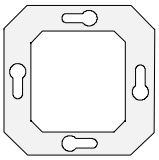
Flat Design RCD, 6-gang



Sensor

Product name:	Room Controller
Design:	flush-mounting device (FMD)
Article. no.	RCD 3096 M .. / RCD .. 3096 M ..
ETS search path:	• Heating, Ventilation, Air Conditioning / Controller / RCD flat x-fold (x = 4, 6) and • Pushbutton / Pushbutton, general / RCD flat x-fold (x = 4, 6)
Status:	28.03.2007

Functions:

Room controller functions

On the press of a key and depending on the ETS parameter settings, the room controller transmits telegrams to the KNX / EIB. These telegrams can be used, for instance, for switching or momentary-contact control, for dimming or for blind/shutter control. It is also possible to program value transmitter functions such as dimming value transmitters, light-scene extensions, temperature value transmitters or brightness value transmitters. Each of the control surfaces of the room controller can be optionally used as a rocker or as two independent keys. The control surface itself can be divided into vertical or horizontal surfaces. When a control surface is configured as a rocker, it is also possible with some functions to trigger special functions by a press on the whole surface of the rocker.

The room controller is equipped with two status LEDs per control surface. These status LEDs can optionally either be permanently on or off, or otherwise act as an actuation or status indicator for a key or a rocker. As an alternative, the LED can also be controlled via separate communication objects. The status LEDS can then also signal the operating states of room temperature controllers or indicate the results of logic value comparisons. A blue operation LED can optionally serve as an orientation light (steady or also flashing) or be controlled via an independent communication object. When the room controller is in the programming mode, the operation LED flashes with a frequency of about 8 Hz. The same flashing rate is also used for indicating that a rocker has been actuated by a press on the full surface; in this case the flashing rate returns to the programmed behaviour after the actuation. If no or a wrong application has been loaded into the room controller, the operation LED flashes with a frequency of abt. 0.75 Hz to indicate an error and the room controller does not work.

Room temperature controller functions:

The room controller can be used to control the temperature of individual rooms. Depending on the control option, the current temperature-setpoint and the room temperature, the controller can transmit actuating variables for the control of heating or cooling systems to the KNX / EIB.

The room temperature can be sensed by the internal temperature sensor or also by a combination consisting of the internal sensor and external sensor. As a supplement to basic heating or cooling, an additional stage can also be activated. The temperature setpoint difference between the basic and the additional stage can be preset. For larger deviations between the setpoint and the actual temperature value, the room can therefore be heated up or cooled down more quickly by switching on the additional stage. The basic and the additional stage can have different control algorithms assigned to them. The controller can operate in 5 operating modes (comfort, standby, night, frost/ heat protection and controller disable) each having their own temperature setpoints for the heating mode or cooling mode. For the heating and cooling functions continuous-action or switching PI or switching 2-state control characteristics can be selected.

In conjunction with a room temperature controller equipped with a 1-byte object for switching over the modes of operation the room controller can be used as a full-featured controller extension unit. The device can also be used for presence detection or for reference value shifting purposes. The integrated temperature sensor allows measuring and transmitting of the room temperature. Central heating control units that are not equipped with a temperature sensor of their own can thus be integrated into the KNX / EIB room temperature control chain.

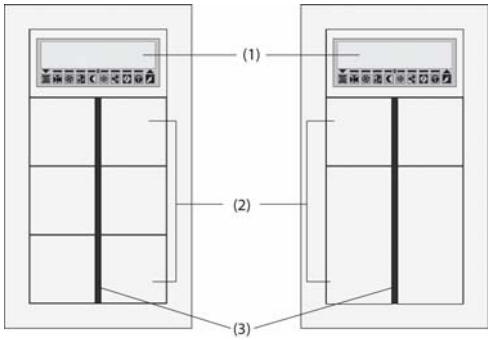
Display functions:

The upper part of the room controller display is a graphic display with 132 x 30 pixels. In this section, two or three rows of text can be displayed. The lower half of the display contains fixed symbols indicating the different operating modes of the room controller. The display backlighting can be switched on and off and its brightness can be varied.

The room controller is equipped with an internal BCU and can be connected directly to the bus line (cf. wiring diagram). The room controller is fastened on a supporting ring with plastic screws supplied with the device.

Article numbers:

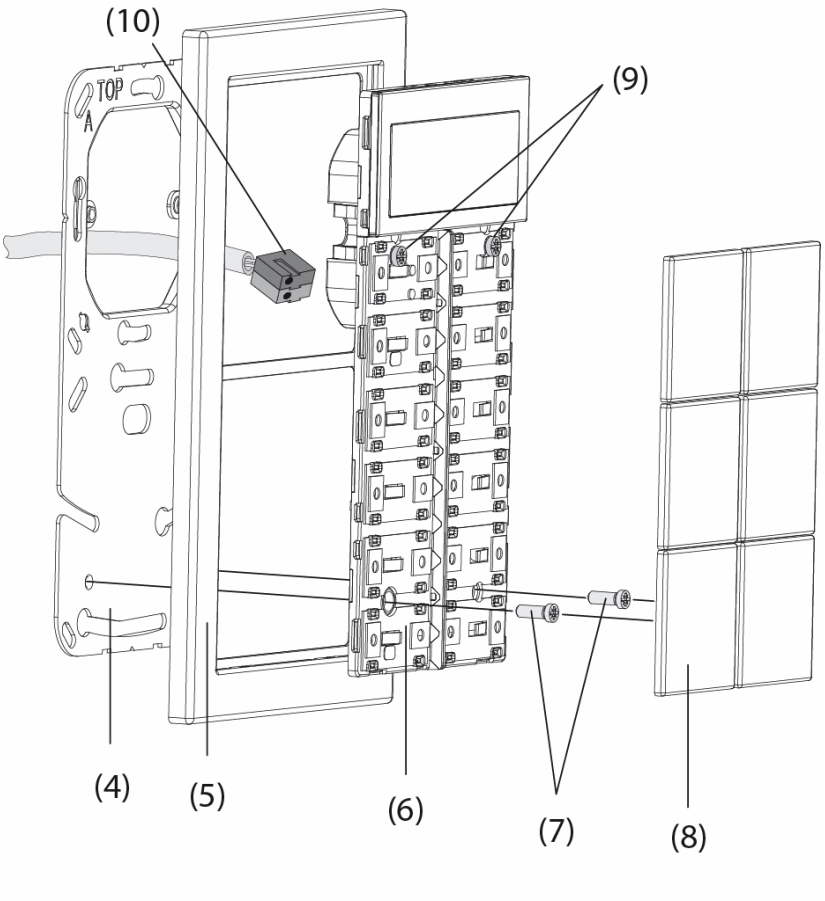
Room Controller Variant	Jung article no.	ELKA article no.
Room Controller 4-fold	RCD .. 3094 M ..	13557510
Room Controller 6-fold	RCD .. 3096 M ..	13557510

Illustration:	Dimensions:	Controls:
	Width: 70 mm (without frame) Height: 140 mm (without frame) Depth: 20 mm (including flush-mounting box)	(1) LC-Display (2) Room controller keys (3) Status LED (red) and operation LED (blue)

Technical data

Type of protection:	IP 20
Safety class:	III
Mark of approval:	KNX / EIB
Ambient temperature:	-5 °C ... +45 °C
Storage / transport temperature:	-25 °C ... +70 °C (storage above +45 °C reduces the lifetime)
Mounting position:	any
Minimum distances:	none
Type of fastening:	fastened on the supporting ring with plastic screws supplied with the device.
KNX / EIB supply	
Voltage:	21 – 32 V DC (SELV)
current rating:	max. 20 mA
Connection:	bus connecting terminal (KNX type 5.1)
External supply	---
Internal temperature sensor:	
Measuring range:	+ 5 °C ...+ 35 °C ±1 %
Resolution:	0.1 K
Air humidity:	0 % ... 95 % (no condensation)

Response to bus voltage failure	
Bus voltage only:	object values will be deleted, LEDs extinguished room temperature controller: no response, control off
Behaviour on return of bus voltage	
Bus voltage only:	room temperature controller: the controller is initialized; depending on parameterization, different temperature values and the status will be transmitted and the switch-over objects will be updated.
Wiring diagram and terminals:	



Fitting:

1. Fit supporting ring (4) in correct position on a flush-mounting box (DIN 49073) ("TOP" mark = up; "Type A" - supporting ring side A for FD design - or "Type B" - supporting ring side B for LS design - in front). Use the screws supplied with the box.
2. Place decorative frame (5) on the supporting ring.
3. Connect the room controller module (6) with the standard bus connecting terminal (10) to the KNX/EIB and plug onto supporting ring (leading the bus wires out at the bottom).
4. Fasten the room controller module with the plastic screws supplied (7 and 9) on the supporting ring (protection against removal or theft; to prevent damage to the device resulting from electrostatic charges use the plastic screws supplied). Tighten the plastic screws without using force (!).
5. Before fitting the covers (8) load the physical address into the device (cf. "Commissioning").

If the device is fitted only on a flush-mounting box, the screws (7) must be sunk in the wall, e.g. by providing a borehole of ø 6 x10 mm.
Use the supporting ring as a template.

Fitting of the key covers:
Place the covers one by one on the room controller module. In the correct position the cover can be snapped on with a brief press.

Commissioning

After connection of the room controller to the bus and after fitting it can be put into operation. The start-up procedure is basically confined to programming with the ETS.

I. Assignment of the physical address

The room controller is equipped with an integrated BCU. The room controller has no separate programming key or LED. The programming mode is activated by a defined and time-delayed press of the first rocker and signalled by the operation LED. For programming of the physical address, the module covers must not be in place on the device.
The physical address is programmed as described below...

Activate the programming mode (cf. Fig.1):
- Press button (11) and keep it pressed.
Then - depending on the variant - press
> the square cover at the top left: key (12)
> press the rectangular cover top left: key (13).
The programming mode is activated. The blue operation LED flashes fast (approx. 8 Hz).

Important:
For pressing the keys use suitable tools (e.g. small screwdriver, tip of ballpoint pen, etc.)
- To exclude any inadvertent activation of the programming mode during a 'normal' use of the control surface in operation later on, the time between the first and the second key actuation must be at least 200 ms. A simultaneous press of both keys (time between first and second key-press < 200 ms) will not result in an activation of the programming mode.
- It should be noted that the operation LED starts flashing fast also in case of a full-surface actuation of rocker 1 (cf. functional description). The difference between fast flashing in this case and fast flashing in the programming mode is that - in case of a full-surface actuation of the rocker - the flashing rate falls back into the programmed basic behaviour when the key is released. In the programming mode, the flashing rate remains the same until the mode is ended. The state of the LED defined by the programming mode will always prevail.

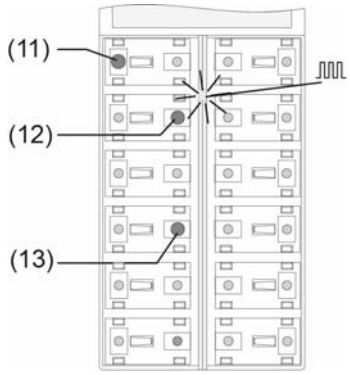


Fig. 1: Keys for activation of the programming mode

1. Program the physical address with the help of the ETS.
2. The programming mode ends:
   - automatically after adoption of the physical address
   - by pressing a key.

   Important:
   - If the programming mode is to be activated or deactivated in a device which is already programmed with a valid application, there is the possibility that telegrams will be transmitted to the bus in that instant when a key is being pressed. The telegram transmitted depends on the key function programmed.

II. Programming of the application

The application is to be programmed thereafter into the device with the help of the ETS. The ETS3.0 from version "d" with Service Release "A" onwards detects automatically whether a valid application has already been programmed into the device before. To reduce the programming time, the ETS3 downloads the whole application 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-optimized partial download in which only the modified data are loaded into the device.

For commissioning operations, the ETS3.0 from version "d" onwards with service release "A" is required.

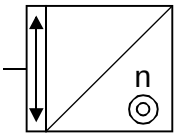
As-supplied state and non-operational application

As long as pushbutton sensor Universal TSM has not yet been programmed with application data by means of the ETS, the blue operation LED flashes at a slow rate (approx. 0.75 Hz). When any of the keys or rockers is pressed, the pertaining status LED lights up briefly (key-press indication). This state persists until the application is programmed into the device.

By slow flashing of its operation LED (approx. 0.75 Hz), the device can also indicate that it was programmed with a non-executable application by the ETS. Applications are non-executable, if they are not intended for use with the room controller in the ETS product database. Attention must also be paid to the fact that the room controller variant is compatible with the one in the project (e. g. if a 6-fold version is designed in the ETS project, a 6-fold version must be installed and also programmed).
The operation LED flashes slowly even if the application program of the room controller has been removed from the device by the ETS.
In both cases, the room controller is not operational.

Hardware information

Software description

ETS search path: • Heating, Ventilation, Air Conditioning / Controller / RCD x-fold (x = 4, 6) and • Pushbutton / Pushbutton, general / RCD flat x-fold (x = 4, 6)	**ETS search path:** 

BAU used:	TPUART + µC (Mask 0705 Light)		
KNX/EIB type class:	3b – Device with cert. PhL + stack		
Configuration:	S-mode standard		
PEI Type	00 $_{Hex}$	0 Dec	
PEI connector	no connector		
Applications:			

No.	**Short description:**	**Name:**	**Version:**
1	none	RCD flat 6-fold RCD flat 4-fold	0.1 / from ETS3.0d: SRA

Application:	RCD flat 6-fold		
Executable from mask version:	7.05		
Number of addresses (max):	254	**dynamic table management:**	Yes No
Number of assignments (max):	255	**Maximum table length:**	
Communication objects:	156 (maximum object number 155, gaps in between)		

Rocker 1…6 [2]

Object [3]	Function	Name:	Type	DP-ID	Flag
0	Switching	P. rocker 1	1 bit	1.xxx	C, W, T, (R)[1]
0	Status-LED top	P. rocker 1	1 bit	1.xxx	C, W (,R)[1]
0	Short-time operation	P. rocker 1	1 bit	1.007	C, T, (R)[1]
0	Value	P. rocker 1	1 byte	5.xxx	C, W, T, (R)[1]
0	Value	P. rocker 1	2 byte	7.xxx	C, W, T, (R)[1]
0	Temperature value	P. rocker 1	2 byte	9.001	C, W, T, (R)[1]
0	Brightness value	P. rocker 1	2 byte	9.004	C, W, T, (R)[1]
0	Scene extension	P. rocker 1	1 byte	18.001	C, T, (R)[1]
0	Channel 1 switching	P. rocker 1	1 bit	1.xxx	C, W, T, (R)[1]
0	Channel 1 value	P. rocker 1	1 byte	5.xxx	C, T, (R)[1]
0	Channel 1 value	P. rocker 1	2 byte	9.001	C, T, (R)[1]
1	Switching	P. rocker 1 full-face actuation	1 bit	1.xxx	C, W, T, (R)[1]
1	Scene extension	P. rocker 1 full-face actuation	1 byte	18.001	C, T, (R)[1]
1	Status LED bottom	P. rocker 1	1 bit	1.xxx	C, W (,R)[1]
18	Dimming	P. rocker 1	4 bit	3.007	C, W, T, (R)[1]
18	Long-time operation	P. rocker 1	1 bit	1.008	C, W, T, (R)[1]
18	Channel 2 switching	P. rocker 1	1 bit	1.xxx	C, W, T, (R)[1]
18	Channel 2 value	P. rocker 1	1 byte	5.xxx	C, T, (R)[1]
18	Channel 2 value	P. rocker 1	2 byte	9.001	C, T, (R)[1]
36	Status-LED top	P. rocker 1	1 bit	1.xxx	C, W (,R)[1]
36	Status-LED top	P. rocker 1	1 byte	20.102	C, W (,R)[1]
36	Status-LED top	P. rocker 1	1 byte	5.xxx	C, W (,R)[1]
36	Status-LED top	P. rocker 1	1 byte	6.xxx	C, W (,R)[1]
37	Status LED bottom	P. rocker 1	1 bit	1.xxx	C, W (,R)[1]
37	Status LED bottom	P. rocker 1	1 byte	20.102	C, W (,R)[1]
37	Status LED bottom	P. rocker 1	1 byte	5.xxx	C, W (,R)[1]
37	Status LED bottom	P. rocker 1	1 byte	6.xxx	C, W (,R)[1]

[1]: The communication objects can be read out (set L-flag).

[2]: The number of rockers or keys depends on the room controller variant used in the project. Mixed use of rocker and pushbutton functions in one and the same room controller possible.

[3]: As an example, the objects are described for rocker 1. The objects for the other rockers are defined in the same way by shifting the object number.

Key 1…12 [2]

Object [4]		Function	Name [4]	Type	DP-ID	Flag
	0	Switching	P. key 1	1 bit	1.xxx	C, W, T, (R) [1]
	0	Status LED	P. key 1	1 bit	1.xxx	C, W (,R) [1]
	0	Short-time operation	P. key 1	1 bit	1.007	C, T, (R) [1]
	0	Value	P. key 1	2 byte	5.xxx	C, W, T, (R) [1]
	0	Value	P. key 1	1 byte	7.xxx	C, W, T, (R) [1]
	0	Temperature value	P. key 1	2 byte	9.001	C, W, T, (R) [1]
	0	Brightness value	P. key 1	2 byte	9.004	C, W, T, (R) [1]
	0	Scene extension	P. key 1	1 byte	18.001	C, T, (R) [1]
	0	Channel 1 switching	P. key 1	1 bit	1.xxx	C, W, T, (R) [1]
	0	Channel 1 value	P. key 1	1 byte	5.xxx	C, T, (R) [1]
	0	Channel 1 value	P. key 1	2 byte	9.001	C, T, (R) [1]
	18	Dimming	P. key 1	4 bit	3.007	C, W, T, (R) [1]
	18	Long-time operation	P. key 1	1-bit	1.008	C, W, T, (R) [1]
	18	Channel 2 switching	P. key 1	1-bit	1.xxx	C, W, T, (R) [1]
	18	Channel 2 value	P. key 1	1 byte	5.xxx	C, T, (R) [1]
	18	Channel 2 value	P. key 1	2 byte	9.001	C, T, (R) [1]
	36	Status LED	P. key 1	1-bit	1.xxx	C, W (,R) [1]
	36	Status LED	P. key 1	1 byte	20.102	C, W (,R) [1]
	36	Status LED	P. key 1	1 byte	5.xxx	C, W (,R) [1]
	36	Status LED	P. key 1	1 byte	6.xxx	C, W (,R) [1]

[1]: The communication objects can be read out (set L-flag).

[2]: The number of rockers or keys depends on the room controller variant used in the project. Mixed use of rocker and pushbutton functions in one and the same room controller possible.

[4]: As an example, the objects are described for key 1. The objects for the keys 2 ... max. 12 are defined in the same way by shifting the object number.

Disabling functions:

Object	Function	Name:	Type	DP-ID	Flag
16	Switching	P. disabling function 1	1-bit	1.xxx	C, W, T, (R) [1]
16	Short-time operation	P. disabling function 1	1-bit	1.007	C, T, (R) [1]
16	Value	P. disabling function 1	1 byte	5.xxx	C, W, T, (R) [1]
16	Value	P. disabling function 1	2 byte	7.xxx	C, W, T, (R) [1]
16	Temperature value	P. disabling function 1	2 byte	9.001	C, W, T, (R) [1]
16	Brightness value	P. disabling function 1	2 byte	9.004	C, W, T, (R) [1]
16	Scene extension	P. disabling function 1	1 byte	18.001	C, T, (R) [1]
16	Channel 1 switching	P. disabling function 1	1-bit	1.xxx	C, W, T, (R) [1]
16	Channel 1 value	P. disabling function 1	1 byte	5.xxx	C, T, (R) [1]
16	Channel 1 value	P. disabling function 1	2 byte	9.001	C, T, (R) [1]
17	Switching	P. disabling function 2	1-bit	1.xxx	C, W, T, (R) [1]
17	Short-time operation	P. disabling function 2	1-bit	1.007	C, T, (R) [1]
17	Value	P. disabling function 2	2 byte	5.xxx	C, W, T, (R) [1]
17	Value	P. disabling function 2	1 byte	7.xxx	C, W, T, (R) [1]
17	Temperature value	P. disabling function 2	2 byte	9.001	C, W, T, (R) [1]
17	Brightness value	P. disabling function 2	2 byte	9.004	C, W, T, (R) [1]
17	Scene extension	P. disabling function 2	1 byte	18.001	C, T, (R) [1]
17	Channel 1 switching	P. disabling function 2	1-bit	1.xxx	C, W, T, (R) [1]
17	Channel 1 value	P. disabling function 2	1 byte	5.xxx	C, T, (R) [1]
17	Channel 1 value	P. disabling function 2	2 byte	9.001	C, T, (R) [1]
34	Long-time operation	P. disabling function 1	1-bit	1.008	C, W, T, (R) [1]
34	Dimming	P. disabling function 1	4-bit	3.007	C, W, T, (R) [1]
34	Channel 2 switching	P. disabling function 1	1-bit	1.xxx	C, W, T, (R) [1]
34	Channel 2 value	P. disabling function 1	1 byte	5.xxx	C, T, (R) [1]
34	Channel 2 value	P. disabling function 1	2 byte	9.001	C, T, (R) [1]
35	Long-time operation	P. disabling function 2	1-bit	1.008	C, W, T, (R) [1]
35	Dimming	P. disabling function 2	4-bit	3.007	C, W, T, (R) [1]
35	Channel 2 switching	P. disabling function 2	1-bit	1.xxx	C, W, T, (R) [1]
35	Channel 2 value	P. disabling function 2	1 byte	5.xxx	C, T, (R) [1]
35	Channel 2 value	P. disabling function 2	2 byte	9.001	C, T, (R) [1]
54	Disabling	P. key disable	1-bit	1.001	C, W (,R) [1]

[1]: The communication objects can be read out (set L-flag).

Operation LED

52	Switching	T. operation LED	1-bit	1.001	C, W (,R) [1]

Alarm message:

Object	Function	Name:	Type	DP-ID	Flag
56	Switching	P. alarm message	1-bit	1.xxx	C, W (,R) [1]
57	Switching	P. alarm signalling acknowledge	1-bit	1.xxx	C, T, (R) [1]

Controller extension:

Object	Function	Name:	Type	DP-ID	Flag
58	Operating mode switch-over	P. controller extension	1 byte	20.102	C, W, T, R
59		P. controller extension	1 byte	20.102	C, W, T, R
60	Presence key	P. controller extension	1-bit	1.001	C, W, T, R
61	Setpoint shift output	P. controller extension	1 byte	6.010	C, W, T, R
62	Setpoint shift input	P. controller extension	1 byte	6.010	C, W, T, R
63	Controller status	P. controller extension	1 byte	undefined	C, W, T, (R) [1]
64	Actual temperature	P. temperature measurement	2 byte	9.001	C, T, (R) [1]
65	External temperature	P. external temperature sensor	2 byte	9.001	C, W, (R) [1]

Scene control

Object	Function	Name	Type	DP-ID	Flag
66	Switching	P. scene output 1 [5]	1-bit	1.001	C, W, T, (R) [1]
66	Value	P. scene output 1 [5]	1 byte	5.xxx	C, W, T, (R) [1]
66	Value	P. scene output 1 [5]	1 byte	5.001	C, W, T, (R) [1]
74	Extension input	P. scenes	1 byte	18.001	C, W (,R) [1]

[1]: The communication objects can be read out (set L-flag).

[5]: Scene outputs 2 ... 8 see scene output 1 taking into consideration an object number shift (66 + number of scene output - 1).

Room temperature controller functions:

Object	Function	Name	Type	DP-ID	Flag
80	Basic setpoint	C. input	2 byte	9.001	C, W
82	Operating mode switch-over	C. input	1 byte	20.102	C, W, T, R
82	Comfort mode	C. input	1-bit	1.001	C, W, T
83	standby mode	C. input	1-bit	1.001	C, W, T
84	Night mode	C. input	1-bit	1.001	C, W, T
85	Frost/ heat protection	C. input	1-bit	1.001	C, W, T
86	Operating mode forcing object	C. input	1 byte	20.102	C, W, T, R
87	Presence object	RTC input / output	1-bit	1.001	C, W, T, R
88	Window status	C. input	1-bit	1.019	C, W, T, R
89	Heating/cooling switch-over:	C. input	1-bit	1.100	C, W, T, R
90	Controller status	RTC output	1 byte	undefined	C, T
90	Controller status, comfort mode	RTC output	1-bit	1.001	C, T
90	Controller status, standby mode	RTC output	1-bit	1.001	C, T
90	Controller status, night mode	RTC output	1-bit	1.001	C, T
90	Controller status, frost / heat protection	RTC output	1-bit	1.001	C, T
90	Controller status, controller disabled	RTC output	1-bit	1.001	C, T
90	Controller status, heating / cooling	RTC output	1-bit	1.001	C, T
90	Controller status, controller inactive	RTC output	1-bit	1.001	C, T
90	Controller status, frost alarm	RTC output	1-bit	1.001	C, T
91	Heating message	RTC output	1-bit	1.001	C, T
92	Cooling message	RTC output	1-bit	1.001	C, T
94	Disable controller	C. input	1-bit	1.001	C, W, T, R
95	Disable additional stage 8	C. input	1-bit	1.001	C, W
96	Actuating variable heating	RTC output	1 byte	5.001	C, T
96	Actuating variable heating	RTC output	1-bit	1.001	C, T
96	Actuating variable basic heating	RTC output	1 byte	5.001	C, T
96	Actuating variable basic heating	RTC output	1-bit	1.001	C, T
96	Actuating variable heating/cooling	RTC output	1 byte	5.001	C, T
96	Actuating variable heating/cooling	RTC output	1-bit	1.001	C, T
96	Actuating variable basic stage	RTC output	1 byte	5.001	C, T
96	Actuating variable basic stage	RTC output	1-bit	1.001	C, T
97	Actuating variable additional heating	RTC output	1 byte	5.001	C, T
97	Actuating variable additional heating	RTC output	1-bit	1.001	C, T
97	Actuating variable additional stage	RTC output	1 byte	5.001	C, T
97	Actuating variable additional stage	RTC output	1-bit	1.001	C, T
98	Actuating variable cooling	RTC output	1 byte	5.001	C, T
98	Actuating variable cooling	RTC output	1-bit	1.001	C, T
98	Actuating variable basic cooling	RTC output	1 byte	5.001	C, T
98	Actuating variable basic cooling	RTC output	1-bit	1.001	C, T
99	Actuating variable additional cooling	RTC output	1 byte	5.001	C, T
99	Actuating variable additional cooling	RTC output	1-bit	1.001	C, T

Room temperature controller functions (continued):

Object	Function	Name	Type	DP-ID	Flag
100	PWM actuating variable heating	C. output	1 byte	5.001	C, T
100	PWM actuating variable basic heating	C. output	1 byte	5.001	C, T
100	PWM actuating variable heating / cooling	C. output	1 byte	5.001	C, T
100	PWM actuating variable basic stage	C. output	1 byte	5.001	C, T
101	PWM actuating variable additional heating	RTC output	1 byte	5.001	C, T
101	PWM actuating variable additional stage	RTC output	1 byte	5.001	C, T
102	PWM actuating variable cooling	RTC output	1 byte	5.001	C, T
102	PWM actuating variable basic cooling	RTC output	1 byte	5.001	C, T
103	PWM actuating variable additional cooling	RTC output	1 byte	5.001	C, T
104	Setpoint temperature	RTC output	2 byte	9.001	C, T, R
106	Setpoint shift feedback	RTC output	1 byte	6.010	C, T, R
107	Setpoint shift preset	C. input	1 byte	6.010	C, W
108	Status report additional stage	RTC output	1 byte	undefined	C, T
109	Actual temperature not adjusted	RTC output	2 byte	9.001	C, T
110	Ventilation automatic / manual	C. input	1-bit	1.001	C, W, T
111	Ventilation, fan level 1	C. output	1-bit	1.001	C, T, R
111	Ventilation, fan level 1 – 8	C. output	1 byte	5.001	C, T, R
112	Ventilation, fan level 2	C. output	1-bit	1.001	C, T, R
113	Ventilation, fan level 3	C. output	1-bit	1.001	C, T, R
114	Ventilation, fan level 4	C. output	1 bit	1.001	C, T, R
115	Ventilation, fan level 5	C. output	1 bit	1.001	C, T, R
116	Ventilation, fan level 6	C. output	1 bit	1.001	C, T, R
117	Ventilation, fan level 7	RC. output	1 bit	1.001	C, T, R
118	Ventilation, fan level 8	C. output	1 bit	1.001	C, T, R
119	Ventilation, forced-control	C. input	1 bit	1.001	C, W
120	Ventilation, level limitation	C. input	1 bit	1.001	C, W
121	Ventilation, fan protection	C. input	1 bit	1.001	C, W
122	Outside temperature	C. input	2 byte	9.001	C, W
123	Cooling setpoint limiting	C. input	1 bit	1.001	C, W
124	Floor temperature	C. input	2 byte	9.001	C, W
125	Clock timer channel 1	C. input	1 bit	1.001	C, W
126	Clock timer channel 2	C. input	1 bit	1.001	C, W
127	Clock timer channel 3	C. input	1 bit	1.001	C, W
128	Clock timer channel 4	C. input	1 bit	1.001	C, W

Display functions:

Object	Function	Name:	Type	DP-ID	Flag
130	Time of day	D. input	3 bytes	10.001	C, W
131	Date	D. input	3 bytes	11.001	C, W
132	Request date/time of day	D. output	1 bit	1.003	C, T
133	Backlighting on/off	D. input	1 bit	1.001	C, W
133	Backlighting brightness	D. input	1 byte	5.001	C, W
134	Info-mode:	D. input/output	1 bit	1.001	C, W, T
135	Fixed page recall	D. input	1 bit	1.001	C, W
135	Variable page recall	D. input	1 byte	5.010	C, W
136	Switching	D. input [page 1 line 1] [6]	1 bit	1.001	C, W
136	Value, 1 byte	D. input [page 1 line 1] [6]	1 byte	5.0xx 6.0xx	C, W
136	Value, 1 dimming value	D. input [page 1 line 1] [6]	1 byte	5.001 5.010	C, W
136	Blind	D. input [page 1 line 1] [6]	1 bit	1.008	C, W
136	Light-scene	D. input [page 1 line 1] [6]	1 byte	18.001	C, W
136	Value, 2 bytes	D. input [page 1 line 1] [6]	2 bytes	7.xxx 8.xxx 9.xxx	C, W
136	Value, 4 bytes	D. input [page 1 line 1] [6]	4 bytes	12.xxx 13.xxx 14.xxx	C, W
136	ASCII, 14 bytes	D. input [page 1 line 1] [6]	14 bytes	16.00x	C, W
139	Symbol recall page 1	D. input	1 bit	1.001	C, W
139	Symbol recall page 1	D. input	1 bytes	5.010 [7]	C, W
152	Central alarm unit line 1	D. input	14 bytes	16.00x	C, W
153	Central alarm unit line 2	D. input	14 bytes	16.00x	C, W
154	Central alarm unit line 3	D. input	14 bytes	16.00x	C, W
155	Central alarm unit selection	D. output	1 bit	1.001	C, T

[6]: As an example, the objects are described for page 1 line 1. The objects of pages 2 to 4 and of the other lines result from object number shifting.

[7]: The object has the datapoint type "ShowElementNo". This type corresponds to an integer without sign.

Rocker function object description

0, 1	Switching	1-bit object for the transmission of switching telegrams (ON, OFF).
0	Short-time operation	1-bit object for the transmission of telegrams with which a blind or shutter drive motor can be stopped or with which the shutter slats can be adjusted by short-time operation.
0, 1	Scene extension	1-byte object for recalling or for storing one of 64 scenes max. from a scene pushbutton sensor.
0	Brightness value	2-byte object for the transmission of a brightness value from 0 lux to 1500. If the variation 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.
0	Temperature value	2-byte object for the transmission of a temperature value from 0 °C to 40 °C. If the variation 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.
0	Value	1-byte object or 2-byte object for the transmission of values from 0 to 255 (corresponding to values from 0 % to 100 %) or from 0 to 65535. If the variation 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 a presettable amount.
0	Channel 1 switching	1-bit object for the transmission of switching telegrams, if the 2-channel control is activated.
0	Channel 1 value	1-byte object or 2-byte object for the transmission of value telegrams, if the 2-channel control is activated.
36	Top status LED	1-bit object or 1-byte object for controlling the status LED.
37	Bottom status LED	1-bit object or 1-byte object for controlling the status LED.
18	Dimming	4-bit object for the transmission of relative dimming telegrams.
18	Long-time operation	1-bit object for the transmission of telegrams with which a blind or shutter drive can raise or lower the curtain.
18	Channel 2 switching	1-bit object for the transmission of switching telegrams, if the 2-channel control is activated.
18	Channel 2 value	1-byte object or 2-byte object for the transmission of value telegrams, if the 2-channel control is activated.

Key function object description

0	Switching	1-bit object for the transmission of switching telegrams (ON, OFF).
0	Short-time operation	1-bit object for the transmission of telegrams with which a blind or shutter drive motor can be stopped or with which the shutter slats can be adjusted by short-time operation.
0	Scene extension	1-byte object enabling the room controller to transmit a telegram to a scene pushbutton sensor for recalling or for storing one of max. 64 scenes.
0	Brightness value	2-byte object for the transmission of a brightness value from 0 lux to 1500. If the variation 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.
0	Temperature value	2-byte object for the transmission of a temperature value from 0 °C to 40 °C. If the variation 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.
0	Value	1-byte object or 2-byte object for the transmission of values from 0 to 255 (corresponding to values from 0 % to 100 %) or from 0 to 65535. If the variation 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 a presettable amount.

	0	Channel 1 switching	1-bit object for the transmission of switching telegrams, if the 2-channel control is activated.
	0	Channel 1 value	1-byte object or 2-byte object for the transmission of value telegrams, if the 2-channel control is activated.
	36	Status LED	1-bit object or 1-byte object for controlling the status LED.
	18	Dimming	4-bit object for the transmission of relative dimming telegrams.
	18	Long-time operation	1-bit object for the transmission of telegrams with which a blind or shutter drive can raise or lower the curtain.
	18	Channel 2 switching	1-bit object for the transmission of switching telegrams, if the 2-channel control is activated.
	18	Channel 2 value	1-byte object or 2-byte object for the transmission of value telegrams, if the 2-channel control is activated.

Disabling function object description

	16, 17	Switching	1-bit object for the transmission of switching telegrams (ON, OFF).
	16, 17	Short-time operation	1-bit object for the transmission of telegrams with which a blind or shutter drive motor can be stopped or with which the shutter slats can be adjusted by short-time operation.
	16, 17	Scene extension	1-byte object enabling the room controller to transmit a telegram to a scene pushbutton sensor for recalling or for storing one of max. 64 scenes.
	16, 17	Brightness value	2-byte object for the transmission of a brightness value from 0 lux to 1500. If the variation 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.
	16, 17	Temperature value	2-byte object for the transmission of a temperature value from 0 °C to 40 °C. If the variation 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.
	16, 17	Value	1-byte object or 2-byte object for the transmission of values from 0 to 255 (corresponding to values from 0 % to 100 %) or from 0 to 65535. If the variation 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 a presettable amount.
	16, 17	Channel 1 switching	1-bit object for the transmission of switching telegrams, if the 2-channel control is activated.
	16, 17	Channel 1 value	1-byte object or 2-byte object for the transmission of value telegrams, if the 2-channel control is activated.
	34, 35	Dimming	4-bit object for the transmission of relative dimming telegrams.
	34, 35	Long-time operation	1-bit object for the transmission of telegrams with which a blind or shutter drive can raise or lower the curtain.
	34, 35	Channel 2 switching	1-bit object for the transmission of switching telegrams, if the 2-channel control is activated.
	34, 35	Channel 2 value	1-byte object or 2-byte object for the transmission of value telegrams, if the 2-channel control is activated.
	54	Disable	1-bit object with which the room controller can be disabled and re-enabled (polarity can be parameterized).

Operation LED object description

	52	Switching	1-bit object for switching the operation LED on or off ("1" = on; "0" = off).

Alarm message object description

↓	56	Switching	1-bit object for the reception of an alarm message (polarity can be parameterized).
↑	57	Switching	1-bit object for transmitting the alarm message acknowledgement (polarity can be parameterized)

Controller extension object description

↓	58	Operating mode switch-over	1-byte object for switching over a room temperature controller between the comfort, standby, night and frost / heat protection operating modes
↑	59	Forced operating mode switch-over	1-byte object for switching over a room temperature controller between the comfort, standby, night and frost / heat protection operating modes
↑	60	Presence key	1-bit object for switching over the presence status of a room temperature controller (polarity can be parameterized).
↑	61	Setpoint shift output	1-byte object for presetting a basic setpoint shift for a controller. $x \leq 0 \leq y$ (0 = no active shifting); integers Value object 62 + 1 (increase step value) Value object 62 + 1 (decrease step value) The possible range of values (x to y) is fixed by the setpoint adjusting range to the 'upper limit' or to the 'lower limit' (parameterizable) in combination with the step value on the room temperature controller.
↑	62	Setpoint shift input	1-byte object used by the extension for receiving the current setpoint shift of the room temperature controller $x \leq 0 \leq y$ (0 = no active shifting); integers The possible range of values (x to y) is fixed by the setpoint adjusting range to the 'upper limit' or to the 'lower limit' (parameterizable) in combination with the step value on the room temperature controller.
↑	63	Controller status	1-byte object used by the extension for receiving the current state of operation of the controller. Status LEDs that can be used to indicate a status independently of a key function can display one of the various information units which are grouped in this byte (bit-oriented evaluation).
↑	64	Actual temperature	2-byte object for the transmission of the measured temperature. When evaluating the room temperature, the room controller can optionally use only the internal sensor or also the value measured by an external sensor.
↑	65	External temperature	2-byte object with which the room controller can receive or scan the temperature value of an external sensor.

Object description for scene control

↓	66…73	Switching	1-bit objects for controlling up to 8 actuator groups (ON, OFF).
↓	66…73	Value	1-byte objects for controlling up to 8 actuator groups (0…255).
↓	74	Extension input	1-byte object with which one of the eight internally stored scenes can be recalled or stored again.

Room temperature controller object description

☐←	80	Basic setpoint:	2-byte object for external preset of basic setpoint. Depending on the control option, the possible range of values is limited by the parameterized frost protection and/or heat protection temperature. The received value is mathematically rounded off to half °C!
☐←	82	Operating mode switch-over:	1-byte object for switch-over of the controller's operating modes acc. to KONNEX.
☐←	82	Comfort operation:	1-bit object for switch-over into the "Comfort" operating mode.
☐←	83	Standby operation:	1-bit object for switch-over into the "standby" operating mode.
☐←	84	Night-time operation:	1-bit object for switch-over into the "night" operating mode.
☐←	85	Frost / heat protection	1-bit object for switch-over into the "frost/heat protection" operating mode.
☐←	86	Forced-control object operating mode:	1-byte object for higher-level forced control of the controller's operating modes acc. to KONNEX.
☐⇄	87	Presence object:	1-bit object (bi-directional) which transmits the status of the presence key - to the bus after pressing or which can be used for connection of a presence detector. (presence detected = "1", presence not detected = "0")
☐←	88	Window status:	1-bit object for the connection of window contacts. (window open = "1", window closed = "0")
☐⇄	89	Heating / cooling change-over:	1-bit object for switching over between control options "heating" and "cooling, if not done by the controller automatically (object value 1: heating; object value 0: cooling). In case of automatic switch-over the active control option can be transmitted (parameter-dependent).
☐→	90	Controller status:	1-byte object for general status feedback
☐→	90	Controller status …:	1-bit object for individual status feedback of parameterizable functions of the controller (frost alarm, heating/cooling, comfort mode, night mode, standby mode, controller disabled, controller inactive, frost/heat protection).
☐→	91	Message heating:	1-bit object for the controller to indicate a request for heating energy (object value = "1": energy requested, object value = "0": no energy requested).
☐→	92	Message cooling:	1-bit object for the controller to indicate a cooling energy request (object value = "1": energy requested, object value = "0": no energy requested).
☐←	94	Controller disable:	1-bit object for deactivating the controller (activation of dew-point operation). (controller deactivated = "1", controller activated = "0")
☐←	95	Disable additional stage:	1-bit object for deactivating the additional stage of the controller. (additional stage deactivated = "1", additional stage activated = "0")

Room temperature controller object description

96	Actuating variable heating	1-byte object for outputting the continuous actuating variable for heating operation
96	Actuating variable heating:	1-bit object to output the switching actuating variable or PWM actuating variable used for the heating operation.
96	Actuating variable basic heating:	1-byte object to output the continuous actuating variable for basic heating operation.
96	Actuating variable basic heating:	1-bit object to output the switching actuating variable or PWM actuating variable used for basic heating.
96	Actuating variable heating/cooling:	1-byte object to output the continuous actuating variable for heating or cooling operation. (via shared object if actuating variables are output)
96	Actuating variable heating/cooling:	1-bit object to output the switching actuating variable or PWM actuating variable alternatively for the heating or cooling operation. (via shared object if actuating variables are output)
96	Actuating variable basic heating and cooling:	1-byte object for the output of the continuous actuating variable either for basic heating or for basic cooling operation. (via shared object if actuating variables are output)
96	Actuating variable basic heating and cooling:	1-bit object to output the switching actuating variable or PWM actuating variable either for basic heating or basic cooling operation. (via shared object if actuating variables are output)
97	Actuating variable additional heating:	1-byte object to output the continuous actuating variable for additional heating operation.
97	Actuating variable additional heating:	1-bit object to output the switching actuating variable or PWM actuating variable for additional heating operation.
97	Actuating variable additional stage:	1-byte object for the output of the continuous actuating variable either for additional heating or cooling operation (via shared object if actuating variables are output)
97	Actuating variable additional stage:	1-bit object to output the switching actuating variable or PWM actuating variable either for the heating or cooling operation. (via shared object if actuating variables are output)
98	Actuating variable cooling:	1-byte object to output the continuous actuating variable for cooling operation.
98	Actuating variable cooling:	1-bit object to output the switching actuating variable or PWM actuating variable for cooling operation.
98	Actuating variable basic cooling:	1-byte object to output the continuous actuating variable for basic cooling operation
98	Actuating variable basic cooling:	1-bit object to output the switching actuating variable or PWM actuating variable for basic cooling operation.
99	Actuating variable additional cooling:	1-byte object to output the continuous actuating variable for additional cooling operation.
99	Actuating variable additional cooling:	1-bit object to output the switching actuating variable or PWM actuating variable for additional cooling operation.
100	PWM actuating variable heating:	1-byte object with PWM actuating variable for status feedback of the actuating variable value for heating operation.
100	PWM actuating variable basic heating:	1-byte object with PWM actuating variable for status feedback of the continuous actuating variable value for basic heating operation
101	PWM actuating variable additional heating:	1-byte object with PWM actuating variable for status feedback of the continuous actuating variable value for additional heating.
102	PWM actuating variable cooling:	1-byte object with PWM actuating variable for status feedback of the continuous actuating variable value for cooling operation.
102	PWM actuating variable basic cooling:	1-byte object with PWM actuating variable for status feedback of the continuous actuating variable value for basic cooling operation

Room temperature controller object description

☐→	103	PWM actuating variable additional cooling:	1-byte object with PWM actuating variable for status feedback of the continuous actuating variable value for additional cooling operation
☐→	104	Setpoint temperature:	2-byte object to output the current temperature setpoint value. Depending on the control option, the possible range of values is limited by the parameterized frost protection and/or heat protection temperature.
☐→	106	Feedback setpoint shift:	1-byte object for current setpoint shift feedback $x \leq 0 \leq y$ (0 = no active shifting); integers The possible range of values (x to y) is fixed by the setting of the upper and lower limits for the setpoint (parameterizable) in combination with the step value (0.5 °C).
☐←	107	Setpoint shift default:	1-byte object for presetting a basic setpoint shift, e.g. via a controller extension. $x \leq 0 \leq y$ (0 = no active shifting); integers The possible range of values (x to y) is fixed by the setting of the upper and lower limits for the setpoint (parameterizable) in combination with the step value (0.5 °C). 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.
☐→	108	Additional status indication:	1-byte object for general additional status feedback
☐→	109	Actual temperature non adjusted	2-byte object to output the actual temperature (room temperature) as measured and not adjusted by the controller. (possible range of values: -99.9 °C ... +99.9 °C / Measuring range of internal temperature sensor: 0 °C to + 40 °C ± 1 %)
☐←	110	Ventilation automatic / manual	1-bit object for switching over between automatic and manual fan control. The object values for automatic or manual operation can be preset.
☐→	111	Ventilation, fan intensity level 1-8	1-byte object to output the current fan intensity level.
☐→	111	Ventilation, fan intensity level	1-bit objects to output the current fan intensity level. The number of objects can be parameterized. After a changing the fan intensity level, the waiting time is started at first. The current fan intensity level remains unchanged. The current fan level is deactivated only after the waiting time has elapsed. After deactivation of the old level, the new level is activated.
☐←	119	Ventilation, forced-control	1-bit for activation of a predefined fan intensity level.
☐←	120	Ventilation, level limitation	1-bit object activating the maximum fan level limitation, e.g. during the night.
☐←	121	Ventilation, fan protection	1-bit object which can be used to activate the fan protection.
☐←	122	Outside temperature	2-byte suitable for receiving the measuring value of a separate outside temperature sensor. This value can be displayed and at the same time be used for controlling the setpoint temperature in cooling operation.
☐←	123	Cooling setpoint limiting	1-bit object which can be used for activating the limitation of the maximum setpoint temperature in cooling operation.
☐←	124	Floor temperature	2-byte object which can be used for limiting the intensity of an underfloor heating.
☐←	125	Clock timer channel 1	1-bit object for activating the corresponding symbol on the display.
☐←	126	Clock timer channel 2	1-bit object for activating the corresponding symbol on the display.
☐←	127	Clock timer channel 3	1-bit object for activating the corresponding symbol on the display.

	128	Clock timer channel 4	1-bit object for activating the corresponding symbol on the display.

Display object description

☐←	130	Time of day	3-byte object for receiving the current time of day.
☐←	131	Date	3-byte object for receiving the current date.
☐←	132	Request date/time of day	1-bit object with which the RCD can request a master clock to transmit the current date and the current time of day. With this information, the RCD can synchronize its internal clock with the master.
☐←	133	Backlighting on/off	1-bit object for activating the display backlighting.
☐←	133	Backlighting dimmer	1-byte object for adjusting the display backlighting via the bus. The numerical values 0 … 255 correspond to brightness values of 0% … 100% (0% = backlighting off)
☐←	134	Info-mode:	1-bit object for switching the display info mode on or off. The info mode can be controlled via the second operation level menu or via parameters. The object is hidden if the parameter "Display info after initialization" is set to OFF.
☐←	135	Fixed page recall	1-bit object for displaying a parameterized page.
☐←	135	Variable page recall	1-byte object for displaying any of the pages.
☐←	136 …138	Switching	1-bit objects receiving switching states to be displayed. For the object values 0 and 1, a static text and variable texts can be parameterized.
☐←	136 …138	Value, 1 byte	1-byte objects receiving values to be displayed. Depending on the datapoint type selected, different formatting options (static text, value conversion, unit text) are available
☐←	136 …138	Dimming value	Dimming objects (1 byte) receiving dimming values to be displayed (line display "dimming").
☐←	136 …138	Bind/shutter	1-bit objects receiving the drive control telegrams to be displayed. For the object values 0 and 1, a static text and variable texts can be parameterized.
☐←	136 …138	Light-scene	1-byte objects receiving scene numbers to be displayed. A static text can be parameterized. The scene number is displayed independent of the scene recall or scene storage function.
☐←	136 …138	Value, 2 bytes	2-byte objects receiving values to be displayed. Depending on the datapoint type selected, different formatting options (static text, value conversion, unit text) are available.
☐←	136 …138	Value, 4 bytes	4-byte objects receiving values to be displayed. Depending on the datapoint type selected, different formatting options (static text, value conversion, unit text) are available.
☐←	136 …138	ASCII, 14 bytes	14-byte objects receiving values to be displayed. A static text can be parameterized.
☐←	139	Symbol recall page 1	1-bit object or 1-byte object with which a 30 x 30 pixels symbol can be displayed on the right-hand margin of the display window. The 1-byte object is of the "ShowElementNo" datapoint type. This type corresponds to an integer without sign. Possible values of the object: 0: no change 1: show symbol no. 1 2: show symbol no. 2 … 255: show symbol no. 255 The room controller's memory holds 30 symbols. Any higher value received by the object will be ignored.
☐←	152 … 154	Message Central alarm unit line 1 ... line 3	14-byte objects suitable for receiving texts from a central alarm unit to be displayed. The messages are acknowledged by the following 1-bit object.

	155	Central alarm unit selection	1-bit object transmitting an acknowledge message to the central alarm unit which can then transmit the next text message.

Room controller scope of functions

- Rocker / key functions
  - Each control surface can either be used as a single rocker or as two independent keys.
  - The control surfaces can be configured in such a way that they are arranged in horizontal or vertical direction.
  - Each rocker can be used for the functions 'switching', 'dimming', 'blind/shutter control', '1-byte value transmitter', '2-byte value transmitter' and 'scene extension'.
  - Each key can be used for the functions 'switching', 'dimming', 'blind/shutter control', '1-byte value transmitter', '2-byte value transmitter', 'scene extension' and room temperature controller extension.
  - 2-channel control: Each rocker or each key can be set for controlling two independent channels. This means that only one key-press is enough to transmit up to 2 telegrams to the bus. The channels can be parameterized independent of one another for the functions 'switching', 'value transmitter (1 byte)' or 'temperature value transmitter (2 bytes)' .
  - As far as the rocker functions 'dimming', 'blind/shutter' (operation concept "Long – Short or Short") and '2-channel control' are concerned, a press on the full surface of the rocker can be evaluated as well. With a rocker full-surface actuation it is possible to send switching telegrams and scene recall requests over the bus independently of the programmed rocker function.
  - The switching function offers the following configurations: Reaction on pressing and / or on releasing, switching on, switching off and toggling.
  - The dimming function offers the following configurations: One- or two-surface actuation, times for short and long press, dimming in different steps, telegram repetition on long press, transmission of stop telegram on key release.
  - The blind/shutter control offers the following configurations: One- or two-surface actuation, four different operation concepts with times for short and long press and slat adjustment.
  - The 1-byte and 2-byte value transmitter function offers the following configurations: Selection of the value range (0 … 100 %, 0 … 255, 0 … 65535, 0 … 1500 lux, 0 … 40 °C), value on key-press, value variation on sustained key-press with different step widths, times between two value telegrams, behaviour on reaching the limit value.
  - The scene control offers the following configurations: Internal storage of 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.
  - The controller extension function offers the following configurations: Operating mode switch-over with normal and high priority, defined selection of an operating mode, change between different operating modes, change of presence status, setpoint shift.

- LED functions
  - Each control surface has two vertically arranged status LEDs.
  - When a status LED is internally connected with the rocker or the key, it can signal a key-press or the current status of a communication object. The status can also be indicated in inverted form.
  - When a status LED is independent of the rocker or key, it can be permanently on or off, indicate the status of its own communication object, the operating state of a room temperature controller or the result of a comparison between signed or unsigned 1-byte values.
  - The operation LED can be permanently on or off, flashing or alternatively switched by means of a communication object.
- Disabling / alarm functions
  - The rockers or keys can be disabled via a 1-bit object. The following configurations are available: Polarity of the disabling object, behaviour at the beginning and at the end of disabling. During an active disable, all or some of the rockers / keys can have no function, can perform the function of a selected key or execute one of two presettable disabling functions.
  - All status LEDs and the operation LED of the room controller can flash simultaneously in case of an alarm message. The following configurations are available: Value of the alarm message object for the states alarm / no alarm, alarm acknowledge by actuation of a key, transmission of the acknowledge signal to other devices.

Room temperature controller scope of functions

- General
  - 5 operating modes: Comfort, standby, night, frost/heat protection and controller disable (dew-point)
  - Operating modes switch-over via 1-byte object according to KONNEX or individual 1-bit objects.

- Heating/cooling system
  - Control options: heating", "cooling", "heating and cooling" each with or without additional stage.
  - PI control (continuous or switching PWM) or 2-state control (switching) adjustable as control algorithms.
  - Continuous (1-byte) or switching (1-bit) actuating variable output.
  - Control parameter for PI controller (if desired: proportional range, reset time) and 2-state controller (hysteresis) presettable.
  - Fan control manually or as a function of the actuating variable (8 stages max.)

- Setpoint values
  - Each operating mode can have its own temperature setpoints (for heating and/or cooling) assigned.
  - The setpoints for the additional stage are derived via a parameterizable stage offset from the values of the basic stage.
  - Setpoint value shifting by local operation on device itself or via communication objects.

- Functions
  - Automatic or object oriented switch-over between "heating" and "cooling".
  - The controller operation can optionally be disabled via an object.
  - Duration of comfort mode prolongation parameterizable.
  - Complete (1-byte) or partial (1-bit) status information can be parameterized and transmitted to the bus via an object.
  - Deactivation of the control or of the additional stage via different objects possible.

- Room temperature measurement
  - Internal and external room temperature sensor available.
  - Internal to external determination of measured value with enabled external sensor.
  - Request interval of external temperature sensor adjustable.
  - The actual and setpoint temperature can be output to the bus (also cyclically), if a parameterizable deviation is detected .
  - The room temperature measurement (actual value) can be adjusted separately for the internal and external sensor via parameter.
  - Frost/heat protection switch-over depending on window state (delayed detection possible) and automatic frost protection.
  - Temperature alarm with upper and lower temperature limit possible. Telegram activation via two separate objects.

- Actuating variable output
  - Separate or combined actuating variable output via one or two objects for "heating and cooling".
  - Normal or inverted actuating variable output parameterizable
  - Automatic transmission and cycle time for actuating variable output parameterizable
  - Fan control via one 1-byte or eight 1-bit objects.

Display scope of functions

- Backlighting can be dimmed and switched
- Pictograms
  - Operating mode of room temperature controller can be displayed
  - Fan control status display
- Text display
  - Display of four pages max. with up to three lines
  - Page recall cyclical and / or event-triggered
- Info-mode:
  - Display of texts for pushbutton sensor operation
- Second control level
  - Room temperature and fan control settings
  - Display of messages from central alarm unit

Table of contents

Functional description

1 General settings

The room controller is equipped with square control surfaces which can be used independently of one another as a rocker with two opposite actuation points or as two keys with one actuation point each. The number of control rockers depends on the room controller variant used.

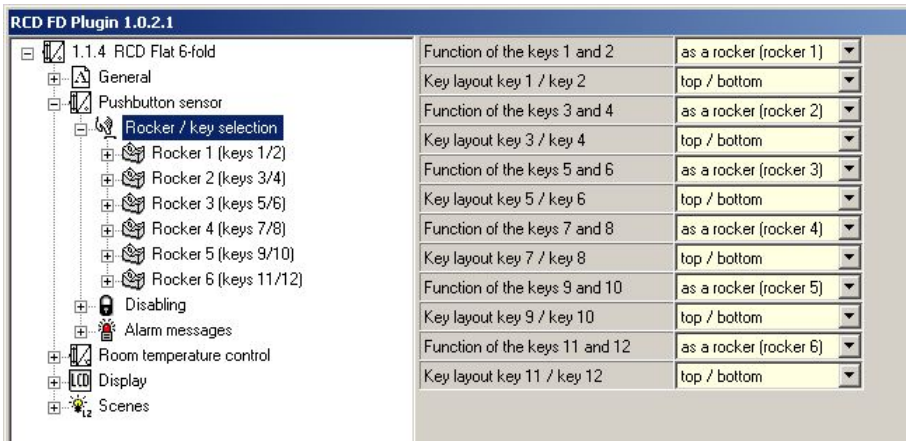
Depending on the function of the rocker / key, the two red LEDs beside each rocker may be internally connected with the control function. They can, however, also be used for signalling completely independent functions or be permanently on or off.
The blue operation LED can also signal the value of an independent object or be permanently on or off. Besides the functions that can be programmed with the application software, the operation LED also indicates that the room controller is in the programming mode for commissioning or diagnosis purposes. The white illumination of the nameplate can represent the value of an independent 1-bit or 1-byte object (brightness value) or be permanently on or off.

Moreover, the room controller has functions which are not immediately linked with the rockers or keys and which must therefore be additionally enabled by the corresponding parameters. These functions are: controller extension function, room temperature measurement, key functions disable, internal scenes and displaying of alarm messages.

Notes on this product documentation:
On different occasions, the functional description makes use of screenshots of the parameter windows. These screenshots are intended to illustrate the parameter settings described in detail. The pictures were taken with the ETS 3. The representation may vary depending on the type of operating system used and of the pertaining configuration settings.

1.1 Rocker / key selection

The choice between rocker and key control is made on the parameter page "Rocker / key selection". The other parameter pages and the communication objects of the rockers or keys are adapted in line with the settings selected on this tab.



If a control surface is used a rocker, both action points act in common on the communication objects assigned to the rocker. As a rule, a press on the two action points will then produce exactly the opposite reaction (e.g. switching: ON, OFF / blind/shutter: UP - DOWN). The commands given when a key is pressed are generally independent of one another.
Depending on the basic function of a rocker, it is also possible with some settings to use a full-surface actuation with a separate function.

When a control surface is used as separate keys, the keys are parameterized independent of one another and can fulfil completely different functions (e.g. switching: TOGGLE – controller operating mode: comfort). In addition to the function selection in case of the rocker function, the key operation offers moreover the possibility of using the keys as an extension for a room temperature controller. Full-surface actuation of the control surface in the key control mode is not possible.

Pressing several rockers or keys at the same time will be considered as an incorrect operator input. The special rocker function "Full-surface actuation" is an exception to the above rule. In this case, the programming of the rocker decides whether the operation is incorrect or not.

1.2 Key arrangement

With the "Key arrangement" parameter, the user can select separately for each key pair of a control surface how the keys are to be arranged on the surface, i.e. where the actuation points are located.

In the basic configuration the two actuation points of a control surface are arranged vertically (top / bottom). As an alternative, the actuation points can be arranged horizontally (left / right).

Different key arrangements can also be programmed in a room controller. The key configuration can still be changed later on. Assigned group addresses or parameter settings remain unaffected.

1.3 Internal key functions

The keys of the room controller can be used on the one hand for sending telegrams to other devices and on the other hand for executing internal functions. These internal functions do not result directly in a transmission of telegrams.

The following internal functions are available:

- Fan control: A key to which the "Fan control" function has been assigned acts immediately on the fan control as part of the room temperature control. A second parameter determines whether the fan control will be switched on the press of a key into automatic or into manual operation. The length of the key-press is not relevant. The function of the fan control is discussed in detail in the room temperature control description.
- Info-key: The info mode can be used to display help on the use of a key when this key is pressed. The use of the info mode is described under the display functions.
- Page changing: The display can show up to four pages with up to three lines per page. A key for changing the page can either be used for calling up a specific page directly or for calling up different pages in a defined order. The use of this feature is described under the display functions.
- Operating mode switch-over Switching over of the operating mode has an immediate effect on the internal room temperature controller. The functions are discussed in the room temperature controller description.
- Setpoint shifting: Shifting of the setpoint has an immediate effect on the internal room temperature controller. Each press of a key increments or decrements the room temperature by a step. The setpoint shifting functions and the steps are discussed in the room temperature controller description.

1.4 Operation LED

The blue operation LED of the room controller is used for different functions which are partly fixed internal default functions.

- In a non-programmed device (as-supplied state) or after downloading of a wrong application program, this LED flashes at a slow rate of 0.75 Hz.
- When the room controller is switched over into the programming mode for commissioning or for ETS diagnosis purposes, the LED flashes at a fast rate of about 8 Hz (cf. "Commissioning" in the hardware description of this documentation).
- To confirm the detection of a full-surface press with the rocker function, the LED flashes with 8 Hz, too.

More LED functions can be preset by means of the parameters in the application software:

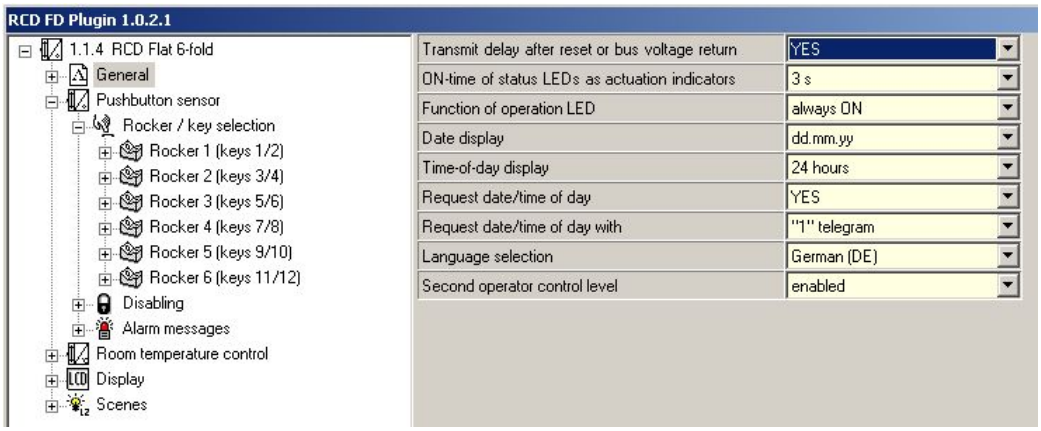
- The LED can be programmed to flash together with all other red status LEDs with a frequency of about 2 Hz, when the communication object for the alarm message is active.
- The LED can display the status of a separate communication object in inverted or non-inverted form.
- The LED can be switched on permanently to serve as an orientation light.
- The LED can be permanently off.

If several of the above states occur at the same time, the priority is as follows:

1. Display of the programming mode. The programming mode is cancelled automatically after a key-press.
2. Display of a valid full-surface actuation with the rocker function.
3. Display of an alarm. The mode of resetting the alarm either automatically by a key-press or by the communication object must be specified in the parameters.
4. The status display of the separate communication object or the permanent states (on, off).

1.5 Transmit delay

After a reset (e.g. after loading of an application program or the physical address or after return of bus voltage), the room controller can automatically transmit telegrams for the room temperature controller extension and room temperature measurement functions. In case of the controller extension, the room controller attempts to get values from the room temperature controller by means of read telegrams in order to update the object states. In case of the room temperature measurement, the room controller transmits the current room temperature to the bus after a reset.
If there are still other devices in the bus which transmit telegrams immediately after a reset, it may be useful to activate the transmit delay for automatically transmitting objects on the "General" parameter page in order to reduce the bus load.



If the transmit delay is activated, the room controller infers the value of its individual delay from the device number in its physical address (physical address: area, line, device number). This value can be about 30 seconds maximum. Without setting a special delay, this principle prevents several room controllers from transmitting telegrams to the bus at the same time.
The transmit delay is not active for the rocker and key functions of the room controller.

1.6 Setting of time and date

The room controller can also display the current time of day and the current date. The internal computation of the current time of day is influenced to a large extent by the size of the internal functions and the data traffic caused thereby. This may result in quite significant deviations. For this reason, the internal time and the internal date should be synchronized at regular intervals. Thus, it is recommended to have a master clock with DCF 77 receiver transmit the current time of day once every hour and the current date once a day to the bus.

Depending on the "Date / time request" parameter, the communication object "Request date / time of day" can transmit a value of "1" for the date at 00:00 and for the time of day at 04:00 to a master clock to request the latest data for synchronization purposes.

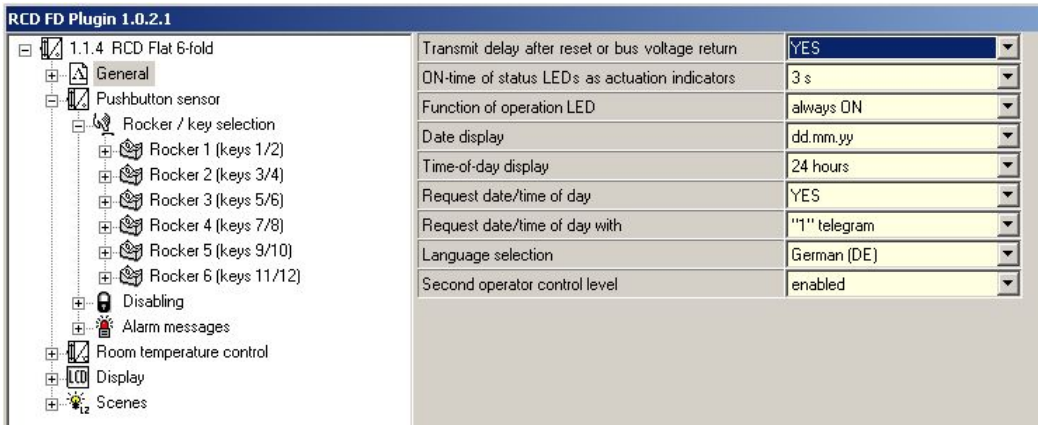
The room controller checks whether a synchronization has occurred within the last 24 hours. If this is not the case, the controller displays --:-- instead of the time and --.--.-- instead of the date.

The time of day can either be displayed in the 12-hour format or in the 24-hour format. This setting is valid for all display screens. The 12-hour format is displayed without additional a.m. and p.m. information.

The date can be displayed in different formats to account for country-specific display standards. The default display is day.month.year. The screen pages can display the year partly with two digits and partly with four digits. The format depends on the space requirements of the character sets used.

1.7 Language settings

The language for the display of text in the info mode and on the second control level can be selected on parameter page "General".



2 "Switching" function

For each rocker or each key with the function set to "switching" the ETS indicates a 1-bit communication object. The parameters of the rocker or key permit fixing the value this object is to adopt on pressing and / or on releasing of the key (ON, OFF, TOGGLE - toggling of the object value). No distinction is made between a brief or long press.

The status LEDs can be parameterized independently as described in chapter "8. Status LED".

3 "Dimming" function

For each rocker or each key with the function set to "dimming" the ETS indicates a 1-bit and a 4-bit object. Generally, the room controller sends a switching telegram after a brief press and a dimming telegram after a long press. In the standard parameterization, the room controller transmits a telegram for stopping the dimming action after a long press. The time needed by the room controller to identify an actuation as a long actuation is presettable in the parameters.

The status LEDs can be parameterized independently as described in chapter "8. Status LED".

3.1 Single-surface and double-surface actuation

A rocker is preprogrammed for double-surface actuation. This means that the room controller transmits a telegram for switching on after a brief press and a telegram for increasing the brightness after a long press on the upper action point. Similarly, the room controller transmits a telegram for switching off after a brief press and a telegram for reducing the brightness after a long press on the lower action point.

Separate keys are preprogrammed for single-surface actuation. In this mode, the room controller transmits on each brief press alternating ON and OFF telegrams ("TOGGLE") . After a long press, the room controller transmits alternating "brighter" and "darker" telegrams.

For the rocker and also for the key function, the command issued on pressing the key or rocker can basically be selected at the user's discretion.

If the actuator can be controlled from several sensors, a faultless single-surface actuation requires that the addressed actuator reports its switching state back to the 1-bit object of the key or rocker and that the 4-bit objects of the room controllers sensors are linked with one another. The room controller would otherwise not be able to recognize that the actuator has been addressed from another sensor, in which case it would have to be actuated twice during the next use in order to produce the desired reaction.

3.2 Advanced parameters

For the dimming function, the room controller 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 room controller is to cover the full adjusting range of the actuator continuously with one dimming telegram ("Increase brightness by 100 %", "Reduce brightness by 100 %) or whether the dimming process is to be performed in several small steps (50 %, 25 %, 12,5 %, 6 %, 3 %, 1,5 %).

In the continuous dimming mode (100%), the room controller 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 steps it may be useful if the room controller repeats the dimming telegram in case of a sustained press automatically at presettable intervals (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.

3.3 Full-surface actuation

When a rocker is used for dimming, the room controller needs a certain time at the beginning of each actuation in order to distinguish between a short and a long actuation. When the full-surface actuation is enabled, the room controller can make use of this time span to evaluate the otherwise invalid simultaneous actuation of both action points.

The room controller detects a full-surface actuation of a rocker, if a control surface is depressed in such a way that both action points of the rocker are actuated at the same time.
When the room controller has detected a valid full-surface actuation, the operation LED flashes fast at a rate of about 8 Hz for the duration of such actuation. The full-surface actuation 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 actuation will be interpreted as an incorrect operation and not executed.

A 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 a scene recall without or with storage function. In the latter case, the full-surface actuation causes a scene to be recalled in less than a second. If the room controller is to send the telegram for storing a scene, the full-surface actuation must be maintained for more than 5 seconds. If the full-surface actuation ends between the first and the fifth second, the room controller will not send any telegrams.
If the status LEDs of the rocker are used as "actuation indicators", they will light up for 3 seconds during transmission of the storage telegram.

4 "Blind/shutter" function

For each rocker or each key with the function set to "blind/shutter" the ETS indicates the two 1-bit objects "short-time operation" and "long-time operation".

The status LEDs can be parameterized independently as described in chapter "8. Status LED".

4.1 Single-surface and double-surface actuation

A rocker is preprogrammed for double-surface actuation. This means that the room controller transmits a telegram for an upward movement after an actuation of the upper action point and a telegram for a downward movement after an actuation of the lower action point.

Separate keys are preprogrammed for single-surface actuation. In this case, the room controller changes the direction of the long-time telegram (TOGGLE) after each sustained press. Several short-time telegrams in succession have the same direction.

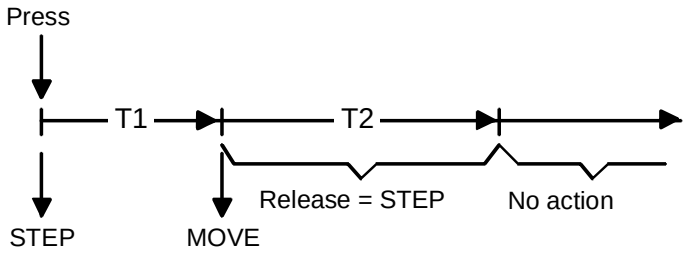
For the key function, the command issued on pressing the key can basically be selected at the user's discretion.

If the actuator can be controlled from several sensors, a faultless single-surface actuation requires that the long-time objects of the room controllers are interlinked. The room controller would otherwise not be able to detect that the actuator has been addressed from another sensor, in which case it would have to be actuated twice during the next use in order to produce the desired reaction.

4.2 Operating concepts

For the control of blind, shutter, awning or similar drives, the room controller supports four operating concepts in which telegrams with a different timing are transmitted. The room controller can therefore be used to operate various drive configurations.
The different operating concepts are described in detail in the following chapters.

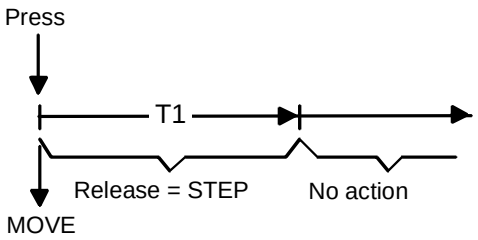
4.2.1 Operating concept "step – move – step".



In the operating concept "step – move – step", the pushbutton sensor shows the following behaviour:

- Immediately on pressing the key, the room controller transmits a short-time telegram. This key-press stops a running drive and starts time T1 ("time between short- and long-time command") If the key is released within T1, no further telegram will be transmitted. This step serves the purpose of stopping a continuous movement.
  The "time between short- and long-time command" in the room controller should be selected shorter than the short-time operation of the actuator to prevent undesired jerky movements of the shutter.
- If the key is kept depressed longer than T1, the room controller transmits a long-time telegram after the end of T1 for starting up the drive motor and time T2 ("slat adjustment time") is started.
- If the key is released within the slat adjustment time, the room controller 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 adjustment time" should be chosen as required by the drive for a complete rotation of the slats. If the slat adjustment time is selected longer than the complete running time of the drive, a pushbutton function is possible as well. This means that the drive is active only when the key is kept depressed.
- If the key is kept depressed longer than T2, the room controller transmits no further telegrams. The drive remains on until the end position is reached.

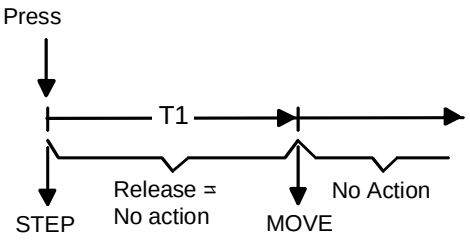
4.2.2 Operating concept "move – step"



If the operating concept "move – step" is selected, the room controller shows the following behaviour:

- Immediately on pressing the key, the room controller transmits a long-time telegram. The drive begins to move and time T1 ("slat adjustment time") is started.
- If the key is released within the slat adjustment time, the room controller sends a short-time telegram. This function is used for adjusting the slats of a blind. The function permits stopping the slats in any position during their rotation.
  The "slat adjustment time" should be chosen as required by the drive for a complete rotation of the slats. If the slat adjustment time is selected longer than the complete running time of the drive, a pushbutton function is possible as well. This means that the drive is active only when the key is kept depressed.
- If the key is kept depressed longer than T1, the room controller transmits no further telegrams. The drive remains on until the end position is reached.

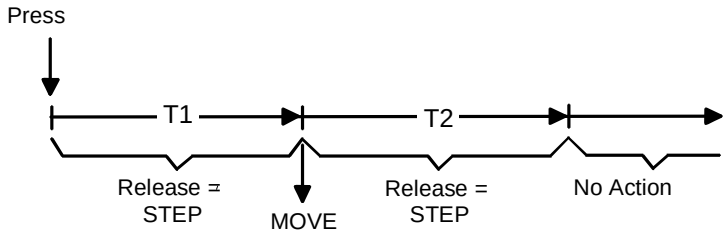
4.2.3 Operating concept "step – move".



In the operating concept "step – move", the room controller shows the following behaviour:

- Immediately on pressing the key, the room controller transmits a short-time telegram. This key-press stops a running drive and starts time T1 ("time between short- and long-time command") If the key is released within T1, no further telegram will be transmitted. This step serves the purpose of stopping a continuous movement.
  The "time between short- and long-time command" in the room controller should be selected shorter than the short-time operation of the actuator to prevent undesired jerky movements of the shutter.
- If the key is kept depressed longer than T1, the room controller transmits a long-time telegram after the end of T1 for starting the drive.
- No further telegram is transmitted when the key is released. The drive remains on until the end position is reached.

4.2.4 Operating concept "move – step or step"



In the operating concept "move – step or step", the room controller shows the following behaviour:

- Immediately on pressing the key, the room controller starts time T1 ("time between short- and long-time command") and waits. If the key is released again before T1 has elapsed, the room controller transmits a short-time telegram. This telegram can be used to stop a running drive. A stationary drive rotates the slats by one step.
- If the key is kept depressed after T1 has elapsed, the room controller transmits a long-time telegram and starts time T2 ("slat adjustment time").
- If the key is released within time T2, the room controller 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 adjustment time" should be chosen as required by the drive for a complete rotation of the slats. If the slat adjustment time is selected longer than the complete running time of the drive, a pushbutton function is possible as well. This means that the drive is active only when the key is kept depressed.
- If the key is kept depressed longer than T2, the room controller transmits no further telegrams. The drive remains on until the end position is reached.

In this operating concept, the room controller will not transmit a telegram immediately after depressing one side of the rocker. This principle permits detecting a full-surface actuation when the sensor is configured as a rocker.

4.3 Full-surface actuation

When a rocker is programmed for blind/shutter operation and if the operating concept "move – step or step" is used, the room controller needs some time at the beginning of each actuation in order to distinguish between a short and a long actuation. When full-surface actuation is enabled, the room controller can make use of this time span to evaluate the otherwise invalid simultaneous actuation of both action points.

The room controller detects a full-surface actuation of a rocker, if a control surface is depressed in such a way that both action points of the rocker are actuated at the same time.
When the room controller has detected a valid full-surface actuation, the operation LED flashes fast at a rate of about 8 Hz for the duration of such actuation. The full-surface actuation must have been detected before the first telegram has been transmitted by the blind/shutter function (STEP or MOVE). If this is not so, even a full-surface actuation will be interpreted as an incorrect operation and not executed.

A 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 a scene recall without or with storage function. In the latter case, the full-surface actuation causes a scene to be recalled in less than a second. If the room controller is to send the telegram for storing a scene, the full-surface actuation must be maintained for more than 5 seconds. If the full-surface actuation ends between the first and the fifth second, the room controller will not send any telegrams. If the status LEDs of the rocker are used as "actuation indicators", they will light up for 3 seconds during transmission of the storage telegram.

5 "1-byte value transmitter" and 2-byte value transmitter" function

For each rocker or each key 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 key, the parameterized value or the value last stored internally by a value change (see below) will be transmitted to the bus. In case of a rocker function, different values can be parameterized or varied for both action points.

The status LEDs can be parameterized independently as described in chapter "8. Status LED".

5.1 Value ranges

The "Functionality" parameter determines the value range used by the controller.

As a 1-byte value transmitter, the room controller 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 room controller 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 key is parameterizable.

5.2 Variation by means of long key-press

If the value variation feature has been enabled in the ETS, the key must be kept depressed for more than 5 seconds in order to vary the current value of the value transmitter. The value variation function continues to be active until the key is released again. In a value variation, the room controller distinguishes the following options...

- The "Starting value for value variation" parameter defines the original starting value for the variation. Variation can begin from the value parameterized in the ETS, from the final value of the last variation 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 variation" defines whether the values will always be increased ("upwards"), always reduced ("downwards") or alternatingly increased and reduced ("switch-over").
- For the value transmitters 0 … 255, 0 … 100 % and 0 … 65535, the step size by which the current value ist to be changed during the value variation can be specified. In case of the temperature and the brightness value transmitter, the step sizes (1 °C and 50 lux) are fixed.
- The parameter "Time between two telegrams" can be used in conjunction 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.
- When the room controller detects during the value variation that the preset step size would result in the limits being exceeded with the next telegram, it adapts the step size once in such a way that the respective limit value is transmitted together with last telegram. Depending on the setting of the parameter "Value variation with overflow", the room controller stops the variation at this instance or inserts a pause consisting of two steps and then continues the variation beginning with the other limit value.

Value range limits for the different value transmitters:

	Functionality	Lower end of number range	Upper end of number range
Value transmitter 1-byte	0 … 255 0 … 100 %	0 0 % (value = "0")	255 100 % (value = "255")
Value transmitter 2-byte	0 … 65535 Temperature value Brightness value	0 0 °C 0 lux	65535 40 °C 1500 lux

Notes on value variation:

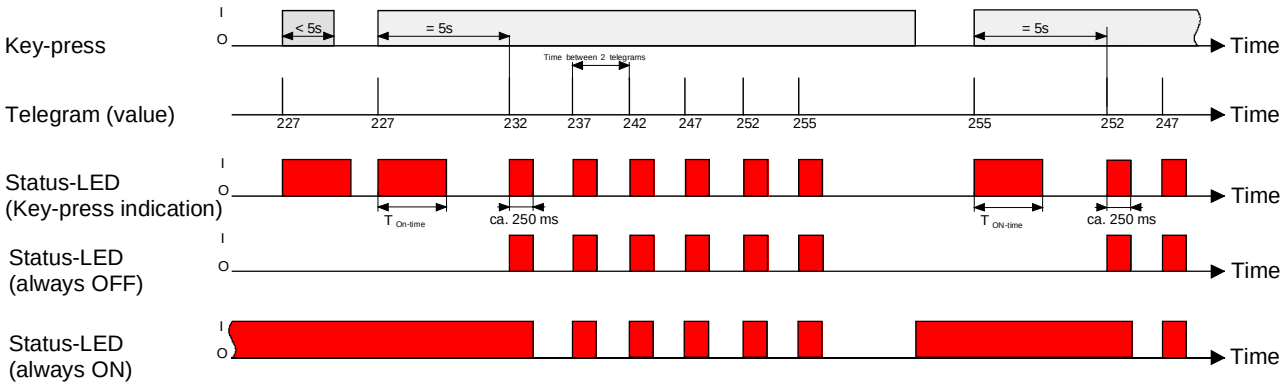
- During a value variation, the newly adjusted values are stored only in the volatile RAM memory of the room controller. Therefore, the stored values are replaced by the preset values programmed in the ETS when the room controller is reset (bus voltage failure or ETS programming).
- During a value variation, the status LED of the corresponding key is switched off irrespective of its parameterization. The status LED will then light up for ca. 250 ms whenever a new value is transmitted.
- When the 1-byte value transmitter operates in the "Value transmitter 0…100 %" function, the step size of the variation is also indicated in "%". If the starting value of the communication object is used, it may happen in this case during value variation 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 size and transmitted. Due to the computation procedure used, the new calculation of the value may be slightly inaccurate.

5.3 Value variation examples

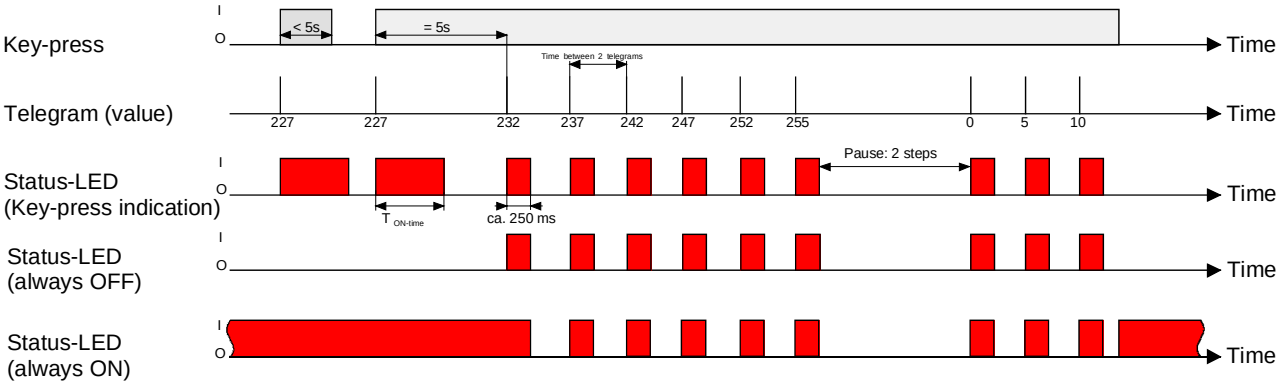
Parameterization:

- Value transmitter 1 byte
  (all other value transmitters basically identical)
- functionality = value transmitter 0…255
- value specified in the ETS (0...255) = 227
- step width (1...10... 5)
- start on value variation = like parameterized value
- direction of value variation = switch-over (alternating)
- time between two telegrams = 0.5 s

Example 1: value variation with overflow? = No



Example 2: value variation with overflow? Yes



6 Scene extension" function

For each rocker or each key with the function set to "scene extension" the ETS indicates the "Function" parameter which distinguishes between ...

- "Scene extension without storage function"
- "Scene extension with storage function"
- "Internal scene recall without storage function"
- "Internal scene recall with storage function"

In the scene extension function, the room controller transmits a preset scene number (1…64) via a separate communication object to the bus when a key is pressed. 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 on the bus. For this reason, the corresponding communication object is not existing. This function can rather be used to recall – and with the storage function also to store – the 8 scenes max. stored internally in the room controller.

In the setting "... without storage function", a key-press triggers the simple recall of a scene. If the status LED is parameterized as actuation indicator, it will be switched on for the parameterized ON-time. A long key-press has no further or additional effect.

In the setting "... with storage function", the room controller monitors the length of the actuation. A key-press of less than a second results in a simple recall of the scene as mentioned above. If the status LED is parameterized as actuation indicator, it will be switched on for the parameterized ON-time.
After a key-press of more than five seconds, the room controller 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 of the room controller will then request the current scene values for the actuator groups used from the bus (cf. chapter "9 Scene control").
An actuation 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 key-press. In case of the rocker function, two different scene numbers can be assigned.

The status LEDs can be parameterized independently as described in chapter "8. Status LED".

7 2-channel operation

In some situations it is desirable to control two different functions with a single key-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...

- Switching (1 bit)
- Value transmitter 0 … 255 (1 byte)
- Value transmitter 0 … 100 % (1 byte)
- Temperature value transmitter (2 bytes)

The object value the room controller is to transmit on a key-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 key. The parameterization 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%.
A temperature value between 0°C and 40°C can be selected as "Temperature value transmitter (2 bytes)".

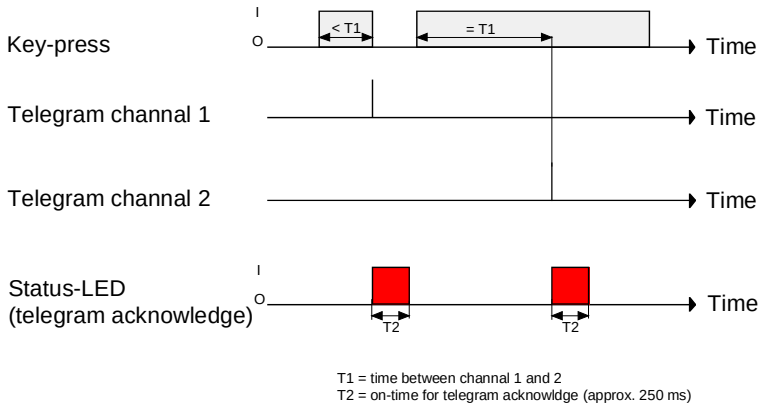
In this case, the variation of the object value on a long key-press is not possible as the determination of the actuation length is needed for the adjustable operating concepts.

Unlike in the other rocker and key functions, the application software assigns the "Telegram acknowledge" function instead of the "Actuation indicator" function to the status LED. In this mode, the status LED lights up for about 250 ms with each telegram transmitted. As an alternative, the status LEDs can be parameterized independently as described in chapter "8. Status LED".

7.1 Operating concept channel 1 or channel 2

In this operating concept, exactly one telegram will be transmitted on each press of a key.

- A short press causes the room controller to transmit the telegram for channel 1.
- A long press causes the room controller to transmit the telegram for channel 2.



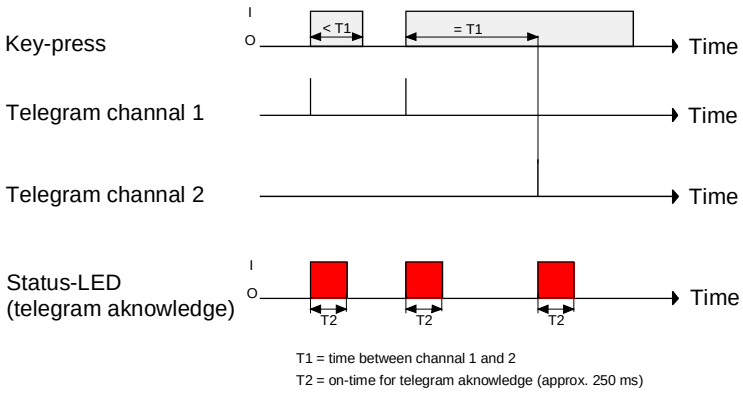
The time required for distinguishing between a short and a long actuation is defined by the parameter "Time between channel 1 and channel 2". If the key is pressed for less than the parameterized time, only the telegram to channel 1 is transmitted. If the length of the key-press exceeds the time between 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 ca. 250 ms in the "Telegram acknowledge" mode.

In this operating concept, the room controller will not transmit a telegram immediately after depressing the rocker. This principle permits detecting also a full-surface actuation. The settings that are possible with full-surface actuation are described below

7.2 Operating concept channel 1 and channel 2

In this concept, one or alternatively two telegrams can be transmitted for each press.

- A short press causes the room controller to transmit the telegram for channel 1.
- A long press causes the room controller to transmit first the telegram for channel 1 and then the telegram for channel 2.



The time required for distinguishing between a short and a long actuation is defined by the parameter "Time between channel 1 and channel 2". In this operating concept, a key-press sends this telegram immediately to channel 1. If the key is held depressed for the parameterized time, the telegram for the second channel will be transmitted as well. If the key is released before the time has elapsed, no further telegram will be transmitted. This operating concept, too, offers the parameterizable possibility of having the transmission of a telegram signalled by the status LED (setting "Telegram acknowledge").

7.3 Full-surface actuation

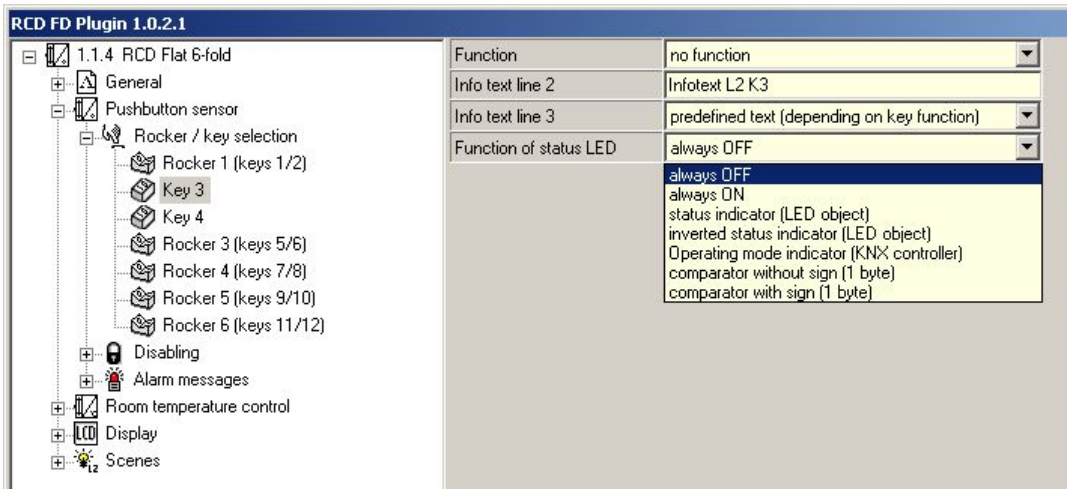
When a rocker is programmed for 2-channel operation and if the operating concept "channel 1 or channel 2" is used, the room controller needs some time at the beginning of each actuation in order to distinguish between a short and a long actuation. When the full-surface actuation is enabled, the room controller can make use of this time span to evaluate the otherwise invalid simultaneous actuation of both action points.

The room controller detects a full-surface actuation of a rocker, if a control surface is depressed in such a way that both action points of the rocker are actuated at the same time.
When the room controller has detected a valid full-surface actuation, the operation LED flashes fast at a rate of about 8 Hz for the duration of such actuation. The full-surface actuation 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 actuation will be interpreted as an incorrect operation and not executed.

A 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 a scene recall without or with storage function. In the latter case, the full-surface actuation causes a scene to be recalled in less than a second. If the room controller is to send the telegram for storing a scene, the full-surface actuation must be maintained for more than 5 seconds. If the full-surface actuation ends between the first and the fifth second, the room controller will not send any telegrams. If the status LEDs of the rocker are used as "actuation indicators", they will light up for 3 seconds during transmission of the storage telegram.

8 Status LED

Each rocker has two status LEDs and each key has one status LED. Depending on the configuration of the rockers or keys, the available functions differ slightly.



Each status LED can indicate the following options…

- always OFF,
- always ON,
- status display (LED object),
- inverted status display (LED object),
- operating mode indication (KNX controller),
- controller status indication (activate controller extension!),
- comparator without sign (1 byte),
- comparator with sign (1 byte).

These are always available even the rocker or key has no function assigned to it.

If a function is assigned to the rocker or to the key, the ETS additionally provides the option...

- Key-press indication,

  which is replaced for the "2-channel operation" function by...

- telegram acknowledge.

If the rocker or the key is used for switching and dimming, the following options are available in addition...

- Status indication (switching object),
- Inverted status indication (switching object)

If a key is used for controller extension operation, the following options can be preset in addition...

- Key function indication active / inactive (only with presence key),
- setpoint shift indication (only with setpoint shift)

Besides the functions that can be preset separately for each status LED, all status LEDs are also used together with the operation LED for alarm messages. In case of an active alarm message, all LEDs of the room controller flash at the same time. After deactivation of the alarm message, all LEDs will immediately return to the state corresponding to their parameterization and communication objects.

8.1 Status LED function "always OFF" or "always ON

The two status LED functions "always OFF" and "always ON" have no further settings and no communication objects. In this setting, the status LED is either permanently ON or permanently OFF.

8.2 Function of the status LED as "actuation indicator / telegram acknowledge"

A status LED used as actuation indicator is switched on by the room controller each time the corresponding rocker or key is pressed. The "ON-time of the status LED as actuation indicator" parameter on parameter page "General" defines how long the LED is lit up. The status LED lights up when the rocker or key is pressed even if a telegram is transmitted by the room controller only after the key or rocker has been released.

In the "2-channel operation" function, the "actuation indicator" option is replaced by the "telegram acknowledge" option. In this case, the status LED lights up for about 250 ms during transmission of the telegrams for both channels.

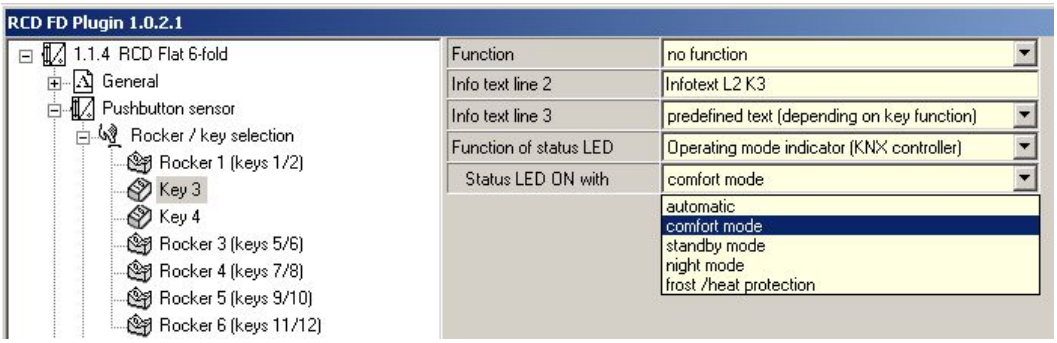
8.3 Function of the status LED as "status indicator

Each status LED can indicate the status of a separate LED communication object independent of the rocker or key configuration. Additionally, the status LEDs can be linked in the rocker or key functions "switching" and "dimming" also with the object used for switching and thus signal the current switching state of the actuator group.

For both, the status indication of the LED object and the status indication of the switching object, the inverted value can be indicated as well.
After a reset of the room controller of after an ETS programming operation, the value of the LED object is always "OFF - 0".

8.4 Function of the status LED as "operating mode indicator (KNX controller)"

For switching over between different operating modes, new room temperature controllers 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 operating modes "comfort", standby", "night", "frost/heat protection". 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 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 in the controller.
After a reset of the room controller of after an ETS programming operation, the value of the LED object is always "0" (automatic).

8.5 Function of the status LED as "controller status indicator

If a status LED is to indicate the status of a room temperature controller, the controller extension must have been activated on parameter page "General". The status LED is then internally linked directly with the 1-byte object "Controller status" of the controller extension. This object must then be linked via a group address with the corresponding communication object of the controller.

The object "Controller status" groups eight different information units in a bit-oriented way in a byte. For this reason, it is important to select in the "Status LED on with..." parameter which information is to be indicated, i.e. which bit is to be evaluated.

The following bits can be selected...

- Bit 0: comfort operation
- Bit 1: standby operation
- Bit 2: night-time operation
- Bit 3: frost/heat protection
- Bit 4: controller disabled
- Bit 5: heating / cooling (heating = 1 / cooling = 0)
- Bit 6: controller inactive (dead-zone operation)
- Bit 7: frost alarm

Description of bit-oriented status messages of the room temperature controller (active = ON):

- Comfort operation:
  active if operating mode "comfort" or "comfort prolongation" or is activated.
- Standby operation:
  active if the operating mode "standby" is activated.
- Night-time operation:
  active if the operating mode "night" is activated.
- Frost/ heat protection:
  active if the operating mode "frost/heat protection" is activated.
- Controller disabled:
  active if controller disable is activated (dew-point mode).
- Heating/cooling:
  active if the heating mode is activated and inactive if the cooling mode is activated. (as a rule inactive when the controller is disabled.)
- Controller inactive:
  active with the "*heating and cooling*" control option when the measured room temperature lies within the dead zone. This status information is generally "0" for the individual "*heating*" or "*cooling*" options! (inactive if controller is disabled.)
- Frost alarm:
  active if the detected room temperature reaches or drops below + 5 °C.

The communication object "Controller status" of the controller extension is updated automatically after a reset of the room controller or after an ETS programming operation, if the parameter "Value request value by controller extension" on parameter page "General" is set to "yes". Updating is effected by means of a value read telegram to the room temperature controller. The controller must answer the request with a value feedback telegram. If the room controller does not receive the answer, the status LED remains off (object value "0"). In this case, the object must first be reactivated via the bus after a reset before a status information can be indicated by the LED. This is also the case, if the "Request value from controller extension" parameter is set to "no".

8.6 Function of the status LED as "comparator"

The status LED can indicate whether a parameterized 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 (-128 … 127) integers. 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".

After a reset of the room controller of after an ETS programming operation, the value of the LED object is always "0".

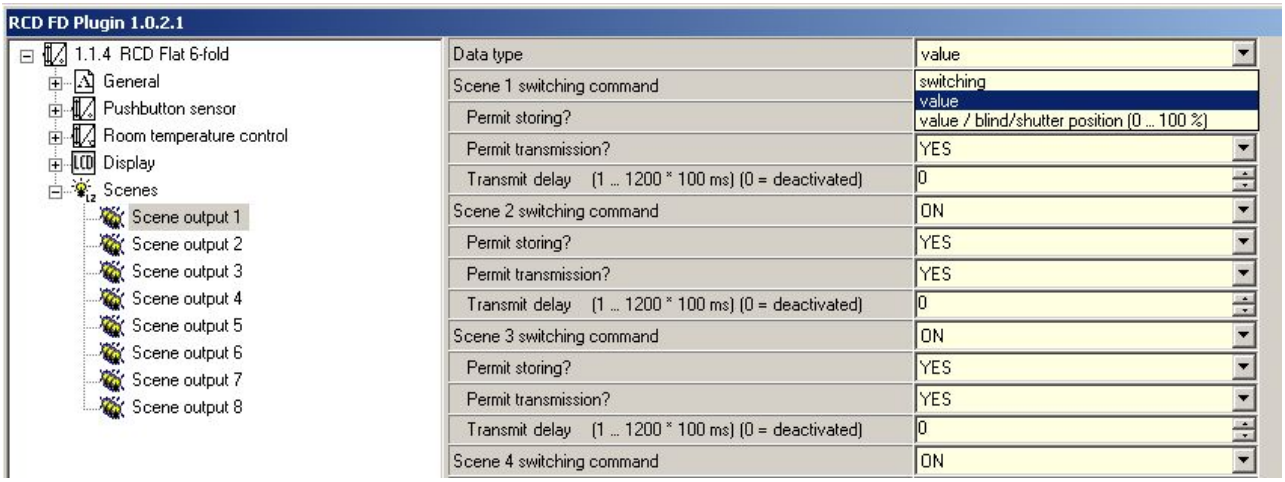
9 Scene control

The room controller can be used in two different ways in a scene control...

- Each rocker or key can work as a scene extension. This feature makes it possible to recall or to store scenes which may be stored in other devices.
- The room controller can independently store up to eight scenes with eight actuator groups. These internal scenes can be recalled or stored by the rockers or keys (internal scene recall) and also by the communication object "scene extension".
  In the following subsections the internal scene function will be dealt with in greater detail.

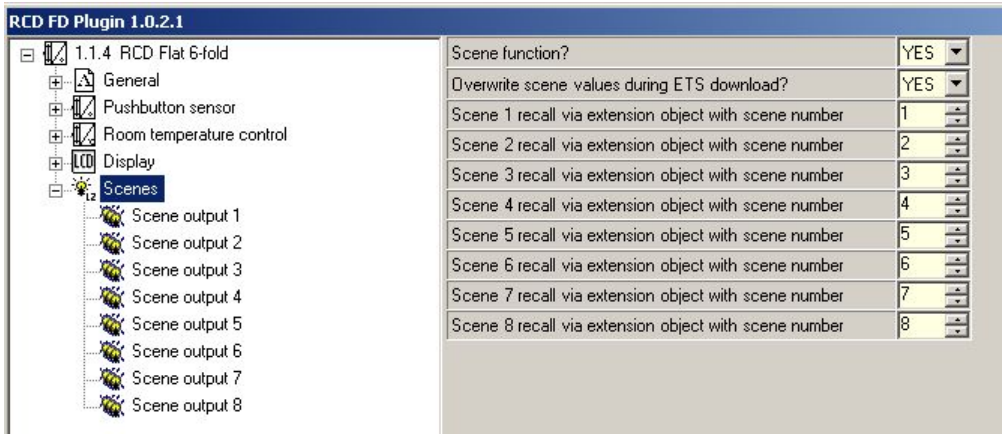
9.1 Scene definition and scene recall

If the internal scenes are to be used, the parameter "scene function" on parameter page "Scenes" must be set to "yes".
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 / shutter position (0 … 100 %)" can be selected. As a rule, blinds are controlled via two scene outputs. One output controls the height of the curtain and the other one adjusts the slat position.



The ETS displays the communication objects and the scene control parameters pertaining to these data-types

It is possible that the values for the individual scenes preset by the parameters are modified later on with the storage function (cf. chapter "9.2 Storage function") when the system is in operation. If the application program is then downloaded again with the ETS, these locally adapted values will 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.



These internal scenes can be recalled directly via the rockers or keys (function "internal scene recall") and also by another bus device via the "scene extension input" communication object. This 1-byte communication object supports the evaluation of up to 64 scene numbers. For this reason it must be specified which of the external scene numbers (1 … 64) is to recall the internal scene (1 … 8). If the same scene number is listed for several internal scenes, 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 "Pause" scenes, closed blinds during the "PC-presentation" scene and no change in the "Discussion" scene. In this example, the parameter "Permit transmission?" can be set to "no" for the "Discussion" scene. The scene output is then deactivated during the corresponding scene.

The parameter "Transmit delay" permits entering 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 keys 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 lights which are to go out only after the blinds/shutters have been raised.

The transmit delay can be set separately for each scene output. The transmit delay defines the time between the individual telegrams during a scene recall. The setting specifies how much time must pass after the first scene telegram before the second telegram is transmitted. After sending the second scene telegram, the parameterized time must again pass before the third telegram is transmitted and so forth... The transmit delay for the first scene telegram starts immediately after the scene has been recalled.
Alternatively, the transmit delay between telegrams can also be deactivated (setting "0"). The telegrams are then transmitted at the shortest possible interval. In this case, however, the order of the telegrams transmitted can deviate from the numbering of the scene outputs.

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 processing of the scene started before will be aborted and the newly received scene number will be processed. A running scene is also aborted when a scene is being stored!
During a scene recall - even if delayed - the control surfaces of the room controller are operational.

9.2 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 regular operation of the system it may be required to adapt these preset values and to store the adapted values in the room controller. This can be achieved with the storage function of the scene control.

The value storage function for the corresponding scene number is enabled with the parameter "Permit storage?" ("yes") or disabled ("no"). When the storage function is disabled, the object value of the corresponding output is disregarded during storage.

A scene storage process can be initiated in two different ways...

by a long rocker or key actuation of a control surface parameterized as "scene extension,
by a storage telegram to the extension object.

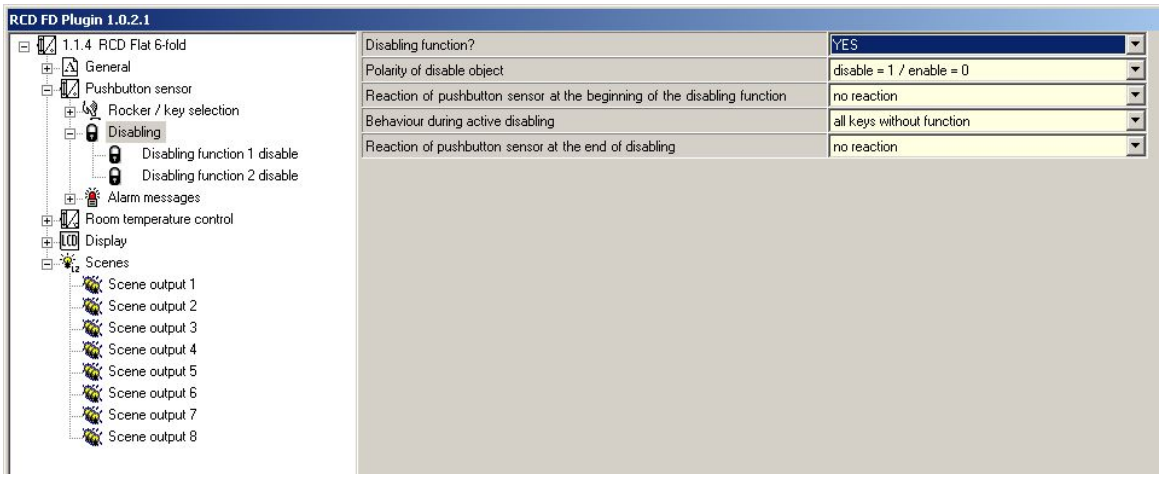
During a storage process, the room controller reads the current object values of the connected actuators. This is effected by means of eight read telegrams (ValueRead) addressed to the devices in the scene which return their own value (ValueResponse) as a reaction to the request. The returned values are received by the room controller and stored in the non-volatile memory of the scene. For each scene output, the room controller waits one second for a response. If no answer is received during this time, the value for this scene output remains unchanged and the room controller scans the next output.

In order to enable the room controller 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 room controller with the ETS.

The storage process will always be executed completely by the room controller and cannot not be aborted before it has ended. Recalling scenes in the course of a storage process is not possible, the control surfaces of the room controller remaining nevertheless operational.

10 Disabling of the keys

With the 1-bit communication object "Key disable", the control surfaces of the room controller can be partly or completely disabled. During a disable, the rockers or keys can temporarily execute other functions as well. An active disable affects only the functions of the rockers or keys. The functions of the status LED, room temperature measurement, scene function and the alarm message are not affected by the disabling function. The disabling function and the pertaining parameters and communication objects are enabled if the parameter "Disabling function ?" is set to "yes" on parameter page "Disabling functions".



The polarity of the disable object is parameterizable. In case of polarity inversion (disabled = 0 / enabled = 1), the disabling function is not activated immediately after a reset or after ETS programming (object value = "0"). There must first be an object update "0" until the disabling function will be activated.
Telegram updates from "0" to "0" or from "1" to "1" on the "Key disable" object remain without effect.

If the disabling function is used, the reaction of the room controller on activation and deactivation of the disabling function can be preset separately in the room controller parameters (parameter "Reaction of room controller at the beginning / end of disable"). In this connexion it is irrelevant which of the control surfaces is influenced and possibly also locked by a disabling function. The room controller always shows the parameterized behaviour. The following settings are possible...

I. "No reaction":
The room controller shows no reaction at the beginning and at the end of disable. The sensor only adopts the state as provided for by the "Behaviour during active disable".

II. "Internal scene recall 1 ...8":
The room controller recalls one of the 8 internal scenes max. Scene storage is not provided for.

III Reaction like key >> X << / >> Y << on pressing /releasing":
The room controller executes the function assigned to any of the "target keys" in non-disabled state. Target keys are control keys of the room controller which may be configured for rocker or for key operation. The target keys are parameterized separately for the beginning (X) of for the end (Y) of disabling (key X / Y: key to key 16 max.).For this purpose, the two keys of a rocker are considered as two separate keys.
The action parameterized for the respective target key is executed. If the target key is parameterized in such a way that it has no function or does not transmit a telegram on pressing or releasing of the key, then there is also no reaction to disabling or to re-enabling. If the selected target key is part of a parameterized rocker, the behaviour preset for the respective rocker side (rocker X.1 or X.2) will be used.
Table 1 shows all possible telegram reactions of the room controller with respect to the target key function.

Function of >>target key<<	reaction "like >>target key<< when pressed"	Reaction "like >>target key<< when released"
switching / toggling	switching telegram	Switching telegram
dimming	switching telegram	no telegram
Blind/shutter	move telegram	no telegram
scene extension	scene recall telegram	no telegram
value transmitter, 8 bits	value telegram	no telegram
value transmitter 2 bytes	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
controller extension operating mode switch-over	operating mode telegram	no telegram
controller extension presence detection	presence telegram	no telegram
controller extension setpoint shift	step value telegram	no telegram
no function	no telegram	no telegram

Table 1: telegram reactions of the room controller depending on the target key function.

The telegrams are transmitted to the bus via the required communication object of the target key.

IV. "Reaction like disabling function 1 / 2 when pressed / released":
The room controller executes the function assigned to either of the two 'virtual' disabling functions. The disabling functions are internal key 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 keys.
The respective parameterization of the predefined disabling function will be executed. If no function or no telegram is parameterized in the disabling function on pressing or releasing of a key, then there is also no reaction to disabling or to re-enabling.
Also for this case, table 1 shows all possible telegram reactions of the room controller depending on programming of the disabling function.
The telegrams are transmitted to the bus via the required communication object of the disabling function.

During disable, the control keys can be separately influenced independently of the room controller's behaviour at the beginning or at the end of disabling.

During disabling...

- all keys can be without function.
  In this case, the room controller is completely locked during disabling. Pressing a key has no effect. The status LEDs of the disabled keys are without function (no key-press indication either). Only the "always ON" or "always OFF" state remains unaffected by the disabling function.

- all keys can behave like predefined keys.
  All keys behave as defined in the parameters for the two specified reference keys of the room controller. The parameter "All even / odd keys behave during disabling like..." defines the reference keys (key 1 to key 4 max.) For all control keys with an even number (2, 4) and for all keys with an odd number (1, 3) it is possible to program not only different reference keys, but also identical reference keys. The two 'virtual' disabling functions of the room controller can also be parameterized as a reference key.
  The telegrams are transmitted to the bus via the communication objects of the specified reference keys. The status LEDs of the reference keys are activated depending on the respective function. The status LEDs of the disabled keys are without function (no key-press indication either). Only the "always ON" or "always OFF" state remains unaffected by the disabling function.

- individual keys can be without function.
  Only the individually specified keys are locked during a disabling function. The other control keys remain unaffected by the disabling function. The keys that will be locked are defined in the parameters on the "Disable – Key selection" page The status LEDs of the disabled keys are without function (no key-press indication either). Only the "always ON" or "always OFF" state remains unaffected by the disabling function.

- individual keys can behave like predefined keys.
  Only the individually specified keys behave as defined in the parameters of the two specified reference keys of the room controller. The parameter "All even / odd keys behave during disabling like..." defines the reference keys (key 1 to key 16 max.) For all control keys with an even number (2, 4) and for all keys with an odd number (1, 3) it is possible to program not only different reference keys, but also identical reference keys. The two 'virtual' disabling functions of the room controller can also be parameterized as a reference key. The keys that will be locked are defined in the parameters on the "Disable – Key selection" page.
  The telegrams are transmitted to the bus via the communication objects of the specified reference keys. The status LEDs of the reference keys are activated depending on the respective function. The status LEDs of the disabled keys are without function (no key-press indication either). Only the "always ON" or "always OFF" state remains unaffected by the disabling function.

Notes on the activation and deactivation of a disabling function:

If a key scan is taking place at the time of activation / deactivation of a disabling function, this function is aborted immediately and with it also the pertaining key function. All keys must first be released before a new key function can be executed if so permitted by the disable state.

11 Controller extension:

11.1 Connection with the room temperature controller

For controlling of a KNX/EIB room temperature controller, the controller extension function can be activated. The controller extension function is enabled with the parameter *"Controller extension"* on the *"Room temperature control"* page.

The controller extension itself is not involved in the regulating process. With the controller extension function, the user can operate the single-room temperature regulation from different places in the room. The controller extension can also be used to adjust central heating control units which are located, for instance, on a sub-distribution board.
Typical KNX/EIB room temperature controllers generally offer different means of influencing or of visualizing the room temperature regulation.

- Switching over between different operating modes (e.g. "Comfort", "Night" ...) with different setpoint temperatures assigned to each mode by the controller
- Detecting the presence of a person in a room. The detection may also be combined with a parameterized change of the operating mode.
- Readjustment of the setpoint temperature in steps which are referred in each case to the parameterized setpoint temperature of the current operating mode (basic setpoint shift).

With its control keys, the room controller can fully control a room temperature controller by changing the operating mode, by predefining the presence situation or by readjusting the setpoint shift (cf. the following sub-chapters). The room controller keys selected as control elements for the extension unit must be parameterized for this purpose as *"Controller extension*". It should be noted that an extension operation is possible only if one control surface is configured as a key and if the controller extension function has been enabled on the *"Room temperature control"* page. In all other cases, the controller extension function is not operational.

In addition, the room controller can – independent of the controller extension function – indicate the state of one or more room temperature controllers with the status LEDs of the keys or rockers. This feature permits the indication of operating modes or the bit-oriented evaluation of different status objects of controllers (cf. chapter "8. Status LEDs").
In case of the controller extension functions "Setpoint shift" or "Presence function", the status LEDs can also signal the state of the corresponding functions directly.

The controller extension can work properly only if all extension objects are linked with the corresponding objects of the room temperature controller. The controller extension with the objects is existent only once in the room controller. All key functions parameterized for the controller extension act on the objects belonging to the extension. Several controller extensions can also act on one master controller.

The communication objects "Operating mode switch-over", "Forced operating mode switch-over", "Presence key", "Setpoint shift input" and "Controller status" of the controller extension updates themselves automatically after a reset of the room controller or after an ETS programming operation, if the parameter *"Request value from controller extension"* on parameter page *"Room temperature control"* is set to "yes". Updating is effected by means of a ValueRead telegram to the room temperature controller. The controller must answer the request with a ValueResponse telegram. If the room controller does not receive all or some of the answers, the affected objects are initialized in the room controller with "0". In this case, the objects must first be actively rewritten by the bus after a reset. This is also the case, if the *"Request value from controller extension"* parameter is set to "no".

11.2 Key functions "Operating mode switch-over" and "Forced operating mode switch-over

Switch-over of the controller operating mode can be effected in accordance with the standard function block for room temperature controllers defined in the Konnex handbook with two 1-byte communication objects. A distinction is made between operating mode switch-over via the normal and the forced-control object. The "Operating mode switch-over" object offers a selection between the following operating modes...

- comfort operation
- standby operation
- night-time operation
- frost / heat protection

The "Forced operating mode switch-over" communication object has the higher priority. The "Forced operating mode switch-over" object permits forced switching between the following modes of operation...

- Auto (normal operating mode switch-over)
- comfort operation
- standby mode
- night-time operation
- frost / heat protection

The operating mode transmitted to the bus when a controller extension key is pressed is defined by the parameter "Operating mode on key-press". Depending on the parameterized functionality, it is possible that ...

- either one of the above-mentioned modes is activated (single selection) on the press of the key,
- or the device is switched over between two or three modes (multiple selection).

Notes on multiple selection:
In order to ensure that a switch-over from one mode into another works properly even from different locations, the operating mode objects of the controller and those of all controller extension room controllers must be interlinked and have their "Write" flag set. In the objects concerned this flag is set by default.
By checking the linked operating mode switch-over object, the controller extension knows which of the possible operating modes is active. Based on this information, the device switches over into the next operating mode in sequence when a key is pressed. In the event that none of the possible operating modes is active, the next operating mode in the sequence is set to "'Comfort" operation (in case of "Standby - >Night" to "Standby"). As far as the switch-overs between the forced operating modes and "Auto" is concerned, the device switches into the "Auto" operating mode when none of the parameterized operating modes is active.

It is not possible to program a reaction on release of the key. A long key-press is evaluated in the same way as a short one and switches into the corresponding mode of operation in so far as this is allowed for the controller.

If a status LED is to indicate the current mode of operation, it must be programmed for "Operating mode indication" and its status object be linked with the corresponding group address for switching with normal or high priority (cf. chapter "8. Status LEDs").

11.3 Key function "Presence key"

All keys with their functions set to "Presence key" are internally linked with the "Presence key" object of the controller extension. The parameter "Presence function on key-press" defines the object value transmitted to the bus on pressing a key.
In order to ensure that the object value transmitted in the "Presence TOGGLE" setting is always the correct one, the presence object of the room temperature controller and the "Presence key" objects of the controller extensions of the room controllers must be interlinked and have their "Write" flag set. In the extension objects concerned this flag is set by default.

It is not possible to program a reaction on release of the key. A long key-press is evaluated in the same way as a short one and switches into the corresponding presence state in so far as this is admissible for the controller.

The status LED of the presence key can indicate both the presence status (setting "Key function indication active / inactive") and also the actuation of the key. In addition, the usual setting options for the status LED are parameterizable as well (cf. chapter "8. Status LEDs").

11.4 Key function "Setpoint shift

The setpoint shift is another available function of the controller extension. It makes use of two 1-byte communication objects with datapoint type 6.010 (integer with sign). This extension function allows to shift the basic setpoint for the temperature on the room temperature controller by actuating a key. Operation of the controller extension is generally the same as the operation of the controller master.

A key parameterized as setpoint shifting key reduces or increases the setpoint shift value on each press by one step respectively. The direction of the value variation is defined by the parameter "Setpoint shift on key-press". Releasing the key and a long press have no other functions.

Communication with main controller:

In order to enable the room controller to effect a setpoint shift in a room temperature controller, the controller must have input and output objects for setpoint shifting. In this case, the output object of the controller must be linked with the input object of the extension and the input object of the controller must be linked with the output object of the extension via an independent group address.
All objects are of the same datapoint type and have the same value range. A setpoint shift is interpreted by object values: a shift in positive direction is expressed by positive values whereas a shift in negative direction is represented by negative object values. An object value of "0" means that no setpoint shift has been avctivated.

Via the "Setpoint shift input" object of the controller extensions which is linked with the room temperature controller the extensions are enabled to determine the current setpoint shift position. Starting from the value of the communication object, each key-press on an extension will adjust the setpoint in the corresponding direction by one counting step. Each time the setpoint is adjusted, the new shift is transmitted to the room temperature controller via the "Setpoint shift output" object of the controller extension to the room temperature controller. The controller itself checks the received value for the minimum and maximum temperature limits (see controller documentation) and adjusts the new setpoint shift if the values are valid. When the new count value is accepted as valid, the controller transfers this value to its output object for setpoint shifting and retransmits the value to the extension as positive feedback.

Due to the standard datapoint type used as the output and input object of the controller extension and the weighting of the individual step by the controller itself, each extension is able to determine whether a shifting took place, in which direction it took place and by how many steps the setpoint was shifted. This requires that the communication objects in all controller extensions and in the controller are linked.
The information about the step value as feedback from the controller enables the extension to continue the adjustment anytime at the right point. The extensions can equally react to a reset of the setpoint shifting function by the controller.

The status LED of a setpoint shifting key can indicate both the setpoint shifting status (setting "Setpoint shift indication") and also the actuation of the key. In addition, the usual setting options for the status LED are parameterizable as well (cf. chapter "8. Status LEDs").

For setpoint shifting status indication, the controller makes use of the step count value which is transmitted to the extension and evaluated for switching of the status LED. The "Status LED" parameter defines the switching behaviour: The LED can be permanently off and light up only after a shift has been detected (setting "ON, ..."). As an alternative, the LED can be permanently on and go out only after a shift has been detected (setting "OFF, ..."). It can also be distinguished whether the LED is ON or OFF only if ...

there has been shifting at all
only a positive shift has been detected,
only a negative shift has been detected.

12 Alarm message

The room controller 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 and the operation LED of the room controller blinking synchronously. This display alarm can be separately enabled with the parameter "Display alarm message" on parameter page "Alarm message" so that it can be used.

When alarm signalling is enabled, the ETS displays the communication object "Alarm message" and further alarm function parameters.
The alarm message object is used as an input for activating or deactivating the indication of the alarm. The polarity of this object can be selected. When the object value corresponds to the "alarm" condition, all status LEDs and the operation LED are always blinking with a frequency of ca. 2 Hz. In case of an alarm, the basic parameters set for the LEDs are of no importance. The LEDs adopt their originally parameterized 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 key functions - are internally stored and recovered at the end of the alarm.

Apart from the possibility of deactivating an alarm message indication via the alarm object, it can also be deactivated locally by a key-press on the room controller itself. The parameter "Reset alarm message by key-press?" defines the key response during an alarm…

If this parameter is set to "Yes", active alarm signal displaying can be deactivated by a key-press on the room controller. This key-press does not cause the parameterized function of the pressed key to be executed. Only after then next key-press will the parameterization of the key 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 key-press will always directly execute the parameterized key function.

If an alarm message indication can be deactivated by a key-press, the parameter "Acknowledge alarm message by" defines whether this key-press transmits an additional alarm acknowledge telegram to the bus via the separate object "Alarm signalling acknowledge".
Such an acknowledge telegram can, for instance, be sent via a 'listening' group address to the "Alarm message" objects of other room controllers in order to reset the alarm status there as well. Attention must be paid during resetting of an alarm to the selectable polarity if the acknowledge object.

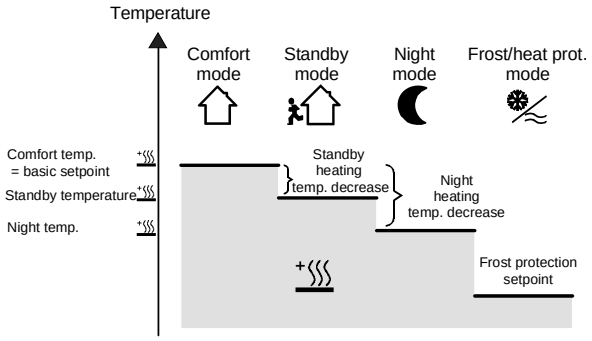
Notes on the alarm message indication function:

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.
An active alarm message is not stored so that the alarm message indication is generally deactivated after a reset or after programming with the ETS.

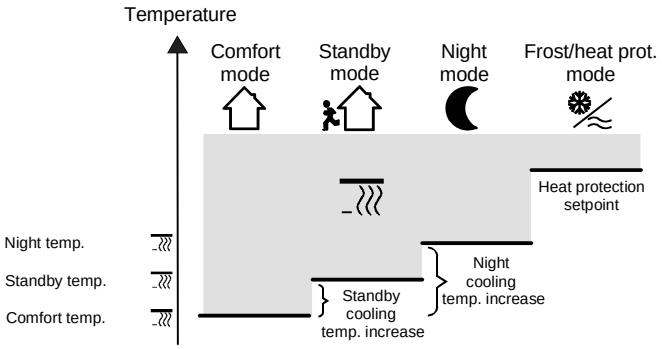
13 Room temperature controller functions

The room temperature controller supports the three control options "heating", "cooling" and "heating and cooling". In all three control options, the controller can work in different operating modes to which different setpoint temperatures are assigned. The following diagrams show these setpoint temperatures and their graduations.

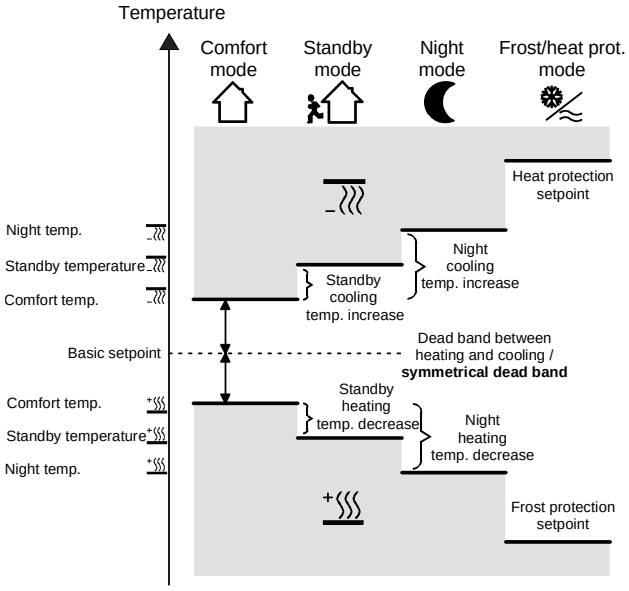
"Heating"

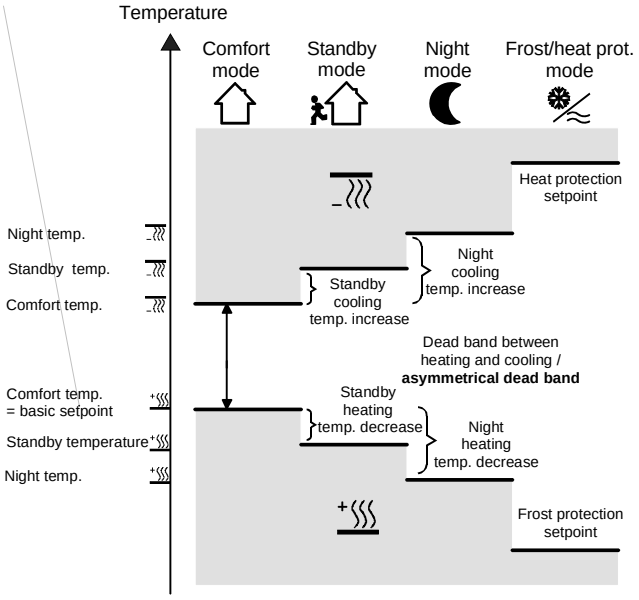


"Cooling"

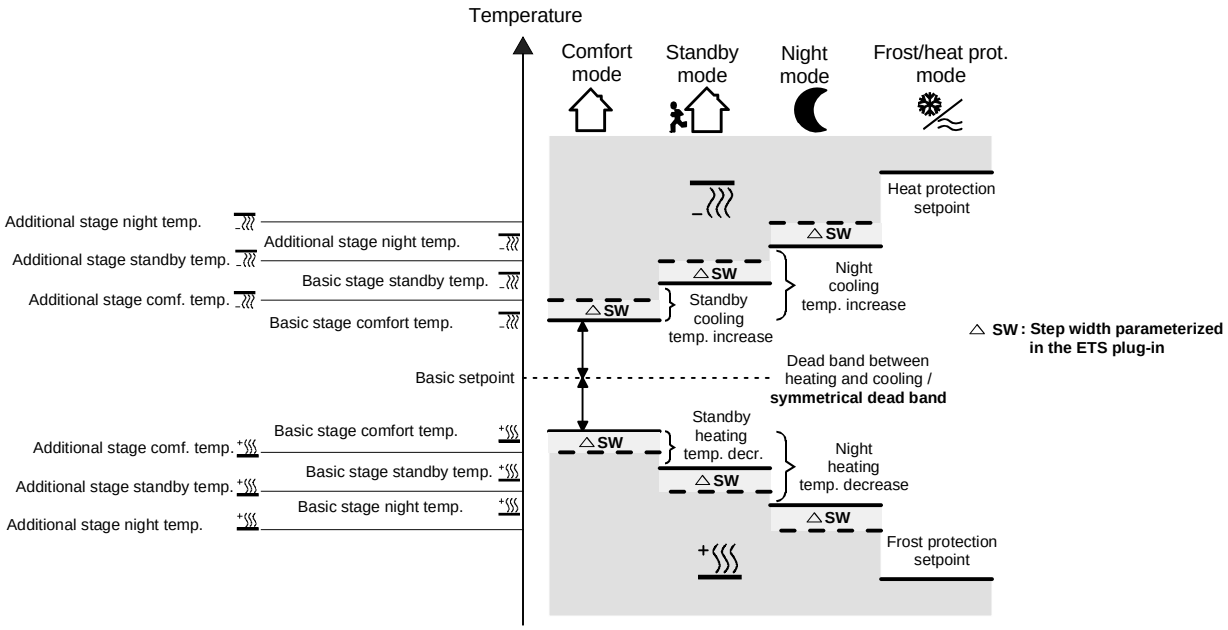


"Heating and cooling"





Temperature control with additional stage considering as an example "heating and cooling" with symmetrical dead zone…



If enabled in the ETS, 6 temperature setpoints can be varied in "heating and cooling" control option. Depending on the temperature decrease, increase or dead zone parameterized in the ETS, all temperature setpoints are derived from the basic setpoint temperature.
It must be pointed out that changing the setpoint temperature for heating in the comfort mode will also change all other setpoint temperature values!

The dead zone (temperature zone for which there is neither heating nor cooling) is the difference between the setpoint temperatures for "heating" and "cooling" in the comfort mode. The following applies:

$$T_{\text{comfort setpoint cooling}} - T_{\text{comfort setpoint heating}} = T_{\text{dead zone}};\ T_{\text{comfort setpoint cooling}} \geq T_{\text{comfort setpoint heating}}$$

Important notes:

- If the dead zone is symmetrical, the basic setpoint is indirectly set via the comfort temperature for heating.
- Changing the comfort setpoint temperature for cooling allows the adjustment of the dead zone. An adjustment of the dead zone with a symmetrical dead zone position will result in a shift of the comfort setpoint temperature for heating and thus of all other temperature setpoints. With an asymmetrical dead zone position, an adjustment of the comfort setpoint temperature for cooling will only shift the temperature setpoints for cooling. It is possible to shift the dead zone to 0 °C via local control ($T_{\text{comfort setpoint cooling}} = T_{\text{comfort setpoint heating}}$). In this case there is neither heating nor cooling, if the determined room temperature equals the comfort setpoint temperatures.

The setpoint 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 the ETS.

It is possible to adjust the setpoint temperatures for "Standby" and "Night" via local control in the programming mode independent of the values for the temperature increase/decrease which were originally parameterized in the ETS.

In this case, the standby or night setpoint temperatures will always shift together with the temperature increase/decrease resulting from the local control during the adjustment of the basic setpoint temperature or the dead zone. After the reprogramming with the ETS, the originally parameterized values can be accepted again.

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

$$T_{\text{night setpoint heating}} \leq T_{\text{comfort setpoint heating}} \leq T_{\text{comfort setpoint cooling}} \leq T_{\text{night setpoint cooling}}$$

In case of a two-stage control the setpoints of the additional stage are always derived dynamically from the setpoints of the basic stage. The temperature setpoints of the additional stage are predefined by the stage offset which is parameterized in the ETS. The stage offset cannot be adjusted in the local control mode.

As far as a change of the basic setpoint temperature is concerned (when a new comfort setpoint temperature value for heating is being received by the "Basic setpoint" communication object), there are basically two cases which must be distinguished:

- Case 1: The basic setpoint change is permanently adopted,
- Case 2: The basic setpoint change is adopted only temporarily (default).

Via the *"Adopt basic temperature setpoint change permanently"* parameter on the *"Room temperature controller function /setpoints"* parameter page, it is possible to determine whether the changed basic temperature value shall be stored in memory permanently (*"yes"*) or only temporarily (*"no"*).

Case 1:

If the basic temperature setpoint is changed, it will be permanently stored in the room temperature controller's EEPROM. The newly adjusted value will overwrite the basic temperature originally parameterized with the ETS!

It should be noted, however, that frequent adjustments of the basic temperature (e.g. several times a day) can affect the product life of the device as the non-volatile memory is designed only for less frequent write access.

Thus the basic setpoint received by the object remains in memory even after a bus voltage failure.

Case 2:

The basic setpoint received via the object stays only temporarily active in the current operating mode. In case of a bus voltage failure or following a switch-over into another operating mode (e.g. comfort followed by standby), the basic setpoint adjusted via local operation or received via the object will be discarded and replaced by the value which was originally parameterized in the ETS.

Important:

- Since the setpoint temperatures for the "standby" and "night" operating modes or the setpoints for the "cooling" control option are derived - in consideration of the increase, decrease or dead zone values that are parameterized in the ETS - from the basic setpoint temperature for "heating", these setpoint temperatures will shift linearly by the change of the basic setpoint value.
  The temperature setpoints for the standby or night mode or "cooling" comfort mode (dead zone) will always be stored in the non-volatile EEPROM.
- It has to be pointed out that temperature setpoints can only be changed or stored via local control or via the "Basic setpoint" object, if it was enabled in the ETS. Any value preset via local control will not be adopted by the object.

13.1 Operating modes

The room temperature controller features several operating modes. By selecting theses modes it is possible to activate different temperature setpoints that, for example, depend on the presence of a person, the status of the heating or cooling system, the time of day or day of week.

- Comfort mode:

The comfort mode should be activated if people are present in the room that requires the room temperature to be adjusted to a comfortable and appropriate value. The switch-over into this operating mode can also take place via presence control.
The comfort mode - when activated - is signalled by LED B ().

- Standby mode

If a room is not in use during the day as people are absent, the standby mode may be activated. This will set the room temperature to a standby value so that heating or cooling energy can be saved in the process.
The standby mode - when activated - is signalled by LED C ().

- Night mode

During the night hours or during a longer absence it is often best to adjust the room temperature to cooler temperatures for heating systems (e.g. in bedrooms). In this case, cooling systems can be adjusted to higher temperature values, if climate control is not required (e.g. in offices). For this purpose the night mode can be activated.
The night mode - when activated - is signalled by LED D ().

- Frost / heat protection mode

Frost protection is necessary, if, for example, the room temperature must not fall below critical values when the window is open. Heat protection might be necessary, if the temperature in a mostly warm environment becomes too high due to external influences.
In these cases, freezing or overheating of the room can be prevented by activating the frost/heat protection depending on the adjusted "heating" or "cooling" control option by specifying an individual temperature setpoint.
A frost/heat protection - when activated - is signalled by LED H ().

- Comfort mode prolongation (temporary comfort mode)

The comfort mode prolongation is to be activated from the night mode or the frost/heat protection (not triggered by the *"window state"* object) and can be used to adjust the room temperature to the comfort temperature for a certain amount of time, if, for example the room 'is used' during the night as well. The prolongation is activated exclusively by a parameterized presence key. The comfort mode prolongation is automatically deactivated after a settable time has elapsed or by pressing the presence key again or via receiving a presence object value = "0". The prolongation cannot be retriggered.

An individual temperature setpoint can be preset for each *"heating"* or *"cooling"* control option.

13.1.1 Operating mode switch-over

There are several ways to activate or switch-over the operating modes. Activating or switching-over – interdependent in terms of priority – are possible via…

a) local operation of the presence key, if enabled,

c) the 1-bit objects that are available separately for each operating mode or alternatively via the KONNEX objects (1 byte).

Ad a):
If the presence key has been selected for presence detection on parameter page "Controller functions", the presence key can be used to switch from the night mode or from the frost/heat protection mode over to the comfort mode for the preset comfort prolongation time on provision that the above modes have not been activated by the "Window state" object. The comfort mode prolongation is deactivated after this time has elapsed, after a new press on the presence key or after receiving a presence object value = "0". If the duration of the comfort prolongation is set to "0", the presence function can be activated, but the operating mode is not changed. During the comfort prolongation period, the comfort LED is lit up together with the "night mode" or the "frost/heat protection" LED.

If the standby mode is active, it is possible to switch into the comfort mode by actuating the presence key or via a presence object value = "1".

Ad b):
One distinguishes whether the operating mode is to be switched-over via separate 1-bit objects or, alternatively, via the 1-byte KONNEX objects. The *"Operating mode switch-over"* parameter on the *"Room temperature controller function"* parameter page predefines how the switch-over will take place.

• Operating mode switch-over via "switching (4 x 1 bit):

There is a separate 1-bit switch-over object for each operating mode. Each one of these objects allows to switch-over or to preset the current operating mode by priority.

Taking into consideration the priority, the following switch-over hierarchy results from an operating mode switch-over via the objects. One distinguishes between presence detection by presence key (table 1 / figure 1) and by presence detector (table 2 / figure 2 on next page):

Table 1

"Operating mode switch-over" objects: Obj.-No. 85	Obj.-No. 82	Obj.-No. 83	Obj.-No. 84	Window status Obj.-No. 88	Presence key object Obj.-No. 87	activated operating mode
X	X	X	X	1	X	Frost / heat protection
1	X	X	X	0	0	Frost / heat protection
0	1	X	X	0	0	Comfort
0	0	1	X	0	0	Standby
0	0	0	1	0	0	Night
1	X	X	X	0	1	Comfort mode prolongation
0	1	X	X	0	1	Comfort
0	0	1	X	0	1	Comfort
0	0	0	1	0	1	Comfort mode prolongation
0	0	0	0	0	0	last selected valid mode
0	0	0	0	0	1	Comfort / comfort mode prolongation *

X = irrelevant
*: Depends on the last selected valid operating mode.

Fig. 1:

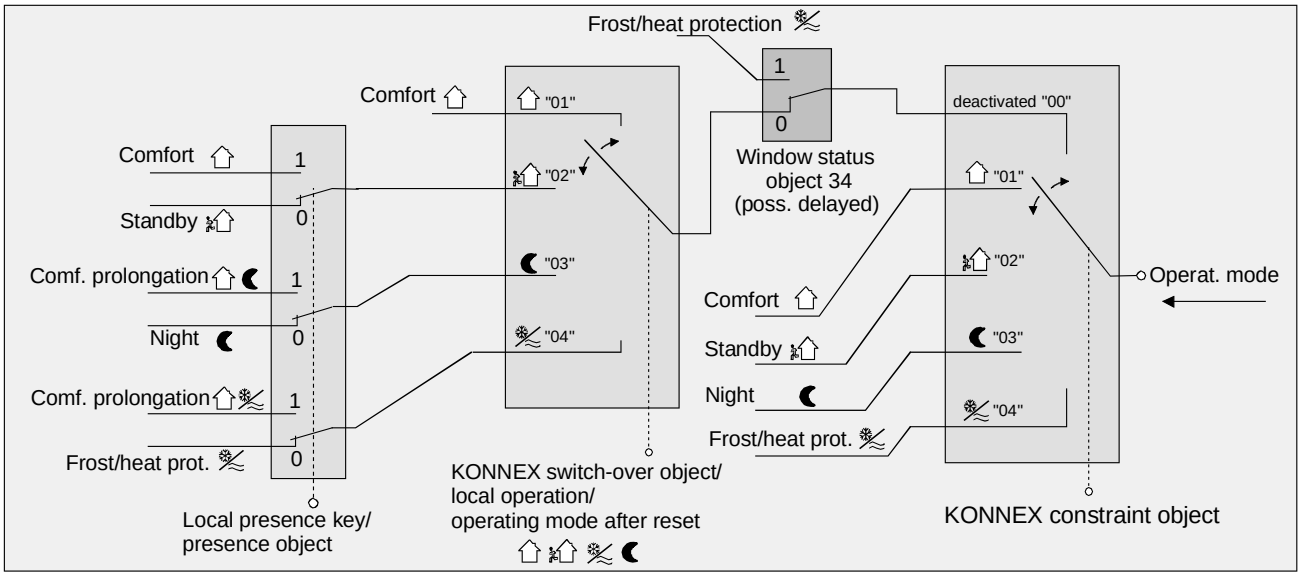
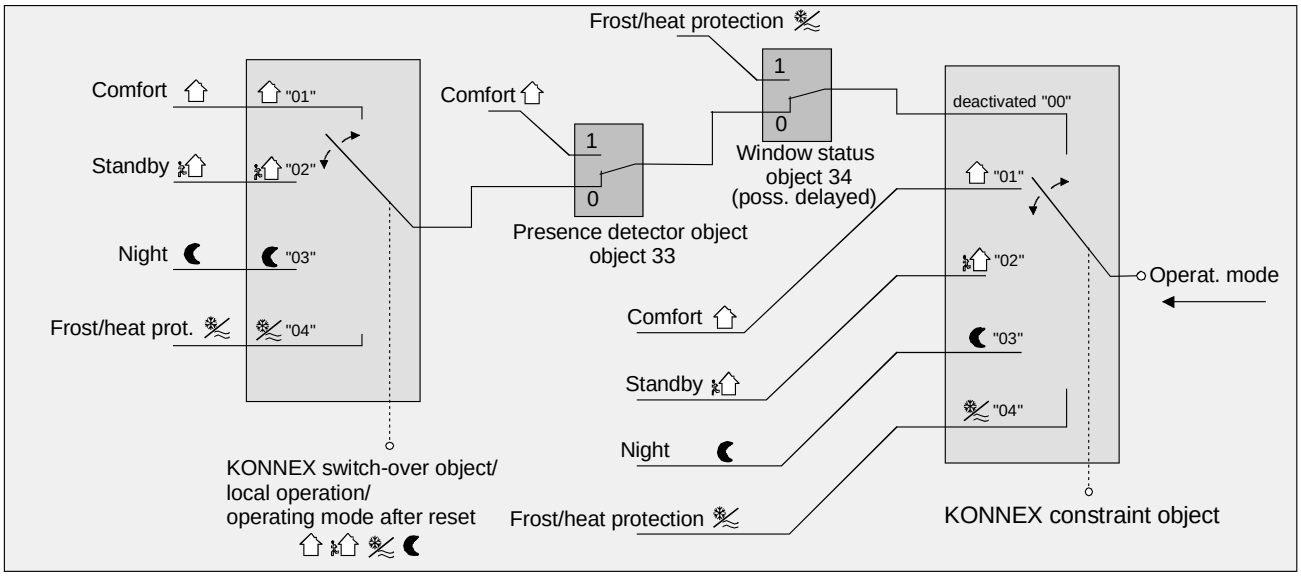


Table 2

"Operating mode switch-over "objects: Obj.-No. 85	Obj.-No. 82	Obj.-No. 83	Obj.-No. 84	Window status Obj.-No. 88	Presence detector object Obj.-No. 87	activated operating mode
X	X	X	X	1	X	Frost / heat protection
X	X	x.y	x.y	0	1	Comfort
1	x.y	x.y	x.y	0	0	Frost / heat protection
0	1	x.y	x.y	0	0	Comfort
0	0	1	x.y	0	0	Standby
0	0	0	1	0	0	Night
0	0	0	0	0	0	last selected valid mode

X = irrelevant

Fig. 2:



Notes on operating mode switch-over via "Switching" (4 x 1-bit):

- When the operating modes are switched-over, the objects, too, (comfort mode / standby mode / night mode / frost/heat protection) will always be updated and can, if applicable, be read out (set "read" flag!). Once the "transmission" flag is set for these objects, changed values will also be actively transmitted to the bus. Following a return of bus voltage or an initialization, the object corresponding to the set operating mode will be updated and its value actively transmitted to the bus when the "transmission" flag is set.
- When parameterizing a presence key:
  The presence object is active "1") for the duration of an activated comfort mode prolongation.
  The presence object will be automatically deleted ("0"), if the comfort mode prolongation is terminated after the prolongation time has elapsed or if the operating mode has been switched by a higher-priority control via the switch-over objects or via local operation.

- The operating mode switch-over via "value" (2 x 1-byte):

A shared 1-bit switch-over object exists for all operating modes. Via this value object, the operating mode can instantly be switched over after receiving only one telegram. The received value will determine the operating mode. In addition, there is a second 1-byte object available which can (by forced control and higher ranking) set an operating mode independent of all other available switch-overs. Both 1-byte objects are implemented according to the KONNEX specification.

Taking into account the priorities there is the following switching hierarchy for an operating mode switch-over by objects, with a distinction being made between a presence detection via presence key (table 1 / figure 1) and by presence detector (table 2 / figure 2 on next page):

Table 1

"Operating mode switch-over" object Obj.-No. 82	"Operating mode forced-control" object *** Obj.-No. 86	Window status Obj.-No. 88	Presence key object Obj.-No. 87	activated operating mode
x.y	01	x.y	x.y	Comfort
x.y	02	x.y	x.y	Standby
x.y	03	x.y	x.y	Night
x.y	04	x.y	x.y	Frost / heat protection
x.y	00	1	x.y	Frost / heat protection
01	00	0	0	Comfort
02	00	0	0	Standby
03	00	0	0	Night
04	00	0	0	Frost / heat protection
01	00	0	1	Comfort
02	00	0	1	Comfort
03	00	0	1	Comfort mode prolongation
04	00	0	1	Comfort mode prolongation
00	00	0	0	last selected valid mode
00	00	0	1	Comfort / comfort mode prolongation *

*: Depends on the last selected valid operating mode. / X = irrelevant

**: Values greater than "04" will not be evaluated. A "00" value will leave the last selected valid operating mode active.

***: Values greater than "04" will not be evaluated. A "00" value signifies that the forced-control object is deactivated.

Fig. 1:

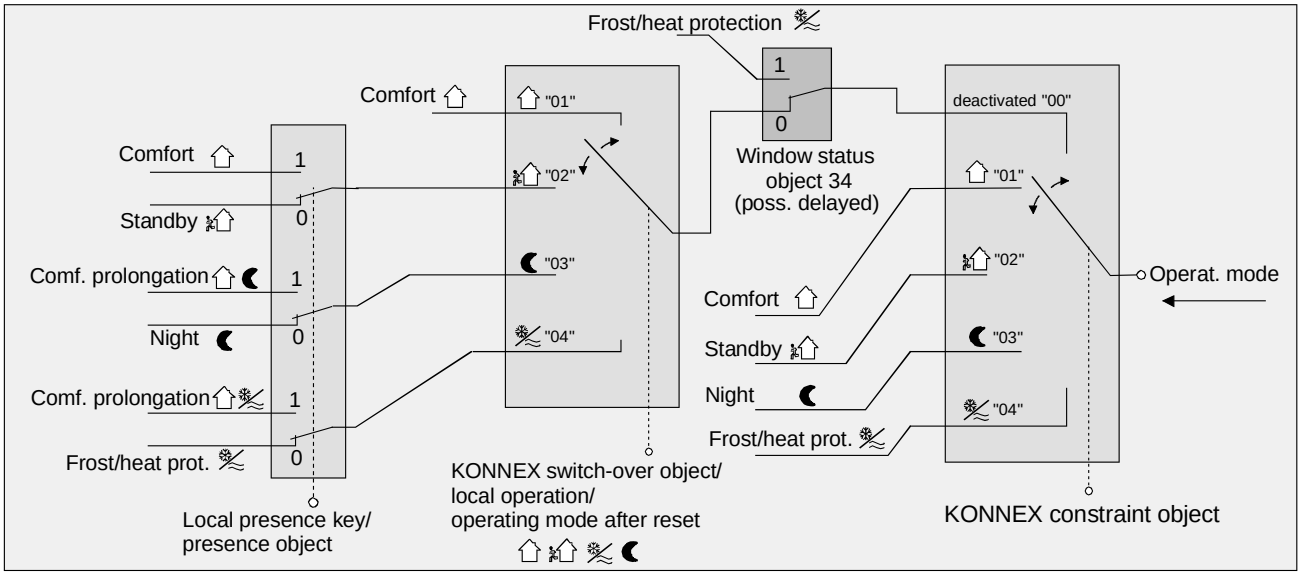


Table 2

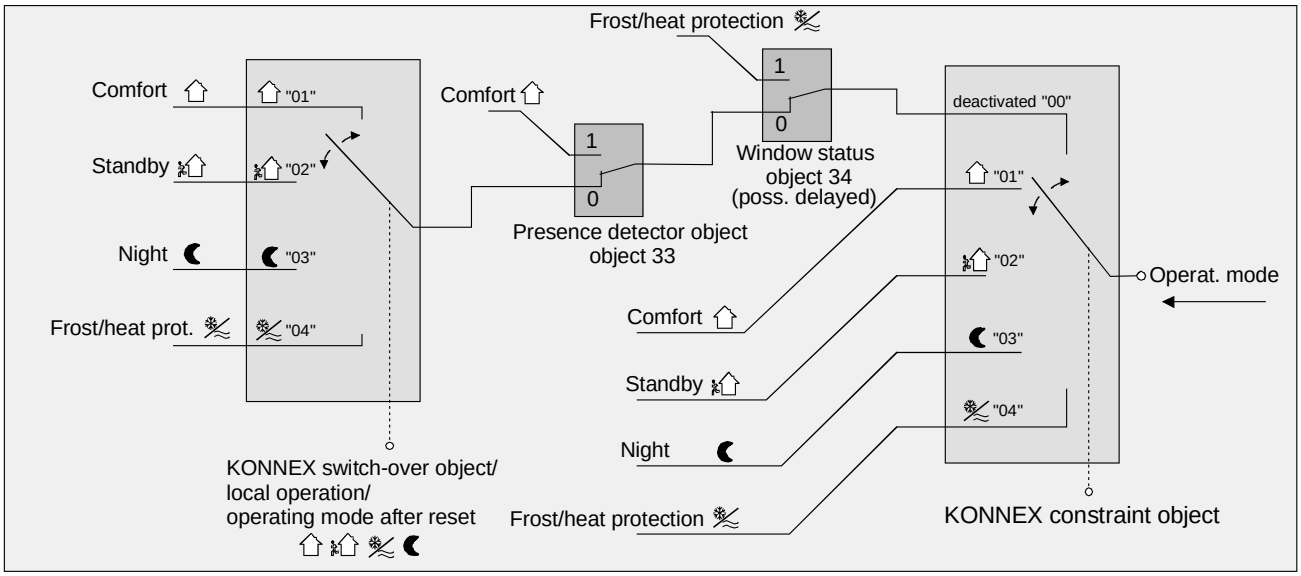
"Operating mode switch-over" object Obj.-No. 82	"Operating mode forced-control" object *** Obj.-No. 86	Window status Obj.-No. 88	Presence detector object Obj.-No. 87	activated operating mode
x.y	01	x.y	x.y	Comfort
x.y	02	x.y	x.y	Standby
x.y	03	x.y	x.y	Night
x.y	04	x.y	x.y	Frost / heat protection
x.y	00	1	x.y	Frost / heat protection
x.y	00	0	1	Comfort
01	00	0	0	Comfort
02	00	0	0	Standby
03	00	0	0	Night
04	00	0	0	Frost / heat protection
00	00	0	0	last selected valid mode

X = irrelevant

**: Values greater than "04" will not be evaluated. A "00" value will leave the last selected valid operating mode active.

***: Values greater than "04" will not be evaluated. A "00" value signifies that the forced-control object is deactivated.

Fig. 2:



Notes for operating mode switch-over via "switching" (2 x 1-byte):

- Any operating mode switch-over will also update the KONNEX switch-over object and can be, if applicable, read out (set "read" flag!). If the "transmission" flag is set with this object, the current value will actively transmitted to the bus following a change. After a return of bus voltage or an initialization, the value corresponding to the adjusted operating mode will be actively transmitted on the bus if flag is set to "transmission". In case controller extensions are used, the "transmission" flag must also be set!
- When parameterizing a presence key:
  The presence object is active ("1") for the duration of an activated comfort mode prolongation.
  The presence object will automatically be deleted ("0"), if the comfort mode prolongation is terminated after the elapsed prolongation time, if the operating mode has been switched by a higher-priority control via the switch-over objects or local operation or if a forced operating mode has been deactivated via the KONNEX forced-control object (forced-control object → "00").

13.1.2 Notes on the operating modes

Presence function / comfort mode prolongation:

Via a presence detection the room temperature controller can switch into the comfort mode prolongation for a short time when a key is pressed or into the comfort mode if movement is detected. The *"Presence detection"* and *"Type of presence detection"* parameters on the "Room temperature controller function – functions" parameter page determine whether the presence detection is controlled by movement via the presence detector or manually by pressing the presence key:

- Presence detection via presence key:

  If the presence key is enabled as the type of presence detection, the setting *"Presence key"* can be selected under key functions. In addition, object 33, the *"presence object"*, is enabled.

  That way, it is possible to switch into the comfort mode prolongation during activated night mode or frost/heat protection (not activated via the "window status" object) by actuating the presence key or via a presence object value = "1". The prolongation is automatically deactivated as soon as the parameterized *"Duration of comfort mode prolongation"* has elapsed. A comfort mode prolongation can be prematurely deactivated, if the presence key is pressed again or if a value = "0" is received by the object. Retriggering of the prolongation time is not possible.
  If the duration of the comfort mode prolongation is set to "0", it will not be possible to activate a comfort mode prolongation from the night mode or the frost/heat protection. In this case, the operating mode is not changed even though the presence function is activated.
  If the standby mode is active, it is possible to switch into the comfort mode by actuating the presence key or via a presence object value = "1". This will also be the case, if the duration of the comfort mode prolongation is parameterized to "0". The active mode remains active for as long as the presence function is activated or until there is another operating mode.

  The presence object or the presence function will always be deleted when switching over into another operating mode or after a forced-control operating mode has been deactivated (with KONNEX forced-control switch-over). The presence object is bi-directional ("W" and "T" flags set to default) so that an activation (= "1") or a deactivation (= "0") of the presence function will result in a transmission of telegrams with the corresponding object value. A presence function including the object that was activated before a reset will always be deleted after the reset.

- Presence detection by the presence detector:

  If a presence detector is enabled for presence detection purposes, only the object 33, the "*Presence object",* will be visible. This object can be used to incorporate presence detectors in the room temperature control.
  If any movement is detected ("1" telegram), the controller will switch into the comfort mode. The presettings by the switch-over objects or via local control directly on the touch sensor itself are not relevant. Only a window contact or the automatic frost protection or the KONNEX forced-control object have a higher priority.
  After the delay time in the presence detector has elapsed ("0" telegram), the controller switches back into the mode which was active before the presence detection or it will track the telegrams of the switch-over objects received during the presence detection.
  Switching-over of the operating mode on the room temperature controller is not possible while the presence detection is active.
  A presence function that was activated before a reset will always be deleted after the reset. In this case the presence detector has to transmit a new "1" telegram in order to activate the presence function.

- Window status / automatic frost protection:

  The room temperature controller provides different ways of switching into the frost/heat protection . Besides switching by means of the corresponding operating mode switch-over object, the frost/heat protection can be activated by a window contact. Among these options, the window contact has the higher priority.

  A telegram with the value = "1" (opened window) to object 34 will activate the frost/heat protection. In this case, the operating mode cannot be deactivated by the operating mode switch-over objects (with the exception of the KONNEX forced-control object).

  Only a telegram with the value = "0" (closed window) will reset the window status and deactivate the frost/heat protection. Subsequently, the operating mode that was set before the opening of the window or tracked via the bus during the time the window was open will be activated.

Operating mode after reset:

In the ETS it is possible to determine via the *"Operating mode after reset"* parameter on the *"Room temperature controller function – functions"* parameter page which operating mode is to be activated following a return of bus voltage or a programming operation with the ETS. The following settings are possible:

- *"Comfort mode":* After the initialization phase the comfort mode is activated.
- *"Standby mode":* After the initialization phase the standby mode is activated.
- *"Night mode":* After the initialization phase the night mode is activated.
- *"Frost/heat protection":* After the initialization phase the frost/heat protection is activated.
- *Restore operating mode before reset":* The mode that was activated before a reset will be readjusted after the initialization phase of the device.

The objects associated with the activated operating mode will be updated after a reset.

Notes on the setting *"Restoring operating mode before reset"*:

- Frequent changes of the operating mode during the operation (e.g. several times a day) may affect the product life of the device as the non-volatile storage (EEPROM) is designed only for less frequent write access.

- A presence function including the object that was activated before a reset is deleted after the reset. The operating mode activated by the presence function, however, remains active after the reset.

  A comfort mode prolongation which was restarted by a reset is automatically deactivated after the prolongation time has elapsed.

  The *"Window status"* object is deleted after a reset ("0"). In this case, too, the frost/heat protection which was previously activated via the window status remains activated even after a reset.

13.1.3 Controller status

The room temperature controller is able to transmit its status. Available is either a general collective status report (1-byte) or alternatively one of up to 8 individual status reports (1-bit).
The *"Status controller"* parameter on the *"Room temperature controller function – actuating variable and status output"* parameter page releases the status report and determines the status format:

- *"Status controller" = "controller general":*

The 1-byte status object 36 holds the complete status information. The status - controlled by the control algorithm – is actively transmitted (cyclically every 30 seconds) to the bus (pre-condition: "T" flag is set!)). The setting of the "R" flag allows the read-out of the status.

Settings	**Relevance of data**	
Controller general 1-byte	Bit 0: 1: comfort mode active Bit 1: 1: standby mode active Bit 2: 1: night mode active Bit 3: 1: frost/heat protection active	Bit 4: 1: controller disabled Bit 5: 1: heating; 0: cooling Bit 6: 1: controller inactive (dead zone) Bit 7: 1: frost alarm (T room ≤ + 5 °C)

- *"Status controller" = "Transmit individual status":*

The 1-bit status object 36 includes the status information selected by the "individual status" parameter. The status - controlled by the control algorithm – is actively transmitted (cyclically every 30 seconds) to the bus (pre-condition: "T" flag is set!)). The setting of the "R" flag allows read-out of the status.

Parameterization for "Individual status"	**Relevance of data**	
Comfort mode active	1: comfort mode / prolongation active	0: no comfort mode
Standby mode active	1: standby mode active	0: no standby mode
Night mode active	1: Night mode active	0: no night mode
Frost/ heat protection active	1: frost/heat protection active	0: no frost/heat protection
Controller disabled	1: controller disabled (dew-point mode)	0: controller not disabled
Heating/cooling	1: heating operation	0: cooling operation
Controller inactive	1: controller inactive (dead zone)	0: controller active
Frost alarm	1: frost alarm (T room ≤ + 5 °C)	0: no frost alarm (T room > + 5 °C)

Meaning of status reports:

- Comfort operation: active when operating mode "comfort ' " or when comfort mode prolongation " " or " " is activated.
- Standby operation: active when operating mode 'standby " " is activated.
- Night-time operation: active when operating mode "night" is activated.
- Frost/ heat protection: active when operating mode "frost/heat protection" is activated.
- Controller disabled: active when controller disable is activated (dew-point mode).
- Heating/cooling: active when heating is activated and inactive when cooling is activated. (inactive with controller disabled.)
- Controller inactive: active in the case of the *"heating and cooling"* control option when the measured room temperature lies within the dead zone. This status information is always "0" for the individual *"heating"* or *"cooling"* control options! (inactive when controller is disabled.)
- Frost alarm: active when the detected room temperature reaches or drops below + 5 °C. The status report has no significant influence on the controller behaviour.

Status object 36 will be updated following a reset after the initialization phase. Afterwards the status is updated every 30 seconds parallel to the calculation of the controller's actuating variable.

13.1.4 Additional controller status

The additional controller status is an object in which information already available on the bus is to be collected so that it can be displayed with a suitable device. This 1-byte object is a mere visualization object which does not allow any write access. This status object possesses a KNX-certified (but not standardized) datapoint type.

Settings for "Controller general"	Relevance of data for "Additional controller status report"	
Bit 0	1: normal operating mode	0: forced-control operating mode
Bit 1	1: comfort prolongation active	0: no comfort prolongation
Bit 2	1: presence (presence detector)	0: no presence (presence detector)
Bit 3	1: presence (presence key)	0: no presence (presence key)
Bit 4	1: window contact active	0: no window opened
Bit 5	1: additional stage active	0: additional stage not active
Bit 6	1: heat protection active (heat protection temp. < actual temp.)	0: no heat protection (heat protection temp. > actual temp.)
Bit 7	1: controller disabled (dew-point mode)	0: controller not disabled

Status object 57 will be updated following a reset after the initialization phase. Thereafter, the additional controller status is updated every 30 seconds parallel to the computation of the actuating variable of the controller. In the event of a change, the new status determined will be transmitted to the EIB.

13.2 Control options and control option switch-over

The room temperature controller features up to two control options. These control options determine whether the controller shall address heating systems (individual control option *"heating"*) or cooling systems (individual control option *"cooling"*) via its actuating variable. It is also possible to activate a mixed-mode in which the controller can switch-over automatically or, alternatively, object-controlled between *"heating"* and *"cooling"*.

Moreover, the control operation can be carried out in two stages for addressing an additional heating and cooling device. If controlled in two stages, actuating variables will be calculated separately for the basic and additional stage and transmitted on the bus depending on the deviation between actual and setpoint temperature.

The *"Control option"* parameter on the *"Room temperature controller functions"* parameter page determines the control option to be carried out and activates, if applicable, the additional stage(s).

For the individual control options *"heating"* or *"cooling"* without additional stage, the controller runs with only one actuating variable. Alternatively, it runs with two actuating variables for the parameterized control option, if the additional stage is activated. Depending on the determined room temperature and the preset setpoint temperatures of the operating modes, the room temperature controller decides independently whether heating or cooling energy is required and calculates the actuating variable for the heating or cooling system.

Following a reset (return of bus voltage or new ETS programming) in the *"heating"* or *"cooling"* mode, the controller will always operate in the control option that was set in the ETS.

In the *"heating and cooling"* mixed-mode the controller is able to address heating and cooling systems. In this case, the switch-over behaviour of the control options can be preset:

- The *"Switching-over between heating and cooling"* parameter on parameter page *"Room temperature controller-functions"* is set to "automatic":

  Depending on the determined room temperature and the preset basic temperature setpoint value or the dead zone, the heating or cooling mode is automatically activated . If the room temperature lies within the preset dead zone, neither heating nor cooling will take place (both actuating variables = "0"). The room will be cooled down if the room temperature is higher than the temperature setpoint for cooling. The room will be heated up, if the room temperature is lower than the temperature setpoint for heating.

  With an automatic switch-over of the control option, the information whether the controller is in the heating mode ("1" telegram) or in the cooling mode ("0" telegram) can be actively transmitted to the bus via the *"Control option switch-over"* object 35. The *"Automatic transmission heating/cooling switch-over"* parameter determines when a control option switch-over is transmitted.

  - Setting *"Changing the control option"*:
    In this case, a telegram is transmitted solely when switching-over from heating to cooling (object value = "0") or from cooling to heating (object value = "1).
  - Setting *"Changing the output variable"*:
    With this setting, the current control option will always be transmitted if the output variable has changed. With the actuating variable = "0" the control option that was last active will be transmitted.

  If the determined room temperature lies within the dead zone, the control option last activated will be retained in the object value until the controller is switched-over into the other control option.

  With an automatic switch-over, the object value can also be transmitted cyclically. The *"Cyclical heating/cooling switch-over"* parameter enables cyclical transmission (factor setting > "0") and determines the cycle time.

  Notes on the automatic switch-over of the control option:

  A dead zone that is too narrow might result in continuous switching over between heating and cooling. For this reason the dead zone (temperature difference between the set-temperatures for heating and cooling comfort mode) should preferably not be adjusted below the default value.

- The *"Switching-over between heating and cooling"* parameter on parameter page *"Room temperature controller-functions"* is set to "via object":

  Independent of the dead zone, the control option is then controlled via the *"Control option switch-over"* object 35. This type of switch-over may be required, for example, in case of heating and cooling via a single-duct system (combined heating and cooling system). For this purpose, the temperature of the medium in the single-duct system must be changed beforehand by the system control. Afterwards the control option is set via the object (often the single-duct system uses cold water for cooling during the summer, hot water for heating during the winter).

  The *"Control option switch-over"* object has the following polarity: "1": heating; "0": cooling. After a reset the object value "0" and the *"Control option heating/ cooling after reset*" parameter will be activated.

  The *"control option heating / cooling after reset"* parameter determines which control option will be activated after a reset. The *"heating"* or *"cooling"* setting causes the controller to activate the parameterized control option directly after the initialization phase. Setting the *"Control option before reset"* parameter will activate the control option that was selected before the reset.

  If a switch-over takes place via the control option object, the controller will first switch-over into a control option that was set after the reset. The controller will switch-over, if applicable, into the other control option only after the device has received an object update.

  Notes on the *"Control option before reset"* setting:

  - Frequent changes of the control option in operation (e.g. several times a day) may affect the product life of the device as in this case the non-volatile storage (EEPROM) is only designed for less frequent write access.

Heating / cooling message:

Depending on the selected control option it is possible to output the information via separate objects whether heating or cooling energy is currently required, i.e. whether heating or cooling operation is in progress.

As long as the actuating variable for heating (cooling) is > "0", a "1" telegram is transmitted via the "heating" ("cooling") signalling object. The message telegrams will be reset only if the actuating variables = "0" ("0" telegram will be transmitted).

Exception: In case of a 2-state control, the LEDs "heating" or "cooling" will light up or the signalling objects for heating and cooling will already become active as soon as the temperature falls short of the temperature setpoint in case of heating or exceeds the temperature setpoint in case of cooling. In this case, the parameterized hysteresis is not being considered.

Heating and cooling at the same time is not possible!

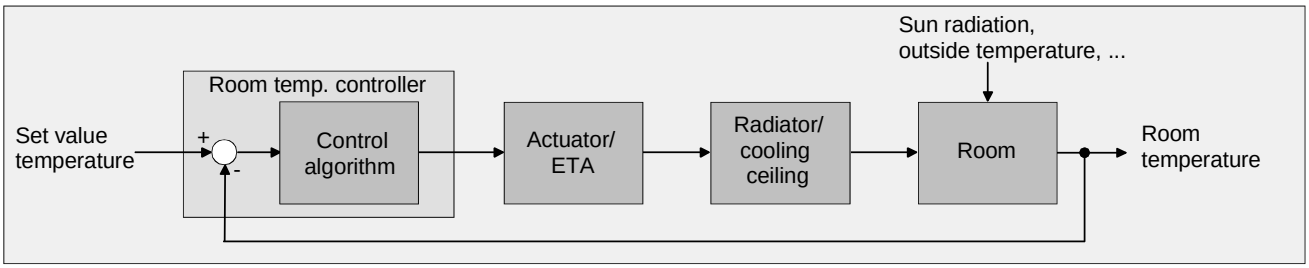
The signalling objects may be enabled via the *"Heating message"* or the *"Cooling message"* parameter on the *"Actuating variable and status output"* parameter page.

The signalling objects are controlled by the control algorithm. It has to be considered that the actuating variable is calculated only every 30 seconds (thus updating the signalling objects every 30 seconds).

13.3 Room temperature control and actuating variables

13.3.1 Control algorithms, control circuits and calculation of actuating variable

A comfortable temperature control for a living space requires a special control algorithm which controls the installed heating or cooling systems. By considering the setpoint temperatures as well as the actual room temperature, the controller determines the actuating variables controlling the heating or cooling system.
The control system (control circuit) consists of the room temperature controller, the servo drive or the switching actuator (for the use of electro-thermal drives), the actual heating or cooling element (e.g. heaters or cooling ceiling) and the room. This results in the following control process:



The controller measures the actual temperature (determined room temperature) and compares it with the given setpoint temperature. The control algorithm calculates the actuating variable from the difference between actual and setpoint temperature. This enables the controller to compensate for actual/setpoint temperature differences in the control circuit caused by external influences (e.g. strong exposure to sun or varying outside temperatures) by regularly readjusting the actuating variable. In addition, the flow temperature of the heating and cooling circuit affects the control process making it necessary to adapt the actuating variables.

The room temperature controller allows the option between a continuous or switching proportional/integral control (PI) or a switching 2-state control.

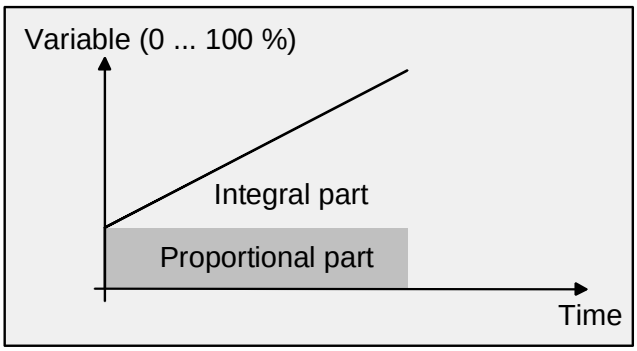
The actuating variables calculated by the control algorithm are output via the "actuating variable heating" or "actuating variable cooling" communication objects. The control algorithm selected for the heating and/or cooling operation determines, among other things, also the format of the actuating variable object. Thus, it is possible to create 1-bit or 1-byte actuating variable objects.

The control algorithm is determined via the "Type of heating control" or "Type of cooling control" parameters on the "Room temperature controller function" parameter page, possibly also for the additional stages.
Each of the following three algorithms can be selected:

1. Continuous PI control:

A PI control is an algorithm consisting of a proportional and an integral part. A combination of these control characteristics allows to accurately adjust the room temperature as fast as possible without or with only small control deviations.

This algorithm lets the room temperature controller calculate a new continuous actuating variable periodically every 30 seconds. This one will be output to the bus via a 1-byte value object, if the calculated actuating variable has changed by a predetermined percentage. The *"Automatic transmission if value changes by..."* parameter on the *"Room temperature controller function – actuating variable and status output"* parameter page determines the change interval in percent.



An additional PI controlled heating or cooling stage works exactly as the PI control of the basic stage. The difference is that the setpoint will shift by taking into account the parameterized stage offset.

Characteristic feature of the PI control:

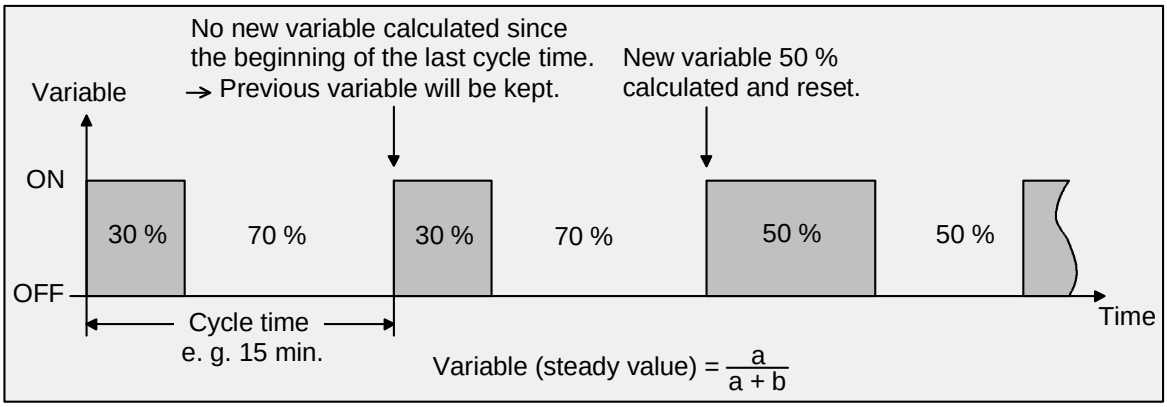
If the setpoint/actual value deviation of the room temperature results in an actuating variable of 100%, the room temperature controller uses the maximum actuating variable until the determined room temperature reaches the setpoint. This special control behaviour is known as 'clipping'.
This will quickly heat up or cool down the temperature in chilled or overheated rooms. In two stage heating or cooling systems this control behaviour also applies to the actuating variables of the additional stages.

2. Switching PI control:

This parameterization will also keep the room temperature constant via the PI control algorithm. Averaged over time, the control system will behave the same as with a continuous controller. The only difference compared to a continuous control is the actuating variable output.
The actuating variable calculated periodically every 30 seconds by the algorithm is internally converted into an equivalent pulse width modulated (PWM) actuating variable signal and output to the bus via a 1-bit switching object after the cycle time.
Allowing for the cycle time which is adjustable via the "Cycle time of the switching actuating variable..." parameter on the "Room temperature controller function – actuating variable and status output" parameter page, the average value of the actuating variable signal resulting from this modulation is a measure for the averaged valve position of the control valve, thus making it a reference value for the adjusted room temperature.
Shifting of the average value and thus changing of the heating output is achieved by changing the pulse/pause ratio of the actuating variable signal.

Depending on the calculated actuating variable, the controller adapts the pulse/pause ratio only at the end of a time period! Each change in the actuating variable is realized no matter what the relative change of the actuating variable is (the *"Automatic transmission if value changes by..."* and *"Cycle time for automatic transmission..."* parameters have no function here). The actuating variable last calculated within an active time period will be realized. If the setpoint temperature changes, for example, due to switching-over into another operating mode, the actuating variable will also be adapted only at the end of an active cycle time.

The following figure shows the output actuating variable switching signal depending on the actuating variable internally calculated (first 30 %, then 50 % actuating variable; actuating variable output not inverted).



With an actuating variable of 0 % (continuously switched-off) or 100 % (continuously switched-on) an actuating variable telegram according to the actuating variable value ("0" or "1") is output after a cycle time has elapsed. With this type of control, the 'clipping' behaviour (cf. "continuous PI control") is active as well.

Even in case of a switching PI control, the controller always calculates internally with continuous actuating variable values. These continuous values can be additionally output to the bus via a separate 1-byte value object, for example, to display it as status information.
With a switching PI control (PWM), the value object 46 is created for heating and the value object 48 for cooling. If additional stages are used, the value object 47 will be additionally enabled for the additional heating and the value object 49 for the additional cooling.
If the actuating variable for heating and cooling is to be output via a shared object, the continuous value for the activated control option will be transmitted via the object 46 and, if applicable, for the additional stages via the object 47.
The status value objects are only updated after the elapse of the parameterized cycle time together with the actuating output. The *"Automatic transmission if value changes by..."* and *"Cycle time for automatic transmission..."* parameters have no function here.

An additional PI controlled heating or cooling stage works exactly the same as the switching PI control of the basic stage. The difference is that the setpoint will shift by taking into account the parameterized stage offset. All PWM controls use the same cycle time.

Cycle time:

In most cases, the pulse width modulated actuating variables are used to control electro-thermal drives. The room temperature controller transmits the switching actuating variable telegrams to a switching actuator (preferably with semi-conductor switching elements) which is connected to the drives.

Setting the cycle time for the PWM signal allows to adapt the control to the drives that are being used. The cycle time determines the switching frequency of the pulse modulated signal and allows the adaptation to the adjusting cycle times of the servo drive (time required by the drive to adjust the valve from a completely closed position to a completely opened position). In addition to the adjusting cycle time, the dead time (time during which the servo drives show no response when switching on or off) has to be considered. If different drives with different adjusting cycle times are used, the longer time is to be accounted for. The manufacturer's specifications for the drive have to be observed.

In standard practice, two cases for the adjustment of the cycle time can be considered:

I. Cycle time 2 x adjusting cycle time of the drives being used, for example 15 minutes (default)

In this case, the pulse/pause times of the PWM signal are long enough for the drives to completely open or close within a time period.

Advantages:
The desired average value for the actuating variable and thus the required room temperature is relatively accurately adjusted even with several drives that are simultaneously activated.

Disadvantages:
It has to be considered that due to the constantly 'travelled' full valve lift the product life of the drives may decrease. The heat transfer to the room in the vicinity of the heater may be non-uniform and may be felt bothering to some people if the cycle times are very long (> 15 minutes) and if the system has a slower response (for example in case of smaller hot water heaters).

Notes:

- This setting for the cycle time is recommended for slower, more inert heating systems (for example underfloor heating).
- This setting is also recommended for a larger number of possibly different drives making it easier to average the valve travel.

II. Cycle time < adjusting cycle time of the drives being used, for example 2 minutes (default)

In this case, the short pulse/pause times of the PWM signal are not sufficient for the drives to completely open or close within a time period.

Advantages:
This setting ensures a constant water flow through the heaters with a uniform heat transfer to the room.
If only one servo drive is controlled, the controller is able to compensate for the shift of the average value caused by the short cycle time by continuously adapting the actuating variable and is thus able to adjust the desired room temperature.

Disadvantages:
If more than one drive is controlled at the same time, the desired average for the actuating variable and thus the required room temperature is adjusted only very poorly or with larger deviations.

Note:

- This setting for the cycle time is recommended for fast-responding heating systems (for example hot water heaters with higher flow temperature).

3. Switching 2-state control:

The 2-state control represents a very simple temperature control. For this type of control, two hysteresis temperature values are predefined. The controller addresses the actuating elements via switch-on and switch-off actuating variable commands (1-bit). A continuous actuating variable will not be calculated with this type of control. The room temperature is evaluated periodically every 30 seconds as well, i.e. the actuating variables, if required, will change only during these times.

While the 2-state temperature control is very simple, the fluctuating temperature is a disadvantage. For this reason, no fast responding heating or cooling systems should be controlled via a 2-state control as it may result in heavy temperature overshooting and thus in a loss of comfort.

When defining the hysteresis limit settings, one has to distinguish between the control options:

- Individual control options *"heating"* or *"cooling"*:

In the heating mode the controller will switch-on the heater, if the temperature falls below a preset limit. In the heating mode the controller will switch-off the heater only, if an adjusted temperature limit has been exceeded.

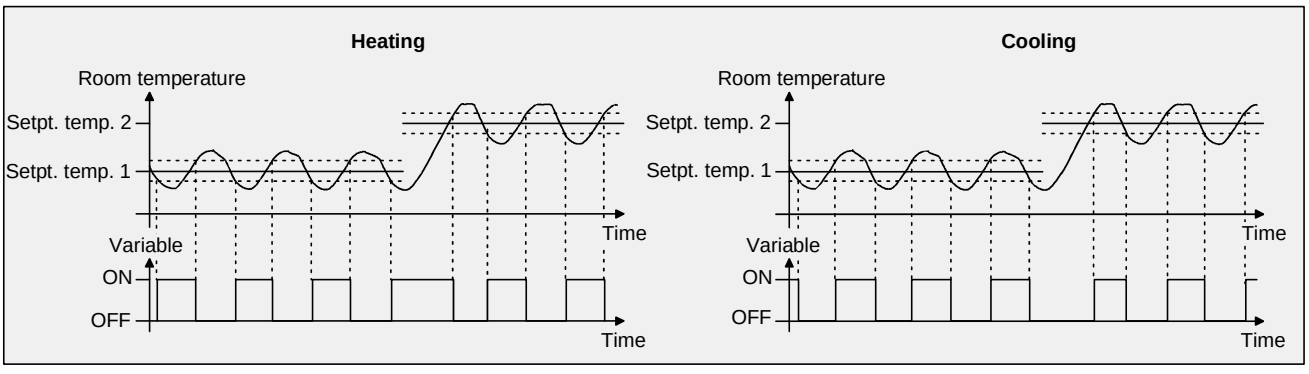
In the cooling mode the controller will switch-on the cooling, if the room temperature has exceeded a preset limit. While in the cooling mode, the controller will switch-off the cooling only if the temperature has fallen below an adjusted temperature limit.

Depending on the switching state of the actuating variable, a "1" or "0" will be output, if the value exceeds or remains under the hysteresis limits.

In case of a 2-state control, the LEDs "heating" or "cooling" will light up or the signalling objects for heating and cooling will already become active as soon as the temperature falls short of the temperature setpoint in case of heating or exceeds the temperature setpoint in case of cooling. In this case, the hysteresis is not taken into account.

The upper and lower hysteresis limits are to be parameterized in the ETS for both control options.

The following figure shows a 2-state control for the individual control options *"heating"* or *"cooling"* (heating on the left, cooling on the right; two temperature setpoints; one-stage heating or cooling; non-inverted actuating variable output):



An additional 2-state control heating or cooling stage works in exactly the same way as the 2-state control of the basic stage. The difference is that the setpoint and the hysteresis values will shift by taking into account the parameterized stage offset.

- *"Heating"* and *"cooling"* mixed mode:

In the heating mode the controller will switch-on the heater, if the temperature falls below a preset limit. The control will switch-off the heater as soon as the room temperature exceeds the temperature setpoint of the active operating mode.

In the cooling mode the controller will switch on the cooling, if the room temperature has exceeded a preset limit. While in the cooling mode the controller will switch off the cooling as soon as the room temperature falls below the temperature setpoint of the active operating mode.

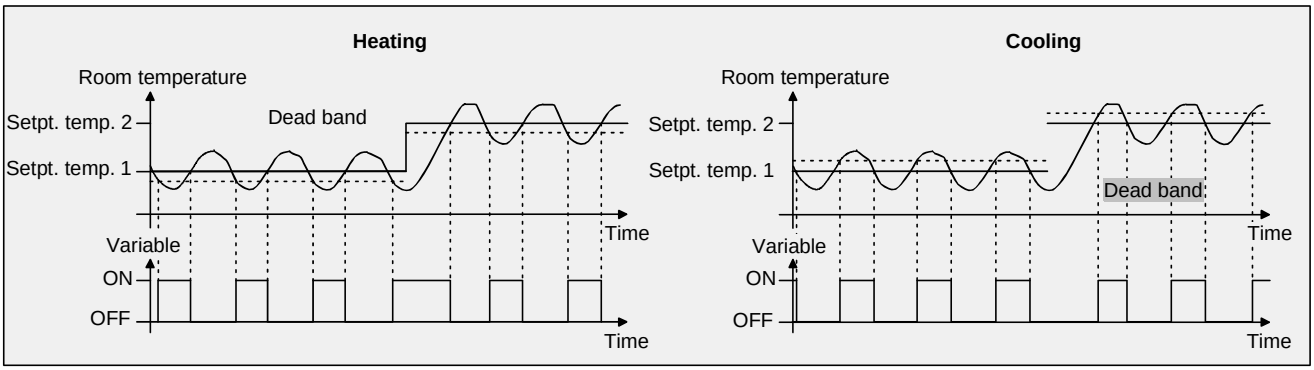
Thus, in mixed-mode operation there is no upper hysteresis limit value for heating or no lower hysteresis limit value for cooling as these values would lie in the dead zone. There is neither heating nor cooling within the dead zone.

Depending on the switching state the actuating variable "1" or "0" will be output, if the values exceed or remain under the hysteresis limits.

In case of a 2-state control, the LEDs "heating" or "cooling" will light up or the signalling objects for heating and cooling will already become active as soon as the temperature falls short of the temperature setpoint in case of heating or exceeds the temperature setpoint in case of cooling. In this case, the hysteresis is not taken into account.

The upper and lower hysteresis limits are to be parameterized in the ETS for both control options.

The following figure shows a 2-state control for the *"heating"* or *"cooling"* mixed-mode (activated heating on the left, activated cooling on the right; two temperature setpoints; non-inverted actuating variable output):



An additional 2-state control heating or cooling stage works in exactly the same way as the 2-state control of the basic stage. The difference is that the setpoint and the hysteresis values will shift by taking into account the parameterized stage offset.

13.3.1.1 Adapting the PI control

There are several systems available which may heat or cool a room. Thus, it is possible to uniformly heat or cool the surroundings with heat transfer media (preferably water or oil) in combination with room air convection. Such systems are used, for example, with wall mounted heaters, underfloor heating or cooling ceilings.
Alternatively, rooms can be heated or cooled by blower units. In most cases, such systems are electrical fan heaters, fan coolers or refrigerating compressors with fans. Due to the direct heating of the room air, such heating and cooling systems work quite fast.

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 in a PI control system 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 stage and, if applicable, also for the additional stages are adjusted via the *Type of heating"* or *"Type of cooling"* parameters These fixed values correspond to the practical values of a properly planned and executed air conditioning system and will result in an ideal behaviour of the temperature control. The following types can be set for heating or cooling.

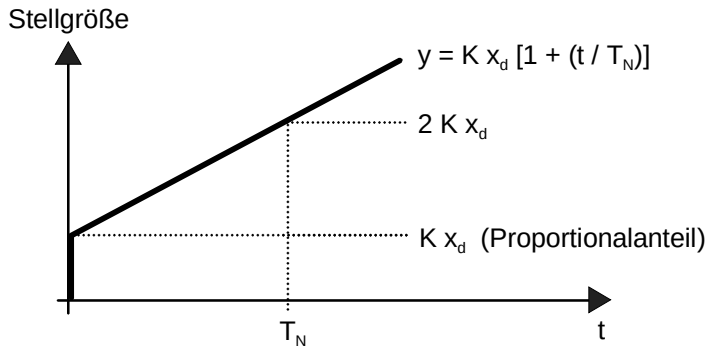
for heating control				
Type of heating	**default values**		**recommended type of PI control:**	**recommended PWM cycle time**
	Proportional range	**Reset-time**		
• Hot water heating	5 Kelvin	150 minutes	continuous / PWM	15 minutes **
• Underfloor heating	5 Kelvin	240 minutes	PWM	15 – 20 min.
• Electrical heating	4 Kelvin	100 minutes	PWM	10 – 15 min.
• Blower convector	4 Kelvin	90 minutes	continuous	---
• Split-unit *	4 Kelvin	90 minutes	PWM	10 – 15 min.
for cooling control				
Type of cooling	**default values**		**recommended type of PI control:**	**recommended PWM cycle time**
	Proportional range	**Reset-time**		
• Cooling ceiling	5 Kelvin	240 minutes	PWM	15 – 20 min.
• Blower convector	4 Kelvin	90 minutes	continuous	---
• Split-unit *	4 Kelvin	90 minutes	PWM	10 – 15 min.

*: split mobile climate control unit,
**: for smaller, fast-working heaters (e.g. higher flow temperature) PWM cycle time 2 – 3 minutes.

If the "Type of heating" or "Type of cooling" parameters are set to "via control parameters" it will be possible to adjust the control parameters manually. The 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).

Notes:

- Even minor adjustments of the control parameters will lead to a noticeably different control behaviour.
- The adaptation should start with the control parameter setting for the corresponding heating or cooling system according to the fixed values mentioned above.



x_d : Regeldifferenz $x_d = x_{soll} - x_{ist}$
P = 1/K : parametrierbarer Proportionalbereich
K = 1/P : Verstärkungsfaktor
T_N : parametrierbare Nachstellzeit

PI control algorithm: Actuating variable $y = K x_d [1 + (t / T_N)]$; By deactivating the reset-time (setting = "0"):

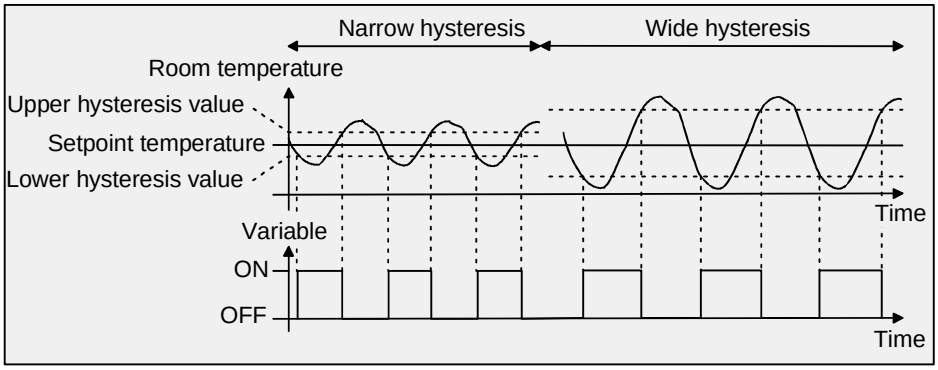
P control algorithm: Actuating variable $y = K x_d$

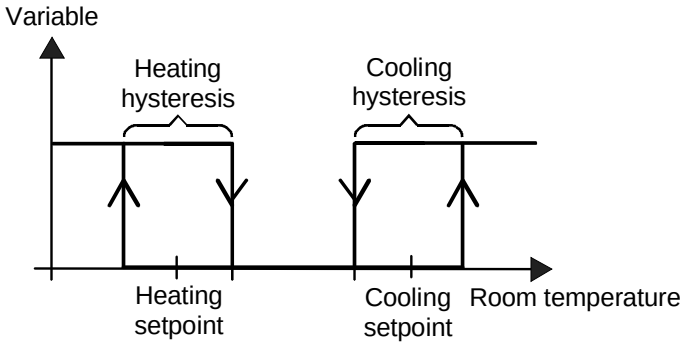
Parameter setting		Result
P	small proportional range	large overshoot in case of setpoint changes (possibly permanently), quick adjustment to the setpoint
P	large proportional range	no (or small) overshoot but slow adjustment
T_N	short reset-time	fast compensation of control deviations (ambient conditions), risk of permanent oscillations
T_N	long reset-time	slow compensation of control deviations

13.3.1.2 Adapting the 2-state control

The 2-state control is a very simple temperature control system. For this type of control, two hysteresis temperature values are predefined.
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.





13.3.2 Actuating variable output

13.3.2.1 Actuating variable objects

The format of the actuating variable objects is determined depending on the control algorithm selected for heating and / or cooling and, if applicable, also for the additional stages. 1-bit or 1-byte actuating variable objects can be created. The control algorithm calculates and outputs the actuating variables in intervals of 30 seconds. With the pulse-width modulated PI control (PWM), the actuating variable is updated, if required, only at the end of a time cycle.

Possible object data formats for the actuating variables separately for both control options, for the basic and the additional stage, are…

- continuous PI control: 1 byte
- switching PI control: 1 bit + additionally 1 byte (e.g. for status indication in visualization systems),
- switching 2-state control: 1 bit.

Depending on the selected control option, the controller is able to address heating and / or cooling systems, to determine actuating variables and to output them via separate objects. One distinguishes between two cases for the mixed mode *"heating and cooling*":

Case 1: Heating and cooling system are two separate systems.

In this case, the *"Transmit actuating variable heating and cooling to a shared object"* parameter should be set to *"no"* (default) on the *"Room temperature controller functions"* parameter page. Thus there are separate objects available for each actuating variable 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 actuating variable heating and cooling to a shared object"* parameter may be set, if required, to *"yes"* on the *"Room temperature controller functions"* parameter page. This will transmit the actuating variables for heating and cooling to the same object. In case of a 2-stage control, another shared object will be enabled for the additional stages for heating and cooling.

With this setting it is only possible to define the same type of control for heating and for cooling as the control and the data format must be identical. The (*"Type of heating / cooling"*) control parameter for cooling and heating still have to be defined separately.

A combined actuating variable object may be required, for example, if heating as well as cooling shall take place via a single-duct system (combined heating and cooling system). For this purpose, the temperature of the medium in the single-duct system must be changed beforehand by the system control. Afterwards the control option is set via the object (often the single-duct system uses cold water for cooling during the summer, hot water for heating during the winter).

Note:

Basically, it is not possible to heat and cool at the same time (actuating variables > "0")!

If required, the actuating variable can be inverted before the transmission. The actuating variable value will be output in inverted form according to the object data format via the *"Output of actuating variable heating"* or *"Output of actuating variable cooling"* parameters or via a combined *"Output of actuating variable"* object . The parameter for inverting the additional stage(s) are additionally available in 2-stage controlled operation.
The following applies…

for continuous actuating variables:	non-inverted:	Actuating variable 0 % ... 100 %, Value 0 … 255,
	inverted:	Actuating variable 0 % ... 100 %, Value 255 … 0,
for switching actuating variables:	non-inverted:	Actuating variable on / off, Value 0 / 1,
	inverted:	Actuating variable on / off, Value 1 / 0.

13.3.2.2 Automatic transmission

- Continuous PI control:
  In case of a continuous PI control the room temperature controller calculates a new actuating variable periodically every 30 seconds and outputs them to the bus via a 1-byte value object. The change interval of the actuating variable can be determined in percent according to which a new actuating variable is to be output on the bus via the *"Automatic transmission if value changes by..."* parameter on the *"Room temperature controller function – actuating variables and status output"* parameter page . The change interval can be parameterized with "0" so that a change in the actuating variable will not result in an automatic transmission.

  In addition to the actuating variable output following a change, the current actuating variable value can be periodically transmitted to the bus. In addition to the times when changes are to be expected, other actuating variable telegrams will be output according to the active value after a parameterizable cycle time.
  This ensures that telegrams can be received within the monitoring interval during periodic safety monitoring of the actuating variable in the servo drive or in the addressed switching actuator. The time interval predetermined by the *"Cycle time for automatic transmission..."* parameter should correspond to the monitoring 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.

  In the case of the continuous PI control it should be noted that - if periodic and automatic transmission are both deactivated - no more actuating variable 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 actuating variable internally every 30 seconds. With this type of control, however, updating of the actuating variable takes place, if required, only at the end of a cycle. The *"Automatic transmission if value changes by..."* and *"Cycle time for automatic transmission..."* parameters are not enabled with this control algorithm.

- 2-state control:
  In case of a 2-state control, the room temperature and thus the hysteresis values are evaluated periodically every 30 seconds, so that the actuating variable, if required, will change only during these times. The *"Automatic transmission if value changes by..."* parameter is not enabled as this control algorithm does not calculate continuous actuating variables.

  In addition to the actuating variable output following a change, the current actuating variable value can be periodically transmitted to the bus. In addition to the times when changes are to be expected, other actuating variable telegrams will be output according to the active value after a parameterizable cycle time.
  This ensures that telegrams can be received within the monitoring interval during periodic safety monitoring of the actuating variable in the servo drive or in the addressed switching actuator. The time interval predetermined by the *"Cycle time for automatic transmission..."* parameter should correspond to the monitoring 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.

13.4 Temperature setpoints

13.4.1 Setpoint presettings in the ETS

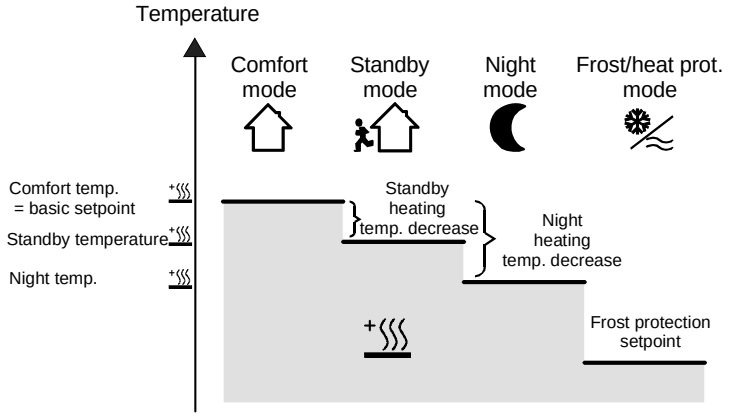
Temperature setpoints can be preset independently for each operating mode. The setpoints for the "comfort ", "standby " und "night " modes can be parameterized in the ETS. If desired, the setpoint temperatures can be subsequently adjusted via local operation of the controller in the programming mode or via object control. The "frost/heat protection " operating mode allows the separate parameterization of two temperature setpoints for heating (frost protection) and cooling (heat protection) only in the ETS.

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). The *"Basic temperature after reset"* parameter on the *"Setpoints"* parameter page determines the basic setpoint which is loaded when the device is programmed with the ETS.
Taking into account the *"Decreasing /increasing the setpoint temperature in standby mode"* or *"Decreasing/ increasing 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 control option. The dead zone will be additionally considered for the *"Heating and cooling"* mode.

In the 2-stage control mode, all setpoint temperatures of the additional stage are derived from the setpoint temperatures of the basic stage. The setpoint temperatures of the additional stage are determined by subtracting the *"stage offset"*, which is parameterized in the ETS from the setpoints of the basic stage in heating mode or by adding the setpoints in cooling mode. If the temperature setpoints of the basic stage are changed by setting a new basic setpoint, the setpoint temperatures of the additional stage 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".

Depending on the control option, the relationships described on the following pages have to be considered for the setpoint temperatures.

13.4.1.1 Setpoints for the "heating" option



(Recommended setpoint temperatures)

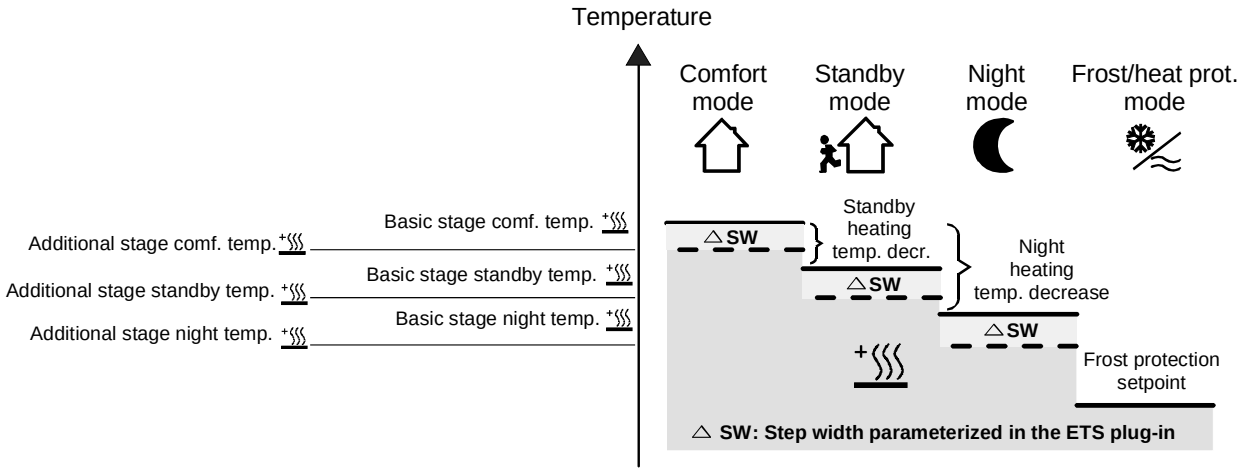
The setpoint temperatures for comfort, standby and night mode exist for this control option. The frost protection temperature can be preset. The following applies…

$$T_{\text{standby setpoint heating}} \leq T_{\text{comfort setpoint heating}} \text{ or } T_{\text{night setpoint heating}} \leq T_{\text{comfort setpoint heating}}$$

The standby and night setpoint temperatures are derived from the comfort setpoint temperature (basic setpoint) in line with the parameterized decrease-temperatures. If enabled, it is also possible to adjust also other reduction temperatures by means of a local operation on the controller itself in the programming mode by changing the setpoint temperature values for night and standby mode.

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 limited by the frost protection temperature in the lower range.

The stage offset parameterized in the ETS will be additionally considered in a two stage heating mode.



$T_{\text{comfort setpoint additional stage heating}} \leq T_{\text{comfort setpoint basic stage heating}}$ / $T_{\text{standby setpoint additional stage heating}} \leq T_{\text{standby setpoint basic stage heating}}$

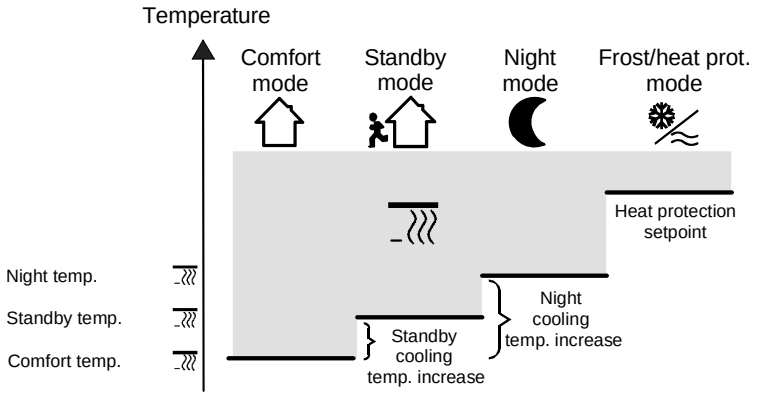
$T_{\text{standby setpoint heating}} \leq T_{\text{comfort setpoint heating}}$

or

$T_{\text{comfort setpoint additional stage heating}} \leq T_{\text{comfort setpoint basic stage heating}}$ / $T_{\text{night setpoint additional stage heating}} \leq T_{\text{night setpoint basic stage heating}}$

$T_{\text{night setpoint value heating}} \leq T_{\text{comfort setpoint heating}}$

13.4.1.2 Setpoints for the "cooling" option



(Recommended setpoint temperatures)

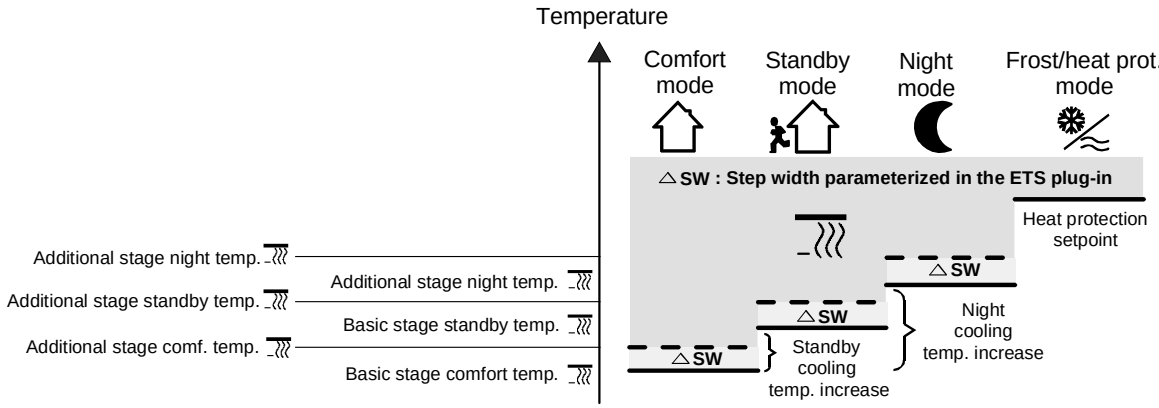
The setpoint temperatures for comfort, standby and night mode exist for this control option. The heat protection temperature can be preset. The following applies…

$$T_{\text{comfort setpoint value cooling}} \leq T_{\text{standby setpoint cooling}} \text{ or } T_{\text{comfort setpoint cooling}} \leq T_{\text{night setpoint cooling}}$$

The standby and night setpoint temperatures are derived from the comfort setpoint temperature (basic setpoint) in line with the parameterized increase temperatures.

The heat protection is supposed to ensure that the maximum permissible room temperature is not exceeded 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 set-temperature lies between - 99.9 °C and + 45.0 °C for "cooling" and is limited by the heat protection temperature in the upper range.

The stage offset parameterized in the ETS will be additionally considered in a two stage heating mode.

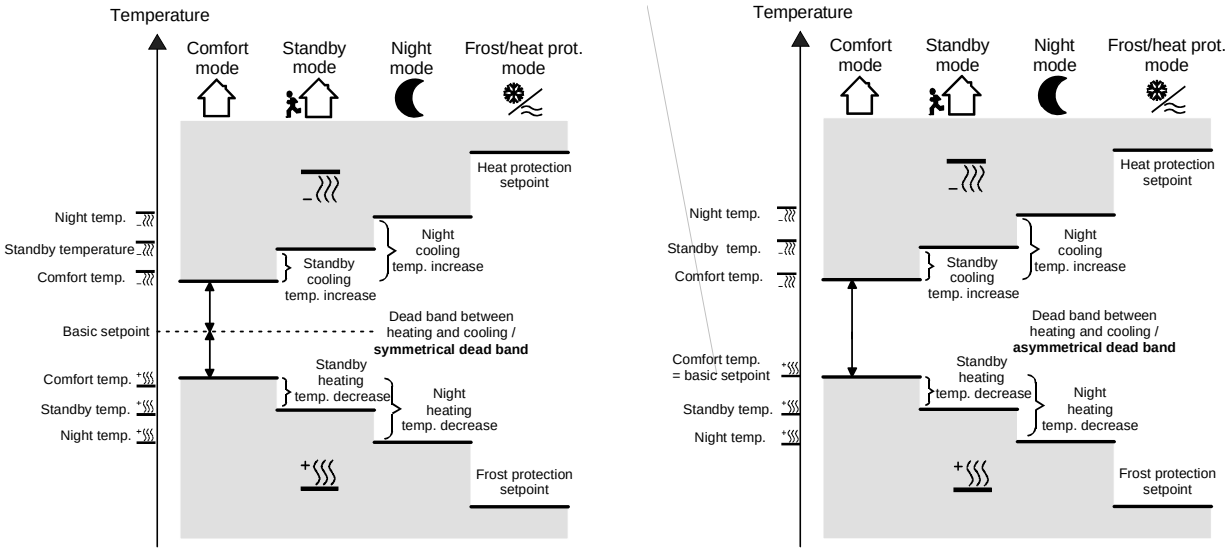


$T_{comfort\ setpoint\ basic\ stage\ cooling} \leq T_{comfort\ setpoint\ additional\ stage\ cooling}$ / $T_{standby\ setpoint\ basic\ stage\ cooling} \leq T_{standby\ setpoint\ additional\ stage\ cooling}$
$T_{comfort\ setpoint\ cooling} \leq T_{standby\ setpoint\ cooling}$

or

$T_{comfort\ setpoint\ basic\ stage\ cooling} \leq T_{comfort\ setpoint\ additional\ stage\ cooling}$ / $T_{night\ setpoint\ basic\ stage\ cooling} \leq T_{night\ setpoint\ additional\ stage\ cooling}$
$T_{comfort\ setpoint\ cooling} \leq T_{night\ setpoint\ cooling}$

13.4.1.3 Setpoint for the "heating and cooling" option



(Recommended setpoint temperatures)

For this control option, the setpoint temperatures of both control options exist for comfort, standby and night mode as well as the dead zone. In addition, the frost protection and the heat protection temperatures can be preset. The following applies…

$T_{standby\ setpoint\ heating} \leq T_{comfort\ setpoint\ heating} \leq T_{comfort\ setpoint\ cooling} \leq T_{standby\ setpoint\ cooling}$

or

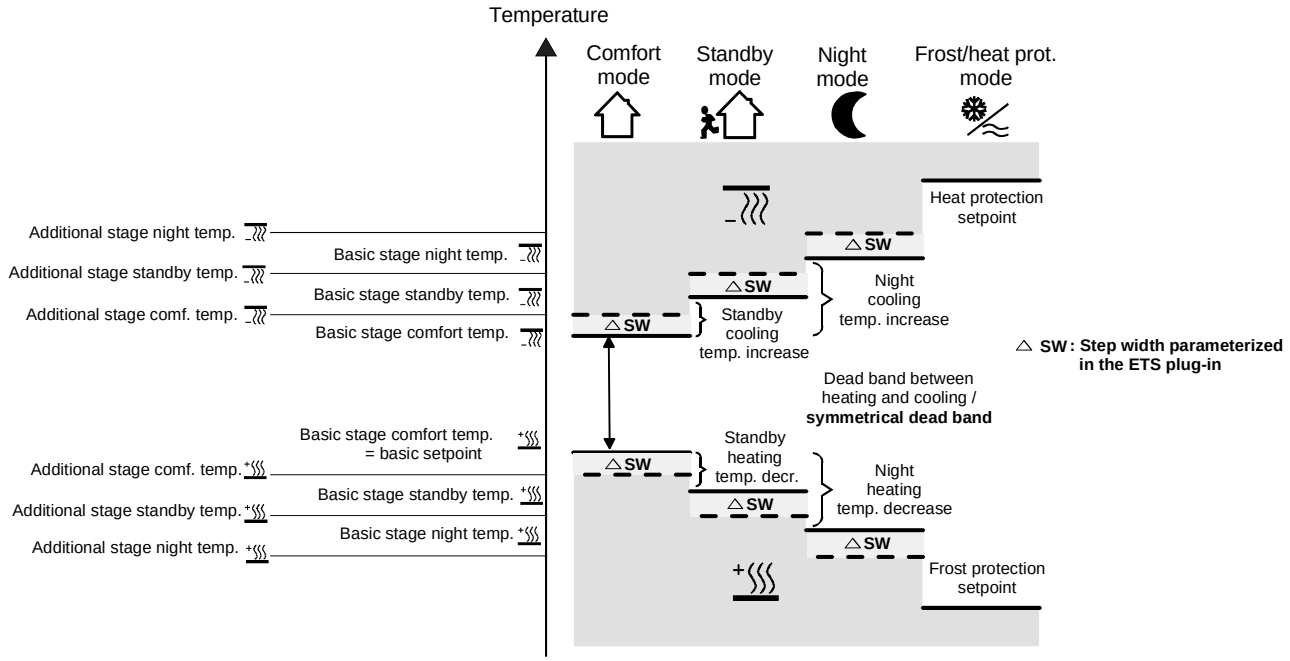
$T_{night\ setpoint\ heating} \leq T_{comfort\ setpoint\ heating} \leq T_{comfort\ setpoint\ cooling} \leq T_{night\ setpoint\ cooling}$

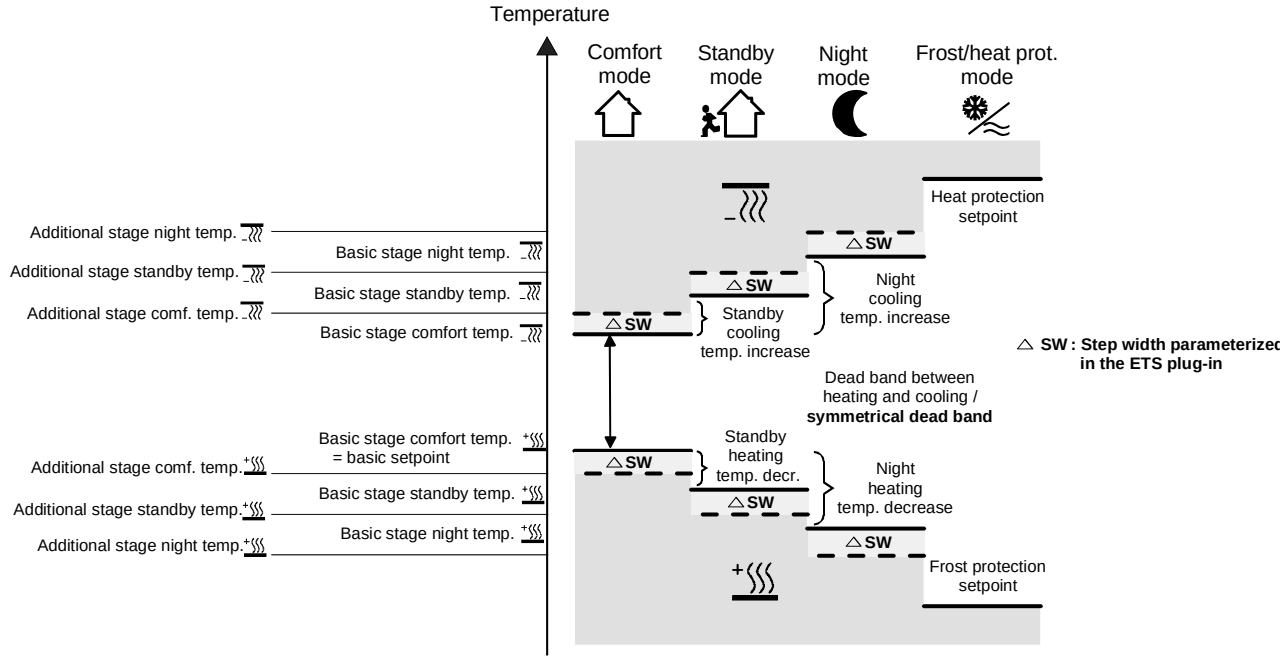
The setpoint temperatures for "Standby" and "Night" are derived from the comfort setpoint temperatures for heating or cooling. The temperature increase (for cooling) and the temperature decrease (for heating) of both operating modes can be preset in the ETS. The comfort temperatures themselves are derived from the dead zone 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 to a set 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 limited by the frost protection temperature in the lower range and by the heat protection temperature in the upper range..

The stage offset parameterized in the ETS will be additionally considered in a 2-stage heating or cooling mode.





$T_{comfort\ setpoint\ additional\ stage\ heating} \leq T_{comfort\ setpoint\ basic\ stage\ heating} \leq T_{comfort\ setpoint\ basic\ stage\ cooling} \leq T_{comfort\ setpoint\ additional\ stage\ cooling}$

$T_{standby\ setpoint\ additional\ stage\ heating} \leq T_{standby\ setpoint\ basic\ stage\ heating} \leq T_{standby\ setpoint\ basic\ stage\ cooling} \leq T_{standby\ setpoint\ additional\ stage\ cooling}$

$T_{standby\ setpoint\ heating} \leq T_{comfort\ setpoint\ heating} \leq T_{comfort\ setpoint\ cooling} \leq T_{standby\ setpoint\ cooling}$

or

$T_{comfort\ setpoint\ additional\ stage\ heating} \leq T_{comfort\ setpoint\ basic\ stage\ heating} \leq T_{comfort\ setpoint\ basic\ stage\ cooling} \leq T_{comfort\ setpoint\ additional\ stage\ cooling}$

$T_{night\ setpoint\ additional\ stage\ heating} \leq T_{night\ setpoint\ basic\ stage\ heating} \leq T_{night\ setpoint\ basic\ stage\ cooling} \leq T_{night\ setpoint\ additional\ stage\ cooling}$

$T_{night\ setpoint\ heating} \leq T_{comfort\ setpoint\ heating} \leq T_{comfort\ setpoint\ cooling} \leq T_{night\ setpoint\ cooling}$

Dead zone:

The comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the adjusted dead zone. The dead zone (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures.
The *"Dead zone between heating and cooling"*, *"Dead zone position"* parameters as well as the *"Basic temperature after reset"* parameter are preset in the ETS. The following settings must be distinguished:

Dead zone = *"symmetrical"* (default):
The dead zone preset in the ETS is divided into two parts at the basic setpoint. The comfort setpoint temperatures are derived directly from the basic setpoint resulting from the half dead zone. The following applies:

$T_{basic\ setpoint} - \frac{1}{2}T_{dead\ zone} = T_{comfort\ setpoint\ heating}$ or $T_{basic\ setpoint} + \frac{1}{2}T_{dead\ zone} = T_{comfort\ setpoint\ cooling}$

➔ $T_{comfort\ setpoint\ cooling} - T_{comfort\ setpoint\ heating} = T_{dead\ zone}$; $T_{comfort\ setpoint\ cooling} \geq T_{comfort\ setpoint\ heating}$

Dead zone position = *"asymmetrical"*:
With this setting, the comfort setpoint temperature for heating equals the basic setpoint!
The dead zone preset in the ETS takes only effect from the basic setpoint in the direction of comfort temperature for cooling. Thus the comfort setpoint temperature for cooling is derived directly from the comfort setpoint for heating. The following applies:

$T_{basic\ setpoint} = T_{comfort\ setpoint\ heating}$ ➔ $T_{basic\ setpoint} + T_{dead\ zone} = T_{comfort\ setpoint\ cooling}$

➔ $T_{comfort\ setpoint\ cooling} - T_{comfort\ setpoint\ heating} = T_{dead\ zone}$; $T_{comfort\ setpoint\ cooling} \geq T_{comfort\ setpoint\ heating}$

13.4.1.4 Limiting the setpoint temperatures in cooling operation

According to the place-of-work regulations, DIN 1946 Part 2 and the industrial premises tenancy laws, the maximum temperature at the place of work must not exceed 26°C and – in case of outside temperatures above 32°C – be at least 6K lower than respective temperature. The value may be exceeded only in exceptional cases. To cope with these guidelines, the room controller has four parameters which apply only to cooling operation.

The parameter "Setpoint temperature limiting during cooling operation" can be used to deactivate the limiting function or to specify the limiting procedure.

In the setting "Difference with respect to outside temperature" a maximum difference between 1 and 15 K can be specified. When the outside temperature rises to such an extent that the maximum difference is exceeded, the controller corrects the setpoint temperature value until the desired difference is again reached. The setpoint temperature is raised only temporarily. When the outside temperature drops again, the setpoint temperature is reduced as well until the original setpoint temperature is again reached.

In the setting "Max. setpoint temperature only", all setpoint temperatures higher than the configured value (default: 26°C) are not accepted. This applies also to the user inside the room who cannot set a higher value by setpoint shifting. The parameterized "heat protection" setpoint cannot be exceeded either.

In the setting "Max. setpoint temperature and difference with respect to outside temperature", the maximum setpoint temperature has the priority. This means that the controller can correct the setpoint temperature based on the difference with respect to the outside temperature until the maximum setpoint temperature is exceeded.

13.4.2 Adjusting the setpoints

13.4.2.1 Adjusting basic temperature and setpoint temperatures for comfort, standby and night mode

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). The *"Basic temperature after reset"* parameter on the *"Setpoints"* parameter page determines the basic setpoint which is loaded when the device is programmed with the ETS.

It is possible to change or adjust the setpoint temperatures 'later' via the *"Basic setpoint"* object).

Any change must always be enabled in the ETS on the *"Setpoints*" parameter page. It is possible to permit the *"Change of basic temperature setpoint"* by directly changing the comfort temperature for heating on the device and/or by presetting a new basic setpoint via the bus.

In case basic setpoint adjustment via the bus is disabled, the object *"Basic setpoint"* will be hidden.

Adjusting the basic setpoint / comfort temperature for heating:

It is only in the event of a basic setpoint change that two cases must be distinguished:

- Case 1: The basic setpoint change is permanently adopted,
- Case 2: The basic setpoint change is adopted only temporarily (default).

Via the *"Adopt basic temperature setpoint change permanently"* parameter on the *"Room temperature controller function /setpoints"* parameter page, it is possible to determine whether the changed basic temperature value shall be stored in memory permanently (*"yes"*) or only temporarily (*"no"*).

Case 1:

If the basic temperature setpoint is changed, it will be permanently stored in the room temperature controller's EEPROM. The newly adjusted value will overwrite the basic setpoint temperature originally parameterized in the ETS! This is the only way to keep the changed basic setpoint even after switching over the operating mode or after a reset.

Notes:

- Frequent adjustments 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 only for less frequent write access.
- Any value preset via local control will not be adopted by the "Basic setpoint" object.
- The stored basic setpoint will still be active after the return of bus voltage. The value of the object is, however, "0". The current basic setpoint can be read out only after an external object update (set “R” flag!).

Case 2:

The basic setpoint adjusted on the room temperature controller itself or received via the object stays only temporarily active in the current operating mode. In case of a bus voltage failure or following a switch-over into another operating mode (e.g. comfort followed by standby), the basic setpoint adjusted via local operation or received via the object will be discarded and replaced by the value which was originally parameterized in the ETS.

Adjusting the setpoints for standby mode, night mode and dead zone (comfort temperature for cooling):

Since the setpoint temperatures for the "standby" and "night" operating modes or the setpoints for the "cooling" control option are derived - in consideration of the increase, decrease or dead zone values that are parameterized in the ETS or preset locally - from the basic setpoint temperature, these setpoint temperatures will shift linearly by the change of the basic setpoint value.

In addition, it is possible to adjust setpoint temperatures other than those parameterized in the ETS for "standby", "night" or "dead zone" only via local control in the programming mode. In this case, the originally parameterized decrease, increase temperatures or dead zone temperatures will be replaced by the new values resulting from the locally adjusted temperature setpoints. Independent of the *"Adopt basic temperature setpoint change permanently"* parameter, the temperature setpoints for the standby or night mode or "cooling" comfort mode (dead zone) will always be stored in the non-volatile EEPROM memory.

13.4.2.2 Basic setpoint shifting

In addition to the setting of individual temperature setpoints by the ETS, by local operation in the programming mode or by the basic setpoint object, the user is able to shift the basic setpoint anytime with the "setpoint shift" key function (if parameterized) within the parameterized limits.

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.

Whether a basic setpoint shift only affects the currently active operating mode or whether it influences all other setpoint temperatures of the remaining operating modes is determined by the *"Adopt change of basic setpoint shift permanently"* parameter on the *"Setpoint"* parameter page.

Settings: *"no"* (default):
Shifting of the basic setpoint is effective only as long as the operating mode or control option is not changed or the basic setpoint is maintained. Otherwise the setpoint shift will be reset to "0".

Setting *"yes"*:
In general, shifting of the basic setpoint affects all operating modes. The shift is maintained even after switching-over the operating mode or the control option or after readjusting the basic setpoint.

The adjustable temperature range for a basic setpoint shift is defined via the *"Adjusting the basic setpoint temperature upwards*" or *"Adjusting the basic setpoint temperature downwards"* parameters. It is possible to shift the current setpoint by a maximum of +/- 10 K. The stage offset is set invariably to 0.5 °C.

Notes on basic setpoint shifting:

- Since the value for the basic setpoint shifting is stored exclusively in volatile memory (RAM), the shift will get lost in case of a reset (e.g. bus voltage failure).
- A setpoint shift does not affect the temperature setpoints for frost or heat protection.

Communication objects for the basic setpoint shifting:

The controller carries the current setpoint shift in the "*Current setpoint shifting"* communication object with a 6.010-byte counting value (acc. to KNX DPT – representation of positive and negative values in a 2's 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 step (0.5 °C) in positive direction, the controller counts up the value by one digit. The counting value will be counted down by one digit, if there is a negative adjustment of the temperature.
Thus the possible range of values for the object is determined by the setpoint adjustment options. A value of "0" means that no setpoint shift has been adjusted.

Example:

Initial situation:
The temperature step for the setpoint shift is set to 0.5 °K.
Current setpoint temperature = 21.0°C / counting value in object 52 = "0" (no setpoint shift active)

After shifting the setpoint:

- A setpoint shift by one temperature step in positive direction will count up the value in object 52 by one = "1". Current setpoint temperature = 21.5°C.
- Another setpoint shift by one temperature step in positive direction will count up the value in object 52 again by one = "2". Current setpoint temperature = 22.0°C.
- A setpoint shift by one temperature step in negative direction will count down the value in object 52 by one = "1". Current setpoint temperature = 21.5°C.
- Another setpoint shift by one temperature step in negative direction will count down the value in object 52 again by one = "0". Current setpoint temperature = 21.0°C.
- Another setpoint shift by one temperature step in negative direction will count down the value in object 52 again by one = "-1". Current setpoint temperature = 20.5°C.

etc.

The maximum possible range of values for the *"Current setpoint shift"* communication object depends on the *"Adjustment options of the basic setpoint temperature upwards/downwards"* parameter. A parameterization of ± 10 K at this point will have the value of the object move within the limits –20 ... +20.

In addition, the setpoint shift of the controller can be externally adjusted via communication object 53 (*"Setpoint shift preset"*). This object has the same datapoint type and range of values as object 52 (see above). A connection with object 53, enables the controller extensions to directly adjust the current setpoint shift of the controller.

As soon as the controller receives a value, it will adjust the setpoint shift accordingly. Each value increment corresponds to a temperature step of 0.5°C (cf. example above). Values that lie within the possible range of values can be approached directly.

The controller monitors the received value independently. As soon as the external preset value exceeds the limits of the adjustment options for the setpoint shifting in positive or negative direction, the controller will correct the received value and adjust the setpoint shifting to maximum. Depending on the direction of the shift, the value feedback is set to the maximum value via communication object 52 (*"Current setpoint shift"*).

13.4.2.3 Transmitting the setpoint temperature

The setpoint temperature determined by the current operating mode or subsequently readjusted can be transmitted actively to the bus by means of object 50 *"Setpoint temperature"*.

The *"Transmission when setpoint temperature changes by..."* parameter on the *"Setpoints"* parameter page determines the temperature value by which the setpoint has to change in order to have the setpoint temperature value transmitted automatically via the object. Temperature value changes between 0.1 C and 25.5°C or 0.1 K and 25.5 K are possible. A setting of "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 room temperature"* parameter determines the cycle time (1 to 255 minutes). The value "0" (default) will deactivate the cyclical transmission of the setpoint temperature.

It should be noted that in case of deactivated cyclical transmission and deactivated automatic transmission, no setpoint temperature telegrams will be transmitted anymore.

Setting the "R" flag on the "Setpoint temperature" object makes it possible to read out the current setpoint. After return of bus voltage or after new programming with the ETS, the object value will be updated according to the current setpoint temperature value and transmitted actively to the bus.

13.5 Room temperature measurement

The room temperature controller measures the actual temperature cyclically and compares it with the given setpoint temperature. The control algorithm calculates the adjusted actuating variable from the difference between actual and setpoint temperature.

In order to always ensure a fault-free and effective room temperature control, it is very important to determine the exact actual temperature.

The room temperature controller features an intergrated temperature sensor. Alternatively (e.g. if the room temperature controller has been installed in an unfavourable location or operates in difficult conditions, for instance, in a moist atmosphere) or additionally (e.g. in large rooms or halls), a second KNX/EIB temperature sensor externally coupled via the bus or an external sensor at channel 4 of the pushbutton interface can be used to determine the actual value.

When choosing the installation location of the controller or the external sensor, the following points should be considered:

- The controller should not be installed in multiple combinations, especially when flush-mounted dimmers are installed in the same combination.
- The sensors should not be installed in the vicinity of large electrical consumers (heat radiation).
- The sensor should not be installed in the vicinity of heaters or cooling systems.
- The temperature sensor should not be exposed to direct sunlight.
- 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 or windows and at least 1.5 m above the floor.

13.5.1 Temperature detection and determination of measured value

The *"Temperature detection"* parameter on the *"Room temperature measurement"* parameter page will determine which one of the sensors is used for sensing the actual temperature. The following settings are possible:

- *"Internal sensor":*

The temperature sensor integrated in the room temperature controller is activated. Thus, the actual temperature is determined only locally on the device. When parameterized as such, the control will start directly after a reset.

- *"External sensor":*

The actual temperature is determined only by the external temperature sensor. The internal sensor is deactivated. The external sensor must transmit the detected temperature value to the room temperature controller's 2-byte *"External temperature sensor"* (DPT-ID 9.001) object 24 . Alternatively or additionally, the room temperature controller can cyclically request the current temperature value (set "R" flag for the external sensor). For this purpose, the *"Interrogation interval for external sensor..."* parameter has to be set to a value > "0". The interrogation interval can be set from 1 minute to 255 minutes. This parameterization will cause the room temperature controller to wait for a temperature value telegram from the external temperature sensor after a reset until the control starts and an actuating variable, if applicable, is output.

- *"Internal and external sensor":*

With this setting the internal as well as the external temperature sensor is active. The external sensor must transmit the detected temperature value to the room temperature controller's 2-byte *"External temperature sensor"* (DPT-ID 9.001) object 24 . Alternatively or additionally, the room temperature controller can cyclically request the current temperature value (set "R" flag for the external sensor). For this purpose, the *"Interrogation interval for external sensor..."* parameter has to be set to a value > "0". The interrogation interval can be set from 1 minute to 255 minutes. This parameterization will cause the room temperature controller to wait for a temperature value telegram from the external temperature sensor after a reset until the control starts and an actuating variable, if applicable, is output.

The actually prevailing temperature is determined on the basis of the two measured temperature values. The weighting of the temperature values is determined by the *"Calculation of temperature based on internal / external measurement"* parameter. Depending on the different locations of the sensors or a possible non-uniform heat distribution inside the room, it is thus possible to adjust the actual temperature measurement. Often, those temperature sensors that are subject to negative external influences (for example, unfavourable location because of exposure to sun or heater or door / window directly next to it) are weighted less heavily.

Example:
Room temperature controller installed next to the entrance door (internal sensor). An additional external temperature sensor is installed on an inner wall in the middle of the room below the ceiling.

Internal sensor: 21.5°C (measuring range of internal sensor: 0 C … + 40°C ±1%)
External sensor: 22.3 °C
Calculation of temperature: 30% to 70 %

Result: $T_{result\ internal} = T_{intern} \cdot 0.3 = 6.45°C$, $T_{result\ external} = T_{external} = 22.3\ °C \cdot 0{,}7 = 15.61\ C \rightarrow$

$T_{Result\ actual} = T_{Result\ intern} + T_{Result\ extern} = 22.06\ C$

13.5.2 Calibrating the measured values

In some cases it may be required to calibrate the temperature measurements of the internal and external sensor. A calibration becomes necessary, if the temperature measured by the sensors stays permanently below or above the actual room temperature in the vicinity of the sensor. The actual room temperature should be determined by a reference measurement with a calibrated temperature measuring device.

The *"Calibration of internal sensor..."* or *"Calibration of external sensor..."* parameter on the *"Room temperature controller function –room temperature measurement"* parameter page allows to parameterize the positive temperature adjustment (increase, factors: 1…127) or the negative adjustment (temperature decrease: factors – 128…-1) in steps of 0.1°C. Thus, the calibration is made only once and is the same for all operating modes.

Notes:

- 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.
- When the measured values from internal and external sensor are used, the actual value is calculated on the basis of the adjusted value.

13.5.3 Transmitting the actual temperature

The measured actual temperature can be actively transmitted to the bus via the *"Actual temperature"* object 23. The *"Transmission when setpoint temperature changes by..."* parameter on the *"Room temperature controller functions – room temperature measurement"* parameter page determines the temperature value by which the actual value has to change in order to have the actual temperature value transmitted automatically via object 23. Temperature value changes between 0.1 C and 25.5°C or 0.1 K and 25.5 K are possible. A setting of "0" at this point will deactivate the automatic transmission of the actual temperature.
In addition, the actual value can be transmitted cyclically. The *"Cyclical transmission of room temperature"* parameter determines the cycle time (1 to 255 minutes). The value "0" (default) deactivates the cyclical transmission of the actual temperature value.
Setting the "R" flag on the "Actual temperature" object makes it possible to read out the current actual value.
It should be noted that in case of deactivated cyclical transmission and deactivated automatic transmission, no setpoint temperature telegrams will be transmitted anymore.

After return of bus voltage or after new programming with the ETS, the object value will be updated according to the actual temperature value and transmitted to the bus.
If no temperature value telegram has as yet been received from the external sensor when such an external sensor is used, only the value provided by the internal sensor will be transmitted. If only the external sensor is used, the value "0" will be in the object after a reset. For this reason, the external temperature sensor should always transmit the current value after a reset.

13.6 Disable functions of the room temperature controller

In certain operating conditions it may be required to deactivate the room temperature control. For example, the 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 *"Switch-off controller (dew-point mode)"* parameter on the *"Room temperature controller functions"* parameter page enables the *"Disable controller"* object 40 when set to *"via object"*. In addition, the controller disable function can be permanently deactivated when set to *"no"* (default).
If a "1" telegram is received via the enabled disable object, the room temperature control is completely deactivated. In this case all actuating variables = "0" and the "dew-point operation" LED is lit up (wait for 30 sec actuating variable update interval). The controller, however, can be operated in this case.

In the 2-stage heating or cooling mode, the additional stage can be separately disabled. The *"Disable object additional stage"* parameter on the *"Room temperature controller functions"* parameter page will enable the *"Disable additional stage"* object 41 when set to *"yes"*. In addition, the disable function of the additional stage can be permanently deactivated when set to *"no"* (default).
In case a "1" telegram is received via the enabled disable object, the room temperature control is completely deactivated by the additional stage. The actuating variable of the additional stage is "0" while the basic stage continues to operate.

A disable is always deleted after a reset (return of bus voltage, ETS programming operation).

13.7 Valve protection

A 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. The *"Valve protection"* parameter on the *"Room temperature controller function"* parameter page will activate the valve protection when set to *"yes"*.

This type of protection is generally started not only for non-active actuating variable 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 actuating variable to the maximum value once a day for a duration of approx. 5 minutes based on the following parameterization:

Actuating variable output not inverted: 1-bit actuating variable: "1", 1-byte actuating variable: "255",
Actuating variable inverted: 1-bit actuating variable: "0", 1-byte actuating variable: "0".

Thus, even valves closed for prolonged periods will be shortly opened on a regular basis.

13.8 Fan control:

The room controller has a fan control mode which can be used when the room temperature control works internally as a PI controller with continuous or switching (PWM) actuating variable output. Depending on the operating mode of the room temperature control, the fan control can be based on different controller actuating variables. For this purpose, the plug-in has the two parameters *"Fan operating mode – controller basic stage"* and *"Fan operating mode – controller additional stage*".

- In single-stage room temperature control, only the paramater "Fan operating mode – controller basic stage" is evaluated. In this case, the user can specify whether the fan is to activated during heating and/or cooling.
- In two-stage room temperature control, the fan control can make use of the basic stage or of the additional stage for heating and for cooling. The simultaneous use of the basic and the additional stage within the same operating mode is not possible.

The fan control supports up to 8 levels with the option of presetting the number of intensity levels actually used. Depending on the actuator controlling the fan, switching can be performed with a 1-byte object or with separate 1-bit objects

- In case of the 1-byte object, the number of the respective fan intensity level or a value of "0" is transmitted.
- In case of the 1-bit objects, the presettable "waiting time during level switch-over" is started before fan intensity level switching can take place. When this time has elapsed, the object of the previous stage is set to "0". Only after the previous bit is "0" will the object of the new intensity level be set to "1".

The fan control can work automatically dependent on the room temperature control, but it can also be controlled manually. The two operating modes are switched over with the 1-bit object *"Ventilation, automatic/manual"* The parameter *"Interpretation object fan control automatic/manual"* defines the object polarity for automatic or manual operation. This parameter specifies at the same time the operating mode that will be active after a reset of the device. In this case, the fan control works in the mode corresponding to the value of "0".

13.8.1 Automatic fan control

The determination of the fan stage in the automatic mode is based on the internal continuous output variable of the room temperature controller. This actuating variable can be limited at the lower and upper end of the range respectively with the two parameters *"Actuating variable is 0% until internal actuating variable exceeds..."* and *"Actuating variable is 100% until internal actuating variable exceeds...".* In addition, the variable can be still be raised by a constant value with the parameter *"Actuating variable offset"*. In case the calculation leads to results greater than 100%, the values are limited automatically by the room controller.

This actuating variable is then compared in the fan control with the thresholds parameterized for the individual intensity levels. When a threshold is exceeded, the control activates the next level. In case of a decreasing actuating variable, the control moreover observes a defined hysteresis which is the same for all thresholds.

When the actuating variable exceeds the first threshold, the fan control evaluates the parameter *"Start with level..."* which means that the control can switch the fan temporarily to a higher level. In automatic operation, the control always switches from the actual level only into the next higher or the next lower level once the motor is running. Due to the "Waiting time during level switch-over" parameter, there is always a short pause between individual switching actions.

13.8.2 Manual fan control

When the fan control works in the automatic mode and when the manual fan control key is pressed, the fan control switches over into the manual mode.

The response of the fan control depends on the setting of the parameters *"Fan intensity level when switching over to manual"* and *"Start with level..."* and on the previously active fan level in the automatic mode.

- If the parameter *"Fan intensity level when switching over to manual"* requires a defined intensity level of between 1 and 8, the control will set this intensity level. The setting of the *"Start with level..."* parameter is taken into account in this case.
- If the parameter *"Fan intensity level when switching over to manual"* is set to *"fan level OFF"*, the control will shut off the fan. The *"Start with level..."* parameter is taken into account on the next press of the manual mode control key.
- If no defined level is specified in the *"Fan intensity level when switching over to manual"* parameter (setting: "no change") and if the fan was off in the automatic mode, it will remain off. The *"Start with level..."* parameter is taken into account on the next press of the manual mode control key.

Each further press on the key increases the current fan intensity level by one step until the highest level is reached. The next press will then cause the fan control to switch to the "Off" position. Thereafter, each following press will then again raise the fan intensity level by one step. The *"Start with level..."* parameter is now ignored until the control switches over again into the automatic mode.

When the fan is shut off manually while running at the highest intensity level, it will continue to run until the parameterized "fan shut-off delay heating" or "fan shut-off delay cooling" delay has elapsed. The shut-off delay will be aborted if the manual mode control key is pressed again within this delay In this case, the fan switches off briefly and then at once back to level 1.

13.8.3 Higher-ranking operating modes

Normally, the fan control works automatically and dependent on the room temperature control or dependent on the manual control operations of the user. Additionally, the following three operating modes have a higher priority (in ascending order):

- Fan protection: The fan protection function can be used to switch a fan that has not been in operation for a prolonged period temporarily to maximum intensity. For this purpose, the "Ventilation, fan protection" communication object is available in the ETS. When this object receives a value of "1", the fan protection function is active. The response at the end of the fan protection function depends on the preceding operating mode. In the automatic mode, the fan is switched to the intensity determined by the room temperature controller. In the manual mode, the fan switches off and can then be switched on again manually. The "Start with level..." parameter is taken into account in this case.
- When the fan control is inactive*, the fan can only be activated via the fan protection function. In this case, the fan is controlled directly via the object value. The fan protection function activates the highest fan intensity level and cannot be influenced by any other parameter (e.g. forced-control or level limitation).
  *) Parameterization example: The controller is in the operating mode "Basic and additional heating and cooling" / "Fan control for basic heating" and the controller is presently in the cooling mode. In this case, fan control is inactive.
- Level limitation: If the ventilation is not to exceed a certain level at night, for instance, the parameter "Level limitation (max. fan level") can be used. In this case, the ETS shows the "Ventilation, level limitation" communication object. Level limitation is active when the object receives the value "1". If a higher level has been set by the automatic or manual mode or by the fan protection function at this time, the ventilation is automatically reduced in successive steps. The response at the end of level limitation depends on the current operating mode. In the manual mode, the limitation level is maintained until the fan level is raised again manually. In the automatic mode, the fan gradually approaches the level determined by the room temperature controller. In the fan protection mode, the fan is switched immediately to the highest possible level.
- Forced-control position: Forced control has the highest priority. As soon as the communication "Ventilation, forced control" receives a "1", the fan is switched immediately to the parameterized level. The response at the end of forced control depends on the current operating mode. In the manual mode, the fan switches off and can then be switched on again by another manual operation. In the automatic mode, the fan switches off and then gradually approaches the level determined by the room temperature controller. In the fan protection mode, the fan switches off and is then switched immediately to the highest possible level.

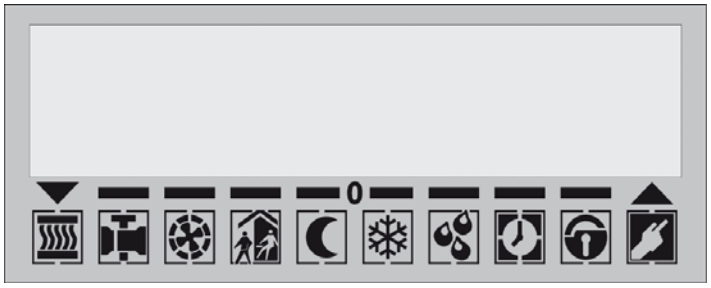
14 Display functions

The room controller is equipped with a backlit LCD.

- In the lower part, the display features two rows with defined symbols representing specific operating states of the device.
- In the upper part, texts specified in the project design phase can be displayed in different font sizes. This part of the display screen is also used for operator prompting purposes on the second control level for setting device functions locally.

14.1 Display elements

The following illustration shows the basic design of the LCD screen with the text display and the different symbols.



The symbols of the upper row have the following functions:

▼ Symbol indicating shut-off, dimming, blind lowering, value reduction
... – – 0 Setpoint value shift towards colder active
0 No setpoint value shift
0 – – ... Setpoint value shift towards warmer active
▲ Symbol indicating switch-on, brightness increase, blind raising, value increase

The symbols of the lower row consist partly of several elements and can also be displayed in combination with other symbols. They have the following functions:

Heating with heating intensity level indicator
Cooling with cooling intensity level indicator
Valve symbol: energy supply; heating or cooling in progress.
Fan control with fan intensity level indication
Comfort operation mode
Standby operation mode
Night-time operation mode
Frost and heat protection
Night-time comfort prolongation
Frost protection or heat protection comfort prolongation
Dew-point operation mode indication; controller is disabled
Switching channels 1...4 are active:
Locked symbol: Key-lock
Hand symbol: Info-mode is active

14.2 Backlighting

The display backlighting can be permanently on or off or switched or dimmed driven by specific events. The backlighting can be activated by the following events:

- a key-press,
- night-time operation of the room temperature control
- the normal or inverted value of a separate switching object
- the value of a separate 1-byte object

The activation of the backlighting by key-press can be combined with anyone of the other events. If the backlighting is activated by key-press, it will be automatically deactivated by the room controller after a presettable time. If the backlighting is activated by one of the other events, it will be deactivated by the room controller after the end of this event.

Brightness and contrast can be adjusted in the menu of the second control level.

14.3 Info-mode:

After a key-press, the screen can display texts describing the function assigned to the key and the value to be transmitted. One distinguishes between single- and double press operation of a key. In the single-press mode, the info text is displayed and the normal key function executed in parallel after one press of the key. In the double-press mode, the first key-press only displays the info text. The normal key function is executed only after the second key-press.

In the info mode, the screen displays three lines of text overwriting the normal display temporarily.

- The first line displays the text "Info Mode"
- The second line displays freely programmable text composed of 18 characters max.
- The third line optionally displays another freely programmable text equally composed of 18 characters max. or an automatically generated text depending on the key function.

The info mode can be switched on or off in four different ways:

- By pressing the key of the room controller defined as the info key. The key can be parameterized to distinguish between single-press and double-press operation.
- In the menu of the second control level. On this level, single-press or double-press operation can be selected locally.
- By a telegram to the 1-bit communication object "Info mode". The selection between single-press or double-press operation is not available in this case. When the T-flag of the object is set, the room controller can also transmit the current value.
- The state after a new start of the application program can be defined in a parameter. This state can be changed in operation as described above.

14.4 Display pages

In the project design, up to four pages max. with up to three lines can be created.
The pages can show values partly referred to internal values of the room controller as, for instance, the setpoint temperature of the room temperature control or to independent communication objects.

14.4.1 Page changes:

A page change can be controlled by three different events with different priority.

- Cyclical page changing has the lowest priority. For this type of change, a time of up to one minute can be parameterized. After this time, the controller automatically displays the next page. When the last page is reached, the cycle restarts with the first page. For pages 2 and 4, the user can specify whether he wants to include these pages in the automatic cycle.
- Deliberate page changes can be achieved by parameterizing the keys of the room controller. The options "Scroll forward to next page", "Scroll backwards to preceding page", "Recall specific page" or "Alternate between page 1 and another page" are available. The key function equally allows to change between pages which are not recalled in the course of the automatic cycle A press on the key restarts the time of the cyclical change. After this time, the automatic change continues from the page last recalled cyclically.
- The parameter "Display page recall" can be used optionally with the 1-bit object "fixed page recall" or the 1-byte object "variable page recall". If one of these objects is used for page changing, the two previously described page changing methods can be overridden. If the "fixed page recall" object is used, the controller jumps automatically to the parameterized page when a "1" is received. If the "variable page recall" object is used, a value from "1" to "4" permits recalling any predefined page. If the recalled page is not programmed, the telegram will be ignored. A value of "0" re-enables the automatic cylce or the manual page change.

14.4.2 Page layout

During the project design, up to four display pages with one, two or three display lines can be defined. For this purpose, two proportional fonts with a character height of 20 and 10 pixels are available.

- The one-line display makes use of the large font.
- The two-line display uses the large font for the first line and the small font for the second line. Alternatively, the first line can be used for displaying a value with the large font and the unit text with the small font.
- The three-line display is only used with the small font.

All characters exceeding the screen display range will be cut off.

In addition to text, a symbol with a size of 30 x 30 pixels can be displayed at the right margin of the screen. Texts and values may be hidden when a symbol is displayed. 30 symbols are stored in the memory of the device (see next page). A separate program permits replacing the predefined symbols by other symbols.

Weather					
1		clouds	2		rain
3		wind	4		storm
5		night	6		sun (day)
7		sun north	8		sun east
9		sun south	10		sun west
Temperature					
11		inside temperature 1	12		inside temperature 2
13		outside temperature	14		setpoint temperature
15		actual temperature			
Timer clock					
			16		presence
17		party	18		holidays
Blinds / shutters / awnings					
19		blinds / shutters UP	20		blinds / shutters DOWN
21		blind / shutter in motion	22		awning extended
Filling					
23		tank empty	24		tank full
Multimedia					
25		request pages	26		multimedia
27		music title playing	28		new music title
29		O.K.	30		adjust

The one-line display makes use of the large font only. The following information can be displayed:

- Time of day
- Time-of-day and weekday
- Date
- Setpoint temperature
- Actual temperature
- External / outside temperature
- Date + time of day
- Time of day and date
- Time of day + setpoint temperature
- Time of day + actual temperature
- Time of day + external / outside temperature

The format of the displayed values is predefined.

The first line of the two-line display corresponds largely to the one-line display. In addition, the following information can be displayed:

- Value display fix DPT 5.xxx (EIS 6)
- Value display DPT 9.xxx (EIS 5)
- Value display DPT 14.xxx (EIS 9)

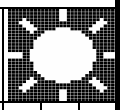
The second line of the two-line display and the three-line display offer the same settings. The small font is used.

- Switching
- Dimming
- Blind/shutter
- Light-scene
- Value display DPT 5.xxx (EIS 6)
- Value display DPT 6.xxx (EIS 14 signed)
- Value display DPT 7.xxx (EIS 10 unsigned)
- Value display DPT 8.xxx (EIS 10 signed)
- Value display DPT 9.xxx (EIS 5)
- Value display DPT 12.xxx (EIS 11 unsigned)
- Value display DPT 13.xxx (EIS 11 signed)
- Value display DPT 14.xxx (EIS 9)
- Value display DPT 16.xxx (EIS 15)
- Static text

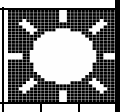
14.4.3 Display examples

The following illustrations are to intended demonstrate the basic options for different line displays. The actual space requirements for texts deviate from the display examples as the fonts are not the same as those used in the room controller.

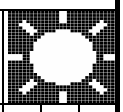
The placeholder shown in the illustrations is always he same.

Time of day:	
with symbol	12:24 
without symbol	12:24

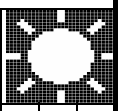
- with one-line display and for first line of the two-line display
- left-aligned display of time of day:
- the leading zero of the hour is replaced by a special blank

Time of day + weekday	
with symbol	Mon 14:35 
without symbol	Mon 14:35

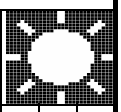
- with one-line display and for first line of the two-line display
- left-aligned display of time of day and weekday
- the leading zero of the hour is replaced by a special blank
- Weekdays can be displayed with three characters for languages where this is necessary or standard practice. The blank space between the weekday and the time of day can be retained.

Date	
with symbol	12.12.2006 
without symbol	12.12.2006

- with one-line display and for first line of the two-line display
- left-aligned display of the date
- leading zeroes of day and month are suppressed
- depending on parameterization, the date is displayed as follows: dd.mm.yyyy, mm.dd.yyyy, yyyy.dd.mm or yyyy.mm.dd

Setpoint temperature or actual temperature															
with symbol	2	0	.	5	°	C									
without symbol	2	0	.	5	°	C									

- with one-line display and for first line of the two-line display
- left-aligned display of setpoint temperature or of actual temperature
- leading zero is suppressed
- display value unsigned

External / outside temperature															
with symbol	-	1	0	.	5	°	C								
without symbol	-	1	0	.	5	°	C								

- with one-line display and for first line of the two-line display
- left-aligned display of temperature
- leading zero suppressed
- display of negative sign, the positive sign is suppressed

Date + time of day (no symbol display)															
without symbol	1	2	.	1	2	.	0	6		2	2	:	1	5	

- with one-line display and for first line of the two-line display
- display only without symbol
- left-aligned display of the date
- leading zeroes of day and month are suppressed
- depending on parameterization, the date is displayed as follows: dd.mm.yy, mm.dd.yy, yy.dd.mm or yy.mm.dd
- right-aligned display of time of day:
- leading zero of hour is suppressed

Time of day + date (no symbol display)													
without symbol	2	2	:	1	5		1	2	.	1	2	.	0	6

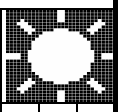
- with one-line display and for first line of the two-line display
- display only without symbol
- left-aligned display of time of day:
- the leading zero of the hour is replaced by a special blank
- right-aligned display of the date
- leading zeroes of day and month are suppressed
- depending on parameterization, the date is displayed as follows: dd.mm.yy, mm.dd.yy, yy.dd.mm or yy.mm.dd

Time of day + setpoint temperature or Time of day + actual temperature (no symbol display)													
without symbol	2	2	:	1	5				2	3	.	5	°	C

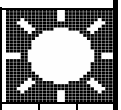
- with one-line display and for first line of the two-line display
- display only without symbol
- left-aligned display of time of day
- the leading zero of the hour is replaced by a special blank
- right-aligned display of temperature
- leading zero is suppressed
- display value unsigned

Time of day + external / outside temperature (no symbol display)													
without symbol	2	2	:	1	5			-	1	0	.	5	°	C

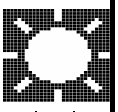
- with one-line display and for first line of the two-line display
- display only without symbol
- left-aligned display of time of day
- the leading zero of the hour is replaced by a special blank
- right-aligned display of temperature
- leading zero is suppressed
- display of negative sign, the positive sign is suppressed

Value display fixed DPT 5.xxx (EIS 6) with large unit text															
with symbol	5	0	%	U	n	i	t								
without symbol	5	0	%	U	n	i	t								

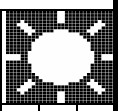
- used for first line of the two-line display
- Display of object data type 5.xxx
- Display format: 0..255 or as shown 0%..100%
- left-aligned display of value
- display limited to three digits max., leading zeroes are suppressed
- for 0%..100%, the '%' sign is displayed directly behind the value without a space
- unit text with 10 characters max., freely programmable
- unit text displayed with 20-pixel or 10-pixel font
- unit texts follows value or '%' sign directly without a space

Value display fixed DPT 5.xxx (EIS 6) with small unit text															
with symbol	5	0	%	U	n	i	t								
without symbol	5	0	%	U	n	i	t								

- used for first line of the two-line display
- Display of object data type 5.xxx
- Display format: 0..255 or as shown 0%..100%
- left-aligned display of value
- display limited to three digits max., leading zeroes are suppressed
- for 0%..100%, the '%' sign is displayed directly behind the value without a space
- unit text with 10 characters max., freely programmable
- unit text displayed with 20-pixel or 10-pixel font
- unit texts follows value or '%' sign directly without a space

Value display DPT 9.xxx and 14.xxx with large unit text														
with symbol	2	0	K	.	l	u	x							
without symbol	1	2	3	4	5	6	7	8	9	.	1	2	3	E

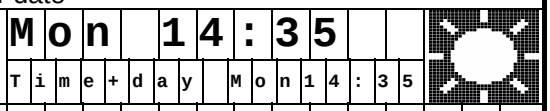
- used for first line of the two-line display
- left-aligned display of value
- Display format parameterizable within the following limits:
  offset: -100000.000..+100000.000 (default: 0.000)
  amplification: 0.001..100000.000 (default: 1.000)
  digits to the left of decimal point 0..9 (default: 3)
  digits after the decimal point: 0..3 (default: 0)
  sign: selectable, positive sign generally not displayed
- leading zeroes are suppressed
- positive sign is generally suppressed
- negative sign always directly before 1st numeral
- unit text with 10 characters max., freely programmable
- unit text displayed with 20-pixel or 10-pixel font
- unit texts follows value or '%' sign directly without a space

Value display fixed DPT 9.xxx and 14.xxx with small unit text														
with symbol	2	0	k	.	l	u	x							
without symbol	1	2	3	4	5	6	7	8	9	.	1	2	3	E

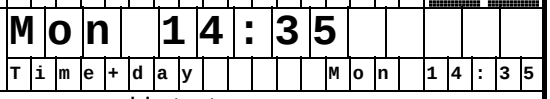
- used for first line of the two-line display
- left-aligned display of value
- display format parameterizable within the following limits:
  offset: -100000.000..+100000.000 (default: 0.000)
  amplification: 0.001..100000.000 (default: 1.000)
  digits to the left of decimal point: 0..9 (default: 3)
  digits after the decimal point: 0..3 (default: 0)
  sign: selectable, positive sign generally not displayed
- leading zeroes are suppressed
- positive sign is generally suppressed
- negative sign always directly before 1st numeral
- unit text with 10 characters max., freely programmable
- unit text displayed with 20-pixel or 10-pixel font
- unit texts follows value or '%' sign directly without a space

Time of day and / or date

with symbol



without symbol

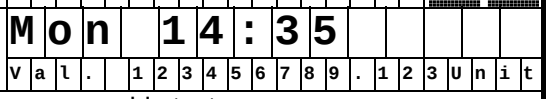


- left-aligned, freely programmable text
  - max. 18 characters
- right-aligned display of weekday, time of day and / or date
  - the leading zero of the hour is replaced by a special blank
  - Weekdays can be displayed with three characters for languages where this is necessary or standard practice. The blank space between the weekday and the time of day can be retained.
  - depending on parameterization, the date is displayed as follows: dd.mm.yy, mm.dd.yy, yy.dd.mm or yy.mm.dd

Value display

with symbol

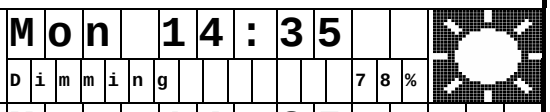
without symbol



- left-aligned, freely programmable text
  - 18 characters max.
- right-aligned value display
  - display format parameterizable within the following limits:
    offset: 0.000..+100000.000 (default: 0.000)
    amplification: 0.001..100000.000 (default: 1.000)
    digits to the left of decimal point: 0..9 (default: 3)
    digits after the decimal point: 0..3 (default: 0)
    sign: depending on datapoint type
  - unit text (10 characters max.) follows value directly without a space

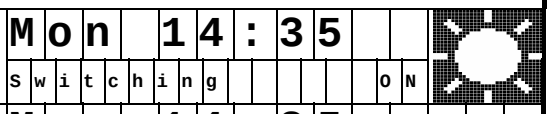
Dimming

with symbol

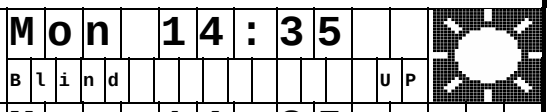


without symbol

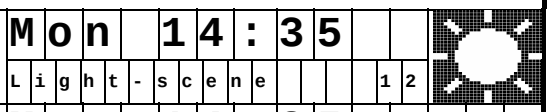
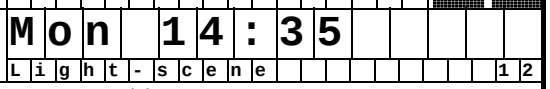
- left-aligned, freely programmable text
  - 18 characters max.
- right-aligned display of brightness value
  - 0%..100%
  - leading zeroes are suppressed
  - the '%' sign follows the value directly without a space

Switching	
with symbol	
without symbol	

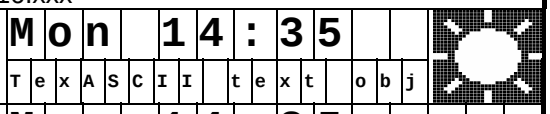
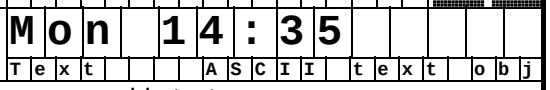
- left-aligned, freely programmable text
  - 18 characters max.
- right-aligned display of the switching object
  - freely programmable text of 18 characters max. respectively for states "0" und "1"

Blind/shutter	
with symbol	
without symbol	

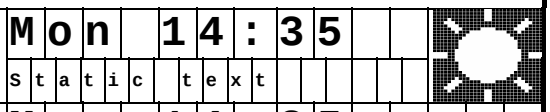
- left-aligned, freely programmable text
  - 18 characters max.
- right-aligned display of long-time object
  - freely programmable text of 18 characters max. respectively for states "0" und "1"

Light-scene	
with symbol	
without symbol	

- left-aligned, freely programmable text
  - 18 characters max.
- right-aligned display of scene number
  - 1 … 64
  - no distinction between recall and storage of scenes

Value display DPT 16.xxx	
with symbol	
without symbol	

- left-aligned, freely programmable text
  - 18 characters max.
- right-aligned display of 14-byte ASCII input object
  left-aligned freely programmable text may be overwritten by displayed value

Static text	
with symbol	
without symbol	

- left-aligned, freely programmable text
  - 18 characters max.

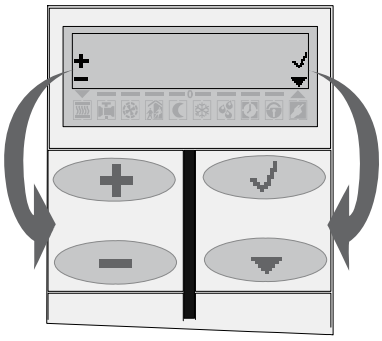
14.5 Second operator control level

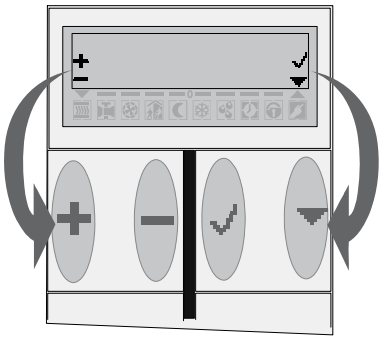
The second operator control level enables the user to change various basic settings of the device locally without using the ETS. To prevent inadvertent changes to essential functions, the device can be programmed in such a way that the access to individual settings or also to the whole second operator control level is denied. The access to the second control level is not possible either, if a key-lock is active. The settings made by the user on the second operator control level remain unchanged even after a reset caused, for instance by a bus voltage failure.

The room controller is switched over to the second operator control level by a pressing keys 1 and 3 simultaneously. A repeated press on the same keys causes the room controller to quit the second operator control level.

Depending on the setting of the parameter "Save changes after manual quitting", the changed settings are either saved or discarded. The three parameters "Automatic quitting of the second operator control level", "Time to automatic quitting" and "Save changed settings" define whether the room controller quits the second operator control level automatically when no entries are made within a specified delay and whether all changed settings are to be saved or discarded in this case . Besides the above-mentioned two possibilities of quitting the second control level menu at any position, the main menu offers the two options "Save" and "Abort" which can be used for ending the second operator control level.

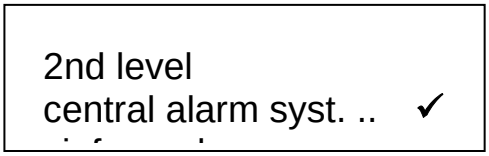
The functions of the second operator control level are organized in a menu/submenu structure. The menus is controlled with keys 1 thru 4. For user guidance purposes, the functions of keys 1 thru 4 are visualized at the sides of the display screen. If a key has no function in the respective context, the corresponding symbol is switched off.





Generally, the keys have the following functions:
+: change between value options, increasing of the set value
-: change between value options, decreasing of the set value
✓: jump to selected submenu, confirming of the set value and return to main menu
▼: next entry; if end of list is reached, continue with first menu item

The main menu of the second operator control level presents itself as follows:



"2nd level" is the heading.
"central alarm Syst." is the menu item actually selected. ✓ opens this submenu.
"info mode" is the following menu item. ▼ selects this item.
+ and – are blanked in this screen.

Items of the main menu:

- central alarm syst.
- info mode
- c.-action controller
- presence
- setpoint point shift
- mode of operation
- fan intens. levels
- device info
- display
- saving
- aborting

The sequence of the menu items is predefined. There are two ways of influencing the main menu configuration with the ETS:

- A main menu item disabled by parameterization does not appear on the list.
- The menu item displayed when the second operator control level is called up can be selected.

In the submenu "Central alarm unit", the room controller can display messages from the central alarm unit. For this purpose, the communcation object "Central alarm unit selection" transmits a telegram to the central alarm unit. The central alarm unit then transmits three telegrams to the 14-byte communication objects "Central alarm unit line 1" to "Central alarm unit line 3". These texts are then displayed on the screen. If no texts are received, the screen displays "- - -".

The keys have the following functions:
+: no function, blanked out
-: no function, blanked out
✓: return to main menu
▼: call up following messages

In the info mode submenu, the room controller displays the current status.
The keys have the following functions:
±: Change between "single-press operation", "double-press operation", "OFF"
✓: confirmation of entry and return to main menu
▼: no function, blanked out

The "continuous-action controller submenu has several entries which can be disabled separately in the parameterization. If an entry can be edited, the respective value blinks. If an entry is disabled, the respective value does not blink.
The keys have the following functions:
±: selects the respective values
✓: confirms an entry and returns to main menu
▼: selects between
"comfort mode", setting of setpoint temperature
"heating-standby", setting of temperature reduction
"cooling-standby", setting of temperature increase
"heating nt reduction", setting of temperature reduction
"cooling nt increase", setting of temperature increase
"heat protection", setting of setpoint temperature
"frost protection", setting of setpoint temperature
"cooling max.", setting of limit value

In the "presence" submenu, the room controller displays the current status. The setting acts like the actuation of the presence key.
The keys have the following functions:
±: changes between "on", "off"
✓: confirms the entry and returns to main menu
▼: no function, blanked out

The "setpoint shift" submenu permits gradual shifting of the setpoint. In the third line, the device displays the numerical value of the shift and also a bargraph.
The keys have the following functions:
±: changes the shift
✓: confirms and returns to main menu
▼: no function, blanked out

In the "mode of operation" submenu, the current status of the device can be displayed and changed.
The keys have the following functions:
±: changes between "Comfort mode", "Standby mode", "Night-time mode", "Frost/heat protection"
✓: confirms and returns to main menu
▼: no function, blanked out

In the "fan intens. levels:" submenu, the current status of the device can be displayed and changed.
The keys have the following functions:
±: changes between "Automatic mode", "OFF", "Manual" level 1", ... "Manual": level 8"
The selection of the manual levels depends on the parameterized number of levels.
✓: confirms and returns to main menu
▼: no function, blanked out

The "Device info" submenu informs about the hardware and software in use. These settings cannot be changed.
The keys have the following functions:
±: no function, blanked out
✓: returns to main menu
▼: goes to next info entry

The "display" submenu shows three pages.
: selection of the respective values
✓: confirms and returns to main menu
▼: changes between
"contrast", setting of contrast from 0% to 100%. The changes made with the ± keys are immediately displayed.
"brightness", setting of brightness from 0% to 100%. The changes made with the ± keys are immediately displayed. The set value is used when the backlighting is switched by a key-press, by the night-time mode of the room temperature controller or via the 1-bit object.
The 1-byte value object for the backlighting brightness overwrites the set value permanently.
A setting of 0% switches the backlighting off.
"pixel test", activates for 2 seconds all pixels and symbols of the display screen. Thereafter, the device is switched back automatically to the main menu.

15 Parameters

Description:	Values:	Remarks:
15.1 General parameters		
General		
Transmit delay after reset or bus voltage return	yes **no**	After a reset (e.g. after loading of an application program or the physical address or after return of bus voltage), the room controller (only 8-fold type) can automatically transmit telegrams for the room temperature controller extension and room temperature measurement functions. In case of the controller extension, the room controller attempts to get values from the room temperature controller by means of read telegrams in order to update the object states. In case of the room temperature measurement, the room controller transmits the current room temperature to the bus after a reset. If there are also other bus devices besides the room controller transmitting telegrams immediately after a reset, it may be useful to activate the transmit delay for automatically transmitting objects in order to reduce the bus load. When the transmit delay is activated (setting: "yes", the room controller calculates the delay time from the device number of its physical address. The controller then waits 30 secs maximum before transmitting telegrams.
ON-time of status LEDs as actuation indicators	1s 2s **3s** 4s 5s	This parameter defines the time the status LED is lit up to indicate actuation. The setting concerns all status LEDs whose function is set to "Actuation indicator"

Function of status LED		This parameter defines the function of the operation LED.
	always OFF	The operation LED is always off.
	always ON	The operation LED is always on, for instance, as orientation lighting.
	switching via object	The operation LED is controlled by a separate communication object ("1" = ON; "0" = OFF).
	inverted switching via object	The operation LED is controlled with inversion by a separate communication object ("1" = OFF; "0" = ON). Besides this function, the operation LED can display different states by means of other blinking rates. These comprise the programming mode, the confirmation of full-surface actuation or the message that an application has not been loaded.
Date display	**dd.mm.yy** mm.dd.yy yy.dd.mm yy.mm.dd	This parameter defines the sequence in which the day, month and year info is displayed on the screen. Depending on the datapoints to be displayed and the font used, the year is indicated with two or four digits.
Time-of-day display	**24 hours** 12 hours	To display the time of day, the room controller can use either the 12- or the 24-hour format. The 12-hour format cannot distinguish between a.m. and p.m.
Request date/time of day	no **yes**	If the parameter is set to "yes" and if the room controller has not received a valid time information during the last 24 hours, the controller uses the "Request date/time of day" object to transmit a telegram to a master clock at 04:00. If the controller has not received a valid date information during the past 24 hours, it transmits a telegram to the master clock at 0:00.
Request date/time of day with	**"1" telegram** "0" telegram	This is the value transmitted by the room controller for requesting the date and the time of day from a master clock.
	German (DE) English (EN) Spanish (ES) Dutch (NL) French (FR) Norwegian (NO)	This parameter indicates the language in which pre-formulated texts (e.g. in the info mode) are displayed on the screen.
Second operator control level	disabled **enabled**	This parameter enables or disables all the functions of the second operator control level together. When the second level is enabled, the ETS shows further parameters.

Second operator control level

Central alarm unit options on second operator control level	**invisible** visible	This parameter can be used to enable the access to messages from the alarm central unit on the second control level.
Continuous-action controller options on second operator control level	invisible **visible**	This parameter can be used to enable the access to the basic settings of the continuous-action controller on the second control level.
Presence options on second operator control level	invisible **visible**	This parameter can be used to enable the access to the presence function of the continuous-action controller on the second control level.
Setpoint shift options on second operator control level	invisible **visible**	This parameter can be used to enable the access to the setpoint shift of the continuous-action controller on the second control level.
Operating mode change-over on second operator control level	**invisible** visible	This parameter can be used to enable the access to the operating mode change-over of the continuous-action controller on the second control level.
Fan intensity level options on second operator control level	**invisible** visible	This parameter can be used to enable the access to the fan control on the second control level.
First menu item of second operator control level	Central alarm unit Info-mode: **Continuous-action controller** Presence Setpoint value shift Mode of operation Fan intensity levels	The selected menu item appears in the first position when the second control level is called up. The other menu item retain their position in the sequence.
Automatic quitting of the second operator control level	no **yes**	If there is no actuation on the second operator control level for a presettable time, the room controller can return automatically to the first control level.
Time to automatic quitting	10 s 20 s **30 s** 1 min 2 min	This parameter fixes the time after which the room controller quits the second control level automatically if no actuation is sensed.
Save changes	**no** yes	When the room controller quits the second control automatically, all changes made can either be saved or discarded.
Save changes after manual quitting	no **yes**	The second control level can be quitted at any position within the menu after pressing keys 1 and 3 simultaneously. In this case, the room controller can either save or discard all changes made.

15.2 Pushbutton sensor

Rocker / key selection

Function of keys 1 and 2 (the same parameters are available for the other control surfaces / key pairs	**as a rocker (rocker 1)** as separate keys	For each control surface the user can independently specify whether it is to be used as a rocker with a common basic function or as two different keys with completely independent functions. Depending on this choice, the ETS displays different communication objects and parameter pages. If a control surface is parameterized as a rocker, it is also possible to activate a full-surface actuation with some basic functions.
Key layout key 1 / key 2 (the same parameters are available for the other control surfaces / key pairs	left / right **top / bottom**	For each control surface the user can specify whether the surface is to be divided horizontally or vertically. This arrangement fixes the actuation points of the control surface.

Rocker 1 (keys 1/2) (only if "Function of keys 1 and 2 = as one rocker (rocker 1)"!)

Function	**Switching** Dimming blind value transmitter 1 byte value transmitter 2 bytes 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.
Info text line 2	**info text L2 R1**	The info text entered here is displayed when a rocker is pressed. The text can be edited at the user's discretion and may consist of 18 characters max.
Info text line 3 top/left	**predefined text (depending on key function)** free text	Depending on the programmed function of the rocker, different texts are predefined for the third line in the device software. As an option, also free texts can be entered. In this case, the ETS shows the next parameter.
Info text line 3 top/left	**info text L3 top/left**	The info text entered here is displayed when a rocker is pressed. The text can be edited at the user's discretion and may consist of 18 characters max.
Info text line 3 bottom/right	**predefined text (depending on key function)** free text	Depending on the programmed function of the rocker, different texts are predefined for the third line in the device software. As an option, also free texts can be entered. In this case, the ETS shows the next parameter.
Info text line 3 bottom/right	**info text L3 top/left**	The info text entered here is displayed when a rocker is pressed. The text can be edited at the user's discretion and may consist of 18 characters max.

The status LEDs of a control surface can be programmed for independent LED functions which have no relationship with the basic functions of the rocker. This always results in the LED parameters described below...

If the function of the status LED = "Operating mode indicator (KNX controller)"

Status LED ON with	automatic mode **comfort operation** standby mode night-time operation frost /heat protection	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-time 4 = frost/ heat protection The value "automatic" is used only by the "forced operating mode switch-over" objects The status LED is on when the object adopts the parameterized value.

If the function of the status LED = "Controller status indicator"

Status LED ON with	**comfort operation** standby mode night-time operation frost /heat protection controller disabled heating / cooling controller inactive (dead zone operation) frost alarm	The "Controller status" communication object of the controller extension function includes eight information units in one byte. This parameter defines which bit is to be indicated by the LED. The controller status can be displayed only if the controller extension is enabled (parameter page "General")!

If the function of the status LED = "Comparator without 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 parameterized reference value is greater or less than or equal to the value of the "Status LED" object.
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 the 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 parameterized 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.

If function of the rocker = "switching

Function of status LED at the top	always OFF always ON **Key-press indication** status indicator (switching object) inverted status indicator (switching object) status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a switching function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal the state of the communication object "Switching • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Function of status LED at the bottom	always OFF always ON **Key-press indication** status indicator (switching object) inverted status indicator (switching object) status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a switching function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal the state of the communication object "Switching • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Command on pressing rocker 1.1	no reaction **ON** OFF TOGGLE	Depending on the "Key arrangement" parameter, these parameters define the reaction taking place when the top (or left-hand) rocker is pressed or released.
Command on releasing rocker 1.1	**no reaction** ON OFF TOGGLE	
Command on pressing rocker 1.2	no reaction ON **OFF** TOGGLE	Depending on the "Key arrangement" parameter, these parameters define the reaction taking place when the bottom (or right-hand) rocker is pressed or released.
Command on releasing rocker 1.2	**no reaction** ON OFF TOGGLE	

If function of the rocker = "dimming		
Function of status LED at the top	always OFF always ON **Key-press indication** status indicator (switching object) inverted status indicator (switching object) status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a dimming function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal the state of the communication object "Switching • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Function of status LED at the bottom	always OFF always ON **Key-press indication** status indicator (switching object) inverted status indicator (switching object) status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a dimming function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal the state of the communication object "Switching • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Command on pressing rocker 1.1	no reaction **Brighter (ON)** Darker (OFF) brighter / darker (TOGGLE) brighter (TOGGLE) darker (TOGGLE)	Depending on the "Key arrangement" parameter, this parameter defines the reaction taking place when the top (or left-hand) rocker is pressed. If the room controller 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 room controller can send the correct telegram on the next key-press.

Command on pressing rocker 1.2	no reaction Brighter (ON) **Darker (OFF)** brighter / darker (TOGGLE) brighter (TOGGLE) darker (TOGGLE)	Depending on the "Key arrangement" parameter, this parameter defines the reaction taking place when the bottom (or right-hand) rocker is pressed. If the room controller 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 room controller can send the correct telegram on the next key-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 room controller to send a 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 room controller to send a 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 step when the brightness is increased. On each key-press, the brightness is changed at maximum by the parameterized step Especially with smaller dimming steps it is recommended that the room controller repeats the dimming telegrams automatically (cf. "Telegram repetition").
Reduce brightness by	1,5 % 3 % 6 % 12,5 % 25 % 50 % **100 %**	This parameter sets the relative dimming step when the brightness is reduced. On each key-press, the brightness is changed at maximum by the parameterized step Especially with smaller dimming steps it is recommended that the room controller repeats the dimming telegrams automatically (cf. "Telegram repetition").
Transmit stop telegram ?	**yes** no	For "Yes" the room controller transmits a telegram for stopping the dimming process when the rocker is released. When the room controller transmits telegrams for dimming in smaller steps, the stop telegram is generally not needed.

Telegram repetition?	yes **no**	This parameter can be used to activate telegram repetition for dimming. With the key held down, the room controller will then transmit the relative dimming telegrams (in the programmed step width) until the key is released.
Time between two telegrams	**200 ms** 300 ms 400 ms 500 ms 750 ms 1 s 2 s	This parameter defines the interval at which the dimming telegrams are automatically repeated in the telegram repetition mode. Visible only if "Telegram repetition = Yes"!
Full-surface actuation	enabled **disabled**	When full-surface actuation is enabled, the ETS shows the following parameters.
Function in case of full-surface actuation	**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 room controller 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 key-press (between 1 s and 5 s) A brief press recalls the scene, a sustained press stores a scene and an invalid full-surface actuation is ignored. Visible only if "Full-surface actuation = enabled"!
Command with full-surface actuation	ON OFF **TOGGLE**	This parameter defines the value of the transmitted telegram a full-surface actuation has been sensed. TOGGLE" switches over the current object value. Visible only if "Function with full-surface actuation = Switching"!
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 "Function with full-surface actuation = Scene recall"!

If function of the rocker = "Blind/shutter"		
Function of status LED at the top	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a blind/shutter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Function of status LED at the bottom	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a blind/shutter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Command on pressing the 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 key-press. If the setting is "TOGGLE", the direction is changed after each long-time command. If several pushbuttons are to control the same drive, the long-time objects of the pushbuttons must be interlinked for a correct change of the running direction.
Operation concept	**Short – long - short** long – short: short – long - short long – short:	For shutter 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) 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) rocker. This parameter is not visible with "Operation concept = Long – Short"!
Slat adjustment time rocker 1.1 (0 … 3000 x 100 ms)	0 … **5** … 3000	Time during which a transmitted MOVE telegram can be terminated by releasing the top (or left-hand) key of the rocker (STEP). This function is used for adjustment of the slats of a blind. This parameter is not visible with "Operation concept = Long – Short"!
Slat adjustment time rocker 1.2 (0 … 3000 x 100 ms)	0 … **5** … 3000	Time during which a transmitted MOVE telegram can be terminated by releasing the bottom (or right-hand) key of the rocker (STEP). This function is used for adjusting the slats of a blind. This parameter is not visible with "Operation concept = Long – Short"!
Full-surface actuation	enabled **disabled**	When full-surface actuation is enabled, the ETS shows the following parameters. Full-surface actuation can only be programmed if "Operation concept = Long – Short or Short"!
Function in case of full-surface actuation	**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 room controller 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 key-press (between 1 s and 5 s) A brief press recalls the scene, a sustained press stores a scene and an invalid full-surface actuation is ignored. Visible only if "Full-surface actuation = enabled"!

Command with full-surface actuation	ON OFF **TOGGLE**	This parameter defines the value of the transmitted telegram a full-surface actuation has been sensed. TOGGLE" switches over the current object value. Visible only if "Function with full-surface actuation = Switching"!
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 "Function with full-surface actuation = Scene recall"!
If function of the rocker = "Value transmitter 1 byte"		
Function of status LED at the top	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a value transmitter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Function of status LED at the bottom	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a value transmitter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.

Functionality	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 % / 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 %	A rocker parameterized 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 % . This decision determines the following parameters and the respective settings.
Value rocker 1.1 (0 … 255)	**0** … 255	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the top (or left-hand) rocker is pressed. Visible only if "Functionality = … 0…255"!
Value rocker 1.2 (0 … 255)	**0** … 255	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the bottom (or right-hand) rocker is pressed. Visible only if "Functionality = … 0…255"!
Value rocker 1.1 (0 … 100 %)	**0** … 100	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the top (or left-hand) rocker is pressed. Visible only if "Functionality = … 0…100 %"!
Value rocker 1.2 (0 … 100 %)	**0** … 100	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the top (or left-hand) rocker is pressed. Visible only if "Functionality = … 0…100 %"!
Value variation by long key-press	enabled **disabled**	If value variation by long key-press is enabled, the ETS shows further parameters. Value variation begins, when the key is being held down for more than 5 s. In this case, the respective status LED blinks as a sign that a new telegram has been transmitted.

Start value for value variation		Value variation can begin with different starting values.
	as specified by parameter	After each long press, the room controller always starts with the value parameterized in the ETS.
	same as value after last variation	After a long press, the room controller starts with the value transmitted by itself as the last value.
	same as value from communication object	After a long press, the room controller starts with the value transmitted by itself or by another device with this group address as the last value. Visible only if "Value variation by long key-press = enabled"!
Direction of value variation	upwards downwards **toggling (alternating)**	With a long press, the room controller can either vary the values always in the same direction or it stores the direction of the last variation and reverses it on the next key-press. Visible only if "Value variation by long key-press = enabled"!
Step width (1 … 15)	**1** … 15	In a value variation, the room controller determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the variation range (0 or 0 %) or if it exceeds the upper limit (0 or 255%), the sensor adapts the step width of the last step automatically. Visible only if "Value variation by long key-press = enabled"!
Time between two telegrams	**0.5 s** 1 s 2 s 3 s	This parameter defines the interval at which the room controller transmits new telegrams during a value variation. Visible only if "Value variation by long key-press = enabled"!

Value variation with overflow	yes **no**	If value variation is to be effected without overflow (setting "no") and if the room controller reaches the lower limit of the variation range (0 or 0 %) or the upper limit (255 or 100 %) during value variation, the variation will be stopped automatically by the sensor. If the value variation with overflow is programmed (setting "yes") and if the pushbutton 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 steps. Thereafter, the room controller sends a telegram with the value of the other range limit and continues to vary the value in the same direction. Visible only if "Value variation by long key-press = enabled"!
If function of the rocker = "Value transmitter 2 byte"		
Function of status LED at the top	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a value transmitter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Function of status LED at the bottom	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a value transmitter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.

Functionality	**Temperature value transmitter** Brightness value transmitter value transmitter (0 … 65535)	A rocker parameterized 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 distinction.
Temperature value (0 … 40 °C) rocker 1.1	0 … **20** … 40	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the top (or left-hand) rocker is pressed. Visible only if "Functionality = Temperature value transmitter"!
Temperature value (0 … 40 °C) rocker 1.2	0 … **20** … 40	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the bottom (or right-hand) rocker is pressed. Visible only if "Functionality = Temperature value transmitter"!
Brightness value rocker 1.1	0, 50, … **300** … 1450, 1500 lux	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the top (or left-hand) rocker is pressed. Visible only if "Functionality = Brightness value transmitter"!
Brightness value rocker 1.2	0, 50, … **300** … 1450, 1500 lux	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the bottom (or right-hand) rocker is pressed. Visible only if "Functionality = Brightness value transmitter"!
Value (0 … 65535) rocker 1.1	**0** … 65535	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the top (or left-hand) rocker is pressed. Visible only if "Functionality = Value transmitter (0 … 65535)"!
Value (0 … 65535) rocker 1.2	**0** … 65535	Depending on the "Key arrangement" parameter, this parameter defines the object value, when the bottom (or right-hand) rocker is pressed. Visible only if "Functionality = Value transmitter (0 … 65535)"!

Value variation by long key-press	enabled **disabled**	If value variation by long key-press is enabled, the ETS shows further parameters. Value variation begins, when the key is being held down for more than 5 s. In this case, the respective status LED blinks as a sign that a new telegram has been transmitted.
Start value for value variation		Value variation can begin with different starting values.
	as specified by parameter	After each long press, the room controller always starts with the value parameterized in the ETS.
	same as value after last variation	After a long press, the room controller starts with the value transmitted by itself as the last value.
	same as value from communication object	After a long press, the room controller starts with the value transmitted by itself or by another device with this group address as the last value. *
		Visible only if "Value variation by long key-press = enabled"!
		*: This setting selectable only if "Functionality = Value transmitter (0…65535)!
Direction of value variation	upwards downwards **toggling (alternating)**	With a long press, the room controller can either vary the values always in the same direction or it stores the direction of the last variation and reverses it on the next key-press.
		Visible only if "Value variation by long key-press = enabled"!
Step size	**1 °C**	For temperature values, the step size of the variation is fixed to 1°C.
		Visible only if "Functionality = Temperature value transmitter" and "Value variation by long key-press = enabled"!
Step size	**50 lux**	For brightness values, the step size of the variation is fixed to 50 lux.
		Visible only if "Functionality = Brightness value transmitter" and "Value variation by long key-press = enabled"!

Step size	1 2 5 10 20 50 75 100 200 500 750 **1000**	This parameter sets the step size of the value variation for the 2-byte value transmitter. Visible only if "Functionality = Temperature value transmitter" and "Value variation by long key-press = enabled"!
Time between two telegrams	0.5 s **1 s** 2 s 3 s	This parameter defines the interval at which the room controller transmits new telegrams during a value variation. Visible only if "Value variation by long key-press = enabled"!
Value variation with overflow	yes **no**	If value variation is to be effected without overflow (setting "No") and if the room controller reaches the lower limit of the variation range (0°C, 0 lux, 0) or the upper limit (+40°C, 1500 lux, 65535) during value variation, the variation will be stopped automatically by the sensor. If the value variation with overflow is programmed (setting "yes") and if the room controller 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 steps. Thereafter, the room controller sends a telegram with the value of the other range limit and continues to vary the value in the same direction.
If function of the rocker = "Scene extension"		
Function of status LED at the top	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a scene extension function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.

Function of status LED at the bottom	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a scene extension function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Functionality	**Scene extension without storage function** Scene extension with storage function Recall of internal scene without storage function Recall of internal scene with storage function	This parameter defines the functionality of the extension. If the room controller is used as scene extension, the scenes can either be stored in one or in several other KNX/EIB devices (e.g. light scene pushbutton sensor). During a scene recall or in a storage function, the room controller 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 room controller Universal TSM is recalled or stored again. No telegram will be transmitted 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 key 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 key 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 key 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 key is pressed.

If function of the rocker = "switching"

Function of status LED at the top	always OFF always ON **telegram acknowledge** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a 2-channel function, the status LED can... • be permanently on or off independent of the communication objects, • indicate whether a telegram has been transmitted, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Function of status LED at the bottom	always OFF always ON **telegram acknowledge** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a 2-channel function, the status LED can... • be permanently on or off independent of the communication objects, • indicate whether a telegram has been transmitted, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Operation concept	**channel 1 or channel 2** channel 1 and channel 2	This parameter defines the 2-channel operation concept. If the setting "Channel 1or channel 2" is selected, the room controller decides dependent on the key-press duration which of the channels will be used. If the setting "Channel 1 and channel 2" is selected, the pushbutton sensor transmits only the telegram of channel 1 on a short key-press and both telegrams on a sustained key-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).
Key command 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. Visible only if "Function channel 1 (2) = Switching (1 bit)"!

Key command 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. Visible only if "Function channel 1 (2) = Switching (1 bit)"!
Value of key 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 key 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 key 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 key 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 key 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 key 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 sensor 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 sensor transmits the telegram for channel 1 and the telegram for channel 2 if the bottom (or right side) of the rocker is pressed.
Full-surface actuation	enabled **disabled**	When full-surface actuation is enabled, the ETS shows the following parameters. Full-surface actuation can only be programmed if "Operation concept = Channel 1 or channel 2"!
Function in case of full-surface actuation	**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 room controller 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 key-press (between 1 s and 5 s) A brief press recalls the scene, a sustained press stores a scene and an invalid full-surface actuation is ignored. Visible only if "Full-surface actuation = enabled"!
Command with full-surface actuation	ON OFF **TOGGLE**	This parameter defines the value of the transmitted telegram a full-surface actuation has been sensed. TOGGLE" switches over the current object value. Visible only if "Function with full-surface actuation = Switching"!
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 "Function with full-surface actuation = Scene recall"!

Rocker 2 see rocker 1!

Key 1 (only if "Function of keys 1 and 2 = as separate keys"!)		
Function	no function **Switching** Dimming blind Value transmitter 1 byte Value transmitter 2 bytes Scene extension 2-channel operation Controller extension (-> "room temperature control") Fan control: Info key: Page changing: Operating mode switch-over setpoint value shift	This parameter defines the basic function of the key. Depending on this setting, the ETS displays different communication objects and parameters for this key.
Info text line 2	**info text Z2 W1**	The text entered here is displayed when a rocker is pressed.
Info text line 3	**predefined text (depending on key function)** free text	Depending on the programmed function of the key, different texts are predefined for the third line in the device software. As an option, also free texts can be entered. In diesem Fall zeigt die ETS den nächsten Parameter an.
Info text line 3	**info text L3 top/left**	The text entered here is displayed when a rocker is pressed. The text can be edited at the user's discretion and may consist of 18 characters max.

The status LEDs of a key can be programmed for independent LED functions which have no relationship with the basic function of the key. This always results in the LED parameters described below.

If the function of the status LED = "Operating mode indicator (KNX controller)"

Status LED ON with	automatic mode **comfort operation** standby mode night-time operation frost /heat protection	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-time 4 = frost/ heat protection The value "automatic" is used only by the "forced operating mode switch-over" objects The status LED is on when the object adopts the parameterized value.

If the function of the status LED = "Controller status indicator"

Status LED ON with	**comfort operation** standby mode night-time operation frost /heat protection Controller disabled Heating / cooling controller inactive (dead zone operation) Frost alarm	The "Controller status" communication object of the controller extension function includes eight bits of information in one byte. This parameter defines which bit is to be indicated by the LED. The controller status can be displayed only if the controller extension is enabled (parameter page "General")!

If the function of the status LED = "Comparator without 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 parameterized reference value is greater or less than or equal to the value of the "Status LED" object.
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 the 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 parameterized 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.

If function of the key = "No function"

Function of status LED	**always OFF** always ON status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	When the rocker is not used, the status LED can ... • be permanently on or off independent of the communication objects, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.

If function of the rocker = "Switching"

Function of status LED	always OFF always ON **Key-press indication** status indicator (switching object) inverted status indicator (switching object) status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a switching function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal the state of the communication object "Switching • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Command on pressing the key	no reaction **ON** OFF TOGGLE	Depending on the "Key arrangement" parameter, these parameters define the reaction taking place when the key is pressed or released.
Command on releasing the key	**no reaction** ON OFF TOGGLE	

If function of the key = "Dimming"		
Function of status LED	always OFF always ON **Key-press indication** status indicator (switching object) inverted status indicator (switching object) status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a dimming function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal the state of the communication object "Switching • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Command on pressing the key	no reaction **Brighter (ON)** Darker (OFF) brighter / darker (TOGGLE) brighter (TOGGLE) darker (TOGGLE)	This parameter defines the reaction when the key is pressed. If the room controller 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 room controller can send the correct telegram on the next key-press.
Time between switching and dimming (100 … 50000 x 1 ms)	100 … **400** … 50000	This parameter defines how long the key must be pressed for the room controller 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 step when the brightness is increased. On each key-press, the brightness is changed at maximum by the parameterized step Especially with smaller dimming steps it is recommended that the room controller repeats the dimming telegrams automatically (cf. "Telegram repetition").
Reduce brightness by	1,5 % 3 % 6 % 12,5 % 25 % 50 % **100 %**	This parameter sets the relative dimming step when the brightness is reduced. On each key-press, the brightness is changed at maximum by the parameterized step Especially with smaller dimming steps it is recommended that the room controller repeats the dimming telegrams automatically (cf. "Telegram repetition").
Transmit stop telegram ?	**yes** no	For "yes" the room controller transmits a telegram for stopping the dimming process when the key is released. Wenn der Raum-Controller Telegramme zum Dimmen in kleinen Stufen sendet, wird das Stoptelegramm in der Regel nicht benötigt.
Telegram repetition?	yes **no**	This parameter can be used to activate telegram repetition for dimming. With the key held down, the room controller will then transmit the relative dimming telegrams (in the programmed step width) until the key is released.
Time between two telegrams	**200 ms** 300 ms 400 ms 500 ms 750 ms 1 s 2 s	This parameter defines the interval at which the dimming telegrams are automatically repeated in the telegram repetition mode. Visible only if "Telegram repetition = Yes"!

If function of the key = "Blind/shutter"		
Function of status LED	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a blind/shutter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Command on pressing the key	DOWN UP **TOGGLE**	This parameter defines the running direction of a drive after a key-press. If the setting is "TOGGLE", the direction is changed after each long-time command. If several pushbuttons are to control the same drive, the long-time objects of the pushbuttons must be interlinked for a correct change of the running direction.
Operational sequence	**Short – long - short** long – short: short – long - short long – short:	For shutter 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 key. This parameter is not visible with "Operation concept = Long – Short"!
Slat adjustment time (0 … 3000 x 100 ms)	0 … **5** … 3000	Time during which a transmitted MOVE telegram can be terminated by releasing the key (STEP). This function is used for adjusting the slats of a blind. This parameter is not visible with "Operation concept = Long – Short"!

If function of the key = "Value transmitter 1 byte"		
Function of status LED	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a value transmitter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Functionality	**value transmitter 0 … 255** value transmitter 0 … 100 %	A key parameterized 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 key is pressed. Visible only if "Functionality = … 0…255"!
Value (0 … 100 %)	**0** … 100	This parameter defines the object value, when the key is pressed. Visible only if "Functionality = … 0…100 %"!
Value variation by long key-press	enabled **disabled**	If value variation by long key-press is enabled, the ETS shows further parameters. Value variation begins, when the key is being held down for more than 5 s. In this case, the respective status LED blinks as a sign that a new telegram has been transmitted.

Start value for value variation		Value variation can begin with different starting values.
	as specified by parameter	After each long press, the room controller always starts with the value parameterized in the ETS.
	same as value after last variation	After a long press, the room controller starts with the value transmitted by itself as the last value.
	same as value from communication object	After a long press, the room controller starts with the value transmitted by itself or by another device with this group address as the last value. Visible only if "Value variation by long key-press = enabled"!
Direction of value variation	upwards downwards **toggling (alternating)**	With a long press, the room controller can either vary the values always in the same direction or it stores the direction of the last variation and reverses it on the next key-press. Visible only if "Value variation by long key-press = enabled"!
Step width (1 … 15)	**1** … 15	In a value variation, the room controller determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the variation range (0 or 0 %) or if it exceeds the upper limit (255 or 100%), the controller adapts the step width of the last step automatically. Visible only if "Value variation by long key-press = enabled"!
Time between two telegrams	**0.5 s** 1 s 2 s 3 s	This parameter defines the interval at which the room controller transmits new telegrams during a value variation. Visible only if "Value variation by long key-press = enabled"!

Value variation with overflow	yes **no**	If value variation is to be effected without overflow (setting "no") and if the room controller reaches the lower limit of the variation range (0 or 0 %) or the upper limit (255 or 100 %) during value variation, the variation will be stopped automatically by the controller. If the value variation with overflow is programmed (setting "yes") and if the room controller 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 steps. Thereafter, the room controller transmits a telegram with the value of the other range limits and continues the value variation in the same direction. Visible only if "Value variation by long key-press = enabled"!
If function of the key = "Value transmitter 2 bytes"		
Function of status LED	always OFF always ON **Key-press indication** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a value transmitter function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Functionality	**temperature value transmitter** brightness value transmitter value transmitter (0 … 65535)	A key parameterized 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 distinction.
Temperature value (0 … 40 °C)	0 … **20** … 40	This parameter defines the object value, when the key is pressed. Visible only if "Functionality = Temperature value transmitter"!
Brightness value	0, 50, … **300** … 1450, 1500 lux	This parameter defines the object value, when the key is pressed. Visible only if "Functionality = Brightness value transmitter"!

Value (0 … 65535)	**0** … 65535	This parameter defines the object value, when the key is pressed. Visible only if "Functionality = Value transmitter (0 … 65535)"!
Value variation by long key-press	enabled **disabled**	If value variation by long key-press is enabled, the ETS shows further parameters. Value variation begins, when the key is being held down for more than 5 s. In this case, the respective status LED blinks as a sign that a new telegram has been transmitted.
Start value for value variation		Value variation can begin with different start values.
	as specified by parameter	After each long press, the room controller always starts with the value parameterized in the ETS.
	same as value after last variation	After a long press, the room controller starts with the value transmitted by itself as the last value.
	same as value from communication object *	After a long press, the room controller starts with the value transmitted by itself or by another device with this group address as the last value. *
		Visible only if "Value variation by long key-press = enabled"! *: This setting selectable only if "Functionality = Value transmitter (0…65535)!
Direction of value variation	upwards downwards **toggling (alternating)**	With a long press, the room controller can either vary the values always in the same direction or it stores the direction of the last variation and reverses it on the next key-press. Visible only if "Value variation by long key-press = enabled"!
Step size	**1 °C**	For temperature values, the step size of the variation is fixed to 1°C. Visible only if "Functionality = Temperature value transmitter" and "Value variation by long key-press = enabled"!
Step size	**50 lux**	For brightness values, the step size of the variation is fixed to 50 lux. Visible only if "Functionality = Brightness value transmitter" and "Value variation by long key-press = enabled"!

Step size	1 2 5 10 20 50 75 100 200 500 750 **1000**	This parameter sets the step size of the value variation for the 2-byte value transmitter. Visible only if "Functionality = Temperature value transmitter" and "Value variation by long key-press = enabled"!
Time between two telegrams	0.5 s **1 s** 2 s 3 s	This parameter defines the interval at which the room controller transmits new telegrams during a value variation. Visible only if "Value variation by long key-press = enabled"!
Value variation with overflow	yes **no**	If value variation is to be effected without overflow (setting "no") and if the room controller reaches the lower limit of the variation range (0°C, 0 lux, 0) or the upper limit (+40°C, 1500 lux, 65535) during value variation, the variation will be stopped automatically by the controller. If the value variation with overflow is programmed (setting "yes") and if the room controller 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 steps. Thereafter, the room controller transmits a telegram with the value of the other range limits and continues the value variation in the same direction.
If function of the rocker = "Scene extension"		
Function of status LED	always OFF always ON **key-press indicator** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a scene extension function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.

Functionality	**Scene extension without storage function** Scene extension with storage function Recall of internal scene without storage function Recall of internal scene with storage function	This parameter defines the functionality of the extension. If the room controller is used as scene extension, the scenes can either be stored in one or in several other KNX/EIB devices (e.g. light scene room controller). during a scene recall or in a storage function, the room controller 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 room controller 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 a key is pressed.
Scene number (1 … 8)	**1** … 8	This parameter defines the number of the internal scene which is recalled or stored when a key is pressed.
If function of the rocker = "Switching"		
Function of status LED	always OFF always ON **telegram acknowledge** status indicator (LED object) inverted status indicator (LED object) operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a 2-channel function, the status LED can... • be permanently on or off independent of the communication objects, • indicate whether a telegram has been transmitted, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. Depending on this setting, the ETS may also display further LED parameters.
Operating concept	**channel 1 or channel 2** channel 1 and channel 2	This parameter defines the 2-channel operating concept. If the setting "Channel 1 or channel 2" is selected, the room controller decides dependent on the key-press duration which of the channels will be used. If the setting "Channel 1 and channel 2" is selected, the device transmits only the telegram of channel 1 on a short key-press and both telegrams on a sustained key-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 key for channel 1 (2)	**ON** OFF TOGGLE	This parameter defines the object value transmitted to the bus, when the key is pressed. Visible only if "Function channel 1 (2) = Switching (1 bit)"!
Value of key for channel 1 (2) (0 … 255)	**0** … 255	This parameter defines the object value transmitted to the bus, when the key is pressed. Visible only if "Function channel 1 (2) = Value transmitter 0…255 (1 byte)"!
Value of key for channel 1 (2) (0 ... 100 %)	**0** … 100	This parameter defines the object value transmitted to the bus, when the key is pressed. Visible only if "Function channel 1 (2) = Value transmitter 0…100 % (1 byte)"!
Temperature value of key for channel 1 (2) (0 … 40 °C)	**0** … 40	This parameter defines the temperature value transmitted to the bus, when the key is pressed. Visible only if "Function channel 1 (2) = Temperature value transmitter (2 bytes)"!
Time between channel 1 und channel 2 (1 … 255 x 100 ms)	0 … **30** … 255	Depending on the selected operating concept, this parameter defines the interval at which the sensor transmits the telegram for channel 1 and the telegram for channel 2 when the key is pressed.

If function of the key = "Controller extension"

Function of status LED	always OFF always ON **key-press indicator** status indicator (LED object) inverted status indicator (LED object) key function active indicator * key function inactive indicator * setpoint value shift indicator ** operating mode indicator (KNX controller) controller status indicator (activate controller extension!) comparator without sign (1 byte) comparator with sign (1 byte)	With a controller extension function the status LED can... • be permanently on or off independent of the communication objects, • signal a key-press, • signal a state of the controller extension, • perform a comparison, • show the state of the own LED object. • signal the presence state (key function indication) * • indicate a setpoint value shift ** Depending on this setting, the ETS may also display further LED parameters. *: The key function indication can only be programmed with a presence key! **: The setpoint value shift can only be programmed, if the key functionality is set to "Setpoint value shift".
Status LED	**ON with variation** ON with positive variation ON with negative variation OFF with variation OFF with positive variation OFF with negative variation	With a setpoint shift indication, the illumination behaviour of the status LED can be adjusted. If the setting is "ON...", the status LED is on only in case of a variation. Otherwise, it is permanently off. If the setting is "OFF...", the status LED switches off in case of a variation. Otherwise, it is permanently on. One can also specify whether the status LED is to be switched whenever a variation occurs or only in case of a positive or alternatively a negative setpoint variation. Visible only if "Function of the status LED = Setpoint value shift indication"!
Functionality	**Operating mode switch-over** forced operating mode switchover Presence key setpoint value shift	A controller extension can optionally switch over the operating mode with normal or high priority, change the presence state or change the current room temperature value. With regard to the setting of this parameter, the ETS shows further parameters.

Operating mode on pressing the key	**comfort operation** standby mode night-time operation frost /heat protection comfort operation -> standby operation -> comfort operation -> night-time operation -> standby operation -> night-time operation -> comfort operation -> standby operation -> night-time operation ->	If the controller extension is to switch over the operating mode of the room temperature controller with normal priority, the extension can – when actuated – either activate a defined mode of operation or change over between different modes of operation. In order for this change to work properly, the controller extension should request the current state of the extension objects after a reset or after reprogramming (set parameter under "General" to "Value request from controller extension = Yes"). Visible only if "Functionality = Operating mode switch-over"!
Forced operating mode on pressing the key	auto (normal operating mode switch-over) **comfort operation** standby mode night-time operation frost /heat protection comfort operation -> standby operation -> comfort operation -> night-time operation -> standby operation -> night-time operation -> comfort operation -> standby operation -> night-time operation -> auto -> comfort operation -> auto -> standby operation ->	If the controller extension is to switch over the operating mode of the room temperature controller with high priority, the extension can – when actuated – either enable the switch-over with normal priority (auto), switch on a defined mode of operation with a high priority or change over between different modes of operation. In order for this change to work properly, the controller extension should request the current state of the extension objects after a reset or after reprogramming (set parameter under "General" to "Value request from controller extension = yes"). Visible only if "Functionality = Forced operating mode switch-over"!
Presence function on pressing the key	presence OFF **presence ON** presence TOGGLE	On pressing a key, the controller extension can switch the presence state of the room temperature controller either on or off in a defined way or change over between both states ("Presence TOGGLE"). In order for this change to work properly, the controller extension should request the current state of the extension objects after a reset or after reprogramming (set parameter under "General" to "Value request from controller extension = yes").

"Setpoint shift" functionality		
Setpoint shift on pressing the key	reduce setpoint value (step size) **increase setpoint value (step size**	This parameter defines the direction of the setpoint shift. For a setpoint value shift, the controller extension makes use of the two communication objects "Output setpoint shift" and "Input setpoint shift". The "Input setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new step size which it transmits via the "Output setpoint shift" communication object to the room temperature controller.
"Fan control" functionality		
Function of key 1	**no function** automatic mode manual control	When the function of the key is set to "Fan control", it can - when pressed - either activate the automatic control dependent on the room temperature control or the manual control. In this case, each press switches on the next level. After the max. level, the fan control switches the fan off. Thereafter, the levels can be reactivated one after another.
"Info key" functionality		
Function of the key	no function info mode off info mode on in single-press operation **info mode toggle in single-press operation** info mode on in double-press operation info mode toggle in double-press operation	On pressing the key, the room controller can switch the info mode on or off or toggle between both states in a defined operation. In addition the user can specify whether the info mode is to be used in single- or in double-press operation

"Page change" functionality		
Function of the key	no function **scroll to next page** scroll to previous page call up page 1 call up page 2 call up page 3 call up page 4 toggle between page 1 and 2 toggle between page 1 and 3 toggle between page 1 and 4	On pressing the key, the screen can display optionally a defined page or change pages in a defined sequence. A change to a non-defined page is prevented by the internal device software.
"Operating mode switch-over" functionality		
Function of the key	no function **comfort mode** standby mode night mode frost /heat protection presence key	On pressing the key, the room temperature controller can be switched to any of the operating modes. The objects for presence detector / key, window status and forced-control object have priority over the operating mode switch-over.
"Setpoint shift" functionality		
Function of the key	no function reduce setpoint value **increase setpoint value**	On pressing the key, the room temperature controller can reduce or increase its setpoint values in steps. The actual setpoint value is calculated by the controller from the basic setpoint value, the current setpoint shift and the step value.

Keys 2 ... max. 4 see key 1!

Disabling

Disabling function?	yes **no**	With this parameter, the disabling function of the pushbutton sensor can be centrally activated. If "yes", the ETS shows further communication object and parameters.
Disabling function active...		
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 like key >>X<< when pressed reaction like key >>X<< when released reaction like disabling function 1 when pressed reaction like disabling function 1 when released reaction like disabling function 2 when pressed reaction like 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 or key functions, the room controller 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 keys in the non-disabled state ("Reaction like key >>X<< …"), • be defined on the following parameter pages ("Reaction like disabling function …"), • recall a scene stored internally in the room controller ("Internal scene recall …").
Key >>X<<	**Key 1** Key 2 … key 4 *	If the room controller is to perform the function of a specific key at the beginning of the disabling state, this key will be selected here. Visible only if "Reaction of the room controller at the beginning of the disabling state = Reaction like key >>X<< on pressing / releasing of the key"! *: The number of keys depends on the projected room controller variant!
Behaviour during active disabling	**all keys without function.** all keys behave like... individual keys without function. individual keys behave like...	While disabling is active... • all keys or only individually selected keys can be disabled ("… no function"), • all keys or only individually selected keys can be restricted to a specific function ("… behave like..."), In this case, the ETS shows further parameters.

All keys with even numbers behave during disabling like...	**key 1** key 2 … key 4 * disabling function 1 disabling function 2	If a specific key function is to be assigned during disabling to all or to individual keys, this parameter can be used to select the desired key the function of which will then be executed. During disabling, all keys with even numbers (2, 4) behave like the one parameterized here. The desired functions can either correspond to the function of an existing key or they can be parameterized as special disabling functions. Visible only if "Behaviour during active disabling = all keys behave like" or "Behaviour during active disabling = individual keys behave like"! *: The number of keys depends on the projected room controller variant!
All keys with odd numbers behave during disabling like...	**key 1** key 2 … key 4 * disabling function 1 disabling function 2	If a specific key function is to be assigned during disabling to all or to individual keys, this parameter can be used to select the desired key the function of which will then be executed. During disabling, all keys with odd numbers (1, 3) behave like the one parameterized here. The desired functions can either correspond to the function of an existing key or they can be parameterized as special disabling functions. Visible only if "Behaviour during active disabling = all keys behave like" or "Behaviour during active disabling = individual keys behave like"! *: The number of keys depends on the projected room controller variant!

Reaction of pushbutton sensor at the end of disabling	**no reaction** reaction like key >>Y<< when pressed reaction like key >>Y<< when released reaction like disabling function 1 when pressed reaction like disabling function 1 when released reaction like disabling function 2 when pressed reaction like 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 or key 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 keys in the non-disabled state ("Reaction like key >>Y<< …"), • be defined on the following parameter pages ("Reaction like disabling function …"), • recall a scene stored internally in the room controller ("Internal scene recall …").
Key >>Y<<	**key 1** key 2 … key 4 *	If the room controller is to perform the function of a specific key at the end of the disabling state, this key will be selected here. Visible only if "Reaction of the room controller at the beginning of the disabling state = Reaction like key >>X<< on pressing / releasing of the key"! *: The number of keys depends on the projected room controller variant!

Key selection disable

Visible only if "Behaviour during active disabling = individual keys no function" or "Behaviour during active disabling = individual keys behave like"!

Selection of the keys for behaviour during disabling		
Key 1?	yes **no**	The user can specify for each key separately whether it will be affected by the disabling function during the diasbling state.
Key 2?	yes **no**	*: The number of keys depends on the projected room controller variant!
…		
Key 4?*	yes **no**	

Disabling function 1 disable / Disabling function 2 disable

With the exception of the status LED control, the parameters available for the two disabling functions are the same as those for the key functions.

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 the signalling of the alarm. When the object value corresponds to the "Alarm" condition, all status LEDs and the operation LED are blinking with a frequency of ca. 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. An active alarm message is not stored so that the alarm message indication is generally deactivated after a reset or after programming with the ETS.
Reset alarm signalling by a key-press?	**yes** no	If this parameter is set to "yes", active alarm signal displaying can be deactivated by a key-press on the room controller. This key-press does not cause the parameterized function of the pressed key to be executed. Only after then next key-press will the parameterization of the key 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 key-press will always execute the parameterized key function.
Use the alarm acknowledge object?	yes **no**	If a display alarm can be deactivated by a key-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 key-press. A telegram can, for instance, be sent via this object to the "Alarm signalling" objects of other room controllers 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 signalling object.

15.3 Room temperature control

Room temperature control

Room temperature controller function	off **on**	Depending on this parameter, further parameter and objects are displayed.
	Controller extension:	
Controller extension function		
Value request from controller extension?	yes **no**	

Controller general

Controller control option	**heating** cooling heating and cooling basic and additional heating basic and additional cooling basic and additional heating and cooling	Setting of the control option
Fan control available	**no** yes	
With fan control		
Fan control (not effective with switching 2-stage control)	heating cooling … additional heating and cooling	The possible control options and the standard setting depend on the controller operating mode.
With two-stage operation		
Disable object additional stage	**no** yes	The additional stages can be disabled via the bus. If "yes" is selected, the disabling object is enabled.
Only with control options "heating and cooling" or "basic and additional heating and cooling"		
Transmit actuating variables for heating and cooling to shared object	**no** yes	If the parameter is set to "yes", the actuating variable will be transmitted to a shared object during heating or cooling. This function is used, if the same heating system is used to cool the room in the summer and used to heat the room in the winter.
Type of heating control (if applicable, for basic and additional stage)	**continuous PI control** switching PI control PWM) switching 2-state control (ON/OFF)	Selects a control algorithm (PI or 2-point) with data format (1-byte or 1-bit) for the heating system.
With continuous or switching PI control		
Type of heating (if applicable, for basic and additional stage)	**hot-water heating (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	Adapts the PI algorithm to different heating systems using experience values for the proportional range and reset time control parameters.
Separate input of control parameter		
Proportional range heating (10 ... 127) * 0.1 K	10...127, **50**	Separate setting of the "proportional range" control parameter.
Reset time heating (0 ... 255) * 1 min; 0 = inactive	0...255, **150**	Separate setting of the "reset time" control parameter.

With switching 2-state control		
Lower hysteresis limit of the 2-state controller heating (-128 ... –5) * 0.1 K	-128...-5, **-5**	Definition of switch-on and switch-off temperatures for heating.
Upper hysteresis limit of the 2-state controller heating (5 ... 127) * 0.1 K	5...127, **5**	Definition of switch-on and switch-off temperatures for heating.
Type of cooling control (if applicable, for basic and additional stage)	**continuous PI control** switching PI control PWM) switching 2-point control (ON/OFF)	Selects a control algorithm (PI or 2-state) with data format (1 byte or 1 bit) for the cooling system. Only if "Transmit actuating variables for heating and cooling to shared object" = "no". If "Transmit actuating variables for heating and cooling to shared object" = "yes", the parameter settings for "Type of heating control" will be accepted.
With continuous or switching PI control		
Type of cooling (if applicable, for basic and additional stage)	**cooling ceiling (5 K / 240 min)** fan convector (4 K / 90 min) split unit (4 K / 90 min) via control parameter	Adapts the PI algorithm to different cooling systems using experience values for the proportional range and reset time control parameters.
Separate input of control parameter		
Proportional range cooling (10 ... 127) * 0.1 K	10...127, **50**	Separate setting of the "proportional range" control parameter.
Reset time cooling (0 ... 255) * 1 min; 0 = inactive	0...255, **240**	Separate setting of the "reset time" control parameter.
With switching 2-state control		
Lower hysteresis limit of the 2-state controller cooling (-128 ... –5) * 0.1 K	-128...-5, **-5**	Defines the switch-on and switch-off temperatures for cooling
Upper hysteresis limit of the 2-state controller cooling (5 ... 127) * 0.1 K	5...127, **5**	Defines the switch-on and switch-off temperatures for cooling
Operating mode switch-over	**via value (1-byte)**	The switch-over of the operating modes via the bus takes place according to the KONNEX specification via a 1-byte value object. In addition, a higher-ranking forced-control object is available for this setting.
	via switching (4 x 1-bit)	The 'classic' switch-over of the operating modes via the bus is via separate 1-bit objects.
Operating mode after reset	comfort mode **standby mode** night mode frost /heat protection	Defines the operating mode which is set, for instance after a reset caused by bus voltage return or by new programming.

With operating mode switch-over via 1-bit objects		
Operating mode when all bit objects = 0 (preferred state)	comfort mode **standby mode** night mode frost /heat protection last state before change to 0	Defines the operating mode which is activated when all 1-bit operating mode objects have value "0".
Mixed control option heating and cooling		
Switching-over between heating and cooling	**automatic**	Depending on the operating mode and the room temperature, switch-over is automatic.
	via object (heating/cooling switch-over)	Switch-over only via the "Heating / cooling switch-over" object 35.
Automatic transmission heating/cooling switch-over	**when control option changes** when output variable changes	Determines when a control option switch-over telegram will be transmitted automatically to the bus via the "Heating / cooling switch-over" object 35. Only if "Switch-over between heating and cooling" = "automatic"!
Cyclical transmission heating/cooling switch-over (0…255) * 1 min; 0=inactive	0 … 255, **0**	The "Heating/cooling switch-over" object can be transmitted cyclically.
🗁 Fan control		
Fan control not possible with switching 2-state controllers		Info-text without settings
Number of fan intensity levels	no fan levels 1 fan level 2 fan levels **3 fan levels** … 8 fan levels	
Fan level switch-over via	**switching objects (8x1 bit)** value object (1 byte)	
Threshold fan off -> level 1, *1%	0 … 100, **1**	These parameters determine the actuating variables of the room controller which will cause the fan control to activate the next level. The number of parameters depends on the maximum number of fan intensity levels.
Threshold fan level 1-> level 2, *1%	0 … 100, **30**	
Threshold fan level 2-> level 3, *1%	0 … 100, **60**	
Threshold fan level 3-> level 4, *1%	0 … 100, **90**	
Threshold fan level 4-> level 5, *1%	0 … 100, **100**	
Threshold fan level 5-> level 6, *1%	0 … 100, **100**	
Threshold fan level 6-> level 7, *1%	0 … 100, **100**	
Threshold fan level 7-> level 8, *1%	0 … 100, **100**	
Hysteresis between thresholds, *1%	1 … 50, **3**	When the actuating variable of the room temperature controller has fallen below the threshold minus hysteresis, the fan control switches back to the previous level.

Waiting time for level switching, *0.1s	1 … 255, **2**	If the actuating variable of the room temperature controller changes so fast that the fan control would be forced to switch directly into several successive levels at a time, the switching is performed only after this waiting time.
Level limitation (max. fan level)	**no level limitation** fan level 1 fan level 2 … fan level 8	If the fan is to run at certain times (e.g. at night) only with reduced speed, the level limitation can be activated.
Behaviour with forced-control	no forced-control fan level 1 fan level 2 … fan level 8 **OFF**	The forced-control function permits control from a higher-ranking system.
Interpretation of object fan control automatic/manual	0=automatic, 1=manual **1=automatic, 0=manual**	The parameter defines the polarity of the object for switching over between automatic and manual control.
Fan level when switching to manual	**no change** fan level 1 fan level 2 … fan level 8 fan level OFF	This level is selected, when the fan control switches over from automatic to manual operation.
Fan shut-off delay heating, *0.1s, 0=inactive	0 … 255, **0**	Fan shut-off is delayed in automatic and in manual operation by this time.
Fan shut-off delay cooling, *0.1s, 0=inactive	0 … 255, **0**	Fan shut-off is delayed in automatic and in manual operation by this time.
Fan protection	**no** yes	With the 1-bit fan protection object, the fan can be switched to the highest possible level (taking into account level limitation and forced-control setting).
Start-up via level	fan level OFF **fan level 1** fan level 2 … fan level 8	If the fan does not start up safely when at a low level, a higher level can be selected in this parameter. For starting, the fan switches in this case first to the level selected and then gradually down.
Actuating variable is 0% until internal actuating variable is greater than...,*1%	1	If necessary, these three parameters can be used for adapting the internal characteristics for determination of the automatic fan level.
Actuating variable is 100% when internal actuating variable is greater than...,*1%	99	If the computational offset exceeds 100%, it will be limited by the internal device software.
Actuating variable offset, *1%	0	

Actuating variable and status output

Automatic transmission if value changes by... (0...100) * 1 %; 0 = inactive	0 to 100, **3**	Determines the size of the actuating variable change that will cause the automatic transmission of the continuous actuating variables via the actuating variable objects. Only if at least one type of control is parameterized to "continuous PI control"!
Cycle time of switching variable (1...255) * 1 min	1 to 255, **15**	Determines the cycle time for the pulse width modulated actuating variable (PWM). Only if at least one type of control is parameterized to "switching PI control (PWM)".
Cycle time for automatic transmission (0...255) * 1 min; 0 = inactive	0 to 255, **10**	Time interval for the cyclical transmission of the actuating variable via the actuating variable objects. Only if at least one type of control is parameterized to "continuous PI control" or "switching 2-state control".
Output of actuating variable heating	inverted (closed when sourcing current)	continuous: act. var. = 100 % - normal act. var. switching: act. var. = 1 – normal act. var.
	normal (opened when sourcing current)	normal actuating variable output heating only with "control option = Heating" or "Heating and cooling"!
Output of actuating variable basic stage heating	inverted (closed when sourcing current)	continuous: act. var. = 100 % - normal act. var. switching: act. var. = 1 – normal act. var.
	normal (opened when sourcing current)	normal actuating variable output heating only with "control option = Heating" or "Heating and cooling"!
Output of actuating variable additional heating	inverted (closed when sourcing current)	continuous: act. var. = 100 % - normal act. var. switching: act. var. = 1 – normal act. var.
	normal (opened when sourcing current)	normal actuating variable output heating only with "control option = Heating" or "Heating and cooling"!
Output of actuating variable cooling	inverted (closed when sourcing current)	continuous: act. var. = 100 % - normal act. var. switching: act. var. = 1 – normal act. var.
	normal (opened when sourcing current)	normal actuating variable output heating only with "control option = Heating" or "Heating and cooling"!
Output of actuating variable basic stage cooling	inverted (closed when sourcing current)	continuous: act. var. = 100 % - normal act. var. switching: act. var. = 1 – normal act. var.
	normal (opened when sourcing current)	normal actuating variable output heating only with "control option = Heating" or "Heating and cooling"!

Output of actuating variable additional stage cooling	inverted (closed when sourcing current)	continuous: act. var. = 100 % - normal act. var. switching: act. var. = 1 – normal act. var.
	normal (opened when sourcing current)	normal actuating variable output heating
		only with "control option = Heating" or "Heating and cooling"!
Heating message	**no** yes	Enables the "heating" message function and thus the "Heating message" object.
Cooling message	**no** yes	Enables the "cooling" message function and thus the "Cooling message" object.
Controller status		The controller can output its current operating status.
	no status	No status will be output.
	controller general	The controller status is generally output via the 1-byte object (object 36 "Controller status").
	transmitting individual status	The controller status preset by the "Individual status" parameter will be output via the 1-bit object (Object 36 "Controller status").
Individual status	**comfort mode active** standby mode active night mode active frost/heat protection active controller disabled heating/cooling controller inactive frost alarm	Defines the controller status to be transmitted. Only if "Controller status" = "transmit individual status".

Setpoint values

Basic temperature after reset (7 ... 4.) * 1 °C	7.0 °C to 40 °C, **21 °C**	Defines the basic setpoint value after the initialization.
Adopt change of basic setpoint shift permanently	**no** yes	
Basic temperature setpoint change	deactivated **permit via the bus**	Determines whether an adjustment of the basic temperature is possible via the bus.
Adopt basic temperature setpoint permanently	**no** yes	This parameter determines whether the basic temperature value which has been adjusted via the bus is to be stored permanently (setting "yes") or only temporarily (setting "no"). When set to "yes" the changed basic value will be retained even after a switch-over of the operating mode and after a reset. Only if "Basic temperature setpoint change" = "permit via the bus"
Frost protection setpoint temperature (7...40) * 1 °C	7 °C to 40 °C, **7 °C**	Defines the setpoint temperature with activated frost protection. Only if "Control option" = "heating" or "heating and cooling", if applicable, with additional stage
Heat protection setpoint temperature (7...45) * 1 °C	7 °C to 45 °C, **35 °C**	Defines the setpoint temperature with activated heat protection. Only if "Control option" = "cooling" or "heating and cooling", if applicable, with additional stage.
Dead zone position:	**Symmetrical** Asymmetrical	The comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the adjusted dead zone. The dead zone (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures. Symmetrical: The dead zone can be equally positioned above and below the basic setpoint (e. g. +/- 1K). The comfort setpoint temperatures are derived directly from the basic setpoint resulting from the half dead zone. Asymmetrical: With this setting, the comfort setpoint temperature for heating equals the basic setpoint! The preset dead zone takes only effect from the basic setpoint in the direction of comfort temperature for cooling. Thus the comfort setpoint temperature for cooling is derived directly from the comfort setpoint for heating. Only with the "heating and cooling" or "basic / additional heating/cooling" mixed modes.

Dead zone between heating and cooling (0...127) * 0.1 K	0 to 127, **20**	The comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the adjusted dead zone. The dead zone (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures. Only with the "heating and cooling" or "basic / additional heating/cooling" mixed modes.
Stage offset from the basic to the additional stage (0...127) * 0.1 K	0 to 127, **20**	In a two-stage control mode it is necessary to determine the temperature difference to the basic stage with which the additional stage is to be incorporated into the control. Only in two-stage controller operation
Transmit when setpoint temperature changes by (0...255) * 0.1 K	0 to 255, **1**	Determines the size of the value change required for automatic transmission of the current value via the "Setpoint temperature" object. 0 = no automatic transmission
Cyclical transmission of setpoint temperature (0...255) * 1 min; 0 = inactive	0 to 255, **0**	Determines whether the setpoint temperature is to be cyclically output via the "Setpoint temperature" object.
Adjustment of setpoint to higher temperatures	0 K +1 K +2 K +3 K **+4 K** +5 K	Determines the maximum adjustment range for the upward adjustment of the basic setpoint temperature.
Step width for gradual setpoint shift upwards	+0.5 K **+1.0 K** +1.5 K +2,0K	For gradual shifting of the setpoints from a controller extension or on the second operator control level, the controller uses this parameter to calculate its new setpoint.
Adjustment of setpoint to lower temperatures (-10...0) * 1 K	0 K -1 K -2 K -3 K **-4 K** -5 K	Determines the maximum adjustment range for the downward adjustment of the basic setpoint temperature.
Step width for gradual setpoint shift downwards	**-1.0 K** -1.5 K -2.0K	For gradual shifting of the setpoints from a controller extension or on the second operator control level, the controller uses this parameter to calculate its new setpoint.
Decreasing the setpoint temperature in standby mode (heating) (-128...0) * 0.1 K	-128 to 0, **-20**	The value by which the standby setpoint temperature for heating is lowered compared to the basic setpoint. Only if "Control option = "heating" or "heating and cooling", if applicable, with additional stages.
Decreasing the setpoint temperature in night mode (heating) (-128...0) * 0.1 K	-128 ... 0, **-40**	The value by which the night setpoint temperature for heating is lowered compared to the basic setpoint. Only if "Control option = "heating" or "heating and cooling", if applicable, with additional stages.

Decreasing the setpoint temperature in standby mode (cooling) (0...127) * 0.1 K	0 to 127, **20**	The value by which the standby setpoint temperature for cooling is lowered compared to the basic setpoint. Only if "Control option = "cooling" or "heating and cooling", if applicable, with additional stages.
Increasing the setpoint temperature in standby mode (cooling) (0...127) * 0.1 K	0 to 127, **40**	The value by which the night setpoint temperature for cooling is lowered compared to the basic setpoint. Only if "Control option = "cooling" or "heating and cooling", if applicable, with additional stages.
Setpoint temperature limitation in cooling operation	**no limitation** only difference to outside temperature only max. setpoint temperature max. setpoint temperature and difference to outside temperature	In the case of strongly increasing outside temperatures, the controller can keep the setpoint temperature during cooling within these limits.
Activation of setpoint temperature limitation in cooling operation via object	**no** yes	This parameter determines whether the 1-bit object for setpoint temperature limitation is displayed.
Difference to outside temperature in cooling operation	1 K … 15 K, **6 K**	This parameter defines the maximum difference between the setpoint temperature in the comfort mode and the outside temperature
Max. setpoint temperature in cooling operation	20°C … 35°C, **26°C**	The comfort mode setpoint temperature cannot exceed this value neither by manual setpoint shift nor by automatic correction.

Controller functions

Presence detection	**presence key**	The presence detection takes place via a presence key on the controller or via the presence object (e.g. presence detector). A press on the presence key activates the comfort mode prolongation.
	presence detector	The presence detection takes place via an external presence detector. The detector is coupled via the presence object. If presence is detected, the comfort mode will be activated as long as the presence detector detects movement. The presence key is without function.
With presence key		
Duration of comfort mode prolongation. (0 ...255) * 1 min; 0 = OFF	0 to 255, **30**	An actuation of the presence key causes the controller to switch into the comfort mode for this time. After this time, the controller switches back automatically
Switching off the controller (dew-point operation)	**no** via the bus	This parameter enables the "Disable controller" object 40. There is no control until enabled (actuating variables = 0). Disabling of the controller when active (dew-point operation) is displayed on the screen.
Valve protection	**no** yes	The valve is periodically opened (every 24 hours). Works against calcification and thus prevents the valve from getting stuck.
Temperature limitation (underfloor heating)	**not available** available	Activates or deactivates the temperature limitation.
Acting on...	**basic stage heating** additional stage heating	Determines the controller output to which the underfloor heating is connected
Maximum temperature underfloor heating * 1°C	20,0°C … 70,0°C, **30°C**	The max. admissible temperature can be set depending on the construction of the underfloor heating. If this temperature is exceeded, the underfloor heating is shut off until the temperature has dropped by at least 1 K.
Limit temperature hysteresis	**1 K**	Fixed value

Room temperature measurement

Temperature detection		Determines which sensor will be used for room temperature measurement. Internal sensor: built-in sensor of the controller External sensor": An external sensor coupled via the bus, e.g. for complicated measuring conditions (swimming pools or similar). Internal and external sensor: Both sensors are used, for example, in large rooms.
	internal sensor	
	external sensor	
	internal and external sensor	
Determination of measured value from internal / external ratio	10% to 90 % 20% to 80 % 30% to 70 % 40% to 60 % **50% to 50 %** 60% to 40 % 70% to 30 % 80% to 20 % 90% to 10 %	Determines the weighting of the measured temperature value for the internal and external sensors. That results in an overall value which will be used for the further evaluation of the room temperature. Only if "Temperature detection" = "internal and external sensor
Calibration of internal sensor (-128...127) * 0.1 K	-128 to 127, **0**	Determines the value by which the internal sensor's room temperature value is calibrated. Only if "Temperature detection = internal sensor" or "internal and external sensor".
Calibration of external sensor (-128...127) * 0.1 K	-128 to 127, **0**	Determines the value to which the external sensor's room temperature value is adapted. Only if "Temperature detection = external sensor" or "internal and external sensor".
Interrogation interval for external sensor (0...255) * 1 min; 0 = inactive	0 to 255, **0**	Determines the interrogation interval for the external sensor's temperature value . 0" = sensor transmits its temperature value automatically. Only if "Temperature detection = external sensor" or "internal and external sensor".
Transmit when setpoint temperature changes by (0..255) * 0,1 K; 0 = no automatic transmission	0 to 255, **3**	Determines the size of the value change of the room temperature after which the current values are automatically transmitted to the bus via the "Actual temperature" object.
Cyclical transmission of room temperature (0...255) * 1 min; 0 = inactive	0 to 255, **15**	Determines whether or when the determined room temperature is to be cyclically output via the "Actual temperature" object.

Second operator control level

Change of comfort mode setpoint temperature	**disabled** enabled	Determines whether the temperature can be changed on the second operator control level.
Change of standby mode setpoint temperature (heating)	disabled **enabled**	Determines whether the temperature can be changed on the second operator control level.
Change of standby mode setpoint temperature (cooling)	disabled **enabled**	Determines whether the temperature can be changed on the second operator control level.
Change of night mode setpoint temperature (heating)	disabled **enabled**	Determines whether the temperature can be changed on the second operator control level.
Change of night mode setpoint temperature (cooling)	disabled **enabled**	Determines whether the temperature can be changed on the second operator control level.
Display & change of max. setpoint temperature (cooling)	**disabled** enabled	Determines whether the temperature can be changed on the second operator control level.
Display & change difference to outside temperature	**disabled** enabled	Determines whether the temperature can be changed on the second operator control level.

15.4 Display

Display

Backlighting	always OFF always ON **on by key-press** on in night mode on by key-press or in night mode Switching object inverted switching object on by key-press or via switching object on by key-press or via inverted switching object value object (0% … 100%) on by key-press or via value object	The display backlighting can be permanently on or off or it can be switched or dimmed driven by specific events. In the case of an activation by key-press, the room controller switches the lighting off again after a presettable time. In the case of an activation by another event (object value), the room controller switches the lighting off when the event has ended.
Automatic switch-off after	15 s 30 s 45 s **1.0 min** 1.5 min … 1 h	The display backlighting is switched off automatically after the preset time, if it had been switched on by a key-press.
Number of display pages	**1 page** 2 pages 3 pages 4 pages	Depending on the number of pages defined, further parameters and communication objects are displayed.
Display page recall	**no recall** via switching object via value object (1 byte)	This parameter can be used to display a 1-bit object for recalling of a defined page or a 1-byte object for recalling of any page. If the 1-bit object gets a value of "1" or when the 1-byte object gets a value from "1" to "4", the corresponding page is displayed. In this case, the cyclical display of pages is stopped. The normal cyclical display is resumed only after the object gets a value of "0".
Recall via switching object		
Display page switching object	page 1 **page 2** page 3 page 4	If the 1-bit object is used for page recall, this parameter determines which page is brought into the foreground.

Cyclical page change (1 … 60s)	1 … 60, **15**	This parameter defines how fast the display switches over between pages. In addition, the user can specify for each individual page whether it is to be included in the cyclical page change.
Info display after initialization	**OFF** Single-press operation Double-press operation	This parameter determines whether the display info mode is to be active after a new start (e.g. commissioning, return of voltage). In addition, the info mode can be selected. When this parameter is set to "off", the "Info-mode" object is not shown in the ETS.
Info text display time	3 s **5 s** 10 s	This parameter determines how long the help texts of the info mode are to be displayed when a key is pressed.
Display pictogram frame	no **yes**	Without the pictogram frame, only the presently active pictograms are visible. When the pictograms are displayed, the frames of the inactive pictograms are visible as placeholders.

Page 1 to page 4:

Except for the cyclical page change parameter, the setting options for the display pages are the same.

Page 1 in cyclical change	**yes**	The parameter defines whether the page is to be part of the cyclical change. For page 1, this parameter is set invariably to "yes". For the other pages, it can be changed.
Number of the symbol to be displayed from table of symbols page 1	0 … 30, **0**	The device software includes 30 symbols which can be displayed at the right margin of the text area. This parameter selects the symbol to be displayed. A value of "0" means that no symbol is displayed.
Recall of the symbol on page 1	**parameterized symbol** via 1-bit object via 1-byte object	The parameter determines whether the above selected symbol is fixed or whether it can be changed in operation.
Only with recall via 1-bit object		
Number of the symbol to be displayed for object value = 0 on page 1	0 … 30, **0**	When the symbol is selected via a 1-bit object, it is possible to choose different symbols for the two object values "0" and "1". A value of "0" means that no symbol is displayed.
Number of the symbol to be displayed for object value = 1 on page 1	0 … 30, **0**	
Number of lines	**1 line** 2 lines with large unit 2 lines with small unit 3 lines	The parameter fixes the number of text lines on the display page. Depending on this setting, further parameters and communication objects are displayed.

One-line display		
🗁 Line 1		
Line display	time of day time-of-day and weekday date setpoint temperature **actual temperature:** external temperature date + time of day time of day and date time of day + actual temperature Time of day + setpoint temperature Time of day + external/outside temperature	The parameter permits selecting the information to be displayed. The format of the corresponding values is fixed.
Two-line display		
🗁 Line 1		
Line display	time of day: time-of-day and weekday date setpoint temperature **actual temperature:** external temperature date + time of day time of day and date time of day + actual temperature time of day + setpoint temperature time of day + external/outside temperature value display fixed DPT 5.xxx (EIS 6) value display fixed DPT 9.xxx (EIS 5) value display fixed DPT 14.xxx (EIS 9)	The parameter permits selecting the information to be displayed. The format of the corresponding values is fixed.
Value display fixed DPT 5.xxx		
Unit text	(no standard value)	The unit text follows the value or the percentage sign directly without a space.
Display format	**0 … 255** 0 … 100%	1-byte values are optionally displayed as integers or as percentages.
Value display DPT 9.xxx and DPT 14.xxx		
Unit text	(no standard value)	The unit text follows the value or the percentage sign directly without a space.
Offset	-100000,00000 … 100000,00000; **0**	These parameters permit adapting the values.
Amplification	0,000 … 100000,000; **1**	
Number of digits to the left of the decimal point	0 … 9, **3**	
Number of digits after the decimal point	0 … 3, **0**	
Sign	no **yes**	

Line 2

Line display	time of day: time-of-day and weekday date setpoint temperature actual temperature: time of day and date switching dimming bind/shutter light-scene value display fixed DPT 5.xxx (EIS 6) value display fixed DPT 6.xxx (EIS 14) value DPT 7.xxx (EIS 10 unsigned) value DPT 8.xxx (EIS 10 unsigned) value DPT 9.xxx (EIS 5) value DPT 12.xxx (EIS 11 unsigned) value DPT 13.xxx (EIS 11 signed) value DPT 14.xxx (EIS 9) value DPT 16.xxx (EIS 15) **Static text**	The parameter permits selecting the information to be displayed.
Line text	(no standard value)	This text is displayed left-aligned It may have a maximum number of 18 characters.
Only with switching:		
Text for switching object value 0	**off**	The two texts for the different object values can be changed. They may have a maximum number of 18 characters.
Text for switching object value 1	**on**	
Only with blind/shutter:		
Text for move object value 0	**off**	The two texts for the different object values can be changed. They may have a maximum number of 18 characters.
Text for move object value 1	**on**	
Value display fixed DPT 5.xxx		
Unit text	(no standard value)	The unit text follows the value or the percentage sign directly without a space.
Display format:	**0 … 255** 0 … 100%	1-byte values are optionally displayed as integers or as percentages.

Value display DPT 5.xxx to DPT 9.xxx and DPT 14.xxx		
Unit text	(no standard value)	The unit text follows the value or the percentage sign directly without a space.
Offset	-100000,00000 … 100000,00000; **0**	These parameters permit adapting the values.
Amplification	0,000 … 100000,000; **1**	
Number of digits to the left of the decimal point	0 … 9, **3**	
Number of digits after the decimal point	0 … 3, **0**	
Sign	no **yes**	
With value display DPT 12.xxx		
Unit text	(no standard value)	The unit text follows the value or the percentage sign directly without a space.
With value display DPT 13.xxx		
Unit text	(no standard value)	The unit text follows the value or the percentage sign directly without a space.
Sign	no **yes**	The value can be displayed with or without sign.
Three-line display		
Line 1	See line 2 of two-line display	
Line 2	See line 2 of two-line display	
Line 3	See line 2 of two-line display	

15.5 Scenes

Scenes

Scene function?	yes **no**	The room controller can handle internally 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 customer 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 room controller, if any.
Data types scene output 1	**switching** value (0 … 255) value / blind/shutter position (0 … 100 %)	The room controller has an independent communication object for each of the eight actuator groups. With these parameters, the object type can be set separately for each output.
… scene output 8	**switching** value (0 … 255) value / blind/shutter position (0 … 100 %)	

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. If several internal scenes have the same scene number, only the first scene with this number can be called up.
Scene output 1 switching command	ON **OFF**	This parameter can be used to predefine the switching command of the first scene output. Visible only if "Data types scene output 1 = switching"!
Scene output 1 value (0 … 255)	**0** … 255	This parameter can be used to predefine the value of the first scene output. Visible only if "Data types scene output 1 = value (0 … 255)"!
Scene output 1 value / blind/shutter position (0 … 100 %)	**0** … 100	This parameter can be used to predefine the value of the first scene output. Visible only if "Data types scene output 1 = value / shutter position (1 … 100 %)"!

Scene output 1 Permit storing?	**yes** **no**	If the user is to be given the possibility of changing the value of the actuator group (scene output) within this scene and of storing it during regular operation, this parameter must be set to "yes".
Scene output 1 Permit transmission?	**yes** **no**	If the state of actuator group is to remain unchanged during the recall of a scene, this parameter can be set to "no". In this case, the room controller 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 output 1 Transmit delay (1 … 1200 * 100 ms) (0 = deactivated)	**0 … 1200**	When the room controller sends the telegrams to the various scene outputs, it can insert a presettable waiting time of 2 min. max. before each telegram. This can be used to reduce bus loading, but also to have certain lamps switched on only after the shutters are really closed. If no delay is selected, the room controller 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.
Scene outputs 2 … 8 see scene output 1!		

Scenes 2 … 8 see scene 1!

Software information
