of the operating mode switchover is determined by the current operating mode of the integrated room temperature controller (figure 45). Consequently, the icon changes the display status whenever a change-over to a different operating mode takes place.
The status value and icon can be omitted optionally.

Figure 45: Status icons for the operating mode switchover

1 Icon for comfort
2 Icon for standby
3 Icon for night reduction
4 Icon for frost / heat protection
5 Icon for presence function

Objects

A channel of the function "operating mode switchover, internal" does not have its own communication objects because only the room temperature controller integrated in the device is activated. All status indications are updated by the controller.

4.2.4.1.12 Channel function "setpoint shift, internal"

With the channel function "setpoint shift, internal", the room temperature controller integrated in the device can be activated, whereby it is possible to shift the current temperature setpoint gradually within a specified range. No direct bus telegrams are generated by this channel function. Status messages of the controller can only trigger bus telegrams.
If this channel function is used, the user can influence the room temperature control on the control section in the room and thereby specify the temperature setpoint without switching over the operating mode.

A KNX channel "setpoint shift, internal" has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation). The sensor element is always executed as a rocker function.
Pressing the sensor surface **+** shifts the current setpoint temperature value by one level in positive direction. Pressing the sensor surface **-** shifts the setpoint by one level in negative direction. The setpoint can be shifted by several levels by pressing a sensor surface repeatedly. A shift by a maximum of 4 levels is possible. The value of a level corresponds to 0.5K. Consequently, the setpoint temperature value can be shifted within the range -2K...0...+2K.

i The controller function must be switched on in the "Room temperature control (RTC)" parameter node in order to use the channel function "setpoint shift, internal".

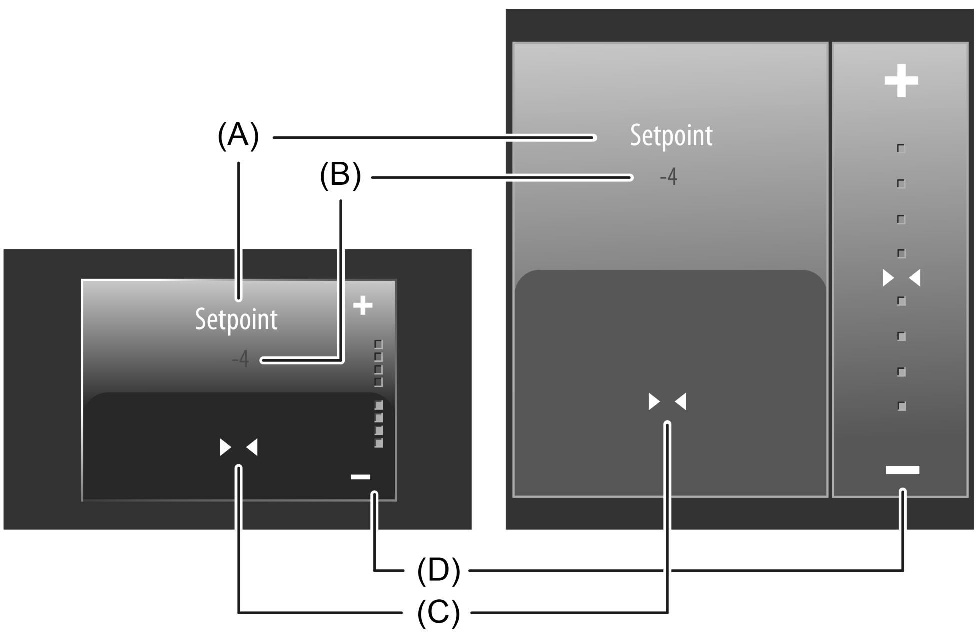


Figure 46: Example of an operating and display element of the channel function "setpoint shift, internal"
left: direct operation / right: selection operation

(A) Text name
(B) Status value
(C) Status icon
(D) Scale

Status elements

The display area contains different display elements (figure 46) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "setpoint").
In addition, a status value (B) can be displayed below the name. The status value displays the

level of the setpoint shift returned by the internal room temperature controller in textual form (-4...0...+4). The value of a level corresponds to 0.5K. The status value "0" means that no setpoint shift is active.
A symbol (C) can optionally be displayed in the lower display area. A parameter in the ETS defines whether the status icon in the display element is used. The setpoint shift icon is static and preset (figure 47). Consequently, the icon does not change the display status.
The status value and icon can be omitted optionally.

Figure 47: Status icon of the setpoint shift

In the channel function "setpoint shift, internal", a scale (D) is displayed in the sensor element. This scale displays the current setpoint shift in graphic form based on the level size feedback of the internal room temperature controller. A 4-stage setpoint shift takes place in a positive or negative direction. A level display in the form of a square is available in the scale for each level. The more squares illuminated, the greater is the level of the setpoint shift.
Shifts in the negative range (temperature drop) are indicated by blue illuminated squares. Shifts in the positive range (temperature increase) are indicated by red illuminated squares.
The scale is always visible and normally supplements the status indication by status value and status icon.

Objects

A channel of the function "setpoint shift, internal" does not have its own communication objects because only the room temperature controller integrated in the device is activated. All status indications are updated by the controller.

4.2.4.1.13 Channel function "Fan controller, internal"

With the channel function "Fan controller, internal", the room temperature controller integrated in the device can be activated. This makes it possible to control the fan from heating and cooling systems operated by circulating air, such as fan coil units (FanCoil units), depending on the command value calculated in the controller or using manual operation. No direct bus telegrams are generated by this channel function. Status messages of the controller can only trigger bus telegrams.
If necessary, the fan controller can be enabled separately by setting the "Fan controller available" parameter in the "Room temperature control -> Controller general" parameter node to "Yes". When the function is enabled additional parameters will appear in the ETS in the "Room temperature control -> Controller general -> Fan controller" as well as additional communication objects.
If this channel function is used, the user can influence the room temperature controller on the control section in the room and thereby specify the fan controller level, without switching over the operating mode.

A KNX channel "Fan controller, internal" has a display element and sensor surface in the graphic interface for operation. The display area and sensor area, depending on the existing operation concept, are combined into one surface (direct operation) or distributed on two surfaces (selection operation). The sensor element is always executed as a rocker function. Operation of the sensor surface **+** increases the current fan level by one level. Operation of the sensor surface **-** reduces the current fan level by one level. The setpoint can be shifted by several levels by pressing a sensor surface repeatedly.

The fan controller distinguishes between Automatic and Manual operation. Switch-over between the two operation modes is carried out through a long press of the operating and display element of the channel function.

Using the channel function, the fan controller can be operated at Level 8 at a maximum, depending on the number of configured levels.

ⓘ The controller function must be switched on in the "Room temperature control (RTC)" parameter node in order to use the channel function "Fan controller".

ⓘ The fan controller works only in conjunction with PI feedback controls with continuous or switching (PWM) command value output. In 2-point feedback control, the fan controller is inactive, even if the function is enabled in the ETS.

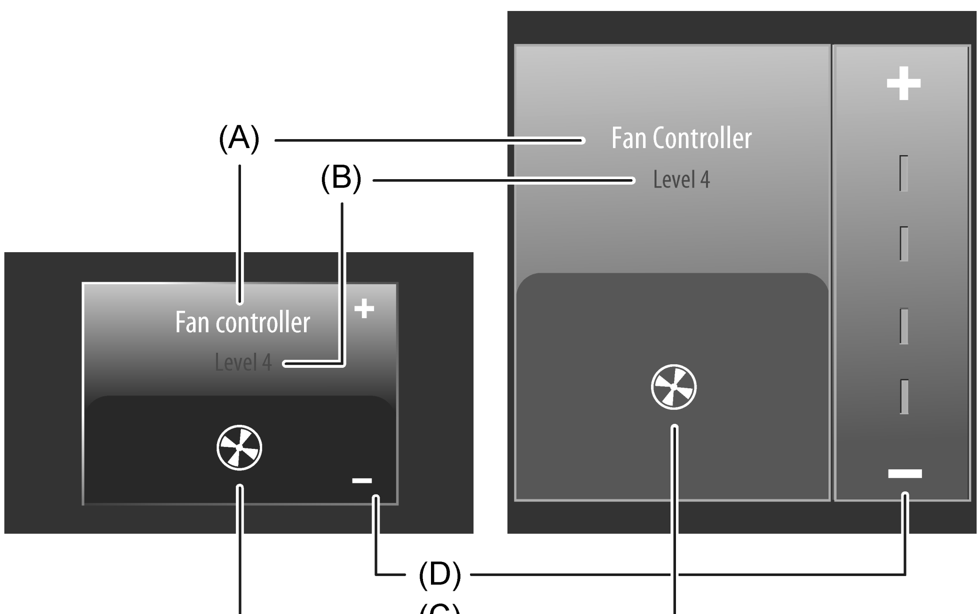


Figure 48: Example of an operating and display element of the channel function "Fan controller, internal"
left: direct operation / right: selection operation

(A) Text name
(B) Status value
(C) Status icon
(D) Scale

Status elements

The display area contains different display elements (figure 48) that are influenced by ETS parameters. A name can be assigned to each KNX channel in the ETS (A). This text name is centred in the display element for display whereby controllable KNX functions are identified for the user (e.g. "Fan controller").
In addition, a status value (B) can be displayed below the name. The status value displays the level of the fan controller returned by the internal room temperature controller in textual form (Off, Level 1, Level 2, ..., Level 8). The status value "Off" means that the fan controller is not active.
The status value can be omitted optionally.
A status icon (C) is displayed in the lower display area. This is not an option and cannot be hidden by a parameter in the ETS, as in other channel functions. The icon shown in the operating and display element of the channel function is dependent on the operating mode of the fan controller. In manual operation, the icon is static and preset (figure 49).

Figure 49: Status icon of the fan controller in manual mode

The state of the icon of the channel function "Fan controller, internal" changes only when the operating mode changes over. Automatic mode is also displayed using a static, preset icon (figure 50).

Figure 50: Status icon of the fan controller in automatic mode

In the channel function "Fan controller, internal", a scale (D) is displayed in the sensor element. When operating the selection, this scale displays the current fan controller level in graphic form based on the level value feedback of the internal room temperature controller. Depending on the configuration, the level can be adjusted to up to 8 levels. A level display in the form of a rectangle is available in the scale for each level. The more rectangles are illuminated, the greater the active level of the fan controller is. When the internal fan controller is operated directly, the level value is fed back solely via the status value.
In the selection operation, the scale is always visible and normally supplements the status indication by status value and status icon.

Objects
A channel of the function "Fan controller, internal" does not have its own communication objects, because only the room temperature controller integrated in the device is activated. All status indications are updated by the controller.

4.2.4.1.14 Channel function "ASCII-Text"

The channel function "ASCII-Text" offers the user the option, according to the datapoint type 16,000, of showing texts received via the KNX Bus in the display of the Smart Control. The texts are fed into the device using two 14-byte communication objects, which means that the text can consist of a maximum of 28 ASCII characters. The separated texts are then combined into a static text for display purposes, which is formatted to be one-line, left-flush and vertically centred. If the length of the text exceeds the line width, the static text automatically becomes a running text, which scrolls to the left at a rate of 5 px/500 ms. Upper and lower-case letters of the Latin alphabet, the ten Arabic numbers and some punctuation characters can be displayed.

An "ASCII Text" KNX channel has a display element in the graphic interface. This channel cannot be used to perform operations on the device since it does not have a sensor surface.

Depending on the number of ASCII characters received, the channel function can be used to display a text of up to 28 characters.
For example, this channel function is used to welcome guests to a hotel (figure 51).

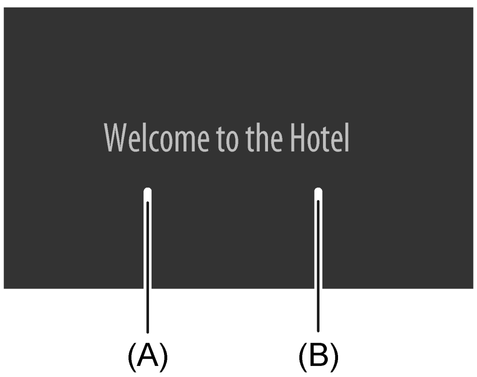


Figure 51: Example of a display element of the channel function "ASCII text"

(A) ASCII text 1
(B) ASCII text 2

Status elements

A designation can also be assigned to the "ASCII Text" channel function in the ETS plug-in. However, this text designation is not displayed in the display element of the device, but is intended solely for orientation in the tree structure of the plug-in. This property is used to simplify function selection, for example on the Start or Favourites page.

Objects

A channel of the "ASCII Text" function has 2 KNX communication objects...

- "D.Input Channel x - ASCII text 1" (14 Bytes, receiving):
  This object allows the device to receive ASCII texts of up to 14 characters, which are transmitted via the KNX bus. This influences the display area of the channel element. Consequently, the feedback object must always be configured properly so that the displays of the channel element work correctly.
  The ASCII test must be transmitted "actively" to the bus.

- "D.Input Channel x - ASCII text 2" (14 Bytes, receiving):
  This object allows the device to receive ASCII texts of up to 14 characters, which are transmitted via the KNX bus. This influences the display area of the channel element. Consequently, the feedback object must always be configured properly so that the displays of the channel element work correctly.
  The ASCII test must be transmitted "actively" to the bus.

4.2.4.1.15 Master button

The device has a master button on the touch sensor surface outside the display area ○●. The master button can be linked to any existing KNX channel. In this way, a function, such as the switching of room lighting, can be executed quickly and easily without touch operation of the display pages.
The master button has a sensor surface (figure 52).

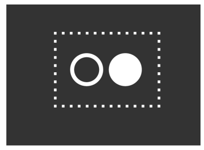


Figure 52: Sensor surface of the master button

A KNX channel can be configured as a rocker function (two button operation - the sensor surfaces execute separate operating functions) or as a push button function (single-surface operation - both sensor surfaces execute the same operating function). The master button always executes push-button functions for channel functions that can be configured alternatively to pushbutton or rocker functions (figure 53).

Function	**Cmd for sensor surface ●○ brief actuation**	**Cmd for sensor surface ●○ long actuation**
Switching	TOGGLE	---
Dimming (Start/Stop)	Switching: TOGGLE	Dimming: TOGGLE Release = Stop
Dimming (Brightness value)	0% / 100% (TOGGLE)	Incr./reduce dimming val. (TOGGLE) until releasing
Ven. blind/shutter (Step/Move/Step)	Step: TOGGLE (Up / Down) / Stop	Move: TOGGLE (Up / Down)
Venetian blind/shutter (Position)	0% / 100% (TOGGLE) Curtain	Incr./reduce position (TOGGLE) until releasing
Scene extension	Recall a scene	Store scene
Value transmitter 1-byte	Transmit value	---
Value transmitter 2-bytes	Transmit value	---
Operating mode switchover	Changing the operating mode	---
Setpoint shift	Increase/reduce setpoint (TOGGLE)	---
Fan controller, internal	Increase/reduce fan level (TOGGLE)	---

Figure 53: Commands of the master button dependent on the assigned channel function

i The times for short and long operations can be adjusted in the ETS.

i In the channel function" Venetian blind/shutter (position)" and the "Venetian blind" shading method, the blind/shutter can be controlled exclusively by the master button. Slat control by the master button is not possible.

i A switched off display illumination disables operation and display elements of the display (see chapter 4.2.4.1.17. Display illumination and operation LED). Consequently, these elements are not operational if a display illumination is switched off. The master button, which is located outside of the display, is independent of the display illumination and disabling of display operating elements. Consequently, the master button can also be operated with a dark display.

4.2.4.1.16 Status line

In each display, a status line is displayed at the top edge of the monitor (figure 54). This status line (A) stands out visually from the rest of the display by means of a graphic horizon. The status line can contain different display information and operating elements.

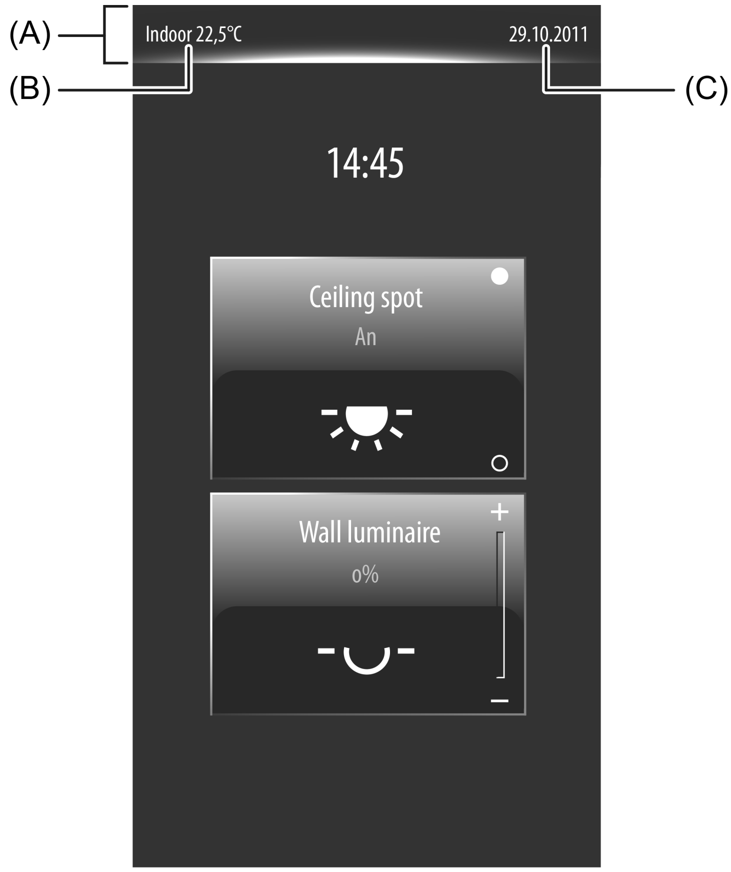


Figure 54: Example of a status line with indoor temperature and date display

(A) Status line with graphic horizon
(B) Inside temperature display
(C) Date display

On the display pages of the main menu levels (see page 63) the status line contains up to four items of display information. Thus, the current room temperature (B) can be displayed left-aligned and the current date (C) can be displayed right-aligned.

The displayed room temperature value corresponds exactly to the value that the internal room temperature regulator works with as actual value. The temperature value is determined by the temperature detection of the device and can either be supplied by the internal temperature sensor, by an external sensor or by a combination of measured values from both sensors (see chapter 4.2.4.3.6. Room temperature measurement).
The unit of the room temperature can be configured in the ETS in the parameter node "Display" by the parameter "Display of indoor temperature". Thus, the room temperature value can either be displayed in "°C" or alternatively in "°F". In addition, this parameter can be defined with the setting "no display" so that the room temperature is not displayed in the status line.

The date displayed in the status line is controlled by the internal system clock of the device. The date of the system clock can be set via the communication object "D.Input Date" (KNX DPT 11.001) or via the system settings in the administration area (see page 130). The format in which the date is displayed can be defined using the ETS parameter "Display date" or in the administrator area. Here, you also define whether the date should be visible at all in the status line.

Unlike the display pages of the main menu levels, the status line contains different operating elements for page navigation ("〈 + Text") or for acknowledging ("Save ✓") or discarding ("〈 Cancel") settings. These elements are dynamic and are displayed and hidden automatically.

4.2.4.1.17 Display illumination and operation LED

Display illumination

The device is equipped with a switchable display illumination. Depending on the required installation location, it may be desirable for the display to be illuminated either permanently or temporarily. The function of the display illumination can be defined in the ETS in the parameter node "Display -> Display illumination". If the display illumination is switched off, the display can no longer be read. Indicators and controls are then no longer present.

ℹ A switched off display illumination disables operation and display elements of the display. Consequently, these elements are not operational if a display illumination is switched off. The master button ○●, which is located outside the display, is independent of the display illumination and disabling of display operating elements. Consequently, the master button can also be operated with a dark display.

After programming with the ETS or after switching on the power supply (device reset), the display illumination can be switched on or off. In this case, the parameter "Display illumination after reset" defines the behaviour. With the "on" setting, the display illumination is switched on after a device reset and switched of again automatically when the time specified by the parameter "Automatic switch-off of display illumination" has elapsed and no additional influence of the illumination occurs within this time (see parameter "Switch on display illumination").
In the setting "off", the display illumination is first switched off after a reset. The illumination can then be switched on by events defined by the parameter "Switch on display illumination".

During ongoing operation of the device, the display illumination can be switched on or off depending on different events. The parameter "Switch on display illumination" specifies the behaviour of the illumination as follows...

- Setting "only via display/button operation":
  The display illumination is switched on by any touch operation of the display, sensor buttons ↲, ❐ and ○● or by an optionally available push-button extension module of the button or rocker operation. The device switches off the illumination of the display automatically again as soon as the delay time defined by the parameter "Automatic switch off display illumination after" has elapsed. Each new operation of the device via the aforementioned events restarts the delay time.
  If the lighting is switched off, only the display illumination is switched on after touching the touch surface the first time. No operating element located on the display surface will be activated yet by this operation. Hence, no commands will be evaluated and transmitted to the bus yet by the first operation for switching on the illumination. An operation on the push-button extension module behaves different to this. An operation on the push-button extension module switches the display illumination on and also directly affects the execution of the configured push-button function.

- Setting "only via switching object":
  With this setting the display illumination can be activated via the 1-bit communication object "Backlighting On/Off". The parameter "Behaviour of display illumination switching object" determines which telegram polarity induces switching on or switching off. This parameter also defines whether the illumination remains on or off by a bus telegram or whether the display illumination switches itself again automatically after switching on. In the latter case, the time specified by the parameter "Automatic switch-off of display illumination" defines when the automatic shut-off takes place automatically after switching on by a bus telegram. If no automatic switch off should take place by the switching object during activation of the display illumination, the illumination stays on until it is switched off by the object.

- Setting "only via display/button operation and switching object":
  This setting is a combination of the options "only via display/button operation" and "only via switching object". In this case, the illumination can be activated either via an operation on the device or via the communication object "Backlighting On/Off". The most recent event prevails and specifies the status of the display illumination.

Operation LED

The device has a blue Operation LED on the front of the device (figure 55). This LED can be switched permanently off or on for the purpose of orientation. A parameter in the ETS defines the behaviour.

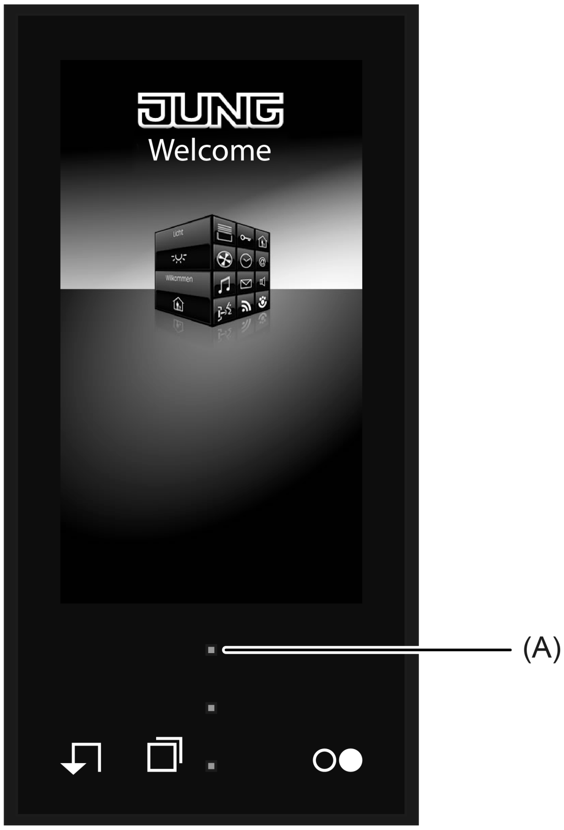


Figure 55: Operation LED on the front of the device

(A) Operation LED (blue)

4.2.4.1.18 Displaying measurement data of a weather station

Display page

The device offers the possibility to display measurement data of a KNX weather station. Displayable values are the wind speed, twilight threshold, up to 3 different brightness values, outdoor temperature, precipitation situation, angle of the sun and up to any 4 different additional external 2-byte values that can be formatted for display. The measured values are displayed by symbols and text in a form adapted to the display concept. A separate display page is provided for this purpose that can be recalled via the function page of the main menu level (figure 56). The menu can be recalled by touching the tile with the icon (1.).
To return to the main menu level, press the "‹ Functions" icon (2.) in the status line at the top edge of the screen.

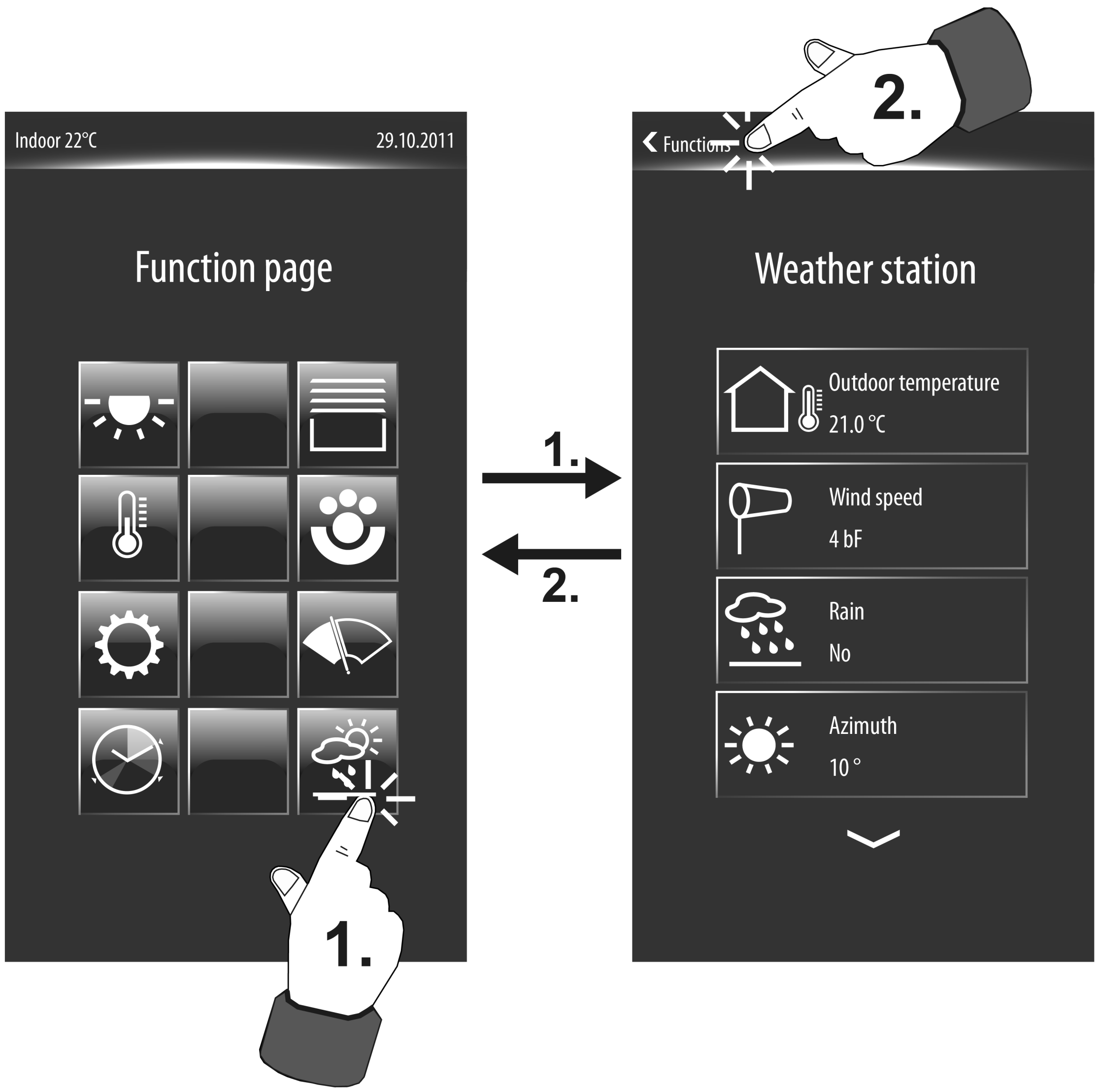


Figure 56: Recalling the display page for the weather station
Example of a view for different measured values (right)

ℹ The number and form of the visible tiles and the arrangement of the icons on the tiles on the function page depends on the number of configured function units and functions. The icons, and consequently, the function units are assigned automatically to the tiles. Visible tiles without assignment have no icon and no function (see page 63).

If the device was commissioned with an ETS programming operation, the display page of the weather station can be recalled as displayed. This requires that the page of the weather station

be configured centrally as "available" by the corresponding parameter in the ETS in the "Display" parameter node.
Up to 14 different measured values can be displayed on the display page of the weather station. The measured values of various data types have to be made available to the device via the bus from an external weather station. Separate communication objects are available for this. In the ETS in the parameter node "Display -> Weather station" you must define which of the maximum of 14 measured values are displayed on the display page (see page 125-126).
If no measured values have been received yet, for example immediately after a device reset, the display shows an invalid value represented by "---".

Each measured value on the display page of the weather station has its own display element (figure 57). The display elements normally contain a measured value symbol (A), a name of the measured value (B) in textual form and the measured value itself (C). The measured value symbols are permanently assigned to the measured values. Only the 4 optionally available external values have no measured value symbols. The text names are entered in the ETS in which each of the measured values is identified individually and can be adapted to the local conditions.

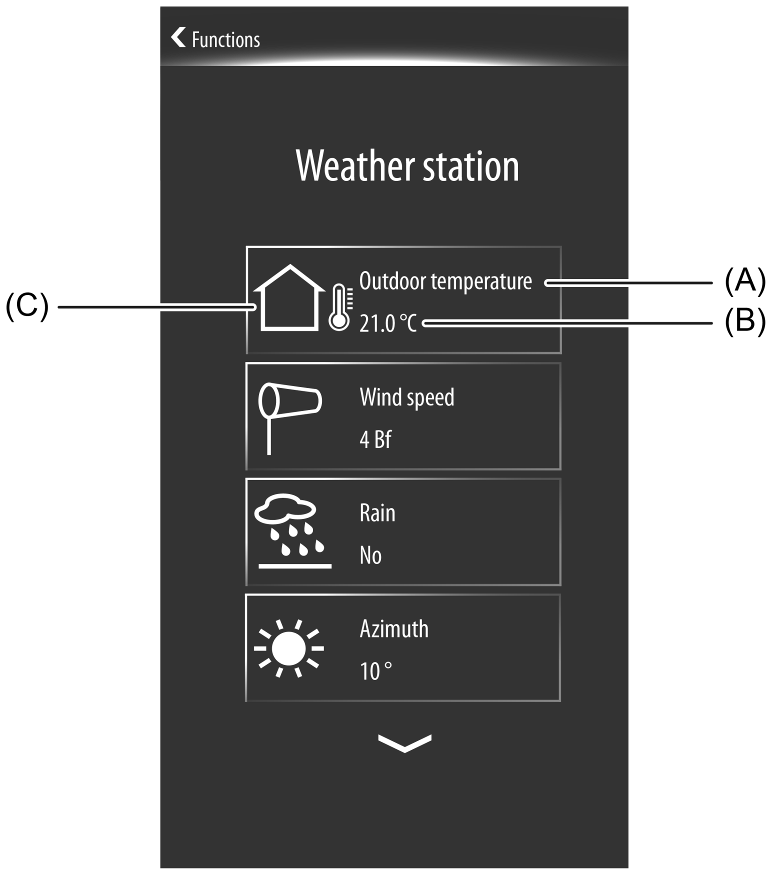


Figure 57: Example of a weather station display page

(A) Measured value symbols (permanently assigned to the measured values / The optionally available external values 1...4 have no symbol.)
(B) Name (is configured in the ETS)
(C) Measured value

Up to 4 different measured values can be displayed at the same time on the display page of the weather station. You can switch the display so that all configured measured values can be viewed gradually either by the sensor surfaces ﹀ / ︿ or alternatively by a vertical movement of your finger.

Configuration and data formats

In the ETS in the parameter node "Display -> Weather station" you define which measured values are actually visible on the display page of the weather station. Each measured value can be enabled in the ETS for display. Furthermore, value units and display formatting must be specified for some measured values. The following table shows all configurable measured values, their data formats incl. units and the assigned symbols for the display.

ⓘ Care must be taken to ensure that the telegrams of the KNX weather station which provide the measured values correspond to the expected data formats.

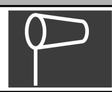
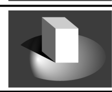
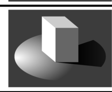
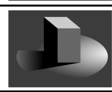
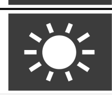
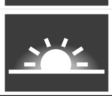
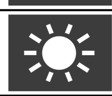
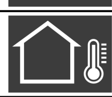
Measured value	Icon	Data format	Displayed unit	Data type for KNX telegram
Wind speed		2 byte	m/s km/h Bft	9.005 (m/s)
Rain		1 bit	---	1.xxx
Brightness 1		2 byte	kLux	9.004 (Lux)
Brightness 2		2 byte	kLux	9.004 (Lux)
Brightness 3		2 byte	kLux	9.004 (Lux)
maximum brightness		2 byte	kLux	9.004 (Lux)
Twilight		2 byte	Lux	9.004 (Lux)
Sun status Azimuth Elevation		1 byte	°	5.003 (0°...360°)
Outdoor temperature		2 byte	°C °F	9.001 (°C)
external value 1	- - -	2 byte	optional (max. 5 characters)	9.xxx
external value 2	- - -	2 byte	optional (max. 5 characters)	9.xxx
external value 3	- - -	2 byte	optional (max. 5 characters)	9.xxx
external value 4	- - -	2 byte	optional (max. 5 characters)	9.xxx

Figure 58: Configurable measured values for the display page of a KNX weather station

- ⓘ The brightness measured values 1...3, the measured value for the maximum brightness and the twilight measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The brightness measured values 1...3 and the measured value for the maximum brightness are converted by the device so that these measured values are displayed in "kLux".
  The measured value of the wind speed must be made available to the device via the bus in "m/s" in compliance with KNX DPT 9.005. According to the parameter setting of the measured value, a conversion and display in the formats "m/s", "km/h" or "Bft (Beaufort)" takes place if necessary.
  The device expects the measured value for the outdoor temperature in "°C" in compliance with KNX DPT 9.001. A conversion and display in the formats "°C" or "°F" according to the parameter setting of the measured value also takes place here if necessary.
- ⓘ The measured values for the sun status (Azimuth and elevation angle) can only be enabled in the ETS for common display.
- ⓘ The 1-bit telegram polarity for the rain signal is predefined: "0" = no rain, "1" = rain.
- ⓘ The measured values for the sun status ("Azimuth", "Altitude") and for the rain situation ("Rain") always have fixed names.
- ⓘ The display formats of the external values 1...4 (gain, offset, and by the number of places before and after the decimal point) can be adapted. The external values have no symbol in the display.

The device uses up to 7 KNX channels to be able to receive all measured values via the bus. For this reason, the choice of available KNX channels is reduced by 7 channels if a display function for the weather station is enabled. If the weather station display page is not configured, a maximum of 30 KNX channels are available for general configuration. If, however, there is a weather station display page, only 23 KNX channels are freely available.

Limiting values

Many KNX weather stations make it possible to carry out a limiting value evaluation of the determined measured values. It is therefore possible, for example, to evaluate a twilight threshold by a limiting value evaluation of the twilight measured value or to monitor brightness or temperature measured values for safety limits. If a weather station is present in the KNX system, the display function for the weather station can evaluate limiting value telegrams which transmits their measured values to the device and also assesses limiting values and transmits in the form of 1-bit telegrams to the bus.

Each 2-byte measured value transmitted to the device for the purpose of display on the weather station page can be assigned to a limiting value. For this purpose, each of these measured values has an additional 1-bit limiting value object. The display of the measured values is influenced by these limiting value objects. If a limiting value telegram is received, the device on the display page of the weather station marks the corresponding element in red (figure 59). This indicates to the user when viewing these measured values that a limiting value has been influenced as a result of the measured value having been exceeded or fallen short of.
The display element concerned remain coloured until the influence by the limiting value is removed again.
The telegram polarity of the limiting value objects is predefined: "0" = limiting value inactive, "1" = limiting value active.

- ⓘ The measured values for the sun status (Azimuth and Elevation) and precipitation have no limiting value evaluation.

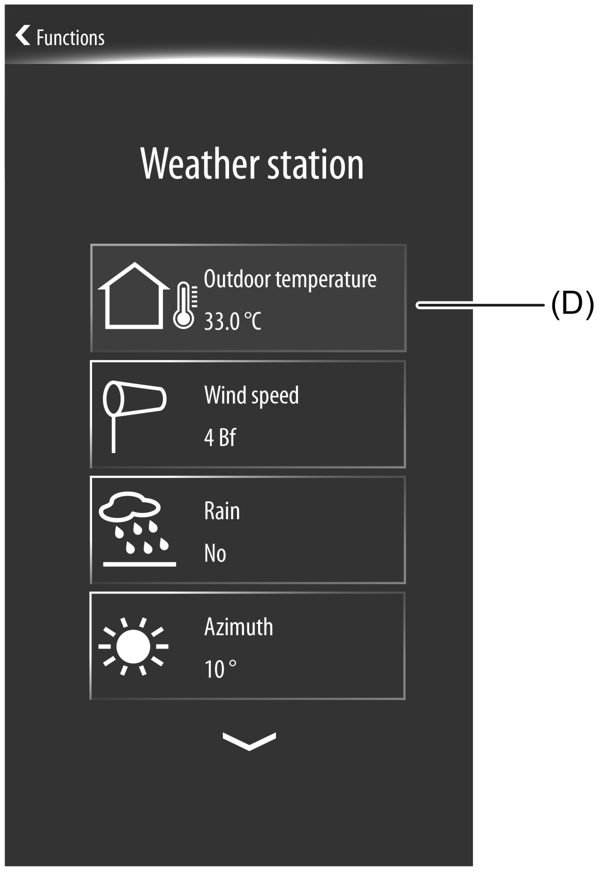


Figure 59: Colour-marked display element due to a limiting value influence (affected here: Measured value for outdoor temperature)

(D) Red colour-marking to indicate a limiting value influence

4.2.4.1.19 System settings

Recalling the administrator page

Different device settings can be made available to the Administrator via a password-protected system page. Hence, it is possible to set time and date, change the password and activate the KNX programming mode. In addition, the current version of the device firmware is displayed to the user.
The administrator is a person who has access to the administrator password (if required) and thus to the aforementioned system settings. Thus, the installer or person commissioning the KNX system with the ETS must be an administrator since the assignment of the physical addresses is only possible with access to the administrator area (see page 15-16).

The system page can be recalled via the function page (figure 60). The menu can be recalled by touching the tile with the ⚙ icon (1.). The display then switches to the admin area and optionally requests a password.

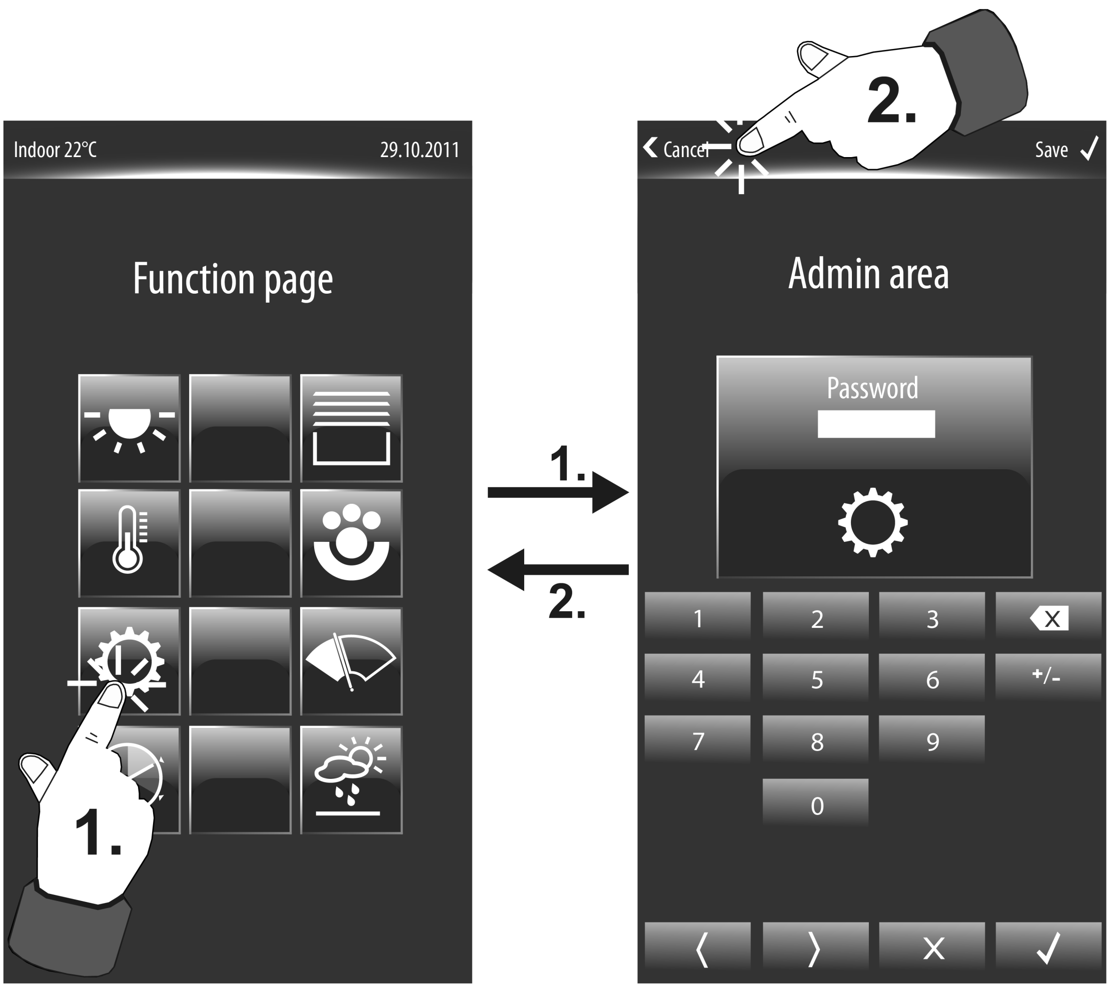


Figure 60: Recalling the system page as an example with password entry (right)

ℹ The number and form of the visible tiles and the arrangement of the icons on the tiles on the function page depends on the number of configured function units and functions. The icons, and consequently, the function units are assigned automatically to the tiles. Visible tiles without assignment have no icon and no function (see page 63).

The administrator area can optionally be protected by a password. The parameter "System page" in the parameter node "Display" defines whether the system page can be accessed with or without password protection. If password protection is enabled, the password must be entered via the displayed keyboard (figure 60). The password entry is acknowledged either via the " ✓" button in the keyboard or alternatively via the "Save ✓" button in the status line. The

device then checks whether the correct password has been entered. If the correct password was entered, likewise if the system page was recalled without password protection, the administrator page is recalled (figure 61). If an incorrect password is entered, "Password incorrect" is displayed on the screen and the entry of a password is requested again.
The password entry can be exited without the direct entry of a password either by pressing the "**X**" button in the keyboard or by pressing the "〈 Cancel" button in the status line (2.). The display then returns to the function page.

ⓘ The password can have 4 to 6 characters. In the as-delivered state, the password is defined as "0000".

ⓘ It should be noted that access to the system page is required in order to activate the KNX programming mode (assignment of the physical address). If the system page is password protected, the programming mode by operation locally on the device can only be activated if the password is known.

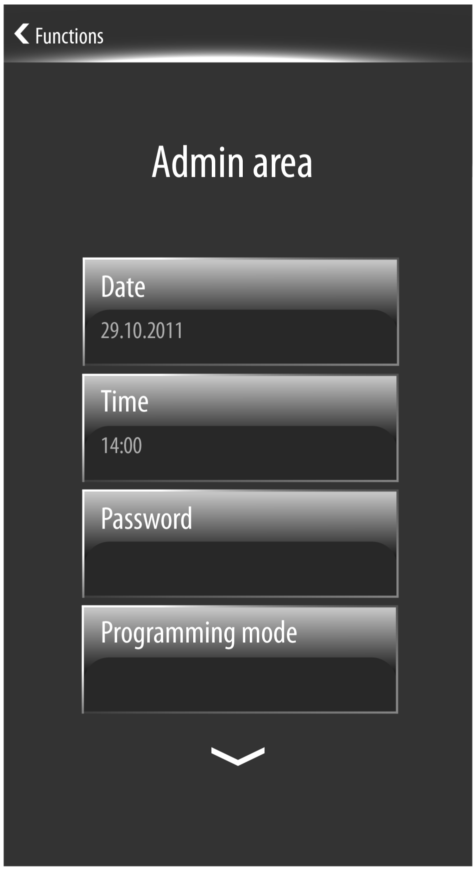


Figure 61: Administrator page as overview of all available system settings

The administrator page is an overview of all available system settings. Each setting has its own button. The administrator page displays a maximum of 4 buttons at the same time. You can switch the display so that all settings are available gradually either by the sensor surfaces ﹀ / ︿ or alternatively by a vertical movement of your finger.

The following settings can be recalled...

- Date
  Settings for the date of the internal system clock. If this button is pressed, a submenu is recalled for setting the date and display format (see page 130).

- Time
  Settings for the time of the internal system clock. If this button is pressed, a submenu is recalled for setting the time and display format (see page 130).

- Password
  Change administrator password for access to the system page. If this button is pressed, a submenu is recalled for setting the password (see page 135-136).
  This setting can also be recalled if the system page is not password protected. In this case, it is possible to set the password in the event that the password protection should be activated via the ETS at a later date.

- Programming mode
  Activating and deactivating the KNX programming mode. If this button is pressed, the programming mode is recalled (see page 136-137).

- Version:
  Display of the current device firmware. The button only acts as a display element. Pressing this button produces no reaction.

Time and date

The time and date can be set separately from each other in the administration area of the device. Depending on which button was pressed in the overview of the system page (1.), the display either branches to the date setting (figure 62) or to the time setting (figure 63).
By pressing the "〈 Admin area" button you return to the system page (2.) without any changes.

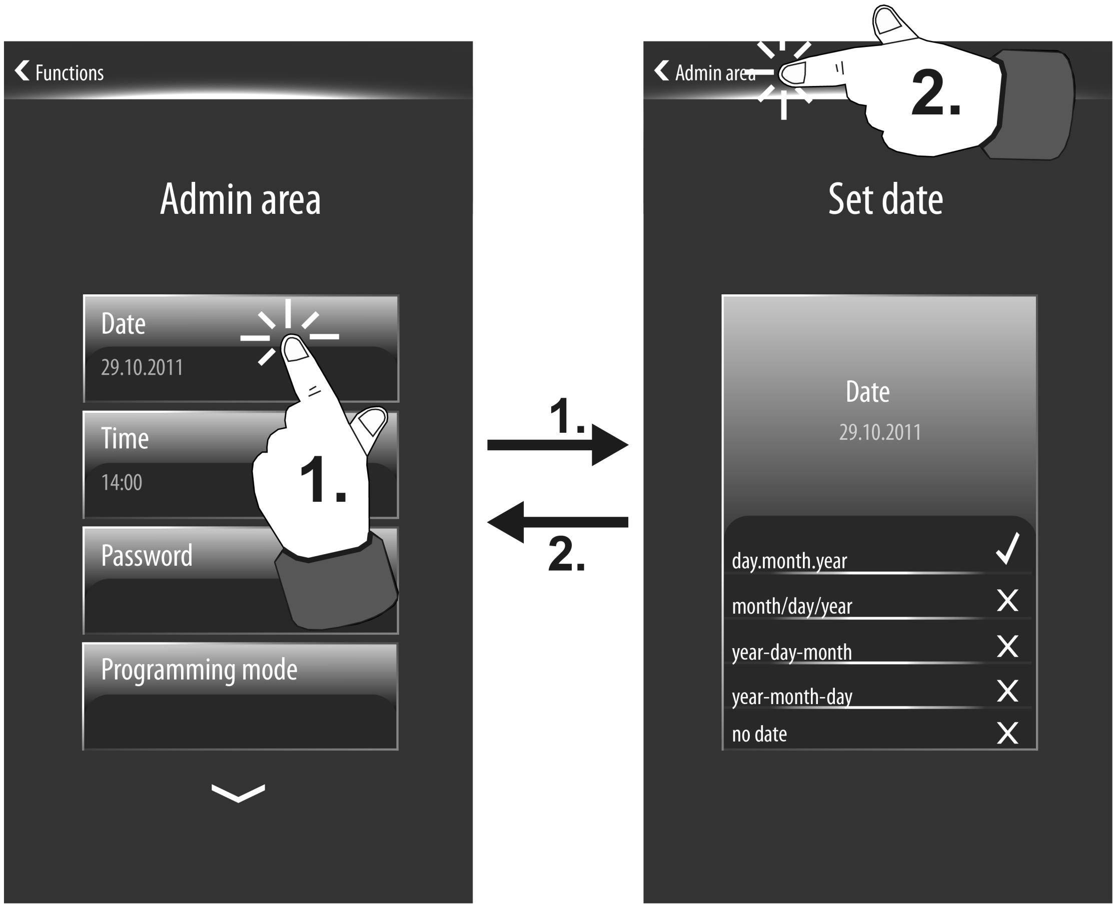


Figure 62: Display page for setting the date and defining the date display format

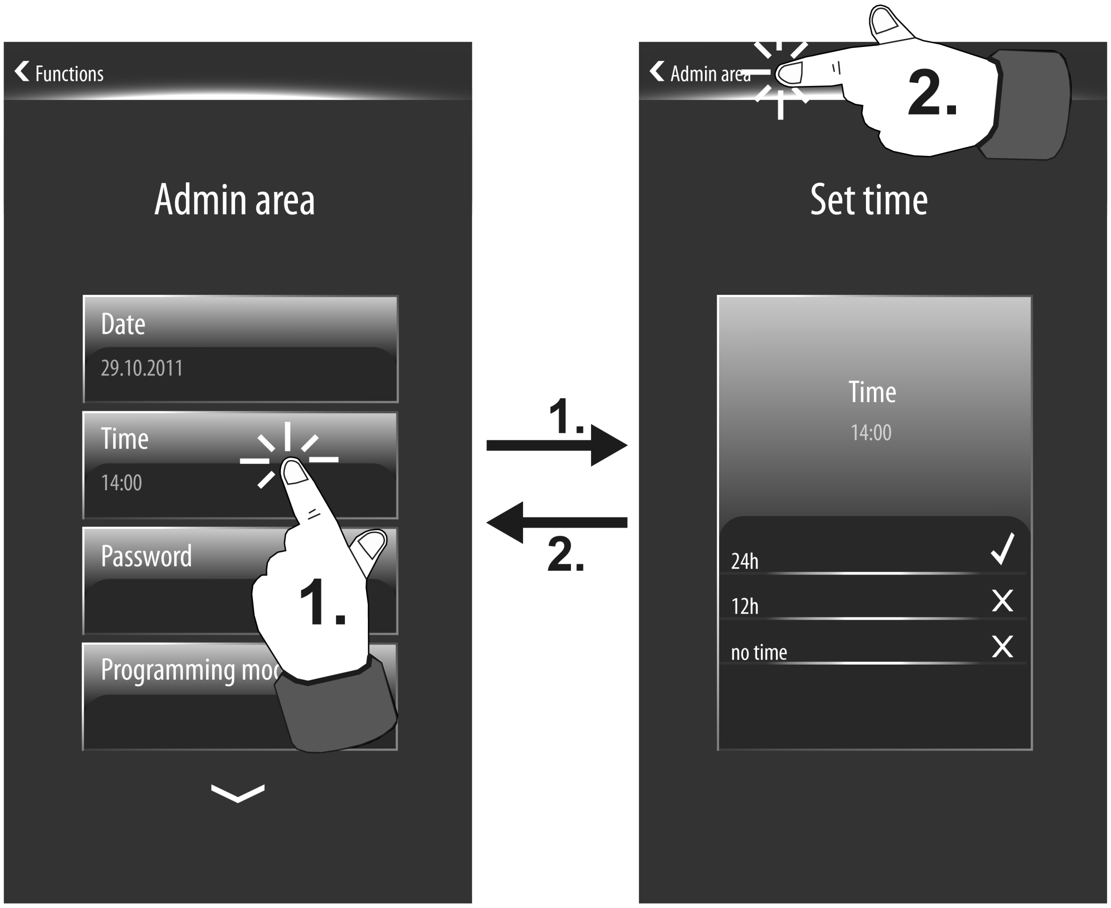


Figure 63: Display page for setting the time and defining the time display format

When setting the date and time, the system clock integrated in the device is set. The system time and system date of the embedded Linux operating system are also derived from this system clock. The system time also controls the internal timer of the device (see page 226).

ℹ The device's internal system clock is designed as a real time clock (RTC) and is extremely accurate. It is advisable to set the system clocks of all devices once a day, for example, by a shared KNX time telegram during the night hours, so that that the timing of all devices is synchronized even over a long period of time.
The system clock has its own energy storage. This will ensure that the clock keeps on running interruption-free for at least 2 hours in the event of a power supply failure.
The real time clock has a calendar function. Depending on the date set, the day is determined automatically by means of the internal calendar which is necessary for processing the timer.

You can set the date or time by pressing your finger on the corresponding display pages of the display area for the date or time (3) (figure 64). The display then branches to the editing mode and displays a keyboard. You can edit the date or time directly via the keyboard (4.).
The setting is acknowledged either via the "✓" button in the keyboard or alternatively via the "Save ✓" button (5.) in the status line and thereby transferred to the system clock. The display then returns to the system page.
Settings can be discarded either by pressing the "**X**" button in the keyboard or by pressing the "‹ Cancel" button in the status line. The display then returns to the system page without saving the setting.

ℹ The following figure shows the editing mode for the date. The time is set in the same way. The keyboard has an "am/pm" button for setting the time of day (morning / afternoon) for the 12-hour display format. In the 24-hour format or for entering the date, this button has no function.

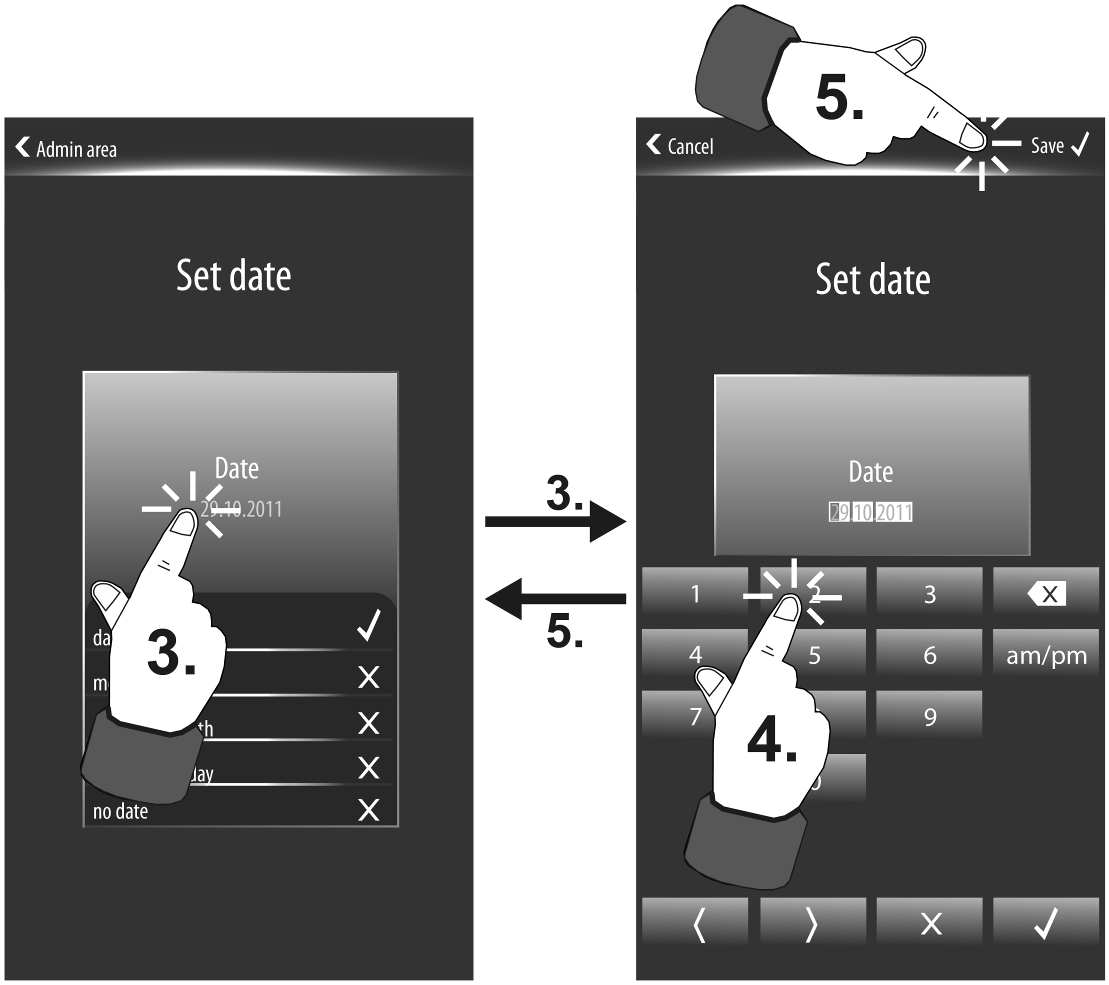


Figure 64: Editing mode for setting the date
(The date is set in the same way)

The date and time can - in addition to the editing function in the administration area - also be set via the KNX communication objects "D.Input Time" (KNX DPT 10.001) and "D.Input Date" (KNX DPT 11.001). The device handles dates and times via the bus or locally on the device equally. The last presetting sets the system clock.
Setting the date and time via the communication objects is appropriate when there is a master clock in the KNX system that is controlled by a time standard (DCF77- or IP-synchronisation). Cyclical transfer of date and time based on the master clock ensures that all devices in the KNX system, as well as the Smart Control, work synchronously.

The parameter "External clock available" in the parameter branch "Display" defines whether bus synchronisation of date and time is possible. If the setting is "Yes", the communication objects as described are available which make bus synchronisation possible. In this case, the changeover from summer to winter time is also controlled externally.
If the setting is "No", the objects for date and time are not available. The internal system clock of the device then works autonomously and can only be set via the administrator area locally on the device. In this case, a summertime/wintertime changeover by manually setting the time locally on the device might also have to take place if required.

If there is an external KNX clock, the Smart Control can transmit a 1-bit telegram requesting a time synchronisation after a device reset (ETS programming or switching on the power supply). The object "Request time" with which the request object of the KNX system clock can optionally be activated is available for this purpose. If the existing KNX clock supports this function, it sends back a time telegram to the device as a response to the request, which ensures that a valid time is set immediately after a device reset.

i The Smart Control cannot work as a master clock. It can only receive date and time telegrams.

i The internal timer of the device also needs information about the current weekday in order to process the switching times. Depending on the date set, the day is determined automatically by means of the internal calendar and the timer is made available. The day transmitted in the KNX time telegram in compliance with DPT 10.001 is irrelevant and is discarded by the device.

Time and date can be displayed in different places. Thus, it is possible to display the time on the start page and the date in the status line on display pages of the main navigation. The display of the date and time can be formatted differently and thus tailored to the user's specific requirements. Additionally, the date and time can be displayed or hidden as required.
The display format and visibility of date and time can be edited in the ETS or in the administration area locally on the device. Consequently, the configuration can take place in the ETS as part of the presetting and adapted by a menu operation at any time afterwards. In the ETS, the parameters "Display date" and "Display time" in the parameter node "Display" define the corresponding display formats. In the setting "no display", the date or time are not displayed in the aforementioned places.

Similarly, the same characteristics of date and time can be edited on the display pages (figure 65). The required display format is selected by finger pressure on the corresponding formatting in the display Display (Marking: **X** = deselected, ✓ = selected). The setting is included in the status line via the "Save ✓" button. The display then returns to the system page. Alternatively, settings can be discarded by pressing the "〈 Cancel" button in the status line. The display then returns to the system page without saving the setting.

i Hiding date or time does not effect the system clock and thus does not effect the processing of the switching times by the timer either. If date or time are not displayed, the internal system clock still continues running normally.

i Regardless of the display format selected for the time, switching times of the internal timer of the device in the ETS or locally on the device in the menus of the timer must be specified in 24-hour format.

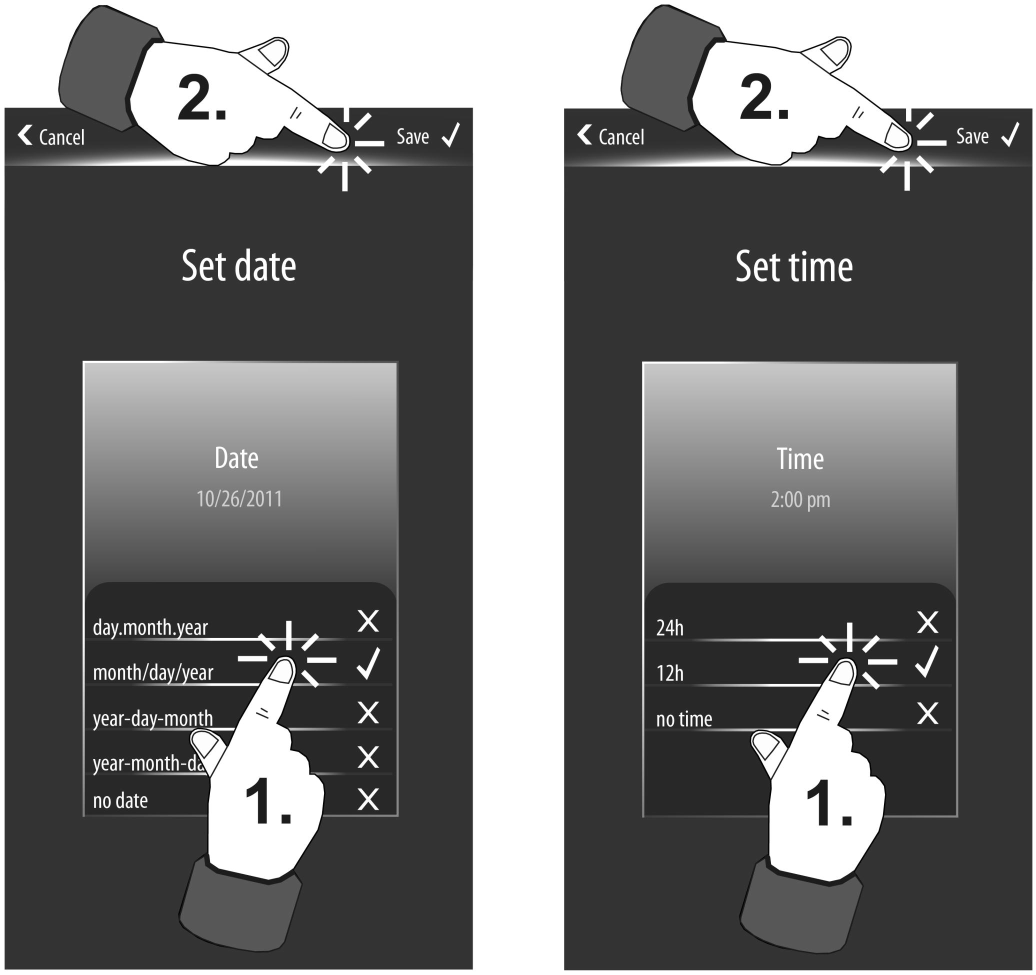


Figure 65: Setting of the display formats for the date (left) and for the time (right)

Resetting password

The administrator password that might be necessary for accessing the system page can be changed if required. The password can only be changed locally on the device via the display page "Set password". This display page is recalled if the "Password" (1.) button is pressed on the system page (figure 66).
The display page can be exited without any further actions by pressing the " ❬ Admin area" button in the status line. The display then returns to the system page without changing the password.

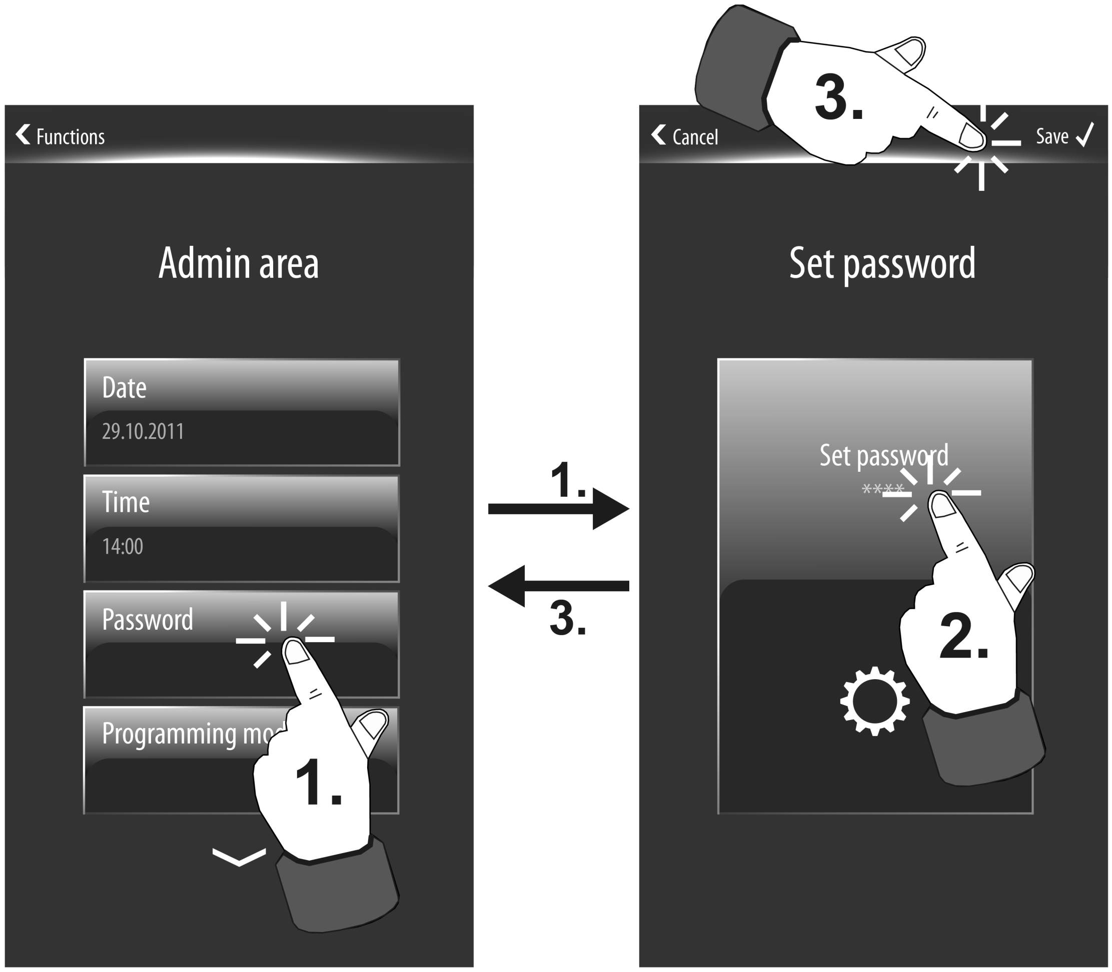


Figure 66: Setting a new administrator password

If you press the display area "Set password" (2), the editing mode is recalled and a keyboard is displayed in the screen (no illustration). The new password can be entered using this keyboard. The individual numbers are only visible briefly after input and are made illegible by * for reasons of security.

ⓘ The password can have 4 to 6 characters. In the as-delivered state, the password is defined as "0000".

The entry of the new password can be acknowledged either via the " ✓" button in the keyboard or alternatively acknowledged and saved via the "Save ✓" (3.) button in the status line. The display then returns to the system page. From this time on the new password is active.
If an unwanted password is entered, the editing mode can be exited without the direct entry of a password either by pressing the "**X**" button in the keyboard or by pressing the "‹ Cancel" button in the status line. In this case, the old password remains unchanged and the display then returns to the system page.

ⓘ The password is saved in a non-volatile memory of the device even in the event of a power supply failure. Unloading of the device by the ETS has no effect on the password. it is only possible to reset the password to the delivery state "0000" by manual resetting.

Activating and deactivating programming mode

The device does not have a separate programming button or LED. The functions of these elements are performed by the display page "Programming mode". The programming mode enables the physical address to be programmed by the ETS (see chapter 2.4. Commissioning) as well as troubleshooting in a KNX system (ETS-diagnostic function"physical addresses").

The display page for the programming mode is recalled if the "Programming mode" (1.) button is pressed on the system page (figure 67). Programming mode is then activated immediately. The display shows an animated graphic.

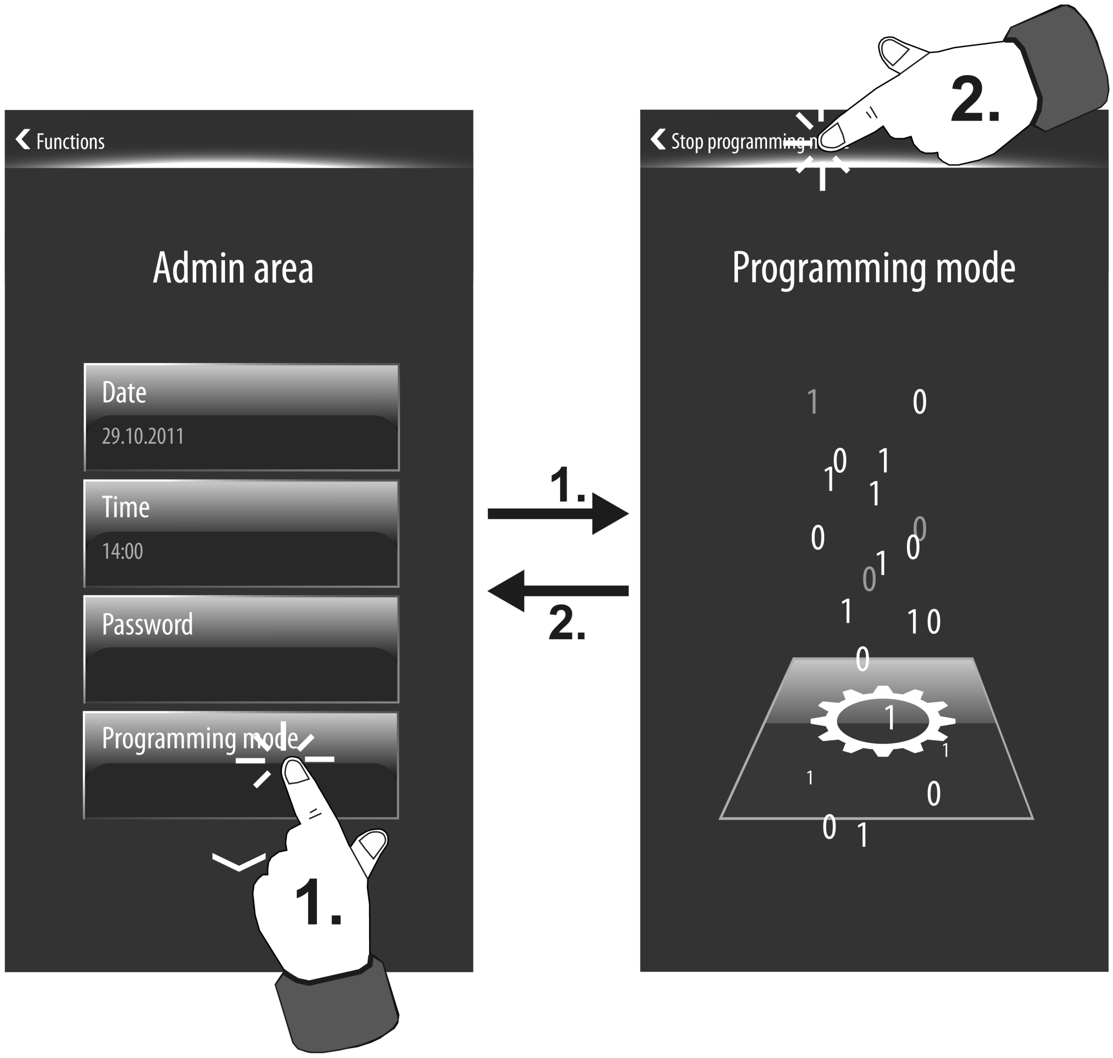


Figure 67: Example for activating and deactivating the programming mode

The programming mode is deactivated again as soon as the"〈 Stop programming mode" button is pressed in the status line (2.). The display then returns to the display page last active prior to recalling the programming mode.
The programming mode can also be activated or deactivated using the ETS. Thus, the possibility of executing programming or diagnostic operations is preserved even without access to the device. If the programming mode is activated by remote access, the device displays the display page of the programming mode immediately and automatically irrespective of the current display information. This display remains unchanged until the programming mode is deactivated by remote access or locally on the device.

ℹ In the unprogrammed delivery state of the device, the "programming mode" button is visible in the start screen after booting. After pressing this button, the KNX programming mode can be activated immediately without having to navigate via the admin area of the demo project.

4.2.4.1.20 Cleaning function

The device features a special cleaning function in order to avoid activating unintentional functions when removing dirt, finger prints etc. While the cleaning function is active, touching the user interface will cause no action.
The cleaning function can be recalled via the function page. The menu can be recalled by touching the tile with the . The display then switches to the display page of the cleaning function. An animated graphic is displayed for 30 seconds. All other indicators and controls are hidden. The device displays the remaining cleaning time on the screen. At the end of the cleaning time, the device returns to normal operation.

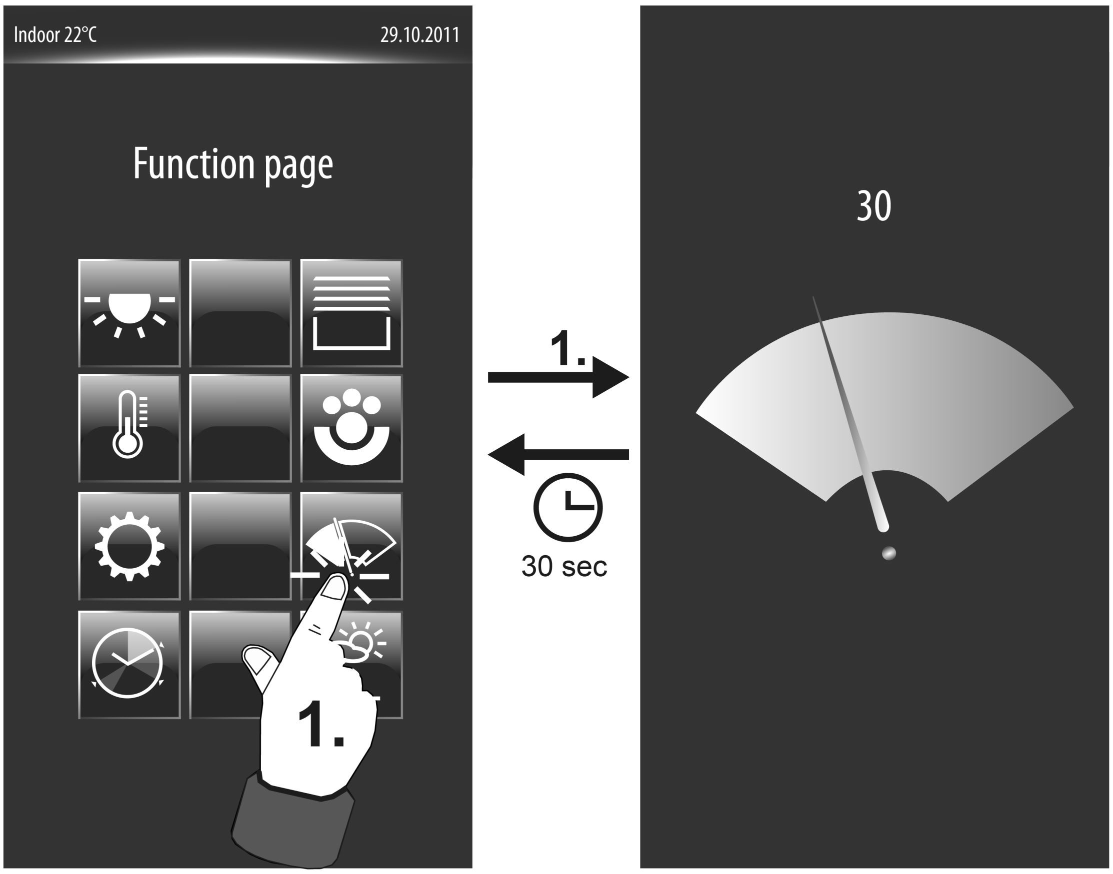


Figure 68: Recalling the cleaning function

- Clean the user interface with a soft cloth. If needed, moisten the cleaning cloth. Do not use sharp objects for cleaning. Do not use sharp cleaning agents, acids or organic solvents. Keep moisture from penetrating into the device.
- The master button ○●, which is located outside of the display, is independent of the cleaning function. Consequently, the master button can also be operated with an active cleaning function.

4.2.4.1.21 Brightness sensor

The device has a brightness sensor that measures the ambient lighting locally. The brightness sensor is located on the front of the device outside of the display (figure 69).

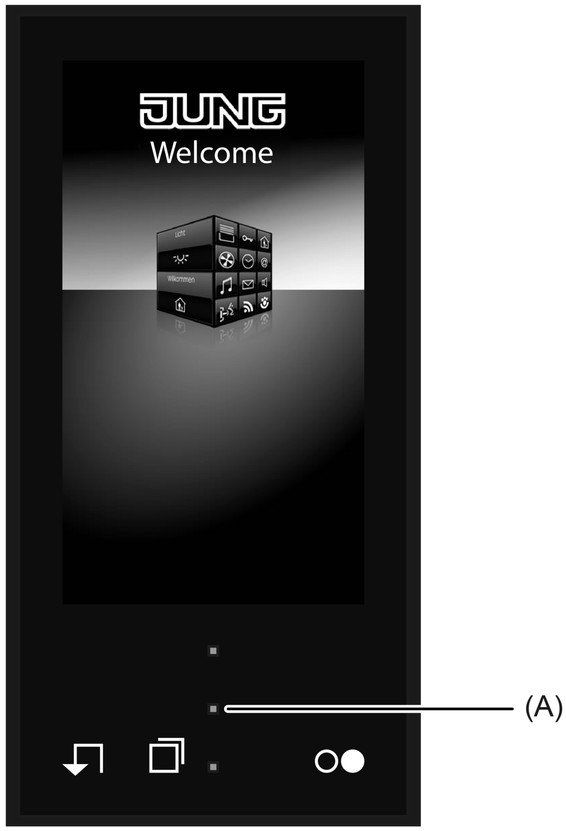


Figure 69: Brightness sensor on the front of the device

(A) Brightness sensor

The determined brightness value can be compared to a configured limiting value. If values fall below or exceed the limiting value, it is possible to transmit a switching telegram to the bus allowing lighting to be triggered, for example. The brightness sensor and associated limiting value evaluation can be enabled and influenced separately in the ETS in the parameter node "Display". In the setting "available", the parameter "Limiting value object brightness sensor" enables the limiting value evaluation and switches the corresponding 1-bit limiting value object to visible. In this case, additional parameters are available for defining the limiting value and specifying a switching hysteresis. In the setting "not available", the device's internal brightness sensor is functionless and therefore no limiting value evaluation is possible.

The physical measurement range of the brightness sensor integrated in the device is referenced to a standard living room measurement during the measured value evaluation and assigned to the percentage value range 0...100 %. The percentage measured value corresponds reliably to the lighting situation in the room (0 % = Darkness, 100 % = as bright as daylight, maximum ambient lighting) and is compared immediately with the configured limiting value in the ETS.
If the preset limiting value is exceeded, a "1" telegram is transmitted to the bus via the limiting value object. As soon as values fall below the limiting value less the set hysteresis, the device transmits a "0" telegram to the bus.
After a device reset (programming with the ETS, switching on the power supply), the brightness value is evaluated immediately. If the determined brightness should be greater than the configured limiting value in this case, the device transmits a "1" telegram to the bus. A "0" telegram is - as described - first retransmitted when the ambient lighting falls below the limiting value less the hysteresis.

i Limiting value and hysteresis must be attuned individually to the brightness quality of the installation location. Thus, it could be necessary in principle to specify a higher limiting value in rooms that are light due to daylight or artificial light. In rather dark rooms, a lower limiting value is normally advisable.
Fluctuations in brightness are to be compensated by the characteristic of the hysteresis. Fluctuations of the ambient lighting, for example, can be caused by persons located in the immediate proximity of the device.

4.2.4.2 Push-button extension module

Optionally, the number of control elements can be expanded by connecting a pushbutton extension module to the Smart Control. The extension module extends the device to include up to 4 mechanical control surfaces. Configuration and commissioning of the extension module is clearly structured and easy to perform using the application program of the Smart Control.

4.2.4.2.1 Button configuration

During the button configuration, you define whether an extension module is connected to Smart Control (basic unit). A push-button extension module expands the number of control surfaces in addition to the sensor surfaces of the basic unit, so that up to four rockers or 8 buttons more are available.
The rockers or buttons of the extension module are evaluated by the application program of the basic unit. In addition, each control surface of the extension module has two status LEDs that are also activated by the application program of the basic unit. Consequently, an extension module does not have any application or bus coupling module of its own, and is configured and put into operation in the ETS via the product database of the basic module. Each basic unit can have only one extension module connected to it. Together, a basic unit and an extension module form the "bus device unit".

Configuration of the control surfaces of the connected extension module is carried out in the ETS on the parameter page "Push-button extension module -> Button configuration". The parameter "Type of extension module" defines which extension module variant is connected to the basic unit. Consequently, the parameter defines which control surfaces and status LED are visible and configurable in the ETS. The setting "no TSEM" deactivates the module interface for the push-button extension. In this case, there are no rocker or button parameters available in the ETS for the extension module. Even the TSEM functions "Disable" (see page 163) and "Alarm signalling" (see page 166), which are available as separate parameter pages, are then not available.

The module control surfaces enabled in this manner are identified in the ETS as module rockers or module buttons. The rocker numbers or button numbers of the extension module are assigned continuously to the buttons (figure 70).

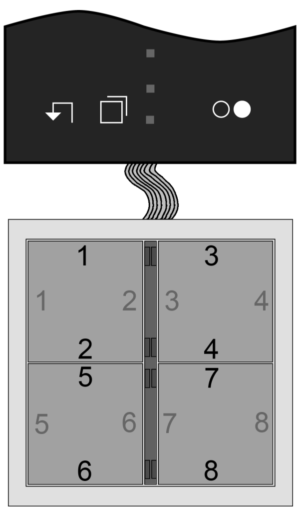


Figure 70: Numbering of the module control surfaces
(demonstrated here based on the example of a 4-gang push-button extension module)

ⓘ For each button pair of a control surface configured in the ETS as a rocker function or as a double-surface push-button function it is possible to set separately how the buttons are to be arranged on the surface, i.e. where the actuation points are located (see page 144-145). In the default setting the two actuation points of a control surface are arranged vertically (top / bottom) . Alternatively the actuation points can be arranged horizontally (left / right) .

4.2.4.2.2 Operation concept, button evaluation and button arrangement

Operation concept and button evaluation

Changeover between rockers and push-button operation of a control surface of the push-button extension module is performed on the parameter pages "Push-button extension module -> button configuration -> operation concept of extension module". The "Operation concept..." parameters parameters specify for each control surface whether the button pair in question is combined into a common rocker function, or alternatively is divided into two separate push-button functions. The additional parameter pages and the communication objects of the rockers or buttons are then also created and adapted depending on the setting parameterized here.

ⓘ Pressing several rockers or buttons at the same time will be considered as a wrong operation. The special rocker function "Full-surface operation" is an exception to the above rule. In this case, the parameterisation of the rocker decides whether the operation is a wrong operation or not. A button evaluation that has been begun is continued until all buttons have been released.

<u>Button pair as rocker function</u>

If a control surface is used as a rocker, both actuation points jointly affect the communication objects that are assigned to the rocker. As a rule, actuation of the two actuation points then result in directly opposite information (e.g. switching: ON - OFF / blind: UP - DOWN). Generally the commands when a button is pressed should be made independently of each other.

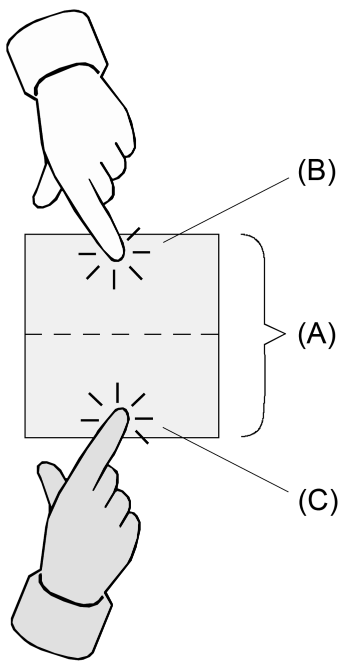


Figure 71: Example of rocker actuation

(A) Control surface as rocker with two actuation points
(B) Actuation point X.1
(C) Actuation point X.2

ⓘ Depending on the button arrangement (see page 144-145) configured in the ETS, the actuation points can be arranged either top / bottom or left / right. The example illustration shows a top / bottom button arrangement.

Full-surface operation with rocker function
Depending on the basic function of a rocker, it is also possible with some settings to use a press on the full surface with a separate function.

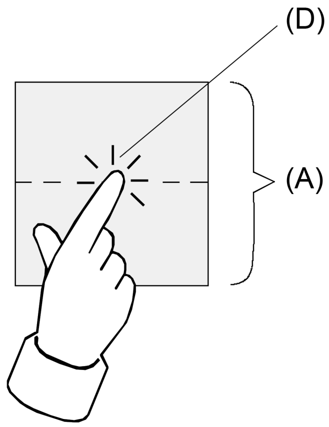


Figure 72: Example of full-surface actuation

(A) Control surface as rocker with full-surface operation
(D) Actuation point for full-surface operation

Button pair as push-button function
In push-button operation, a distinction is made whether the control surface is divided into two separate and functionally independent buttons (double-surface operation), or whether a control surface functions as a single "large" button (single-surface operation). The parameter "Button evaluation" on the parameter page "Operation concept..." configures either double-surface or single-surface operation for each button pair.

In double-surface operation the buttons are configured independently of each other, and can fulfil completely different functions (e.g. switching: TOGGLE – thermostat operating mode: Comfort). Full-surface actuation of an operating area is not possible as a push button function.

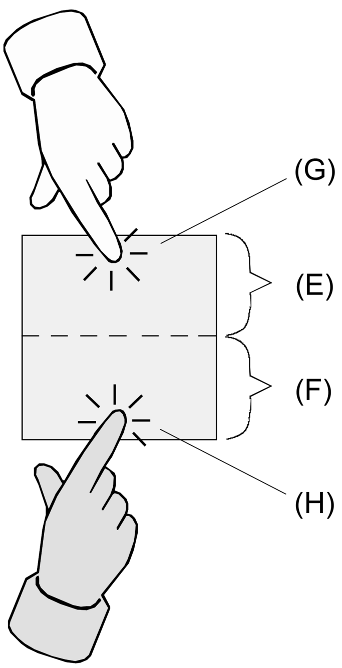


Figure 73: Example of button actuation with double-surface operation

(E) First part of the control surface as button with a single actuation point
(F) Second part of the control surface as button with a single actuation point
(G) Actuation point for button X (X = 1, 3, 5, 7)
(H) Actuation point for button Y (Y = 2, 4, 6, 8)

i Depending on the button arrangement configured in the ETS (see page 144-145), the buttons and thus the actuation points of a control surface can be arranged either top / bottom or left / right for double-surface operation of the buttons. The example illustration shows a top / bottom button arrangement. With single-surface operation the button arrangement cannot be adjusted, because there is only one button per control surface.

In single-surface operation, the entire control surface is evaluated only as a single "large" button. This button is configured independently of the other buttons or rockers of the push button sensor and can fulfil various functions (e.g. Switching: TOGGLE).

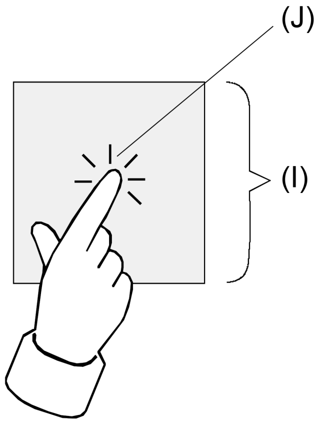


Figure 74: Example of button actuation in single-surface operation

(I) Entire control surface as button with a single actuation point
(J) Actuation point for button X (X = 1, 3, 5, 7)

i An operating area is always created in the ETS as a button pair. However, because in single-surface operation only one button functionally exists, the second button of the button pair has no function and is physically not present. During configuration in the ETS it is shown as button without any further button parameters. Only the status LED of this button which is physically not used can be configured separately and if needed also activated via its own communication object.
The physically present button which is to be evaluated in single-surface operation is always created as a button with an uneven button number. If, for example, the first operating area of a push button sensor is configured to single-surface operation, then button 1 can be configured in the ETS. Button 2 is then the physically not present button without parameters.

Button arrangement

On the parameter page "Operation concept of extension module", it is possible to set separately for each button pair of a control surface configured in the ETS as a rocker function or as a double-surface push-button function how the buttons are to be arranged on the surface, i.e. where the actuation points are located.
Here the parameter "Button arrangement" specifies the actuation point evaluation.

In the default setting the two actuation points of a control surface are arranged vertically (top / bottom) (figure 75). Alternatively the actuation points can be arranged horizontally (left / right) (figure 76).
The following illustrations show examples of the button arrangements on the push-button extension module (module rockers 1 & 2).

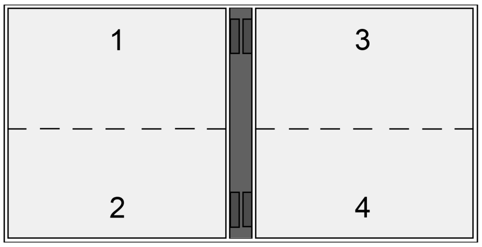


Figure 75: button arrangement "top / bottom"

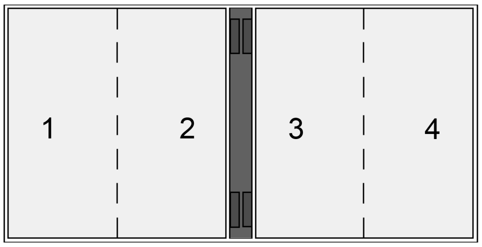


Figure 76: button arrangement "left / right"

It is also possible to combine different button arrangement in the same push-button extension module (figure 77).

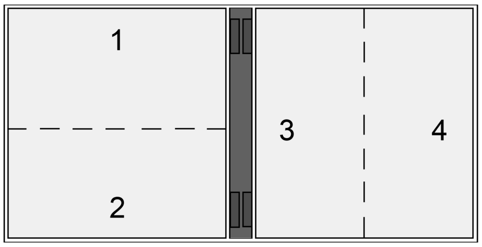


Figure 77: Different button configurations in the same push-button extension module

ⓘ The configuration can still be changed later on. Assigned group addresses or parameter settings remain unaffected by such changes.

4.2.4.2.3 Switching function

For each rocker or each button with the function set to "Switching", the ETS indicates a 1-bit communication object. The parameters of the rocker or button permit fixing the value this object is to adopt on pressing and / or on releasing (ON, OFF, TOGGLE – toggling of the object value). No distinction is made between a brief or long press.

The status LEDs can be configured independently (see page 161-162).

4.2.4.2.4 Dimming function

For each rocker or each button with the function set to "Dimming", the ETS indicates a 1-bit object and a 4-bit object. Generally, the push-button extension module transmits a switching telegram after a brief press and a dimming telegram after a long press. In the standard parameterisation the extension module transmits a telegram for stopping the dimming action after a long press. The time needed by the extension module to detect an actuation as a long actuation can be set in the parameters.

The status LEDs can be configured independently (see page 161-162).

<u>Single-surface and double-surface operation in the dimming function</u>
As a rocker, the device is preprogrammed for double-surface actuation for the dimming function. This means that the extension module transmits a telegram for switch-on after a brief press and a telegram for increasing the brightness after a long press of the left button ("brighter"). Similarly, the extension module transmits a telegram for switch-off after a brief press and a telegram for reducing the brightness after a long press on the right button ("darker").
As a button, the device is preprogrammed for single-surface actuation for the dimming function. In this mode, the extension module transmits on each brief press ON and OFF telegrams in an alternating pattern ("TOGGLE"). After a long press, the extension module transmits "brighter" and "darker" telegrams in an alternating pattern.
The parameter "Command on pressing the button" or Command on pressing the rocker" on the parameter pages of the buttons or rockers defines the single-surface or double-surface operation principle for the dimming function.
For the rocker and also for the button function, the command issued on pressing the button or rocker can basically be selected at the user's discretion.

<u>Advanced parameters</u>
For the dimming function, the extension module can be programmed with advanced parameters which are hidden in the standard view for greater clarity. If necessary, these advanced parameters can be activated and thus be made visible.
The advanced parameters can be used to determine whether the extension module is to cover the full adjusting range of the actuator with one dimming telegram continuously ("Increase brightness by 100 %", "Reduce brightness 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 extension module 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 extension module 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.
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.

<u>Full-surface operation</u>
When a rocker is used for dimming, the extension module needs some time at the beginning of each operation in order to distinguish between a short and a long operation. When the full-surface operation is enabled in the ETS, the extension module can make use of this time span to evaluate the otherwise invalid simultaneous actuation of both actuation points.
The extension module detects a full-surface operation of a rocker if a control surface is depressed over a large area so that both buttons of the rocker are actuated.
Full-surface operation must have been detected before the first telegram has been transmitted by the dimming function (switching or dimming). If this is not so, even a full-surface operation will be interpreted as a wrong operation and not be executed.
Full-surface actuation is independent. It has a communication object of its own an can optionally be used for switching (ON, OFF, TOGGLE – toggling of the object value) or for scene recall without or with storage function. In the last case, a press on the full surface causes a scene to be recalled in less than a second. If the extension module is to send the telegram for storing a scene, full-surface actuation must be maintained for more than five seconds. If full-surface actuation ends between the first and the fifth second, the extension module will not send any telegrams. If the status LEDs of the rocker are used as "button-press displays", they will light up for three seconds during transmission of the storage telegram.

ℹ Full-surface actuation cannot be configured in the push button functions.

4.2.4.2.5 Venetian blind function

For each rocker or button with the function set to "Venetian blind", the ETS indicates the two 1-bit objects "Short-time operation" and "Long-time operation".

The status LEDs can be configured independently (see page 161-162).

Operation concept for the Venetian blind function
For the control of Venetian blind, roller shutter, awning or similar drives, the extension module supports four operation concepts in which the telegrams are transmitted in different time sequences. The extension module can therefore be used to operate a wide variety of drive configurations.
The different operation concepts are described in detail in the following chapters.

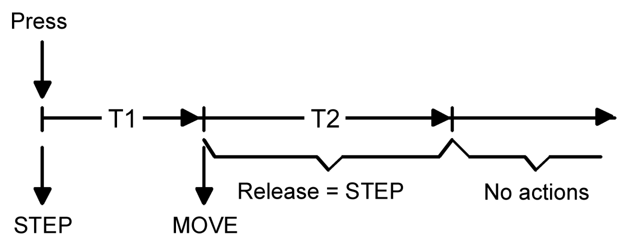


Figure 78: Operation concept "short – long – short"

Operation concept "short - long – short":
In the operation concept "short – long – short", the extension module shows the following behaviour:

- Immediately on pressing the button, the extension module 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 time and long time command" in the extension module 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 extension module 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 extension module 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 extension module transmits no further telegram. The drive remains on until the end position is reached.

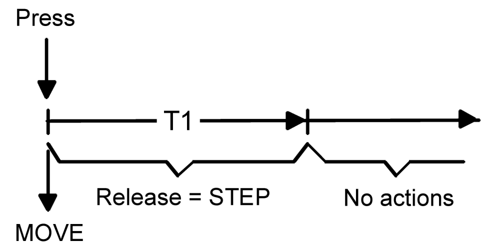


Figure 79: Operation concept "long – short"

Operation concept "long – short":
In the operation concept "long – short", the extension module shows the following behaviour:

- Immediately on pressing the button, the extension module 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 extension module transmits a short time telegram. This function is used for adjusting the slats of a blind. The function permits stopping the slats in any position during their rotation.
  The "slat adjusting time" should be chosen as required by the drive for a complete rotation of the slats. If the "slat adjusting time" is selected longer than the complete 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 extension module transmits no further telegram. The drive remains on until the end position is reached.

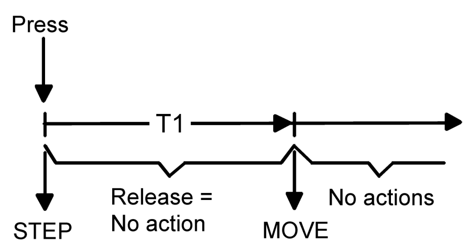


Figure 80: Operation concept "short – long"

Operation concept "short – long":
In the operation concept "short – long, the extension module shows the following behaviour:

- Immediately on pressing the button, the extension module 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 time and long time command" in the extension module 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 extension module transmits a long time telegram after the end of T1 for starting the drive.
- No further telegram is transmitted by the extension module when the button is released. The drive remains on until the end position is reached.

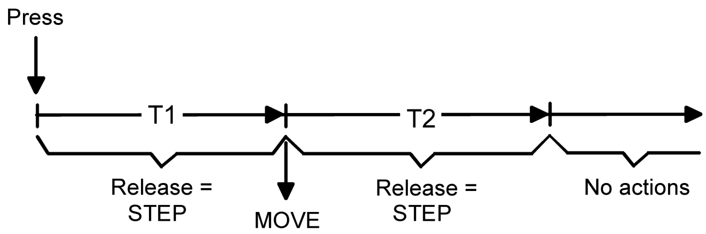


Figure 81: Operation concept "long – short or short"

Operation concept "long – short or short":
In the operation concept "long – short or short", the extension module shows the following behaviour:

- Immediately on pressing the button, the extension module starts time T1 ("time between short time and long time command") and waits. If the button is released again before T1 has elapsed, the extension module 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 extension module transmits a long time telegram and starts time T2 ("slat adjusting time").
- If the button is released within T2, the extension module 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 extension module transmits no further telegram. The drive remains on until the end position is reached.

i In this operation concept, the extension module will not transmit a telegram immediately after depressing one side of the rocker. This principle permits detecting a full-surface operation when the sensor is configured as a rocker.

Single-surface and double-surface operation in the blind function
As a rocker, the device is preprogrammed for double-surface actuation for the Venetian blind function. This means, for example, that the extension module transmits a telegram for moving upwards on pressing the left button and a telegram for moving downwards on pressing the right button.
As a button, the device is preprogrammed for single-surface actuation for the Venetian blind function. In this case, the extension module 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.
The parameter "Command on pressing the button" or Command on pressing the rocker" on the parameter pages of the buttons or rockers defines the single-surface or double-surface operation principle for the Venetian blind function.
For the button function, the command issued on pressing the button can basically be selected at the user's discretion.

Full-surface operation with Venetian blind function
When a rocker is configured for venetian blind operation and if the operation concept "long – short or short" is used, the extension module needs some time at the beginning of each operation in order to distinguish between a short and a long operation. When the full-surface operation is enabled, the extension module can make use of this time span to evaluate the otherwise invalid simultaneous actuation of both actuation points.
The extension module detects a full-surface operation of a rocker if a control surface is depressed over a large area so that both buttons of the rocker are actuated.
Full-surface operation must have been detected before the first telegram has been transmitted by the Venetian blind function (short time or long time). If this is not so, even a full-surface operation will be interpreted as a wrong operation and not be executed.
Full-surface actuation is independent. It has a communication object of its own an can optionally

be used for switching (ON, OFF, TOGGLE – toggling of the object value) or for scene recall without or with storage function. In the last case, a press on the full surface causes a scene to be recalled in less than a second. If the extension module is to send the telegram for storing a scene, full-surface actuation must be maintained for more than five seconds. If full-surface actuation ends between the first and the fifth second, the extension module will not send any telegrams. If the status LEDs of the rocker are used as "button-press displays", they will light up for three seconds during transmission of the storage telegram.

i Full-surface actuation cannot be configured in the push button functions.

4.2.4.2.6 Value transmitter function

For each rocker or button with the function set to "1-byte value transmitter" or "2-byte value transmitter" the ETS indicates a corresponding object. On the press of a button, the configured value or the value last stored internally by a value change (see below) will be transmitted to the bus. In case of the rocker function, different values can be configured or varied for both buttons.
The status LEDs can be configured independently (see page 161-162).

Value ranges
The "Function" parameter determines the value range used by the push button.
As a 1-byte value transmitter, the extension module can optionally transmit integers from 0 … 255 or relative values within a range of 0 … 100 % (e.g. as dimming value transmitter).

As a 2-byte value transmitter, the extension module can optionally transmit integers from 0 … 65535, temperature values within a range of 0 … 40 °C or brightness values from 0 … 1500 lux.
For each of these ranges, the value that can be transmitted to the bus for each actuation of a rocker or button is configurable.

Adjustment by means of long button-press
If the value adjustment feature has been enabled in the ETS, the button must be kept depressed for more than 5 seconds in order to vary the current value of the value transmitter. The value adjustment function continues to be active until the button is released again. In a value adjustment, the extension module distinguishes between the following options...

- The "Starting value in case of value adjustment" parameter defines the original starting value for the adjustment. Adjustment can begin from the value configured in the ETS, from the final value of the last adjustment cycle or from the current value of the communication object, with the last option not being available for the temperature and brightness value transmitter.
- The parameter "Direction of value adjustment" defines whether the values will always be increased ("upwards"), always reduced ("downwards") or alternately increased and reduced ("toggling").
- For the value transmitters 0 … 255, 0 … 100 % and 0 … 65535, the "step width" by which the current value is to be changed during the value adjustment can be specified. In case of the temperature and the brightness value transmitter, the step widthspecifications (1 °C and 50 lux) are fixed.
- The parameter "Time between two telegrams" can be used in connection with the step size to define the time required to cycle through the full respective value range. This value defines the time span between two value transmissions.
- If, during the value adjustment, the extension module detects that the preset step width would result in the limits being exceeded with the next telegram, it adapts the step width once in such a way that the respective limit value is transmitted together with last telegram. Depending on the setting of the parameter "Value adjustment with overflow", the extension module stops the adjustment at this instance or inserts a pause consisting of two levels and then continues the adjustment beginning with the other limit value.

Type	Function	Lower numerical limit	Upper numerical limit
1-byte value transmitter	0...255	0	255
1-byte value transmitter	0...100 %	0 % (value = 0)	100 % (value = 255)
2-byte value transmitter	0...65535	0	65535
2-byte value transmitter	Temperature value	0 °C	40 °C
2-byte value transmitter	Brightness value	0 lux	1.500 lux

Value range limits for the different value transmitters

- During a value adjustment, the newly adjusted values are only in the volatile RAM memory of the extension module. Therefore, the stored values are replaced by the preset values programmed in the ETS when a reset occurs (bus voltage failure or ETS programming).
- In the functions "Always OFF", "Always ON" and "Button-press display", the status LED indicates an active value change when the value of the corresponding button is changed. The status LED is then switched off and will then light up for approx. 250 ms whenever a new value is transmitted.
- With the 1-byte value transmitter in the "Value transmitter 0…100 %" function, the step width of the adjustment will also be indicated in "%". If the starting value of the communication object is used, it may happen in this case during value adjustment that the value last received via the object must be rounded and adapted before a new value can be calculated on the basis of the step width and transmitted. Due to the computation procedure used, the new calculation of the value may be slightly inaccurate.

Value adjustment examples

Configuration example:

- Value transmitter 1-byte (all other value transmitters identical)
- Function = value transmitter 0…255
- Value configured in the ETS (0...255) = 227
- Step width (1...10) = 5
- Start on value adjustment = same as configured value
- Direction of value adjustment = toggling (alternating)
- Time between two telegrams = 0.5 s

Example 1: Value adjustment with overflow? = No

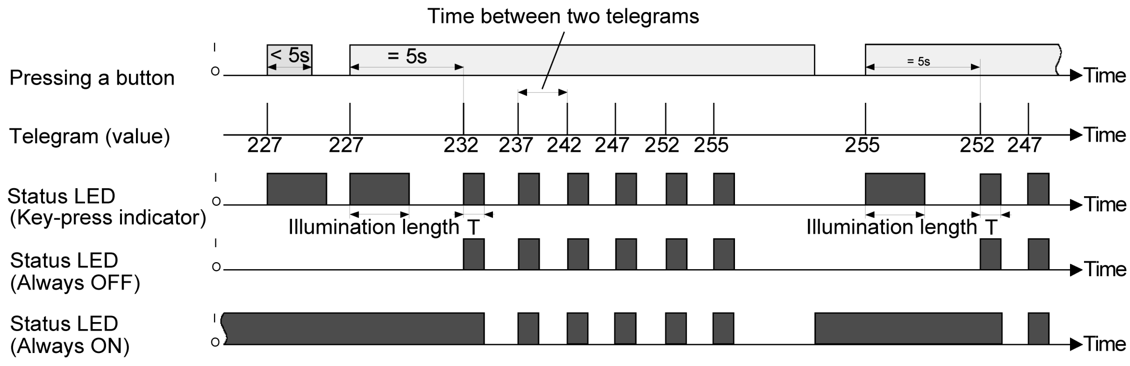


Figure 82: Example of value adjustment without value range overflow

Example 2: Value adjustment with overflow? = Yes

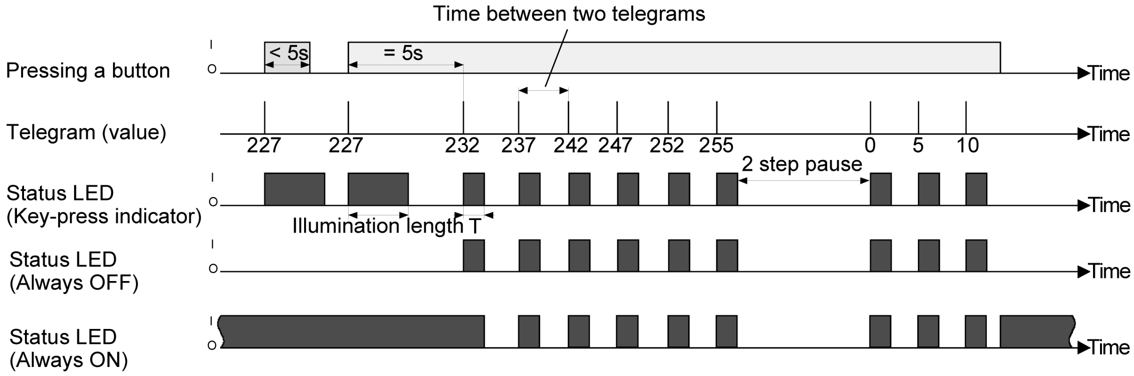


Figure 83: Example of value adjustment with value range overflow

4.2.4.2.7 Scene extension function

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",
- "Recall of internal scene without storage function",
- "Recall of internal scene extension with storage function".

In the scene extension function, the extension module transmits a preset scene number (1…64) via a separate 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. The recall of an internal scene does not result in a telegram being transmitted to the bus. For this reason, the corresponding communication object is missing. This function can rather be used to recall – and with the storage function also to store – the up to 8 scenes stored internally in the device.

In the setting "... without storage function", a button-press triggers the simple recall of a scene. If the status LED is configured as button-press display, it will be switched on for the configured ON time. A long button-press has no further or additional effect.
In the setting "... with storage function", the extension module monitors the length of the actuation. A button-press of less than a second results in a simple recall of the scene as mentioned above. If the status LED is configured as button-press display, it will be switched on for the configured ON time.
After a button-press of more than five seconds, the extension module generates a storage instruction. In the scene extension function, a storage telegram is in this case transmitted to the bus. If configured for the recall of an internal scene, the sensor will store the internal scene.
An operation lasting between one and five seconds will be discarded as invalid.

The parameter "Scene number" specifies which of the maximum of 8 internal or 64 external scenes is to be used after a button-press. In case of the rocker function, two different scene numbers can be assigned.

The status LEDs can be configured independently (see page 161-162).

4.2.4.2.8 2-channel operation function

In some situations it is desirable to control two different functions with a single button-press and to transmit different telegrams, i.e. to operate two function channels at a time. This is possible with the "2-channel operation" function.

For both channels, the parameters "Function channel 1" and "Function channel 2" can be used to determine the communication object types to be used. The following types are available for selection…
- Switching (1 bit)
- Value transmitter 0 … 255 (1-byte)
- Value transmitter 0 … 100 % (1-byte)
- Temperature value transmitter (2 bytes)

The object value the extension module is to transmit on a button-press can be selected depending on the selected object type. The "Switching (1 bit)" type permits selecting whether an ON or an OFF telegram is to be transmitted or whether the object value is be switched over (TOGGLE) and transmitted on the press of a button.
The configuration as "Value transmitter 0 … 255 (1 byte)" or as "Value transmitter 0 … 100 % (1 byte)" permits entering the object value freely within a range from 0 to 255 or from 0% to 100%. The "Temperature value transmitter (2 bytes)" permits selecting a temperature value between 0°C and 40°C.

In this case, the adjustment of the object value on a long button-press is not possible as the determination of the actuation length is needed for the adjustable operation concepts.

Unlike in the other rocker and button functions, the application software 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. As an alternative, the status LEDs can be configured independently (see page 161-162).

Operation concept channel 1 or channel 2

In this operation concept, exactly one telegram will be transmitted on each press of a button.
- On a brief press the extension module transmits the telegram for channel 1.
- On a long press the extension module transmits the telegram for channel 2.

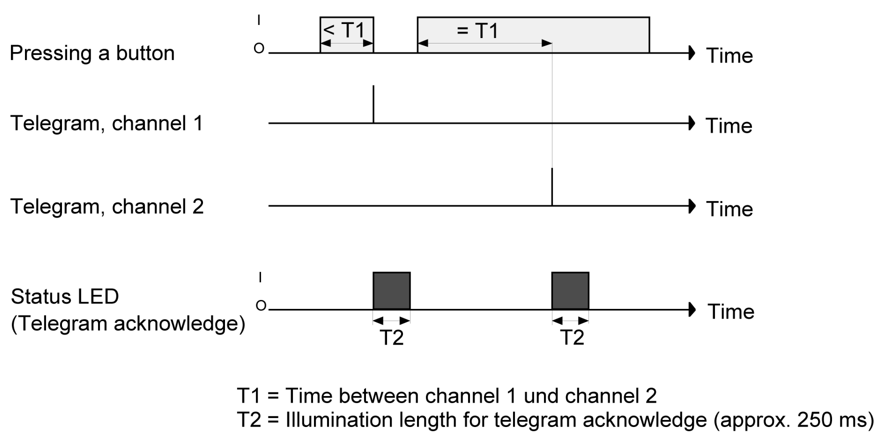


Figure 84: Example of operation concept "Channel 1 or Channel 2"

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 extension module will not transmit a telegram immediately after pressing the rocker. This principle also permits the detection of full-surface operation. The settings that are possible with full-surface operation are described below.

Operation concept channel 1 and channel 2

With this operation concept, one or alternatively two telegrams can be transmitted on each button-press.

- On a brief press the extension module transmits the telegram for channel 1.
- A long press causes the extension module to transmit first the telegram for channel 1 and then the telegram for channel 2.

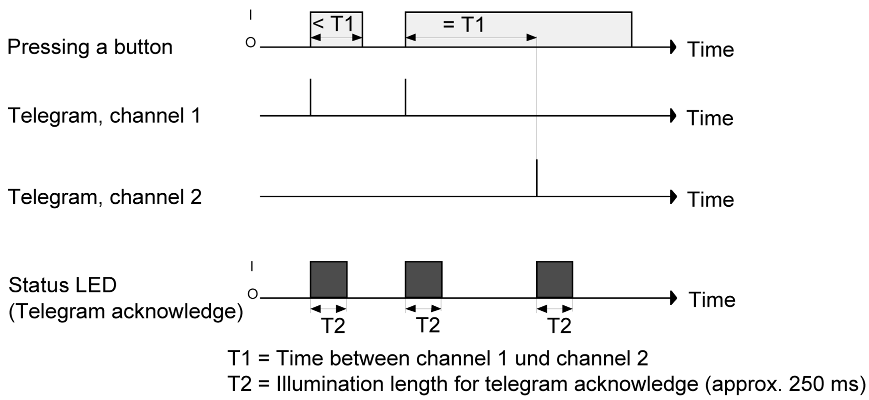


Figure 85: Example for operation concept "Channel 1 and channel 2"

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 parameterizable possibility of having the transmission of a telegram signalled by the status LED (setting "Telegram acknowledge").

Full-surface operation with 2-channel operation
When a rocker is programmed for 2-channel operation and if the operation concept "channel 1 or channel 2" is used, the extension module needs some time at the beginning of each operation in order to distinguish between a short and a long operation. When the full-surface operation is enabled, the extension module can make use of this time span to evaluate the otherwise invalid simultaneous actuation of both actuation points.
The extension module detects a full-surface operation of a rocker if a control surface is depressed over a large area so that both buttons of the rocker are actuated.
The full-surface operation must have been detected before the first telegram has been transmitted by the 2-channel function. If this is not so, even a full-surface operation will be interpreted as a wrong operation and not be executed.

4.2.4.2.9 "Controller operating mode" function

The "Operating mode switchover, internal" push-button function can be used to control the internal room temperature controller. At the same time, it is possible to switch over the operating mode. In the controller operating mode, a distinction is made between two functions, specified by the "Button function" parameter. On the one hand, the operating mode (Comfort, Standby, Night, Frost/heat protection) can be configured by a button-press to change over ("operating mode change-over" setting). On the other hand it is possible to activate the Presence function ("Presence button" setting). The Presence function allows activation of Comfort mode or a comfort extension on the internal controller.

i It should be noted that the "Operating mode switchover, internal" function is only possible with a button configuration. The room temperature controller function must be enabled using the parameter of the same name in the "Room temperature control" parameter node. Otherwise the operation of the controller operating mode in the "Push-button extension module" function section has no function.

4.2.4.2.10 "Setpoint shift" function

The "Setpoint shift, internal" push-button function can be used to control the internal room temperature controller. If this push-button function is used, it is possible to shift the setpoint temperature of the controller in a positive or negative direction by pressing the button.

i It should be noted that the "Setpoint shift, internal" function is only possible with a button configuration. The room temperature controller function must be enabled using the parameter of the same name in the "Room temperature control" parameter node. Otherwise the operation of the setpoint shift in the "Push-button extension module" function section has no function.

4.2.4.2.11 Status LED

Each operating area of the pushbutton extension module has two status LEDs. The LED functions available differ slightly depending on the configuration of the rockers or buttons.

Each status LED distinguishes the following options...
- Always OFF,
- Always ON,
- Control via separate LED object,
- Comparator without sign (1 byte),
- Comparator with sign (1 byte).

These setting options are generally available even if the buttons have no function assigned.

If a function has been assigned to the rocker or button, the ETS displays moreover the option…
- Button-press display.

In the function "2-channel operation", this setting is replaced by…
- Telegram acknowledgment.

If the rocker or the button is used for switching or dimming or to control setpoint shift, the following functions can additionally be set...
- Status indication,
- inverted status indication.

In addition, the Status LEDs may possess the following option, if a operating mode switchover or a setpoint shift is <u>not</u> configured ...
- Operating mode indication (KNX controller).

i Besides the functions that can be set separately for each status LED, all status LEDs are also used for alarm signalling. If this is active, all LEDs of the extension module flash simultaneously. After deactivation of the alarm signalling, all LEDs will immediately return to the state corresponding to their configuration and communication objects.

<u>Function of the status LED "Always OFF" or "Always ON".</u> The corresponding status LED is either always off or always on depending on the parameter setting.

<u>Function of the status LED "Button-press display" or "Telegram acknowledgement":</u>
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 "ON time of status LEDs as actuation displays" on the parameter node "push-button extension module -> button configuration" specifies for how long the LED is switched on in common for all status LEDs. The status LED lights up when the rocker or button is pressed even if the telegram is transmitted by the sensor only when the button or rocker is released.

With the function "2-channel operation" the option "Button-press display" is replaced by "Telegram acknowledge". In this case the status LED is illuminated when both channels are transmitted for about 250 ms each.

<u>Function of the status LED "Control via separate LED object", "Status display", and "Inverted status display"</u>

Each status LED can indicate the status of a separate LED communication object independently of the rocker or pushbutton configuration. Here the LED can be switched on or off statically via the 1-bit object value received, or also activated as flashing.
Additionally, the status LEDs can be linked in the rocker or button functions "Switching" or "Dimming" also with the object used for switching and thus signal the current switching state of the actuator group. In the function "setpoint shift", the LED indicates with this setting an active shift in a positive or negative direction.

For the status indications, there is also the option of displaying the active status in inverted form.
After a device reset, the value of an LED object is always "OFF".

Function of status LED as "operating mode display (KNX controller)"
For switching over between different modes of operation, new room temperature controller can make use of two communication objects of the 20.102 "HVAC-Mode" data type. One of these objects can switch over with normal priority between the "Comfort", "Standby", "Night", "Frost/heat protection" operating modes. The second object has a higher priority. It permits switching over between "Automatic", "Comfort", "Standby", "Night", "Frost/heat protection". Automatic means in this case that the object with the lower priority is active.

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 the room temperature controller. The desired operating mode which 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.

After a device reset, the value of the LED object is always "0" (Automatic).

Function of status LED as "comparator"
The status LED can indicate whether a configured comparison value is greater than, equal to or less than the 1-byte object value of the status object. This comparator can be used for unsigned (0 … 255) or for signed integers (-128 … 127). The data format of the comparison is defined by the function of the status LED.
The status LED lights up only if the comparison is "true".

i After a device reset, the value of the LED object is always "0".

4.2.4.2.12 Disabling function

Disabling function configuration

With the 1-bit communication object "B. Key disabling", the operating areas of the push-button extension module can be partly or completely disabled. During a disable, the rockers or buttons can also temporarily execute other functions.
An active disable applies only to the functions of the rockers or buttons of the push-button extension module. The status LED or other functions of the device are not affected by the disabling function.

The disabling function and the pertaining parameters and communication objects are enabled if the parameter "Disabling function ?" in the parameter node "Push-button extension module -> Disable" is set to "Yes".

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 device reset (object value = "0"). There must first be an object update "0" until the disabling function will be activated.

ℹ Telegram updates from "0" to "0" or from "1" to "1" on the "button disabling" object remain without effect.

Presetting the reaction at the beginning and end of a disable.

If the disabling function is used, the reaction of the push-button extension module on activation and deactivation of the disabling function can be preset separately in the parameters (parameter "Reaction of push-button sensor at the beginning / end of disabling"). In this connection it is irrelevant which of the operating areas is influenced and possibly also locked by disabling. The push-button extension module always shows the configured behaviour.

The disabling function must have been enabled in advance.

- Set the parameter "Reaction of pushbutton sensor at the beginning / end of disabling" to "No reaction".

  The push-button extension module shows no reaction at the beginning and at the end of disabling. The sensor only adopts the state as provided for by the "Behaviour during active disabling".

- Set the parameter "Reaction of pushbutton sensor at the beginning / end of disabling" to "Internal scene recall scene 1 …8".

  The push-button extension module recalls one of the up to 8 internal scenes. Scene storage is not possible.

- Set the parameter "Reaction of pushbutton sensor at the beginning / end of disabling" to "Reaction as button >> X << / >> Y << when pressed / released".

  The push-button extension module executes the function assigned to any "target button" in non-disabled state. Target buttons are operating buttons of the push-button extension sensor which may be configured for rocker or for button operation. The target buttons are configured separately for the beginning (X) of for the end (Y) of disabling. Both buttons of a rocker are treated as two separate buttons.
  The action configured for the respective target button is executed. If the configuration of the target button has no function or no telegram on pressing or releasing the button, or if a module button is configured without the suitable extension module connected, then there is also no reaction to disabling or to re-enabling. If the selected target button is part of a configured rocker, the behaviour preset for the respective rocker side (rocker X.1 or X.2) will be used. The telegrams are transmitted to the bus via the required communication object of the target button.
  The following table shows all possible telegram reactions of the push-button extension module with respect to the target button function.

Function of >>target button<<	Reaction "as >>target button<< on pressing"	Reaction "as >>target button<< on releasing"
Switching / toggling	Switching telegram	Switching telegram
Dimming	Switching telegram	No telegram
Venetian blind	Move telegram	No telegram
Scene extension	Scene recall telegram	No telegram
1-byte value transmitter	Value telegram	No telegram
2-byte value transmitter	Value telegram	No telegram
Temperature value transmitter	Temperature value telegram	No telegram
Brightness value transmitter	Brightness value telegram	No telegram
2-channel operation Channel 1: 1-bit object type	Switching telegram	No telegram
2-channel operation Channel 1: 1-byte object type	Value telegram	No telegram
2-channel operation Channel 1: 2-byte object type	Temperature value telegram	No telegram
Operating mode switchover, internal operating mode	Specifying operating mode	No telegram
Operating mode switchover, internal Presence button	Switching over presence mode	No telegram
Setpoint shift, internal	Specifying step value	No telegram
No function	No telegram	No telegram

Reactions of the push-button extension module with respect to the target button function.

- Set the parameter "Reaction of pushbutton sensor at the beginning / end of disabling" to "Reaction as disabling function 1 / 2 when pressed / released".

  The push-button extension module executes the function assigned to either of the two "virtual" disabling functions. The disabling functions are internal button functions with independent communication objects and independent parameters. Except for the status LED, the setting possibilities available for disabling function 1 and disabling function 2 are the same as for the buttons.
  The respective configuration of the predefined disabling function will be executed. If no function or no telegram is configuration in the disabling function on pressing or releasing of a button, then there is also no reaction to disabling or to re-enabling.
  For this setting, the above table shows all possible telegram reactions of the push-button extension module depending on the configuration of the disabling function.
  The telegrams are transmitted to the bus via the required communication object of the disabling function.

Setting the behaviour during a disabling function

Irrespective of the behaviour shown by the push-button extension module at the beginning or at the end of disabling, the control buttons can be separately influenced during disabling.

The disabling function must have been enabled in advance.

- Set the parameter "Behaviour during active disabling" to "All buttons without function".

In this case, the push-button extension module is completely disabled during disabling. Pressing a button has no effect. The status LEDs of the disabled buttons are without function (no button-press display either). Only the "Always ON" or "Always OFF" state remains unaffected by the disabling function.

- Set the parameter "Behaviour during active disabling" to "all buttons behave like". Also set the parameters "All buttons with even / odd numbers behave during disabling like" to the desired module button number or disabling function.

  All buttons behave as defined in the parameters for the two specified reference buttons of the push-button extension module. For all control buttons with an even number (2, 4, 6, …) and for all buttons with an odd number (1, 3, 5, …) it is possible to program not only different reference buttons, but also identical reference buttons. The two "virtual" disabling functions 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 are without function (no button-press display either). Only the "Always ON" or "Always OFF" state remains unaffected by the disabling function.

- Set the parameter "Behaviour during active disabling" to "Individual buttons without function". In the "Disable -> Disable - Button selection" parameter node, specify the buttons to which the disable is to apply.

  Only the individually specified buttons are locked during disabling. The other control buttons remain unaffected by disabling. The status LEDs of the disabled buttons are without function (no button-press display either). Only the "Always ON" or "Always OFF" state remains unaffected by the disabling function.

- Set the parameter "Behaviour during active disabling" to "Individual buttons behave like". In the "Disable -> Disable - Button selection" parameter node, specify the buttons to which the disable is to apply. Also set the parameters "All buttons with even / odd numbers behave during disabling like" to the desired module button number or disabling function.

  Only the individually specified buttons behave as defined in the parameters of the two specified reference buttons of the push button extension module. For all control buttons with an even number (2, 4, 6, …) and for all buttons with an odd number (1, 3, 5, …) it is possible to program not only different reference buttons, but also identical reference buttons. The two "virtual" disabling functions can also be configured as a reference button. The buttons that will be disabled are defined in the parameters under "Disable -> Disable – Buttons selection".
  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 are without function (no button-press display either). Only the "Always ON" or "Always OFF" state remains unaffected by the disabling function.

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.

4.2.4.2.13 Alarm signal

The device permits signalling of a alarm which might be, for instance, a burglar or a fire alarm from a KNX/EIB central alarm unit. An alarm is signalled by all status LEDs of the push-button extension module flashing synchronously. Consequently, the alarm signalling display is only available when a push-button extension module is connected to the device.
The alarm signalling can be enabled with the parameter "Alarm signalling display" on the parameter page "Push-button extension module -> Alarm signalling".

When alarm signalling is enabled, the ETS displays the communication object "B.Alarm signalling" and further alarm function parameters. The alarm signalling object is used as an input for activating or deactivating alarm signal displaying. The polarity of the object can be selected. When the object value corresponds to the "Alarm" condition, all status LEDs of the extension module are always flashing with a frequency of approx. 2 Hz. If there is an alarm, the behaviour of the status LED for normal operation as configured in the ETS has no significance. The LEDs adopt their originally configured behaviour only after the alarm signalling function has been deactivated. Changes of the state of the LEDs during an alarm - if they are controlled by separate LED objects or if they signal push-button functions - are internally stored and recovered at the end of the alarm.

Apart from the possibility of deactivating an alarm signal via the alarm object, it can also be deactivated locally on the device by pressing any button on the extension module. The "Reset alarm signalling by a button-press?" parameter defines the button response during an alarm…

- If this parameter is set to "Yes", active alarm signal displaying can be deactivated by a button-press on the push-button extension module. This button-press does not cause the configured function of the pressed button to be executed. Only after then next button-press will the configuration of the button be evaluated and a telegram be transmitted to the bus, if applicable.
- If "No" has been selected, alarm signalling can only be deactivated via the alarm signalling object. A button-press will always directly execute the configured button function.

If alarm signalling can be deactivated by a button-press, the parameter "Acknowledge alarm signalling by" defines whether an additional alarm acknowledge telegram is to be transmitted to the bus via the separate object "B.Alarm signalling acknowledge" after triggering by this button-press.
Such an acknowledge telegram can, for instance, be sent via a 'listening' group address to the "Alarm signalling" objects of other bus devices in order to reset the alarm status there as well. Attention must be paid during resetting of an alarm to the selectable polarity of the acknowledge object.

ℹ Notes on the polarity of the alarm object: If the setting is "Alarm when OFF and alarm reset when ON", the alarm object must be actively written by the bus with "0" to activate the alarm after a reset or after programming with the ETS.

ℹ An active alarm message is not stored so that the alarm indication is generally deactivated after a device reset or after programming with the ETS.

4.2.4.3 Room temperature controller

The device can be used for single-room temperature control. Depending on the operating mode, the current temperature setpoint and on the room temperature, command values for heating or cooling control and fan control can be sent to the KNX/EIB. Usually, these command values are then converted by a suitable KNX/EIB actuator, e.g. heating or switching actuators or directly by bus-compatible actuating drives, evaluated and converted to physical variables for air conditioning control.

The room temperature control is an independent function section of the device. It has its own parameter and object range in the ETS configuration. Therefore, the room temperature controller can be switched on or off, irrespective of the push button sensor function.

4.2.4.3.1 Operating modes and operating mode change-over

Introduction

The room temperature controller distinguishes between two different operating modes. The operating modes specify whether you want the controller to use its variable to trigger heating systems ("heating" single operating mode) or cooling systems ("cooling" single operating mode). You can also activate mixed operation, with the controller being capable of changing over between "Heating" and "Cooling" either automatically or, alternatively, controlled by a communication object.
In addition, you can establish two-level control operation to control an additional heating or cooling unit. For two-level feedback control, separate command values will be calculated as a function of the temperature deviation between the setpoint and the actual value and transmitted to the bus for the basic and additional levels. The parameter "Operating mode" in the "Room temperature control -> Controller general" parameter branch specifies the operating mode and, if necessary, enables the additional level(s).

"Heating" or "cooling" single operating modes

In the single "Heating" or "Cooling" operating modes without any additional level, the controller will always work with one command value and, alternatively, when the additional level is enabled, it will use two command value in the configured operating mode. Depending on the room temperature determined and on the specified setpoint temperatures of the operating modes, the room temperature controller will automatically decide whether heating or cooling energy is required and calculates the command value for the heating or cooling system.

"Heating and cooling" mixed operating mode

In the "Heating and cooling" mixed operating mode, the controller is capable of triggering heating and cooling systems. In this connection, you can set the change-over behaviour of the operating modes...

- "Change-over between heating and cooling" parameter in the "Room temperature control -> Controller general -> Setpoints" parameter branch set to "Automatic".
  In this case, a heating or cooling mode will be automatically activated, depending on the room temperature determined and on the given temperature basic setpoint, or on the deadband, respectively. If the room temperature is within the preset deadband neither heating nor cooling will take place (both command values = "0"). If the room temperature is higher than the cooling temperature setpoint cooling will take place. If the room temperature is lower than the cooling temperature setpoint heating will take place.
  When the heating/cooling operating mode is changed over automatically, the information can be actively sent to the bus via the object "Heating/cooling change-over" to indicate whether the controller is working in the heating mode ("1" telegram) or in the cooling mode ("0" telegram). In this connection, the "Automatic heating/cooling change-over transmission" parameter specifies when an operating mode change-over will be transmitted...
  Setting "On changing the operating mode": in this case, a telegram will be transmitted solely on change-over from heating to cooling (object value = "0") or from cooling to heating (object value = "1"), respectively.
  - Setting "On changing the output command value": with this setting, the current operating mode will be transmitted whenever there is a modification of the output command value. If the command value = "0" the operating mode which was active last will be transmitted. If the room temperature determined is within the deadband, the operating mode activated last will be retained in the object value until a change-over to the other operating mode takes place, if necessary. In addition, the object value can be output in cycles when automatic switch-over is being made.
  The "Cyclical transmission heating/cooling change-over" parameter enables cyclic transmission (factor > "0" setting) and specifies the cycle time.
  With an automatic operating mode change-over, it should be noted that under certain circumstances there will be continuous change-over between heating and cooling if the deadband is too small. For this reason, you should, if possible, not set the deadband (temperature difference between the setpoint temperatures for the comfort heating and cooling modes) below the default value (2 K).

- "Change-over between heating and cooling" parameter in the "Room temperature control -> Controller general -> Setpoints" parameter branch set to "Via object".
  In this case, the operating mode is controlled via the object "Heating/cooling change-over", irrespective of the deadband. This type of change-over can, for example, become necessary if both heating and cooling should be carried out through a one-pipe system (heating and cooling system). For this, the temperature of the medium in the single-pipe system must be changed via the system control. Afterwards the heating/cooling operating mode is set via the object (often the single-pipe system uses cold water for cooling during the summer, hot water for heating during the winter).
  The "Heating/cooling change-over" object has the following polarities: "1": heating; "0" cooling. After a reset, the object value will be "0", and the "Heating/cooling operating mode change-over after reset" set in the ETS will be activated. You can use the "Heating/cooling operating mode after reset" parameter to set which mode you want to activate after a reset. For the "Heating" or "Cooling" settings, the controller will activate the configured heating/ cooling operating mode immediately after the initialisation phase. In case of parameterisation "Operating mode before reset" the operating mode which was selected before the reset will be activated.
  If a change-over is made through the object the operating mode will first be changed into the one specified to be activated after a reset. A change-over to the other operating mode will only take place after the device receives an object update, if necessary.
  Notes on the setting "Operating mode before reset": frequent changing of the operating mode (e. g. several times a day) during running operation can adversely affect the life of the device as the read-only memory (EEPROM) used has been designed for less frequent write access events only.

It is not possible to heat and cool at the same time (command value > "0"). Only with PWM is it possible that a short-time 'command value overlapping' could occur during the transition between heating and cooling, due to the matching of the command value at the end of a time cycle. However, such overlapping will be corrected at the end of a PWM time cycle.

Heating/cooling message

Depending on the set operating mode, separate objects can be used to signal whether the controller for the first control circuit 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.

ℹ It should be noted that with a 2-point feedback control the message objects for heating and cooling will already become active as soon as the temperature falls short of the temperature setpoint of the active operating mode in case of heating or exceeds the temperature setpoint in case of cooling. In this case, the configured hysteresis is not taken into account.

The signal objects can be enabled by the "Heating message" or "Cooling message" parameters in the "Room temperature control -> Command value and status output" parameter branch. The control algorithm controls the signal objects. Please note that the command value is recalculated every 30 s, followed by an updating of the signal objects.

4.2.4.3.2 Control algorithms and calculation of command values

Introduction

To facilitate convenient temperature control in living or business spaces a specific control algorithm which controls the installed heating or cooling systems is required. Taking account of the preset temperature setpoints and the actual room temperature, the controller thus determines command values which trigger the heating or the cooling system. The control system (control circuit) consists of a room temperature controller, an actuator or switching actuator (when ETD electrothermal drives are used), the actual heating or cooling element (e. g. radiator or cooling ceiling) and of the room. This results in a controlled system (figure 86).

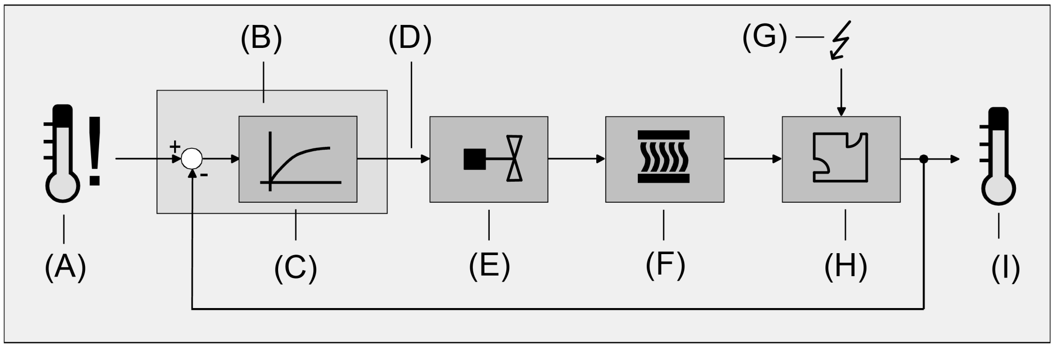


Figure 86: Controlled system of single-room temperature control

(A) Setpoint temperature specification
(B) Room temperature controller
(C) Control algorithm
(D) Command value
(E) Valve control (actuating drive, ETD, heating actuator, ...)
(F) Heat / cold exchanger (radiator, cooling ceiling, FanCoil, ...)
(G) Fault variable (sunlight penetration, outdoor temperature, illumination systems, ...)
(H) Room
(I) Actual temperature (room temperature)

The controller measures the actual temperature (I) and compares it with the given setpoint temperature (A). With the aid of the selected control algorithm (C), the command value (D) 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 (E), meaning that heating or cooling energy in the heat or cold exchangers (F) is passed into the room (H).
Regular readjustment of the command value means that the controller is able to compensate for setpoint / actual temperature differences caused by external influences (G) in the control circuit. In addition, the flow temperature of the heating or cooling circuit influences the control system which necessitates adaptations of the variable.

The room temperature controller facilitates either proportional/integral (PI) feedback control as a continuously working or switching option, or, alternatively, switching 2-point feedback control. In some practical cases, it can become necessary to use more than one control algorithm. For example, in bigger systems using floor heating, one control circuit which solely triggers the floor heating can be used to keep the latter at a constant temperature. The radiators on the wall, and possibly even in a side area of the room, will be controlled separately by an additional level with its own control algorithm. In such cases, distinction must be made between the different types of control, as floor heating systems, in most cases, require control parameters which are different to those of radiators on the wall, for example. It is possible to configure up to four independent control algorithms in two-level heating and cooling operation.

The command values calculated by the control algorithm are output via the "Heating command value" or "Cooling command value" communication objects. Depending on the control algorithm selected for the heating and/or cooling mode, the format of the command value objects is, among other things, also specified. 1-bit or 1-byte actuating objects can be created in this way (see page 206). The control algorithm is specified by the parameters "Type of heating control" or "Type of cooling control" in the "Room temperature control -> Controller general" parameter branch and, if necessary, also with a distinction of the basic and additional stages.

Continuous PI control

PI control is an algorithm which consists of a proportional part and an integral part. Through the combination of these control properties, you can obtain room temperature control as quickly and precisely as possible without or only with low deviations.
When you use this algorithm, the room temperature controller will calculate a new continuous command value in cycles of 30 seconds and send it to the bus via a 1-byte value object if the calculated command value has changed by a specified percentage. You can use the "Automatic transmission on change by…" parameter in the "Room temperature control -> Command value and status output" parameter branch to set the change interval in percent.

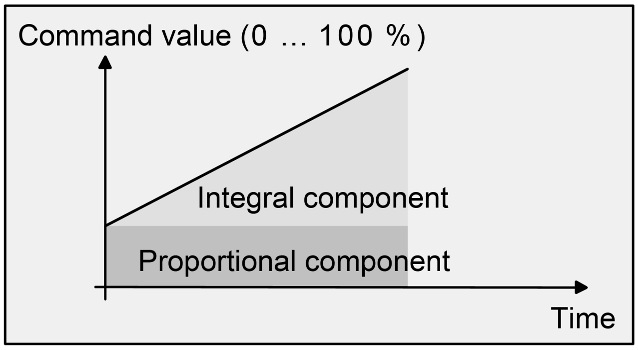


Figure 87: Continuous PI control

An additional heating or cooling level as PI control works in the same way as the PI control of the basic level, with the exception that the setpoint will shift, taking account of the configured level width.

Switching PI control

With this type of feedback control, the room temperature will also be kept constant by the PI control algorithm. Taking the mean value for a given time, the same behaviour of the control system will result as you would obtain with a continuous controller. The difference compared with continuous feedback control is only the way how the command value is output. The command value calculated by the algorithm in cycles of every 30 seconds is internally converted into a pulse-width-modulated (PWM) command value signal and sent to the bus via a 1-bit switching object after the cycle time has elapsed. The mean value of the command value signal resulting from this modulation is a measure for the averaged position of the control valve, thus being a reference to the room temperature set, taking account of the cycle time which you can set through the "Cycle time of the switching command value…" parameter in the "Room temperature control -> Command value and status output" parameter branch.
A shift of the mean value, and thus a change in the heating capacity, can be obtained by changing the duty factor of the switch-on and switch-off pulses of the command value signal. The duty factor will be adapted by the controller only at the end of a time period, depending on the command value calculated. This applies to any change of the command value, regardless of what the ratio is by which the command value changes (the "Automatic transmission on change by…" and "Cycle time for automatic transmission..." parameters will have no function in this

case).
Each command value calculated last during an active time period will be converted. Even after you have changed the setpoint temperature, for example, by switching over the operating mode, the command value will still be adapted after the end of an active cycle time. The diagram below shows the command value switching signal output according to the internally calculated command value (first of all, a command value of 30 %, then of 50 %, with the command value output not being inverted).

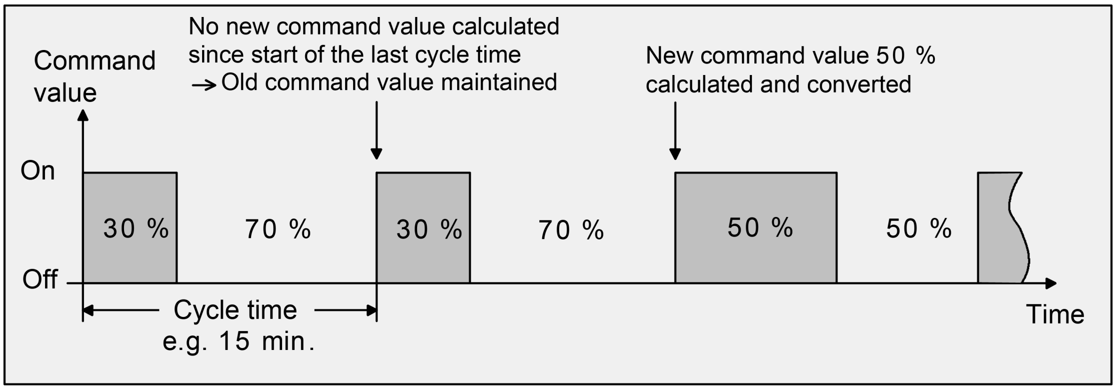


Figure 88: Switching PI control

For a command value of 0 % (permanently off) or of 100 % (permanently on), a command value telegram corresponding to the command value ("0" or "1") will always be sent after a cycle time has elapsed.
For switching PI control, the controller will always use continuous command values for internal calculation. Such continuous values can additionally be sent to the bus via a separate 1-byte value object, for example, as status information for visualisation purposes (if necessary, also separately for the additional levels). The status value objects will be updated at the same time as the command value is output and will only take place after the configured cycle time has elapsed. The parameters "automatic transmission on change by..." and "Cycle time for automatic transmission..." parameters will have no function in this case. An additional heating or cooling level as switching PI control works in the same way as the PI control of the basic stage, with the exception that the setpoint will shift, taking account of the configured level width. All PWM control options will use the same cycle time.

Cycle time:

The pulse-width-modulated command values are mainly used for activating electrothermal drives (ETD). In this connection, the room temperature controller sends the switching command values telegrams to a switching actuator equipped with semiconductor switching elements which the drives are connected to (e.g. heating actuator or room actuator). By setting the cycle time of the PWM signal on the controller, you can adapt the feedback control to the drives used. The cycle time sets the switching frequency of the PWM signal and allows adaptation to the adjusting cycle times of the actuators used (the adjusting time it takes the drive to bring the valve from its completely closed to its completely opened position). In addition to the adjusting cycle time, take account of the dead time (the time in which the actuators do not show any response when being switched or off). If different actuators with different adjusting cycle times are used, take account of the longest of the times. Always note the information given by the manufacturers of the actuators.

During cycle time configuration, a distinction can always be made between two cases...

Case 1: Cycle time > 2 x adjusting cycle time of the electrothermal drives used (ETD)

In this case, the switch-on or switch-off times of the PWM signal are long enough for the actuators to have sufficient time to fully open or fully close within a given time period.

Advantages:
The desired mean value for the command value and thus for the required room temperature will be set relatively precisely, even for several actuators triggered at the same time.

Disadvantages:
It should be noted, that, due to the full valve lift to be continuously 'swept', the life expectancy of the actuators can diminish. For very long cycle times (> 15 minutes) with less sluggishness in the system, the heat emission into the room, for example, in the vicinity of the radiators, can possibly be non-uniform and be found disturbing.

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

Case 2: Cycle time < adjusting cycle time of the electrothermal drives used (ETD)

In this case, the switch-on or switch-off times of the PWM signal are too short for the actuators to have enough time to fully open or fully close within a given period.

Advantages:
This setting ensures continuous water flow through the radiators, thus facilitating uniform heat emission into the room.
If only one actuator is triggered the controller can continuously adapt the command value to compensate the mean value shift caused by the short cycle time, thus setting the desired room temperature.

Disadvantages:
If more than one drive is triggered at the same time the desired mean value will become the command value, which will result in a very poor adjustment of the required room temperature, or in adjustment of the latter with major deviations, respectively.
The continuous flow of water through the valve, and thus the continuous heating of the drives causes changes to the dead times of the drives during the opening and closing phase. The short cycle time and the dead times means that the required variable (mean value) is only set with a possibly large deviation. For the room temperature to be regulated constantly after a set time, the controller must continually adjust the command value to compensate for the mean value shift caused by the short cycle time. Usually, the control algorithm implemented in the controller (PI control) ensures that control deviations are compensated.

- ℹ This setting is recommended for quick-reaction heating systems (such as surface radiators).

2-point feedback control

The 2-point 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 command value is not calculated for this type of control.
The room temperature is also evaluated by this type of control in cycles every 30 seconds. Thus the command values change, if required, only at these times. The disadvantage of a continuously varying temperature as a result of this feedback control option is in contrast with the advantage of this very simple 2-point room temperature control. For this reason, quick-reaction heating or cooling systems should not be triggered by a 2-point feedback control system, for this can lead to very high overshooting of the temperature, thus resulting in loss of comfort. When presetting the hysteresis limiting values, you should distinguish between the operating modes.

"Heating" or "cooling" single operating modes:

In heating mode, the controller will turn on the heating when the room temperature has fallen below a preset limit. In heating mode, the feedback control will only turn off the heating once a preset temperature limit has been exceeded.
In cooling mode, the controller will turn on the cooling system when the room temperature has exceeded a preset limit. The control system will only turn off the cooling system once the temperature has fallen below a preset limit. In this connection, variable "1" or "0" will be output, depending on the switching status, if the temperature exceeds or falls below the hysteresis limits.
The hysteresis limits of both operating modes can be configured in the ETS.

i It has to be pointed out that the message objects for heating and cooling will already become active as soon as the temperature falls short of the temperature setpoint of the active operating mode in case of heating or exceeds the temperature setpoint in case of cooling. In this case the hysteresis is not being considered.

The following two images each show a 2-point feedback control for the individual operating modes "Heating" (figure 89) or "Cooling" (figure 90). The images take two temperature setpoints, one-stage heating or cooling and non-inverted command value output.

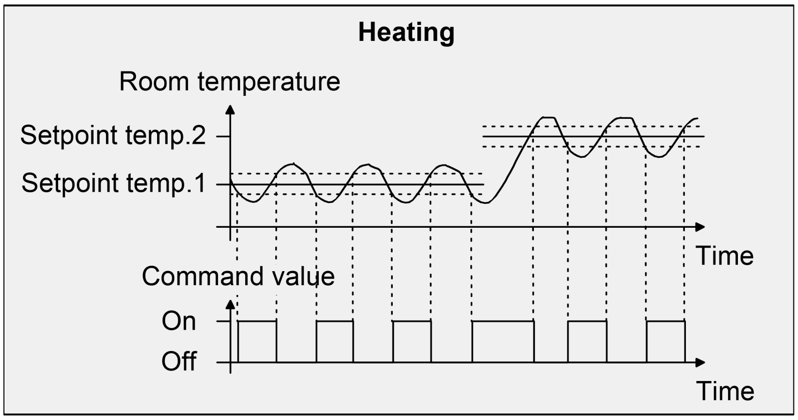


Figure 89: 2-point feedback control for the single "Heating" operating mode

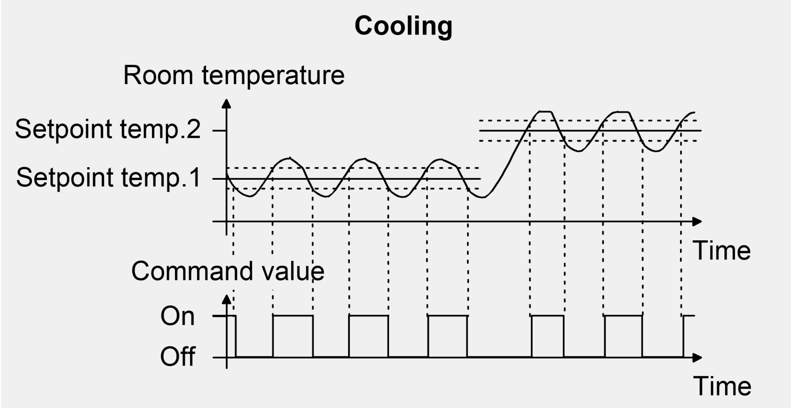


Figure 90: 2-point feedback control for the single "Cooling" operating mode

An additional 2-point feedback control heating or cooling level works exactly the same as the 2-point feedback control of the basic level. The difference is that the setpoint and the hysteresis values will shift by taking into account the configured level offset.

"Heating and cooling" mixed operating mode:

In mixed operation, a distinction is made whether the change-over between heating and cooling is to be effected automatically or in a controlled way through the object...

- With automatic operating mode change-over, in the heating mode the controller will turn on the heating when the room temperature has fallen below a preset hysteresis limit. In this case, as soon as the room temperature exceeds the setpoint of the current operating mode, the feedback control will turn off the heating in the heating mode. Similarly, in cooling mode, the controller will turn on the cooling system when the room temperature has exceeded a preset hysteresis limit. As soon as the room temperature falls below the setpoint of the current operating mode, the feedback control will turn off the cooling system in the cooling mode. Thus, in mixed operation, there is no upper hysteresis limit for heating or no lower one for cooling, respectively, for these values would be in the deadband. Within the deadband, neither heating nor cooling will take place.
- With operating mode change-over via the object, in the heating mode, the controller will turn on the heating when the room temperature has fallen below a preset hysteresis limit. The feedback control will only turn off the heating in the heating mode once the preset upper hysteresis limit has been exceeded. Similarly, in cooling mode, the controller will turn on the cooling system when the room temperature has exceeded a preset hysteresis limit. The feedback control will only turn off the cooling system in the cooling mode once the temperature has fallen below the preset lower hysteresis limit. As with the individual modes of heating or cooling, there are two hysteresis limits per operating mode. Although there is a deadband for the calculation of the temperature setpoints for cooling, it has no influence of 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.

i Also with an automatic operating mode switch, an upper hysteresis limit for heating and a lower hysteresis limit for cooling can be configured in the ETS for 2-point feedback control, although they have no function.

The following two images show 2-point feedback control for the mixed operating mode "Heating and cooling", distinguishing between heating mode (figure 91) and cooling mode (figure 92). The images take two temperature setpoints, a non-inverted command value output and an automatic operating mode change-over. When the operating mode is changed-over via the object, an upper hysteresis for heating and a lower hysteresis for cooling and be configured.

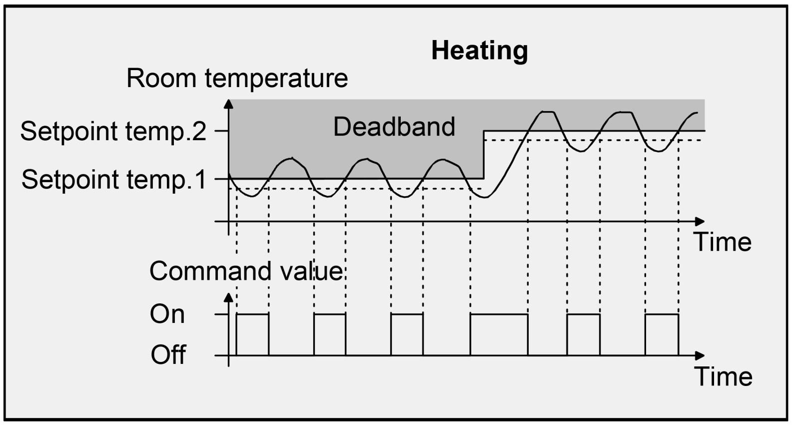


Figure 91: 2-point feedback control for mixed "Heating and cooling" mode with active heating mode.

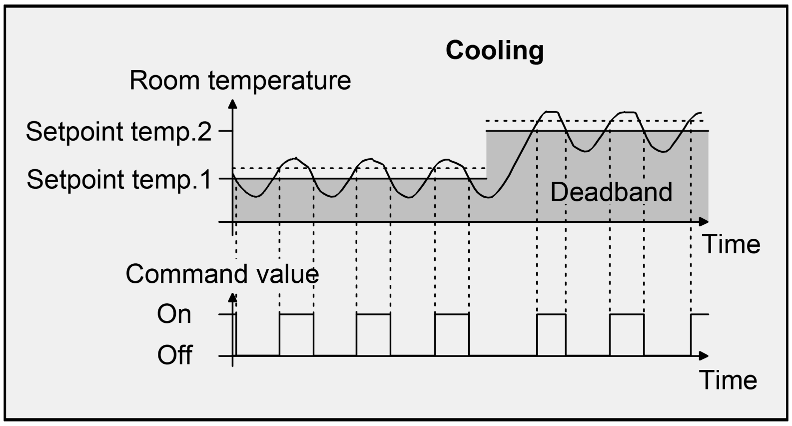


Figure 92: 2-point feedback control for mixed "Heating and cooling" mode with active cooling operation.

Depending on the switching state, the command value "1" or "0" will be output if the values exceed or remain under the hysteresis limits or the setpoints.

i It has to be pointed out that the message objects for heating and cooling will already become active as soon as the temperature falls short of the temperature setpoint of the active operating mode in case of heating or exceeds the temperature setpoint in case of cooling. In this case the hysteresis is not being considered.

An additional 2-point feedback control heating or cooling level works exactly the same as the 2-point feedback control of the basic level. The difference is that the setpoint and the hysteresis values will shift by taking into account the configured level offset.

4.2.4.3.3 Adapting the control algorithms

Adapting the PI control

There are several systems available, which may heat or cool 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 'experience values' 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 optimized via control parameters.
Predefined control parameters for the heating or cooling level and, if applicable, also for the additional levels are adjusted via the "Type of heating" or "Type of cooling" parameters. These fixed values correspond to the practical values of a properly planned and executed air conditioning system and will result in an ideal behaviour of the temperature control. The heating and cooling types shown in the following tables can be specified for heating and cooling operation.

Type of heating	**Proportional range (preset)**	**Reset time (preset)**	**Recommended PI control type**	**Recommended PWM cycle time**
Heat water heating	5 Kelvin	150 minutes	Continuous / PWM	15 min.
Underfloor heating	5 Kelvin	240 minutes	PWM	15-20 min.
Electrical heating	4 Kelvin	100 minutes	PWM	10-15 min.
Fan coil unit	4 Kelvin	90 minutes	Continuous	---
Split unit (split climate control unit)	4 Kelvin	90 minutes	PWM	10-15 min.

Predefined control parameters and recommend control types for heating systems

Cooling type	**Proportional range (preset)**	**Reset time (preset)**	**Recommended PI control type**	**Recommended PWM cycle time**
Cooling ceiling	5 Kelvin	240 minutes	PWM	15-20 min.
Fan coil unit	4 Kelvin	90 minutes	Continuous	---
Split unit (split climate control unit)	4 Kelvin	90 minutes	PWM	10-15 min.

Predefined control parameters and recommend control types for cooling systems

If the "Type of heating" or "Type of cooling" parameters are set to "Via control parameters" it will be possible to adjust the control parameter 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.

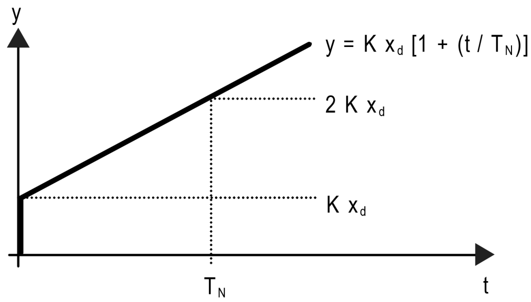


Figure 93: Function of the command value of a PI control

y: Command value
x_d: Control difference ($x_d = x_{set} - x_{act}$)
P = 1/K : Configurable proportional band
K = 1/P : Gain factor
T_N: Configurable reset time

PI control algorithm: Command value $y = K x_d [1 + (t / T_N)]$

Deactivation of the reset time (setting = "0") ->
P control algorithm: Command value $y = K x_d$

Parameter setting	Effect
P: Small proportional range	Large overshoot in case of setpoint changes (possibly permanently), quick adjustment to the setpoint
P: Large proportional range	No (or small) overshoot but slow adjustment
T_N: Short reset time	Fast compensation of control deviations (ambient conditions), risk of permanent oscillations
T_N: Long reset time	Slow compensation of control deviations

Effects of the settings for the control parameters

Adapting the 2-point feedback control

The 2-point 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 small temperature variations but to a higher bus load.
- A large hysteresis switches less frequently but will cause uncomfortable temperature variations.

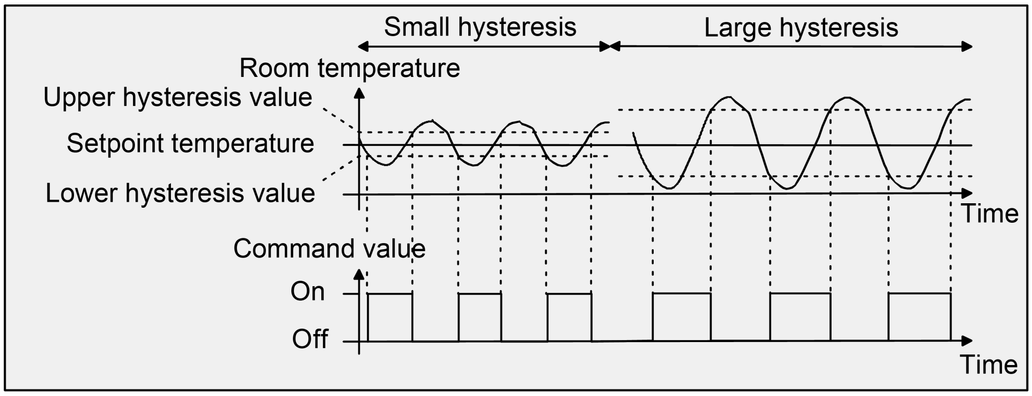


Figure 94: Effects of the hysteresis on the switching behaviour of the command value of 2-point feedback control

4.2.4.3.4 Operating mode switchover

Introduction - The operating modes

The room temperature controller has various operating modes. The selection of these modes will, for example, facilitate the activation of different temperature setpoints, depending on the presence of a person, on the state of the heating or cooling system, on the time of the day, or on the day of the week. The following operating modes can be distinguished…

- Comfort mode
  Comfort mode is usually activated if persons are in a room, and the room temperature should, for this reason, be adjusted to an adequately convenient value. The change-over to this operating mode can take place either by pressing a button or with presence control, for example, using a PIR motion detector on the wall or a ceiling mounted detector.

- Standby mode
  If a room is not used during the day because persons are absent, you can activate the Standby mode. Thereby, you can adjust the room temperature on a standby value, thus to save heating or cooling energy, respectively.

- Night operation
  During the night hours or during the absence of persons for a longer time, it mostly makes sense to adjust the room temperature to lower values for heating systems (e.g. in bedrooms). In this case, cooling system can be set to higher temperature values, if air conditioning is not required (e.g. in offices). For this purpose, you can activate the Night mode.

- Frost/heat protection mode
  Frost protection will be required if, for example, the room temperature must not fall below critical values while the window is open. Heat protection can be required where the temperature rises too much in an environment which is always warm, mainly due to external influences. In such cases, you can activate the Frost/heat protection operating mode and prescribe some temperature setpoint of its own for either option, depending on whether "Heating" or "Cooling" has been selected, to prevent freezing or overheating of the room.

- Comfort extension (temporary Comfort mode)
  You can activate the comfort extension from the night or frost/heat protection mode (not triggered by the "Window status" object) and use it to adjust the room temperature to a comfort value for some time if, for example, the room is also 'used' during the night hours. This mode can exclusively be activated by a presence button or also by the presence object, respectively. The comfort extension option will be automatically deactivated after a definable time has elapsed, or by pressing the presence button once more, or by receiving a presence object value = 0, respectively. You cannot retrigger this extension.

i You can assign an own temperature setpoint to the "Heating" or "Cooling" operating modes for each operating mode.

Operating mode switchover

You can activate or switch over the operating modes in various ways. Depending on one another in priority, activation or change-over is possible by…

- local control on the device by a KNX channel function or push button function of the extension module (Operating mode switchover, internal).
- The 1-bit communication objects separately available for each operating mode or alternatively through the KNX objects. In the last case, also through a controller extension.

The following section describes the individual options for changing over the operating modes in more detail.

<u>Change-over of the operating mode by KNX channel function or push button function</u>
A KNX channel or push button of the push-button extension module can be configured to the function "operating mode switchover, internal". In this case, it is necessary to further define in the ETS configuration which operating mode should be activated when a button is pressed. The "Comfort", "Standby", "Night" and "Frost/heat protection" modes are available for this purpose. To be able to activate the comfort extension, it is possible to use a presence button either optionally or in addition. The presence button, just like the operating mode change-over, is an operating function for the internal controller. The presence button means it is possible to change to the comfort extension or to deactivate it prematurely when Night or Frost/heat protection mode (not activated by the "Window status" object) has been activated. Also, it is possible to change over from the Standby to the Comfort mode when the presence button is pressed.
The function of a status LED of a push-button extension module can be configured irrespective of the push button function.. For example, it is possible that the controller status LED is controlled by a separate communication object.

<u>Change-over of the operating mode using KNX communication objects</u>
A distinction is made whether the operating modes should be changed over via separate 1-bit objects or, alternatively, by the 1-byte KNX objects.

The "Operating mode change-over" parameter in the "Room temperature control -> Controller general" parameter branch specifies the switching method as follows...

- Operating mode change-over "Via switching (4 x 1 bit)"

  There is a separate 1-bit change-over object for each operating mode. Each of these objects allows the current operating mode to be switched over or to be set, depending on the priority. Taking account of the priority, a specific hierarchy will result from the operating mode change-over by the objects, a distinction being made between presence detection by the presence button (figure 95) or the motion detector (figure 96). 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 .
  The following table also shows the status of the communication objects and the resulting operating mode.

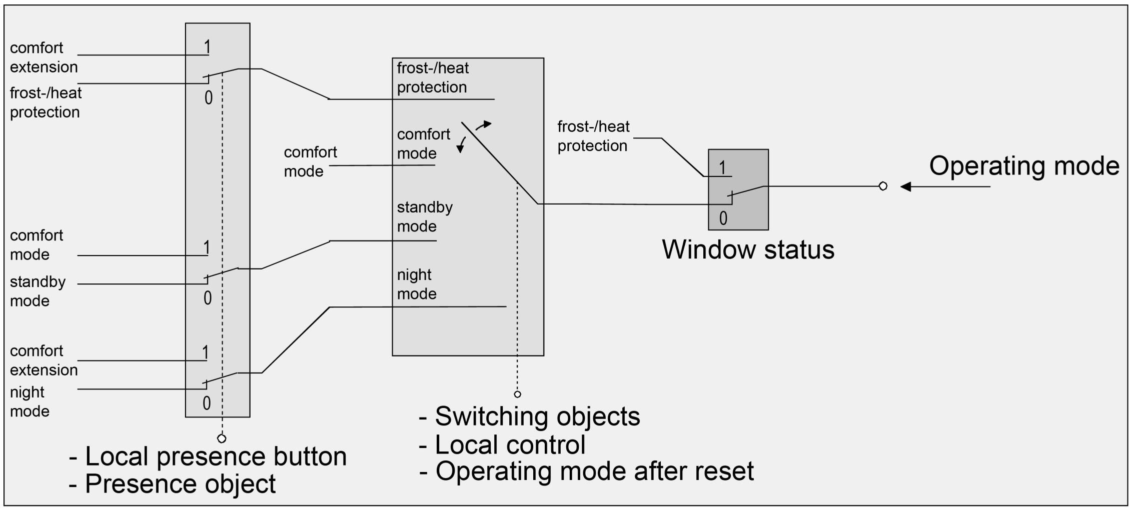


Figure 95: Operating mode change-over through 4 x 1-bit objects with presence button

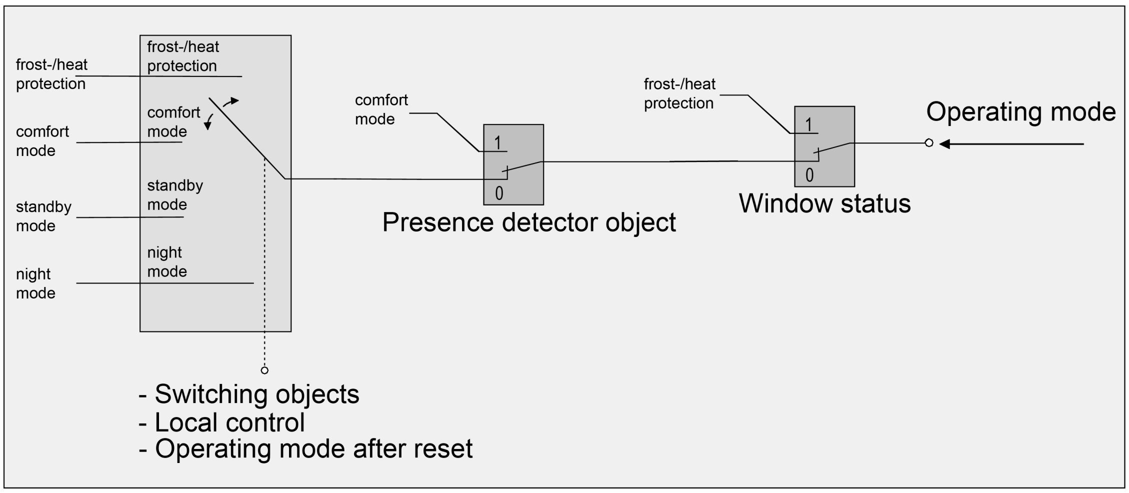


Figure 96: Operating mode change-over through 4 x 1-bit objects with motion detector

Object "Frost/heat protection"	Object "Comfort mode"	Object "Standby mode"	Object "Night mode"	Object "Window status"	Mo-tion button	Mo-tion detector	Resulting operating mode
1	X	X	X	0	0	-	Frost/heat protection
0	1	X	X	0	0	-	Comfort mode
0	0	1	X	0	0	-	Standby mode
0	0	0	1	0	0	-	Night operation
0	0	0	0	0	0	-	last operating mode *
X	X	X	X	1	X	-	Frost/heat protection

1	X	X	X	0	1	-	Comfort extension
0	1	X	X	0	1	-	Comfort mode
0	0	1	X	0	1	-	Comfort mode
0	0	0	1	0	1	-	Comfort ex-tension
0	0	0	0	0	1	-	Comfort mode / extension **
1	X	X	X	0	-	0	Frost/heat protection
0	1	X	X	0	-	0	Comfort mode
0	0	1	X	0	-	0	Standby mode
0	0	0	1	0	-	0	Night operation
0	0	0	0	0	-	0	last operating mode *
X	X	X	X	1	-	X	Frost/heat protection
X	X	X	X	0	-	1	Comfort mode

Status of the communication objects and the resulting operating mode

X: Status irrelevant
-: Not possible
*: no change, last valid operating mode set.
**: Dependent on the last active operating mode.

i When changing over the operating mode, the objects "Comfort mode", "Standby mode", "Night mode" and "Frost/heat protection" are updated by the controller and can be read out when the appropriate Read flags are set. If the "Transmit" flag has been set for these objects the current values will, in addition, be automatically transmitted to the bus when they are changed. After bus voltage recovery or after initialisation of the controller, the object which corresponds to the selected operating mode will be updated and its value actively transmitted to the bus if the "Transmit" flag has been set.

i A change-over through the objects has the same importance as a local change-over on the device. An operating mode set by an object can therefore be shifted by an operating mode change-over on the device, if no higher-priority mode (e.g. window contact / motion detector) is activated.

i In parameterisation of a presence button: the presence object will be active ("1") for the period of an comfort extension. The presence object will be automatically deleted ("0") if the comfort extension is stopped after the extension time has elapsed, or if the operating mode has been changed by a higher-priority operation through the change-over objects or by local control. The controller therefore automatically resets the status of the presence button when an object is received via the operating mode objects.

- Operating mode change-over through "value (1 byte)"

  There is a common 1-byte change-over object for all operating modes. During the running time, the operating mode can be changed over through this value object immediately after the receipt of only one telegram. In this connection, the value received will set the operating mode. In addition, a second 1-byte object is available which, by forced control and through higher level, can set an operating mode, irrespective of any other change-over options. According to the KNX specification, both 1-byte objects have been implemented.
  Taking account of the priority, a specific hierarchy will result from the operating mode change-over by the objects, a distinction being made between presence detection by the presence button (figure 97) or the motion detector (figure 98). 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 .
  The following table also shows the status of the communication objects and the resulting operating mode.

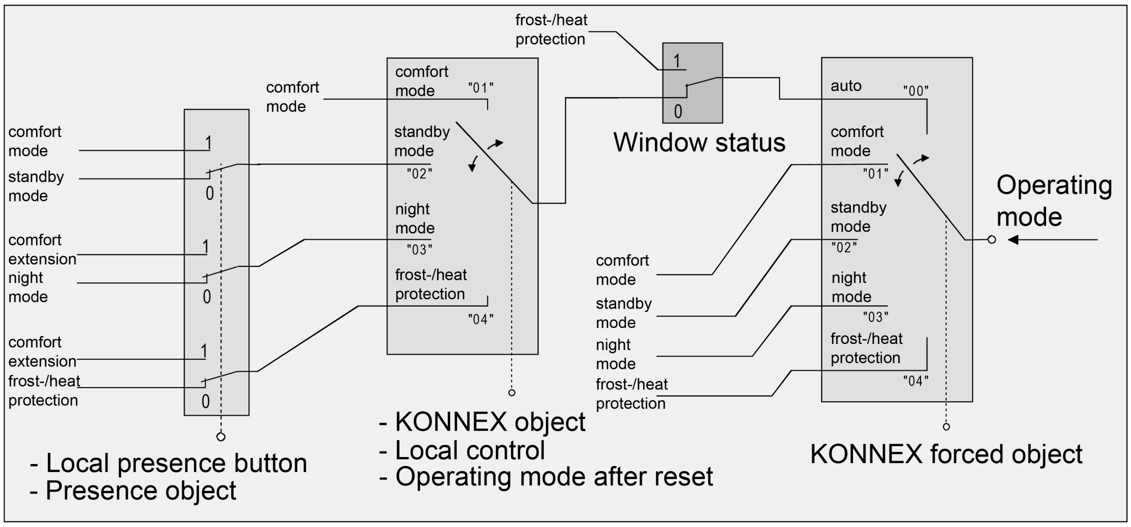


Figure 97: Operating mode change-over through KONNEX object with presence button

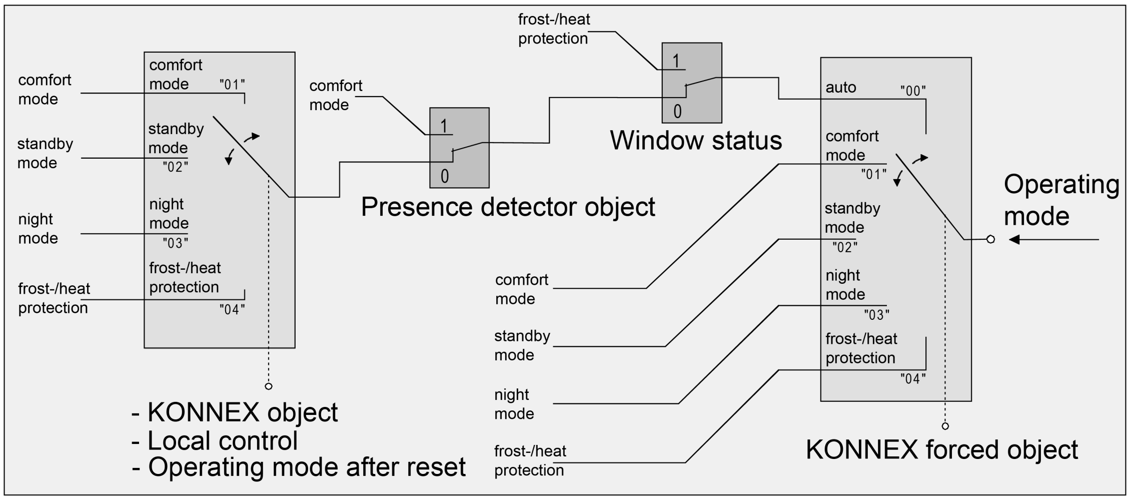


Figure 98: Operating mode change-over through KONNEX object with motion detector

Object value "Operating mode change-over"	Object value "Forced object operating mode"	Object "Window status"	Mo-tion button	Mo-tion 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 When changing over an operating mode, for example through local control, the KNX switching object is updated by the controller and can be read out when the "Read" flag is set. If the "Transmit" flag has been set for this object the current value will, in addition, be automatically transmitted to the bus when it is changed.
  After a device reset, the value corresponding to the set operating mode will be actively transmitted to the bus if the "Transmit" flag has been set.
- ℹ Change-over by the KNX object "Operating mode change-over" has the same priority as a local change-over on the pushbutton sensor. An operating mode set by the object (e.g. by a controller extension) can therefore be shifted by an operating mode change-over on the device, if no higher-priority mode (e.g. window contact / motion detector) or the KNX forced object is activated.
  The KNX forced object will always have the highest priority.
- 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 a higher-priority operation through the change-over objects or by local control 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 change over to a comfort extension upon push button actuation or go into the Comfort mode when movement by a person in the room is detected. In this connection, the "Presence detection" parameter in the "Room temperature control -> Controller functionality" parameter node sets whether presence detection should be movement-controlled by a motion detector or manual through presence button actuation...

- Presence detection by the presence button
  If you configure the presence button for the presence detection, you can select the "presence button" setting from the KNX channel functions or from the push button functions of the extension module (function selection "operating mode switchover, internal"). In addition, the "Presence object" is enabled. In this way, you can actuate the presence button or use a presence object value = "1" to change over to comfort extension when the Night or the Frost/heat protection mode is active (not activated by the "window status" object). The extension will be automatically deactivated as soon as the configured "Length of comfort extension" time has elapsed. If you press the presence button once more, or if the presence object receives a value ="0", you can deactivate the comfort extension earlier. 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 you can operate the presence button or use a presence object value = "1" to change over to the comfort mode. This will also be the case if you have configured the length of comfort prolongation to "0". The comfort mode will remain active as long as the presence function remains active, or until another operating mode comes into effect.
  The presence object or the presence function, respectively, will always be deleted whenever a change-over to a different operating mode takes place, or after a forced operating mode has been deactivated (associated with KNX forced change-over). A presence function activated before a device reset (programming operation, bus voltage failure) is always deleted, along with the object value, after the reset.

- Presence detection by the motion detector
  If a motion detector is configured for motion detection, then the controller only evaluates the "Presence object". With this object, it is possible to integrate motion detectors into room temperature control. If a movement is detected ("1" telegram) the controller will change over into the Comfort mode. In this connection, it is irrelevant what has been set by the change-over objects or by local control directly on the device. Only a window contact or the KNX forced object are of higher priority.
  After the movement delay time has elapsed in the motion detector ("0" telegram), the controller will return to the operating mode which was active before presence detection, or it will compensate the telegrams of the operating mode objects received during presence detection, respectively. During active presence detection, you cannot change-over the operating mode on the room temperature controller.
  A presence function activated before a device reset (programming operation, bus voltage failure) is always deleted, along with the object value, after the reset. In this case, the motion detector must transmit a new "1" telegram to the controller to activate the presence function.

i If the motion detector is configured for presence detection, it is always possible to configure the presence button in the KNX channel functions or push button functions of the extension module. However, this parameterisation then has no effect.

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 the switch-over by the corresponding operating mode switch-over object or by room temperature regulator operation on the device, the frost/heat protection mode can by activated by a window contact or, alternatively, frost protection can be activated by an automatic temperature control option. With these options, the window contact or the automatic function has higher priority. You can use the "frost/heat protection" parameter in the "room temperature control -> controller general" parameter branch to set the way how such higher-priority switch-over will take place...

- Frost/heat protection switch-over "via window status"
  The 1-bit object, "window status" is enabled. A telegram having the value of = "1" (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, neither by local operation nor by the switch-over objects (with the exception of the KNX override object). Only a telegram with the value of = "0" (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 parameterise a window status delay. Such delay can make sense if short ventilation of the room by opening the window is not supposed to change the operating mode. You can use the "window status delay" parameter to set this delay time between 1 and 255 minutes. The window status will only be changed and thus the frost/heat protection mode activated after this parameterised 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. The value of the object "window status" is deleted after a reset.

- 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 the room when windows or external doors are open. In connection with this function, a quick temperature drop can be detected by measuring the actual temperature every minute as, for example, is the case when a window is open. If the temperature decrease detected reaches a parameterised value the room temperature regulator will automatically switch over to the frost protection mode. You can use the "automatic frost protection temperature drop" parameter to set the maximum temperature drop in K/min for switching over to the frost protection mode. After the time preset by the "frost protection period in automatic mode" parameter has elapsed, the regulator will return into the mode which was set before frost protection. Re-triggering will not be possible.
  If a switch-over was made by 1 byte via the KNX change-over object during frost protection and a new operating mode was received, or a new mode has been specified, this tracked mode will be set after automatic frost protection. If a switch-over was made by 4 x 1 bit during frost protection via the change-over object, then this newly received mode will be discarded after the end of the automatic frost protection. The controller then remains in frost protection. Only after that can the operating mode be switched over by the objects or locally on the device. The KNX override 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 switch-over to frost protection can take place at room temperatures in the dead band or in the active cooling mode if the "heating and cooling" mode is on. Automatic heat protection activation is not intended with this parameterization.

i When a window is open or when the automatic frost protection is active, it is not possible to switch over the controller operating mode using KNX channels or buttons with the "operating mode switchover, internal" function, and not in the menu for the settings. An operation of the KNX channels or buttons will also not be tracked either after the window closes, or at the end of the automatic frost protection.

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 parameterized temperature decrease is not low enough. Therefore switching into the frost/heat protection mode by window contacts should generally be preferred to the automatic option.

Additional information on the operating mode after a reset

In the ETS, it is possible to use the "Operating mode after reset" parameter in the "Room temperature control -> Controller general" parameter node to set which operating mode should be activated after bus voltage recovery or re-programming by the ETS. The following settings are possible...

- "Comfort operation" -> The comfort mode will be activated after the initialisation phase.
- "Standby mode" -> The standby mode will be activated after the initialisation phase.
- "Night operation" -> The night mode will be activated after the initialisation phase.
- "Frost/heat protection operation" -> The frost/heat protection mode will be activated after the initialisation phase.
- "Restore operation mode before reset" -> The mode set before a reset according to the operating mode object or channel-/push button function (normal priority) 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 operating mode objects will be updated after a reset.

ℹ Note on the "restore operation mode before reset" setting:
Frequent changing of the operating mode (e. g. several times a day) during running operation can adversely affect the life of the device as the read-only memory (EEPROM) used has been designed for less frequent write access events only.

4.2.4.3.5 Temperature setpoints

Overview of the setpoint temperatures

Depending on the operating mode, different cases should be distinguished when specifying the setpoint temperature, which then have an impact on the setpoint specifications and the dependencies of the setpoint temperatures.

Setpoints for operating mode "Heating"

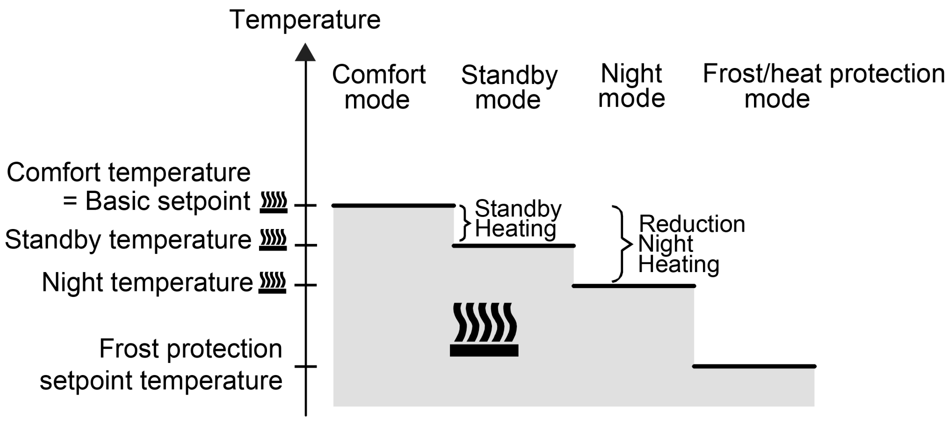


Figure 99: Setpoint temperatures in the operating mode "Heating" (recommended specification)

In this operating mode, the setpoint temperatures for Comfort, Standby and Night mode and the frost protection temperature can be preset (figure 99).
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 should be set to a smaller value than the night temperature for heating (default: +7 °C). In principle, however, it is possible to select frost protection temperature values between +7 °C and +40 °C.
The possible range of values for a setpoint temperature lies between +7.0 °C and +99.9 °C for "heating" and is bounded by the frost protection temperature in the lower range.

The level offset configured in ETS will be additionally considered in a two-level heating mode (figure 100).

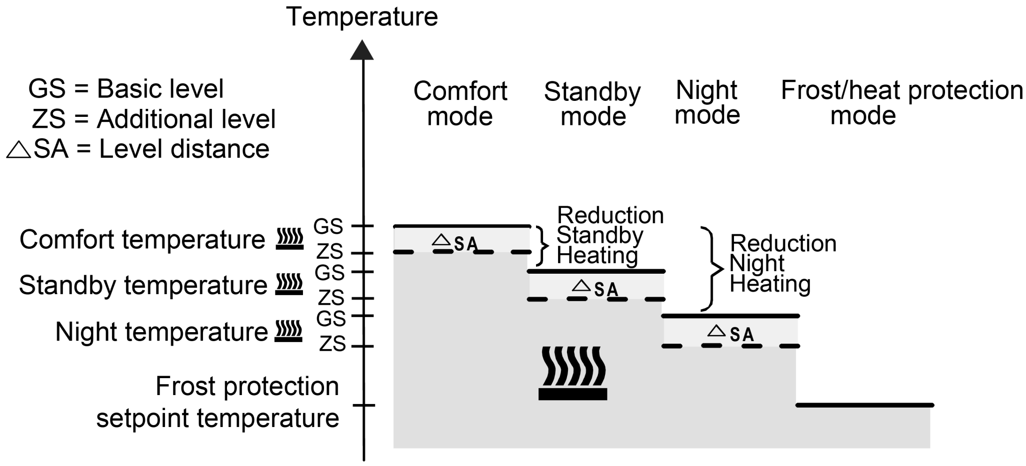


Figure 100: Setpoint temperatures in the operating mode "Basic and additional heating" (recommended specification)

$T_{\text{Comfort setpoint additional level heating}} \leq T_{\text{Comfort setpoint basic level heating}}$
$T_{\text{Standby setpoint additional level heating}} \leq T_{\text{Standby setpoint basic level heating}}$
$T_{\text{Standby setpoint heating}} \leq T_{\text{Comfort setpoint heating}}$

or

$T_{\text{Comfort setpoint additional level heating}} \leq T_{\text{Comfort setpoint basic level heating}}$
$T_{\text{Night setpoint additional level heating}} \leq T_{\text{Night setpoint basic level heating}}$
$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}}$

Setpoints for the "cooling" operating mode

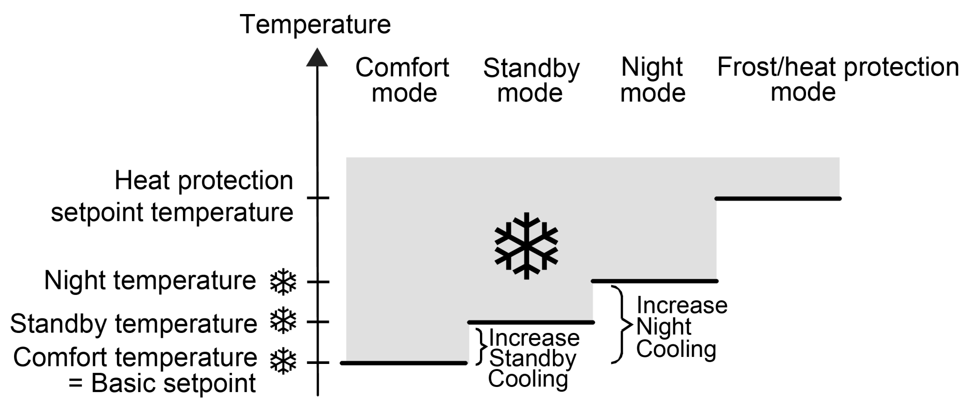


Figure 101: Setpoint temperatures in the operating mode "Cooling" (recommended specification)

The setpoint temperatures for Comfort, Standby and Night mode exist in this operating mode and the heat protection temperature can be preset (figure 101).
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 should be set to a larger value than the night temperature (default: +35 °C). In principle, however, it is possible to select heat protection temperature values between +7 °C and +45 °C.
The possible range of values for a setpoint temperature lies between -99.9 °C and +45.0 °C for "cooling" and is bounded by the heat protection temperature in the upper range.

The level offset configured in ETS will be additionally considered in a two-level cooling mode (figure 102).

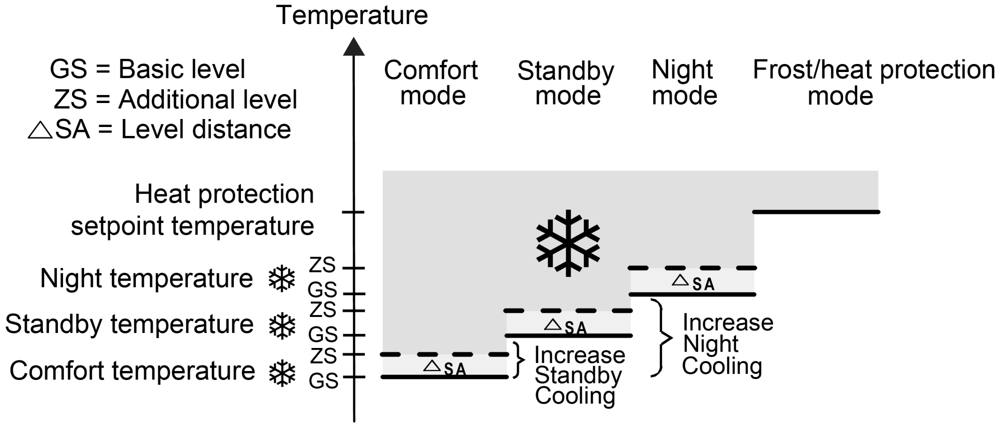


Figure 102: Setpoint temperatures in the operating mode "Basic and additional cooling" (recommended specification)

$T_{\text{Comfort setpoint basic level heating}} \leq T_{\text{Comfort setpoint additional level heating}}$
$T_{\text{Standby setpoint basic level heating}} \leq T_{\text{Standby setpoint additional level heating}}$
$T_{\text{Comfort setpoint cooling}} \leq T_{\text{Standby setpoint cooling}}$

or

$T_{\text{Comfort setpoint basic level heating}} \leq T_{\text{Comfort setpoint additional level heating}}$
$T_{\text{Night setpoint basic level heating}} \leq T_{\text{Night setpoint additional level heating}}$
$T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}}$

Setpoints for the "heating and cooling" operating mode

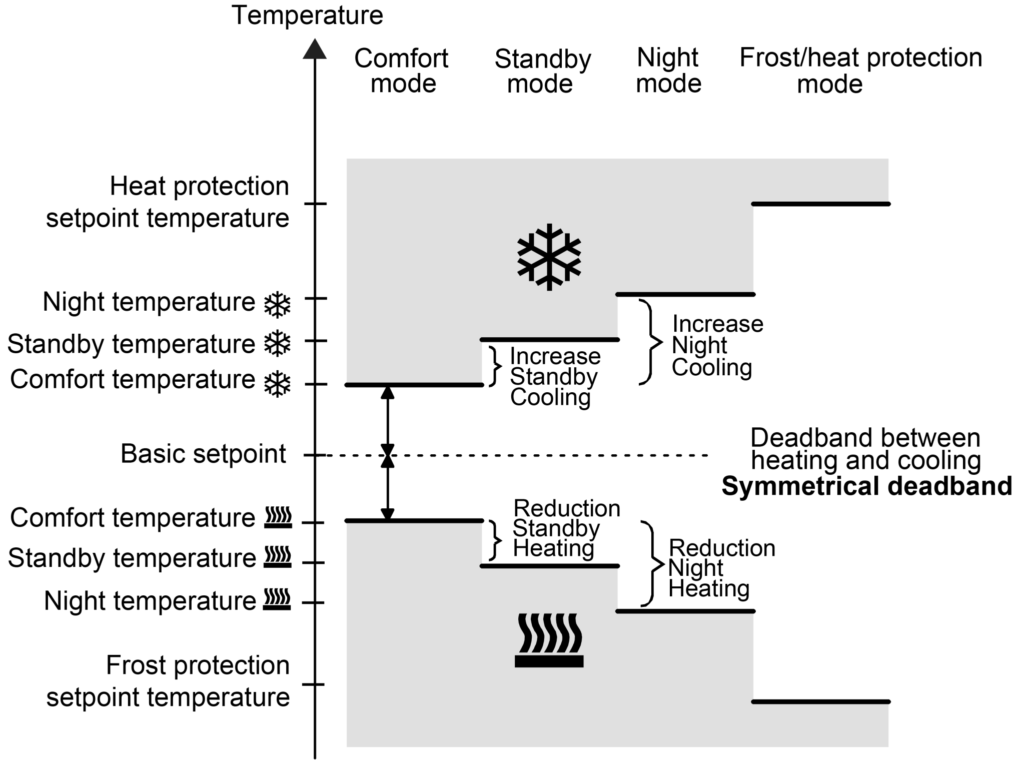


Figure 103: Setpoint temperatures in the operating mode "Heating and cooling" with symmetrical deadband (recommended specification)

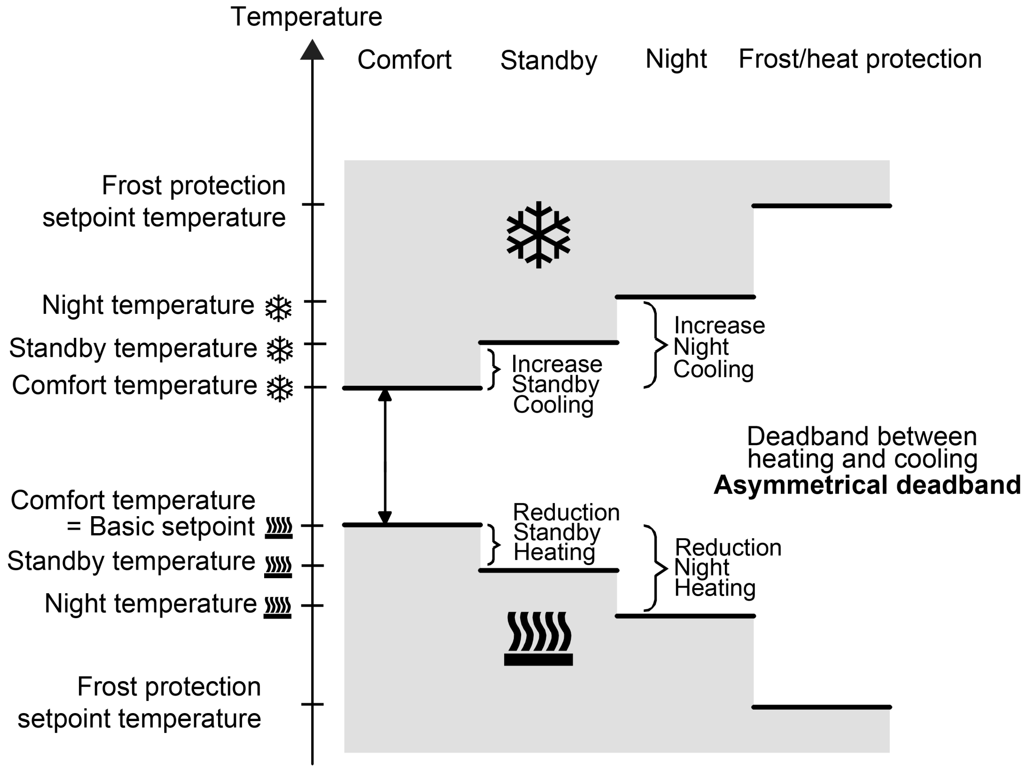


Figure 104: Setpoint temperatures in the operating mode "Heating and cooling" with asymmetrical deadband (recommended specification)

For this heating/cooling operating mode, the setpoint temperatures of both heating/cooling modes exist for the Comfort, Standby and Night operating modes as well as the deadband. A distinction is made in the deadband position with combined heating and cooling. A symmetrical (figure 103) or an asymmetrical (figure 104) deadband position can be configured. In addition, the frost protection and the heat protection temperatures can be preset.
The following applies…

$T_{\text{Standby setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Standby setpoint cooling}}$

or

$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}}$

The set-temperatures for "Standby" and "Night" are derived from the comfort setpoint temperatures for heating or cooling. The temperature increase (for cooling) and the temperature decrease (for heating) of both operating modes can be preset in ETS. The comfort temperatures itself are derived from the deadband and the basic setpoint.
The frost protection is supposed to prevent the heating system from freezing. For this reason the frost protection temperature should be set to a smaller value than the night temperature for heating (default: +7 °C). In principle, however, it is possible to select frost protection temperature values between +7 °C and +40 °C. The heat protection is supposed to prevent the temperature from exceeding the maximum permissible room temperature in order to protect system components. For this reason the heat protection temperature should be set to a larger value than the night temperature for cooling (default: +35 °C). In principle, however, it is possible to select heat protection temperature values between +7 °C and +45 °C.
The possible range of values for a setpoint temperature ("heating and cooling") lies between +7 °C and +45.0 °C and is bounded by the frost protection temperature in the lower range and by the heat protection temperature in the upper range.

The level offset configured in ETS will be additionally considered in a two-level heating or cooling mode.

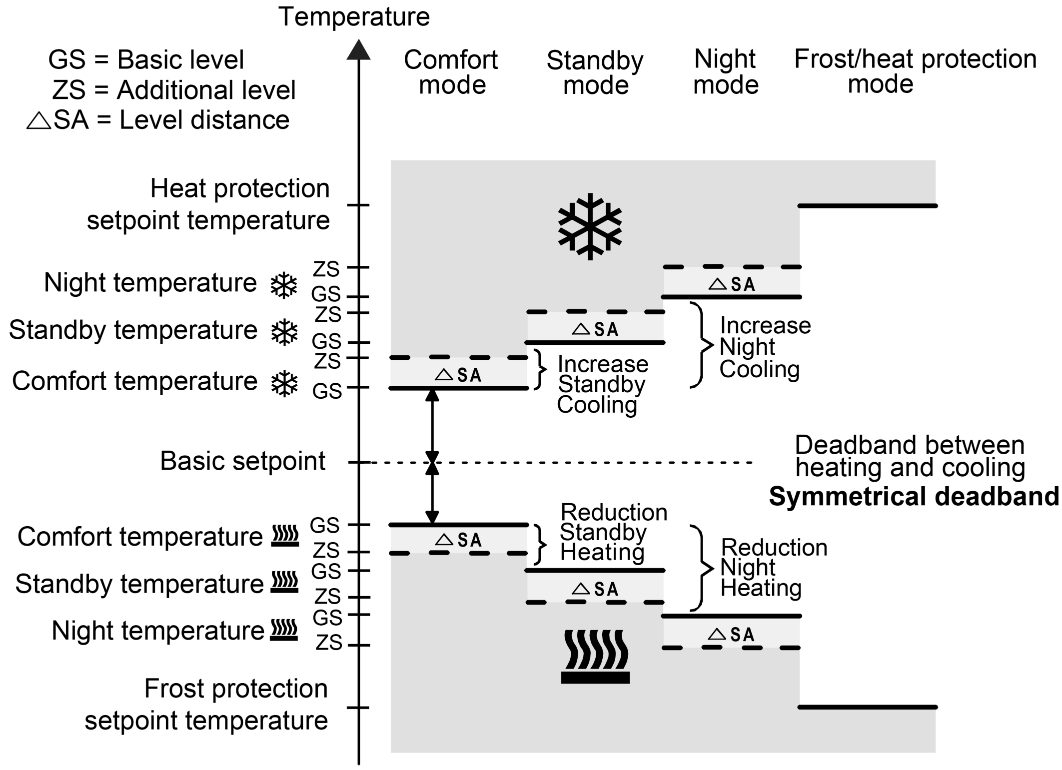


Figure 105: Setpoint temperatures in the operating mode "Basic and additional heating and cooling" with symmetrical deadband (recommended specification)

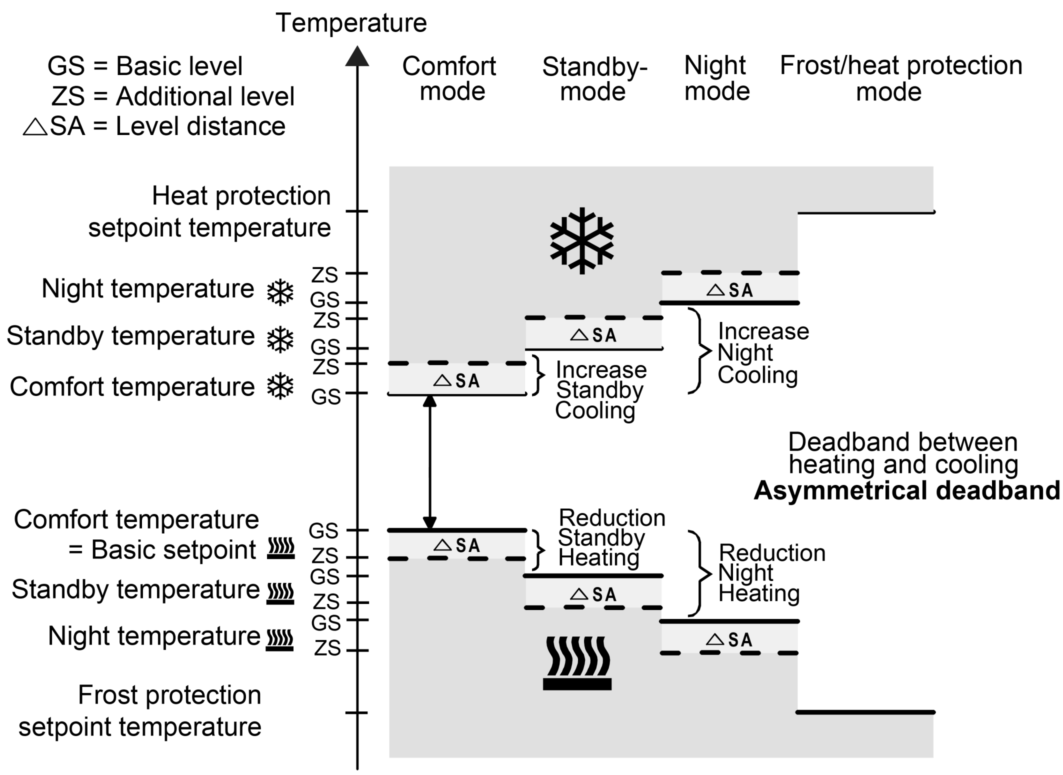


Figure 106: Setpoint temperatures in the operating mode "Basic and additional heating and cooling" with asymmetrical deadband (recommended specification)

$T_{\text{Comfort setpoint add. level Heating}} \leq T_{\text{Comfort setpoint basic level Heating}} \leq T_{\text{Comfort setpoint basic level Cooling}} \leq T_{\text{Comfort setpoint add. level Cooling}}$
$T_{\text{Standby setpoint add. level Heating}} \leq T_{\text{Standby setpoint basic level Heating}} \leq T_{\text{Standby setpoint basic level Cooling}} \leq T_{\text{Standby setpoint add. level Cooling}}$
$T_{\text{Standby setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Standby setpoint cooling}}$

or

$T_{\text{Comfort setpoint add. level Heating}} \leq T_{\text{Comfort setpoint basic level Heating}} \leq T_{\text{Comfort setpoint basic level Cooling}} \leq T_{\text{Comfort setpoint add. level Cooling}}$
$T_{\text{Night setpoint add. level Heating}} \leq T_{\text{Night setpoint basic level Heating}} \leq T_{\text{Night setpoint basic level Cooling}} \leq T_{\text{Night setpoint add. level Cooling}}$
$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}}$

<u>deadband and deadband positions in the combined heating and cooling operating mode</u>

The comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the adjusted deadband. The deadband (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures.

The "deadband between heating and cooling", "deadband position" parameters as well as the "Basic temperature after reset" parameter are preset in the ETS configuration. One distinguishes between the following settings...

- deadband = "symmetrical"
  The deadband preset in the ETS is divided into two parts at the basic setpoint. The comfort set-temperatures are derived directly from the basic setpoint resulting from the half Dead band.
  The following applies...
  $T_{\text{Basic setpoint}} - \frac{1}{2}T_{\text{deadband}} = T_{\text{Comfort heating setpoint}}$

  and

  $T_{\text{Basic setpoint}} + \frac{1}{2}T_{\text{deadband}} = T_{\text{Comfort setpoint cooling}}$
  -> $T_{\text{Comfort cooling setpoint}} - T_{\text{Comfort heating setpoint}} = T_{\text{deadband}}$
  -> $T_{\text{Comfort cooling setpoint}} \geq T_{\text{Comfort heating setpoint}}$

- deadband position = "Asymmetrical"
  With this setting the comfort setpoint temperature for heating equals the basic setpoint. The deadband preset in the ETS is effective only from the basic setpoint in the direction of comfort temperature for cooling. Thus the comfort set-temperature for cooling is derived directly from the comfort setpoint for heating.
  The following applies...
  $T_{\text{Basic setpoint}} = T_{\text{Comfort heating setpoint}}$
  -> $T_{\text{Basic setpoint}} + T_{\text{deadband}} = T_{\text{Comfort heating setpoint}}$
  -> $T_{\text{Comfort cooling setpoint}} - T_{\text{Comfort heating setpoint}} = T_{\text{deadband}}$
  -> $T_{\text{Comfort cooling setpoint}} \geq T_{\text{Comfort heating setpoint}}$

Setpoint presettings in the ETS

Temperature setpoints can be preset for each operating mode in the ETS as part of first configuration. It is possible to configure the setpoints for the "Comfort", "Standby" and "Night" modes in the ETS plug-in. The setpoint temperatures can later be adapted during regular operation by KNX communication objects if desired.
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.

When presetting the setpoint 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) (see page 190). The "Basic temperature after reset" parameter in the "Setpoint" parameter page determines the basic setpoint, which is loaded when the device is programmed via the ETS. Taking into account the "Reduce / increase the setpoint temperature in standby mode" or "Reduce / increase the setpoint temperature in night mode" parameters the temperature setpoints for the standby and night mode are derived from this value depending on the heating or cooling operating mode. The deadband will be additionally considered for the "Heating and cooling"operating mode.
In two-level control mode, all set-temperatures of the additional level are derived from the setpoint temperatures of the basic level. The setpoint temperatures of the additional level are determined by subtracting the "Difference between basic and additional levels", which is permanently configured in the ETS, from the setpoints of the basic level in heating mode or by adding the setpoints in cooling mode. If the temperature setpoints of the basic level are changed by setting a new basic setpoint, the setpoint temperatures of the additional level will be indirectly and automatically changed as well. Both stages will heat or cool with the same actuating variable at the same time when the setpoint difference is "0".

The temperature setpoints programmed in the room temperature controller by the ETS during commissioning can be changed via communication objects. In the ETS the parameter "Overwrite setpoints in device during ETS programming operation?" can be used on the parameter page "Room temperature control -> Controller general -> Setpoints" 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 on "Yes", then the temperature setpoints are deleted in the device during a programming operation and replaced by the values of the ETS. If this parameter is configured to "No", then setpoints present in the device remain unchanged. The setpoint temperatures entered in the ETS then have no significance.

i During initial commissioning of the device the parameter "Overwrite setpoints in device during ETS programming operation?" must be set to "Yes" in order to perform valid initialisation of the memory slots in the device. The setting "Yes" is also necessary if essential controller properties (operating mode, setpoint presetting, etc.) are being changed in the ETS using new parameter configurations!

Limitation of the setpoint temperatures in cooling mode

In accordance with German statutory requirements, the temperature at the workplace should be a maximum of 26 °C, or at least 6 K below outdoor temperatures of 32 °C. Exceeding these limits is only permissible in exception circumstances. To meet these requirements, the room temperature controller offers a setpoint temperature limit, which is only effective in cooling mode. If necessary, the controller limits the setpoint temperature to specific values and prevents an adjustment beyond the limits.

The "Setpoint temperature limit in cooling mode" parameter in the "Room temperature control -> Controller general -> Setpoint values" parameter node activates the limit and its function. The following settings are possible...

- Setting "Only difference to outdoor temperature"
  In this setting, the outdoor temperature is monitored and compare to the active setpoint temperature. The maximum temperature difference to the outdoor temperature can be specified in the range between 1 K and 15 K. The specification is made using the "Difference to outdoor temperature in cooling mode" parameter. The value can be set in levels of 1 K.
  If the outdoor temperature rises above 32 °C in the sense of the statutory requirements, then the controller activates the setpoint temperature limit. It then permanently monitors the outdoor temperature and raises the setpoint temperature so that is beneath the outdoor temperature by the amount configured. Should the outdoor temperature continue rise, the controller raises the setpoint temperature until the required difference to the outdoor temperature is achieved. It is then not possible to undershoot the raised setpoint, e.g. by changing the basic setpoint change.
  The change to the setpoint temperature limit is temporary. It only applies for as long as the outdoor temperature exceeds 32 °C.
  With the setpoint temperature limit, the configured temperature difference relates to the setpoint temperature of the Comfort mode for cooling. In other operating modes, the temperature distance to Comfort mode must be taken into account. Example...
  In the ETS, the difference to the outdoor temperature is set as 6 K. The Standby setpoint temperature is configured to 2 K higher than the Comfort setpoint temperature. The result of this is that, for command value limiting, the setpoint temperature in Standby operating mode may only be a maximum of 4 K below the outdoor temperature. The setpoint temperature limit applies to Night mode in the same way.

ℹ The automatic setpoint temperature raising by the setpoint temperature limit goes only as far as the configured heat protection temperature. Therefore the heat protection temperature can never be exceeded.

ℹ A basic setpoint shift never affects an active setpoint temperature limit with differential measurement to the outdoor temperature. In this case, the setpoint temperature limit only works with the unshifted basic setpoint. A setpoint shift active before the limitation is restored after the limitation, if it was not reset in another way, e.g. by an operating mode change-over.

- Setting "Only max. setpoint temperature"
  In this setting, no setpoint temperatures are permitted in Cooling mode related to the Comfort, Standby and Night modes, which are greater than the maximum setpoints configured in the ETS. The maximum setpoint temperature is specified in the "Max. setpoint temperature in Cooling mode" parameter and be configured within the limits 20 °C to 35 °C in 1 °C levels.
  With an active limit, no larger setpoint can be set in cooling operation, e.g. by a basic setpoint change or a setpoint shift. However, heat protection is not influenced by the setpoint temperature limit.
  The maximum setpoint temperature configured in the ETS generally relates to the Comfort setpoint temperature of Cooling mode. In other operating modes, the temperature distance to Comfort mode must be taken into account. Example...
  The maximum setpoint temperature is configured to 26 °C. The Standby setpoint temperature is configured to 2 K higher than the Comfort setpoint temperature. The result of this is that, for command value limiting, the setpoint temperature in Standby operating mode is limited to 28 °C. The setpoint temperature limit applies to Night mode in the same way.

- Setting "Max. setpoint temperature and difference to outdoor temperature"
  This setting is a combination of the two above-mentioned settings. In the downward direction, the setpoint temperature is limited by the maximum outdoor temperature difference, whilst in the upward direction, the limit is made by the maximum setpoint. The maximum setpoint temperature has priority over the outdoor temperature difference. This means that the controller keeps on raising the setpoint temperature upwards according to the difference to the outdoor temperature configured in the ETS until the maximum setpoint temperature or the heat protection temperature is exceeded. Then the setpoint is limited to the maximum value.

A setpoint limit enabled in the ETS can be activated or deactivated as necessary using a 1-bit object. For this, the "Activation of the setpoint temperature limit via object in cooling mode" parameter can be set to "Yes". In this case, the controller only takes the setpoint limit into account, if it has been enabled via the object "Cooling setpoint temp. limit" ("1" telegram). If the limitation is not enabled ("0" telegram), the cooling setpoint temperatures are not limited.
After a device reset (bus voltage return, programming operation), the object value is "0", meaning that the setpoint limit is inactive.

i The setpoint limit has no function in Heating mode.

Adjusting the basic temperature / temperature for Comfort mode

With the setpoint 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 in the "Room temperature measurement -> Controller general -> Setpoint" parameter page determines the basic setpoint which is loaded when the device is programmed via the ETS. The 2-byte object "Basic setpoint" provides the option of changing the basic temperature, and thus all the dependent setpoint temperatures 'at a later date'.
A change via the object must always be enabled in the ETS by configuring the parameter "Change the basic temperature setpoint via bus" to "Approve". If the basic setpoint adjustment via the bus is disabled, the "Basic setpoint" object will be hidden (setting "deactivated").

The basic setpoint sets the appropriate comfort temperature directly in the individual operating modes "Heating" or "Cooling". In the combined operating mode "Heating and cooling", the basic setpoint sets the comfort temperature for heating either directly (asymmetrical deadband) or indirectly (symmetrical deadband) according to the deadband positions configured in the ETS. The comfort setpoint temperature for cooling is then derived directly from the comfort setpoint for heating, taking the deadband into account.

i The size of the deadband as well as the deadband position (symmetrical / asymmetrical) in "Heating and cooling" can only be changed in the ETS.

If the basic setpoint has been modified, we have to distinguish between two cases that are set by the parameter "Apply change to basic temperature setpoint permanently"...

- Case 1: The basic setpoint adjustment is permanently accepted ("Yes" setting):
  If, with this setting, the basic temperature setpoint is adjusted, the controller saves the value permanently to the EEPROM. The newly adjusted value will overwrite the basic temperature originally configured via the ETS after a reset! This is the only way to keep the adjusted basic setpoint even after change-over of the operating mode or after a reset. With this setting, it should be noted that frequent changing of the basic temperature (e.g. several times a day) can affect the product life of the device as the non-volatile storage (EEPROM) is designed for less frequent write access. A previously saved basic setpoint remains active after the return of bus voltage, providing that the device was not programmed by the ETS.

- Case 2: The basic setpoint adjustment is only temporarily accepted ("No" setting):
  The basic setpoint, which was received via the object, stays only temporarily active in the current operating mode. In the case of a bus voltage failure or following a change-over to another operating mode (e.g. Comfort followed by Standby), the basic setpoint received via the object will be discarded and replaced by the value which was originally configured in the ETS.

Basic setpoint shift

In addition to the setting of individual temperature setpoints via the ETS or via a basic setpoint, the user is able to shift the basic setpoint within a specific range via the basic setpoint object with the channel or "setpoint shift, internal" push-button function. During each operation, the basic setpoint is shifted upwards or downwards by one level (depending on the button operation and parameterisation). An adjustment by up to 4 steps is possible in this way. The value of a level corresponds to 0.5 K. Consequently, the setpoint temperature value can be shifted within the range -2 K...0...+2 K. The adjusted temperature value is instantly accepted as the new setpoint during operation.

i It has to be considered that a shift of the displayed setpoint temperature (temperature offset of the basic temperature) will directly affect the basic setpoint and as a result shift all other temperature setpoints.
A positive shift is possible up to the configured heat protection temperature. A negative shift is possible up to the set frost protection temperature.

Whether a basic setpoint shifting only affects the currently active operating mode or whether it influences all other set-temperatures of the remaining operating modes is determined by the "Accept modification of shift of basic setpoint value permanently" parameter in the "Room temperature control -> Controller general -> Setpoints" parameter page...

- "No" setting:
  The basic setpoint shifting carried out is in effect for only as long as the operating mode or heating/cooling mode has not changed or the basic setpoint is maintained. Otherwise the setpoint shift will be reset to "0".

- "Yes" setting:
  In general, the shifting of the basic setpoint carried out affects all operating modes. The shifting is maintained even after change-over of the operating mode or the heating/cooling mode or readjusting the basic setpoint.

ℹ Since the value for the basic setpoint shift is stored exclusively in volatile memory (RAM), the shift will get lost in case of a reset (e.g. bus voltage failure).

ℹ A setpoint shift does not affect the temperature setpoints for frost or heat protection!

Communication objects for the basic setpoint shift:

The controller tracks the current setpoint shift in the communication object "Current setpoint shift" via the controller with a 1-byte counter value (acc. to KNX DPT 6.010 – representation of positive and negative values in a double complement). By connecting to this object the controller extensions are also able to display the current setpoint shift. As soon as there is an adjustment by one temperature increment in positive direction, the controller counts up the value. The counter value will be counted down if there is a negative adjustment of the temperature. A value of "0" means that no setpoint shift has been adjusted.

Example:
Starting situation: current setpoint temperature = 21.0°C / Counter value in "Feedback setpoint shift" = "0" (no active setpoint shift)
After the setpoint shift:
-> A setpoint shift by one temperature increment in the positive direction will count up the value in the "Current setpoint shift" object by one = "1".
-> Current setpoint temperature = 21.5°C
-> An additional setpoint shift by one temperature increment in the positive direction will again count up the value in the "Current setpoint shift" object by one = "2".
-> Current setpoint temperature = 22.0°C
-> A setpoint shift by one temperature increment in the negative direction will count down the value in the "Current setpoint shift" object by one = "1".
-> Current setpoint temperature = 21.5°C
-> An additional setpoint shift by one temperature increment in the negative direction will again count down the value in the "Current setpoint shift" object by one = "0".
-> Current setpoint temperature = 21.0°C
-> An additional setpoint shift by one temperature increment in the negative direction will again count down the value in the "Current setpoint shift" object by one = "-1".
-> Current setpoint temperature = 20.5°C, etc. ...

In addition, the controller's setpoint shift can be externally adjusted via the communication object "Preset setpoint shift". This object has the same data point type and range of values as the object "Current setpoint offset" (see above). By connecting to the "Setpoint shift specification" object the controller extensions are able to directly adjust the current setpoint shift of the controller. As soon as the controller receives a value, it will adjust the setpoint shift correspondingly. Values that lie within the possible value range of the basic setpoint shift can be directly jumped to.
The controller monitors the received value independently. As soon as the external preset value exceeds the limits of the adjustment options for the setpoint shift in positive or negative direction, the controller will correct the received value and adjust the setpoint shift to maximum. Depending on the direction of the shift, the value feedback is set to the maximum value via the communication object "Current setpoint shift".
Controller extensions connected to the controller via the aforementioned objects have to work with the same step width as the controller (0.5 K)!

Transmitting the setpoint temperature

The setpoint temperature, which is given by the active operating mode can be actively transmitted onto the bus via the 2-byte "Set temperature" object. The "Transmission at setpoint temperature modification by..." parameter in the "Room temperature control -> controller general -> setpoint values" parameter node determines the temperature value by which the setpoint has to change in order to have the setpoint temperature value transmitted automatically via the object. Possible temperature value changes lie within a range of 0.1 K and 25.5 K. The setting "0" at this point will deactivate the automatic transmission of the set temperature.

In addition, the setpoint can be transmitted cyclically. The "Cyclical transmission of setpoint temperature" parameter determines the cycle time (1 to 255 minutes). The value "0" will deactivate the periodical transmission of the setpoint temperature value. It has to be pointed out that with deactivated periodical transmission and deactivated automatic transmission, no setpoint temperature telegrams will be transmitted in case of a change.
Setting the "Read" flag on the "Setpoint temperature" object makes it possible to read out the current setpoint. Following the return of bus voltage or after re-programming via the ETS, the object value will be initialised according to the current setpoint temperature value and actively transmitted to the bus.

4.2.4.3.6 Room temperature measurement

Basic principles

The room temperature regulator periodically measures the actual temperature of the room and compares it with the given setpoint temperature of the active operating mode. The control algorithm calculates the adjusted command value from the difference between actual and setpoint temperatures. In order to ensure a fault-free and effective room temperature control, it is very important to determine the exact actual temperature.
The room temperature controller possesses an integrated temperature sensor, using which the room temperature can be detected. Alternatively (e.g. if the room temperature controller has been installed in an unfavourable location or operates in difficult conditions, for example, in a moist atmosphere) or in addition (e.g. in large rooms or halls), a second temperature sensor linked via bus telegrams can be used to determine the actual value. This second sensor can either be a room temperature controller coupled via the KNX or a controller extension with temperature recording.

When choosing the installation location of the controller or the external sensors, the following points should be considered...

- The controller 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 units and at least 1.5 m above the floor.

i Room temperature measurement by the device is always active, irrespective of the other functions and can thus be used independently (e.g. for simple measurement and display of a room temperature without control). The room temperature determined by the room temperature measurement can optionally be displayed in the status line on the display pages of the main menu level (see page 119-120).

Temperature detection and measured value formation

The parameter "Temperature detection" in the parameter node "Temperature measurement" specifies by which sensor the room temperature is determined. The following settings are possible for temperature detection

- "internal sensor"
  The temperature sensor integrated in the room temperature controller is activated. Thus, the actual temperature value is determined only locally on the device.
  In this parameterisation the feedback control will start directly after a device reset.

- "received temperature value"
  The actual temperature is determined solely via a temperature value received from the bus. In this case, the sensor must either be a KNX room thermostat coupled via the 2-byte object "Received temperature" or a controller extension with temperature detection. The room temperature controller can request the current temperature value cyclically. For this purpose, the parameter "Request time of the received temperature value" must be set to a value > "0". The request interval can be configured within the limits of 1 minute to 255 minutes.
  After a device reset the room temperature controller will first wait for a valid temperature telegram until the feedback control starts and a command value, if applicable, is output.

- "internal sensor + received temperature value"
  In this setting, the internal sensor and received temperature value are combined together. The received temperature value can be transmitted by a sensor, which is a KNX room thermostat coupled via the 2-byte object "Received temperature" or a controller extension with temperature detection.
  With the setting "Received temperature value" the room temperature controller can request the current temperature value cyclically. For this purpose, the parameter "Request time of the received temperature value" must be set to a value > "0". The request interval can be configured within the limits of 1 minute to 255 minutes. After a device reset the room temperature controller will first wait for a valid temperature telegram until the feedback control starts and a command value, if applicable, is output.
  When evaluating, the real actual temperature is made up from the two respective measured temperature values. The weighting of the temperature values is defined by the parameter "Measured value formation, temperature value to be received internally". 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: a room temperature controller is installed next to the entrance to the room (internal sensor). An additional external KNX temperature sensor has been mounted on an inner wall in the middle of the room below the ceiling.
  Internal sensor: 21.5 °C
  External sensor: 22.3 °C
  Determination of measured value: 30 % to 70 %

  -> $T_{\text{Result internal}} = T_{\text{internal}} \cdot 0.3 = 6.45$ °C,
  -> $T_{\text{Result external}} = T_{\text{external}} = 22.3$ °C $\cdot\ 0.7 = 15.61$ °C
  -> $T_{\text{Result actual}} = T_{\text{Result internal}} + T_{\text{Result external}} = \underline{22.06\ °C}$

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 parameters "Internal sensor calibration" and "Calibration of received temperature value" in the parameter node "Temperature measurement" can parameterise 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 controller 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 (see "Transmission of the actual temperature"). The current room temperature can also be displayed optionally in the status line on the display pages of the main menu level (see page 119-120).
When determining the measured value using combined sensors, the two adjusted values are used to calculate the actual value.

Transmission of the actual temperature

The determined actual temperature can be actively transmitted to the bus via the 2-byte "Actual temperature" object. The parameter "Transmission when room temperature change by..." in the parameter node "Temperature measurement" defines the temperature value by which the actual value must change so that the actual temperature value is transmitted automatically via the object. Possible temperature value changes lie within a range of 0.1 K and 25.5 K. The 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.
Setting the "Read" flag on the "actual temperature" object makes it possible to read out the current actual value at any time over the bus. It has to be pointed out that with deactivated periodical transmission and deactivated automatic transmission, no more actual-temperature telegrams will be transmitted".

Following the return of bus voltage, new programming via the ETS, the object value will be updated according to the actual temperature value and transmitted on the bus. During room temperature control, the controller 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.

4.2.4.3.7 Command value and status output

Command value objects

The format of the command value objects are determined depending on the control algorithm selected for heating and / or cooling and, if applicable, also for the additional levels. 1 bit or 1 byte command value objects can be created in the ETS. The control algorithm calculates the command values in intervals of 30 seconds and outputs them via the objects. With the pulse width modulated PI control (PWM) the command value is updated, if required, solely at the end of a time cycle.

Possible object data formats for the command values separately for both heating/cooling operating modes, for the basic and the additional level or for both control circuits are…

- Continuous PI control: 1 byte
- Switching PI control: 1 bit + additionally 1 byte (for example for the status indication with visualisations),
- Switching 2-point feedback control: 1 bit.

Depending on the selected heating/cooling operating mode, the controller is able to address heating and / or cooling systems, to determine command values and to output them via separate objects. One distinguishes between two cases for the "Heating and cooling" mixed operating mode...

- Case 1: Heating and cooling system are two separate systems
  In this case the "Transmit heating and cooling command value to one common object" parameter should be set to "No" in the "Room temperature control -> Controller functions" parameter node. Thus, there are separate objects available for each command value, which can be separately addressed via the individual systems.
  This setting allows to define separate types of control for heating and cooling.

- Case 2: Heating and cooling system are a combined system
  In this case the "Transmit heating and cooling command value to one common object" parameter may be set, if required, to "Yes". This will transmit the command values for heating and cooling to the same object. In case of a two-level feedback control, another shared object will be enabled for the additional levels for heating and cooling.
  With this setting it is only possible to define the same type of feedback control for heating and for cooling as the feedback control and the data format must be identical. The ("Type of heating / cooling") control parameter for cooling and heating still has to be defined separately.
  A combined command value object may be required, for example, if heating as well as cooling shall take place via a single-pipe system (combined heating and cooling system). For this, the temperature of the medium in the single-pipe system must be changed via the system control. Afterwards the heating/cooling operating mode is set via the object (often the single-pipe system uses cold water for cooling during the summer, hot water for heating during the winter).

If required, the command value can be inverted before the transmission to the KNX. With output via a combined object, the parameters "Output of heating command value", "Output of cooling command value" or "Output of command values..." output the command value in inverted fashion according to the object data format. The parameters for inverting the additional level(s) are additionally available in the two-level control.

The following applies…
For continuous command values:
-> Not inverted: Command value 0 % ... 100 %, value 0 ... 255
-> Inverted: Command value 0 % ... 100 %, value 255 ... 0
For switching command values:
-> Not inverted: Command value off / on, value 0 / 1
-> Inverted: Command value off / on, value 1 / 0

Automatic transmission

On automatic transmission of the command value telegrams, a distinction is made with regard to the type of control...

- Continuous PI control:
  In case of a continuous PI control, the room temperature controller calculates a new command value periodically every 30 seconds and outputs it to the bus via a 1-byte value object. The change interval of the command value can be determined in percent according to which a new command value is to be output on the bus via the "Automatic transmission on change by..." parameter in the "Room temperature control -> Controller general -> Command values and status output" parameter node. The change interval can be configured to "0" so that a change in the command value will not result in an automatic transmission.
  In addition to the command value output following a change, the current command value value may be periodically transmitted on the bus. In addition to the times when changes are to be expected, other command value telegrams will be output according to the active value after a configurable cycle time. This ensures that during a periodic access control of the command value in servo drive or in the addressed switching actuator, telegrams are received within the control interval. The time interval predetermined by the "Cycle time for automatic transmission..." parameter parameter should correspond to the control interval in the actuator (cycle time in the controller is preferably to be parameterized smaller). The "0" setting will deactivate the periodic transmission of the actuating variable.
  With continuous PI control it must be noted that if the cyclical and the automatic transmission are both deactivated, no command value telegrams will be transmitted in case of a change!

- Switching PI control (PWM):
  In case of a switching PI control (PWM), the room temperature controller calculates a new command value internally every 30 seconds. In this feedback control, however, the update of the command value takes place, if required, solely at the end of a PWM cycle. The parameters "automatic transmission on change by..." and "Cycle time for automatic transmission..." are not enabled with this control algorithm. The parameter "Cycle time of the switching command value..." defines the cycle time of the PWM command value signal.

- 2-point control:
  In case of a 2-point feedback control, the room temperature and thus the hysteresis values are evaluated periodically every 30 seconds, so that the command values, if required, will change solely during these times. The "Automatic transmission on change by..." parameter is not enabled as this control algorithm does not calculate continuous command values.
  In addition to the command value output following a change, the current command value value may be periodically transmitted on the bus. In addition to the times when changes are to be expected, other command value telegrams will be output according to the active value after a configurable cycle time. This ensures that during a periodic access control of the command value in servo drive or in the addressed switching actuator, telegrams are received within the control interval. The time interval predetermined by the "Cycle time for automatic transmission..." parameter parameter should correspond to the control interval in the actuator (cycle time in the controller is preferably to be parameterized smaller). The "0" setting will deactivate the periodic transmission of the actuating variable.

Command value limit

Optionally a command value limit can configured in the ETS. The command value limit allows the restriction of calculated command values to the range limits "minimum" and "maximum". The limits are permanently set in the ETS and, if command value limitation is active, can be neither undershot or exceeded during device operation. It is possible, if available, to specify various limiting values for the basic and additional stages and for heating and cooling.

i It should be noted that the command value limit has no effect with "2-point feedback control" and with "Transmitting of command values for heating and cooling via a common object"! In that case it is still possible to configure the command value limit in the ETS, but it will have no function.

The "Command value limit" parameter on the parameter page "Room temperature control -> Controller general -> Command values and status output" defines the mode of action of the limiting function. The command value limit can either be activated or deactivated using the 1-bit communication object "Command value limit", or be permanently active. When controlling via the object, it is possible to have the controller activate the command value limit automatically after bus voltage return or an ETS programming operation. Here the "Command value limit after reset" parameter defines the initialisation behaviour. In the "Deactivated" setting, the command value limit is not automatically activated after a device reset. A "1" telegram must first be received via the "Command value limit" object for the limit to be activated. In the "Activated" setting, the controller activates the command value limit automatically after a device reset. To deactivate the limit a "0" telegram must be received via the "Command value limit" object. The limit can be switched on or off at any time using the object.
With a permanently active command value limit, the initialisation behaviour cannot be configured separately after a device reset, as the limit is always active. In this case it is also not possible to configure any object.

As soon as the command value limit is active, calculated command values are limited according to the limiting values from the ETS. The behaviour with regard to the minimum or maximum command value is then as follows...

- Minimum command value:
  The "Minimum command value" parameter specifies the lower command value limiting value. The setting can be made in 5 % increments in the range 5 % ... 50 %. With an active command value limit, the set minimum command value is not undershot by command values. If the controller calculates smaller command values, it sets the configured minimum command value. The controller transmits a 0% command value if no more heating or cooling energy has to be demanded.

- Maximum command value:
  The "Maximum command value" parameter specifies the upper command value limiting value. The setting can be made in 5 % increments in the range 55 % ... 100 %. With an active command value limit, the set maximum command value is not exceeded. If the controller calculates larger command values, it sets the configured maximum command value.

If the limit is removed, the device automatically repositions the most recently calculated command value to the unlimited values when the next calculation interval for the command values (30 seconds) has elapsed.

i If the controller executes a valve protection function, the command value limit is temporarily deactivated in order to make use of the full motion range of the valve.

i An active command value limit has a negative effect on the control result when the command value range is very restricted. A control deviation must be expected.

Controller status

The room temperature controller can transmit its current status to the KNX. A choice of data formats is available for this. The "Controller status" parameter in the "Room temperature control -> Controller general -> Command value and status output" parameter branch will enable the status signal and set the status format...

- "KNX compliant"
  The KNX compliant controller status feedback is harmonised on a manufacturer-specific basis, and consists of 3 communication objects. The 2-byte object "KNX status" (DPT 22.101) indicates elementary functions of the controller. This object is supplemented by the two 1-byte objects "KNX status operating mode" and "KNX status forced operating mode" (DPT 20.102), which report back the operating mode actually set on the controller (see page 181). The last two objects mentioned above are generally used to enable controller extensions to display the controller operating mode correctly in the KNX compliant status display. Therefore these objects should be connected with controller extensions if the KNX compliant status feedback is not configured.

Bit of the status telegram	Meaning
0	Controller error status ("0" = no error / "1" = error)
1	not used (permanent "0")
2	not used (permanent "0")
3	not used (permanent "0")
4	not used (permanent "0")
5	not used (permanent "0")
6	not used (permanent "0")
7	not used (permanent "0")
8	Operating mode ("0" = Cooling / "1" = Heating)
9	not used (permanent "0")
10	not used (permanent "0")
11	not used (permanent "0")
12	Controller disabled (dew point operation) ("0" = Controller enabled / "1" = Controller disabled)
13	Frost alarm ("0" = Frost protection temperature exceeded / "1" = frost protection temperature undershot)
14	Heat alarm ("0" = heat protection temperature exceeded / "1" = Heat protection temperature exceeded)
15	not used (permanent "0")

Bit encoding of the 2 byte KNX compliant status telegram

- "Controller general":
  The general controller status collects essential status information of the controller in two 1-byte communication objects. The "Controller status" object contains fundamental status information. The "Status signal addition" object collects in a bit-orientated manner further information that is not available via the "Controller status" object. For example, controller extensions can evaluate the additional status information, in order to be able to display all the necessary controller status information on the extension display.

Bit of the status telegram	Meaning
0	On "1": Comfort operation activated
1	On "1": Standby mode active
2	On "1": Night mode active
3	On "1": Frost/heat protection mode active
4	On "1": Controller disabled
5	On "1": Heating, on "0": Cooling
6	On "1": Controller inactive (deadband)
7	On "1": Frost alarm ($T_{Room} \leq +5$ °C)

Bit encoding of the 1 byte status telegram

Bit of the status telegram	Meaning on "1"	Meaning on "0"
0	Normal operating mode	Forced operating mode
1	Comfort extension active	No comfort extension
2	Presence (Motion detector)	No presence (Motion detector)
3	Presence (Presence button)	No presence (Presence button)
4	Window opened	No window opened
5	Additional level active	Additional level inactive
6	Heat protection active	Heat protection inactive
7	Controller disabled (dew point operation)	Controller not disabled

Bit encoding of the 1 byte additional status telegram

- "Transmit individual state"
  The 1 bit status object "Controller status, ..." contains the status information selected by the "Single status" parameter. Meaning of the status signals:

  "Comfort mode active" -> Active if operating mode "Comfort" or a comfort extension is activated.

  "Standby mode active" -> active if the "standby " operating mode is activated.

  "Night-mode active" -> active if the "night " operating mode is activated.

  "Frost/heat protection active" -> active if the "frost/heat protection" operating mode is activated.

  "Controller disabled" -> Active if controller disable is activated (dew point mode).

  "Heating / cooling" -> Active if heating is activated and inactive if cooling is activated. Inactive if controller is disabled.

  "Controller inactive" -> Active with the "heating and cooling" operating mode when the measured room temperature lies within the dead zone. This status information is always "0" for the individual "Heating" or "Cooling" operating modes. Inactive if controller is disabled.

  "Frost alarm" -> Is active if the detected room temperature reaches or falls below +5 °C. This status signal will have no special influence on the control behaviour.

i Upon a reset, the status objects will be updated after the initialisation phase. After this, updating is performed cyclically every 30 seconds in parallel with the command value calculation of the controller command values. Telegrams are only transmitted to the bus when the status changes.

Special case for command value 100% (Clipping mode)

If with a PI control the calculated command value of the controller exceeds the physical limits of the actuator, in other words if the calculated command value is greater than 100%, then the command value is set to the maximum value (100%) and thus limited. This special, necessary control behaviour is also called "clipping". With PI control the command value can reach the value "100%" if there is a large deviation of the room temperature from the setpoint temperature or the controller requires a long time to adjust to the setpoint with the heating or cooling energy that is being applied. The controller can evaluate this state in a particular manner and react to it in various ways.
The parameter "Behaviour with command value = 100% (clipping mode PI control)" on the parameter page "Room temperature control -> Controller general -> Command values and status output" defines the functions of the PI controller when the command value is 100%...

- "keep 100% until setpoint = actual, then 0%" setting:
  The controller keeps the maximum command value until the room temperature (actual value) reaches the setpoint temperature. After that is reduces the command value down to 0% all at once (controller reset).
  The advantage of this control behaviour is that in this way sustainable heating up of undercooled rooms or effective cooling of overheated rooms will be achieved by overshooting the setpoint. The disadvantage is the in some circumstances the overshooting of the room temperature may be found disturbing.

- Setting "keep 100% as required, then adjust downwards":
  The controller maintains the maximum command value only as long as it is necessary. After that it adjusts the command value downwards according to the PI algorithm. The advantage of this control characteristic is the fact that the room temperature does not exceed the setpoint temperature at all, or only slightly. The disadvantage is that this control principle increases the tendency to oscillate about the setpoint.

Which of the methods of functioning described above is used often depends on what heating or cooling system is used (underfloor heating, radiators, fan coils, cooling ceilings, etc.), and how effective these systems are. We recommend selecting the setting "keep 100% until setpoint = actual, then 0%" (default setting). Only if this control behaviour has an adverse effect on the people's perception of the temperature in a room should the setting "keep 100% as required, then adjust downwards" be used.

ℹ Clipping may also occur when a command value limit is active (maximum command value). In this case, if the internally calculated command value reaches 100%, then the controller only transmits to the bus the maximum command value according to the ETS configuration. The clipping (switching off when setpoint = actual or adjusting downwards) is performed, however.

ℹ It should be noted that the clipping mode has no effect with "2-point feedback control"! In that case it is still possible to configure the parameter "Behaviour with command value = 100%" in the ETS, but it will have no function.

4.2.4.3.8 Fan controller

Operating mode and fan levels

The room temperature control can be supplemented with a fan controller. This makes it possible to control the fan from heating and cooling systems operated by circulating air, such as fan coil units (FanCoil units), depending on the command value calculated in the controller or using manual operation. If necessary, the fan controller can be enabled separately by setting the "Fan controller available" parameter in the "Room temperature control -> Controller general" parameter node to "Yes". When the function is enabled additional parameters will appear in the ETS in the "Room temperature control -> Controller general -> Fan controller" as well as additional communication objects.
If the fan controller is enabled, the fan controller icon (figure 49) becomes visible in the display after the device is commissioned (ETS programming operation).

i The fan controller works only in conjunction with PI feedback controls with continuous or switching (PWM) command value output. In 2-point feedback control, the fan controller is inactive, even if the function is enabled in the ETS.

Depending on the operating mode of the room temperature control, as configured in the ETS (see chapter 4.2.4.3.1. Operating modes and operating mode change-over), various controller command values can be used as the basis for fan control. The "Fan operating mode" parameter specifies which command value of the controller controls the fan controller. With one-level room temperature control, it is possible to select whether the fan is activated during heating and/or during cooling. With two-level room temperature control, it is also possible for the fan controller to be set to the basic level or the additional level during heating and cooling. However, under no circumstances is it possible to use the basic and additional levels simultaneously for a fan controller within an operating mode.
Fan coil units are as a rule equipped with filters, and have multi-level blowers whose speed and thus ventilation output can be varied by means of fan level inputs. For this reason, the fan controller of the room temperature controller supports up to 8 fan level outputs, for which the actually used number of levels (1...8) is set using the "Number of fan levels" parameter.
The controller controls the levels of a fan using bus telegrams. Usually, the fan level telegrams are received and evaluated by simple switching actuators. The electrical control of the fan level inputs of a fan coil unit takes place via these actuators. Depending on the data format of the objects of the controlled actuators, the change-over between the fan levels can either take place via up to 8 separate 1-bit objects or, alternatively, via one 1-byte object. The "Fan level change-over via" parameter defines the data format of the controller. With the 1-bit objects, each fan level discreetly receives its own object. With the 1-byte object, the active fan level is expressed by a value.

Fan level	Object value
Fan OFF	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

Value meaning for 1-byte fan level object

Due to fan motors' inertia, as a rule there is a limit to how short the time intervals for switching the fan levels can be, i.e. there is a limit to how quickly the fan speed can be varied. Often the technical information for a fan coil unit specifies change-over times that the fan controller must

maintain for each fan level change-over. The change-over direction, i.e. whether the level is being increased or decreased, does not play any role here.
With a change-over via the 1-bit objects, when the fan level is changed by the controller, the active fan level is first switched off before the new level is switched on. If the fan controller is working in automatic mode, the settable "Waiting time on level change-over" is maintained on change-over of the levels. For this short time, the fan level objects all receive the status "0 - Fan off". A new level is only then switched on when the waiting time has elapsed. Only one fan level output is ever switched on (changeover principle).
With change-over via the 1-byte object, on changing the fan level, the change-over takes place directly into the new level, without setting the "OFF" status. If the fan controller is working in automatic mode, the settable "Waiting time on level change-over" (dwell time) is always taken into account before change-over of the levels. With rapid level change-over, the change to the new level only takes place once the waiting time has elapsed.

i The change from level 1 to OFF always takes place immediately, without a waiting time. An optionally-configured switch-on level is applied directly.

i In manual mode, the "Waiting time on level change-over" is only significant for the switch-on level (Start-up via level). Here, the fan levels can be switched over without a delay through manual operation.

i When changing from manual operation to automatic operation, the waiting time is taken into account in the case of a connected level change.

The fan level active in the current controller operating state is shown in the display of the device when the "Display status text" parameter of the "Fan controller, internal" channel function is enabled. In both automatic and manual operation (for a function description, please see the section "Automatic operation / manual operation"), the display takes place in the following manner...
Off
Level 1
Level 2
Level 3
Level 4
Level 5
Level 6
Level 7
Level 8

i The fans of a fan coil unit are - as described above - controlled by the fan level objects of the controller. The electromechanical valves for heating and/or cooling, integrated into the blower devices, can be controlled via suitable switching actuators using the objects "Heating message" or "Cooling message" (see page 169).

i The 1-byte object "Ventilation visualisation" can, if necessary, also be evaluated by other bus devices (e.g. visualisation - panel / PC software). It always transmits the current fan level as a 1-byte value, either automatically on a change or passively on reading out (see table: Value explanation for 1-byte fan level object).

i The objects of the fan levels are only updated by the controller. These objects may not be written to by other bus subscribers. Reading out is possible.

i After a device reset, the fan level objects and the visualisation object are updated and the status transmitted to the bus.

Automatic operation / manual operation

The fan controller distinguishes between automatic and manual operation. The switchover between the two operation modes takes place using the 1-bit object "Ventilation, auto/manual" or through long operation of the display / operating element directly on the device. In manual operation, the fan control (figure 49) icon is illuminated in the display.

The parameter "Interpretation object fan control automatic/manual" in the fan control parameter group defines with which switching value the automatic or manual operation is set via the communication object. Automatic mode is always active after a device reset.

- i The "Ventilation, auto/manual" object transmits actively ("Transmit" flag set). When the operating mode is changed over using local control, the valid status is transmitted to the bus.
- i Updates to the object value "Automatic mode active" -> "Automatic mode active" or "Manual mode active" -> "Manual mode active" do not produce any reaction.

Automatic mode:
The command value of the controller is used internally in the device for automatic control of the fan levels. As a transition between the levels, there are threshold values, defined according to the command value of the controller, which can be set using parameters in the ETS. If the command value exceeds the threshold value of a level, the appropriate level is activated. If the command value sinks below a threshold value, minus the configured hysteresis, then the change-over takes place into the next lowest fan level. The hysteresis value applies to all the threshold values.
The threshold values for the individual fan levels can be parameterised freely in the range from 1 ... 99 %. The threshold values are not checked for plausibility in the ETS, meaning that incorrect parameterisation is possible. For this reason, it must be ensured that the threshold values, compared to the level value, are configured in a rising direction (level 1 threshold value > level 2 threshold value > level 3 threshold value > etc.).
When the command value changes, and thus the fan level, it is only possible to switch directly into neighbouring levels (exception: switch-on level). Thus, in Automatic operation, it is only possible, for example, to switch from level 2 down to level 1 or up to level 3. If the command value change exceeds or undershoots the threshold values of multiple fan levels, then, starting with the current fan level, all the fan levels are activated in succession until the fan level specified by the command value is reached.
If the fan is switched off by the automatic system, then it runs on for the time configured as "Fan run-on time, heating" or "Fan run-on time, cooling", providing that these run-on times are configured in the ETS.

- i In automatic mode, the fan level objects are updated according to the internal command value calculation (cyclically every 30 seconds) plus the waiting time configured for level change-over. Telegram transmission only takes place when the object values of the fan levels are changed. After a device reset, the fan level objects are updated and the status transmitted to the bus.
- i If a switch-on level is configured in the ETS ("Start-up via level" parameter), then, before the automatic activation of a fan level, it is possible to switch to a level, specified in the ETS and usually higher, for a brief time according to the command value (see section "Switch-on level").
- i The command value evaluated by the fan controller in Automatic mode can be optionally limited by in the top and bottom command value ranges by the parameters "Command value is 0% until internal command value is greater than" and "Command value is 100% as soon as internal command value is greater than". In addition, the command value can also be raised by a constant value by the "Command value offset" parameter (see page 218-219).

Manual operation:
If the controller is in automatic mode, then a long press of the display / operating element or a command to the communication object "Ventilation, auto/manual" switches to manual mode. The parameter "Fan level on change-over to manual" then decides whether the fan level most recently set in automatic mode is maintained, the fan is switched off or a defined fan level is set (see also next section "Switch-on level").
If the top sensor element **+** is pressed, the controller switches to the next-highest fan level. If the fan is at the highest level, pressing it again has no effect.
If the fan is switched off manually from the highest level, then it runs on for the time configured

as "Fan run-on time, heating" or "Fan run-on time, cooling", providing that these run-on times are configured in the ETS. If, during the run-on time, the manual control button is pressed again, the controller will terminate the run-on time. The fan switches off briefly and then switches immediately to level 1.

i The 1-bit object "Ventilation, auto/manual" only allows change-over between automatic and manual operation. It is not possible to switch the fan levels on using the object. This function is reserved solely for local control.

i When changing from manual operation to automatic operation, the waiting time configured in the ETS is taken into account in the case of a connected level change.

i The parameter "Fan level on change-over to manual" is not checked for plausibility in the ETS, meaning that an implausible parameterisation is possible. For this reason, care should be taken to ensure that there is no level in the configuration which is higher than the actual fan levels. If a level which does not exist is to be configured for the change-over to manual control, then the fan controller changes over to the maximum possible level when changing over to manual operation.

i In manual operation, the switch-on level only functions in certain situations (see next section "Switch-on level").

Switch-on level

The fan can, if it was switched off before and should now start up, be switched on at a defined switch-on level. This switch-on level can be any of the available fan levels, and is set in the ETS using the "Start-up via level" parameter. The switch-on level is generally one of the higher fan levels of a fan coil unit, so that at the beginning of a heating or cooling process the fan can start up correctly (reliable start-up of the fan motor through transfer of a higher torque, and thus a higher fan speed).
The switch-on level remains active for the "Waiting time on level change-over" configured in the ETS. In automatic operation, the controller only switches to the fan level specified by the command value, when the waiting time has elapsed. There is no change-over if, after the waiting time has elapsed, the fan level specified by the command value equals the switch-on level.

i If the controlled fan requires a longer period of time for the start-up, then the waiting time in the ETS should be configured to higher values (possible time range 100 ms ... 25.5 s). It should be noted that the waiting time is also taken into account on each level change-over in automatic operation!

The switch-on level is always taken into account by the fan controller in automatic mode on switching the fan on (if it was previously switched off by the command value evaluation) and, in certain situations, after activation of manual operation. On changing over to manual operation, the behaviour of the fan depends on the settings of the parameter "Fan level on changing over to manual" and "Start-up via level" and the previous fan level in automatic operation as follows...

- If, due to the "Fan level on change-over to manual" parameter, a defined level from level 1 to level 8 is requested, the controller will set this level on activating manual operation. In this case, the parameter "Start-up via level" is not taken into account if the fan was most recently switched off in automatic operation.

- If, due to the "Fan level on change-over to manual" parameter, "Fan level OFF" is requested, the controller will switch the fan off during the change-over to manual operation. On subsequent pressing of the button for manual control, the "Start-up via level" parameter is taken into account and the switch-on level set. Then, the controller waits in this level until further manual operation.

- If, due to the "Fan level on change-over to manual" parameter, no defined level is requested ("No change" setting) and the fan was switched off during automatic operation, then it will remain switched off on changing over to manual operation. On subsequent pressing of the button for manual control, the fan is switched to the first level. The "Start-up via level" parameter is thus not taken into account.

i A configured switch-on level is applied directly without a waiting time.

i With a fan change-over via the 1-bit objects, when the fan level is changed by the controller, the active fan level is first switched off before the new level is switched on. In this case, the switch-off of a fan level and the subsequent changeover to a new fan level is not evaluated as a fan start-up, also meaning that the switch-on level is not set In automatic operation, the switch-on level is only taken into account if the fan was switched off previously by the command value evaluation (command value < level 1 threshold value minus hysteresis) and then it is to start up using a new command value.

i The start-up via the switch-on level also takes place after a change-over from manual operation to automatic operation, providing that the fan was most recently switched off in manual operation and, in automatic operation, a new command value requires the fan to be switched on.

i The parameter "Start-up via level" is not checked for plausibility in the ETS, meaning that an implausible parameterisation is possible. For this reason, care should be taken to ensure that there is no switch-on level in the configuration which is higher than the actual fan levels. The fan controller automatically corrects a faulty parameterisation by activating level 1 for the start-up, meaning that the fan starts up normally without a switch-on level.

Fan level limit

To reduce the fan noise of a fan coil, the fan level limit can be activated. The level limit reduces the sound emissions by limiting the maximum fan level to a fan level value specified in the ETS by the "Level limit" parameter (limit level). The limitation can be switched on and off via a 1-bit "Fan, level limit" object, and thus activated in accordance with requirements, for example via a timer during night-time hours in order to reduce noise in bedrooms, or via "manual" operation of a pushbutton when a "quiet room" is needed (auditorium or the like). The limitation of the fan level is activated by receipt of a "1" telegram via the object "Fan, level limitation". Deactivation is therefore achieved through the receipt of a "0" telegram.
While a limitation is active, the fan controller prevents the fan from being switched to a higher level than the limitation level. If, at the instant that the limit is activated, the fan is running at a level that is greater than the limit level, then the fan level is immediately reduced to the limitation value. In this case the switching sequence of the individual levels and the waiting time configured in the ETS are also taken into account in the level change-over.
The limitation level can be one of the available fan levels.
The level controller distinguishes between Automatic and Manual operation.

i The fan level limit overdrives the switch-on level. As a result, when the fan is switched on, if the limit is active, the level has an active limit and the switch-on limit is not started. In this case, the limit level is jumped to without waiting.

i The level limit has no effect with an activated fan forced position.

ⓘ The parameter "Level limit" is not checked for plausibility in the ETS, meaning that an implausible parameterisation is possible. For this reason, care should be taken to ensure that there is no limit level in the configuration which is higher than the actual fan levels. If a higher limit level is configured, then the limit has no effect.

Forced fan position

The controller provides the option of activating a forced fan position via the bus. With an active forced position, the fan levels can neither be controlled nor switched over in either automatic or manual mode. The fan remains in the forced state until the forced position is removed using the bus. In this manner, it is possible to switch the fan to a locked and controlled state, for example for servicing purposes.
As soon as a "1" telegram is received via the 1-bit object "Ventilation, forced position", the controller immediately sets the fan level configured in the ETS without delay. The fan can also be completely switched off. The only special feature when activating the forced position is the fact that the fan controller is in automatic operation and a waiting time elapses, due to a previous level change-over. In this case, the fan controller only switches to the forced position level without the waiting time elapsing.
The forced position is dominant. For this reason, if connect be overdriven from automatic mode, manual mode, the level limit or fan protection. Only when the forced position is removed does the fan control begin to control the fan levels according to the active operating mode.
The removal takes place when a "0" telegram is received via the
object "Ventilation, forced position". The fan always switches itself off first. In automatic operation, the controller then evaluates the active command value and, when the waiting time configured in the ETS has elapsed, switches to the required fan level, taking an optionally-configured switch-on level into account. In manual operation, the fan first remains switched off. The fan level is only raised when the manual control button is pressed again. If a switch-on level is configured, the controller will, when a button is pressed, switch to the switch-on level and remain there until further operation occurs.

ⓘ The parameter "Behaviour with forced position" is not checked for plausibility in the ETS, meaning that an implausible parameterisation is possible. For this reason, care should be taken to ensure that there is no fan level in the configuration which is higher than the actual fan levels. If a higher level is configured for behaviour in a forced position than the number of fan levels, then the fan controller with start up the maximum possible level when the forced position is activated.

ⓘ The forced fan position does not influence the control algorithm integrated in the controller. The command values of the PI feedback control continue to be transmitted to the bus, even with a forced fan.

Command value limiting values and command value offset

In automatic operation, the command value of the controller is used internally in the device to control the fan levels, according to the fan operating mode. As a transition between the levels, there are threshold values, defined according to the command value of the controller, which can be set using parameters in the ETS. The evaluation of the controller command values can be specially influenced for automatic fan control.
The command value to be evaluated for the fan controller can be influenced by the "Command value is 0% until internal command value is greater than" parameter in the lower command value range. The fan controller only evaluates the command value according to the configured threshold values when the internal command value of the controller exceeds the configured limiting value. With smaller command values, the fan remains at a standstill.
Similarly, the command value to be evaluated for the fan controller can be limited by the "Command value is 100% as soon as internal command value is greater than" parameter in the upper command value range. In this case, the controller evaluates command values which exceed the configured limiting value as 100%. This means that the fan works at full power even with command values not at the maximum.

The "Command value offset" parameter allows configuration of a constant command value offset for the fan. The fan controller always adds the configured offset to the command value to be evaluated. The effect of this is that the fan turns at greater power then required by the command value, according to the threshold values. The result of this is that, even if the command value is switched off, the fan will continue to work when the first command value threshold value is exceeded by the offset.

ℹ A configured command value offset cannot not affect a command value of greater than 100%. The maximum command value of the fan controllers is therefore defined as 100 %.

Fan protection

The fan protection function allows the fan of a fan coil unit, which has not been active for some time, to be temporarily switched to the maximum level. In this way, the controller fan motors can be protected against stiffness. In addition, the fan blades and the heat exchanger of the fan coil unit are protected against dust against dust.
If the fan protection is to be used, it must be enabled using the parameter of the same name in the ETS. Fan protection can then be activated or deactivated directly using the 1-bit communication object "Ventilation, fan protection", for example using a KNX/EIB time switch.
If the fan protection object has the switching value "1", then the fan protection function is active. The fan then works at the highest possible fan level and overdrives automatic and manual operation. Fan protection can then be switched off again using the "0" switching value in the communication object.

The reaction of the fan to switching fan protection depends on the operating mode of the automatic fan system. In automatic operation, the fan switches back to the level determined by the command value of the room temperature control. In manual operation, the fan switches off and can then be switched on again by additional manual actuation. The "Start-up via level" parameter is taken into account here.

ℹ Even if the fan controller is inactive due to the controller operating mode, it is possible to activate the fan using fan protection.

ℹ With an active level limit, the maximum fan level of fan protection is specified by the limit level.

ℹ For reasons of safety, fan protection is not carried out with an active forced position.

ℹ If fan run-on times are configured in the ETS, then the fan is switched off after a delay when fan protection is deactivated.

4.2.4.3.9 Disable functions of the room temperature controller

Disable controller

Certain operation conditions may require the deactivation of the room temperature control. For example, the feedback control can be switched off during the dew point mode of a cooling system or during maintenance work on the heating or cooling system. The parameter "Switch off controller (dew point operation)" in the parameter node "Room temperature control -> Controller functionality" enables the 1-bit object "Disable controller" when set to "Via bus". In addition, the controller disable function can be switched off when set to "No".

In case a "1" telegram is received via the enabled disable object, the room temperature control will be completely deactivated. In this case, the command values are equal "0" (wait 30 s for update interval of the command values). The controller, however, can be operated in this case.

The additional level can be separately disabled when in two-level heating or cooling mode. When set to "Yes", the "Additional level disabling object" parameter in the "Room temperature control -> Controller general" parameter node will enable the
1 bit "Disable additional level" object. In addition, the disable function of the additional level can be switched off when set to "No". In case a "1" telegram is received via the enabled disable object, the room temperature control is completely deactivated by the additional level. The command value of the additional level is "0" while the basic level continues to operate.

i A disable is always deleted after a reset (return of bus voltage, ETS programming operation).

4.2.4.3.10 Valve protection

Valve protection may be carried out periodically in order to prevent the addressed control valves of the heater or cooling system to become calcified or stuck. When set to "Yes", the "Valve protection" parameter in the "Room temperature control -> Controller functionality" parameter node activates valve protection.
This type of protection is generally started not only for non-active command value objects, i.e. for objects which have not requested any heating or cooling energy over the past 24 hours. For these objects, by taking into account the following parameterisation the controller will periodically set the command value to the maximum value once a day for a duration of approx. 5 minutes...

Command value output not inverted:
-> 1-bit command value: "1", 1-byte command value: "255"
Command value output inverted:
-> 1-bit command value: "0", 1-byte command value: "0"

Thus even long closed valves will be opened briefly on a regular basis.

i A controller disable has no influence on the valve protection. This means that valve protection is carried out, even when the controller is disabled.

i The controller checks the 24 hr time cycle for valve protection using its internal clock. With a time-synchronised clock, valve protection takes place each day at 8.00 in the morning.

4.2.4.4 Light scene function

The device can be used in two different ways as part of a scene control system...

- Every sensor surface on the device display in the form of a KNX channel can work as a scene extension (configuration-dependent). This feature makes it possible to recall or to store scenes which are stored in other devices (see page 99-100).
- The device can independently store up to eight scenes with eight actuator groups. These internal scenes can be recalled or stored via the device's own sensor surfaces (internal scene recall) as well as via the communication object "B. scenes - extension input".
  In the following subsections the internal scene function will be dealt with in greater detail.

Scene definition and scene recall

If the internal scenes are to be used, the parameter "Scene function ?" must be set to "Yes" on the "Scene" parameter node.
The matching data types for the eight scene outputs must then be selected and adapted to the actuator groups used. The types "Switching", "Value (0 … 255)" or "Value / blind position (0 … 100 %)" can be selected. As a rule, Venetian blinds are controlled via two scene outputs. One output controls the blind height and the other one adjusts the slat position.
There is a separate parameter node available in the ETS for each scene output. The data types can be selected in this node using the parameters of the same name. The ETS sets the corresponding communication objects and the additional parameters of the scene commands. The scene parameters can be set in the parameter node of a scene output for each individual scene ("scene 1 … 8"). The setting options are the same for all 8 scenes.

It is possible that the values for the individual scenes preset by the parameters are modified later on with the storage function (see page 223) when the system is in operation. If the application program is then loaded again with the ETS, these locally adapted values will normally be overwritten by the parameters. Due to the fact that it may take considerable efforts to readjust the values for all scenes in the system, the parameter "Overwrite scene values during ETS download ?" offers the possibility of retaining the scene values stored in operation without overwriting them.

The internal scenes can be recalled directly via the device's own sensor surfaces of the channel functions (Function "Internal scene recall) as well as from another bus device via the communication object "B. scene extension input". This 1 byte communication object supports the evaluation of up to 64 scene numbers in compliance with the KNX data point type 18.001 (SceneControl). For this reason it must be specified which of the external scene numbers (1 … 64) is to recall the internal scene (1 … 8). This specification is made using the parameters "Recall scene 1...8 via extension object with scene number" in the "Scenes " parameter node. If the same scene number is listed for several internal scenes at this point, it is always only the first of these scenes that will be activated (scene with the lowest scene number).
In some situations there may be the requirement that a group of actuators is not controlled by all, but only by certain scenes. A classroom, for instance, may require open blinds for the "Welcome" and "Break" scenes, closed blinds in the "PC presentation" scene and no change in the "Discussion" scene. In this example, the parameter "Permit transmission ?" in the parameter node of a scene output can be set to "No" for the "Discussion" scene. The scene output is then deactivated during the corresponding scene.

The parameter "Transmit delay" permits an individual waiting time for each scene output. This transmit delay can be used in different situations...

- When the actuators participating in a scene transmit status messages automatically or when several scene buttons are used to increase the number of channels within the scenes, the recall of a scene may result for a short time in high bus loading. The transmit delay helps to reduce the bus load at the time of scene recall.
- Sometimes, it is desirable that an action is started only after another action has ended. This can be for instance the illumination which is to shut off only after the blinds/shutters have been raised.

The transmit delay can be set separately for each scene output in the parameter group of a scene. The transmit delay defines the time delay between the individual telegrams during a

scene recall. The setting specifies how much time must pass after the first scene telegram before the second is transmitted. After transmission of the second scene telegram, the configured time must again pass before the third is transmitted and so forth... The transmit delay for the scene telegram of the first output starts immediately after the scene has been recalled.
The transmit delay between telegrams can also be deactivated (setting "0"). The telegrams are then transmitted at the shortest possible time interval. In this case, however, the order of the telegrams transmitted can deviate from the numbering of the scene outputs.

i When a new scene recall (also with the same scene number) occurs during a current scene recall - even in consideration of the pertaining transmit delays - the scene processing started first will be aborted and the newly received scene number will be processed. A running scene is also aborted when a scene is being stored!

i During a scene recall - even if delayed - the sensor surfaces of the device are normally operational.

Storing scenes

For each output of a scene, the user can define a corresponding scene value in the ETS which is then transmitted to the bus during a scene recall. During the ongoing operation of the system it may be necessary to adapt these preset values and to save the adapted values in the device. This can be ensured by the storage function of the scene control.
The value storage function for the corresponding scene number is enabled with the parameter "Permit storing ?" ("Yes") or disabled ("No"). When the storage function is disabled, the object value of the corresponding output is not sampled during storage.

A scene storage process can be initiated in two different ways...
- by a long press of a control surface configured as "scene extension",
- by a storage telegram to the extension object.

During a storage process, the device reads the current object values of the connected actuators. This is carried out by means of eight read telegrams (ValueRead) addressed to the devices in the scene which return their own value (ValueResponse) as a reaction to the request. The returned values are received by the device and taken over permanently into the scene memory. Per scene output, the scene control waits one second for a response. If no answer is received during this time, the value for this scene output remains unchanged and the next output is scanned.

In order to enable the device to read the object value of the actuator addressed when a scene is stored, the read flag of the corresponding actuator object must be set. This should be done only for one actuator out of an actuator group so that the value response is unequivocal.
The stored values overwrite those programmed into the device with the ETS.

i A storage process will always be executed completely and cannot not be aborted before it has ended.

i It is not possible to recall scenes during a storage process, but the sensor surfaces still remain operational.

4.2.4.5 Room temperature controller page

Definition and function

The device offers the option of displaying specific functions for the operation of the room temperature controller on a special page. In this view, the channel functions "Operating mode switchover", "Setpoint shift" and "Fan controller" can be shown clearly and on one page (figure 107).

Figure 107: Example of a room temperature controller page (here with active channel function "Operating mode switchover")

This room temperature controller page can be opened via the function page of the device, if enabled in the parameters. On the function page, the room temperature controller page has a separate display icon (figure 108), which is displayed in its own tile. Selection is carried out in the same manner, for example calling up the timer or the weather station.

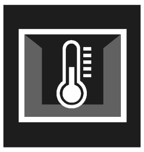


Figure 108: Status icon of the room temperature controller page

ℹ The project planning of the three functions "Operating mode switchover, internal" (see page 109-110), "Setpoint shift, internal" (see page 111) and "Fan controller, internal" (see page 113-114) is carried out, as described, in the "Display" and "Room temperature control" parameter nodes.

The indoor temperature, and optionally the outdoor temperature, is displayed in the top third of the display.
The available parameters for the room temperature controller page can be used to decide which of the three available channel functions on the room temperature controller page can be displayed and operated. The functions on this page are always operated using the selection operation and rocker function. The sequence, in which the three functions are displayed on the room temperature controller page, cannot be changed. At the top, the "Operating mode switchover", if available, is displayed, followed by the "Setpoint shift" function. The room temperature controller page is completed in the bottom third with the channel function "Fan controller" (figure 107). If, for example, the operating mode switchover was not enabled, the setpoint shift is displayed above the fan control. At the same time, the size of the display and operating elements is adapted dynamically to two elements.
In addition, it is possible to specify in the "Room temperature controller page" parameter node whether a status text is to be displayed for the three functions.

It is only possible to enable a presence button in the parameters of the room temperature controller page for the "Operating mode switchover" channel function. In contrast to the operation of the channel function on the Start or Favourites page, this is not selected by operating the sensor areas 〈 and 〉, but can be operated directly in a separate part of the display and operating element of the function of the room temperature controller page. A comfort extension is activated by operating the presence button icon (see page 110), if the presence button for presence recording was set in the "Controller functionality" parameter node and if night operation or frost/heat protection is activated. If no presence button is parameterised, the icon is shown in darkened form and is not sensitive.
The special feature on the room temperature controller page is that the remaining time of the comfort extension is displayed, accurate to one minute.
Even on this special page, the operating mode is switched over using the sensor surfaces of the rocker function. When the required operating mode is selected, the currently selected mode is shown in a recessed box and confirmed by displaying the status text.

In the parameters of the room temperature controller page, the display of the icon (figure 47) can only be permitted for the "Setpoint shift, internal" channel function. The function is operated in the same manner. In addition, in these parameters it is possible to assign a designation for the "Setpoint shift" function, which is then displayed on the room temperature controller page.

i The absolute setpoint temperature is visualised on the setpoint shift display element. The parameter "Display of the inside temperature" in the node "display" of the PlugIn determines whether the absolute setpoint temperature is displayed in °C or °F. If this is configured to "no display", the absolute setpoint temperature is displayed in °C.

A designation of max. 18 characters can be assigned to the "Fan controller, internal" channel function, which is then shown on the room temperature controller page.

4.2.4.6 Timer switch

4.2.4.6.1 Definition, function and channel commands

Definition and function

The device has an integrated weekly timer. This can be configured by the ETS and using a special timer display page. The timer has up to 8 switching times, which directly affect the configured KNX channels (1...30) in the device and can handle the data formats Switching (1 Bit), Value 1 byte (incl. brightness value and position setting) and Value 2 byte. The timer does not have its own communication objects. Telegrams are transmitted to the bus for the switching times via the objects of the KNX channels. The timer can also handle channel functions that affect the internal room temperature controller (operating mode switchover, setpoint shift). Thus, the setpoint temperature of the controller can be influenced depending on the time of the day. Additionally, it is possible to also activate a random function (see page 230) and an astro function (see page 229) for brightness-dependent lighting or shading control in the morning or evening twilight for each switching time.

The timer is controlled by the device's internal system clock (time and date of the operating system). Consequently, a valid time and current date must be preset for the correct execution of the switching times. The system clock can be set via the communication objects "D.Input Time" (KNX DPT 10.001) and "D.Eingang Date" (KNX DPT 11.001) or via the system settings in the administration area (see page 130).

ℹ The device's internal system clock is designed as a real time clock (RTC) and is extremely accurate. It is advisable to set the system clocks of all devices once a day, for example, by a shared KNX time telegram during the night hours, so that that the timing of all devices is synchronized even over a long period of time.
The system clock has its own energy storage. This will ensure that the clock keeps on running interruption-free for at least 2 hours in the event of a power supply failure.
The real time clock has a calendar function. Depending on the date set, the day is determined automatically by means of the internal calendar which is necessary for processing the timer. The day transmitted in the KNX time telegram in compliance with DPT 10.001 is irrelevant and is discarded by the device.

Switching times are allocated to KNX channels and can be configured down to the minute. Weekdays can be freely specified for each switching time. The set weekdays specify on which days of a calendar week the timer commands are to be executed. A switching time thus consists of the time of day and weekday information.
At each minute mark - possibly offset by a few seconds - the timer checks the set switching times. If a switching time corresponds to the current time (check for hours and minutes) and current weekday, the preset channel command is executed. Different channel commands (e.g. switching a lighting system on and off) require various switching times. Allocate KNX channels to several switching times if possible. This makes it possible, for example, to configure exterior lighting (e.g. channel 1) to be switched on in the evening (switching time 1) and to be switched off again in the morning (switching time 2).
If a channel is allocated to several switching times with an identical configuration (the same time and weekday), the channel command of the switching time with the highest number (1...8) will always be executed.

ℹ Switching times are not tracked if the set time or preset weekday was skipped as a result of setting the system clock or power failure. Switching times are executed redundantly, however, if the time is reset. Examples...
1. Current time: 11:59, set switching time: 12:00 -> The system clock is preset to 12:01. -> The switching time was skipped and will not be repeated.
2. Current time: 12:00, set switching time: 12:00 -> The switching time is executed on time. -> The system clock is reset to 11:59. -> The switching time is executed again at 12:00.
3. Current time: 11:59, current weekday: Monday, set switching time: 12:00, Monday -> The date of the system clock is changed so that the next weekday (Tuesday) is active. -> The switching time was skipped and will not be repeated.

Channel commands of the timer

Each switching time must be allocated to a KNX channel. The switching time can be allocated as a presetting in the ETS or afterwards via the timer display page. Depending on the function of the allocated KNX channel, the switching time executes a channel command when executing a switching time. Channel commands can be set in the ETS or by a user via the timer display page, but they can also be preset statically by the channel function. The following table illustrates the executable channel commands dependent on the channel function and shows the enabled ETS parameter in each case.

Channel function	Channel command	Enabled ETS parameter
Switching	ON or Off telegramm	Switching value "ON" / "OFF"
Dimming (Start/Stop)	ON or Off telegramm	Switching value "ON" / "OFF"
Dimming (Brightness value)	Brightness value telegram (0...255)	1-byte switching value (0...255)
Venetian blind/shutter (Step/Move/Step)	Down or up telegram (Move)	Switching value "move down" / "move up"
Venetian blind/shutter (Position)	Position telegram blind/shutter (0...255)	1-byte switching value (0...255)
Scene extension	Recall of a scene according to channel configuration	---
1-byte value transmitter	Transmit value (0...255)	1-byte switching value (0...255)
2-byte value transmitter	Transmit value (floating-point)	2-byte switching value (0...255)
Operating mode switchover, internal	---	1-byte switching value (1...5)
Setpoint shift, internal	Setpoint shift in steps (-4...0...+4)	2-byte switching value (-4...0...+4)

Executable channel commands of the timer depending on the function of the allocated KNX channel

- i The ETS parameters "switching value", "1-byte switching value" and "2-byte switching value" are always visible. The function of the allocated KNX channel defines which of these parameters is enabled (see table). In the case of the channel function "scene extension", none of the aforementioned parameters are activated. In these cases, the channel command of the timer is specified directly by the configuration of the KNX channel. Thus, the timer is then not able to trigger any other command other than that already defined in the channel.
- i In the case of the channel function "setpoint shift, internal", the channel command of the timer is defined in the ETS by the enabled parameter "2-byte switching value". It should be noted here that the device only accepts values within the value range of the setpoint shift (-4...0...+4). Entered values which contain decimal places are rounded to the nearest whole number, of course.
- i In the case of the channel function "operating mode switchover, internal", the channel command of the timer is defined in the ETS by the enabled parameter "1-byte switching value". It should be noted here that the device only accepts values within the value range of the operating mode setting...
  1 = Comfort, 2 = Standby, 3 = Night, 4 = Frost/heat protection, 5 = Presence function

i Telegrams of the timer are transmitted to the bus for the switching times via the objects of the KNX channels. The timer commands do not influence the individually set button/rocker commands (transmission values) of the KNX channels, however.
Example "value transmitter": The channel is set to the value "50" (button/rocker command) in the ETS or by local operation on the device. The timer executes a switching command with the value "75" and then transmits a telegram with this value via the channel object. The actual transmission value of the channel ("50") is not affected by this. In the case of a subsequent operation of the channel, the value "50" is transmitted to the bus.

4.2.4.6.2 Astro and random function

Astro function

The astro function allows the control of a lighting or shading system depending on sunrise and sunset and a limit time. The astro function can be activated or deactivated separately for each switching time as a presetting in the ETS as well as subsequently via the switching time display pages.
The time of the sunrise and sunset (astro time) is location-dependent and is calculated by the device according to local geographic co-ordinates. These can be set in the "Timer" parameter node of the ETS plug-in by the project planner. To simplify the configuration, the local coordinates of the astro function are preset to near the centre of Germany. If the standard coordinates are maintained, the device works with the coordinates for the city of Kassel (51"19'N[51,31], 9"30'O[9,50]). This location definition can be altered according to the place of installation.

When the astro function is activated, the switching time set acts as a limit time. Whether the limit time affects sunrise or sunset is evaluated by the device according to the set time. Times between 00:00 and 11:59 are evaluated as sunrise and times between 12:00 and 23:59 as sunset.
An astro function usually affects lighting (e.g. exterior lighting) or shading (e.g. roller shutters). The behaviour of the device when processing the astro switching times varies according to these applications. The ETS parameter "Astro" in the parameter node of a switching time generally enables the astro function and defines the astro behaviour as follows...

- Setting "Light":
  Sunrise (switching times 00:00 - 11:59): if sunrise occurs <u>before</u> the set time (for example in the summer months), then, at sunrise, the switching time command (e.g. external lighting OFF) is sent to the bus. If sunrise occurs later (for example during the winter months), then the switching time command is triggered at the set time at the latest.
  Sunset (switching times 12:00 - 23:59): if sunset occurs <u>after</u> the set time (for example in the summer months), then the switching time command (e.g. external lighting ON) is sent to the bus at sunset. If sunset occurs earlier (for example during the winter months), then the switching time command is triggered at the set time at the latest.

- Setting "Blind/shutter":
  Sunrise (switching times 00:00 - 11:59): if sunrise occurs <u>after</u> the set time (for example in the winter months), then the switching time command (e.g. roller shutters UP) is only sent to the bus at sunrise. If sunrise occurs earlier (for example during the summer months), then the switching time command is triggered at the set time at the latest.
  Sunset (switching times 12:00 - 23:59): if sunset occurs <u>before</u> the set time (for example in the winter months), then the switching time command (e.g. roller shutter DOWN) is sent directly to the bus at sunset. If sunset occurs later (for example during the summer months), then the switching time command is triggered at the set time at the latest.

ℹ Astro times for sunrise and sunset can vary by several hours. As a result, a switching time with an active astro function might affect the allocated KNX channel by another switching time. The mutual influence of different switching times is not intercepted.
Example: a switching time is set to 17:00, astro function active (seasonal sunset between 16:00 and 22:00), an additional switching time is set to 19:00 -> In this case, the second time (19:00) would be affected by the astro function. The channel commands of the switching times are always executed in accordance with their set or calculated time. The same would apply, if both switching times in the example had the astro function active.

ℹ The calculated astro time is dependent on the time of year. The internal system clock of the device must be set with a valid time and current date in order for the astro function to work properly.

Random function

A switching time can be triggered offset in a set random period. The random function can be activated separately for each switching time.
Each day at 00:00, the device calculates a time offset individually and randomly for each switching time, by which a switching time is brought forward minute-by-minute (-) or is set back (+). The maximum time offset between the set switching time and actual time of execution is unalterably set to +/- 15 minutes. This allows time offsets of between 1 and 15 minutes. The device randomly determines a time from the time window of the maximum time offset and adds this time either to the set switching time or, alternatively, subtracts it from the switching time.

i It is not possible to transfer the switching times into the previous or next day using the time offset, i.e. the random function does not extended beyond the ends of days. If a randomly calculated time offset of a switching time go beyond the end of a day, then the random function for the affected switching time is not executed.

i Several switching times can be allocated to a KNX channel. The device does not intercept any switching times that overlap due to the random time offset. When using the random function to specify the switching times that refer to the same KNX channel, care should be taken to ensure that the individual switching times are apart by at least +/- the maximum time offset.
Example: maximum time offset = +/- 15 minutes, one switching time set to 11:00, random function active -> other switching times of the channel may be between 00:00 ... 10:45 and 11:15 ... 23:59. The same applies to additional switching times with a random function.

i If, in addition to the random function, an astro function is also activated, then the following prioritisation applies to the calculation of the switching time:
1. Calculation of the astro time
2. The random time is added or subtracted to the astro time calculated.

4.2.4.6.3 Setting switching times

There are basically two options when setting the switching times. The up to eight switching times can be defined in the ETS plug-in as a presetting. Additionally, or alternatively, it is possible to set or change each switching time directly on the device after commissioning.

Setting switching times in the ETS

The timer can be configured in the ETS in the parameter node of the same name. In this way, it is possible to preset the switching times and thus adapt to the customer's later requirements with regard to the channel assignments, switching times and channel commands. This requires that the timer be configured centrally as "available" by the parameter of the same name in the "Display" parameter node. Each of the up to 8 switching times will then have its own parameter page with separate parameters. Each switching time has the same parameter set and thus has the same scope of functions.

i The switching times preset by the ETS and loaded into the device during commissioning can be changed later at any time directly on the device on the display pages of the timer (see page 232).

The following parameters are available per switching time...

- Parameter "Switching time x (x = 1...8)":
  This parameter specifies whether the switching time is active or inactive. Only active switching times are executed. Inactive switching times in the ETS can subsequently be activated on the device after commissioning. Similarly, activated switching times can subsequently be deactivated on the display pages of the switching times by means of ETS.

- Parameter "switching time hour" and "Switching time minute":
  The actual switching time is specified here. The hours (0...23 / 24h format) and minutes (0...59) of the switching time are subdivided into two parameter fields.

- Parameter of the weekdays:
  The parameters of the weekdays specify on which days of a calendar week the switching time event is to take place. Each weekday has its own parameter. In the "active" setting, the weekday of the switching time is assigned.
  Active switching times have to be assigned to at least one weekday so that the channel commands of these switching times are executed.

- Parameter "Astro": This parameter defines whether the astro function is activated for the switching time concerned (see page 229). The parameter additionally defines the astro behaviour which determines whether a lighting (setting "light") or a blind, shutter or awning (setting "shading") is activated by the astro function.
  In the "no" setting, the astro function is inactive for the switching time.

- Parameter "Random offset":
  This parameter specifies whether the random function is activated for the switching concerned (see page 230). If the setting is "yes", the assigned switching time is triggered offset in a set random period (+/- 15 minutes). The "no" setting deactivates the random function.

- Parameter "Channel no.":
  For each switching time it is necessary to specify which KNX channel it affects. The parameter "Channel no." assigns the switching time to one of the KNX channels (1...30) available in the device. Care must be taken to ensure that only channels are allocated that are also available in the channel configuration in the parameter nodes "channels..." i.e. were configured with channel functions!
  Channels 24...30 are only available and consequently only assignable to a switching time if no weather station page is configured.

- Parameter "switching value", "1-byte switching value" and "2-byte switching value":
  Depending on the function of the allocated KNX channel, the switching time executes a channel command when executing a switching time. The aforementioned parameters specify which channel command has to be executed.
  The ETS parameters "switching value", "1-byte switching value" and "2-byte switching value" are always visible. The function of the allocated KNX channel defines which of these parameters is enabled (see page 227-228). In the case of the channel function "scene extension", none of the aforementioned parameters are activated. In these cases, the channel command of the timer is specified directly by the configuration of the KNX channel. Thus, the timer is then not able to trigger any other command other than that already defined in the channel.
  In the case of the channel function "operating mode switchover, internal", the channel command of the timer is defined in the ETS by the enabled parameter "1-byte switching value". It should be noted here that the device only accepts values within the value range of the operating mode setting: 1 = Comfort, 2 = Standby, 3 = Night, 4 = Frost/heat protection, 5 = Presence function.
  In the case of the channel function "setpoint shift, internal", the channel command of the timer is defined in the ETS by the enabled parameter "2-byte switching value". It should be noted here that the device only accepts values within the value range of the setpoint shift (-4...0...+4). Entered values which contain decimal places are rounded to the nearest whole number, of course.

i For the switching times preset in the ETS to be correctly transferred to the device during a programming operation, the parameter "Overwrite timer parameter" in the parameter node "Display" must be set to "Yes". Before putting into operation for the first time, this parameter should be set to "Yes". Otherwise, the switching times preset in the ETS are not transferred to the device.
If the parameter is configured to "Yes", the switching times changed directly on the device via the display pages are always overwritten during programming operations. If the setting is "No", the last configured switching times set on the device remain unchanged during an ETS programming operation.

i All parameters for the switching times can also be influenced on the device on the display pages of the timer. The deletion and reallocation of switching times not only changes enabled times, weekdays and channel commands, but it is also possible to change allocations of channels, i.e. to change over from switching a lighting system to controlling a shading system.

Setting switching times directly on the device

If the device was commissioned with an ETS programming operation, then the switching times of the timer switch can be edited directly. This requires that the timer be configured centrally as "available" by the parameter in the ETS of the same name in the "Display" parameter node. The timer has its own menu that can be recalled via the function page of the main menu level (figure 109). The menu can be recalled by touching the tile with the icon (1.).

ℹ The number and form of the visible tiles and the arrangement of the icons on the tiles on the function page depends on the number of configured function units and functions. The icons, and consequently, the function units are assigned automatically to the tiles. Visible tiles without assignment have no icon and no function (see chapter 4.2.4.1.1. Display structure).

As soon as the page of the timer is opened, an overview of the switching times is displayed. Each switching time has a touchable sensor surface. As soon as the sensor surface is touched and thus a switching time is selected, the display branches to the sub-menu of this switching time.

Up to 4 switching times are displayed simultaneously in the overview. The sensor surfaces ﹀ or ︿ enable the overview to be switched so that all 8 switching times are displayed and selected.

To return to the main menu level, press the "‹ functions" icon (2.) in the overview of the switching times in the status line at the top edge of the screen.

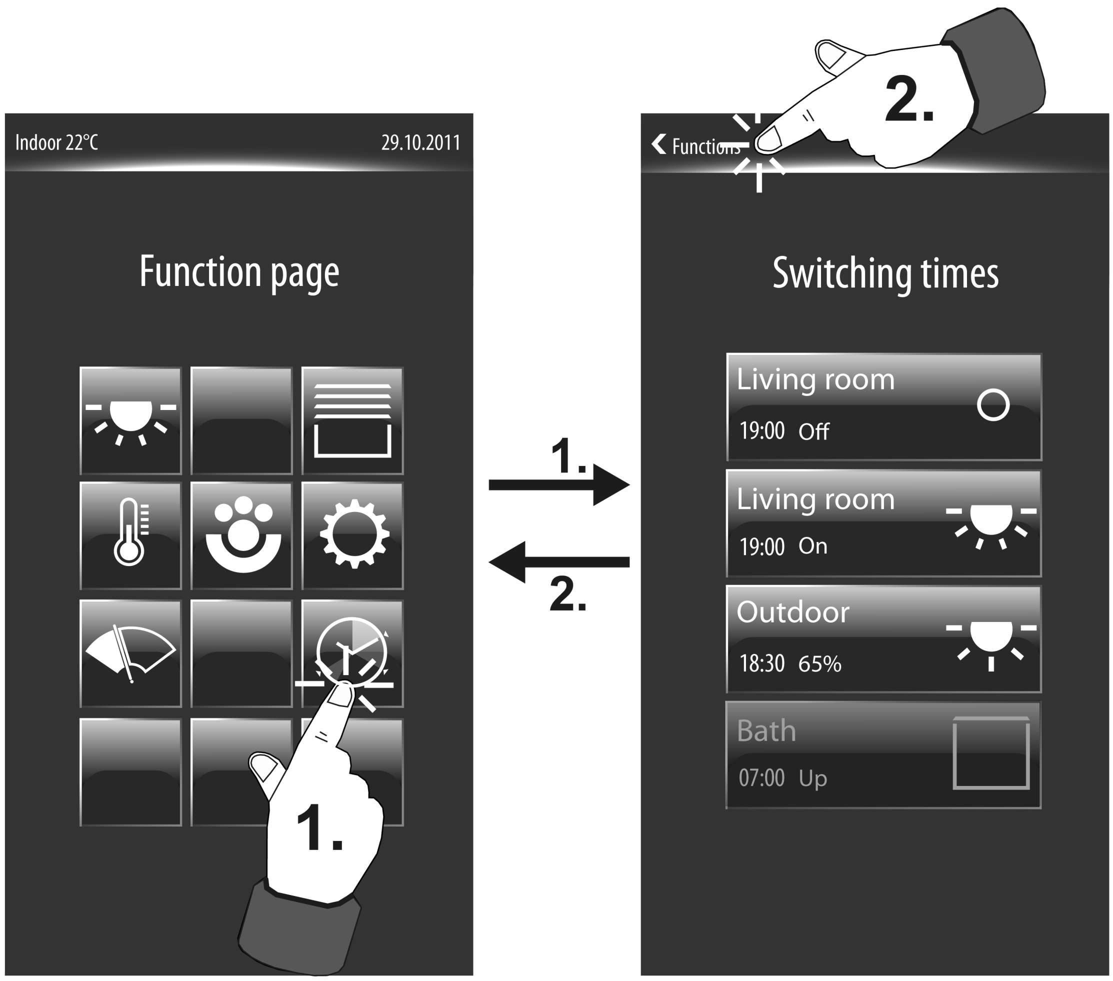


Figure 109: Recalling the timer display page
Example of a view for switching times (right)

ℹ Switching times can be individually deleted in the submenus (see page 238-239). The configurations for the switching time concerned are discarded and the allocation of channels are removed by the deletion. When a switching time is deleted, a memory location is reserved that can be assigned again later at any time by the creation of a new switching time. Deleted switching times can therefore be set up again at any time. For this purpose, a button with the name "New - create switching time" is displayed in the overview. If all 8 switching times are available, the "New" button is omitted.

The sensor surfaces of the switching times visible in the display have different display elements (figure 110). For this reason, each switching time is indicated by the room name (A) to identify the area of operation (e.g. "living room", "kitchen"). This room name is specified by allocating the KNX channels to the existing rooms (parameter "room" in the parameter node of a channel). In addition, the enabled switching time is indicated (B) in the sensor element. A status text (C) to the right of the switching time indicates which channel command with an active switching time is being executed for the specified time. The executable channel commands are dependent on the configured function of the allocated KNX channel (see page 227-228). A status icon (D) is also displayed on the right-hand side of the sensor elements. Just like the status text, the icon also indicates the channel command to be executed in graphic form. With some channel functions the icon can be changed if required and thus adapted to the activated KNX function. In the sensor element of a switching time, the symbol selected by the ETS configuration of the allocated KNX channel is always used.

Switching times can be active or inactive. The sensor surfaces of inactive switching times are greyed out (E) in the overview indicating that these switching times are not being edited and thus not executed either. Inactive switching times can be activated in the submenu of a switching time at any time.

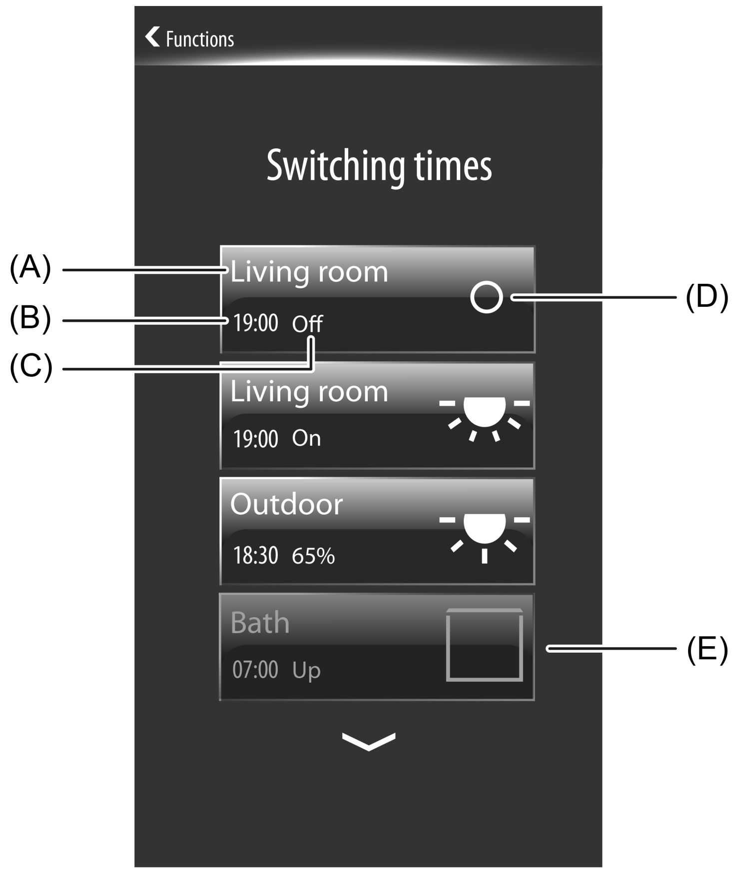


Figure 110: Example of display elements of the sensor elements in the Switching times overview

(A) Room name

(B) Switching time
(C) Status text for channel command of the switching time
(D) Status icon for channel command of the switching time
(E) Greyed out sensor surface for indicating an inactive switching time

If you touch a sensor surface with your finger in the overview of all switching times, the device branches to the submenu of the switching time that was selected. The submenu can be used to change, activate, deactivate or delete switching times. The submenus of each switching time have different operating and display areas (figure 111).
To return to the overview page of the switching times, press the "❬ Switching times" icon (3.) in the status line at the top edge of the screen.

ℹ Each switching time has its own submenu. A square box in the display of the submenu below the room name indicates in which menu you are in and how many switching times are generally created. The white illuminated box indicates the switching time (1...8) currently selected. The number of switching times available might be limited if individual switching times were deleted before.
In the submenu, you can switch over to other switching times by pressing and pulling with your finger (left-right movement). After selecting a switching time, it is therefore possible to switch over to the other available switching times without having to make a detour to the overview page.

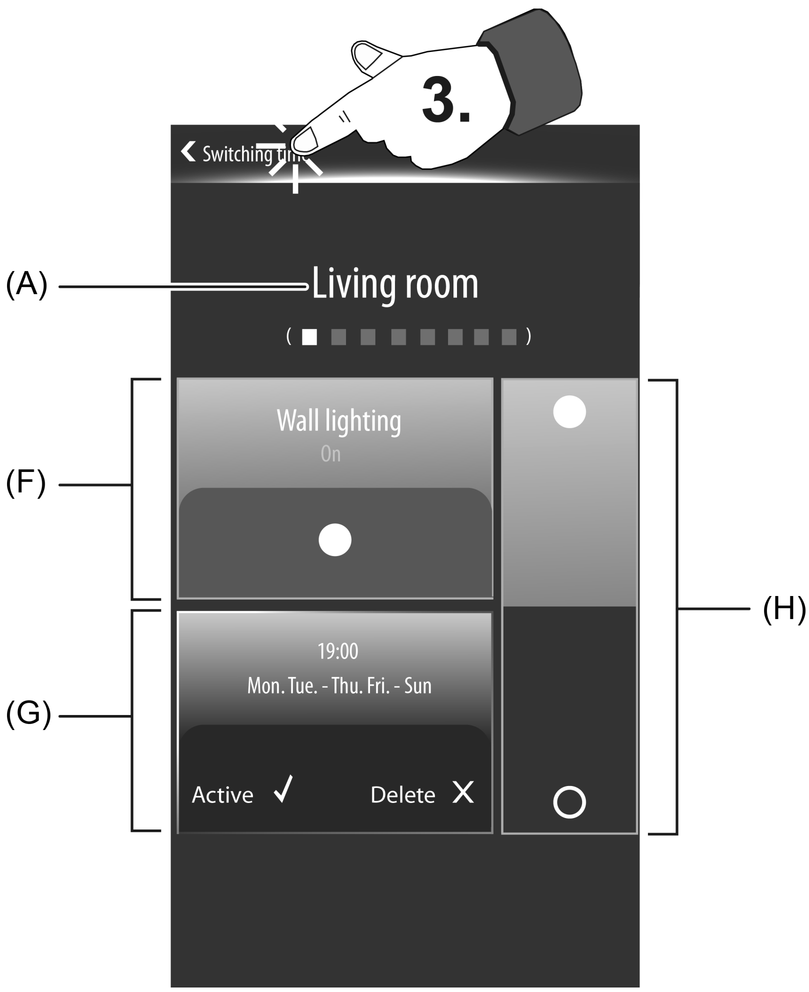


Figure 111: Example of a submenu for the configuration of a switching time
(here: Channel function Switching)

(A) Room name

(F) Display area for channel name and channel command (the text and icon are dependent on the channel function)

(G) Display area for the switching time

(H) Operating area for presetting the channel command (depending on the channel function)

The room name (A) is displayed in the upper area of the submenu of a switching time. The area of operation of the switching time is identified by this. A switching time submenu also has 3 additional display areas...

- In the first display area (F), the name of the allocated KNX channel is displayed. This clearly identifies which KNX function is activated by the switching time (e.g. "wall lighting", "ceiling spot", "roller blind window"...). The name is configured in the ETS in the parameter node of the KNX channel concerned. In addition, a status text and status icon are displayed in this display area according to the set channel command of the switching time.
  These display elements are dependent on the function of the allocated KNX channel (see description of the channel functions). With some channel functions the icon can be changed if required and thus adapted to the activated KNX function. In the display area of a switching time, the icon selected during the ETS configuration of the allocated KNX channel is always used.
  In the channel functions "dimming (brightness value"), "Venetian blind/shutter (position)", "1-byte value transmitter", "2-byte value transmitter" and "setpoint shift internal", you can touch the status text in the first display area with your finger. This causes a keyboard to be shown in the display in which the value of the switching time, i.e. the channel command, can be edited.
- In the second display area (G), settings for the switching time are displayed. Thus, the display shows the enabled time and weekdays of the switching time in this area. You can touch this display area with your finger. As a result, the display branches to the editing mode for setting the aforementioned switching time parameters (see below).
  The "Active" and "Delete" buttons are visible along the bottom of the described display area. By touching the "Active" button the selected switching time can be activated (Display: ✓) or deactivated (Display: **X**). The delete mode is selected similarly by touching the "Delete" button (see page 238-239).
  The selection for an active or inactive switching time or for the delete mode is only applied if the "Save ✓" icon in the status line of the submenu at the top edge of the display is pressed. After editing a switching time, the new settings can also only be saved using this icon in the status line. Alternatively, a setting or selection can be discarded by pressing the " 〈 Cancel" icon in the status line. In this case, the old settings for the switching time remain active.
- In the operating area (H), the channel command for the selected switching time can be preset or changed. The selectable channel commands and thus the appearance of the sensor area is dependent on the configured channel function (see page 227-228). Thus, the sensor area can be two-part (rocker element, switch on/off, move up/down) or can also contain value slider.
  It should be noted that the timer can only handle some channel functions simplified. Thus, for example, a channel function "dimming (Start/Stop)" can only be controlled by ON and OFF commands. This is similar in the case of the channel function "Venetian blind/shutter (Step/Move/Step)". Long-time operation (move) only is operational here using the timer.
  The channel command for the channel functions "scene extension" and "operating mode switchover internal" cannot be preset with the timer. The command that was set in the channel configuration is always executed when executing a switching time. Consequently, the sensor element (H) of the timer is empty for this channel function and not operational.
  In the channel function "setpoint shift internal", the sensor area only shows the graphic for the 4-level setpoint shift. The channel command and thus the value of the setpoint shift (-4...0...+4) is preset by the timer by a long press of the status value in the first display area (F). The level size for the setpoint shift can then be entered via the keyboard.
  A modified channel command is only applied if the "Save ✓" icon in the status line of the submenu at the top edge of the display is pressed. Alternatively, a setting can be discarded by pressing the " 〈 Cancel" icon in the status line. In this case, the old settings for the channel command remain active.

If you touch the second display area (G) with your finger, the display branches to the editing mode for setting the switching time parameters (figure 112). At this point, it is possible set the switching time itself as well as the weekdays of the switching time to enabled. To select or deselect a weekday, you must briefly touch the corresponding day with your finger (**X** = deselected, ✓ = selected). Active switching times have to be assigned to at least one weekday so that the channel commands of these switching times are executed.

If you touch the display area of the switching time for a long time (4.), the device displays a keyboard in which the switching time within a range of 00:00 ... 23:59 can be edited(figure 113). By pressing the " ✓"button in the keyboard, a new switching time can be included in the configuration. By pressing the "**X**" button, the input is discarded without change and the switching time parameter view is displayed again.

In the editing mode of a switching time, the assignment for the random or astro function can also be influenced separate from each other. The random function is selected or deselected by touching the word "random" (see page 230). Likewise, the assignment for the astro function can also be selected or deselected by touching the word "astro" (see page 229).
The assignment for the astro function has 3 statuses: No assignment for the astro function -> Display: "Astro **X**", assignment for the astro function to activate a lighting system -> Display: "Astro Light ✓", assignment for the astro function to activate a shading system -> Display: "Astro Blind ✓".

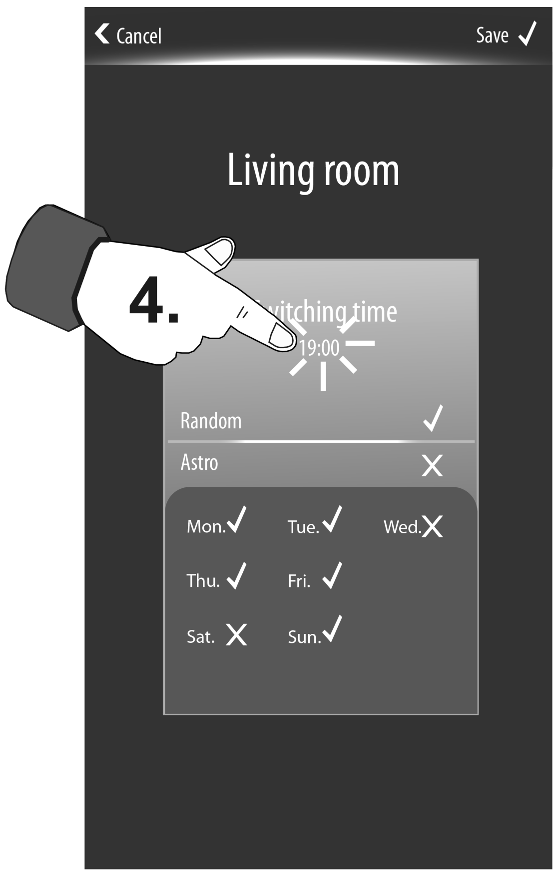


Figure 112: Example of editing mode of switching time parameters

Figure 113: Example of keyboard editing mode for setting a switching time

- The switching times settable directly on the device may only be edited in 24 hour format, irrespective of the configured display format of the time.
- The switching times changed on the device are saved in the non-volatile memory of the device. Switching times changed on the device incl. allocations of channels, channel commands and allocations for random and astro functions can be overwritten during a programming operation with the default switching times of the ETS. For this purpose, the parameter "Overwrite timer parameter" in the parameter node "Display" must be set to "Yes". If this parameter is configured to "No", then the last switching times set on the device remain unchanged during a n ETS programming operation.

Deleting switching times and inserting new

On the bottom edge in the display area (G) of a switching time submenu, the "Delete" button is visible (figure 111). The delete mode of a switching time is selected by touching this button (Display: ✓). The switching time is first deleted, however, when the "Save ✓" icon in the status line of the submenu at the top edge of the display is pressed. The configurations for the switching time concerned are discarded and the allocation of channels are removed by the deletion.
Deleted switching time are inactive and are removed from the switching time overview (figure 110). As a result, it is possible that the overview will display a lower number of switching times than the maximum 8 available.

When a switching time is deleted, a memory location is reserved that can be assigned again later at any time by the creation of a new switching time. Deleted switching times can therefore be set up again directly on the device. For this purpose, a button with the name "New - create switching time" is displayed in the overview (figure 114). If all 8 switching times are available, the "New" button is omitted.

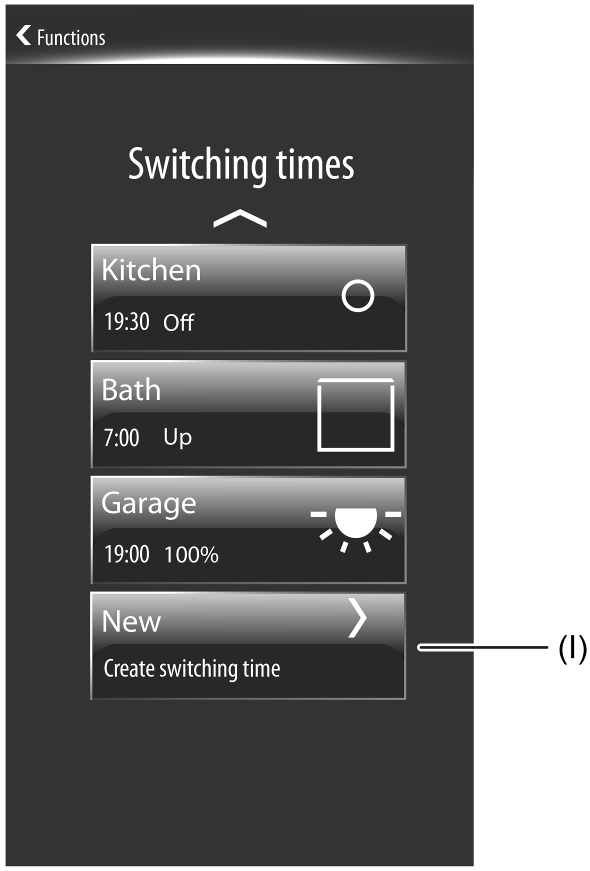


Figure 114: Example of an overview for switching times with sensor surface for creating a new switching time

(I) Sensor surface for creating a new switching time

By touching the button with the name "New - create switching time" the display branches to a channel selection. This channel selection displays an overview of all KNX channels available in the device. A channel can be selected and thus assigned to the new switching time here. In the further course of the configuration - as described in the previous section - additional parameters can be set for the new switching time.

A new switching time first becomes effectively saved in the device memory when the "Save" ✓" icon in the status line of the submenu at the top edge of the display is pressed after setting all necessary parameters.

4.2.4.7 Delivery state

As long as the device has not yet been programmed with application data in the ETS, a demo project is present in the device. The demo project can be recalled by pressing the "Demo" button with your finger, which is visible in the delivery state in the start screen after booting. The demo project displays various control and display elements and enables navigation through different display pages. With the demo project, configurable device functions can be clearly displayed for presentation purposes.

The as delivered state persists until the application is programmed into the device (see chapter 2.4. Commissioning). After programming with the ETS, the functions configured in the ETS are then enabled.

Unloading of the application program by the ETS completely deactivates the device function that was last programmed. In this case, the device is reset again to the delivery state described above.

i No bus communication takes place in the un-programmed delivery state of the device or in the case of an application program unloaded via the ETS. The updating of status elements of the demo project is simulated after an operation of the sensor elements.

i Access to the administrator environment of the device can be protected optionally by a password. The administrator password can be changed locally on the device and saved permanently in the device memory.
Unloading of the device by the ETS has no effect on the password! It is only possible to reset the password to the delivery state "0000" by manual resetting locally on the device.

4.2.5 Parameters

4.2.5.1 Display

Description	Values	Comment
□↵ Display		
External clock present	**Yes** No	The date and time can also be set via the KNX communication objects "D. Input Time" (KNX DPT 10.001) and "D. Input Date" (KNX DPT 11.001). Setting the date and time via the communication objects is appropriate when there is a master clock in the KNX system that is controlled by a time standard (DCF77- or IP-synchronisation). Cyclical transfer of date and time based on the master clock ensures that all devices in the KNX system, as well as the Smart Control, work synchronously. The parameter "External clock available" defines whether bus synchronisation of date and time is possible. If the setting is "Yes", the communication objects as described are available which make bus synchronisation possible. In this case, the changeover from summer to winter time is also controlled externally. If the setting is "No", the objects for date and time are not available. The internal system clock of the device then works autonomously and can only be set via the administrator area locally on the device. If no external clock is present, summertime/wintertime must be changed over by the device itself if necessary. For this purpose, the parameter "Automatic summertime/ wintertime changeover" defines whether or not a controlled changeover of the time should take place by the internal calendar.
Date display	**DD.MM.YYYY** MM/DD/YYYY YYYY-DD-MM YYYY-MM-DD No indication	The date can be displayed in the status line on display pages of the main navigation. The display of the date can be formatted differently and thus tailored to the user's specific requirements. In addition, the date can be displayed or hidden as required. In the ETS, the parameter "Display date" defines the display format of the date display. In the setting "no display", the date is not displayed in the aforementioned places.
Time display	**24 hours** 12 hours No indication	The time can be displayed on the start page. The display of the time can be formatted differently and thus tailored to the user's specific requirements. In

		addition, the time can be displayed or hidden as required. In the ETS, the parameter "Display time" defines the display format of the date display. In the setting "no display", the time is not displayed in the aforementioned places. Regardless of the display format selected for the time, switching times of the internal timer of the device in the ETS or locally on the device in the menus of the timer must be specified in 24-hour format.
Display of interior temperature	**°C** °F No indication	In each display, a status line is displayed at the top edge of the monitor. This status line stands out visually from the rest of the display by means of a graphic horizon. The status line can contain different display information and operating elements, thus it can also display the current room temperature, for example. The displayed room temperature value corresponds exactly to the value that the internal room temperature regulator works with as actual value. The temperature value is determined by the temperature detection of the device and can either be supplied by the internal temperature sensor, by an external sensor or by a combination of measured values from both sensors. The unit of the room temperature can be configured in the ETS the parameter "Display of indoor temperature". Thus, the room temperature value can either be displayed in "°C" or alternatively in "°F". In addition, this parameter can be defined with the setting "no display" so that the room temperature is not displayed in the status line.
Language selection	**German (DE)** English (EN) Spanish (ES) Dutch (NL) French (FR) Norwegian (NO) Italian (IT) Russian (RU)	This parameter defines the language used to depict the texts specified by the manufacturer in the display.
The function of the master button is connected to the KNX channel	Not assigned **Channel 1 : Designation, channel 1** ... Channel 30 : Designation, channel 30	The device has a master button on the touch sensor surface outside the display area. The master button can be linked to any existing KNX channel. In this way, a function, such as the switching of room lighting, can be executed quickly and easily without touch operation of the display pages.

		This parameter defines the assignment of the master button to the KNX channel required. It is important to note that the channel assigned here is also actually present in the configuration and has been configured with the group addresses! In the setting "Not assigned", the master button has no function. The channels 24...30 are only available if no weather station display page has been configured.
Limiting value object of the brightness sensor	**present** not present	The device has a brightness sensor that measures the ambient lighting locally. The brightness sensor is located on the front of the device outside of the display. The determined brightness value can be compared with a configured limiting value. If values fall below or exceed the limiting value, it is possible to transmit a switching telegram to the bus allowing lighting to be triggered, for example. The brightness sensor and associated limiting value evaluation can be enabled and influenced separately in the ETS. In the setting "available", the parameter "Limiting value object brightness sensor" enables the limiting value evaluation and switches the corresponding 1-bit limiting value object to visible. In this case, additional parameters are available for defining the limiting value and specifying a switching hysteresis. In the setting "not available", the device's internal brightness sensor is functionless and therefore no limiting value evaluation is possible.
Switch on if exceeded (%)	0...**50**...100 %	The brightness sensor integrated in the device has a physical value range from 0...20.000 lux. This value range is reduced to a standard living room measurement during the measured value evaluation and assigned to the percentage value range 0...100 %. The percentage measured value corresponds reliably to the lighting situation in the room (0 % = Darkness, 100 % = as bright as daylight, maximum ambient lighting) and is compared immediately with the configured limiting value in the ETS. If the preset limiting value is exceeded, a "1" telegram is transmitted to the bus via the limiting value object. As soon as values fall below the limiting value less the set hysteresis, the device transmits a "0" telegram to the bus. This parameter is only visible on the enabled limiting value object.

Hysteresis (%)	**10**...50 %	This parameter defines the hysteresis of the configured brightness limiting value. If the preset limiting value is exceeded, a "1" telegram is transmitted to the bus via the limiting value object. As soon as values fall below the limiting value less the set hysteresis, the device transmits a "0" telegram to the bus. This parameter is only visible on the enabled limiting value object.
Function of operation LED	always OFF **always ON**	The parameter defines the function of the operation LED on the front of the device.
System page	**without password protection** with password protection	Different device settings can be made available to the administrator via a system page. This administrator area can optionally be protected by a password. The parameter "System page" defines whether the system page can be accessed with or without password protection. In the as-delivered state (demo project), the password protection is active. The administrator password can be changed if required. The password can only be changed locally on the device via the display page "Set password". In the default setting, the password is defined as "0000".
Start page	**present** not present	The start page is on the display page of the main menu level. Frequently used operating functions or central functions can be stored on the start page. The maximum of 4 operational functions ensure that the start page is very clearly structured. There are no submenus or additional navigation elements either. Thus, the channels can be operated quickly and clearly and their status can be read at a glance. This parameter defines whether the start page is available or not. The display pages of the main menu level can be selected in sequence and thus displayed. The display sequence is fixed: Start page (if available) -> favourite page (if available) -> room page -> function page -> ... If the start page is available, the parameter node "Display -> Timer" is available.

Automatic return to the start page after	5s **10s** 15s 20s 30s 45s 1.0 min	If the start page is available, a time-controlled return to this display page takes place. The start page thus corresponds to the basic display of the Smart Control. This parameter defines the time that must elapse after the last operation until the return to the start page.
Favourite page	**present** not present	The favourite page is on the display page of the main menu level. The favourite page can be used to concentrate essential operating and display functions at a central place in the device. The maximum of 4 operational functions ensure that the favourite page is very clearly structured as well. Since there are no submenus or additional navigation elements, the channels can be operated quickly and clearly and their status can be read at a glance. This parameter defines whether the favourite page is available or not. The display pages of the main menu level can be selected in sequence and thus displayed. The display sequence is fixed: Start page (if available) -> favourite page (if available) -> room page -> function page -> ... If a favourite page is available, the parameter node "Display -> Favourite page" is available.
Weather station page	present **not present**	The device offers the possibility to display measurement data of a KNX weather station. If the device was commissioned with an ETS programming operation, the display page of the weather station can be recalled via the function page. This requires that the page of the weather station be configured centrally as "available" by the parameter "Weather station page" in the ETS. Up to 14 different measured values can be displayed on the display page of the weather station. The measured values of various data types have to be made available to the device via the bus from an external weather station. The device uses up to 7 KNX channels to be able to receive all measured values via the bus. For this reason, the choice of available KNX channels is reduced by 7 channels if a display function for the weather station is enabled. If the weather station display page is not configured, a maximum of 30 KNX channels are available for general configuration. If, however, there is a weather station display page, only

		23 KNX channels are freely available. If a display page for the weather station is available, the parameter node "Display -> Weather station" is available.
Room temperature controller side	present **not present**	The device offers the option of outputting specific functions for the operation of the room temperature controller on a special page. In this view, the channel functions "Operating mode switchover", "Setpoint shift" and "Fan controller" can be shown and operated on one page. The room temperature controller page can be configured if this parameter is set to "available". If a room temperature controller page is available, the parameter node "Display -> Room temperature controller page" is available.
Timer switch	present **not present**	The device has an integrated weekly timer and can be configured using the ETS and via a special timer display page. This timer can be configured if this parameter is set to "available". If a timer is available, the parameter node "Display -> Timer" is available.

□↵ Display -> Display illumination

Display illumination after reset	off **on**	After programming with the ETS or after switching on the power supply (device reset), the display illumination can be switched on or off. In this case, the parameter "Display illumination after reset" defines the behaviour. With the "on" setting, the display illumination is switched on after a device reset and switched off again automatically when the time specified by the parameter "Automatic switch-off of display illumination" has elapsed and no additional influence of the illumination occurs within this time (see parameter "Switch on display illumination"). In the setting "off", the display illumination is first switched off after a reset. The illumination can then be switched on by events defined by the parameter "Switch on display illumination". If the display illumination is switched off, the display can no longer be read. Indicators and controls are then no longer present.
Switching on display illumination	**via display/button operation and switching object** only via display/button	During ongoing operation of the device, the display illumination can be switched on or off depending on different events. The parameter "Switch on display illumination" specifies the behaviour of

	operation only via switching object	the illumination. Setting "only via display/button operation": The display illumination is switched on by any touch operation of the display, sensor buttons , and or by an optionally available push-button extension module of the button or rocker operation. The device switches off the illumination of the display automatically again as soon as the delay time defined by the parameter "Automatic switch off display illumination after" has elapsed. Each new operation of the device via the aforementioned events restarts the delay time. Setting "Only via switching object": In this setting, the display illumination can only be activated via the 1-bit communication object "Backlighting On/ Off". The parameter "Behaviour of display illumination switching object" determines which telegram polarity induces switching on or switching off. Setting "via Display/button operation and switching object": This setting is a combination of the options "only via display/button operation" and "only via switching object". In this case, the illumination can be activated either via an operation on the device or via the communication object "Backlighting On/ Off". The most recent event prevails and specifies the status of the display illumination. If the display illumination is switched off, the display can no longer be read. Indicators and controls are then no longer present.
Behaviour of switching object display illumination	0-telegram or 1-telegram ON, automatic switch-off **1-Telegram ON, Switch off 0-telegram automatically** 0-Telegram ON, Switch off 1-telegram automatically 1-Telegram ON, 0-Telegram OFF 0-Telegram ON, 1-Telegram OFF	This parameter defines the telegram polarity of the object "Backlighting On/ Off". It also defines whether the illumination remains on or off by a bus telegram or whether the display illumination switches itself again automatically after switching on. In the latter case, the time specified by the parameter "Automatic switch-off of display illumination" defines when the automatic shut-off takes place automatically after switching on by a bus telegram. If no automatic switch off should take place by the switching object during activation of the display illumination, the illumination stays on until it is switched off again by the object. This parameter is only visible when the display illumination can be activated by the object.

Automatic deactivation of the display illumination after	15s 30s 45s **1.0 min** 1.5 min 2.0 min 5.0 min 10.0 min 15.0 min 30.0 min 1h	This parameter defines the time that must elapse after an operation until the display illumination is switched off automatically. The parameter is only effective when an automatic switch-off has been provided by definition in the parameters "Switch on display illumination" and "Behaviour of switching object display illumination".

□↵ Display -> Start page

Operation concept	**Selection operation** Direct operation	Frequently used operating functions or central functions can be stored on the start page. The functions can be operated either by selection operation or direct operation. In the selection operation, elements must first be selected. Afterwards, operations are performed by means of the control command (switch on or off, move up or down, ...). Alternatively, direct operation is available for selection. In this case, the control command is also executed simultaneously time by touching the operating element. This operation concept is the same as the operation of a push-button sensor. It can be used in particular on the start page for purposefully executing central functions quickly and clearly (e.g. "All ON / All OFF", "room lighting ON / OFF"). This parameter defines which operation concept is used on the start page.
Grid start page	1-gang **2-gang** 4-gang * *: Only with selection operation!	The start page has a defined display grid. The grid defines the number of KNX channels available on the start page. 1, 2 or even 4 KNX channels can be operational depending on the operation concept. The size of the operating elements varies depending on the set grid.
Function 1 on the start page	Not assigned **Channel 1 : Designation** ... Channel 30 : Designation	This parameter defines the assignment of the first available function of the start page to a KNX channel. 1, 2 or 4 functions are available depending on the grid. It is important to note that the channel assigned here is also actually present in the configuration and has been configured with the group addresses! In the setting "Not assigned", the function has no effect. The channels 24...30 are only available if no weather station display page has been configured.

Function 2 on the start page	Like parameter "Function 1 on the start page".	Like parameter "Function 1 on the start page". Only with "Grid start page" = "2-gang".
Function 3 on the start page	Like parameter "Function 1 on the start page".	Like parameter "Function 1 on the start page". Only with "Grid start page" = "4-gang".
Function 4 on the start page	Like parameter "Function 1 on the start page".	Like parameter "Function 1 on the start page". Only with "Grid start page" = "4-gang".

□↵ Display -> Favourite page

Operation concept	**Selection operation** Direct operation	Frequently used operating functions can be stored on the favourite page. The functions can be operated either by selection operation or direct operation. In the selection operation, elements must first be selected. Afterwards, operations are performed by means of the control command (switch on or off, move up or down, ...). Alternatively, direct operation is available for selection. In this case, the control command is also executed simultaneously time by touching the operating element. This operation concept is the same as the operation of a push-button sensor. This parameter defines which operation concept is used on the favourite page.
Favourite page grid	1-gang **2-gang** 4-gang * *: Only with selection operation!	The favourite page has a defined display grid. The grid defines the number of KNX channels available on the favourite page. 1, 2 or even 4 KNX channels can be operational depending on the operation concept. The size of the operating elements varies depending on the set grid.
Function 1 on the favourite page	Not assigned **Channel 1 : Designation** ... Channel 30 : Designation	This parameter defines the assignment of the first available function of the favourite page to a KNX channel. 1, 2 or 4 functions are available depending on the grid. It is important to note that the channel assigned here is also actually present in the configuration and has been configured with the group addresses! In the setting "Not assigned", the function has no effect. The channels 24...30 are only available if no weather

		station display page has been configured.
Function 2 on the favourite page	Like parameter "Function 1 on the favourite page".	Like parameter "Function 1 on the favourite page". Only with "Raster favourite page" = "2-gang".
Function 3 on the favourite page	Like parameter "Function 1 on the favourite page".	Like parameter "Function 1 on the favourite page". Only with "Raster favourite page" = "4-gang".
Function 4 on the favourite page	Like parameter "Function 1 on the favourite page".	Like parameter "Function 1 on the favourite page". Only with "Raster favourite page" = "4-gang".

□↵ Display -> Rooms

Number of rooms	**1**...8	Each KNX channel must be allocated to a room (area of operation). Channels can be operated and visualized room-oriented via the room page. All rooms (1...8) that were created in the ETS PlugIn at this point are available on the room page.
Name of room 1	**Room 1**, text entry up to a max. of 18 characters	A display name can be assigned here to the room concerned (e.g. "Living room", "Kitchen"). The name, among other things, is displayed in plain text in the room buttons on the room page. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Name of room 2...8	**Room x**, text entry up to a max. of 18 characters	Like parameter "Name of room 1".
Installation location	**Room 1: Name of room 1** ... Room 8: Name of room 8	This parameter specifies the room in which the device is installed. In this way, the device sorts the set room in the room view to the topmost position so that the locally installed functions are quickly and easily available for operation.

□↵ Display -> Function units

Number of function units	1...**4**...8	Each controllable KNX channel is allocated to a function unit (light, shading, heating, ...). Up to 8 function

		units are available for assignment. The first 4 function units are predefined as standard: Function unit 1 = "Switching", Function unit 2 = "Venetian blind", Function unit 3 = "Temperature", Function unit 4 = "Scenes". 4 additional function units can optionally be configured here.
Name of function unit 1	**Light, free text with maximum of 18 characters**	The first function unit is assigned to the function "Light" by default. Consequently, the name is also predefined. The project planner can adapt both settings according to the application. If the standard settings are maintained, function unit 1 is automatically assigned KNX channels, which are configured to the functions "Switching" or "Dimming". Alternatively, it can also be assigned to every other KNX channel.
Icon of function unit 1	**Icon 1: Light**	The "Light" icon is preassigned to the first function unit. The project planner can adjust the choice of icons using this parameter from a collection of 20 icons according to the application.
Name of function unit 2	**Venetian blind**	The second function unit is preassigned to the function "Venetian blind". Consequently, the name is also predefined. The project planner can adapt both settings according to the application. If the standard settings are maintained, function unit 2 is automatically assigned KNX channels, which are configured to the functions "Venetian blind/Roller shutter...". konfiguriert werden. Alternatively, it can also be assigned to every other KNX channel.
Icon of function unit 2	**Icon 2: Venetian blind**	The "Venetian blind" icon is preassigned to the second function unit. The project planner can adjust the choice of icons using this parameter from a collection of 20 icons according to the application.
Name of function unit 3	**Temperature**	The third function unit is preassigned to the function "Temperature". Consequently, the name is also predefined. The project planner can adapt both settings according to the application. If the standard settings are maintained, function unit 3 is automatically assigned KNX channels,

		which are configured to the functions "Operating mode switchover, internal" or "Setpoint shift, internal". Alternatively, it can also be assigned to every other KNX channel.
Icon of function unit 3	**Icon 3: Temperature**	The "Temperature" icon is preassigned to the third function unit. The project planner can adjust the choice of icons using this parameter from a collection of 20 icons according to the application.
Name of function unit 4	**Scene**	The fourth function unit is preassigned to the function "Scenes". Consequently, the name is also predefined. The project planner can adapt both settings according to the application. If the standard settings are maintained, function unit 4 is automatically assigned KNX channels, which are configured to the functions "Scene extension". Alternatively, it can also be assigned to every other KNX channel.
Icon of function unit 4	**Icon 4: Scenes**	The "Scenes" icon is preassigned to the fourth function unit. The project planner can adjust the choice of icons using this parameter from a collection of 20 icons according to the application.
Name of function unit 5 ... Name of function unit 8	**Function unit 5** ... **Function unit 8**	The function units 5...8 can optionally be enabled (see parameter "Number of function units"). These function units can be assigned to any KNX channels. This parameter defines the function unit name that, among others, is visible on the function pages in the device display. Function unit 5 is assigned automatically to KNX channels configured to the functions "1-byte value transmitter" or "2-byte value transmitter". The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Icon of function unit 5 ... Icon of function unit 8	**no icon** Icon 1: Light Icon 2: Venetian blind Icon 3: Temperature Icon 4: Scenes Icon 5: Switching Icon 6: Central Icon 7: Multimedia Icon 8: Ventilation	A display icon must be assigned to each user-defined function unit (5...8). The parameter "Icon..." provides a collection of 20 icons for this purpose. Icons can be assigned multiple times so that different function units have the same icon.

	Icon 9: Holiday Icon 10: Warning Icon 11: Alarm Icon 12: Cooling Icon 13: DCM Icon 14: Door Icon 15: Window Icon 16: Weather Icon 17: Messages Icon 18: Outdoors Icon 19: Indoors Icon 20: Setpoint	

□↤ Display -> channels 1...30 -> channel X (X = 1...30)

Function unit	no function unit Function unit 1: Name of function unit 1 Function unit 2: Name of function unit 2 Function unit 3: Name of function unit 3 Function unit 4: Name of function unit 4 Function unit 5: Name of function unit 5 Function unit 6: Name of function unit 6 Function unit 7: Name of function unit 7 Function unit 8: Name of function unit 8	Each controllable KNX channel must be allocated to a function unit (light, shading, heating, ...). Up to 8 function units are available for assignment. The first 4 function units are defined as follows: Function unit 1 = "Switching", Function unit 2 = "Venetian blind", Function unit 3 = "Temperature", Function unit 4 = "Scenes". The function units 5...8 can be enabled optionally in the parameter node "Display -> Function unit". It is possible to allocate a channel to a function unit which is not visible itself on the function page, because it was not created in the configuration of the function units in the parameter node "Display -> Function units". In this case, the KNX channel concerned cannot be accessed via the function page! It is generally recommendable to assign KNX channels only to function units that are also available in the function unit configuration. The standard setting of this parameter depends on the set function of the channel.
Room	no room **Room 1: Name of room 1** ... Room 8: Name of room 8	Each KNX channel must be allocated to a room (area of operation). Channels can be operated and visualized room-oriented via the room page. A maximum of 8 rooms are available for assignment. The number of rooms (1...8) is configured in the parameter node "Display -> Rooms". It is possible to allocate a channel to a room which is not visible itself on the room page, because it was not created in the configuration of the rooms in the parameter node "Display -> Rooms". In this case, the KNX channel concerned cannot be accessed via the room page! It is generally recommendable to assign KNX channels only to rooms that are also available in the room configuration.

Function	**no function** Switching * Dimming (Start/Stop) Dimming (Brightness value) Venetian blind/shutter (Step/Move/Step) Venetian blind/shutter (Position) Scene extension 1-byte value transmitter 2-byte value transmitter Operating mode switchover, internal Setpoint shift, internal Fan controller, internal ASCII text *: In channel 1, the function "switching" is set as the default function.	The KNX channels enable control commands to be transmitted to the bus (e.g. "Switch lighting", "Move blind" "Change-over operating mode of room temperature controller") depending on the function set here. The device can receive statuses or values in the opposite direction via the channels and visualize them in the device display. Operation and display elements assigned to the individual KNX channels and which can be recalled via the room and function pages are available for this purpose. The character of these display elements depends on the channel function set here. Frequently used KNX channels can be allocated to the start and favourite page whereby these channels can be operated quickly and clearly. Additionally, their statuses can be read easily without having to navigate via display pages.
Name	Text with a maximum variable length of 18 characters, e. g. "**Light**"	A text name which is displayed on different display pages for identification of the activated function can be assigned here to each KNX channel (e. g. "Spots kitchen", "Venetian blind bathroom"). The standard setting of this parameter depends on the set channel function. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.

The following parameters are only visible for the function "Switching"...

Icons	no icon **Icon 1: Status** Icon 2: Illumination Icon 3: Present / Absent Icon 4: Disabled / Enabled	An icon can be displayed in the lower area of the channel display element. This parameter defines which type of status icon is used in the display element. This makes it possible to adapt the icon display to the activated function (e.g. switching of lighting). The configured status icon changes depending on the switching state thereby enabling the state of the controlled KNX channel to be read clearly. The icon can be omitted optionally in the display (setting: no icon).

Displaying status text

	Yes No	A status text, which visualises different texts (e.g. "Off" / "On" or "Absent" / "Present") in the display depending on the object value of the switching status feedback ("0" / "1"), can be displayed optionally below the text name. The parameters "Status text for object value 0" and "Status text for object value 1" define which status text is displayed. This parameter defines the visibility of the status text in the display element of the channel. After a device reset, the display shows "---" until a feedback object value of the status text is received.
Status text for object value 0	**Off**, free text with a max. of 12 characters	This parameter defines the status text for the value "0" of the channel switching object. A text with a maximum of 12 characters can be entered. The parameter is only visible when a status text is to be displayed.
Status text for object value 1	**On**, free text with a max. of 12 characters	This parameter defines the status text for the value "1" of the channel switching object. A text with a maximum of 12 characters can be entered. The parameter is only visible when a status text is to be displayed.
Surface evaluation	Button function (single surface) **Rocker function (double surface)**	The operating element of the channel can be evaluated optionally on the touch surface as a rocker switch (double-surface principle) or as a button (single surface principle). This parameter defines the sensor evaluation and thus specifies the character of the sensor element in the display. In the button function, a further parameter opens in the plug-in. The operating element can be touched anywhere. The preset push-button function will then always be executed. With the rocker function, the operating element is divided into two sensor areas. These sensor areas are one above the other and must be operated separate from each other. It is not permissible to operate both sensor areas of a rocker simultaneously.
Command on pressing the button	no function ON OFF **TOGGLE**	This parameter is only visible when the "Surface evaluation" parameter is configured to "Button function (single surface)". The function is configured on pressing the button. When pressing a button, either an ON, an OFF or a TOGGLE telegram can be transmitted to

		the KNX bus. There is also the option not to implement any function when a button is pressed.

The following parameters are only visible for the function "Dimming (start/stop)"...

Time between switching and dimming (100ms...50000ms)	100...**400**...50000	This parameter defines the duration of a sensor surface operation for triggering a dimming telegram. A sensor operation shorter than the time set here triggers switching telegrams. Dimming telegrams are transmitted to the bus by sensor operations that are longer than the time set here. A stop telegram is triggered automatically by releasing a long pressed sensor element whereby a dimming process is stopped at the current brightness value.
Displaying icons	**Yes** No	An icon can be displayed in the lower area of the channel display element (setting: Yes). The "Lighting" icon is then always used. The character of the status icon changes depending on the dimming state thereby enabling the brightness state of the activated KNX channel to be read clearly. The icon can be omitted optionally in the display (setting: no).
Displaying status value	**Yes** No	A status value can be displayed optionally below the text name, which displays brightness values in plain text ("0...100 %") depending on the object value of the dimming value feedback of the dimmer actuator addressed. This parameter defines the visibility of the status value in the display element of the channel. After a device reset, the display shows "---%" until a feedback object value of the status text is received.
Surface evaluation	**Button function (single surface)** Rocker function (double surface)	The operating element of the channel can be evaluated optionally on the touch surface as a rocker switch (double-surface principle) or as a button (single surface principle). This parameter defines the sensor evaluation and thus specifies the character of the sensor element in the display. With the function as a button, the operating element can be touched anywhere. The preset push-button function will then always be executed. With the rocker function, the operating element is divided into two sensor areas. These sensor areas are one above the other and must be operated separate from each other. It is not permissible to operate both sensor

		areas of a rocker simultaneously.

The following parameters are only visible for the function "Dimming (Brightness value)"...

Time between switching and dimming (100ms...50000ms)	100...**400**...50000	The sensor element of the function "dimming (brightness value)" is always executed as a rocker function and distinguishes between short and long operations. A short sensor operation triggers value telegrams "100 %" or "0 %", depending on the operated sensor surface + or -. In this way, as with a switching operation, the activated load is switched on and off. Brightness value telegrams are transmitted to the bus gradually in a defined time interval by means of long operations of the sensor surfaces + or -. The device then increases or decreases the value cyclically during the operation depending on the value transmitter level configured in the ETS and transmits the values as a brightness setting. The value sequence generated in this way is converted to a dimming process by the activated dimmer actuator. The time for executing a switching operation (0% or 100% / shorter operation than the time set here) or value adjustment (longer operation than the time set here) can be configured here.
Displaying icons	**Yes** No	An icon can be displayed in the lower area of the channel display element (setting: Yes). The "Lighting" icon is then always used. The character of the status icon changes depending on the dimming state thereby enabling the brightness state of the activated KNX channel to be read clearly. The icon can be omitted optionally in the display (setting: no).
Displaying status value	**Yes** No	A status value can be displayed optionally below the text name, which displays brightness values in plain text ("0...100 %") depending on the object value of the dimming value feedback of the dimmer actuator addressed. This parameter defines the visibility of the status value in the display element of the channel. After a device reset, the display shows "---%" until a feedback object value of the status text is received.

Value transmitter levels	5% **10%** 15% 20% 25% are not to be transmitted during adjustment	Brightness value telegrams are transmitted to the bus gradually in a defined time interval by means of long operations of the sensor surfaces + or -. The device then increases or decreases the value cyclically during the operation depending on the value transmitter level configured here and transmits the values as a brightness setting. The value sequence generated in this way is converted to a dimming process by the activated dimmer actuator. In the setting "not to be transmitted during adjustment", the value adjustment is deactivated by a long button-press.
Time between two value telegrams	500ms **1s** 2s 3s	This parameter defines the time between two value telegrams on a long button-press. The time must be attuned as much as possible to the dimming speed of the dimmer actuator in order to attain a constant and interruption-free dimming process during the value adjustment.
Activate keyboard on pressing the status value (brightness)	**Yes** No	In addition to the possibilities of specifying a brightness value using the sensor surfaces + / - or slider, a keyboard can optionally be shown in the display. It is possible to specify a brightness value directly using the keyboard. The keyboard becomes visible by pressing your finger on the display area (long press approx. 1s) if this was also enabled here (setting: Yes). If the setting is "No", a long operation of the display area shows no response.

The following parameters are only visible for the function "Venetian blind/shutter (Step/Move/Step)"...

Shadow	**Venetian blind** Shutter	The KNX channel can be adapted to the shading system type by this parameter. It is possible to configure "Venetian blinds" incl. slat control whereby vertical slat systems are also controllable or alternatively "roller shutters" whereby window drives or awnings are also controllable. To simplify the control, no slat functions are available in the rolling shutter shading method, which is why the slat adjusting time, among other things, is omitted. In this case, the selectable status icons are also adapted.

Time between short-time and long-time command (1...3000 x 100 ms)	1...**4**...3000	The sensor element of the function Venetian blind/shutter (Step/Move/Step) " distinguishes between short and long operations. Depending on this, different telegrams are transmitted to the bus. Immediately on pressing a sensor surface, the device transmits a short time telegram to the bus , whereupon a running drive is stopped and the "time between short and long time command " preset here is started internally. If the pressed sensor element is released again within this time, the device transmits no further telegram. This short time serves the purpose of stopping a continuous movement The "time between short and long time command" should be selected shorter than the short time operation of the actuator to prevent any jerky movement of the activated drive.
Slat adjusting time (0...3000 x 100 ms)	0...**5**...3000	If the sensor element is kept depressed longer than the "time between short and long time command", the device transmits a long time telegram for starting up the drive after this time has elapsed. The "slat adjusting time" specified here is then started internally. If the sensor element is released again within the slat adjusting time, the device transmits 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 this time is selected longer than the complete running time of the drive, a push-button function is possible as well. Here, the drive only remains on while the sensor element is kept depressed. This parameter is visible only in the 'Venetian blind' shading method.
Icon	no icon **Icon 1: Venetian blind** Icon 2: Vertical slat	An icon can be displayed in the lower area of the channel display element. In the "Venetian blind" type, status icons with status values for each slat position and blind height (Venetian blind height, position vertical system) are displayed in the display surface. This parameter defines which type of status icon is used in the display element for the blind/ shutter height. The character of the status icon changes depending on the position value returned by the actuator thereby enabling the current blind/ shutter position of the activated KNX

		channel to be read clearly. The status icon for the slat position is predefined and consequently not influenced by this parameter. The icon can be omitted optionally in the display (setting: no icon). This parameter is visible only in the 'Venetian blind' shading method.
Icon	no icon **Icon 1: Shutter** Icon 2: Roof window Icon 3: Awning	An icon can be displayed in the lower area of the channel display element. In the "ROLLING SHUTTER" type, a status icon for the shutter height (rolling shutter height, roof window opening, awning position) can be configured. This parameter defines which type of status icon is used in the display element. The character of the status icon changes depending on the position value returned by the actuator thereby enabling the current position of the activated KNX channel to be read clearly. The icon can be omitted optionally in the display (setting: no icon). This parameter is visible only in the 'Rolling shutter' shading method.
Display status value (0...100%)	**Yes** No	A status value can be displayed optionally below the text name, which displays position values in plain text ("0...100 %") depending on the object value of the position feedback of the Venetian blind or shutter actuator addressed. This parameter defines the visibility of the status value in the display element of the channel. After a device reset, the display shows "---%" until a feedback object value of the status text is received.
Surface evaluation	Button function (single surface) **Rocker function (double surface)**	The operating element of the channel can be evaluated optionally on the touch surface as a rocker switch (double-surface principle) or as a button (single surface principle). This parameter defines the sensor evaluation and thus specifies the character of the sensor element in the display. With the function as a button, the operating element can be touched anywhere. The preset push-button function will then always be executed. With the rocker function, the operating element is divided into two sensor areas. These sensor areas are one above the other and must be operated separate from each other. It is not permissible to operate both sensor

		areas of a rocker simultaneously.

The following parameters are only visible for the function "Venetian blind/shutter (Position)"...

Shadow	**Venetian blind** Shutter	The KNX channel can be adapted to the shading system type by this parameter. It is possible to configure "Venetian blinds" incl. slat control whereby vertical slat systems are also controllable or alternatively "roller shutters" whereby window drives or awnings are also controllable. To simplify the control, no slat functions are available in the rolling shutter shading method, which is why the slat adjusting time, among other things, is omitted. In this case, the selectable status icons are also adapted.
Time between short-time and long-time command (1...3000 x 100 ms)	1...**4**...3000	A short sensor operation triggers value telegrams "100 %" or "0 %", depending on the operated sensor surface In this way, the activated blind/shutter or slats can be moved to the end position. Position value telegrams are transmitted to the bus gradually in a defined time interval by means of long operations of the sensor surfaces. The device then increases or decreases the value cyclically during the operation depending on the value transmitter level configured in the ETS and transmits the values as a position setting. The value sequence generated in this way is converted to a movement by the activated Venetian blind or shutter actuator. The time for executing a movement in the end positions (0% or 100% / shorter operation than the time set here) or a value adjustment (longer operation than the time set here) can be configured here.
Icon	no icon **Icon 1: Venetian blind** Icon 2: Vertical slat	An icon can be displayed in the lower area of the channel display element. In the "Venetian blind" type, status icons with status values for each slat position and blind height (Venetian blind height, position vertical system) are displayed in the display surface. This parameter defines which type of status icon is used in the display element for the blind/shutter height. The character of the status icon changes depending on the position value returned by the actuator thereby enabling the current blind/shutter position of the activated KNX channel to be read clearly. The status

		icon for the slat position is predefined and consequently not influenced by this parameter. The icon can be omitted optionally in the display (setting: no icon). This parameter is visible only in the 'Venetian blind' shading method.
Icon	no icon **Icon 1: Shutter** Icon 2: Roof window Icon 3: Awning	An icon can be displayed in the lower area of the channel display element. In the "ROLLING SHUTTER" type, a status icon for the shutter height (rolling shutter height, roof window opening, awning position) can be configured. This parameter defines which type of status icon is used in the display element. The character of the status icon changes depending on the position value returned by the actuator thereby enabling the current position of the activated KNX channel to be read clearly. The icon can be omitted optionally in the display (setting: no icon). This parameter is visible only in the 'Rolling shutter' shading method.
Display status value (0...100%)	**Yes** No	A status value can be displayed optionally below the text name, which displays position values in plain text ("0...100 %") depending on the object value of the position feedback of the Venetian blind or shutter actuator addressed. This parameter defines the visibility of the status value in the display element of the channel. After a device reset, the display shows "---%" until a feedback object value of the status text is received.
Value transmitter levels (blind/shutter height)	5% **10%** 15% 20% 25% are not to be transmitted during adjustment	Position value telegrams are transmitted to the bus gradually in a defined time interval by means of long operations of the sensor surfaces. The device then increases or decreases the value cyclically for the blind/shutter height during the operation depending on the value transmitter level configured here and transmits the values as a position setting. The value sequence generated in this way is converted to a movement by the activated Venetian blind or shutter actuator. In the setting "not to be transmitted during adjustment", the value adjustment of the blind/shutter height is deactivated by a long button-press.

Activate keyboard on pressing the status value (blind/shutter height)	**Yes** No	In addition to the possibilities of specifying a blind/shutter position value using the sensor surfaces or slider, a keyboard can optionally be shown in the display. It is possible to specify a position value for the blind/shutter height directly using the keyboard. The keyboard becomes visible by pressing your finger on the display area of the status icon for the blind/shutter (long press approx. 1s) if this was also enabled here (setting: Yes). If the setting is "No", a long operation of the aforementioned display area shows no response.
Value transmitter levels (slat position)	5% **10%** 15% 20% 25% are not to be transmitted during adjustment	Position value telegrams are transmitted to the bus gradually in a defined time interval by means of long operations of the sensor surfaces. The device then increases or decreases the value cyclically for the slat position during the operation depending on the value transmitter level configured here and transmits the values as a position setting. The value sequence generated in this way is converted to a slat movement by the activated shutter actuator. In the setting "not to be transmitted during adjustment", the value adjustment of the slats is deactivated by a long button-press.
Activate keyboard on pressing the status value (slat position)	**Yes** No	In addition to the possibilities of specifying a slat position value using the sensor surfaces or slider, a keyboard can optionally be shown in the display. It is possible to specify a position value for the slat position directly using the keyboard. The keyboard becomes visible by pressing your finger on the display area of the status icon for the slats (long-press approx. 1s) if this was also enabled here (setting: Yes). If the setting is "No", a long operation of the aforementioned display area shows no response.
Time between two value telegrams	500ms **1s** 2s 3s	This parameter defines the time between two value telegrams on a long button-press. The time must be attuned as much as possible to the dimming speed of the dimmer actuator in order to attain a constant and interruption-free dimming process during the value adjustment.

Slat correction when moving to the upper end position	**Yes** No	A KNX channel of the function "Venetian blind/shutter (position)" supports the supplementary function of the slat correction. Many KNX shutter actuators track the slat position when the shutter height changes due to a position setting. These actuators also reposition the slats when the blind position is preset to 0%, i.e. to the upper end position. This repositioning of the slats is often undesirable in the upper end position of the Venetian blind since the returned blind height also changes again due to the movement of the slats (position of blind unequal 0%). To prevent the slat from being repositioned in the upper blind end position, the automatic slat correction can be activated here. If the slat correction has been activated (setting: Yes), the device always transmits a slat position of 0% for a blind height presetting of 0%. As a result, the slat is not repositioned when the upper end position is reached since this is already in the 0% position after the upward movement. It does not matter which operation performs the 0% presetting. Consequently, the slat correction will only function after short or long operations of the sensor surfaces or when changing the slider if a 0% blind position is set. The automatic slat correction does not apply to position presettings for the blind within the range 1...100%. In such cases, the device only transmits slat positions when a slat operation is performed using the sensor surfaces or the slider. In the setting "No", the slat correction does not apply. In this case, the device does not position the slats automatically to 0% at a 0% blind/shutter height. Shutter actuators then normally track slat positions that were last specified or set. The slat correction is available only in the 'Venetian blind' shading method.

The following parameters are only visible for the function "Scene extension"...

Displaying scene icon	**Yes** No	An icon can be displayed in the lower area of the channel display element (setting: Yes). The "scene" icon is then always used. The scene function icon is static and preset. Consequently, the icon does not change the display status for a scene recall or scene storage function. The icon can be omitted optionally in the display (setting: no).

Function	**Scene extension without storage function** Scene extension with storage function Recall internal scene without storage function Recall internal scene with storage function	This parameter specifies how the scene extension works. In the scene extension function, the device with a sensor surface operation transmits a preset scene number to the bus via a separate communication object. This feature permits recalling scenes stored in other devices and also storing them, if the storage function is used. The recall of an internal scene does not result in a telegram being transmitted to the bus. This function can be used to recall or – with the storage function – to store the up to 8 scenes stored internally in the local device as well. The channel function "scene extension" distinguishes between short and long operations of the sensor surface. In the setting "... without storage function", an operation triggers the simple recall of a scene. In the setting "... with storage function", the device monitors the length of the actuation. A sensor surface operation of less than five seconds results in a simple recall of the scene as described above. After an operation of more than five seconds, the device generates a storage instruction.
Scene number on pressing the button	**1**...64	This parameter defines the scene number for a scene recall or scene storage function. This number is transmitted to the bus via the scene extension object. This parameter is only visible for the function as scene extension.
Scene number on pressing the button	**1**...8	This parameter defines the scene number for an internal scene recall or internal scene storage function. This parameter is only visible in the function for recalling or saving internal scenes.

The following parameters are only visible for the function "Value transmitter 1 byte"...

Icons	**no icon** Icon 1: Venetian blind Icon 2: Vertical slat Icon 3: Shutter Icon 4: Roof window Icon 5: Awning Icon 6: Brightness value/ dimming value	An icon can be displayed in the lower area of the channel display element. This parameter defines which type of status icon is used in the display element. The character of the status icon changes depending on the feedback value thereby enabling the value status (e.g. brightness value or blind/shutter position) of the activated KNX channel to be read clearly. The icon can be omitted optionally in the display (setting: no icon).

Displaying status value	**Yes** No	A status value can be displayed optionally below the text name, which displays values in plain text ("0...255" / "0...100 %") depending on the object value of the value feedback of an actuator. The data format of this status value indicator is determined by the ETS "Function" parameter. In the function as "value transmitter 0%...100%", the displayed value is supplemented automatically by the unit "%". After a device reset, the display shows "---" "---%" until a feedback object value of the status text is received.
Function	**Value transmitter 0...255** Value transmitter 0…100 %	With the channel function "1-byte value transmitter" telegrams in compliance with the KNX data types 5.010 (unformatted / 0...255) and 5.001 (Scaling / 0...100%) can be transmitted to the bus. A sensor operation triggers the value telegram configured in the ETS. The ETS "Function" parameter determines the data format of the object and specifies which value range the channel function uses. The channel can optionally process integers from 0…255 or values within a range of 0…100%. The scaling of the status indications also adapts itself depending on this setting.
Surface evaluation	**Button function (single surface)** Display function	In the function "1-byte value transmitter", the sensor element is always executed as a push-button function and does not distinguish between any short and long operations. As an alternative to the operating function, it is possible to deactivate the sensor surface in the ETS. To do this, set this parameter to "Display function". In this case, the channel concerned only works as a display function for value visualization. Consequently, touching the sensor or display elements does not induce any response.
Value on pressing the button	**0**...255	This parameter defines the value transmitted to the bus on pressing the sensor surface via the object "1-byte value transmitter". This parameter is only visible when the "surface evaluation" is configured to "Button function (single surface)".

Activate keyboard after a long press on status value	**Yes** No	In addition to the possibility of recalling a value programmed by the ETS, a keyboard can optionally be shown in the display. It is possible to specify a value directly using the keyboard and thus to permanently vary from the value configured in the ETS. The keyboard becomes visible by pressing your finger on the display area (long press approx. 1s) if this was also enabled here (setting: Yes). Using the keyboard, any value defined by the "Function" parameter within the range (0...255" / " 0...100%") can be entered numerically. After applying the value, it is transmitted to the bus and saved permanently in the device memory. Only an ETS programming operation resets the value to the ETS configuration. If the setting is "No", a long operation of the display area shows no response. This parameter is only visible when the " surface evaluation" is configured to " Button function (single surface)".

The following parameters are only visible for the function "Value transmitter 2 byte"...

Icons	**no icon** Icon 1: Brightness Icon 2: Temperature Icon 3: Air humidity Icon 4: Air pressure Icon 5: Limiting value	An icon can be displayed in the lower area of the channel display element. This parameter defines which type of status icon is used in the display element. The icons of the 2-byte value transmitter are static and do not change their appearance. The icon can be omitted optionally in the display (setting: no icon).
Displaying status value	**Yes**	A status value is displayed below the text name, which displays values in plain text ("e.g "45%rF"). depending on the object value of the value feedback of an actuator. The status value is always visible. After a device reset, the display shows "---" (possibly supplemented by a unit) until a feedback object value of the status text is received.
Displaying unit text	Yes **No**	The status text in the display can optionally be supplemented by a unit. The text for the value unit ("%rF" for example) is specified by the parameter "Text for unit".
Text for unit	**°C**, free text with a max. of 5 characters	This parameter specifies the unit for the status text. A text with a maximum of 5 characters can be entered.

		This parameter is only visible when a status text with unit text is to be displayed.
Surface evaluation	**Button function (single surface)** Display function	In the function "2-byte value transmitter", the sensor element is always executed as a push-button function and does not distinguish between any short and long operations. As an alternative to the operating function, it is possible to deactivate the sensor surface in the ETS. To do this, set this parameter to "Display function". In this case, the channel concerned only works as a display function for value visualization. Consequently, touching the sensor or display elements does not induce any response.
Value on pressing the button	-671088.64... **0.0** ...670760.96	This parameter defines the value transmitted to the bus on pressing the sensor surface via the object "2-byte value transmitter". The value that the user enters in the entry field is converted by the ETS PlugIn to the KNX data type 9.0xx (floating-point numbers) and written in the ETS database. This can result in value adjustments due to rounding. The value transmitted via the communication object of the channel during an operation can vary from the ETS preset value because a gain factor and value offset can be configured optionally (see "Gain" and "Offset"). This parameter is only visible when the "surface evaluation" is configured to "Button function (single surface)".
Activate keyboard after a long press on status value	**Yes** No	In addition to the possibility of recalling a value programmed by the ETS, a keyboard can optionally be shown in the display. It is possible to specify a value directly using the keyboard and thus to permanently vary from the value configured in the ETS. The keyboard becomes visible by pressing your finger on the display area (long press approx. 1s) if this was also enabled here (setting: Yes). Using the keyboard, a value can be entered numerically. It should be noted that only values within the "Minimum value" and "Maximum value" limits defined by the ETS parameters can be entered. After applying the value, it is transmitted to the bus and saved permanently in the device memory. Only an ETS programming operation resets the value to the ETS configuration.

		If the setting is "No", a long operation of the display area shows no response. This parameter is only visible when the "surface evaluation" is configured to "Button function (single surface)".
Minimum value	-671088.64... **0.0** ...670760.96	This parameter scales the bar graph in the display (value feedback in graphic form) by defining the minimum displayable value (no deflection of the bar graph). Furthermore, this parameter predefines the minimum presettable value via the keyboard provided that a keyboard is used for presetting the value.
Maximum value	-671088.64... **100024.32** ...670760.96	This parameter scales the bar graph in the display (value feedback in graphic form) by defining the maximum displayable value (full deflection of the bar graph). Furthermore, this parameter predefines the maximum presettable value via the keyboard provided that a keyboard is used for presetting the value.
Amplification	-671088.64... **1.0** ...670760.96	Before a value is transmitted to the bus via the object during an operation, the device calculates the value to be transmitted based on the gain factor and value offset. The same applies to the value display. The value received from the bus via the feedback object is influenced - in the opposite way than during transmission - by the gain factor and value offset and only displayed afterwards. This parameter specifies the gain of the value. The gain can be positive as well as negative.
Offset	-1215752191... **0** ...1215752191	Before a value is transmitted to the bus via the object during an operation, the device calculates the value to be transmitted based on the gain factor and value offset. The same applies to the value display. The value received from the bus via the feedback object is influenced - in the opposite way than during transmission - by the gain factor and value offset and only displayed afterwards. This parameter defines the offset (shift) of the value. The offset can be positive as well as negative.

Number of the integer digits	1...**5**...20	This parameter influences the values entered via the keyboard. The parameter specifies how many numbers can be preset before the decimal point via the keyboard and thus defines the value range that can be preset in this way. This parameter is only visible when a keyboard can be used.
Number of decimal places	1...**2**...18	This parameter defines how many places the status value has after the decimal point in the display.

The following parameters are only visible for the function "Operating mode switchover, internal"...

Displaying icon	**Yes** No	An icon can be displayed in the lower area of the channel display element (setting: Yes). The displayed icon of the operating mode switchover is determined by the current operating mode of the integrated room temperature controller. Consequently, the icon changes the display status whenever a change-over to a different operating mode takes place, The icon can be omitted optionally in the display (setting: no).
Displaying status text	**Yes** No	A status text can be displayed optionally below the text name, which visualises different texts ("Comfort", "Standby", "Night", "Frost/heat protection", "Presence button") in the display depending on the operating mode of the integrated room temperature controller.

The following parameters are only visible for the function "Setpoint shift, internal"...

Displaying icon	**Yes** No	An icon can be displayed in the lower area of the channel display element (setting: Yes). The setpoint shift icon is static and preset. Consequently, the icon does not change the display status. The icon can be omitted optionally in the display (setting: no).
Displaying status value	**Yes** No	A status value can be displayed optionally below the text name. The status value displays the level of the setpoint shift returned by the internal room temperature controller in textual form (-4...0...+4). The value of a level

		corresponds to 0.5K. The status value "0" means that no setpoint shift is active.

The following parameters are only visible for the function "Fan controller, internal"...

Displaying status value	**Yes** No	A status value can be displayed optionally below the text name. The status value displays the level of the fan controller returned by the internal room temperature controller in textual form (Off, Level 1, Level 2, ..., Level 8). The status value "Off" means that no fan control is active.

The "ASCII Text" function does not contain any special parameters.

□↵ Display -> Weather station

Displaying wind speed	**in km/h** in Bft in m/s No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "wind speed" should be evaluated and displayed. Furthermore, the parameter also defines the unit of the measured value. The measured value of the wind speed must be made available to the device via the bus in "m/s" in compliance with KNX DPT 9.005. According to the parameter setting of the measured value, a conversion and display in the formats "m/s", "km/h" or "Bft (Beaufort)" takes place if necessary.
Name	**Wind speed**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the measured value of the wind speed, which is displayed on the display page of the weather station for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Display rain	**Yes** No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The

		measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "Rain" should be evaluated and displayed.
Display brightness 1	**in kLux** No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "Brightness 1" should be evaluated and displayed. The unit of the measured value is defined as "kLux". Up to 4 different brightness values can be displayed (brightness 1, 2, 3 and max. brightness) by adding further measured values. The brightness measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The measured value is converted by the device so that these measured values are displayed in "kLux".
Name	**Brightness 1**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the measured value of the first brightness (e.g. "Sun East"), which is displayed on the display page of the weather station for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Display brightness 2	**in kLux** No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "Brightness 2" should be evaluated and displayed. The unit of the measured value is defined as "kLux". Up to 4 different brightness values can be displayed (brightness 1, 2, 3 and max. brightness) by adding further measured values. The brightness measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The measured value is

		converted by the device so that these measured values are displayed in "kLux".
Name	**Brightness 2**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the measured value of the second brightness (e.g. "Sun South"), which is displayed on the display page of the weather station for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Display brightness 3	**in kLux** No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "Brightness 3" should be evaluated and displayed. The unit of the measured value is defined as "kLux". Up to 4 different brightness values can be displayed (brightness 1, 2, 3 and max. brightness) by adding further measured values. The brightness measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The measured value is converted by the device so that these measured values are displayed in "kLux".
Name	**Brightness 3**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the measured value of the third brightness (e.g. "Sun West"), which is displayed on the display page of the weather station for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Display maximum brightness	**in kLux** No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "maximum brightness"

		should be evaluated and displayed. The unit of the measured value is defined as "kLux". Up to 4 different brightness values can be displayed (brightness 1, 2, 3 and max. brightness) by adding further measured values. The brightness measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004. The measured value is converted by the device so that these measured values are displayed in "kLux".
Name	**max. brightness**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the measured value of the maximum brightness which is displayed on the display page of the weather station for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Display twilight	**in Lux** No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "Twilight" should be evaluated and displayed. The unit of the measured value is defined as "lux". The twilight measured value must be transmitted to the device via the bus in the format "lux" in compliance with KNX DPT 9.004.
Name	**Twilight**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the measured value of the twilight brightness, which is displayed on the display page of the weather station for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Display sun status	**Yes** No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a

		separate KNX communication object. This parameter defines whether two measured values for displaying the sun status (Azimuth and elevation angle) should be evaluated and displayed. The unit and data format of the measured values are defined as "°". Care must be taken to ensure that the telegrams of the KNX weather station correspond to the defined data format (KNX DPT 5.003 "0°...360°"). The measured values for the sun status always have fixed names in the display.
Display of outdoor temperature	**in °C** in °F No indication	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "Outdoor temperature" should be evaluated and displayed. Furthermore, the parameter also defines the unit of the measured value. The device expects the measured value for the outdoor temperature in "°C" in compliance with KNX DPT 9.001. According to the parameter setting of the measured value, a conversion and display in the formats "°C" or "°F" takes place if necessary.
Name	**Outdoor temperature**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the measured value of the outdoor temperature, which is displayed on the display page of the weather station for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Display external value 1	**Yes** No	The device offers the possibility to display measurement data of a KNX weather station. Each measured value on the display page of the weather station has its own display element. The measured value itself is received by a separate KNX communication object. Up to 4 external 2 byte values, which correspond to the KNX data format 9. xxx (floating-point numbers), can additionally be visualized on the weather station display. This parameter defines whether the first external measured value should be

		evaluated and displayed. The measured value must be made available to the device via the bus in compliance with KNX DPT 9.xxx. The measured value may possibly be converted and adapted to the required display format according to the setting of the parameter "Gain", "Offset", "Number of integer digits" and "Number of decimal places".
Name	**Value 1**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the first measured value (e.g. "Temperature Loggia"), which is displayed on the display page of the weather station for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Display unit	**Yes** No	The value in the display can optionally be supplemented by a unit (setting: Yes). The text for the value unit ("°C" for example) is specified by the parameter "Text for unit". In the setting "No", the value display is not supplemented by a unit.
Text for unit	free text with a max. of 5 characters, no text is entered in the presetting	This parameter specifies the unit for the value display. A text with a maximum of 5 characters can be entered. This parameter is only visible when the external value is to be supplemented by a unit text.
Amplification (-10,000,000... 10,000,000)	-10,000,000... **1.0** ...10,000,000	When a value is received from the bus, the device calculates the value display based on the gain factor and value offset (value display = bus value x gain + offset). This parameter specifies the gain of the value. The gain can be positive as well as negative.
Offset (-10,000,000... 10,000,000)	-10,000,000... **0.0** ...10,000,000	When a value is received from the bus, the device calculates the value display based on the gain factor and value offset (value display = bus value x gain + offset). This parameter defines the offset (shift) of the value. The offset can be positive as well as negative.
Number of integer digits	0...**3**...9	This parameter defines how many digits the status value has in the display.

Number of decimal places	0...**1**...3	This parameter defines how many places the status value has after the decimal point in the display.
Display external value 2...4		Like "Display external value 1"!

□↵ Display -> Room temperature controller side

Display of outdoor temperature	**present** not present	The device offers the possibility to display measurement data of a KNX weather station. On the display page of the room temperature controller side the display of the outdoor temperature has its own display element. The measured value itself is received by a separate KNX communication object. This parameter defines whether the measured value "Outdoor temperature" should be displayed on the room temperature controller side.
Display of operating mode switch-over	**present** not present	This parameter defines whether an operating mode switch-over is possible on the room temperature controller side. If the operating mode switch-over is present, additional parameters are available.
Display of status text of the operating mode switch-over	**Yes** No	In the operating and display element of the operating mode switch-over a status text can be displayed optionally on the room temperature controller side, which visualises the activity of the mode below the display of the operating mode (Comfort, Standby, ...) of the integrated room temperature controller. In the case of a comfort extension that has been activated using the presence button, the remaining extension time is displayed.
Presence button	**Yes** No	This parameter defines whether the "Comfort" operating mode can be extended using a presence button on the room temperature controller side.
Setpoint value shift display	**present** not present	This parameter defines whether a setpoint shift is possible on the room temperature controller side. If the operating mode switch-over is present, additional parameters are available.
Designation of the setpoint shift	**Setpoint shift**, free text with a maximum	A text name can be assigned here to the setpoint shift function, which is displayed

	variable length of 18 characters	on the display page of the room temperature controller side for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Setpoint shift display symbol	**Yes** No	In the operating and display element of the setpoint shift a symbol can be displayed (Setting: Yes) on the room temperature controller side. The setpoint shift icon is static and preset. Consequently, the icon does not change the display status. The icon can be omitted optionally in the display (setting: no).
Setpoint shift status text display	**Yes** No	In the operating and display element of the setpoint shift a status text can be displayed optionally on the room temperature controller side. The status text displays the level of the setpoint shift returned by the internal room temperature controller in textual form (-4...0...+4). The value of a level corresponds to 0.5K. The status value "0" means that no setpoint shift is active.
Fan controller display	**present** not present	This parameter defines whether a fan controller is possible on the room temperature controller side. If a fan controller is present, additional parameters are available.
Designation of the fan controller	**Fan controller**, free text with a maximum variable length of 18 characters	A text name can be assigned here to the fan controller function, which is displayed on the display page of the room temperature controller side for identification. The possible length of the text depends on the set size of the letters or numbers entered in the entry field and can vary. A text with a maximum of 18 characters can be entered.
Fan controller status text display	**Yes** No	In the operating and display element of the fan controller a status text can be displayed optionally on the room temperature controller side. The status text displays the level of the fan controller returned by the internal room temperature controller in textual form (Off, Level 1, Level 2, ..., Level 8). The status text "Off" means that no fan

		control is active.

□↵ Display -> Timer

Overwriting timer parameter	**Yes** No	For the switching times preset in the ETS to be correctly transferred to the device during a programming operation, the parameter "Overwrite timer parameter" must be set to "Yes". Before putting into operation for the first time, this parameter should be set to "Yes". Otherwise, the switching times preset in the ETS are not transferred to the device. If the parameter is configured to "Yes", the switching times changed directly on the device via the display pages are always overwritten during programming operations. If the setting is "No", the last configured switching times set on the device remain unchanged during an ETS programming operation. This parameter is only visible if a timer is present.
Geographic longitude of the location (-180.0°...180.0°)	-180.0...**9.5**...180.0	The geographic longitude of the location where the device is installed is entered here. The default is the coordinates of the city of Kassel.
Geographic latitude of the location (-180.0°...180.0°)	-180.0...**51.31**...180.0	The geographic latitude of the location where the device is installed is entered here. The default is the coordinates of the city of Kassel.
Time zone	UTC-12h...**UTC+1h**... UTC+14h	The time zone of the location/country where the device is located is entered here. The default is the coordinates of the city of Kassel, Germany.
Automatic summer/ winter time changeover	**Yes** No	Here, it is specified whether the timer works with an automatic change-over from summer to winter time. In the "Yes" setting, the time is changed over automatically. In the "No" setting, the time must be adjusted manually.

□↵ Display -> Timer -> Switching time 1

Switching time 1	**not active** active	The device has an integrated weekly timer and can be configured using the ETS. The timer has up to 8 switching times, which directly affect the configured KNX channels (1...30) in the device.

		This parameter specifies whether the first switching time is enabled or disabled. Only active switching times are executed. Inactive switching times in the ETS can subsequently be activated on the device after commissioning. Similarly, activated switching times can subsequently be deactivated on the display pages of the switching times by means of ETS.
Switching time hour	0...**8**...23	The switching time is specified here. This parameter defines the hours (0...23 / 24h-format) of the switching time event.
Switching time minute	**0**...59	The switching time is specified here. This parameter defines the minutes (0...59) of the switching time. For the switching times preset in the ETS to be correctly transferred to the device during a programming operation, the parameter "Overwrite timer parameter" in the parameter node "Display" must be set to "Yes". Before putting into operation for the first time, this parameter should be set to "Yes". Otherwise, the switching times preset in the ETS are not transferred to the device.
Monday	not active **active**	This parameter specifies whether the switching time event is to take place on Mondays. In the "active" setting, the weekday of the switching time is assigned.
Tuesday	not active **active**	This parameter specifies whether the switching time event is to take place on Tuesdays. In the "active" setting, the weekday of the switching time is assigned.
Wednesday	not active **active**	This parameter specifies whether the switching time event is to take place on Wednesdays. In the "active" setting, the weekday of the switching time is assigned.
Thursday	not active **active**	This parameter specifies whether the switching time event is to take place on Thursdays. In the "active" setting, the weekday of the switching time is

		assigned.
Friday	not active **active**	This parameter specifies whether the switching time event is to take place on Fridays. In the "active" setting, the weekday of the switching time is assigned.
Saturday	not active **active**	This parameter specifies whether the switching time event is to take place on Saturdays. In the "active" setting, the weekday of the switching time is assigned.
Sunday	not active **active**	This parameter specifies whether the switching time event is to take place on Sundays. In the "active" setting, the weekday of the switching time is assigned.
Astro	**No** Light Blind	This parameter defines whether the astro function is activated for the switching time event concerned. The parameter additionally defines the astro behaviour which determines whether a lighting (setting "light") or a blind, shutter or awning (setting "shading") is activated by the astro function. In the "No" setting, the astro function is inactive for the switching time.
Random offset	Yes **No**	This parameter specifies whether the random function is activated for the switching time event concerned. If the setting is "yes", the assigned switching time is triggered offset in a set random period (+/- 15 minutes). The "no" setting deactivates the random function.
Channel no.	Not assigned **Channel 1 : Designation, channel 1** .. Channel 30 : Designation, channel 30	For each switching time it is necessary to specify which KNX channel it affects. The parameter "Channel no." assigns the switching time to one of the KNX channels (1...30) available in the device. Care must be taken to ensure that only channels are allocated that are also available in the channel configuration in the parameter nodes "channels..." i.e. were configured with channel functions! Channels 24...30 are only available and consequently only assignable to a switching time if no weather station page is configured.

Switching value	**ON/Lowering** OFF/Raising	Depending on the function of the allocated KNX channel, the switching time executes a channel command when executing a switching time. This parameter defines which channel command should be executed for the channel functions "switching", "dimming (Start/Stop)" and "Venetian blind/shutter (Step/Move/Step)". The ETS parameters "switching value", "1-byte switching value" and "2-byte switching value" are always visible. The function of the allocated KNX channel defines which of these parameters is enabled In the channel functions "scene extension" and "operating mode switchover internal" none of the aforementioned parameters are enabled. In these cases, the channel command of the timer is specified directly by the configuration of the KNX channel.
1-byte switching value	0...**255**	Depending on the function of the allocated KNX channel, the switching time executes a channel command when executing a switching time. This parameter defines which channel command should be executed for the channel functions "dimming (brightness value)", "Venetian blind/shutter (position)" and "1-byte value transmitter". The ETS parameters "switching value", "1-byte switching value" and "2-byte switching value" are always visible. The function of the allocated KNX channel defines which of these parameters is enabled In the channel functions "scene extension" and "operating mode switchover internal" none of the aforementioned parameters are enabled. In these cases, the channel command of the timer is specified directly by the configuration of the KNX channel.
2-byte switching value	-671088.64... **0.0** ...670760.96	Depending on the function of the allocated KNX channel, the switching time executes a channel command when executing a switching time. This parameter defines which channel command should be executed for the channel functions "2-byte value transmitter" and "setpoint shift, internal". The value that the user enters in the entry field is converted by the ETS PlugIn to the KNX data type 9.0xx

(floating-point numbers) and written in the ETS database. This can result in value adjustments due to rounding.
In the channel function "setpoint shift internal", it should be noted that the device only accepts values within the value range of the setpoint shift (-4...0...+4). Entered values which contain decimal places are rounded to the nearest whole number, of course.
The ETS parameters "switching value", "1-byte switching value" and "2-byte switching value" are always visible. The function of the allocated KNX channel defines which of these parameters is enabled In the channel functions "scene extension" and "operating mode switchover internal" none of the aforementioned parameters are enabled. In these cases, the channel command of the timer is specified directly by the configuration of the KNX channel.

□↵ Display -> Timer -> Switching time 2...8 like switching time 1!

4.2.5.2 Controller function

Description	Values	Comment
☐↵ Room temperature control (RTC)		
Room temperature controller function	Disabled **Enabled**	The controller function block integrated in the device can either be switched on or off. The setting of this parameter has an impact on the function of the controller and thus on the visible parameters and objects displayed in the ETS. In the "switched-on" setting, the controller function block works as a main controller. The internal control algorithm is active, meaning that the device can be used for single-room temperature control. In the "switched-off" setting, the controller function block is switched off completely. No room temperature control can be executed by the device.
☐↵ Room temperature control (RTC) -> Controller general		
Operating mode	**Heating** Cooling Heating and cooling Basic and additional heating Basic and additional cooling Basic and additional heating and cooling	The room temperature controller distinguishes between two different operating modes. The operating modes specify whether you want the controller to use its variable to trigger heating systems ("heating" single operating mode) or cooling systems ("cooling" single operating mode). You can also activate mixed operation, with the controller being capable of changing over between "Heating" and "Cooling" either automatically or, alternatively, controlled by a communication object. In addition, you can establish two-level control operation to control an additional heating or cooling unit. For two-level feedback control, separate command values will be calculated as a function of the temperature deviation between the setpoint and the actual value and transmitted to the bus for the basic and additional levels. This parameter specifies the operating mode and, if necessary, enables the additional level(s).
Fan controller available	**No** Yes	The room temperature control can be supplemented with a fan controller using this parameter. By enabling the fan controller ("Yes" setting), it is possible to control the fan from heating and cooling systems operated by circulating air, such as FanCoil units, depending on the command value calculated in the controller or using manual operation. When the function is enabled, additional

		parameters will appear in the ETS in the "Room temperature control -> Controller general -> Fan controller" as well as additional communication objects. Fan control is not possible with switching 2-point feedback control.
Fan operating mode (ineffective with switching 2-point feedback control)	Heating Cooling Heating and cooling Basic heating Additional heating Basic cooling Additional cooling Basic heating and cooling Basic heating and additional cooling Basic cooling and additional heating Additional heating and cooling	Depending on the operating mode of the room temperature control, as configured in the ETS, various controller command values can be used as the basis for fan control. The "Fan operating mode" parameter specifies which command value of the controller controls the fan controller. With one-level room temperature control, it is possible to select whether the fan is activated during heating and/or during cooling. With two-level room temperature control, it is also possible for the fan controller to be set to the basic level or the additional level during heating and cooling. However, under no circumstances is it possible to use the basic and additional levels simultaneously for a fan controller within an operating mode. The basic setting of this parameter depends on the selected controller operating mode.
Additional stage inhibit object	Yes **No**	The additional levels can be separately disabled via the bus. The parameter enables the disable object as necessary. This parameter is only visible in two-level heating and cooling operation.
Send variable heating and cooling to one common object	Yes **No**	If the parameter is set to "Yes", the command value will be transmitted on a shared object during heating or cooling. This function is used, if the same heating system is used to cool the room in the summer and used to heat the room in the winter. This parameter is only visible with "heating and cooling" mixed operating mode, if applicable, with additional levels.
Type of heating control (if applicable, for basic and additional stage)	**Continuous PI control** Switching PI control (PWM) Switching 2-point control (ON/OFF)	Selecting a feedback control algorithm (PI or 2-point) with data format (1-byte or 1-bit) for the heating system.

Type of heating (if applicable, for basic and additional level)	**Hot water heater (5 K / 150 min)** Underfloor heating (5 K / 240 min) Electric heating (4 K / 100 min) Fan convector (4 K / 90 min) Split unit (4 K / 90 min) via control parameter	Adapting the PI algorithm to different heating systems using predefined values for the proportional range and reset time control parameters. With the "Using control parameters" setting, it is possible to set the control parameters in a manner deviating from the predefined values within specific limits. This parameter is only visible if "Type of heating control = Continuous PI control".
Proportional range heating (10...127) * 0.1 K	10...**50**...127	Separate setting of the "Proportional range" control parameter. This parameter is only visible if "Type of heating = via control parameter" and the heating control type "PI control".
Reset time heating (0...255) * 1 min; 0 = inactive	0...**50**...255	Separate setting of the "Reset time" control parameter. This parameter is only visible if "Type of heating = via control parameter" and the heating control type "PI control".
Top hysteresis of the 2-point controller heating (5...127) * 0.1 K	**5**...127	Definition of top hysteresis (switch-off temperatures) of the heating. This parameter is only visible if "Type of heating control = Switching 2-point feedback control (ON/OFF)".
Bottom hysteresis of the 2-point controller heating (-128...–5) * 0.1 K	-128...**-5**	Definition of bottom hysteresis (switch-on temperatures) of the heating. This parameter is only visible if "Type of heating control = Switching 2-point feedback control (ON/OFF)".
Type of cooling control (if applicable, for basic and additional stage)	**Continuous PI control** Switching PI control (PWM) Switching 2-point control (ON/OFF)	Selecting a feedback control algorithm (PI or 2-point) with data format (1 byte or 1 bit) for the cooling system
Type of cooling (if applicable, for basic and additional level)	**Cooling ceiling (5 K / 240 min)** Fan convector (4 K / 90 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"

	Split unit (4 K / 90 min) via control parameter	setting, it is possible to set the control parameters in a manner deviating from the predefined values within specific limits. This parameter is only visible if "Type of cooling control = PI control".
Proportional range cooling (10...127) * 0.1 K	10...**50**...127	Separate setting of the "Proportional range" control parameter. This parameter is only visible if "Type of cooling = via control parameter" and the cooling control type "PI control".
Reset time cooling (0...255) * 1 min; 0 = inactive	0...**150**...255	Separate setting of the "Reset time" control parameter. This parameter is only visible if "Type of cooling = via control parameter" and the cooling control type "PI control".
Top hysteresis of the 2-point controller cooling (5...127) * 0.1 K	**5**...127	Definition of top hysteresis (switch-on temperatures) of the cooling. This parameter is only visible if "Type of cooling control = Switching 2-point feedback control (ON/OFF)".
Cooling 2-point controller hysteresis lower limit (-128...–5) * 0.1 K	-128...**-5**	Definition of bottom hysteresis (switch-off temperatures) of the cooling. This parameter is only visible if "Type of cooling control = Switching 2-point feedback control (ON/OFF)".
Operating mode switch-over	**Via value (1 byte)** Via switching (4 x 1 bit)	In the setting "Via value (1-byte) the change-over of the operating modes via the bus takes place according to the KNX specification via a 1-byte value object. In addition, a higher-ranking forced-object is available for this setting. In the setting "Via switching (4 x 1 bit) " the ‘classic’ change-over of the operating modes via the bus is via four separate 1-bit objects.
Operation mode after reset	Restore operation 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 or by push button function (normal priority) 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. Frequent changing of the operating mode (e. g. several times a day) during running operation can adversely affect the life of the device as the read-only memory (EEPROM) used has been designed for less frequent write access events only.
Frost/heat protection	Automatic frost protection **via window status**	Here it is possible to determine how the room temperature regulator switches into the frost/heat protection. With "automatic frost protection": the automatic frost protection is activated. Depending on the room temperature this allows an automatic switch-over into the frost protection mode. With "Via window status": switch-over into the frost/heat protection takes place via the "window status" object.
Automatic frost protection temperature drop	**Off** 0.2 K / min. 0.3 K / min. 0.4 K / min. 0.5 K / min. 0.6 K / min.	This parameter determines the decrease temperature by which the room temperature has to decrease within one minute in order for the controller to switch into the frost protection mode. The "OFF" setting will deactivate the frost protection automatic. Only visible if "frost/heat protection = Automatic frost protection"!
Frost protection period in automatic mode (1...255) * 1 min.	1...**20**...255	The length of the automatic frost protection is defined here. After the preset time has elapsed, the controller will return to the operating mode which was set before frost protection. Re-triggering will not be possible. Only visible if "frost/heat protection = Automatic frost protection"!
Window status delay (0...255) * 1 min.; 0 = inactive	**0**...255	This parameter defines the delay time for the window status. After the parameterised time has elapsed after the window is opened the window status will be changed and thus the frost/heat protection mode activated. Such delay can make sense if short ventilation of the room by opening the window is not supposed to change the operating mode. Only visible if "Frost/heat protection = via window status"!

□↵ Room temperature control (RTC) -> Controller general -> Fan controller

Number of fan levels	No fan levels 1 fan level	The fan controller of the room temperature controller supports up to 8

	2 fan levels **3 fan levels** 4 fan levels 5 fan levels 6 fan levels 7 fan levels 8 fan levels	fan level outputs, for which the actually used number of levels (1...8) is set using this parameter.
Fan level switch-over via	**Switching objects (8 x 1 Bit)** Value object (1 byte)	Depending on the data format of the objects of the controlled actuators, the change-over between the fan levels can either take place via up to 8 separate 1-bit objects or, alternatively, via one 1-byte object. The "Fan level change-over via" parameter defines the data format of the controller. With the 1-bit objects, each fan level discreetly receives its own object. With the 1-byte object, the active fan level is expressed by a value ("0" = Fan OFF / "1" = Level 1 / "2" = Level 2 / "3" = Level 3 / etc.).
Fan threshold value OFF -> Level 1, * 1 %	**1**...100	In automatic operation, the command value of the controller is used internally in the device for automatic control of the fan levels. As a transition between the levels, there are threshold values, defined according to the command value of the controller, which can be set here. If the command value exceeds the threshold value of a level, the appropriate level is activated. If the command value sinks below a threshold value, minus the configured hysteresis, then the change-over takes place into the next lowest fan level.
Fan level 1 threshold value -> Level 2, * 1 %	1...**30**...100	
Fan level 2 threshold value -> Level 3, * 1 %	1...**60**...100	
Fan level 3 threshold value -> Level 4, * 1 %	1...**90**...100	
Fan level 5 threshold value -> Level 6, * 1 %	1...**100**	
Fan level 6 threshold value -> Level 7, * 1 %	1...**100**	
Fan level 7 threshold value -> Level 8, * 1 %	1...**100**	
	1...**3**...50	

Hysteresis between threshold values, *1%		If the command value of the room temperature control has undershot the threshold value minus the hysteresis, the fan controller switches back to the previous level.
Waiting time for level change-over *0.1 s	1...**2**...255	Due to fan motors' inertia, as a rule there is a limit to how short the time intervals for switching the fan levels can be, i.e. there is a limit to how quickly the fan speed can be varied. If the fan controller is working in automatic mode, the settable "Waiting time on level change-over" is maintained on change-over of the levels.
Level limit (max. fan level)	**No level limit** Fan level 1 Fan level 2 Fan level 3 Fan level 4 Fan level 5 Fan level 6 Fan level 7 Fan level 8	To reduce the fan noise of a fan coil, the fan level limit can be activated. The level limit reduces the sound emissions by limiting the maximum fan level to a fan level value configured here (limitation level). The limit can be switched on and off using the "Fan, level limit" 1-bit object and thus activated as necessary. The parameter "Level limit" is not checked for plausibility in the ETS, meaning that an implausible parameterisation is possible. For this reason, care should be taken to ensure that there is no limit level in the configuration which is higher than the actual fan levels. If a higher limit level is configured, then the limit has no effect.
Behaviour on forced position	no forced position Fan level 1 Fan level 2 Fan level 3 Fan level 4 Fan level 5 Fan level 6 Fan level 7 Fan level 8 **Fan level OFF**	The controller provides the option of activating a forced fan position via the bus. With an active forced position, the fan levels can neither be controlled nor switched over in either automatic or manual mode. The fan remains in the forced state until the forced position is removed using the bus. In this manner, it is possible to switch the fan to a locked and controlled state, for example for servicing purposes. As soon as the forced position is activated, the controller jumps to the fan level configured in this parameter without any waiting time. The fan can also be completely switched off.
Object interpretation, automatic/manual fan control	0=Automatic,1=Manual **1=Automatic,0=Manual**	The parameter specifies the polarity of the object for the change-over between automatic and manual fan control. Automatic mode is always active after a device reset.

Fan level on change-over to manual	**no change** Fan level 1 Fan level 2 Fan level 3 Fan level 4 Fan level 5 Fan level 6 Fan level 7 Fan level 8 Fan level OFF	On change-over from automatic operation to manual operation, this parameter then decides whether the fan level most recently set in automatic operation is maintained, the fan is switched off or a defined fan level is set. The parameter "Fan level on change-over to manual" is not checked for plausibility in the ETS, meaning that an implausible parameterisation is possible. For this reason, care should be taken to ensure that there is no level in the configuration which is higher than the actual fan levels. If a level which does not exist is to be configured for the change-over to manual control, then the fan controller changes over to the maximum possible level when changing over to manual operation.
Heating fan run-on time, *0.1 s, 0=Inactive	**0**...255	If the fan is switched-off in automatic or manual operation, it runs on for the time configured at this point, provided that a factor of more than "0" is set. This parameter applies to the controller operating mode "Heating" (if necessary, in the basic and additional levels).
Cooling fan run-on time, *0.1 s, 0=Inactive	**0**...255	If the fan is switched-off in automatic or manual operation, it runs on for the time configured at this point, provided that a factor of more than "0" is set. This parameter applies to the controller operating mode "Cooling" (if necessary, in the basic and additional levels).
Fan protection	**No** Yes	The fan protection function allows the fan of a fan coil unit, which has not been active for some time, to be temporarily switched to the maximum level. In this way, the controller fan motors can be protected against stiffness. In addition, the fan blades and the heat exchanger of the fan coil unit are protected against dust. If the fan protection is to be used, it must be enabled using the "Yes" setting at this point.
Start-up using level	Fan level OFF **Fan level 1** Fan level 2 Fan level 3 Fan level 4 Fan level 5 Fan level 6 Fan level 7 Fan level 8	The fan can, if it was switched off before and should now start up, be switched on at a defined switch-on level. This switch-on level can be any of the available fan levels, and is set using this parameter. The switch-on level is usually one of the higher fan levels of a blower convector. The switch-on level remains active for the "Waiting time on level change-over" configured in the ETS. The parameter "Start-up via level" is not checked for plausibility in the ETS, meaning that an implausible parameterisation is possible. For this reason, care should be taken to ensure that there is no switch-on level in the configuration which is higher than the

		actual fan levels. The fan controller automatically corrects a faulty parameterisation by activating level 1 for the start-up, meaning that the fan starts up normally without a switch-on level.
Command value is 0%, until internal command value is greater than, *1%	**1**...100	The command value evaluated by the fan controller in automatic operation can be optionally limited by this parameter in the bottom command value range.
Command value is 100%, as soon as internal command value is greater than, *1%	1...**99**...100	The command value evaluated by the fan controller in Automatic mode can be optionally limited by this parameter in the top command value range.
Command value offset, *1%	**0**...100	The command value evaluated by the fan controller in Automatic mode can be optionally raised by the static offset configured here. Should the calculation produce a value of over 100 %, then the command value is limited to the maximum value.

□↵ Room temperature control (RTC) -> Controller general -> Command value and status output

Automatic transmission at modification by (0...100) * 1 %; 0 = inactive	0...**3**...100	This parameter determines the size of the command value change that will automatically transmit continuous command value telegrams via the command value objects. Thus this parameter only affects command values which are configured to "Continuous PI control" and to the 1 byte additional command value objects of the "Switching PI control (PWM)".
Cycle time of the switching command value (1...255) * 1 min	1...**15**...255	This parameter specifies the cycle time for the pulse width modulated command value (PWM). Thus this parameter only affects command values which are configured to "Switching PI control (PWM)".
Cycle time for automatic transmission (0...255) * 1 min; 0 = inactive	0...**10**...255	This parameter determines the time interval for the cyclical transmission of the command values via all command value objects.
Output of the heating command value	Inverted (under current, this means closed) **Normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for heating is output normally or in inverted form. This parameter is only visible if the operating mode "Heating" or "Heating and cooling" is configured and not two-level operation.

Output of the heating basic level command value	Inverted (under current, this means closed) **Normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for the heating basic level is output normally or in inverted form. This parameter is only visible if the operating mode "Heating" or "Heating and cooling" is configured along with two-level operation.
Output of the heating additional level command value	Inverted (under current, this means closed) **Normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for the heating additional level is output normally or in inverted form. This parameter is only visible if the operating mode "Heating" or "Heating and cooling" is configured along with two-level operation.
Output of the cooling command value	Inverted (under current, this means closed) **Normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for cooling is output normally or in inverted form. This parameter is only visible if the operating mode "Cooling" or "Heating and cooling" is configured and not two-level operation.
Output of the cooling basic level command value	Inverted (under current, this means closed) **Normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for the cooling basic level is output normally or in inverted form. This parameter is only visible if the operating mode "Cooling" or "Heating and cooling" is configured along with two-level operation.
Output of the cooling additional level command value	Inverted (under current, this means closed) **Normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for the cooling additional level is output normally or in inverted form. This parameter is only visible if the operating mode "Cooling" or "Heating and cooling" is configured along with two-level operation.
Command value limit	**Deactivated** continuously activated can be activated via object	The command value limit allows the restriction of calculated command values to the range limits "minimum" and "maximum". The limits are permanently set in the ETS and, if command value limitation is active, can be neither undershot or exceeded during device operation. The "Command value limit" parameter defines the mode of action of the limiting function. The command value limit can

		either be activated or deactivated using the 1-bit communication object "Command value limit", or be permanently active.
Command value limit after reset	**Deactivated** Activated	When controlling via the object, it is possible to have the controller activate the command value limit automatically after bus voltage return or an ETS programming operation. This parameter defines the initialisation behaviour here. In the "Deactivated" setting, the command value limit is not automatically activated after a device reset. A "1" telegram must first be received via the "Command value limit" object for the limit to be activated. In the "Activated" setting, the controller activates the command value limit automatically after a device reset. To deactivate the limit a "0" telegram must be received via the "Command value limit" object. The limit can be switched on or off at any time using the object. This parameter is only visible with "Command value limit = can be activated via object"!
Minimum command value for heating (optionally also for basic and additional level)	**5%**, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%	The "Minimum command value" parameter specifies the lower command value limiting value for heating. With an active command value limit, the set minimum command value is not undershot by command values. If the controller calculates smaller command values, it sets the configured minimum command value. The controller transmits a 0 % command value if no more heating or cooling energy has to be demanded.
Maximum command value for heating (optionally also for basic and additional level)	55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, **95%**, 100%	The "Maximum command value" parameter specifies the upper command value limiting value for heating. With an active command value limit, the set maximum command value is not exceeded. If the controller calculates larger command values, it sets the configured maximum command value.
Minimum command value for cooling (optionally also for basic and additional level)	**5%**, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%	The "Minimum command value" parameter specifies the lower command value limiting value for cooling. With an active command value limit, the set minimum command value is not undershot by command values. If the controller calculates smaller command values, it sets the configured minimum

		command value. The controller transmits a 0 % command value if no more heating or cooling energy has to be demanded.
Maximum command value for cooling (optionally also for basic and additional level)	55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, **95%**, 100%	The "Maximum command value" parameter specifies the upper command value limiting value for cooling. With an active command value limit, the set maximum command value is not exceeded. If the controller calculates larger command values, it sets the configured maximum command value.
Heating message	Yes **No**	Depending on the set operating mode, a separate object can be used to signal whether the controller for the first control circuit is currently demanding heating energy and is thus actively heating. The "Yes" setting here enables the message function for heating.
Cooling message	Yes **No**	Depending on the set operating mode, a separate object can be used to signal whether the controller for the first control circuit is currently demanding cooling energy and is thus actively cooling. The "Yes" setting here enables the message function for cooling.
Controller status	no status **KNX compliant** Controller general Transmit individual state	The room temperature controller can transmit its current status to the KNX/EIB. A choice of data formats is available for this. This parameter enables the status signal and sets the status format.
Single status	**Comfort mode** Active Standby mode activated Night mode activated Frost/heat protection active Controller disabled Heating / cooling Controller inactive Frost alarm	Here, the status information is defined, which is to be transmitted onto the bus as the 1-bit controller status. This parameter is only visible if the parameter "Controller status" is set to "Transmit single status".

Behaviour when command value = 100% (Clipping mode)	**keep 100% until setpoint = actual, then 0%** keep 100% as required, then adjust downwards	If with a PI control the calculated command value of the controller exceeds the physical limits of the actuator, in other words if the calculated command value is greater than 100%, then the command value is set to the maximum value (100%) and thus limited. With PI control the command value can reach the value "100%" if there is a large deviation of the room temperature from the setpoint temperature or the controller requires a long time to adjust to the setpoint with the heating or cooling energy that is being applied. The controller can evaluate this state in a particular manner and react to it in various ways. This parameter defines the functions of the PI controller when the command value is 100%. "keep 100% until setpoint = actual, then 0%" setting: The controller keeps the maximum command value until the room temperature (actual value) reaches the setpoint temperature. After that is reduces the command value down to 0% all at once (controller reset). The advantage of this control behaviour is that in this way sustainable heating up of undercooled rooms or effective cooling of overheated rooms will be achieved by overshooting the setpoint. The disadvantage is the in some circumstances the overshooting of the room temperature may be found disturbing. Setting "keep 100% as required, then adjust downwards": The controller maintains the maximum command value only as long as it is necessary. After that it adjusts the command value downwards according to the PI algorithm. The advantage of this control characteristic is the fact that the room temperature does not exceed the setpoint temperature at all, or only slightly. The disadvantage is that this control principle increases the tendency to oscillate about the setpoint.

□↵ Room temperature control (RTC) -> Controller general -> Setpoints

Overwrite setpoints in device after ETS programming operation?	**Yes** No	The temperature setpoints 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 on "Yes", then the temperature setpoints are deleted in the device during a programming operation and replaced by the values of the ETS. If this parameter is configured to "No", then setpoints present in the device remain unchanged. The setpoint temperatures entered in the ETS then have no significance.
Basic temperature after reset (7.0...40.0) * 1°C	7.0...**21.0**...40.0	This parameter defines the temperature value to be applies as the basic setpoint after commissioning by the ETS. All the temperature setpoints are derived from the basic setpoint.
Accept change of the basic setpoint shift permanently	**No** Yes	In addition to the setting of individual temperature setpoints via the ETS or via a basic setpoint the user is able to shift the basic setpoint within a settable range via the basic setpoint object with the "setpoint or shift" push-button function, if this is configured to a function button or sensor surface. Whether a basic setpoint shifting only affects the currently active operating mode or whether it influences all other setpoint temperatures of the remaining operating modes is determined by this parameter. In the "Yes" setting, the shift of the basic setpoint carried out affects all operating modes. The shifting is maintained even after change-over of the operating mode or the heating/cooling mode or readjusting the basic setpoint. In the "No" setting, the basic setpoint shift carried out is in effect for only as long as the operating mode or heating/cooling mode has not changed or the basic setpoint is maintained. Otherwise the setpoint shift will be reset to "0".
Modification of the basic temperature setpoint value	Deactivated **approve via bus**	Here, it is possible to specify if it is possible to change the basic setpoint via the bus.
Accept modification of the basic temperature	**No** Yes	One has to distinguish between two cases, defined by this parameter, if the

setpoint value permanently?		basic setpoint has been modified via the object. When set to "Yes": If, with this setting, the temperature setpoint is adjusted, the controller saves the value permanently to the EEPROM (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. With this setting, it should be noted that frequent changing of the basic temperature (e.g. several times a day because of cyclical telegrams) can affect the product life of the device as the non-volatile storage is designed for less frequent write access. When set to "No": The setpoints set on the room temperature controller or received via the objects remain active only temporarily. In case of a bus voltage failure or following a switch-over to another operating mode (e.g. Comfort followed by Standby, or also Comfort followed by Comfort), or after a switch-over of the heating/cooling mode (e.g. heating after cooling), the last setpoint changed will be discarded and replaced by the initial value.
Frost protection setpoint temperature (7.0...40.0)	**7.0**...40.0	This parameter specifies the setpoint temperature for frost protection. The parameter is only visible in "Heating" or "Heating and cooling" operating modes (if necessary with additional levels).
Heat protection setpoint temperature (7.0...45.0)	7.0...**35.0**...45.0	This parameter specifies the setpoint temperature for heat protection. The parameter is only visible in "Cooling" or "Heating and cooling" operating modes (if necessary with additional levels).
Deadband position	symmetrical **asymmetrical**	The comfort setpoint temperatures for "Heating and cooling" operating modes are derived from the basic setpoint in consideration of the adjusted deadband. The deadband (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures. Symmetrical setting: the deadband preset in the ETS plug-in is divided in two parts at the basic setpoint. 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 "Heating and cooling" operating modes (if necessary with additional levels)!
Deadband between heating and cooling (0...127) * 0.1 K	0...**20**...127	The comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the adjusted deadband. The deadband (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures. It is set using this parameter. The parameter is only visible in "Heating and cooling" operating modes (if necessary with additional levels).
Difference between basic and additional levels (0...127) * 0.1 K	0...**20**...127	In a two-level control mode, it is necessary to determine the temperature difference to the basic level with which the additional level is to be incorporated into the feedback control. This parameter defines the level spacing. The parameter can only be seen in two-level control operation.
Transmission at setpoint temperature change by (0...255) * 0.1 K	0...**1**...255	Determines the size of the value change required to automatically transmit the current value via the "Setpoint temperature" object. In the "0" setting, the setpoint temperature is not transmitted automatically when there is a change.
Cyclical transmission of setpoint temperature (0...255) * 1 min; 0 = inactive	**0**...255	This parameter determines whether the setpoint temperature is to be transmitted periodically via the "Setpoint temperature" object. Definition of the

		cycle time by this parameter In the "0" setting, the setpoint temperature is not transmitted automatically cyclically.
Upward adjustment of the basic setpoint temperature (0...10) * 1 K	**+ 2 K**	This is used to show the maximum range in which the basic setpoint temperature can be adjusted upwards. This parameter cannot be changed!
Downward adjustment of the basic setpoint temperature (-10...0) * 1 K	**- 2 K**	This is used to show the maximum range in which the basic setpoint temperature can be adjusted downwards. This parameter cannot be changed!
Step width of the 4-level setpoint shift	**0.5 K**	This parameter defines the value of a level of the basic setpoint shift. The basic setpoint can be shifted by up to 4 levels. The parameter cannot be changed!
Lower the setpoint temperature during standby operating mode (heating) (-128...0) * 0.1 K	-128...**-20**...0	The value by which the standby setpoint temperature for heating is lowered compared to the heating comfort temperature. The parameter is only visible in "Heating" or "Heating and cooling" operating modes (if necessary with additional levels).
Lower the setpoint temperature during Night mode (heating) (-128...0) * 0.1 K	-128...**-40**...0	The value by which the night setpoint temperature for heating is lowered compared to the heating comfort temperature. The parameter is only visible in "Heating" or "Heating and cooling" operating modes (if necessary with additional levels).
Raise the setpoint temperature during standby operating mode (cooling) (-128...127) * 0.1 K	0...**20**...127	The value by which the standby setpoint temperature for cooling is lowered compared to the cooling comfort temperature. The parameter is only visible in "Cooling" or "Heating and cooling" operating modes (if necessary with additional levels).
Raise the setpoint temperature during Night mode (cooling) (-128...127) * 0.1 K	0...**40**...127	The value by which the night temperature for cooling is lowered compared to the cooling comfort temperature.

		The parameter is only visible in "Cooling" or "Heating and cooling" operating modes (if necessary with additional levels).
Change-over between heating and cooling	**Automatic** Via object (heating/cooling change-over)	In a configured mixed mode it is possible to switch over between heating and cooling. With "Automatic": Depending on the operating mode and the room temperature, the change-over takes place automatically. With "Via object (heating/cooling change-over)": The change-over takes place only via the object "Heating / cooling change-over".
Heating / cooling operating mode after reset	**Heating** Cooling Operating mode before reset	The preset operating mode for after the return of the bus voltage is specified here. Only visible if "Change-over between heating and cooling = via object"!
Automatic heating/ cooling switch-over transmission	**On changing the operating mode** On changing the output value	Here, it is possible to specify when a telegram is transmitted automatically onto the bus via the object "Heating / cooling change-over". Only visible if "Change-over between heating and cooling = automatic".
Cyclical transmission heating/cooling change-over (0...255) * 1 min; 0 = inactive	**0**...255	This parameter specifies whether the current object status of the "Heating / cooling change-over" object should be output cyclically to the bus on an automatic change-over. The cycle time can be set here. The "0" setting will deactivate the periodic transmission of the object value. Only visible if "Change-over between heating and cooling = automatic".
Setpoint temperature limit in cooling operation	**No limit** Only difference to outdoor temperature Only max. setpoint temperature Max. setpoint and difference to outdoor temperature	Optionally, the setpoint temperature limit can be enabled here, which is only effective in cooling operation. If necessary, the controller limits the setpoint temperature to specific values and prevents an adjustment beyond the limits. "Only difference to outdoor temperature" setting, the outdoor temperature is monitored and compared to the active setpoint temperature in this setting. The specification of the maximum temperature difference to the outdoor

temperature is made using the "Difference to outdoor temperature in cooling mode" parameter. If the outdoor temperature rises above 32 °C, then the controller activates the setpoint temperature limit. It then permanently monitors the outdoor temperature and raises the setpoint temperature so that is beneath the outdoor temperature by the amount configured. Should the outdoor temperature continue rise, the controller raises the setpoint temperature until the required difference to the outdoor temperature is achieved, or, at most, the heat protection temperature. It is then not possible to undershoot the raised setpoint, e.g. by changing the basic setpoint change. The change to the setpoint temperature limit is temporary. It only applies for as long as the outdoor temperature exceeds 32 °C.

"Only max. setpoint temperature" setting: In this setting, no setpoint temperatures are permitted in Cooling mode related to the Comfort, Standby and Night modes, which are greater than the maximum setpoints configured in the ETS. The maximum temperature setpoint is specified by the "Max. setpoint temperature in cooling operation" parameter. With an active limit, no larger setpoint can be set in cooling operation, e.g. by a basic setpoint change or a setpoint shift. However, heat protection is not influenced by the setpoint temperature limit.

"Max. setpoint temperature and difference to outdoor temperature" setting: This setting is a combination of the two above-mentioned settings. In the downward direction, the setpoint temperature is limited by the maximum outdoor temperature difference, whilst in the upward direction, the limit is made by the maximum setpoint. The maximum setpoint temperature has priority over the outdoor temperature difference. This means that the controller keeps on raising the setpoint temperature upwards according to the difference to the outdoor temperature configured in the ETS until the maximum setpoint temperature or the heat protection temperature is exceeded. Then the setpoint is limited to the maximum value.

Activation of the setpoint temperature limit in cooling operation via object	**No** Yes	A setpoint limit enabled in the ETS can be activated or deactivated as necessary using a 1-bit object. For this, this parameter can be set to "Yes". In this case, the controller only takes the setpoint limit into account, if it has been enabled via the object "Cooling setpoint temp. limit" ("1" telegram). If the limitation is not enabled ("0" telegram), the cooling setpoint temperatures are not limited. This parameter is visible only if setpoint temperature monitoring is enabled.
Difference to outdoor temperature in cooling operation	1 K...**6 K**...15 K	This parameter defines the maximum difference between the setpoint temperature in Comfort mode and the outdoor temperature with an active setpoint temperature limit. This parameter is visible only if setpoint temperature monitoring is enabled. However, this is only if the parameter "Setpoint temperature limit in cooling operation" is then set to "Only difference to outdoor temperature" or "Max. setpoint temperature and difference to outdoor temperature".
Max. setpoint temperature in cooling operation	20°C...**26°C**...35°C	This parameter defines the maximum setpoint temperature in Comfort mode with an active setpoint temperature limit. This parameter is visible only if setpoint temperature monitoring is enabled. However, this is only if the parameter "Setpoint temperature limit in cooling operation" is then set to "Only max. setpoint temperature" or "Max. setpoint temperature and difference to outdoor temperature".

□↵ Room temperature control (RTC) -> Controller functionality

Presence detection	none **Presence button** Motion detector	In the "None" setting, the presence mode is deactivated. In the "Presence button" setting, presence detection takes place using a button on the device or via the presence 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 "Motion detector" setting, presence detection takes place using an external motion detector, coupled to the presence object. Comfort mode is recalled when a presence is detected.

		Comfort mode remains active until the motion detector ceases to detect movement. In this setting, a presence button on the device has no function.
Length of the comfort extension (0...255) * 1 min; 0 = OFF	0...**30**...255	When the presence button is pressed from the Night mode or Frost/heat protection, the controller switches to Comfort mode for the length of time specified here. When this time has elapsed, it switches back automatically. In the "0" setting, the comfort extension is switched off, meaning that it cannot be activated from Night or Frost/heat protection mode. In this case, the operating mode will not be changed, although the presence function has been activated. This parameter is only visible when presence detection is configured to "Presence button".
Switch off controller (dew point operation)	**No** via bus	This parameter enables the "Disable controller" object. If the controller is disabled, there is no feedback control until enabled in both control circuits (command values = 0).
Valve protection	**No** Yes	Valve protection may be carried out periodically in order to prevent the addressed control valves of the heater or cooling system from becoming calcified or stuck. The "Yes" setting in this parameter activates valve protection. This type of protection is generally started not only for non-active command value outputs, i.e. for outputs which have not requested any heating or cooling energy over the past 24 hours. For these outputs, the controller will periodically set the command value to the maximum value once a day for a duration of approx. 5 minutes.
Switching time 1	**not active** active	The device has an integrated weekly timer and can be configured using the ETS. The timer has up to 8 switching times, which directly affect the configured KNX channels (1...30) in the device. This parameter specifies whether the first switching time is enabled or disabled. Only active switching times are executed. Inactive switching times in the ETS can subsequently be activated on the device after commissioning. Similarly, activated switching times can

		subsequently be deactivated on the display pages of the switching times by means of ETS.
Switching time hour	0...**8**...23	The switching time is specified here. This parameter defines the hours (0...23 / 24h-format) of the switching time event.
Switching time minute	**0**...59	The switching time is specified here. This parameter defines the minutes (0...59) of the switching time. For the switching times preset in the ETS to be correctly transferred to the device during a programming operation, the parameter "Overwrite timer parameter" in the parameter node "Display" must be set to "Yes". Before putting into operation for the first time, this parameter should be set to "Yes". Otherwise, the switching times preset in the ETS are not transferred to the device.
Monday	not active **active**	This parameter specifies whether the switching time event is to take place on Mondays. In the "active" setting, the weekday of the switching time is assigned.
Tuesday	not active **active**	This parameter specifies whether the switching time event is to take place on Tuesdays. In the "active" setting, the weekday of the switching time is assigned.
Wednesday	not active **active**	This parameter specifies whether the switching time event is to take place on Wednesdays. In the "active" setting, the weekday of the switching time is assigned.
Thursday	not active **active**	This parameter specifies whether the switching time event is to take place on Thursdays. In the "active" setting, the weekday of the switching time is assigned.
Friday	not active **active**	This parameter specifies whether the switching time event is to take place on Fridays. In the "active" setting, the

		weekday of the switching time is assigned.
Saturday	not active **active**	This parameter specifies whether the switching time event is to take place on Saturdays. In the "active" setting, the weekday of the switching time is assigned.
Sunday	not active **active**	This parameter specifies whether the switching time event is to take place on Sundays. In the "active" setting, the weekday of the switching time is assigned.
Astro	**No** Light Blind	This parameter defines whether the astro function is activated for the switching time event concerned. The parameter additionally defines the astro behaviour which determines whether a lighting (setting "light") or a blind, shutter or awning (setting "shading") is activated by the astro function. In the "No" setting, the astro function is inactive for the switching time.
Random offset	Yes **No**	This parameter specifies whether the random function is activated for the switching time event concerned. If the setting is "yes", the assigned switching time is triggered offset in a set random period (+/- 15 minutes). The "no" setting deactivates the random function.
Channel no.	Not assigned **Channel 1 : Designation, channel 1** .. Channel 30 : Designation, channel 30	For each switching time it is necessary to specify which KNX channel it affects. The parameter "Channel no." assigns the switching time to one of the KNX channels (1...30) available in the device. Care must be taken to ensure that only channels are allocated that are also available in the channel configuration in the parameter nodes "channels..." i.e. were configured with channel functions! Channels 24...30 are only available and consequently only assignable to a switching time if no weather station page is configured.
Switching value	**ON/Lowering** OFF/Raising	Depending on the function of the allocated KNX channel, the switching time executes a channel command when executing a switching time. This parameter defines which channel

		command should be executed for the channel functions "switching", "dimming (Start/Stop)" and "Venetian blind/shutter (Step/Move/Step)". The ETS parameters "switching value", "1-byte switching value" and "2-byte switching value" are always visible. The function of the allocated KNX channel defines which of these parameters is enabled In the channel functions "scene extension" and "operating mode switchover internal" none of the aforementioned parameters are enabled. In these cases, the channel command of the timer is specified directly by the configuration of the KNX channel.
1-byte switching value	0...**255**	Depending on the function of the allocated KNX channel, the switching time executes a channel command when executing a switching time. This parameter defines which channel command should be executed for the channel functions "dimming (brightness value)", "Venetian blind/shutter (position)" and "1-byte value transmitter". The ETS parameters "switching value", "1-byte switching value" and "2-byte switching value" are always visible. The function of the allocated KNX channel defines which of these parameters is enabled In the channel functions "scene extension" and "operating mode switchover internal" none of the aforementioned parameters are enabled. In these cases, the channel command of the timer is specified directly by the configuration of the KNX channel.
2-byte switching value	-671088.64... **0.0** ...670760.96	Depending on the function of the allocated KNX channel, the switching time executes a channel command when executing a switching time. This parameter defines which channel command should be executed for the channel functions "2-byte value transmitter" and "setpoint shift, internal". The value that the user enters in the entry field is converted by the ETS PlugIn to the KNX data type 9.0xx (floating-point numbers) and written in the ETS database. This can result in value adjustments due to rounding. In the channel function "setpoint shift internal", it should be noted that the device only accepts values within the value range of the setpoint shift (-4...0...+4). Entered values which

contain decimal places are rounded to the nearest whole number, of course. The ETS parameters "switching value", "1-byte switching value" and "2-byte switching value" are always visible. The function of the allocated KNX channel defines which of these parameters is enabled In the channel functions "scene extension" and "operating mode switchover internal" none of the aforementioned parameters are enabled. In these cases, the channel command of the timer is specified directly by the configuration of the KNX channel.

4.2.5.3 Temperature measurement

Description	Values	Comment
□↵ Temperature measurement		
Temperature detection	**internal sensor** received temperature value internal sensor + received temperature value	The "Temperature detection" parameter specifies the sensors to detect the room temperature. Setting "internal sensor": the temperature sensor integrated in the room temperature controller is activated. Thus, the actual temperature value is determined only locally on the device. In this parameterisation the feedback control will start directly after a device reset. "Received temperature value" setting; Actual temperature is determined solely via a temperature value received from the bus. The sensor, in this case, can be a KNX/EIB room thermostat coupled via the 2-byte object "Received temperature". After a device reset the room temperature controller will first wait for a valid temperature telegram until the feedback control starts and a command value, if applicable, is output. Setting "internal sensor + received temperature value": In these settings, the selected temperature sources are combined together. The sensors in this case are the temperature sensor integrated in the device and a KNX/EIB room thermostat coupled via the 2-byte object "Received temperature". After a device reset the room temperature controller will first wait for a valid temperature telegram until the feedback control starts and a command value, if applicable, is output.
Measured value formation, temperature value to be received internally	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 sensor and the temperature value received from the bus 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 "temperature recording = internal sensor + received temperature value!
Internal sensor calibration (-128...127) * 0.1 K	-128...**0**...127	Determines the value by which the internal sensor's room temperature value is calibrated. This parameter is only visible when the temperature recording system requires an internal sensor.

Calibration of received temperature value (-128...127) * 0.1 K	-128...**0**...127	Determines the value by which the temperature value received from the bus is calibrated. This parameter is only visible when the temperature recording system requires that a temperature value is received.
Request time for received temperature value (0...255) * 1 min; 0 = inactive	**0**...255	The request time for the temperature value received from the bus is specified here. In the "0" setting, the temperature value is not automatically polled by the controller. In this case the communication partner must transmit its temperature value itself. This parameter is only visible when the temperature recording system requires that a temperature value is received.
Transmission when room temperature change by (0...255) * 0.1 K; 0 = inactive	0...**3**...255	Determines the size of the value change of the room temperature after which the current values are automatically transmitted on the bus via the "Actual temperature" object.
Cyclical transmission of room temperature (0...255) * 1 min; 0 = inactive	0...**15**...255	This parameter specifies whether and when the determined room temperature is to be periodically output via the "Actual temperature" object.

4.2.5.4 Push-button extension module

Description	Values	Comment
□↵ Push-button extension module -> Button configuration		
Type of extension module		
	no PBEM 1-gang 2-gang 3-gang 4-gang	If an extension module is connected to the Smart Control, the type of extension module must be configured here.
Light period of status LED for button-press display	1 sec 2 sec **3 sec** 4 sec 5 sec	This parameter defines the switch-on time the status LED is lit up to indicate actuation. The setting concerns all status LEDs of the extension module whose function is set to "Button-press display".
□↵ Push-button extension module -> Button configuration -> Operation concept of extension module		
Operation concept of module buttons 1 and 2 (The same parameters are available for the other operating areas / button pairs of the extension module.)	**Rocker function (Rocker 1)** Button function	For each control surface of the extension module, 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.
Button evaluation (The same parameters are available for the other operating areas / button pairs of the extension module.)	Single area operation (only as button 1) **Double-area operation (as buttons 1 + 2)**	If the operation concept of an operating area is configured as "push button function", this parameter can be used to specify whether single-surface or double-surface operation should be implemented. In single-surface operation, the entire control surface is evaluated only as a single "large" button. The surface can be depressed at any desired point in order to execute the underlying push button function. In this setting, the button with the even button number of the button pair (e.g. button 2) is inactive and physically not present. In double-surface operation, the operating area is divided into two mutually independent buttons.
Button arrangement (The same parameters are available for the	Left / right **Top / bottom**	In the rocker function and in the pushbutton function with double-surface principle, for each operating area the user can independently specify whether

other operating areas / button pairs of the extension module.)		it is to be divided horizontally or vertically. This defines the actuation points of the operating areas.

□↵ Push-button extension module -> Button configuration -> Operation concept of extension module -> Module rocker switch 1 (buttons 1/2)

Function	**No function** Switching Dimming Venetian blind Value transmitter 1-byte 2-byte value transmitter Scene extension 2-channel operation	This parameter is used to define the basic function of the rocker. Depending on this choice, the ETS displays different communication objects and parameters for this rocker.

The following parameters are only visible for the rocker function "Switching"...

Command on pressing rocker 1.1	No function **ON** OFF TOGGLE	Depending on the "button arrangement" parameter, these parameters define the reaction that takes place when the top (or left-hand) rocker is pressed or released.
Command on releasing rocker 1.1	**No function** ON OFF TOGGLE	
Command on pressing rocker 1.2	No function ON **OFF** TOGGLE	Depending on the "button arrangement" parameter, these parameters define the reaction that takes place when the bottom (or right-hand) rocker is pressed or released.
Command on releasing rocker 1.2	**No function** ON OFF TOGGLE	

The following parameters are only visible for the rocker function "Dimming"...

Command on pressing rocker 1.1	No reaction **Brighter (ON)** Darker (OFF) Brighter / darker (TOGGLE) Brighter (TOGGLE) Darker (TOGGLE)	Depending on the "Button arrangement" parameter, this parameter defines the reaction that takes place when the top (or left-hand) rocker is pressed. If the push button sensor is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be linked with one another. In the "Brighter/darker (TOGGLE)" setting, the dimming objects must be interlinked as well so that the push button sensor can send the correct telegram on the next button-press.

Command on pressing rocker 1.2	No reaction Brighter (ON) **Darker (OFF)** Brighter / darker (TOGGLE) Brighter (TOGGLE) Darker (TOGGLE)	Depending on the "Button arrangement" parameter, this parameter defines the reaction that takes place when the bottom (or right-hand) rocker is pressed. If the push button sensor is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be linked with one another. In the "Brighter/darker (TOGGLE)" setting, the dimming objects must be interlinked as well so that the push button sensor can send the correct telegram on the next button-press.
Time between switching and dimming, rocker 1.1 (100...50000 x 1 ms)	100...**400**...50000	This parameter defines how long the top (or left-hand) rocker must be pressed for the pushbutton sensor to send a dimming telegram.
Time between switching and dimming, rocker 1.2 (100...50000 x 1 ms)	100...**400**...50000	This parameter defines how long the bottom (or right-hand) rocker must be pressed for the pushbutton sensor to send a dimming telegram.
Advanced parameters	Activated **Deactivated**	When the advanced parameters are activated, the ETS shows the following parameters.
Advanced parameters activated...		
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 level. Especially with smaller dimming levels it is advisable for the push button sensor to repeat the dimming telegrams automatically (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 level. Especially with smaller dimming levels it is advisable for the push button sensor to repeat the dimming telegrams automatically (see "telegram repetition").
Transmit stop telegram?		

	Yes No	On "Yes" the push button sensor transmits a telegram for stopping the dimming process when the rocker is released. When the push button sensor transmits telegrams for dimming in smaller levels, the stop telegram is generally not needed.
Telegram repeat?	Yes **No**	This parameter can be used to activate telegram repetition for dimming. With the button held down, the push button sensor will then transmit the relative dimming telegrams (in the programmed level width) until the button is released.
Time between two telegrams	**200 ms** 300 ms 400 ms 500 ms 750 ms 1 sec 2 sec	This parameter defines the interval at which the dimming telegrams are automatically repeated in the telegram repetition mode. Visible only if "Telegram repetition = Yes"!
Full-surface operation	enabled **disabled**	When the full-surface operation is enabled, the ETS shows the following parameters.
Function for full-surface operation	**Switching** Scene recall without storage function Scene recall with storage function	In case of full-surface operation, this parameter defines the function that is to be used. The ETS shows the corresponding communication object and the other parameters. If the push button sensor is to recall a scene with storage function by full-surface actuation, it will make a distinction between a brief press (less than 1 s), a sustained press (longer than 5 s) and an invalid button-press (between 1 s and 5 s). A brief press recalls the scene, a sustained press stores a scene and an invalid full-surface operation is ignored. Visible only if "Full-surface operation = enabled"!
Command for full-surface operation	ON OFF **TOGGLE**	This parameter defines the value of the transmitted telegram when a full-surface operation has been sensed. "TOGGLE" changes over the current object value. Visible only if "Full-surface operation = enabled"!
Scene number (1 … 64)	**1**, 2, ... 64	This parameter defines the scene number which is to be transmitted to the

		bus after a scene recall or during storage of a scene. Visible only if "Full-surface operation = enabled"!

The following parameters are only visible for the rocker function "Venetian Blind"...

Command on pressing rocker	**Rocker X.1:UP / Rocker X.2: DOWN** Rocker X.1:DOWN / Rocker X.2: UP Rocker X.1:TOGGLE / Rocker X.2: TOGGLE	This parameter defines the running direction of a drive after a button-press. If the setting is "TOGGLE", the direction is changed after each long time command. If several push buttons are to control the same drive, the long time objects of the push buttons must be interlinked for a correct change of the running direction.
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 Rocker 1.1 (1...3000 x 100 ms)	1...**4**...3000	This parameter sets the time after which the long time operation will be evaluated on pressing the top (or left-hand) button of the rocker. This parameter is not visible with "Operation concept = long – short"!
Time between short-time and long-time command Rocker 1.2 (1...3000 x 100 ms)	1...**4**...3000	This parameter sets the time after which the long time operation will be evaluated on pressing the bottom (or right-hand) button of the rocker. This parameter is not visible with "Operation concept = long – short"!
Slat adjusting time rocker 1.1 (0…3000 x 100 ms)	0...**5**...3000	Time during which a transmitted long time telegram can be terminated by releasing the top (or left-hand) button of the rocker (short time). This function serves to adjust the slats of a blind. This parameter is not visible with "Operation concept = long – short"!
Slat adjusting time, rocker 1.2 (0…3000 x 100 ms)	0...**5**...3000	Time during which a transmitted long time telegram can be terminated by releasing the bottom (or right-hand) button of the rocker (short time). This function serves to adjust the slats of a blind. This parameter is not visible with

		"Operation concept = long – short"!
Full-surface operation	enabled **disabled**	When the full-surface operation is enabled, the ETS shows the following parameters. Full-surface operation can only be programmed if "Operation concept = long – short or short"!
Function for full-surface operation	**Switching** Scene recall without storage function Scene recall with storage function	In case of full-surface operation, this parameter defines the function that is to be used. The ETS shows the corresponding communication object and the other parameters. If the push button sensor is to recall a scene with storage function by full-surface actuation, it will make a distinction between a brief press (less than 1 s), a sustained press (longer than 5 s) and an invalid button-press (between 1 s and 5 s). A brief press recalls the scene, a sustained press stores a scene and an invalid full-surface operation is ignored. Visible only if "Full-surface operation = enabled"!
Command for full-surface operation	ON OFF **TOGGLE**	This parameter defines the value of the transmitted telegram when a full-surface operation has been sensed. "TOGGLE" changes over the current object value. Visible only if "Full-surface operation = enabled"!
Scene number (1...64)	**1**, 2, ... 64	This parameter defines the scene number which is to be transmitted to the bus after a scene recall or during storage of a scene. Visible only if "Full-surface operation = enabled"!

The following parameters are only visible for the rocker function "Value transmitter 1 byte"...

Function	Rocker X.1 / X.2 no function **Rocker X.1: 0...255 /** **Rocker X.2: 0...255 /** Rocker X.1: 0...100 % / Rocker X.2: 0...100 % Rocker X.1: 0...255 / Rocker X.2: no function Rocker X.1: 0...100 % /	A rocker configured as "Value transmitter 1 byte" permits selecting whether the values to be transmitted are interpreted as integers from 0 to 255 or as a percentage from 0 % to 100 %. The following parameters and their settings depend on this distinction.

	Rocker X.2: no function Rocker X.1: no function / Rocker X.2: 0...255 Rocker X.1: no function / Rocker X.2: 0...100 %	
Value, rocker 1.1 (0...255)	**0**...255	Depending on the "Button arrangement" parameter, this parameter defines the object value when the top (or left-hand) rocker is pressed. Visible only if "Function = 0…255"!
Value, rocker 1.2 (0...255)	**0**...255	Depending on the "Button arrangement" parameter, this parameter defines the object value when the bottom (or right-hand) rocker is pressed. Visible only if "Function = 0…255"!
Value, rocker 1.1 (0...100 %)	**0**...100	Depending on the "Button arrangement" parameter, this parameter defines the object value when the top (or left-hand) rocker is pressed. Visible only if "Function = 0...100 %"!
Value, rocker 1.2 (0...100 %)	**0**...100	Depending on the "Button arrangement" parameter, this parameter defines the object value when the bottom (or right-hand) rocker is pressed. Visible only if "Function = 0...100 %"!
Value adjustment by long button-press	enabled **disabled**	If value adjustment by long button-press is enabled, the ETS shows further parameters. Value adjustment begins, when the button is held down for more than 5 s. In this case, the respective status LED flashes as a sign that a new telegram has been transmitted.
Starting value in case of value adjustment	Same as configured value Same as value after last adjustment **Same as value from communication object**	Value adjustment can begin with different starting values. In the setting "Same as parameterised value", after each long press the pushbutton sensor always starts with the value programmed in the ETS. In the setting "Same as value after last adjustment", after a long press the pushbutton sensor starts with the value transmitted by itself or by another device with this group address as the last value. In the setting "Same as value from

		communication object", after a long press the pushbutton sensor starts with the value transmitted by itself or by another device with this group address as the last value. This parameter is only visible if "Value adjustment by long button-press = enabled"!
Direction of value adjustment	Upwards Downwards **Toggling (alternating)**	With a long press, the push button sensor 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. This parameter is only visible if "Value adjustment by long button-press = enabled"!
Step width (1...15)	**1**...15	In a value adjustment, the pushbutton sensor 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 (0 or 0 %) or if it exceeds the upper limit (255 or 100%), the sensor adapts the step width of the last step automatically. This parameter is only visible if "Value adjustment by long button-press = enabled"!
Time between two telegrams	**0.5 sec** 1 sec 2 sec 3 sec	In a value adjustment, the pushbutton sensor 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 (0 or 0 %) or if it exceeds the upper limit (255 or 100%), the sensor adapts the step width of the last step automatically. This parameter is only visible if "Value adjustment by long button-press = enabled"!
Value adjustment with overflow ?	Yes **No**	If value adjustment is to be effected without overflow (setting "No") and if the pushbutton sensor reaches the lower limit of the adjustment range (0 or 0 %) or the upper limit (255 or 100 %) during value adjustment, the adjustment will be stopped automatically by the sensor. If the value adjustment with overflow is programmed (setting "Yes") and if the push button sensor reaches the lower or the upper limit, it will transmit the value of this range limit and then add a pause the duration of which corresponds to two levels. Thereafter, the push button sensor transmits a telegram with the value of the other range limit and

		continues the value adjustment in the same direction.

The following parameters are only visible for the rocker function "Value transmitter 2 byte"...

Function	**Temperature value transmitter** Brightness value transmitter Value transmitter (0...65535)	A rocker configured as "Value transmitter 1 byte" permits selecting whether the values to be transmitted are to be interpreted as temperature values (0 °C to 40 °C), as brightness values (0 lux to 1500 lux) or as integers (0 to 65535). The following parameters and their settings depend on this selection.
Temperature value (0...40 °C) Rocker 1.1	0...**20**...40	Depending on the "Button arrangement" parameter, this parameter defines the object value when the top (or left-hand) rocker is pressed. Visible only if "Function = Temperature value transmitter"!
Temperature value (0...40 °C) Rocker 1.2	0...**20**...40	Depending on the "Button arrangement" parameter, this parameter defines the object value when the bottom (or right-hand) rocker is pressed. Visible only if "Function = Temperature value transmitter"!
Brightness value Rocker 1.1	0, 50,...**300**..., 1450, 1500 lux	Depending on the "Button arrangement" parameter, this parameter defines the object value when the top (or left-hand) rocker is pressed. Visible only if "Function = Temperature value transmitter"!
Brightness value Rocker 1.2	0, 50,...**300**..., 1450, 1500 lux	Depending on the "Button arrangement" parameter, this parameter defines the object value when the bottom (or right-hand) rocker is pressed. Visible only if "Function = Brightness value transmitter"!
Value (0...65535) Rocker 1.1	**0**...65535	Depending on the "Button arrangement" parameter, this parameter defines the object value when the top (or left-hand) rocker is pressed. Visible only with "Function = Value transmitter (0...65535)"!
Value (0...65535) Rocker 1.2	**0**...65535	Depending on the "Button arrangement" parameter, this parameter defines the

		object value when the bottom (or right-hand) rocker is pressed. Visible only with "Function = Value transmitter (0...65535)"!
Value adjustment by long button-press	enabled **disabled**	If value adjustment by long button-press is enabled, the ETS shows further parameters. Value adjustment begins, when the button is held down for more than 5 s. In this case, the respective status LED flashes as a sign that a new telegram has been transmitted.
Starting value in case of value adjustment	**Same as configured value** Same as value after last adjustment **Same as value from communication object**	Value adjustment can begin with different starting values. This parameter is only visible if "Value adjustment by long button-press = enabled"! In the setting "Same as parameterised value", after each long press the pushbutton sensor always starts with the value programmed in the ETS. In the setting "Same as value after last adjustment", after a long press the pushbutton sensor starts with the value transmitted by itself or by another device with this group address as the last value. In the setting "Same as value from communication object", after a long press the pushbutton sensor starts with the value transmitted by itself or by another device with this group address as the last value. This setting is selectable only if "Function = Value transmitter (0...65535)"!
Direction of value adjustment	Upwards Downwards **Toggling (alternating)**	With a long press, the push button sensor 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. Visible only if "Value adjustment by long button-press = enabled"!
Step width	**1 °C**	For temperature values, the step size of the adjustment is fixed to 1°C. Visible only if "Function = Temperature value transmitter" and "Value adjustment by long button-press = enabled"!
Step width	**50 lux**	For brightness values, the step width of the adjustment is fixed to 50 lux. Visible only if "Function = Brightness value transmitter" and "Value adjustment by long button-press = enabled"!

Step width	1 2 5 10 20 50 75 100 200 500 750 **1000**	This parameter sets the step width of the value adjustment for the 2-byte value transmitter. Only visible if "Function = Value transmitter (0 ... 65535)" and "Value adjustment by long button-press = enabled"!
Time between two telegrams	0.5 sec **1 sec** 2 sec 3 sec	This parameter defines the interval at which the push button sensor transmits new telegrams during a value adjustment. Visible only if "Value adjustment by long button-press = enabled"!
Value adjustment with overflow	Yes **No**	If value adjustment is to be effected without overflow (setting "No") and if the pushbutton sensor reaches the lower limit of the adjustment range (0°C, 0 lux, 0) or the upper limit (40°C, 1500 lux, 65535) during value adjustment, the adjustment will be stopped automatically by the sensor. If the value adjustment with overflow is programmed (setting "Yes") and if the push-button sensor reaches the lower or the upper limit, it will transmit the value of this range limit and then add a pause the duration of which corresponds to two levels. Thereafter, the push button sensor transmits a telegram with the value of the other range limits and continues the value adjustment in the same direction.

The following parameters are only visible for the rocker function "Scene extension"...

Function	**Scene extension without storage function** Scene extension with storage function Recall of internal scene extension without storage function Recall of internal scene with storage function	This parameter defines the functionality of the extension. If the push button sensor is used as a scene extension, the scenes can either be stored in one or in several other KNX/EIB devices (e.g. light scene push button sensor). During a scene recall or in a storage function, the push button sensor transmits a telegram with the respective scene number via the extension object of the rocker. During the recall of an internal scene, a scene stored internally in the universal

		pushbutton sensor TSM is recalled or stored again. In this case, the sensor transmits no telegram to the bus via a scene extension object. For this setting, the internal scene function must be enabled.
Scene number (1...64) Rocker 1.1	**1**...64	In accordance with the KNX standard, objects with data type 18.001 "Scene Control" can recall or store up to 64 scenes by their numbers. The parameter defines the scene number to be transmitted when the top (or left) of the button is pressed.
Scene number (1...64) Rocker 1.2	**1**...64	In accordance with the KNX standard, objects with data type 18.001 "Scene Control" can recall or store up to 64 scenes by their numbers. The parameter defines the scene number to be transmitted when the bottom (or right) of the button is pressed.
Scene number (1...8) Rocker 1.1	**1**...8	This parameter defines the number of the internal scene which is recalled or stored when the top (or left) of the button is pressed.
Scene number (1...8) Rocker 1.2	**1**...8	This parameter defines the number of the internal scene which is recalled or stored when the bottom (or right) of the button is pressed.

The following parameters are only visible for the rocker function "2-channel operation"...

Operation concept	**Channel 1 or channel 2** Channel 1 and channel 2	This parameter defines the 2-channel operation concept. If the setting "Channel 1 or channel 2" is selected, the push button sensor 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 push button sensor transmits only the telegram of channel 1 on a short button-press and both telegrams on a sustained button-press.
Function channel 1 (2)	No function **Switching (1 bit)** Value transmitter 0...255 (1 byte)	This parameter defines the channel function and specifies which other parameters and which communication object are to be displayed for channel 1 (2).

	Value transmitter 0...100% (1 byte) Temperature value transmitter (2-bytes)	
Command of button for channel 1 (2) Rocker 1.1	**ON** OFF TOGGLE	This parameter defines the object value transmitted to the bus when the top (or left-hand) rocker is pressed. Only visible if "Function channel 1 (2) = Switching (1 bit)"!
Command of button for channel 1 (2) Rocker 1.2	ON **OFF** TOGGLE	This parameter defines the object value transmitted to the bus when the bottom (or right-hand) rocker is pressed. Only visible if "Function channel 1 (2) = Switching (1 bit)"!
Value of the button for Channel 1 (2) Rocker 1.1 (0...255)	**0**...255	This parameter defines the object value transmitted to the bus when the top (or left-hand) rocker is pressed. Visible only if "Function channel 1 (2) = value transmitter 0…255 (1 byte)"!
Value of the button for Channel 1 (2) Rocker 1.2 (0...255)	**0**...255	This parameter defines the object value transmitted to the bus when the bottom (or right-hand) rocker is pressed. Visible only if "Function channel 1 (2) = value transmitter 0…255 (1 byte)"!
Value of the button for Channel 1 (2) Rocker 1.1 (0...100 %)	**0**...100	This parameter defines the object value transmitted to the bus when the top (or left-hand) rocker is pressed. Visible only if "Function channel 1 (2) = value transmitter 0…100 % (1 byte)"!
Value of the button for Channel 1 (2) Rocker 1.2 (0...100 %)	**0**...100	This parameter defines the object value transmitted to the bus when the bottom (or right-hand) rocker is pressed. Visible only if "Function channel 1 (2) = value transmitter 0…100 % (1 byte)"!
Temperature value of the button for channel 1 (2) Rocker 1.1 (0...40 °C)	**0**...40	This parameter defines the temperature value transmitted to the bus when the top (or left-hand) rocker is pressed. Visible only if "Function channel 1 (2) = Temperature value transmitter (2 bytes)"!

Temperature value of the button for channel 1 (2) Rocker 1.2 (0...40 °C)	**0**...40	This parameter defines the temperature value transmitted to the bus when the bottom (or right-hand) rocker is pressed. Visible only if "Function channel 1 (2) = Temperature value transmitter (2 bytes)"!
Time between channel 1 and channel 2 Rocker 1.1 (1...255 x 100 ms)	0...**30**...255	Depending on the selected operation concept, this parameter defines the interval at which the push-button transmits the telegram for channel 1 and the telegram for channel 2 when the top (or left side) of the rocker is pressed.
Time between channel 1 and channel 2 Rocker 1.2 (1...255 x 100 ms)	0...**30**...255	Depending on the selected operation concept, this parameter defines the interval at which the push-button transmits the telegram for channel 1 and the telegram for channel 2 when the bottom (or right side) of the rocker is pressed.
Full-surface operation	enabled **disabled**	When the full-surface operation is enabled, the ETS shows the following parameters. Full-surface operation can only be programmed if "Operation concept = Channel 1 or channel 2"!
Function for full-surface operation	**Switching** Scene recall without storage function Scene recall with storage function	In case of full-surface operation, this parameter defines the function that is to be used. The ETS shows the corresponding communication object and the other parameters. If the push button sensor is to recall a scene with storage function by full-surface actuation, it will make a distinction between a brief press (less than 1 s), a sustained press (longer than 5 s) and an invalid button-press (between 1 s and 5 s). A brief press recalls the scene, a sustained press stores a scene and an invalid full-surface operation is ignored. Visible only if "Full-surface operation = enabled"!
Command for full-surface operation	ON OFF **TOGGLE**	This parameter defines the value of the transmitted telegram when a full-surface operation has been sensed. "TOGGLE" changes over the current object value. Visible only if "Full-surface operation = enabled"!
Scene number (1...64)	**1**, 2, ... 64	

		This parameter defines the scene number which is to be transmitted to the bus after a scene recall or during storage of a scene. Visible only if "Full-surface operation = enabled"!

□↲ Push-button extension module -> Button configuration -> Operation concept of extension module -> Module rocker switch 2...4 like module rocker switch 1!

□↲ Push-button extension module -> Button configuration -> Operation concept of extension module -> Module button 1

Function	**No function** Switching Dimming Venetian blind Value transmitter 1-byte 2-byte value transmitter Scene extension 2-channel operation Operating mode switchover, internal Setpoint shift, internal	This parameter defines the basic function of the button. Depending on this setting, the ETS displays different communication objects and parameters for this button.

The following parameters are only visible for the push-button function "Switching"...

Command on pressing the button	No function ON OFF **TOGGLE**	Depending on the "button arrangement" parameter, these parameters define the reaction that takes place when the button is pressed or released.
Command on releasing the button	**No function** ON OFF TOGGLE	

The following parameters are only visible for the push-button function "Dimming"...

Command on pressing the button	No reaction Brighter (ON) Darker (OFF) **Brighter / darker (TOGGLE)** Brighter (TOGGLE) Darker (TOGGLE)	This parameter defines the reaction when the button is pressed. If the push button sensor is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be linked with one another. In the "Brighter/darker (TOGGLE)" setting, the dimming objects must be interlinked as well so that the push button sensor can send the correct telegram on the next button-press.
Time between switching and dimming (100...50000 x 1 ms)	100...**400**...50000	This parameter defines how long the button must be pressed for the push button sensor to transmit a dimming

		telegram.
Advanced parameters	Activated **Deactivated**	When the advanced parameters are activated, the ETS shows the following parameters.
Advanced parameters activated...		
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 level. Especially with smaller dimming levels it is advisable for the push button sensor to repeat the dimming telegrams automatically (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 level. Especially with smaller dimming levels it is advisable for the push button sensor to repeat the dimming telegrams automatically (see "telegram repetition").
Transmit stop telegram?	**Yes** No	On "Yes" the push button sensor transmits a telegram for stopping the dimming process when the rocker is released. When the push button sensor transmits telegrams for dimming in smaller levels, the stop telegram is generally not needed.
Telegram repeat?	Yes **No**	This parameter can be used to activate telegram repetition for dimming. With the button held down, the push button sensor will then transmit the relative dimming telegrams (in the programmed level width) until the button is released.
Time between two telegrams	**200 ms** 300 ms 400 ms 500 ms 750 ms 1 sec 2 sec	This parameter defines the interval at which the dimming telegrams are automatically repeated in the telegram repetition mode. Visible only if "Telegram repetition = Yes"!

The following parameters are only visible for the push-button function "Venetian Blind"...

Command on pressing the button	DOWN UP **TOGGLE**	This parameter defines the running direction of a drive after a button-press. If the setting is "TOGGLE", the direction is changed after each long time command. If several push buttons are to control the same drive, the long time objects of the push buttons must be interlinked for a correct change of the running direction.
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 (1...3000 x 100 ms)	1...**4**...3000	This parameter sets the time after which the long time operation will be evaluated on pressing the top (or left-hand) button of the rocker. This parameter is not visible with "Operation concept = long – short"!
Slat adjusting time (0…3000 x 100 ms)	0...**5**...3000	Time during which a transmitted long time telegram can be terminated by releasing the top (or left-hand) button of the rocker (short time). This function serves to adjust the slats of a blind. This parameter is not visible with "Operation concept = long – short"!

The following parameters are only visible for the push-button function "Value transmitter 1 byte"...

Function	**Value transmitter 0...255** Value transmitter 0…100 %	A button configured as "Value transmitter 1 byte" permits selecting whether the values to be transmitted are interpreted as integers from 0 to 255 or as a percentage from 0 % to 100 %. The following parameters and their settings depend on this distinction.
Value (0...255)	**0**...255	This parameter defines the object value when the button is pressed. Visible only if "Function = 0...255"!
Value (0...100 %)	**0**...100	This parameter defines the object value when the button is pressed. Visible only

		if "Function = 0...100 %"!
Value adjustment by long button-press	enabled **disabled**	If value adjustment by long button-press is enabled, the ETS shows further parameters. Value adjustment begins, when the button is held down for more than 5 s. In this case, the respective status LED flashes as a sign that a new telegram has been transmitted.
Starting value in case of value adjustment	Same as configured value Same as value after last adjustment **Same as value from communication object**	Value adjustment can begin with different starting values. In the setting "Same as parameterised value", after each long press the pushbutton sensor always starts with the value programmed in the ETS. In the setting "Same as value after last adjustment", after a long press the pushbutton sensor starts with the value transmitted by itself or by another device with this group address as the last value. In the setting "Same as value from communication object", after a long press the pushbutton sensor starts with the value transmitted by itself or by another device with this group address as the last value. This parameter is only visible if "Value adjustment by long button-press = enabled"!
Direction of value adjustment	Upwards Downwards **Toggling (alternating)**	With a long press, the push button sensor 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. Visible only if "Value adjustment by long button-press = enabled"!
Step width (1...15)	**1**...15	In a value adjustment, the pushbutton sensor 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 (0 or 0 %) or if it exceeds the upper limit (255 or 100%), the sensor adapts the step width of the last step automatically. Visible only if "Value adjustment by long button-press = enabled"!
Time between two telegrams	**0.5 sec** 1 sec 2 sec 3 sec	In a value adjustment, the pushbutton sensor 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 (0 or 0 %) or if it exceeds the upper limit (255 or 100%), the sensor adapts the step width of the last step automatically. Visible only if "Value adjustment by long button-press = enabled"!
Value adjustment with overflow	Yes **No**	If value adjustment is to be effected without overflow (setting "No") and if the pushbutton sensor reaches the lower limit of the adjustment range (0 or 0 %) or the upper limit (255 or 100 %) during value adjustment, the adjustment will be stopped automatically by the sensor. If the value adjustment with overflow is programmed (setting "Yes") and if the push button sensor reaches the lower or the upper limit, it will transmit the value of this range limit and then add a pause the duration of which corresponds to two levels. Thereafter, the push button sensor transmits a telegram with the value of the other range limit and continues the value adjustment in the same direction.

The following parameters are only visible for the push-button function "Value transmitter 2 byte"...

Function	**Temperature value transmitter** Brightness value transmitter Value transmitter (0...65535)	A button configured as "Value transmitter 1 byte" permits selecting whether the values to be transmitted are to be interpreted as temperature values (0 °C to 40 °C), as brightness values (0 lux to 1500 lux) or as integers (0 to 65535). The following parameters and their settings depend on this selection.
Temperature value (0...40 °C)	0...**20**...40	This parameter defines the object value when the button is pressed. Visible only if "Function = Temperature value transmitter"!
Brightness value	0, 50,...**300**...1450, 1500 Lux	This parameter defines the object value when the button is pressed. Visible only if "Function = Brightness value transmitter"!
Value (0...65535)	**0**...65535	This parameter defines the object value when the button is pressed. Visible only with "Function = Value transmitter (0...65535)"!

Value adjustment by long button-press	enabled **disabled**	If value adjustment by long button-press is enabled, the ETS shows further parameters. Value adjustment begins, when the button is held down for more than 5 s. In this case, the respective status LED flashes as a sign that a new telegram has been transmitted.
Starting value in case of value adjustment	**Same as configured value** Same as value after last adjustment **Same as value from communication object**	Value adjustment can begin with different starting values. This parameter is only visible if "Value adjustment by long button-press = enabled"! In the setting "Same as parameterised value", after each long press the pushbutton sensor always starts with the value programmed in the ETS. In the setting "Same as value after last adjustment", after a long press the pushbutton sensor starts with the value transmitted by itself or by another device with this group address as the last value. In the setting "Same as value from communication object", after a long press the pushbutton sensor starts with the value transmitted by itself or by another device with this group address as the last value. This setting is selectable only if "Function = Value transmitter (0...65535)"!
Direction of value adjustment	Upwards Downwards **Toggling (alternating)**	With a long press, the push button sensor 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. Visible only if "Value adjustment by long button-press = enabled"!
Step width	**1 °C**	For temperature values, the step size of the adjustment is fixed to 1°C. Visible only if "Function = Temperature value transmitter" and "Value adjustment by long button-press = enabled"!
Step width	**50 lux**	For brightness values, the step width of the adjustment is fixed to 50 lux. Visible only if "Function = Brightness value transmitter" and "Value adjustment by long button-press = enabled"!
Step width	1 2 5 10	This parameter sets the step width of the value adjustment for the 2-byte value transmitter. Only visible if "Function = Value transmitter (0 ...

	20 50 75 100 200 500 750 **1000**	65535)" and "Value adjustment by long button-press = enabled"!
Time between two telegrams	0.5 sec **1 sec** 2 sec 3 sec	This parameter defines the interval at which the push button sensor transmits new telegrams during a value adjustment. Visible only if "Value adjustment by long button-press = enabled"!
Value adjustment with overflow	Yes **No**	If value adjustment is to be effected without overflow (setting "No") and if the pushbutton sensor reaches the lower limit of the adjustment range (0°C, 0 lux, 0) or the upper limit (40°C, 1500 lux, 65535) during value adjustment, the adjustment will be stopped automatically by the sensor. If the value adjustment with overflow is programmed (setting "Yes") and if the push-button sensor reaches the lower or the upper limit, it will transmit the value of this range limit and then add a pause the duration of which corresponds to two levels. Thereafter, the push button sensor transmits a telegram with the value of the other range limits and continues the value adjustment in the same direction.

The following parameters are only visible for the push-button function "Scene extension"...

Function	**Scene extension without storage function** Scene extension with storage function Recall of internal scene extension without storage function Recall of internal scene with storage function	This parameter defines the functionality of the extension. If the push button sensor is used as a scene extension, the scenes can either be stored in one or in several other KNX/EIB devices (e.g. light scene push button sensor). During a scene recall or in a storage function, the push button sensor transmits a telegram with the respective scene number via the extension object of the rocker. During the recall of an internal scene, a scene stored internally in the universal pushbutton sensor TSM is recalled or stored again. In this case, the sensor transmits no telegram to the bus via a scene extension object. For this setting, the internal scene function must be enabled.

Scene number (1...64)	**1**...64	In accordance with the KNX standard, objects with data type 18.001 "Scene Control" can recall or store up to 64 scenes by their numbers. The parameter defines the scene number to be transmitted when the button is pressed.
Scene number (1...8)	**1**...8	This parameter defines the number of the internal scene which is recalled or stored when a button is pressed.

The following parameters are only visible for the push-button function "2-channel operation"...

Operation concept	**Channel 1 or channel 2** Channel 1 and channel 2	This parameter defines the 2-channel operation concept. If the setting "Channel 1 or channel 2" is selected, the push button sensor 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 push button sensor transmits only the telegram of channel 1 on a short button-press and both telegrams on a sustained button-press.
Function channel 1 (2)	No function **Switching (1 bit)** Value transmitter 0...255 (1 byte) Value transmitter 0...100% (1 byte) Temperature value transmitter (2-bytes)	This parameter defines the channel function and specifies which other parameters and which communication object are to be displayed for channel 1 (2).
Command of button for channel 1 (2)	**ON** OFF TOGGLE	This parameter defines the object value transmitted to the bus when the button is pressed. Only visible if "Function channel 1 (2) = Switching (1 bit)"!
Value of the button for Channel 1 (2) (0...255)	**0**...255	This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = value transmitter 0…255 (1 byte)"!
Value of the button for Channel 1 (2) (0...100 %)	**0**...100	This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = value transmitter 0…100 % (1 byte)"!

Temperature value of the button for channel 1 (2) (0...40 °C)	**0**...40	This parameter defines the temperature value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = Temperature value transmitter (2 bytes)"!
Time between channel 1 and channel 2 (1...255 x 100 ms)	0...**30**...255	Depending on the selected operation concept, this parameter defines the interval at which the push button transmits the telegram for channel 1 and the telegram for channel 2 when the button is pressed.

The following parameters are only visible for the push-button function "Operating mode switchover, internal"...

Button function	No function **Operating mode switch-over** Presence button	The "Operating mode switchover, internal" push-button function can be used to control the internal room temperature controller. If this push-button function is used, it is possible to change over the operating mode by pressing the button. In the controller operating mode, a distinction is made between two functions, specified by this parameter. On the one hand, the operating mode (Comfort, Standby, Night, Frost/heat protection) can be changed over and influenced ("Operating mode change-over" setting). On the other hand it is possible to activate the Presence function ("Presence button" setting). The Presence function allows activation of Comfort mode or a comfort extension on the internal controller.
Operating mode button actuation	**Comfort mode** Standby mode Night operation Frost/heat protection mode Comfort mode -> Standby mode Comfort mode -> Night operation Standby mode -> Night operation Comfort mode ->	Here, there is a specification of which operating mode is activated when a button is pressed. It is possible to change over between various operating modes. Only visible if "Button function = Operating mode change-over".

	Standby mode -> Night operation	
Presence button actuation	Presence OFF **Presence ON** Presence TOGGLE	Pressing the button can either switch the presence status of the room temperature controller on or off or toggle it. Only visible if "button function = presence button"

The following parameters are only visible for the push-button function "Setpoint shift, internal"...

Button actuation	No function Reduce setpoint **Increase setpoint**	The "Setpoint shift, internal" push-button function can be used to control the internal room temperature controller. If this push-button function is used, it is possible to shift the basic setpoint temperature of the controller in a positive direction ("Increase setpoint" setting) or in a negative direction ("Reduce setpoint" setting) by pressing the button.

□↵ Push-button extension module -> Button configuration -> Operation concept of extension module -> Module button 2...8 like module button 1!

The following parameters are valid for the status LED of the buttons or rockers...

Function of status LED (With the rocker function, the parameters for the left and right status LED are separate and configurable).	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.
	Button-press display	The status LED indicates a button actuation. The ON time is set on the parameter page "Push-button extension module -> Button configuration" in common for all status LEDs that are configured as actuation displays.
	Telegram acknowledgment	The status LED indicates the transmission of a telegram in 2-channel operation. This setting can only be configured for the pushbutton or rocker function "2-channel operation".

Status indication (switching object)	In the "Switching" and "Dimming" push-button functions, the status LED signals the status of the "Switching" object. The object value is evaluated as follows: "ON" -> "LED illuminated / OFF" -> LED goes out.
Inverted status display (switching object)	In the "Switching" and "Dimming" push-button functions, the status LED signals the inverted status of the "Switching" object. The object value is evaluated as follows: "ON" -> "LED illuminated / OFF" -> LED goes out.
Status indication	The status LED indicates the status of the push-button function "setpoint shift, internal". The status is evaluated as follows: "Shift active" -> LED illuminated / "Shift inactive" -> LED goes out.
Inverted status display.	The status LED indicates the inverted status of the push-button function "setpoint shift, internal". The status is evaluated as follows: "Shift inactive" -> LED illuminated / "Shift active" -> LED goes out.
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 (KNX controller)	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. This setting cannot be configured with the push-button functions "operating mode switchover, internal", or "setpoint shift, internal".
Comparator without sign (1-byte)	The status LED is activated depending on a comparison. In this configuration there is a separate 1-byte communication object available via which the unsigned reference value (0...255) is received. This setting causes the additional parameter "Status LED ON with" to be shown.
Comparator with sign (1-byte)	The status LED is activated depending on a comparison. In this configuration there is a separate 1-byte

		communication object available via which the positive or negative reference value (-128...127) is received. This setting causes the additional parameter "Status LED ON with" to be shown. The presetting of the parameter "Function of status LED" depends on the configured pushbutton or rocker function.
The function of the status LED = "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	If the "Function of status LED ..." is set to "Control via separate LED object", then the telegram polarity of the 1-bit object "Status LED" can be specified at this point. 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.
If the function of status LED = "Operating mode display (KNX controller)"...		
Status LED ON with	Automatic mode **Comfort mode** Standby mode Night mode Frost/heat protection mode	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.
If the function of status LED = "Comparator without sign"...		
Status LED ON with	**Reference value greater than received value** Reference value less than received value	The status LED indicates whether the configured reference value is greater or less than or equal to the value of the "Status LED" object".

	Reference value equal to received value	
Reference value (0 … 255)	**0**...255	This parameter defines the reference value to which the value of the "Status LED" object is compared.
If the function of status LED = "Comparator with sign"...		
Status LED ON with	**Reference value greater than received value** Reference value less than received value Reference value equal to received value	The status LED indicates whether the configured reference value is greater or less than or equal to the value of the "Status LED" object".
Reference value (-128...127)	-128...**0**...127	This parameter defines the reference value to which the value of the "Status LED" object is compared.

□↵ Push-button extension module -> Disable

Disabling function?	Yes **No**	With this parameter, the disabling function of the push-button extension module can be centrally activated. If "Yes", the ETS shows further communication object and parameters.
Polarity of disabling object	**disable = 1 / enable = 0** Disable = 0 / enable = 1	This parameter defines the value of the disabling object at which the disabling function is active.
Reaction of pushbutton sensor at the beginning of the disabling function	**No reaction** Reaction as button >>X<< when pressed Reaction as button >>X<< when released Reaction as disabling function 1 when pressed Reaction as disabling function 1 when released Reaction as disabling function 2 when pressed Reaction as disabling function 2 when released Internal scene recall scene 1	Besides disabling of rocker and button functions, the pushbutton sensor can also and in addition trigger a specific function at the time of activation of the disabling state. This function can... correspond to the function assigned to any of the buttons in the non-disabled state ("Reaction as button >>X<< …"), be defined on the following parameter pages ("Reaction as disabling function …"), recall a scene stored internally in the pushbutton sensor ("Internal scene recall …").

	Internal scene recall scene 2 Internal scene recall scene 3 Internal scene recall scene 4 Internal scene recall scene 5 Internal scene recall scene 6 Internal scene recall scene 7 Internal scene recall scene 8	
Button >>X<<	**Module button 1** Module button 2 … Module button 8	If the pushbutton sensor is to perform the function of a specific button at the beginning of the disabling state, this button will be selected here. Visible only if "Reaction of pushbutton sensor at the beginning of the disabling function = Reaction as button >>X<< on pressing / releasing"!
Behaviour during active disabling	**All buttons without function** All buttons behave as Individual buttons without function Individual buttons behave as	While disabling is active... all buttons or only individually selected buttons can be disabled ("… no function"), all buttons or only individually selected buttons can be restricted to a specific function ("… behave as"). In this case, the ETS shows further parameters.
All buttons with even numbers behave during disabling as	**Module button 1** Module button 2 ... Module button 8 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 the buttons with an even button number behave like the one configured here. The desired functions can either correspond to the function of an existing button or they can be configured as special disabling functions. Visible only if "Behaviour during active disabling = all buttons behave as" or "Behaviour during active disabling = individual buttons behave as"!

All buttons with odd numbers behave during disabling as	**Module button 1** Module button 2 ... Module button 8 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 the buttons with an odd button number behave like the one configured here. The desired functions can either correspond to the function of an existing button or they can be configured as special disabling functions. Visible only if "Behaviour during active disabling = all buttons behave as" or "Behaviour during active disabling = individual buttons behave as"!
Reaction of pushbutton sensor at the end of disabling	**No reaction** Reaction as button >>Y<< when pressed Reaction as button >>Y<< when released Reaction as disabling function 1 when pressed Reaction as disabling function 1 when released Reaction as disabling function 2 when pressed Reaction as disabling function 2 when released Internal scene recall scene 1 Internal scene recall scene 2 Internal scene recall scene 3 Internal scene recall scene 4 Internal scene recall scene 5 Internal scene recall scene 6 Internal scene recall scene 7 Internal scene recall scene 8	Besides disabling of rocker and button functions, the pushbutton sensor can also trigger a special function immediately at the end of disabling. This function can... correspond to the function assigned to any of the buttons in the non-disabled state ("Reaction as button >>X<< …"), be defined on the following parameter pages ("Reaction as disabling function …"), recall a scene stored internally in the pushbutton sensor ("Internal scene recall …").

Button >>Y<<	**Module button 1** Module button 2 … Module button 8	If the pushbutton sensor is to perform the function of a specific button at the end of the disabling state, this button will be selected here. Only visible if "Reaction of pushbutton sensor at the end of disabling = Reaction as button >>Y<< on pressing / releasing"!

□↵ Push-button extension module -> Disable -> Disable - button selection

Module button 1 Module button 2 … Module button 8	Yes **No**	The user can specify for each module button separately whether it will be affected by the disabling function during the disabling state.

□↵ Push-button extension module -> Disable -> Disable - disabling function 1 / Disable - disabling function 2.

With the exception of the status LED control, the parameters available for the two disabling functions are the same as those for the button functions.

□↵ Push-button extension module -> Alarm signalling

Alarm signal display	Activated **Deactivated**	This parameter can be used to enable alarm signal displaying. When alarm signalling is enabled, the ETS displays further parameters and up to two further communication objects.
Polarity of the alarm signalling object	**Alarm when ON and alarm reset when OFF** Alarm when OFF and alarm reset when ON	The alarm signalling object is used as an input for activating or deactivating alarm signal displaying. If the object value corresponds to the "Alarm" state, all status LEDs flash at a frequency of approx. 2 Hz. If the setting is "Alarm when OFF and alarm reset when ON", the object must first be actively written by the bus with "0" to activate the alarm after a reset. An alarm signal is not stored so that the alarm signalling is generally deactivated after a reset or after programming with the ETS.
Reset alarm signalling by a button-press?	**Yes** No	If this parameter is set to "Yes", active alarm signal displaying can be deactivated by a button-press on the

		push-button extension module. This button-press does not cause the configured function of the pressed button to be executed. Only after then next button-press will the configuration of the button be evaluated and a telegram be transmitted to the bus, if applicable. If "No" has been selected, alarm signalling can only be deactivated via the alarm signalling object. A button-press will always execute the configured button function.
Use the alarm acknowledge object?	Yes **No**	If alarm signalling can be deactivated by a button-press, this parameter defines whether an additional alarm acknowledge telegram is to be transmitted to the bus via the separate object "Alarm signalling acknowledge" after triggering by this button-press. A telegram can, for instance, be sent via this object to the "Alarm signalling" objects of other push button sensors in order to reset the alarm status there as well (observe the polarity of the acknowledge object!).
Acknowledge alarm signalling by	**OFF telegram** **ON telegram**	This parameter sets the polarity of the "Alarm signalling acknowledge" object. This parameter presetting depends on the selected polarity of the alarm message object.

4.2.5.5 Scene

Description	Values	Comment
□↵ Scene		
Scene function ?	Yes **No**	The device can internally handle eight scenes with eight actuator groups. This parameter activates the scene function and the other parameters and communication objects, if needed.
Overwrite scene values during ETS download?	**Yes** No	If the values of the actuator groups that have been changed on site by the used are to be reset to the values preset in the ETS during an application download by the ETS, the setting "Yes" must be chosen. If "No" is selected, the ETS values will not overwrite the scene values stored in the device, if any.
Scene 1 Recall via extension object with scene number	**1** ... 64	If the internal scenes are to be recalled via the extension object, a definite number is required for each of them. This parameter serves to specify the extension number of the first scene.
Scene 2 Recall via extension object with scene number	1...**2** ... 64	If the internal scenes are to be recalled via the extension object, a definite number is required for each of them. This parameter serves to specify the extension number of the second scene.
Scene 3 Recall via extension object with scene number	1...**3** ... 64	If the internal scenes are to be recalled via the extension object, a definite number is required for each of them. This parameter serves to specify the extension number of the third scene.
Scene 4 Recall via extension object with scene number	1...**4** ... 64	If the internal scenes are to be recalled via the extension object, a definite number is required for each of them. This parameter serves to specify the extension number of the fourth scene.
Scene 5 Recall via extension object with scene number	1...**5** ... 64	If the internal scenes are to be recalled via the extension object, a definite number is required for each of them. This parameter serves to specify the extension number of the fifth scene.
	1...**6** ... 64	If the internal scenes are to be recalled via the extension object, a definite

Scene 6 Recall via extension object with scene number		number is required for each of them. This parameter serves to specify the extension number of the sixth scene.
Scene 7 Recall via extension object with scene number	1...**7** ... 64	If the internal scenes are to be recalled via the extension object, a definite number is required for each of them. This parameter serves to specify the extension number of the seventh scene.
Scene 8 Recall via extension object with scene number	1...**8** ... 64	If the internal scenes are to be recalled via the extension object, a definite number is required for each of them. This parameter serves to specify the extension number of the eighth scene.

□↵ Scene -> Scene output 1

Data type	**Switching** Value (0 … 255) Value / position of Venetian blind (0 … 100%)	Selection of the data format of the scene output.
Scene 1 Switching command	**ON** OFF	The switching command of the first scene can be predefined here. This parameter is only visible if "Data type = Switching".
Scene 1 Value (0 … 255)	**0**...255	The value of the first scene can be predefined here. This parameter is only visible if "Data type = Value (0...255)".
Scene 1 Value / position of Venetian blind (0 … 100 %)	**0**...100	The value of the first scene can be predefined here. This parameter is only visible if "Data type = Value / Venetian blind (0...100%)".
Scene 1 Allow save?	**Yes** No	If the user is to be given the possibility of changing the value of the scene and of storing it while the system is running, this parameter must be set to "Yes".
Scene 1 Allow transmission?	**Yes** No	If the state of an actuator group is to remain unchanged during the recall of a scene, this parameter can be set to "No". In this case, the device does not transmit a telegram via the scene output

		concerned during the recall of the scene. The scene output is deactivated for this scene.
Scene 1 Transmit delay (1 … 1200 * 100 ms) (0 = deactivated)	**0**...1200	When the device sends the telegrams to the various scene outputs, it can insert a presettable waiting time of 2 min. max. before each telegram. The bus load can be reduced by this. In this way, it is possible to have certain illumination switched on only after the shutters are really closed. If no delay is selected ("0" setting), the device sends the output telegrams with maximum speed. With this setting it may happen in some cases that the telegram sequence is not compatible with output numbering.
Scenes 2 … 8 see scene 1!		

□↵ Scene -> Scene output 2...8 like Scene output 1!

5 Appendix

5.1 Index

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