KNX manual
iON 108 KNX
Room controller

iON 108 KNX- 4969238

iON 108 BK	4969248
iON 108 SR	4969268
iON 108 KNX G BK	4969298
iON 108 KNX G WH	4969288

theben

Contents

1 Functional characteristics

- Multifunction button with display
- Two button operation of up to 20 functions
- Functions: switching, dimming, blinds, scenes, values, sequence, colour control
- RGB, RGBW HSV, HSVW, and XY colour control.
- Display DPT9 values, temperature, CO_2 content etc.
- Integrated room temperature controller
- Display room temperature or internal RTC setpoint
- Control of operating mode, temperature and fan stages
- Durable LC display to show functions and status
- Brightness of the LC display adjustable via object or automatically controlled
- Bus coupling unit integrated
- No additional power supply required

2 Proper use

The iON 108 KNX room controller with integrated temperature sensor can be used in residential buildings, meeting rooms and offices, as well as in commercial buildings. It is mounted on a standard junction box using the supplied mounting plate. Combinations of two iON KNX are possible with a 2-way mounting plate available as an accessory. The integrated bus coupling unit makes installation and connection to the bus system quick and easy.

The iON 108 KNX room controller has 20 functions, an LC display and a BLE module for operation with the iONplay app via smartphone or tablet. It can be used to switch and dim lights, raise and lower blinds, trigger and save scenes, regulate temperature, control colours and display the status. The room controller also supports heating and cooling operating modes, as well as the control of the fan stages.

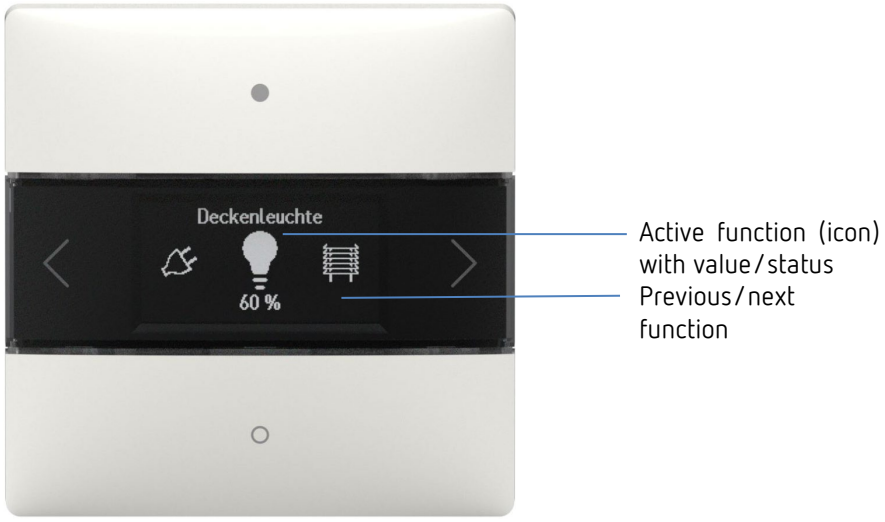
You can select a suitable icon from a library for each of the 20 functions on the ION 108 KNX room controller. The icon is supplemented by individual function names (for example "ceiling spots" or "terrace blinds") and the current status (on/off/dimming value/position). This makes the room controller easier to use and navigate. The brightness of the LC display adjusts itself depending on the surrounding brightness. If it is dark in the room, the display lighting is dimmed down to prevent disturbing light effects. During the day, the display shines brighter and thus remains optimally readable.

3 Technical data

KNX bus voltage	21-32 V DC
KNX bus power input	12.5 mA
KNX medium	TP1-256
Mode of operation	Type 1 in accordance with EN 60730-1
Ambient temperature	– 5 °C ... + 45 °C
Temperature measurement range	0 °C ... + 65 °C +- 0.4%
Protection rating	IP 20 in accordance with EN 60529
Protection class	III subject to correct installation
Pollution degree	2
Rated impulse voltage	0.8 kV
Radio frequency/transmission power	BLE 2.4 GHz Class 2 (2.5 mW) (iON 108 KNX)
Software	Class A

4 Operation

The iON 108 KNX room controller is a multi-touch sensor with 4 buttons (up/down/right/left).



4.1 Selecting functions

➢ Press the right/left arrow button.

→ A function is selected (switching On/Off, dimming, blinds, function, move 0-255, percent list, floating point 2 byte, floating point 4 byte, HVAC, scenes, colour temperature, RGB, RGBW, XY colour, sequence, actual temperature).

4.1.1 Further settings in the functions

➢ Press buttons up/down.

→ Operating the selected functions. The LEDs light up to confirm.

4.2 Favourites

If more than one function or the room temperature controller (RTC) is activated, up to three functions can be selected as favourites A, B, C. This allows the three most frequently required functions to be called up directly one after the other.

Parameter		**Long button push**	
Activate room temperature controller	*Favourite A*	Left	Right
yes	F1..F20	Display RTC	Jump between favourites
yes	RTC	Jump between favourites	
no	F1..F20	Jump between favourites	

4.3 Room temperature controller (RTC) function

If the room temperature controller is selected, the measured actual temperature is displayed in this level. Depending on the configuration in the ETS parameters, the left/right buttons can be used to go to the settings of setpoint temperature, operating mode, fan speed, etc.
If required, the respective setting can be changed with the up/down buttons.

5 Operation via iONplay app

The iON 108 KNX room controller can be controlled via Bluetooth using the iONplay app. The smartphone or tablet will be connected to the room controller via the integrated Bluetooth module. The duration of pairing can be set individually.

ⓘ Up to 30 room controllers can be managed via the app. The app visualizes and controls up to 20 functions.

The app control of the iON 108 KNX room controller is especially suitable for living rooms, meeting rooms or hotels. When used in a hotel, the pairing is automatically terminated after an adjustable period.

5.1 Connecting smartphone/tablet to the room controller

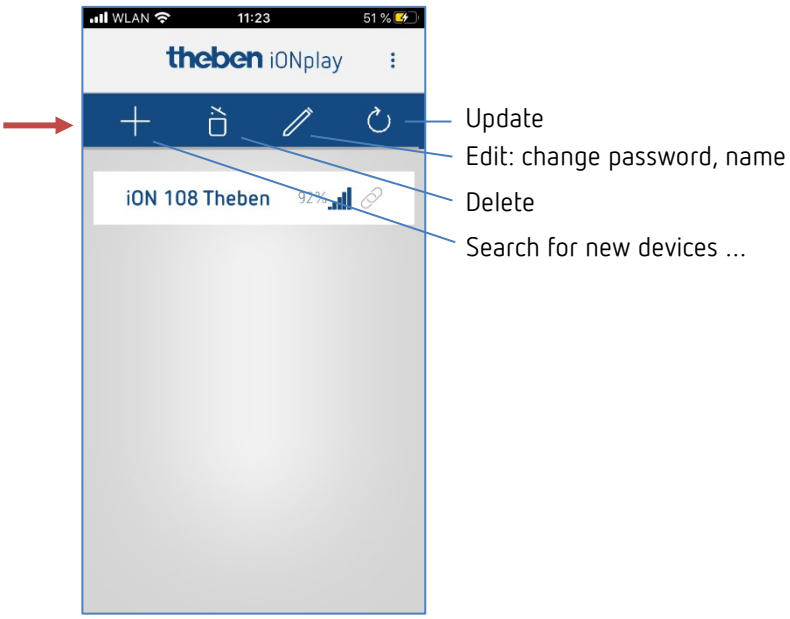
The iON is connected to the app on the smartphone using the buttons on the device. The duration of the pairing can be set in the ETS.

➢ Download the iONplay app from the App Store or Google Play Store.

Available on the App Store

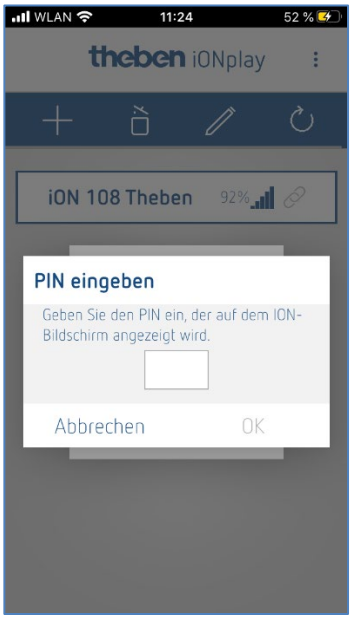
GET IT ON Google play

➢ Open iONplay app and press + in the menu bar.



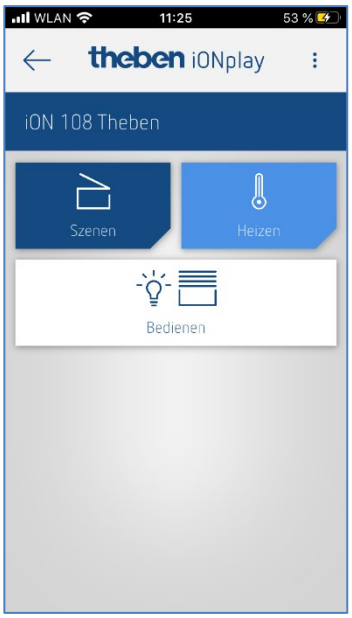
→ Device list of available iON devices appears

- Select device and confirm with OK.
- Tap on displayed device.
- Enter the PIN that appears on the iON display.



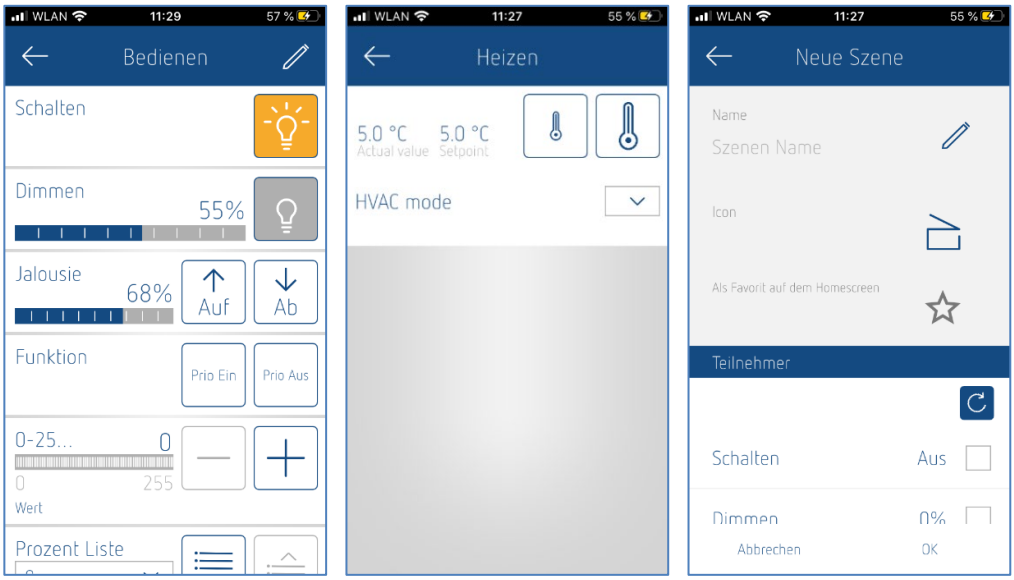
- Press OK.

The following window opens:



Here, you can use the button

- **Operate** → to switch, dim, raise or lower blinds etc. or use the button
- **Heating** → for comfort temperature, temperature reduction at night etc. or use
- **Scenes** → to enter new lighting scenarios



If the time set in the ETS application is exceeded, the connection is not established automatically. The devices must be paired again (e.g. hotel application, so a guest cannot control previous rooms on his next visit).

In the event of a device failure, "---" appears in the temperature display (either RTC display or function=actual value).

6 The iON 108 application program

6.1 Selection in the product database

Manufacturer	Theben AG
Product family	Push-buttons
Product type	iON
Program names	iON 108

Number of communication objects	Max. 129
Number of group addresses	255
Number of associations	255

ⓘ The ETS database can be found on our website: www.theben.de/downloads

ⓘ Recommended ETS version: ETS 5.7.5 or higher

6.2 Overview of communication objects

6.2.1 General information

No.	Object name	Function	Length	R	W	C	T	DPT
1	*Display*	*Reduced*	1 bit	-	W	C	-	1.001
		Brightness	1 byte	-	W	C	-	5.001
2	*Block display*	*Block = 1*	1 bit	-	W	C	-	1.001
		Block = 0	1 bit	-	W	C	-	1.003
4	*In operation message*	*Send*	1 bit	R	-	C	T	1.001
5	*Alarm*	*Input*	1 bit	-	W	C	-	1.005
6	*Buttons*	*Block = 1*	1 bit	-	W	C	-	1.001
		Block = 0	1 bit	-	W	C	-	1.003

6.2.2 General button functions

No.	Object name	Function	Length	R	W	C	T	DPT
10	*F1*	*Switching*	1 bit	R	W	C	T	1.001
		Priority	2 bit	R	W	C	T	2.001
		Send value	1 byte	R	W	C	T	5.010
		Send percentage value	1 byte	R	W	C	T	5.001
		2 bytes DPT 9.x	2 bytes	R	W	C	T	9.001
		4 bytes DPT 14.x	4 bytes	R	W	C	T	14.014
		HVAC operating mode	1 byte	R	W	C	T	20.108
		Call up scene	1 byte	R	-	C	T	17.001
		Call up/save scene	1 byte	R	-	C	T	18.001
		Send colour temperature	2 bytes	R	-	C	T	7.600
		RGB value	3 bytes	R	-	C	T	232.600
		RGBW value	6 bytes	R	-	C	T	251.600
		RGB(W) red	1 byte	R	-	C	T	5.001
		HSV(W) colour hue	1 byte	R	-	C	T	5.003
		XY value	6 bytes	R	-	C	T	242.600
		X colour value	2 bytes	R	-	C	T	7.001
11	*F1*	*RGB(W) green*	1 byte	R	-	C	T	5.001
		HSV(W) saturation	1 byte	R	-	C	T	5.001
		Y colour value	2 bytes	R	-	C	T	7.001
12	*F1*	*XY brightness*	1 byte	R	-	C	T	5.001
		RGB(W) blue	1 byte	R	-	C	T	5.001
		HSV(W) brightness	1 byte	R	-	C	T	5.001
13	*F1*	*White level*	1 byte	R	-	C	T	5.001

6.2.3 Dimming function

No.	Object name	Function	Length	R	W	C	T	DPT
10	*F1*	*Switching*	1 bit	R	W	C	T	1.001
11	*F1*	*Brighter/darker*	4 bit	R	-	C	T	3.007
12	*F1*	*Dimming value feedback*	8 bit	-	W	C	-	5.001
13	*F1.1*	*Send dimming value (double-click + iON Play)*	1 byte	R	W	C	T	5.001

6.2.4 Blinds function

No.	Object name	Function	Length	R	W	C	T	DPT
10	*F1*	*Step/stop*	1 bit	-	-	C	T	1.010
11	*F1*	*UP/DOWN*	1 bit	-	W	C	T	1.008
		UP	1 bit	-	-	C	T	1.008
		DOWN	1 bit	-	-	C	T	1.008
12	*F1.1*	*Height % (double-click + iON Play)*	1 byte	-	-	C	T	5.001
13	*F1.1*	*Slat %*	1 byte	-	-	C	T	5.001

6.2.5 Sequence function

No.	Object name	Function	Length	R	W	C	T	DPT
10	*F1.1*	*Switching*	1 bit	R	W	C	T	1.001
		Priority	2 bit	R	W	C	T	2.001
		Send value	1 byte	R	W	C	T	5.010
		Send percentage value	1 byte	R	W	C	T	5.001
		2 bytes DPT 9.x	2 bytes	R	W	C	T	9.001
		4 bytes DPT 14.x	4 bytes	R	W	C	T	14.014
		HVAC operating mode	1 byte	R	W	C	T	20.108
		Call up scene	1 byte	R	-	C	T	17.001
		Send colour temperature	2 bytes	R	-	C	T	7.600
		RGB value	3 bytes	R	-	C	T	232.600
		RGBW value	6 bytes	R	-	C	T	251.600
		XY value	6 bytes	R	-	C	T	242.600
11	*F1.2*	*Switching*	1 bit	R	W	C	T	1.001
		Priority	2 bit	R	W	C	T	2.001
		Send value	1 byte	R	W	C	T	5.010
		Send percentage value	1 byte	R	W	C	T	5.001
		2 bytes DPT 9.x	2 bytes	R	W	C	T	9.001
		4 bytes DPT 14.x	4 bytes	R	W	C	T	14.014
		HVAC operating mode	1 byte	R	W	C	T	20.108
		Call up scene	1 byte	R	-	C	T	17.001
		Send colour temperature	2 bytes	R	-	C	T	7.600
		RGB value	3 bytes	R	-	C	T	232.600
		RGBW value	6 bytes	R	-	C	T	251.600
		XY value	6 bytes	R	-	C	T	242.600
12	*F1.3*	*Switching*	1 bit	R	W	C	T	1.001
		Priority	2 bit	R	W	C	T	2.001
		Send value	1 byte	R	W	C	T	5.010
		Send percentage value	1 byte	R	W	C	T	5.001
		2 bytes DPT 9.x	2 bytes	R	W	C	T	9.001
		4 bytes DPT 14.x	4 bytes	R	W	C	T	14.014
		HVAC operating mode	1 byte	R	W	C	T	20.108
		Call up scene	1 byte	R	-	C	T	17.001
		Send colour temperature	2 bytes	R	-	C	T	7.600
		RGB value	3 bytes	R	-	C	T	232.600
		RGBW value	6 bytes	R	-	C	T	251.600
		XY value	6 bytes	R	-	C	T	242.600
13	*F1.4*	*Switching*	1 bit	R	W	C	T	1.001
		Priority	2 bit	R	W	C	T	2.001
		Send value	1 byte	R	W	C	T	5.010
		Send percentage value	1 byte	R	W	C	T	5.001
		2 bytes DPT 9.x	2 bytes	R	W	C	T	9.001
		4 bytes DPT 14.x	4 bytes	R	W	C	T	14.014
		HVAC operating mode	1 byte	R	W	C	T	20.108
		Call up scene	1 byte	R	-	C	T	17.001
		Send colour temperature	2 bytes	R	-	C	T	7.600
		RGB value	3 bytes	R	-	C	T	232.600
		RGBW value	6 bytes	R	-	C	T	251.600

No.	Object name	Function	Length	R	W	C	T	DPT
		XY value	6 bytes	R	-	C	T	242.600

6.2.6 Display value function

No.	Object name	Function	Length	R	W	C	T	DPT
10	*F1*	*Display value (switching)*	2 byte	-	W	C	-	1.xxx
		Display value (0-255)	2 byte	-	W	C	-	5.010
		Display value (%)	2 byte	-	W	C	-	5.001
		Display value (DPT7.)*	2 byte	-	W	C	-	7.xxx
		Display value (DPT8.)*	2 byte	-	W	C	-	8.xxx
		Display value (DPT9.)*	2 byte	-	W	C	-	9.xxx

6.2.7 Controller extension unit function

No.	Object name	Function	Length	R	W	C	T	DPT
10	*F1*	*Send setpoint value*	2 bytes	R	-	C	T	9001
11	*F1*	*Receive setpoint value*	2 bytes	-	W	C	-	9001
12	*F1*	*Receive actual value*	2 bytes	-	W	C	-	9001

6.2.8 Room temperature controller (RTC)

No.	Object name	Function	Length	R	W	C	T	DPT
250	*Base setpoint*	*Defining the set temperature*	2 bytes	-	W	C	-	9.001
251	*Manual setpoint offset*	*Receive*	2 bytes	-	W	C	-	9.002
252	*Manual setpoint offset*	*Send*	2 Bytes	R	-	C	T	9.002
253	*Outdoor temperature compensation*	*Move setpoint*	2 bytes	-	W	C	-	9.002
		Send	2 bytes	R	-	C	T	9.002
254	*Operating mode preset*	*Receive*	1 byte	-	W	C	-	20.102
255	*Presence*	*Receive*	1 bit	-	W	C	-	1.018
256	*Window status*	*Closed=0, open=1*	1 bit	-	W	C	-	1.019
257	*Current operating mode*	*Send*	1 byte	R	-	C	T	20.102
258	*Operating mode as scene*	*Save/call up*	1 byte	-	W	C	T	18.001
259	*Heating/cooling actuating value*	*Send*	1 byte	-	-	C	T	5.001
259	*Heating/cooling actuating value*	*Send*	1 bit	-	-	C	T	1.001
	Heating actuating value		1 bit	-	-	C	T	1.001
			1 byte	-	-	C	T	5.001
260	*PWM heating additional stage*	*Send*	1 byte	-	-	C	T	5.001
	Actuating value additional stage heating		1 bit	-	-	C	T	1.001
261	*Cooling actuating value*	*Send*	1 bit	-	-	C	T	1.001
			1 byte	-	-	C	T	5.001
262	*Actuating value additional stage cooling*	*Send*	1 byte	-	-	C	T	5.001
	PWM cooling additional stage		1 bit	-	-	C	T	1.001
263	*Send heating mode/cooling mode*	*0 = heating, 1 = cooling*	1 bit	R	-	C	T	1.001
		0 = cooling, 1 = heating	1 bit	R	-	C	T	1.100
	Change over between heating and cooling	*0 = heating, 1 = cooling*	1 bit	-	W	C	-	1.001
		0 = cooling, 1 = heating	1 bit	-	W	C	-	1.100
264	*Current setpoint*	*Setting/sending*	2 bytes	R	W	C	T	9.001
265	*Control actual value*	*send*	2 bytes	-	-	C	T	9.001
266	*External actual value*	*Receive*	2 bytes	-	W	C	-	9.001
267	*Actual value failure*	*Send*	1 bit	R	-	C	T	1.001
268	*Outdoor temperature*	*Receive*	2 bytes	-	W	C	-	9.001
269	*Dew point alarm*	*Receive*	1 bit	-	W	C	-	1.005
270	*Fan stage in forced operation*	*Send*	1 byte	R	-	C	T	5.010
271	*Fan Forced/Auto*	*Send: Auto = 1, Forced = 0*	1 bit	R	-	C	T	1.001
		Send: Forced = 1, Auto = 0	1 bit	R	-	C	T	1.001
272	*Fan stage in forced operation*	*Receive*	1 byte	-	W	C	-	5.010

No.	Object name	Function	Length	R	W	C	T	DPT
273	*Fan Forced/Auto*	*Receive: Auto = 1, Forced = 0*	1 bit	-	W	C	-	1.001
		Receive: Forced = 1, Auto = 0	1 bit	-	W	C	-	1.001
274	*Actual value floor temperature*	*Receive*	2 bytes	-	W	C	-	9.001

6.3 Description of communication objects

6.3.1 General objects

Object 1: Device LEDs
Only available with the setting *Reduce brightness of LEDs = via bus*.

Object type	Function
Via switch object	1 = Reduce brightness 0 = normal brightness
Via percentage value	0..100% = maximum LED brightness

Object 2: Block display
The display is blocked via this object.
The polarity of the block telegram can be configured on the General/Settings parameter page.

Object 4: Send in operation message
Sends cyclically[1] a 1 as signal indicating that the device is present and in operation.

Object 5: Alarm
1 bit receive object.
Reception of an external alarm telegram is indicated by flashing or pulsing of all LEDs.
LED colour and time intervals can be set on the ***Alarm*** parameter page.

Object 6: Block buttons
All buttons are blocked via this object.
The direction of action of the block object is defined on the ***Settings*** parameter page.

[1] See *Send operating message* parameter.

6.3.2 Switching function (1 bit)

Object 10: F1 switching
Sends ON/OFF switching telegrams.

6.3.3 Dimming function

Object 10: F1 switching
Switches the dimmer on and off.

Object 11: F1 brighter/darker
4-bit dimming commands.

Object 12: F1 dimming value feedback
Receives the current dimming value of the dimming actuator.

Object 13: F1.1 send dimming value (double-click + iON Play)
Output object for the additional function with double-click.
This allows a predefined dimming value to be set directly.


The object can also be used with the iON Play app.
This function is also available when the double-click function is deactivated.

6.3.4 Blinds function

Object 10: F1 step/stop
Sends step/stop commands to the blind actuator.

Object 11: F1 UP/DOWN
Sends operating commands to the blind actuator.

Object 12: F1 height feedback %
Receives the current actuating height of the blind actuator.

Object 13: F1.1 height % (double-click + iON Play)
Height telegram for positioning the blinds upon double-click.

> The object can also be used with the iON Play app.
> This function is also available when the double-click function is deactivated.

Object 14: F1.1 – slat %
Slat telegram for positioning the blinds upon double-click.

6.3.5 Priority function (2 bit)

Object 10: F1 priority
Sends priority telegrams.

6.3.6 Value function (1 byte)

Object 10: F1 send value
Sends value telegrams 0-255.

6.3.7 Percentage value function (1 byte)

Object 10: F1 send percentage value
Sends percentage telegrams 0-100%.

6.3.8 Floating-point number DPT 9.x function (2 byte)

Object 10: F1 send 2 byte DPT9.x
Sends floating point values from -670760 to 670760.

6.3.9 Floating-point number DPT 14.x function (4 byte)

Object 10: F1 send 4 byte DPT14.x
Sends floating point values from -1E+38 to 1E+38.
Coding: IEEE-754 single.

6.3.10 HVAC function

Object 10 F1 HVAC operating mode
Coding of HVAC operation modes:

Value	Operating mode
0	Auto
1	Comfort
2	Standby
3	Night
4	Frost protection/heat protection

6.3.11 Scenes function

Object 10 F1 HVAC operating mode
Sends retrieval or storage telegrams for scene numbers 1-64.

6.3.12 Colour temperature function DPT 7.600 (2 byte)

Object 10: F1 send colour temperature
Sends colour temperature telegrams from 1000 to 10000 K.

6.3.13 RGB/RGBW/XY colour value function

With these colour values, the colour components can either be sent together in one object or separately to several objects.
In HSV or HSVW format, the output is exclusively via separate objects.

Objects 10, 11, 12, 13 RGB, RGBW, XY colour value, red, green, blue, white value

Function	Output	Obj. No.	Object function
RGB colour value	*RGB 3 bytes*	*10*	*RGB value*
	RGB separate objects	*10*	*RGB(W) red*
		11	*RGB(W) green*
		12	*RGB(W) blue*
	HSV separate objects	*10*	*HSV(W) colour hue*
		11	*HSV(W) saturation*
		12	*HSV(W) brightness*
RGBW colour value	*RGBW 6 bytes*	*10*	*RGB value*
	RGBW separate objects	*10*	*RGB(W) red*
		11	*RGB(W) green*
		12	*RGB(W) blue*
		13	*White level*
	HSVW separate objects	*10*	*HSV(W) colour hue*
		11	*HSV(W) saturation*
		12	*HSV(W) brightness*
		13	*White level*
XY colour value	*XY 6 bytes*	*10*	*XY value*
	XY separate objects	*10*	*X colour value*
		11	*Y colour value*
		12	*XY brightness*

6.3.14 Sequence function

Object 10 F1.1

First output object of the sequence.
12 telegram formats can be set:
Switching ON/OFF, priority, send percentage value, send value, 2 byte DPT 9.x, 4 byte DPT 14.x. HVAC modes, scenes (call up or send), colour temperature, colours[2] in RGB, RGBW and XY format.

Object 11 F1.2

Second output object of the sequence.
12 telegram formats can be set:
Switching ON/OFF, priority, send percentage value, send value, 2 byte DPT 9.x, 4 byte DPT 14.x. HVAC modes, scenes (call up or send), colour temperature, colours[3] in RGB, RGBW and XY format.

[2] Here, the colours are output as 3 or 6 byte object.
[3] Here, the colours are output as 3 or 6 byte object.

Object 12 F1.3
Third output object of the sequence.
12 telegram formats can be set:
Switching ON/OFF, priority, send percentage value, send value, 2 byte DPT 9.x, 4 byte DPT 14.x. HVAC modes, scenes (call up or send), colour temperature, colours[4] in RGB, RGBW and XY format.

Object 13 F1.4
Fourth output object of the sequence.
12 telegram formats can be set:
Switching ON/OFF, priority, send percentage value, send value, 2 byte DPT 9.x, 4 byte DPT 14.x. HVAC modes, scenes (call up or send), colour temperature, colours[5] in RGB, RGBW and XY format.

6.3.15 Display value function

Object 10: F1 display value [6]
Receives an external value to be shown on the display.
The format is defined with the object type parameter.

Object types	Format
Switching (1 bit)	DPT1.xxx
Value 0-255 (1 byte)	DPT5.010
Percentage value (1 byte)	DPT5.001
Value 0-65535 DPT7.x (2 byte)	DPT7.xxx
Value -32768...32767 DPT8.x (2 byte)	DPT8.xxx
Floating-point number DPT 9.x (2 byte)	DPT9.xxx

6.3.16 Controller extension function[7]

Object 10: F1 send setpoint
Sends the setpoint set on the device for a controller in a different room (external controller).

Object 11: F1 receive setpoint
Receives the current setpoint of the external controller.

Object 12: F1 receive actual value
Receives the current actual value of the external controller.

[4] Here, the colours are output as 3 or 6 byte object.
[5] Here, the colours are output as 3 or 6 byte object.
[6] Only for devices from firmware version 1.1.0 and application program from V2.0.
[7] Only for devices from firmware version 1.1.0 and application program from V2.0.

6.3.17 Objects for the room temperature controller (RTC)

Object 250: Base setpoint
The function of the object is defined by the parameter *Rotary control function*.

Parameter: *Rotary control function*	Object function
Base setpoint	Sends the base setpoint set at the rotary control.
Manual offset or blocked	Receives the base setpoint from the bus. The base setpoint is first specified via the application at start-up and stored in the *Base setpoint* object. Afterwards, it can be specified again at any time via this object (limited by the *minimum* or *maximum valid setpoint*).

Object 251: Receive manual setpoint offset
The object receives a temperature difference.
The desired room temperature (current setpoint) can be adjusted against the base setpoint by this difference.
The following applies in comfort mode (heating):
Current setpoint = base setpoint + manual setpoint offset.
Values outside the configured range are limited to the highest or lowest value.
If a 0 is received, a previously entered setpoint offset is
reset to 0 K.

Object 252: Send manual setpoint offset
The object reports back the currently set setpoint offset (see above).

Object 253: Outdoor temperature compensation/move setpoint
The function of the object is defined by the parameter *setpoint correction at high outdoor temperature*.

Setpoint correction at high outdoor temperature	Object function	Data direction
Receive only	Receives setpoint correction for outdoor temperature compensation.	Receive
Calculate internally and send	Reports the current setpoint correction as an amount or as a differential. The format of the correction value (see following table) is set on the ***Setpoint adjustment*** parameter page.	Send

Format of correction value	Object function	Example
Absolute	Sends the amount: Unadjusted base setpoint + setpoint correction as setpoint for additional temperature controllers.	Unadjusted base setpoint = 20 °C. Setpoint correction = +2 K The object transmits: 22 °C
Relative	Calculated setpoint correction (in Kelvin) based on outdoor temperature.	Unadjusted base setpoint = 20 °C. Setpoint correction = +2 K The object sends: 2 K

Object 254: Operating mode preset

Can be used to directly activate one of 4 operating modes.
1 = Comfort
2 = Standby
3 = Night,
4 = Frost protection (heat protection)

The configured *operating mode after reset* is active until a new valid operating mode is received or changed at the device by the user.

Object 255: Presence.

The status of a presence detector (e.g. push button, motion detector) can be received via this object.
1 on this object activates comfort operating mode.

Object 256: Window status

Window position:
The status of a window contact can be received via this object.
1 on this object activates frost/heat protection operating mode.

Object 257: Current operating mode.

Sends the current HVAC operating mode.

Value	HVAC operating mode
1	Comfort
2	Standby
3	Night
4	Frost protection/heat protection

Object 258: Operating mode as scene.

Teaching in and calling up scenes.
A scene only consists of the current operating mode preset.
Saving scene: The current value of the *Operating mode preset* object is saved together with the corresponding scene number.
Calling up scene: The content of the *Operating mode preset* object will be overwritten by the saved value, and the new operating mode will be accepted by the RTC.
See in the Appendix, *Operating mode as scene*

Object 259: Heating actuating value or heating/cooling actuating value.

Sends the current heating actuating value (0...100%) or heating or cooling if the *output of cooling actuating value* parameter has been set to *together with heating actuating value*. (***Cooling control*** parameter page).

Type of control	Object format
Continuous	1 byte
2-point	1 bit

Object 260 Additional heating stage actuating value or PWM additional heating stage

Sends the actuating value for the additional heating stage depending on the configuration, as 1 bit PWM, or 1 byte percentage telegram.
This object is only available if the additional stage is used.

Object 261: Cooling actuating value

Sends the current actuating value or cooling switching command depending on the type of control selected on the ***Cooling control*** parameter page.
The object is only available if the cooling function has been selected on the ***Settings*** parameter page (*control* = heating and cooling).

Object 262: Additional cooling stage actuating value or PWM additional cooling stage

Sends the actuating value for the additional cooling stage depending on the configuration, as 1 bit PWM, or 1 byte percentage telegram.
This object is only available if the additional stage is used.

Object 263: Send heating/cooling operation, or change over between heating and cooling

The object is available if the cooling function has been selected on the ***Settings*** parameter page (*control = heating and cooling*).
The function of the object depends on the *change over between heating and cooling* parameter on the ***Cooling control*** parameter page.

Parameter: Change over between heating and cooling	Function
automatic	Reports whether the room thermostat is currently operating in heating or cooling mode.
via object	Receives the switch command for change over between heating and cooling mode.

The telegram format can be set on the ***Cooling control*** parameter page:

Parameter: *Format of Heating/cooling object*	Telegram format
DPT1.100	Heating = 1, cooling = 0
Inverted	Heating = 0, cooling = 1

Object 264: Current setpoint

Sends the current set temperature.
The transmission behaviour can be set on the ***Heating setpoints*** parameter page.

Object 265: Control actual value

Sends the actual value actually used by the room temperature controller.

Object 266: External actual value

Only available if *external actual value* has been selected as a source.

Receives the room temperature from another measurement point via the bus.
This object can be activated on the ***Actual value*** parameter page.

Object 267: Send actual value failure

Only available if the actual value monitoring is activated (*Monitor actual value = yes*).
Sends a 1, as soon as one of the selected sources for the actual value provides an unusable value, or (if selected) if no new actual value telegram has been received by the *External actual value* object within the actual value monitoring time.

Unusable temperature values might occur if a temperature sensor is mechanically damaged, or if the electrical connection is interrupted or short-circuited.

As long as at least one valid actual value remains available, this will be continued to be used for control, and the emergency program remains inactive. This is the case if the average value is determined from the internal and an external sensor.

Object 268: Receive outdoor temperature

Only available if the *setpoint correction at high outdoor temperature* parameter has been set to *calculate internally and send*.
Receives the outdoor temperature for internal calculation of the setpoint adjustment in cooling mode

Object 269: Receive dew point alarm

The object is available if the cooling function has been selected on the ***Settings*** parameter page (*control = heating and cooling*).
When receiving a 1, cooling will be stopped, so the temperature cannot drop down to the dew point.

Object 270: Fan stage in forced mode - send

The object is available if the fan stage control parameter has been set to yes (RTC setting parameter page).

If a manual fan stage is selected on the device, this object sends a percentage value that corresponds to the configured threshold value.
Alternatively, a fan stage between 1 and 5 can also be sent.
To do this, the *Fan stage telegram format* parameter must be set to *stages 1 to 5*.

See in the Appendix: Fan forced mode

The forced operation of the fan has no effect on the actuating value

Object 271: Fan forced/ auto - send

The object is available if the fan stage control parameter has been set to yes (RTC setting parameter page).

Sends a forced command to the fan coil actuator or to fan control if a fan stage on the device is set manually on the RTC display page.

The fan stage desired for forced operation is sent by the Fan stage in forced mode object.

See in the Appendix: *Fan forced mode*.

Object 272: Fan stage in forced mode - receive

The object is available if the fan stage control parameter has been set to yes (RTC setting parameter page).

Receives the current fan stage of the fan coil actuator or fan control to display it.

See in the Appendix: Fan forced mode

Object 273: Fan forced/auto - receive

The object is available if the fan stage control parameter has been set to yes (RTC setting parameter page).

Receives the current status of the fan coil actuator or fan control to display it

See in the Appendix: *Fan forced mode*.

Object 274: Actual value floor temperature

Only available if *system type = floor heating and use floor temperature limitation = yes*.
Receives the current floor temperature in order to limit it.

6.4 Parameter pages overview

Parameter page	Description
General functional block	
Settings	Basic settings: Number of functions, activate room temperature controller, operating properties, individual texts, etc.
Alarm	Display behaviour on reception of an alarm telegram.
Favourites	Settings for quick access and preferred sequence of functions.
Function blocks F1-F20	
Configuration options	Function of the buttons: object type, type of control, transmission behaviour etc.
Double-click	Additional telegrams for *Dimming* and *Blinds*.
Sequence	Sequence characteristics. Object format
Step 1	Set transmission behaviour, telegrams and time.
Step 2	
Step 3	
Step 4	
RTC functional block	
Setting	General settings for operation and temperature control
Actual value	Source for actual value measurement, actual value monitoring etc.
Operating mode	Operating mode after reset, presence sensor etc.
Heating control	Control parameters, installation type etc. for heating mode.
Heating setpoints	Base setpoint, lowering, frost protection etc.
Additional stage heating	Type of actuating value, proportional band, transmission behaviour.
Cooling control	Control parameters, installation type etc. for cooling mode.
Cooling setpoints	Dead zone, standby, heat protection etc.
Setpoint adjustment	Setting of maximum adjustment.
Additional stage cooling	Type of actuating value, proportional band, transmission behaviour.
Fan stages	Settings for forced operation and fan stage display.

6.5 General parameters

6.5.1 Settings

The upper and lower button together create a function, such as switching, dimming etc.
The device can execute up to 20 different functions.
The desired function is selected by pressing the buttons left and right.

Designation	Values	Description
Device names	Text field	User-specific designation for this device.
Number of functions	0-20	Number of required functions
Activate room temperature controller (RTC)[8]	***No*** Yes	Use room temperature controller function?
RTC display and operation on the device[9]	*No*	The room temperature controller works in the background, but it is not visible to the user and cannot be controlled.
	Yes	The room temperature controller is displayed and can be operated.
Activate Bluetooth[10]	*no*	Do not use Bluetooth functions.
	yes	Use Bluetooth functions.
Activate alarm function	***no***	Do not use.
	yes	See below, parameter page ***Alarm***.
Reduce display brightness		The display should:
	never	Shine at maximum brightness at all times.
	always	Always shine at the specified brightness
	at darkness	Shine at the specified brightness when it is dark in the room.
	via bus	Be able to be reduced or dimmed via bus telegrams.

[8] Always activated if *Number of functions = 0*. Only for devices from firmware version 1.1.0 and application program from V2.0.
[9] Only available if parameter *Activate room temperature controller (RTC) = yes Only for devices from firmware version 1.1.0 and application program from V2.0.*
[10] Only for devices from firmware version 1.1.0 and application program from V2.0.

Designation	Values	Description
Switch off display	***never***	The display always remains on.
	after 1 min *after 2 min* *after 5 min* *after 10 min*	The display only switches on when a button is pressed and goes out after the configured time.
Object type	***via switch object***	Brightness reducible via switch telegram.
	via percentage value	The brightness of the display can be set as desired via dimming telegrams.
Value for reduced brightness	*0-100%* Default = ***30%***	Reduced display brightness, if not specified via the bus.
Swap upper and lower display lines[11]	*no*	Original sequence: The function name is displayed in the top line and the status in the bottom line.
	yes	The status is displayed in the top line and the function name in the bottom line.
Send operating message	*Never* *every 2 min* *every 3 min* *...* ***every 30 min*** *every 45 min* *every 60 min*	The device has the option of sending an operating message to the bus to indicate whether it is still functional or present (anti-theft protection).
Polarity blocking telegrams	***Block with 1 (standard)***	0 = cancel block 1 = block
	Block with 0	0 = block 1 = cancel block
Long button push starting at	***300 ms***, *400 ms* *500 ms, 600 ms* *700 ms, 800 ms* *900 ms, 1 s, 1,5 s,* *2 s, 2,5 s, 3 s*[12]	Serves to clearly differentiate between long and short button push. If the button is pressed for at least as long as the set time, then a long button push will be registered.
Time for double-click	***300 ms***, *400 ms* *500 ms, 600 ms* *700 ms, 800 ms* *900 ms, 1 s*	Serves to differentiate between a double-click and 2 single clicks. Time period in which the second click must begin, in order to recognise a double-click.
For value lists or move value		

[11] From firmware version 1.23 and application program version 2.2
[12] Only for devices from firmware version 1.1.0 and application program from V2.0.

Designation	Values	Description
Send delay	*Send each value immediately* ***1 s**, 2 s, 3 s, 4 s, 5 s*	When tapping within a value list or using the move values function: Always send the currently displayed value immediately. Only send after a waiting time. Prevents the disturbing transmission of intermediate values. This allows several values to be skipped, and only the last selected value is transmitted.
Scroll direction top button	***Ascending: value or list entry 1, 2, 3*** *Descending: value or list entry 3, 2, 1*	This parameter determines the running direction of all list entries. **Move value:** Smallest value first. **Value list:** First list entry first. **Move value:** Greatest value first. **Value list:** Last list entry first.
Scroll direction bottom button	*Ascending: value or list entry 1, 2, 3* ***Descending: value or list entry 3, 2, 1***	Is set automatically.
Texts for HVAC operating modes		
Text for auto	***Auto***	User-specific texts for the HVAC operating modes.
Text for comfort	***Comfort***	
Text for standby	***Standby***	
Text for night mode	***Eco***	
Text for frost or heat protection	***Protect***	

6.5.2 Alarm

The display can be used to signal an alarm condition.
When an alarm object is received, the display flashes or pulses at the specified time interval.

Designation	Values	Description
Trigger alarm function at	***Object value = 1*** *Object value = 0*	Polarity of the alarm object
Behaviour on alarm display active	***Flashing*** *Pulsing*	Behaviour on reception of an alarm telegram.
Flashing – duty cycle	*100..2000 ms* Default = ***500 ms***	Desired duty cycle (1000 ms = 1 second).
Flashing – switch-off duration	*100..2000 ms* Default = ***500 ms***	Desired switch-off duration.

6.5.3 Favourites

ⓘ This parameter page is available when more than 1 function or the RTC is activated[13]

Quick access

ⓘ This allows the 3 most frequently used functions to be called up directly one after the other, without detouring via the those in between.

Designation	Values	Description
Favourite A	*RTC* ***Function F1*** *Function F2* *Function F3* *Function F4* ... *Function F18* *Function F19* *Function F20*	Available favourites for the quick access. The order in which the favourites are called up depends on the *sequence of functions* configured below.
Favourite B	*Function F1* ***Function F2*** *Function F3* *Function F4* ... *Function F18* *Function F19* *Function F20*	
Favourite C	*Function F1* *Function F2* ***Function F3*** *Function F4* ... *Function F18* *Function F19* *Function F20*	
Automatically back to favourite A	*never* *after 1 min* *after 2 min* *after 5 min* *after 10 min*	The display remains on the function last used. After the set time, the display always returns to the function set as *Favourite A*.

[13] See *Number of functions* parameter + *Activate room temperature controller* on the ***Settings*** parameter page.

Switch between favourites:

Parameter		**Long button push**	
Activate room temperature controller	*Favourite A*	Left	Right
yes	F1..F20	Display RTC	Jump between favourites
yes	RTC	Jump between favourites	
no	F1..F20	Jump between favourites	

Sequence of functions

The order of the functions can be adjusted to user-specific requirements with F1..F20 so they are displayed in the desired order when scrolling.
For this purpose, at least 3 functions must be activated[14].

Designation	Values	Description
Display position 1	***Function F1*** *Function F2* *Function F3* *Function F4* … *Function F17* *Function F18* *Function F19* *Function F20*	Function to be displayed first when scrolling,
Display position 2	*Function F1* ***Function F2*** *Function F3* *Function F4* … *Function F17* *Function F18* *Function F19* *Function F20*	Function to be displayed second when scrolling,
Display position 3	See above..	Functions as they should be displayed consecutively.
Display position 4	See above..	
Display position 5	See above..	
Display position 6	See above..	
Display position 7	See above..	
Display position 8	See above..	
Display position 9	See above..	
Display position 10	See above..	
Display position 11	See above..	
Display position 12	See above..	
Display position 13	See above..	
Display position 14	See above..	
Display position 15	See above..	
Display position 16	See above..	
Display position 17	See above..	
Display position 18	See above..	
Display position 19	See above..	
Display position 20	See above..	

[14] See *Number of functions* parameter on the ***Settings*** parameter page.

6.5.4 Temperature

ⓘ This parameter page is available if the RTC is not activated[15]

Designation	Values	Description
Temperature calibration internal sensor	-64..+64 *(x 0.1 K)*	Correction value for temperature measurement if sent temperature deviates from the actual ambient temperature. **Example:** temperature = 20 °C sent temperature = 21 °C Correction value = 10 (i.e. 10 x 0.1 °C)
Send temperature in the event of change of	***not due to a change*** *0.2 K, 0.3 K, 0.5 K, 0.7 K* *1 K, 1.5 K, 2 K*	only cyclical sending possible. Minimum change for resending.
Send temperature cyclically	**no** *yes*	Should cyclical sending take place?
Send cyclically	*every min* *every 2 min* *every 3 min* … ***every 30 min*** … *every 60 min*	How often should it be resent?

[15] If RTC activated: See parameter page ***RTC – actual value***.

6.6 Function-related parameters

6.6.1 Common parameters

Designation	Values	Description
Function	***Switching..*** *Dimming* *Blinds* *Priority (2 bit)* *Value 0-255 (1 byte)* *Percentage value (1 byte)* *Floating-point number DPT 9.x (2 byte)* *Floating-point number DPT 14.x (4 byte)* *HVAC* *Scenes* *Colour temperature DPT 7.600 (2 byte)* *RGB colour value* *RGBW colour value* *XY colour value* *Sequence* *Display value*	Type of telegram and object type for this function.
Mode of operation[16]		Display and selection of the values to be sent. ⓘ See in the Appendix: *Modes of operation*
	Fixed values	Each button sends its own value.
	Value list	A list with up to 12 entries is available. The value to be sent from the list is selected directly at the device.
	Move values[17]	A defined value range (Min...Max) is available. The value to be sent is selected directly at the device.

[16] This parameter is not available for the functions switching, dimming, blinds, sequence, display value.
[17] Only for value 0-225, percentage value, floating point numbers and colour temperature.

Designation	Values	Description
Heading	Text field	This text appears both in the device display and in the ETS in the name of the group objects of a function. **Example:** F1 living room
Icon	Icon list	User-specific icon for this device.

6.6.2 Parameters for switching

Designation	Values	Description
Telegram	***top ON/bottom OFF*** *top change over/bottom change over* *top OFF/bottom ON*	Assignment of the top and bottom button.[18]
Text for ON	Text field	User-specific designation for the switch-on and switch-off functions.
Text for OFF	Text field	
Response when the block is set	***Ignore block*** *Block*	The block function is ineffective. Do not send telegram.

[18] Only for devices from firmware version 1.1.0 and application program from V2.0.

6.6.3 Parameters for dimming

Designation	Values	Description
Response to long/short	***Top brighter/ON, bottom darker/OFF***	**Top button:** Short button push = ON Long button push = brighter Release = stop **Bottom button:** Short button push = OFF Long button push = darker Release = stop
	Top brighter/change over, bottom darker/change over	**Top button:** Short button push = ON/OFF Long button push = brighter Release = stop **Bottom button:** Short button push = ON/OFF Long button push = darker Release = stop
Increment for dimming		With a long button push, the dimming value is:
	100%	Increased (or decreased) until the button is released.
	50% *25%* *12.5%* *6%* *3%* *1.5%*	Increased by the selected value (or reduced)
Response when the block is set[19]	***Ignore block***	The block function is ineffective with this telegram.
	Block	The button does not send any telegrams.
Double-click additional function	***no***	No double-click function
	yes	The Double-click parameter page is shown.

ⓘ No telegram is sent when the block is cancelled.

[19] Also applies to the double-click function

6.6.3.1 Double-click parameter page

Each button can be double-clicked to set a predefined brightness.

Designation	Values	Description
Top button		
Dimming value	*0-100%*	Any percentage value between 0 and 100% can be sent.
Bottom button		
Dimming value	*0-100%*	Any percentage value between 0 and 100% can be sent.

6.6.4 Parameters for blinds

Operation: Top button UP, bottom button DOWN

Designation	Values	Description
Movement is stopped by	*Releasing the button* ***Short operation***	How is the stop command to be triggered?
Response when the block is set[20]	***Ignore block*** *Block*	The block function is ineffective with this telegram. The buttons do not send telegrams.
Double-click additional function	***no*** *yes*	No double-click function The Double-click parameter page is shown.

6.6.4.1 Double-click parameter page

Each button can be double-clicked to move to a predefined blinds position.

Designation	Values	Description
Top button		
Height	*0-100%*	Required blind height
Slat	*0-100%*	Required slat position.
Bottom button		
Height	*0-100%*	Required blind height
Slat	*0-100%*	Required slat position.

[20] Also applies to the double-click function

6.6.5 Mode of operation: fixed values

If the *Mode of operation* parameter is set to: *Fixed values*, the top or bottom button can be used to send one telegram respectively.

See in the Appendix: *Modes of operation*

6.6.5.1 Additional parameters for the scenes or colours functions

Designation	Values	Description
Scene function[21]	***Calling up scenes***	Calling up scenes
	Call up and save scenes	Short button push: Call up scene. Long button push: Save scene. No double-click function.
Output[22]		Colour model and allocation of colour telegrams.
	With RGB colour	
	RGB 3 byte DPT232.600	1 RGB object
	RGB separate objects	3 objects: red, green, blue.
	HSV separate objects	3 objects: Colour value (hue), colour saturation (saturation), bright value (value)
	With RGBW colour	
	RGBW 6 byte DPT251.600	1 RGBW object
	RGBW separate objects	4 objects: red, green, blue, white level (white).
	HSVW separate objects	4 objects: Colour value (hue), colour saturation (saturation), bright value (value), white level (white).
	With XY colour	
	XY 6 byte DPT242.600 *XY separate objects DPT7.001*	1 XY object. 3 objects: X value, Y value, brightness.

[21] Only with *Function = scenes*
[22] Only for RGB, RGBW and XY colours.

6.6.5.2 Parameters for the buttons

Designation	Values	Description	
Top button			
Telegram	*With object type = priority 2 bit*		
		Function	Value
	inactive	Priority inactive (no control)	0 (00_{bin})
	ON	Priority ON (control: enable, on)	3 (11_{bin})
	OFF	Priority OFF (control: disable, off)	2 (10_{bin})
	With object type = value 0-255		
	*0-**255***	Any value between 0 and 255 can be sent.	
	With object type = percentage value 1 byte		
	*0-**100%***	Any percentage value between 0 and 100% can be sent.	
	With object type = 2 byte floating-point number		
	-670760...670760 Default: ***0***	Any value between -670760 and 670760 can be sent.	
	With object type = 4 byte floating-point number		
	-1E+38.. 1E+38 Default: ***0***	Any value between -1E+38 and 1E+38 can be sent. Input format: The ETS only allows the input as a decimal without power. **Example:** 15234825.123456	
	With object type = HVAC		
	Auto *Comfort* *Standby* *Temperature reduction at night* *Frost/heat protection*	HVAC operating mode.	
	With object type = scenes		
	1-64	Scene number for call-up or save telegram.	
	With object type = colour temperature	DPT 7.600 (2 bytes)	
	1000-10000 K	Colour temperature.	
	With object type = RGB colour		

Designation	Values	Description
	RGB (HSV) [23] *colour value*	The colour can be selected directly via the Color Picker. The colour value is additionally displayed as a 6 byte hexadecimal value.
	With object type = RGBW colour	
	RGBW (HSVW) [24] *colour value*	The colour can be selected directly via the Color Picker. The colour value is additionally displayed as a 6 byte hexadecimal value.
	White level	The white level is entered separately.
	With object type = XY colour	
	X colour value 0-1	Input of XY components
	Y colour value 0-1	
	Brightness 0-100%	The brightness is entered separately.
Descriptive text	Text field	User-specific designation for this button
Bottom button		
Telegram	See above: Same object type as top button.	
Descriptive text	Text field	User-specific designation for this button
Response when the block is set	***Ignore block***	The block function is ineffective with this telegram.
	Block	The button does not send any telegrams.

[23] See parameter: *Output*.
[24] See parameter: *Output*.

6.6.6 Mode of operation: value list

If the *Mode of operation* parameter is on the setting: *Value list*, a value within a list can be selected and sent using the top and bottom button.

See in the Appendix: *Modes of operation*

Designation	Values	Description	
Length of list	*2-12*[25]	Number of list entries.	
Value 1			
Telegram	*With object type = priority 2 bit*		
	inactive	Function: Priority inactive (no control)	Value: 0 (00_{bin})
	ON	Function: Priority ON (control: enable, on)	Value: 3 (11_{bin})
	OFF	Function: Priority OFF (control: disable, off)	Value: 2 (10_{bin})
	With object type = value 0-255		
	*0-**255***	Any value between 0 and 255 can be sent.	
	With object type = percentage value 1 byte		
	*0-**100%***	Any percentage value between 0 and 100% can be sent.	
	With object type = 2 byte floating-point number		
	-670760...670760 Default: ***0***	Any value between -670760 and 670760 can be sent.	
	With object type = 4 byte floating-point number		
	-1E+38.. 1E+38 Default: ***0***	Any value between -1E+38 and 1E+38 can be sent. Input format: The ETS only allows the input as a decimal without power. **Example:** 15234825.123456	
	With object type = HVAC		
	Auto *Comfort* *Standby* *Temperature reduction at night* *Frost/heat protection*	HVAC operating mode.	
	With object type = scenes		

[25] Maximum length: With HVAC = 5, with priority = 3 list entries.

Designation	Values	Description
	1-64	Scene number for call-up or save telegram.
	With object type = colour temperature	DPT 7.600 (2 bytes)
	1000-10000 K	Colour temperature.
	With object type = RGB colour	
	RGB (HSV) [26] *colour value*	The colour can be selected directly via the Color Picker. The colour value is additionally displayed as a 6 byte hexadecimal value.
	With object type = RGBW colour	
	RGBW (HSVW) [27] *colour value*	The colour can be selected directly via the Color Picker. The colour value is additionally displayed as a 6 byte hexadecimal value.
	White level	The white level is entered separately.
	With object type = XY colour	
	X colour value 0-1	Input of XY components
	Y colour value 0-1	
	Brightness 0-100%	The brightness is entered separately.
Descriptive text	Text field	User-specific designation for this value
Value 2 (see value 1)		
Value 3 (see value 1)		
Value 4 (see value 1)		
Value 5 (see value 1)		
Value 6 (see value 1)		
Value 7 (see value 1)		
Value 8 (see value 1)		
Value 9 (see value 1)		
Value 10 (see value 1)		
Value 11 (see value 1)		
Value 12 (see value 1)		
Response when the block is set	***Ignore block***	The block function is ineffective.
	Block	The buttons do not send telegrams.
Output [28]	*RGB 3 byte DPT232.600* *RGBW 6 byte DPT251.600* *XY 6 byte DPT242.600*	Fixed setting for the colour telegrams, depending on the colour scheme.

[26] See parameter: *Output*.
[27] See parameter: *Output*.
[28] Only for RGB, RGBW and XY colours.

6.6.7 Mode of operation: move values

If the *Mode of operation* parameter is set to: *Move values*, the top and bottom button can be used to set and send a value within a defined range (minimum value..maximum value).

See in the Appendix: *Modes of operation*

The maximum value must be greater than the set minimum value.

Designation	Values	Description
Descriptive text	Text field	User-specific designation for this value range.
Unit	Text field	Optional text field for the measuring unit, e.g. °C etc.
Minimum value		
Telegram	*With object type = value 0-255*	
	*0-**255***	Any value between 0 and 255.
	With object type = percentage value 1 byte	
	*0-**100%***	Any percentage value between 0 and 100%.
	With object type = 2 byte floating-point number	
	-670760...670760 Default: ***0***	Any value between -670760 and 670760.
	With object type = 4 byte floating-point number	
	-1E+38.. 1E+38 Default: ***0***	Any value between -1E+38 and 1E+38. Input format: The ETS only allows the input as a decimal without power. **Example:** 15234825.123456
	With object type = colour temperature	DPT 7.600 (2 bytes)
	1000-10000 K	Colour temperature.
Maximum value		
Telegram	*With object type = value 0-255*	
	*0-**255***	Any value between 0 and 255.
	With object type = percentage value 1 byte	
	*0-**100%***	Any percentage value between 0 and 100%.
	With object type = 2 byte floating-point number	
	-670760...670760 Default: ***0***	Any value between -670760 and 670760.
	With object type = 4 byte floating-point number	

Designation	Values	Description
	-1E+38.. 1E+38 Default: ***0***	Any value between -1E+38 and 1E+38. Input format: The ETS only allows the input as a decimal without power. **Example:** 15234825.123456
	With object type = colour temperature	DPT 7.600 (2 bytes)
	1000-10000 K	Colour temperature.
Increment		Size of the intermediate steps. Small values allow a very fine adjustment, but increase the number of steps. Larger values allow a faster, however coarser adjustment.
	With object type = value 0-255	
	1-255	Any value between 1 and 255.
	With object type = percentage value 1 byte	
	1-100%	Any percentage value between 1 and 100%.
	With object type = 2 byte floating-point number	
	0.1...670760 *Default:* **1**	Any value between 0.1 and 670760.
	With object type = 4 byte floating-point number	
	0.1...1E+38 *Default:* **1**	Any value between -1E+38 and 1E+38. Input format: The ETS only allows the input as a decimal without power. Example: 15234825.123456
	With object type = colour temperature DPT 7.600 (2 Byte)	
	1000-10000 K	Colour temperature.
Display before receipt of value		What should be displayed if no telegrams were received and the object therefore does not yet have a defined status?
	Space	The display should remain empty.
	---	Display 3 dashes.
	according to object value after Reset	Displays the value which is allocated to value 0. Examples: 0 m/s 0.0 °C No rain
	Read from object via bus	The device sends a read command to the allocated object as soon as the line is selected.

Designation	Values	Description
		The display remains empty if no answer is received.
Response when the block is set	*Ignore block* *Block*	The block function is ineffective. The buttons do not send telegrams.

6.6.8 Sequence function

The sequence consists of 4 steps, which can be executed one after the other either by button push or time-controlled.
The sequence has a total of 4 objects.
At each step, all 4 objects can send a new telegram each.

Designation	Values	Description
Sequence details	***Step 1-2-3-4-1-2-3-4*** *Step 1-2-3-4-3-2-1*	In which order should the steps be executed?
Advancing the sequence	***via button*** *time-controlled*	The change to the next step is exclusively triggered by a button push. Once triggered, the sequence is automatically executed. The interval between 2 steps can be individually set for each step.
Restart sequence automatically	***no*** *yes*	The sequence is only executed once. Once started, the sequence is repeated an unlimited number of times and can, depending on the configuration, be stopped with a double-click or a long button push.
On long button push	*no function* ***set to step 1*** *End sequence*	Long button push will be ignored. Reset sequence to the beginning. End time-controlled sequence.
On double-click	***no function*** *set to step 1* *End sequence*	Long button push will be ignored. Reset sequence to the beginning. End time-controlled sequence.
Response when the block is set	***Ignore block***	The block function is ineffective.
	Set to step 1 and stop time	The sequence counter is reset to step 1 and the sequence is stopped. No telegram is sent.
Object types		

Designation	Values	Description
Object 1	***Switching (1 bit)*** *Priority (2 bit)* *Value 0-255 (1 byte)* *Percentage value (1 byte)* *Floating-point number DPT 9.x (2 byte)* *Floating-point number DPT 14.x (4 byte)* *HVAC* *Scenes* *Colour temperature DPT 7.600* *(2 byte)* *RGB colour* *RGBW colour* *XY colour*	Telegram type for this object.
Output	*RGB 3 byte DPT232.600* *RGBW 6 byte DPT251.600* *XY 6 byte DPT242.600*	Fixed setting for the colour telegrams, depending on the colour scheme.
Object 2	See object 1	
Output	See above	
Object 3	See object 1	
Output	See above	
Object 4	See object 1	
Output	See above	

ⓘ No telegram is sent when the block is cancelled.

6.6.8.1 Step 1, 2, 3, 4 parameter pages

This parameter page can be configured individually for each step.

Designation	Values	Description	
Send object 1	***No*** *yes*	Use first object during this step?	
Telegram[29]	*With object type = switching 1 bit*		
	ON *OFF* *INVERT*	Send switch-on command Send switch-off command Invert current state (ON-OFF-ON etc.)	
	With object type = priority 2 bit		
	inactive *ON* *OFF*	Function Priority inactive (no control) Priority ON (control: enable, on) Priority OFF (control: disable, off)	Value 0 (00_{bin}) 3 (11_{bin}) 2 (10_{bin})
	With object type = value 0-255		
	*0-**255***	Any value between 0 and 255 can be sent.	
	With object type = percentage value *1 byte*		
	*0-**100%***	Any percentage value between 0 and 100% can be sent.	
	With object type = 2 byte floating-point number		
	-670760...670760 Default: ***0***	Any value between -670760 and 670760 can be sent.	
	With object type = 4 byte floating-point number		
	-1E+38.. 1E+38 Default: ***0***	Any value between -1E+38 and 1E+38 can be sent. Input format: The ETS only allows the input as a decimal without power. **Example:** 15234825.123456	
	With object type = HVAC		
	Auto *Comfort* *Standby* *Temperature reduction at night* *Frost/heat protection*	HVAC operating mode.	
	With object type = scenes		
	1-64	Scene number for call-up or save telegram.	

[29] or RGB, RGBW colour value.

Designation	Values	Description
	With object type = colour temperature	DPT 7.600 (2 bytes)
	1000-10000 K	Colour temperature.
	With object type = RGB colour	
	RGB colour value	The colour can be selected directly via the Color Picker. The colour value is additionally displayed as a 6 byte hexadecimal value.
	With object type = RGBW colour	
	RGBW colour value	The colour can be selected directly via the Color Picker. The colour value is additionally displayed as a 6 byte hexadecimal value.
	White level	The white level is entered separately.
	With object type = XY colour	
	X colour value 0-1	Input of XY components
	Y colour value 0-1	
	Brightness 0-100%	The brightness is entered separately.
Send object 2	See object 1	Use second object during this step?
Telegram	See object 1	
Send object 3	See object 1	Use third object during this step?
Telegram	See object 1	
Send object 4	See object 1	Use fourth object during this step?
Telegram	See object 1	
Advance to next step[30]		
Time unit	***Seconds*** *Minutes*	Unit for waiting time.
Time interval for advancing	*1..120 secs/min*	Waiting time before the next step is executed.

[30] If *Advancing the sequence = time-controlled*.
In step 4 only available if the sequence is automatically restarted.
See parameter page ***Sequence.***

6.6.9 Display value function

Among other things, this function can be used to display the room temperature, the RTC setpoint, or different data types.

Designation	Values	Description
Source		Displayed is:
	Receive via object	An external DPT9.xxx value, e.g. CO2, temperature, brightness, wind speed etc.
	Actual value RTC	The internally measured room temperature.
	Setpoint value RTC	The currently set setpoint for the internal room temperature controller.
Object type	*Switching (1 bit)* *Value 0-255 (1 byte)* *Percentage value (1 byte)* *Value 0-65535 DPT7.x (2 byte)* *Value -32768...32767 DPT8.x (2 byte)* ***Floating-point number DPT 9.x (2 byte)***	Select the telegram type used.[31]
Unit	Free text entry	Unit matching the DPT value.

[31] Only for devices from firmware version 1.1.0 and application program from V2.0.

6.6.10 Controller extension function[32]

This function can be used to operate a room temperature controller which is located in a different room.[33]
The setpoint can be set at the device and sent.
The device receives the feedback of the real setpoint[34] and the actual value of the external controller, to show them in the display.

Designation	Values	Description
Heading	Text field	This text appears both in the device display and in the ETS in the name of the group objects of a function. **Example:** F1 living room

[32] Only for devices from firmware version 1.1.0 and application program from V2.0.
[33] e.g. a flush-mounted device or also an iON 108 with hidden RTC.
[34] Depending, among other things, on the set operating mode.

6.7 RTC functional block

The RTC is called up on the device[35] by pressing and holding the left button.

6.7.1 Setting

Designation	Values	Description
Control	***Only heating control***	Only heating mode
	Heating and cooling	In addition, a cooling system has to be controlled.
Manual offset works	***in comfort, standby and night mode,*** *in comfort and standby,* *only in comfort*	The setpoint offset: is only considered in the selected modes, and is ineffective in all other modes.
Manual offset at the end of night mode	***Do not change***	The set offset is retained.
	Reset to 0 K	Delete manual offset.
Setpoint correction at high outdoor temperature	***None***	Function is deactivated
	Receive only	The correction value is received by the bus, and the own setpoint is adjusted to the increase in outside temperature.
	Calculate internally and send	The device calculates the correction value, sends it to other controllers and adjusts the own setpoint to the increase in outside temperature. See in the Appendix: *Setpoint correction*
Texts for heading		
Text for setpoint value	***Setpoint***	User-specific display texts for navigation through the RTC menu.
Text for actual value	***Actual value***	
Text for HVAC operating modes	***HVAC mode***	
Text for fan control	***Fan control***	
Text for heating/cooling	***Heating/cooling***	

[35] Prerequisite: The RTC must be activated in the ETS project (***General/Settings*** parameter page).

6.7.2 Actual value

On this parameter page, the source is selected which is used as the actual value for control. This can be the temperature sensor integrated in the device, an external sensor, or a combination of 2 sensors.

Designation	Values	Description
Source for actual value	***Internal sensor***	Control actual value. The device measures and controls the room temperature via the internal sensor. (Control actual value = internally measured temperature).
	Average value of int. + ext. actual value object	The device calculates the average value of the room temperature received from the bus and the internal measurement.
	External actual value object	The room temperature is solely acquired via the bus.
Temperature calibration internal sensor[36]	-64..+64 *(x 0.1 K)*	Correction value for temperature measurement if sent temperature deviates from the actual ambient temperature. **Example:** temperature = 20 °C sent temperature = 21 °C Correction value = 10 (i.e. 10 x 0.1 °C)
Send control actual value in the event of change of	***not due to a change***	only cyclical sending possible.
	0.2 K, 0.3 K, 0.5 K, 0.7 K 1 K, 1.5 K, 2 K	Minimum change for resending.
Send control actual value cyclically	***no***	Only send in the event of a change.
	yes	Send in the event of a change and cyclically.
Monitor actual value	***no***	No monitoring.

[36] Only if the internal sensor is used as the *source for the actual value*.

Designation	Values	Description
	yes	All selected actual value sources are monitored. In case of an error, the object sends *actual value failure* error telegrams. ⓘ As long as at least one valid actual value remains available, this will be continued to be used for control, and the emergency program remains inactive. This is the case if the average value is determined from the internal and an external sensor.
Monitoring time for external actual value	*2 min, 3 min, 5 min, 10 min, 15 min, 20 min, 30 min, 45 min, 60 min*	Only for the *External actual value* object. If no value is received within the configured time and the object is the only selected source, the emergency program will be activated. ⓘ As long as at least one valid actual value remains available, this will be continued to be used for control, and the emergency program remains inactive. This is the case if the average value is determined from the internal and an external sensor.

Designation	Values	Description
Emergency program in case of actual value failure	*with PI controller: 0%, w/ 2-point controller: Off* ***with PI controller: 10%, with 2-point controller: On*** *with PI controller: 20%, with 2-point controller: On* *with PI controller: 30%, with 2-point controller: On* *with PI controller: 50%, with 2-point controller: On*	The emergency program will only be executed if the selected Source for actual value provides no valid value anymore. The heating/cooling will then be controlled with a fixed actuating value. This might be the case if only one *Source for actual value* is selected, e.g. only *internal*. In case of actual value failure, the value of the actuating value for the emergency program will, depending on the operating mode (heating/cooling), be output to the corresponding object. ⓘ As long as at least one valid actual value remains available, this will be continued to be used for control, and the emergency program remains inactive. This is the case if the average value is determined from the internal and an external sensor. **Example:** *Average value of internal + external actual value object*. If the external actual value fails, the RTC controls with the remaining, i.e. with the internal sensor, in this case.
Actual value failure telegram	*always cyclically* ***only send cyclically in case of an error***	The object sends the current status always cyclically and in the event of a change: Error = 1, no error = 0 Only sends in case of an error, cyclically and in the event of a change: error = 1.
Send cyclically	*every min* *every 2 min* *every 3 min* … ***every 30 min*** … *every 60 min*	How often should it be resent?

6.7.3 Operating mode

Designation	Values	Description
Operating mode after reset	*Frost protection* *Temperature reduction at night* ***Standby*** *Comfort*	Operating mode after start-up or reprogramming
Type of presence sensor	 *Presence detectors* ***Presence button***	The presence sensor activates comfort operating mode. Operating type comfort provided the presence object is set[37]. If a new operating mode is received on the operating mode preset object with the presence object set, it will be accepted and the presence object will be reset. Reception of the same operating mode prior to the presence status (e.g. via cycl. sending) is ignored. If the presence object is set for night/frost mode, it is reset after running the parameterised comfort extension[38] If the presence object is set during standby mode, the comfort operating mode is accepted without time restriction.
When increasing the temperature at the device	 ***Do not set presence object*** *Set presence object*	Only if *type of presence sensor = presence button*. Only increase the temperature Presence object is set, the controller changes to comfort mode.

[37] Exception: If a window is opened (window object = 1), the room thermostat switches to frost protection mode.
[38] Exception: If a window is opened (window object = 1), the room thermostat switches to frost protection mode.

Designation	Values	Description
Time for comfort extension	*30 min* *1 h* *1.5 h* ***2 h*** *2.5 h* *3 h* *3.5 h*	This determines how long the controller should remain in comfort mode after the presence button is pressed.
Cyclical sending of current operating mode	***do not send cyclically*** *every 2 min* *every 3 min* … *every 45 min* *every 60 min*	How often should it be resent?

6.7.4 Heating control

Designation	Values	Description
Type of control	***Continuous*** *2-point*	Infinite control (0.. 100%). Switching control (On/Off). See in the Appendix: *Continuous and switching control*.
Number of heating stages	***Only one heating stage*** *Main stage and additional stage*	Choice of 1- or 2-stage heating
Hysteresis of 2-point controller	*0.3 K* *0.5 K* *0.7 K* ***1 K*** *1.5 K*	Interval between the tripping point (setpoint) and the turn back on point (setpoint – hysteresis). The hysteresis prevents a permanent switching on/off.
Recirculation of hysteresis after switching point	***None*** *0.1 K/min* *0.2 K/min* *0.3 K/min*	The recirculation causes a gradual decrease in the hysteresis over time, and the control accuracy is increased. The hysteresis is equivalent to the programmed value for each switch-off and is gradually reduced by the recirculation process. The hysteresis can reduce to 0 K over prolonged periods of switch-off. When switching on the next time, it will be reset to the configured value.
Setting the control parameters	***via installation type*** *user-defined*	Standard application. The control parameters are preset. Professional use: Configure P/PI controller yourself.
Use floor temperature limitation [39] [40]	*No*	no floor temperature limitation.

[39] From firmware version 1.23 and application programme version 2.2
[40] Only if *system type = floor heating*

Designation	Values	Description
	Yes	The floor temperature is received via the *Floor temperature actual value* object. The *Maximum floor temperature* and *Floor temperature hysteresis* parameters are displayed on the ***Heating setpoints*** parameter page. Functionality: If the *Maximum floor temperature* is reached, the heating control value is reduced to 0%. The hysteresis is 5 K.
Installation type	***Radiator heating system*** *Underfloor heating*	PI controller with: Integration time = 90 minutes Bandwidth = 2.5 K Integration time = 30 h Bandwidth = 4 K
Proportional band of heating controller	*1 K, 1.5 K, 2 K,* **2.5 K**, *3 K, 3.5 K, 4 K, 4.5 K, 5 K, 5.5 K, 6 K, 6.5 K, 7 K, 7.5 K, 8 K, 8.5 K*	Professional setting for adapting the control response to the room. Small values cause large changes in actuating values, larger values cause a finer actuating value adjustment. See in the Appendix: *Temperature control*
Integration time of heating controller	*pure P controller 30 min, 60 min* **90 min**, *120 min 150 min, 180 min 210 min 4 h, 5 h, 10 h 15 h, 20 h, 25 h 30 h, 35 h*	Professional setting: See in the Appendix: *Response of the PI controller* This time can be adapted to suit particular circumstances. If the heating system is over-dimensioned and therefore too fast, shorter values should be used. On the other side, longer integration times are beneficial for a slightly undersized heating (slow).
Sending of heating actuating value	*At change by 1% At change by 2% At change by 3%* ***At change by 5%*** *At change by 7% At change by 10% At change by 15%*	After what percentage change in the actuating value is the new value to be transmitted. Small values increase control accuracy, but also the bus load.
Cyclical sending of heating actuating value	***do not send cyclically*** *every 2 min every 3 min* … *every 45 min every 60 min*	How often should it be resent?

6.7.5 Heating setpoints

Designation	Values	Description
Base setpoint after loading the application	*18 °C, 19 °C, 20 °C* ***21 °C**, 22 °C, 23 °C* *24 °C, 25 °C*	Output setpoint for temperature control.
Minimum valid base setpoint	*5-20 °C at 1 degree increments* Default: ***10 °C***	If the object receives a base setpoint which is lower than the minimum valid base setpoint, the base setpoint will be increased to the value set here.
Maximum valid base setpoint	*17..***32 °C** *at 1 degree increments*	If the object receives a base setpoint which is higher than the maximum valid base setpoint, the base setpoint will be set to the value set here.
Maximum valid setpoint offset	*+/- 1 K* *+/- 2 K* ***+/- 3 K*** *+/- 4 K* *+/- 5 K*	Limits the possible setting range for the setpoint offset function. Is valid for the *Man. setpoint offset* as well as for the rotary control.
Send in the event of a change	*Yes*	Send when the value is changed.
	No	Do not send
Send cyclically	*Yes* *No*	Resend value at regular intervals.
Cycle time	*Every min* *Every 2 min* *Every 3 min* *Every 5 min* *Every 10 min* *Every 15 min* *Every 30 min* *Every 45 min* *Every 60 min*	Time interval between telegrams.
Reduction in standby mode (when heating)	*0 K, 0,5 K, 1 K, 1,5 K,* ***2 K,** 2,5 K, 3 K, 3,5 K,* *4 K, 4,5 K, 5 K, 6 K, 7 K, 8 K*	**Example:** With a base setpoint of 21 °C in heating mode and a reduction of 2K, the device controls with a setpoint of 21 − 2 = 19 °C.
Reduction in night mode (during heating)	*0 K, 0,5 K, 1 K, 1,5 K,* ***2 K,** 2,5 K, 3 K, 3,5 K,* *4 K, 4,5 K, 5 K, 6 K, 7 K, 8 K*[41]	By what value should the temperature be reduced in night mode?
Setpoint for frost protection mode (during heating)	*3-10 °C* Default: ***6 °C***	Preset temperature for frost protection mode in heating mode (Heat protection applies in cooling mode).

[41] Only for devices from firmware version 1.1.0 and application program from V2.0.

Designation	Values	Description
Current setpoint in comfort mode		Feedback of current setpoint via the bus:
	Actual value (heating <> cooling)	The setpoint actually being used for control is always to be sent (= current setpoint). **Example** with Base setpoint 21 °C and dead zone 2 K: During heating, 21 °C is transmitted and during cooling, base setpoint + dead zone is transmitted (21 °C + 2 K = 23 °C)
	Average value between heating and cooling	Same value in comfort mode during both heating and cooling mode, i.e.: base setpoint + half dead zone will be sent, so users of the room will not be irritated. **Example** with Base setpoint 21 °C and dead zone of 2 K: Average value = 21 °C+1 K=22 °C, but 21 °C or 23 °C are used for control
Cyclical sending of current setpoint	***do not send cyclically*** *every 2 min* *every 3 min* ... *every 45 min* *every 60 min*	How often should it be resent?
Maximum floor temperature [42]	*24 °C, 26 °C, 28 °C* **30 °C,** *32 °C, 34 °C* *36 °C, 38 °C, 40 °C*	Maximum permissible floor temperature.
Floor temperature hysteresis[43]	*1 K* *2 K* ***3 K*** *4 K* *5 K*	Interval between the switch-off point (setpoint) and the switch-back-on point (setpoint – hysteresis). The hysteresis prevents a permanent switching on/off.

[42] Only if *system type = floor heating and use floor temperature limitation = yes*.
[43] From firmware version 1.23 and application programme version 2.2

6.7.6 Additional stage heating

Temperature control is done via a proportional controller.

Designation	Values	Description
Output of the actuating value		Control is done via a proportional controller.
	Percent	Continuous actuating value 0-100%
	PWM	Pulse-width modulated switching actuating value.
Difference between main stage and additional stage	*0 K, 0.5 K, 1 K* *1.5 K,* **2 K**, *2.5 K* *3 K, 3.5 K, 4 K*	Defines the negative distance between the current setpoint and the setpoint of the additional stage. **Example** with base setpoint of 21 °C and difference of 1 K: The main stage controls with the base setpoint and the addition stage controls with Base setpoint − 1 K = 20 °C
Proportional band	*1 K, 1.5 K, 2 K, 2.5 K* *3 K, 3.5 K,* **4 K**, *4.5 K* *5 K, 5.5 K, 6 K, 6.5 K* *7 K, 7.5 K, 8 K, 8.5 K*	With continuous additional stage, Professional setting for adapting the control response to the room. Large values cause finer changes to the control variables with the same control deviation and more precise control than smaller values.
PWM period	*3-30 min* Default: ***5 min***	An actuation cycle consists of a switch-on and a switch-off process and forms a PWM period. **Example:** Actuating value = 20%, PWM time = 10 min: In an actuating cycle of 10 min, 2 min switched on and 8 min switched off (i.e. 20% on / 80% off).
Sending of actuating value	*At change by 1%* *At change by 2%* *At change by 3%* ***At change by 5%*** *At change by 7%* *At change by 10%* *At change by 15%*	After what percentage change in the actuating value is the new value to be transmitted. Small values increase control accuracy, but also the bus load.

Designation	Values	Description
Send cyclically	***do not send cyclically*** *every 2 min* *every 3 min* ... *every 45 min* *every 60 min*	How often should it be resent?

6.7.7 Cooling control

Designation	Values	Description
Type of control	***Continuous***	Infinite control (0.. 100%).
	2-point	Switching control (On/Off). See in the Appendix: *Continuous and switching control*.
Number of cooling stages	***Only one cooling stage*** *Main stage and additional stage*	Choice of 1- or 2-stage cooling
Hysteresis of 2-point controller	*0.3 K, 0.5 K, 0.7 K* **1 K**, *1.5 K*	Interval between the tripping point (setpoint) and the turn back on point (setpoint – hysteresis). The hysteresis prevents a permanent switching on/off.
Recirculation of hysteresis after switching point	***None*** *0.1 K/min* *0.2 K/min* *0.3 K/min*	The recirculation causes a gradual decrease in the hysteresis over time, and the control accuracy is increased. The hysteresis is equivalent to the programmed value for each switch-off and is gradually reduced by the recirculation process. The hysteresis can reduce to 0 K over prolonged periods of switch-off. When switching on the next time, it will be reset to the configured value.
Setting the control parameters	***Via installation type***	Standard application. The control parameters are preset.
	user-defined	Professional use: Configure P/PI controller yourself.
Installation type	***Cooling surface***	PI controller with: Integration time = 240 minutes Bandwidth = 5 K
	Fan coil unit	Integration time = 180 min. Bandwidth = 4 K
Proportional band of the cooling controller	*1 K, 1.5 K, 2 K, 2.5 K* *3 K, 3.5 K, 4 K, 4.5 K* **5 K**, *5.5 K, 6 K, 6.5 K* *7 K, 7.5 K, 8 K, 8.5 K*	Professional setting for adapting the control response to the room. Small values cause large changes in actuating values, larger values cause a finer actuating value adjustment. See in the Appendix: *Temperature control*

Designation	Values	Description
Integration time of the cooling controller	*30 min, 60 min,* **90 min**, *120 min* *150 min, 180 min* *210 min* *4 h, 5 h, 10 h* *15 h, 20 h, 25 h* *30 h, 35 h*	Professional setting: See in the Appendix: *Response of the PI controller* This time can be adapted to suit particular circumstances. If the cooling system is over-dimensioned and therefore too fast, shorter values should be used. On the other side, longer integration times are beneficial for a slightly undersized cooling (slow).
Sends cooling actuating value	*at change by 1%* *at change by 2%* *at change by 3%* ***at change by 5%*** *at change by 7%* *at change by 10%* *at change by 15%*	After what percentage change in the actuating value is the new value to be transmitted. Small values increase control accuracy, but also the bus load.
Change over between heating and cooling	***Automatic*** *Via object*	The controller automatically switches to cooling mode if the actual temperature is above the setpoint. The cooling mode can only be activated on the bus via object *Change over between heating and cooling*. Cooling mode remains off, as long as this object is not set.
Format object heating/cooling	***DPT1.100 (heating=1/cooling=0)*** *Inverted (heating=0/cooling=1)*	Standard format. Compatible with RAM 713 S, VARIA etc.
Output of the cooling actuating value	***On separate obj. (4-pipe systems)*** *In common with actuating val. heating (for 2-pipe systems)*	For 4-pipe systems: The actuating values are sent to 2 separate objects: Obj. *heating actuating value* Obj. *cooling actuating value.* For 2-pipe systems: The actuating value is always sent to the same object (obj. *actuating value heating/cooling*), independent of whether heating or cooling mode is active.
Send cooling actuating value cyclically	***do not send cyclically*** *every 2 min* *every 3 min* … *every 45 min* *every 60 min*	How often should it be resent?

6.7.8 Cooling setpoints

Designation	Values	Description
Dead zone between heating and cooling	*0 K, 0.5 K, 1 K, 1.5 K,* **2 K**, *2.5 K, 3 K, 3.5 K 4 K, 4.5 K, 5 K, 5.5 K, 6 K + hysteresis heating*[44] *+ hysteresis cooling*[45]	Specifies the buffer zone between setpoints for heating and cooling mode. The dead zone is expanded through hysteresis in switching (2 point) control. See in the Appendix: *Dead zone*
Increase in standby mode (during cooling)	*0 K, 0,5 K, 1 K, 1,5 K,* ***2 K,*** *2,5 K, 3 K, 3,5 K, 4 K, 4,5 K, 5 K, 6 K, 7 K, 8 K*	The standby temperature is increased in cooling mode.
Increase in night mode (during cooling)	*0 K, 0,5 K, 1 K, 1,5 K,* ***2 K,*** *2,5 K, 3 K, 3,5 K, 4 K, 4,5 K, 5 K, 6 K, 7 K, 8 K*[46]	In cooling mode, the temperature is increased in night mode.
Setpoint for heat protection mode (during cooling)	***0 = 42 °C, i.e. no real heat protection*** *29 °C, 30 °C, 31 °C 32 °C, 33 °C, 34 °C 35 °C*	Heat protection represents the maximum permitted temperature for the controlled room. It performs the same function during cooling as frost protection mode during heating, e.g. saves energy while prohibiting non-permitted temperatures.

[44] Only for type of control heating = 2-point.
[45] Only with type of control cooling = 2-point.
[46] Only for devices from firmware version 1.1.0 and application program from V2.0.

6.7.9 Setpoint adjustment

Designation	Values	Description
Setpoint correction from	**25 °C**, *26 °C, 27 °C, 28 °C 29 °C, 30 °C, 31 °C, 32 °C 33 °C, 34 °C, 35 °C, 36 °C 37 °C, 38 °C, 39 °C, 40 °C*	Activation threshold for setpoint correction.
Adjustment	*1 K per 1 K outdoor temperature* *1 K per 2 K outdoor temperature* **1 K per 3 K outdoor temperature** *1 K per 4 K outdoor temperature* *1 K per 5 K outdoor temperature* *1 K per 6 K outdoor temperature* *1 K per 7 K outdoor temperature*	Strength of setpoint correction: At which change of the outdoor temperature should the setpoint be adjusted by 1 K?
Setpoint adjustment format	***relative***	The *Outdoor temperature compensation* object sends a temperature difference in K, depending on the outdoor temperature. This value can be used as a setpoint offset for additional room temperature controllers.
	absolute	The *Outdoor temperature compensation* object sends a setpoint in °C (base setpoint without correction). This is increased depending on the outdoor temperature and serves as setpoint for additional temperature controllers.
Start setpoint	*15 °C-30 °C* Default: ***21 °C***	(Only with format = absolute). This is the base setpoint for the external controller. If correction is required, it is added to this and the result is sent as a new, adjusted set point
Maximum adjustment	*Unlimited*[47]	The setpoint continues to increase as long as the outside temperature increases.

[47] *In case of setpoint correction at high temperatures = internally calculate and send.*

Designation	Values	Description
	Until heat protection temp. reached[48] *+3 K* *+5 K* *+7 K*	The setpoint is only increased up to the configured heat protection temperature. The setpoint increase ends as soon as the adjustment has achieved the set value.
Send setpoint adjustment	***do not send cyclically*** *every 2 min* *every 3 min* *...* *every 45 min* *every 60 min*	How often should it be resent?

[48] *In case of setpoint correction at high temperatures = only receive.*

6.7.10 Additional stage cooling

Control is done via a proportional controller.

Designation	Values	Description
Type of actuating value		Control is done via a proportional controller.
	Percent	Continuous actuating value 0-100%
	PWM	Pulse-width modulated switching actuating value.
Difference between main stage and additional stage	*0 K, 0.5 K, 1 K* *1.5 K,* **2 K**, *2.5 K* *3 K, 3.5 K, 4 K*	Defines the negative distance between the current setpoint and the setpoint of the additional stage. **Example** with base setpoint of 21 °C and difference of 1 K: The main stage controls with the base setpoint and the addition stage controls with Base setpoint − 1 K = 20 °C
Proportional band	*1 K, 1.5 K, 2 K, 2.5 K* *3 K, 3.5 K,* **4 K**, *4.5 K* *5 K, 5.5 K, 6 K, 6.5 K* *7 K, 7.5 K, 8 K, 8.5 K*	With continuous additional stage, Professional setting for adapting the control response to the room. Large values cause finer changes to the control variables with the same control deviation and more precise control than smaller values.
PWM period	*3-30 min* Default: ***5 min***	An actuation cycle consists of a switch-on and a switch-off process and forms a PWM period. **Example:** Actuating value = 20%, PWM time = 10 min: In an actuating cycle of 10 min, 2 min switched on and 8 min switched off (i.e. 20% on/80% off).
Sending of actuating value	*At change by 1%* *At change by 2%* *At change by 3%* ***At change by 5%*** *At change by 7%* *At change by 10%* *At change by 15%*	After what percentage change in the actuating value is the new value to be transmitted. Small values increase control accuracy, but also the bus load.

Designation	Values	Description
Send cyclically	***do not send cyclically*** *every 2 min* *every 3 min* ... *every 45 min* *every 60 min*	How often should it be resent?

6.7.11 Fan stages

This parameter page is only available if the fan stage control has been activated on the *RTC setting* parameter page.

Designation	Values	Meaning
Number of fan stages	*1..5*	How many stages does the fan control used have?
Value for fan stage 1	Format percent	
	0%..100%	The percentage values are used with fan coil actuator FCA 1 and with the majority of fan actuators.
	Format stages 1 to 5	
	1..5	For actuators with control via stages.
Value for fan stage 2	*see above.* *Default value = 50%*	See above.
Value for fan stage 3	*see above.* *Default value = 80%*	See above.
Value for fan stage 4	*see above.* *Default value = 90%*	See above.
Value for fan stage 5	*see above.* *Default value = 100%*	See above.
Switch fan between auto and forced		Effect of forced object to adapt to the used fan coil actuator. See in the Appendix: Fan forced mode
	Force = 1	Setting for the Theben Fan Coil Actuators. Forced mode is triggered by 1.
	Force = 0	Forced mode is triggered by 0.

7 Typical applications

These application examples are designed to aid planning and are not to be considered an exhaustive list. They can be extended and updated as required.
Standard or customer-defined parameter settings apply for the parameters not listed here.

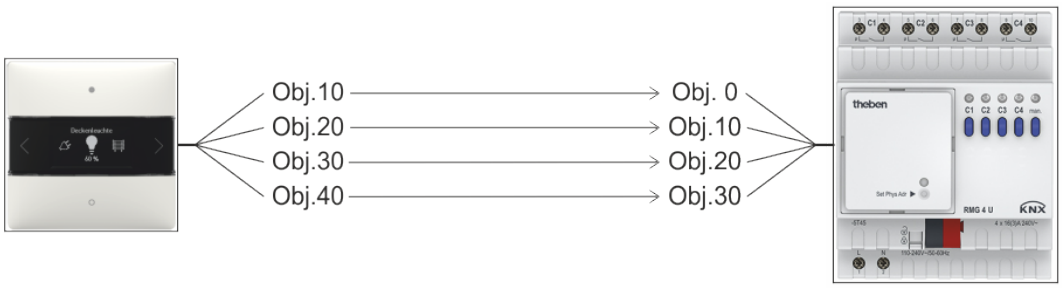
7.1 Switching light

iON 108 controls the switch actuator RMG 4 U.
All 4 channels are used.

7.1.1 Devices

- iON 108 (4969234)
- RMG 4 U (4930223)

7.1.2 Overview



7.1.3 Objects and links

Links

No.	iON 108 Object name	No.	RMG 4 U Object name	Comment
10	*F1 switching*	0	*RMG 4 U channel C1*	iON 108 sends switch commands to RMG 4 U
20	*F2 switching*	10	*RMG 4 U channel C2*	
30	*F3 switching*	20	*RMG 4 U channel C3*	
40	*F4 switching*	30	*RMG 4 U channel C4*	

7.1.4 Important parameter settings

iON 108

Parameter page	Parameter	Setting
F1	*Function*	*Button*
Button object 1	*Object type*	*Switching*
	Send after short operation	*Send telegram*
	Telegram	*Change over*

RMG 4 U

Parameter page	Parameter	Setting
RMG 4 U channel C1... C4: Configuration options	*Button function*	*Switching On/Off*
	Activation of function via	*Switch object*

7.2 2 lighting groups dimming (one button operation)

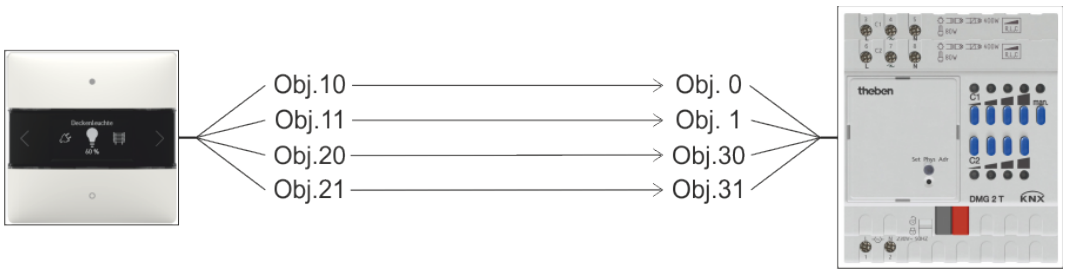
iON 108 controls both channels of dimming actuator DMG 2 T.
Only one button is used per lighting group (dimming actuator channel).

One short button push switches the light on or off.
With a long button push the brightness changes.
When the button is pressed again, the dimming direction changes (brighter/darker).

7.2.1 Devices

- iON 108 (4969232)
- DMG 2 T (4930270)

7.2.2 Overview



7.2.3 Objects and links

Table 15: Links

No.	iON 108 Object name	No.	DMG 2 T Object name	Comment
10	*F1* *Switching*	0	*DMG 2 T channel 1* *Switching On/Off*	Long button push for brighter/darker dimming commands. Short button push for On/Off commands.
11	*F1* *Brighter/darker*	1	*DMG 2 T channel 1* *Brighter/darker*	
20	*F2* *Switching*	30	*DMG 2 T channel 2* *Switching On/Off*	
21	*F2* *Brighter/darker*	31	*DMG 2 T channel 2* *Brighter/darker*	

7.2.4 Important parameter settings

iON 108

Parameter page	Parameter	Setting
F1, T2	*Button function*	Dimming
Dimming	*Response to long/short*	One button operation

DMG 2 T

Parameter page	Parameter	Setting
Dimming response	*Switching on/off with a 4-bit Telegram*	*no*

7.3 2 lighting groups dimming (2 rocker buttons)

iON 108 controls both channels of dimming actuator DMG 2 T.
2 buttons are used per lighting group (dimming actuator channel).

One short button push switches the light on or off.
With a long button push the brightness changes.

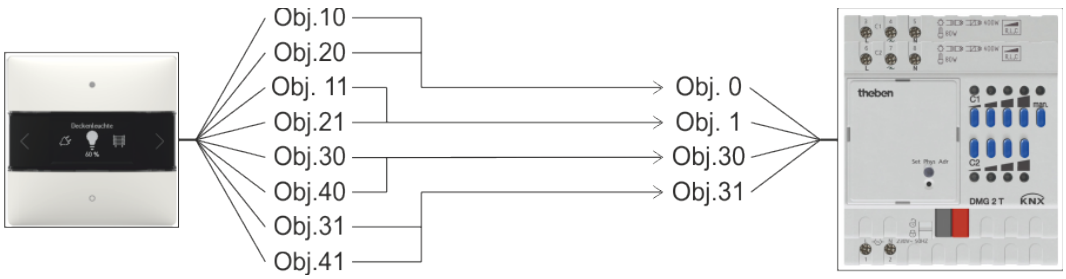
- left button → brighter
- right button → darker

> One rocker button, i.e. 2 buttons are used for each lighting group.
> The left and right button of a rocker button send the telegrams to the dimming actuator via a common group address.

7.3.1 Devices

- iON 108 (4969234)
- DMG 2 T (4930270)

7.3.2 Overview



7.3.3 Objects and links

Links

No.	iON 108 Object name	No.	DMG 2 T Object name	Comment
10	*F1 Switching*	0	*DMG 2 T Channel C1 Switching On/Off*	First lighting group: Sends On/Off commands to the dimming actuator with a short button push,
20	*F2 Switching*			
11	*F1 Brighter*	1	*DMG 2 T Channel C1 Brighter/darker*	Sends brighter/darker commands to the dimming actuator with a long button push.
21	*F2 Darker*			
30	*F3 Switching*	30	*DMG 2 T Channel C2 Switching On/Off*	Second lighting group: Sends On/Off commands to the dimming actuator with a short button push,
40	*F4 Switching*			
31	*F3 Brighter*	31	*DMG 2 T Channel C2 Brighter/darker*	Sends brighter/darker commands to the dimming actuator with a long button push.
41	*F4 Darker*			

7.3.4 Important parameter settings

iON 108

Parameter page	Parameter	Setting
F1 (2,3,4)	*Button function*	Dimming
(F1) ***dimming***	*Response to long/short*	Brighter/On[49]
(F2) ***dimming***	*Response to long/short*	Darker/Off[50]
(F3) ***dimming***	*Response to long/short*	Brighter/On[51]
(F4) ***dimming***	*Response to long/short*	Darker/Off[52]

DMG 2 T

Parameter page	Parameter	Setting
Dimming response	*Switching on/off with a 4-bit Telegram*	*no*

[49] Brighter/change over is also possible.
[50] Darker/change over is also possible.
[51] Brighter/change over is also possible.
[52] Darker/change over is also possible.

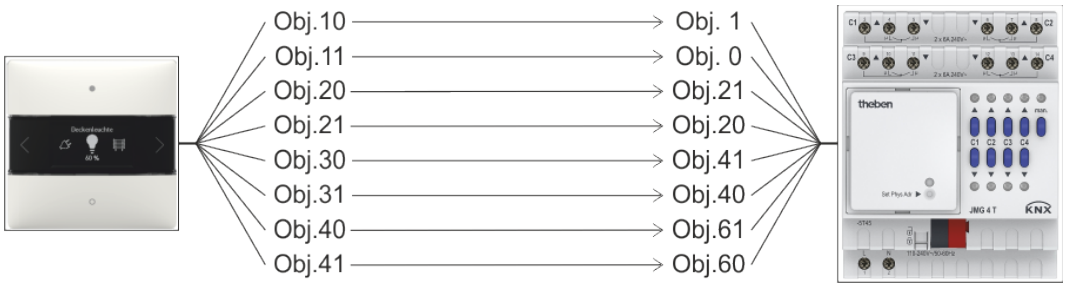
7.4 Controlling 4 blinds or blind groups

iON 108 controls the blind actuator JMG 4 T.
A long button push raises or lowers the blinds.
A short button push triggers the step/stop function.

7.4.1 Devices

- iON 108 (4969234)
- JMG 4 T (4930250)

7.4.2 Overview



7.4.3 Objects and links

Links

No.	iON 108 Object name	No.	JMG 4 T Object name	Comment
10	*F1* *Step/stop*	1	*JMG 4 T C1* *Step/stop*	Long button push for Up/down operating commands. Short button push for Step/stop commands.
11	*F1* *Up/down*	0	*JMG 4 T C1* *Up/down*	
20	*F2* *Step/stop*	21	*JMG 4 T C2* *Step/stop*	
21	*F2* *Up/down*	20	*JMG 4 T C2* *Up/down*	
30	*F3* *Step/stop*	41	*JMG 4 T C3* *Step/stop*	
31	*F3* *Up/down*	40	*JMG 4 T C3* *Up/down*	
40	*F4* *Step/stop*	61	*JMG 4 T C4* *Step/stop*	
41	*F4* *Up/down*	60	*JMG 4 T C4* *Up/down*	

7.4.4 Important parameter settings

iON 108

Parameter page	Parameter	Setting
F1 (2,3,4)	*Function*	Blinds
Blinds	*Operation*	One button operation

JMG 4 T

Parameter page	Parameter	Setting
JMG 4 JMG 4 T	*Type of hanging*	*Blinds*

7.5 RTC - Heating with presence detector and frost protection via window contact.

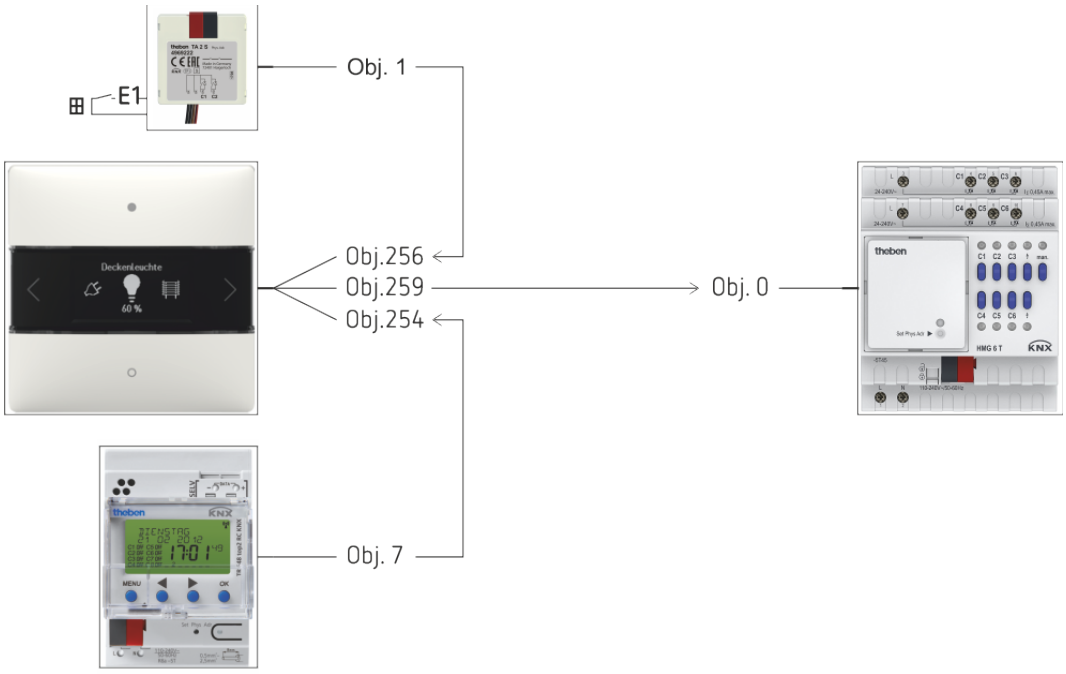
The room temperature controller (RTC) controls one or more actuators.
The comfort mode is triggered on the device, otherwise the controller is in standby during the day and in night mode during the night.
If a window is opened, the controller has to automatically change to frost protection mode.

All windows are fitted with window contacts. These are connected to a binary input.
The window status is sent via a common group address to the window position input object.
The device will recognise when a window is opened and automatically switch to frost protection mode. When the window is closed, the previously set operation mode will be restored.

7.5.1 Devices

- iON 108 (Order No. 4969238)
- TA 2 S (Order No. 4969222)
- TR 648 top2 RC KNX (Order No. 6489212)
- HM 6 T (4940240)

7.5.2 Overview



7.5.3 Objects and links

No.	TR 648 top2 Object name	No.	iON 108 Object name	Comment
7	C1.1 switching channel – HVAC operating mode	254	Operating mode preset	Switches the controller between standby and night.

No.	iON 108 Object name	No.	HM 6 T Object name	Comment
259	Heating actuating value	0	Continuous actuating value	Actuating value for the heating actuator.

No.	TA 2 S Object name	No.	iON 108 Object name	Comment
1	Channel I1.1 switching	256	Window status	The windows status is detected at input E1 (window contact) and sent to the controller (window status) via a group address. When opening the window, the controller changes into frost protection mode.

7.5.4 Important parameter settings

Standard or customer-defined parameter settings apply to unlisted parameters.

iON 108 : RTC

Parameter page	Parameter	Setting
Setting	*Control*	*Only heating control*

TA 2 S

Parameter page	Parameter	Setting
Channel 1	*Activate channel*	*ON*
	Channel function	*Switch*
	How many telegrams are to be sent	*One telegram*
Switch object 1	*Object type*	*Switching (1 bit)*
	Send if input = 1	*yes*
	Value	*ON*
	Send if input = 0	*yes*
	Value	*OFF*
	Send cyclically	*yes*
	Response after restoration of the bus supply	*update (immediately)*

TR 648 top2 RC:

Parameter page	Parameter	Setting
General information	*Activate time switch channel C1*	*yes*
Switching channel C1	*Telegram type C1.1*	*HVAC operating mode*
	With clock -> ON	*send following telegram once*
	Telegram	*Standby*
	With clock -> OFF	*send following telegram once*
	Telegram	*Temperature reduction at night*

HM 6 T:

Parameter page	Parameter	Setting
Channel H1: Configuration options	*Channel function*	*Heating actuator*
	Type of actuating value	*continuous..*

8 Appendix

8.1 Modes of operation

For each function (F1-F20) the mode of operation, i.e. the operation method, can be selected individually.
There are 3 modes of operation available.

8.1.1 Mode of operation: fixed values

Each button sends its own value.
This mode of operation is fixed for switching, dimming and blinds.
It is freely selectable for priority, value 0-255, percentage value, floating point numbers, HVAC, scenes, colour temperature and colour value (RGB etc.).

The telegram is sent immediately each time the button is pushed.

8.1.2 Mode of operation: value list

This mode of operation is freely selectable for priority, value 0-255, percentage value, floating point numbers, HVAC, scenes, colour temperature, colour values (RGB etc.).

A list with 2 to 12 entries is available.
For certain functions, the maximum list length can also be smaller.
This applies to priority (max. 3 entries) and HVAC (max. 5 entries).

The value to be sent from the list is selected directly at the device.
By pressing the top or bottom button, all values in the list are displayed one after the other.

The displayed values can be sent with or without delay.
This setting is made with the *Send Delay* parameter on the ***General/Settings*** parameter page (heading: For value lists or move value).

With send delay
If a delay is selected (default = 1 s), the values are only displayed when scrolling through.

Transmission only takes place after the button is released and the delay has expired.
Thus only the desired value is sent and no intermediate values.

Without send delay
When scrolling through, all values displayed in succession are sent immediately without delay.

The *scrolling direction* is set on the ***General/Settings*** parameter page (heading: For value lists or move value).

8.1.3 Mode of operation: move value

This mode of operation is freely selectable for value 0-255, percentage value, floating point numbers and colour temperature.

A defined value range, minimum/maximum value is available.
The value to be sent is selected directly at the device.

By pressing the top or bottom button, the value is changed stepwise between minimum/maximum value.

The displayed values can be sent with or without delay.
This setting is made with the *Send Delay* parameter on the ***General/Settings*** parameter page (heading: For value lists or move value).

With send delay
If a delay is selected (default = 1 s), the values are only displayed when scrolling through. Transmission only takes place after the button is released and the delay has expired.

Without send delay
When scrolling through, all values displayed in succession are sent immediately without delay.

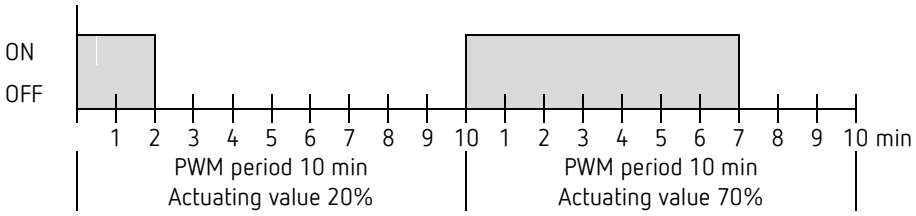
The *scrolling direction* is set on the ***General/Settings*** parameter page (heading: For value lists or move value).

8.2 PWM cycle

8.2.1 Basic principle

In order to achieve e.g. a heating output of 50%, the 50% actuating value is converted into switch-on/switch-off cycles.
The actuator is switched on for 50% of the time and switched off for 50% of the time over a fixed period (10 minutes in our example).

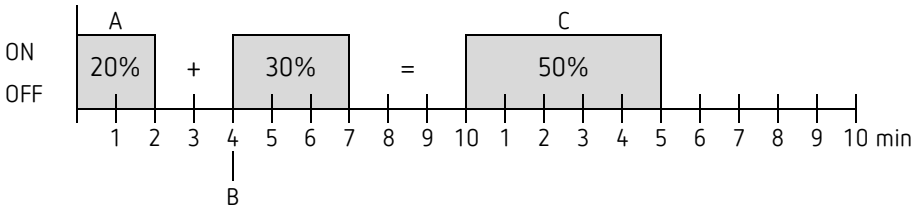
Example: 2 different turn-on times of 2 and 7 minutes indicate the implementation of 2 different actuating values, that is once 20% and once 70% during a PWM period of 10 minutes.



8.2.2 Response to changes in actuating value

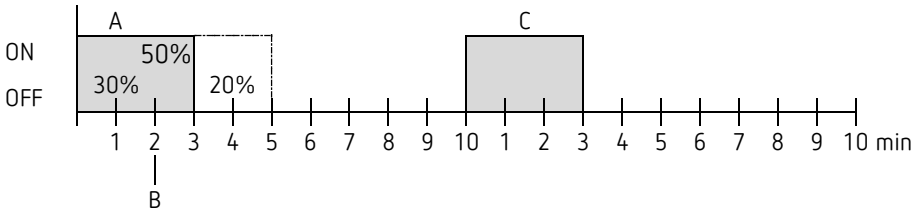
Every change in the actuating value is immediately transferred to the PWM cycle, in order to respond to changes in the quickest possible time.

Example 1: The last actuating value was 20% (A).
A new actuating value of 50% is received during the cycle (B).
The output is immediately switched on and the missing 30% turn-on time is added.
The next cycle is executed with 50% (C).



If the rated turn-on time for the current cycle has already exceeded while receiving the new actuating value, the output is immediately switched off and the new actuating value is executed during the next cycle.

Example 2: The last actuating value was 50% (A)
A new actuating value of 30% is received during the cycle (B).
The output is switched off after completing 30% of the PWM cycle and thus the new actuating value is already executed.



8.3 Operating mode as scene (RTC)

8.3.1 Principle

The current operating mode can be saved via an object with the scene function and restored later at any time.
When saving a scene, the current operating mode is assigned to the respective scene number.
When the scene number is called up, the previously saved operating mode is reactivated.
This allows the device to be easily and conveniently integrated into any user scene.
The scenes are permanently stored and remain intact even after the application has been downloaded again.

In order to save or call up the scene, the respective code is sent to the *Operating mode as scene* object.

Scene	Call up		Save		Scene	Call up		Save	
	Hex.	Dec.	Hex.	Dec.		Hex.	Dec.	Hex.	Dec.
1	$00	0	$80	128	33	$20	32	$A0	160
2	$01	1	$81	129	34	$21	33	$A1	161
3	$02	2	$82	130	35	$22	34	$A2	162
4	$03	3	$83	131	36	$23	35	$A3	163
5	$04	4	$84	132	37	$24	36	$A4	164
6	$05	5	$85	133	38	$25	37	$A5	165
7	$06	6	$86	134	39	$26	38	$A6	166
8	$07	7	$87	135	40	$27	39	$A7	167
9	$08	8	$88	136	41	$28	40	$A8	168
10	$09	9	$89	137	42	$29	41	$A9	169
11	$0A	10	$8A	138	43	$2A	42	$AA	170
12	$0B	11	$8B	139	44	$2B	43	$AB	171
13	$0C	12	$8C	140	45	$2C	44	$AC	172
14	$0D	13	$8D	141	46	$2D	45	$AD	173
15	$0E	14	$8E	142	47	$2E	46	$AE	174
16	$0F	15	$8F	143	48	$2F	47	$AF	175
17	$10	16	$90	144	49	$30	48	$B0	176
18	$11	17	$91	145	50	$31	49	$B1	177
19	$12	18	$92	146	51	$32	50	$B2	178
20	$13	19	$93	147	52	$33	51	$B3	179
21	$14	20	$94	148	53	$34	52	$B4	180
22	$15	21	$95	149	54	$35	53	$B5	181
23	$16	22	$96	150	55	$36	54	$B6	182
24	$17	23	$97	151	56	$37	55	$B7	183
25	$18	24	$98	152	57	$38	56	$B8	184
26	$19	25	$99	153	58	$39	57	$B9	185
27	$1A	26	$9A	154	59	$3A	58	$BA	186
28	$1B	27	$9B	155	60	$3B	59	$BB	187
29	$1C	28	$9C	156	61	$3C	60	$BC	188
30	$1D	29	$9D	157	62	$3D	61	$BD	189
31	$1E	30	$9E	158	63	$3E	62	$BE	190
32	$1F	31	$9F	159	64	$3F	63	$BF	191

8.4 Setpoint correction

The setpoint correction enables a *dynamic adjustment* of the setpoint to the outdoor temperature when cooling.

This function prevents an excessive temperature gradient between the outdoor area and the cooled interior at high outdoor temperatures.

If the outdoor temperature exceeds a set threshold, adjustment is activated and a corresponding increase of the setpoint is calculated.

The current outdoor temperature for calculating the correction is received via *Outdoor temperature* object.

The setpoint correction is activated on the ***Settings*** parameter page via the *Use setpoint correction at high outdoor temperatures* parameter and is set on the ***Set point adjustment*** parameter page.

The setpoint correction is internally linked to the RTC, so no bus connection is required.

8.5 Fan stage in forced operation

This function allows manual preselection of the fan stage on the RTC display page of the device. The fan coil actuator or the fan control unit is put into forced operation for this purpose.

Important: Depending on the actuator used, either 1 or 0 is needed to trigger forced operation.

This response is adjustable, see *Switch fan between auto and forced* parameter on the *Fan stages* parameter page.

Send response in forced mode with fan coil actuator FCA 1, FCA 2 (forced = 1)[53]*:*
The *Fan forced/auto - send* object sends a 1 to the fan coil actuator, thereby triggering forced mode.
The *Fan stage in forced mode - send* object sends the control variable for the selected fan stage in accordance with the set threshold value.
This actuating value is accepted in the fan coil actuator (in accordance with the set threshold) as a fan stage between 0 and 3.

Important: The sent forced actuating value should always be higher than the threshold setting of the fan coil actuator.

Example:

Threshold for Fan stage	Set values at iON 108	Recommended values for FCA 1 or FCA 2
1	20%	10%
2	50%	40%
3	80%	70%

If fan stage 2 is selected with the button, the actuating value 50% will be sent.

As the threshold for stage 2 in the fan coil actuator is set to 40%, the received actuating value of 50% is clearly allocated to fan stage 2 and accepted by the fan.

[53] *Forced = 1, fan stage telegram format = percent*

8.6 Temperature control

8.6.1 Introduction

If the device is not configured as a switching controller, it can alternatively be configured as a P or as a PI controller, whereby PI control is preferable.

With the proportional controller (P controller), the actuating value is statically adjusted to the control deviation.
The proportional integral controller (PI controller) is far more flexible, i.e. it controls dynamically, i.e. more quickly and more accurately.

To explain the function of both temperature controllers, the following example compares the room to be heated with a vessel

The filling level of the vessel denotes the room temperature.
The water feed stands for the radiator output.
The heat losses of the room are shown by a discharge.

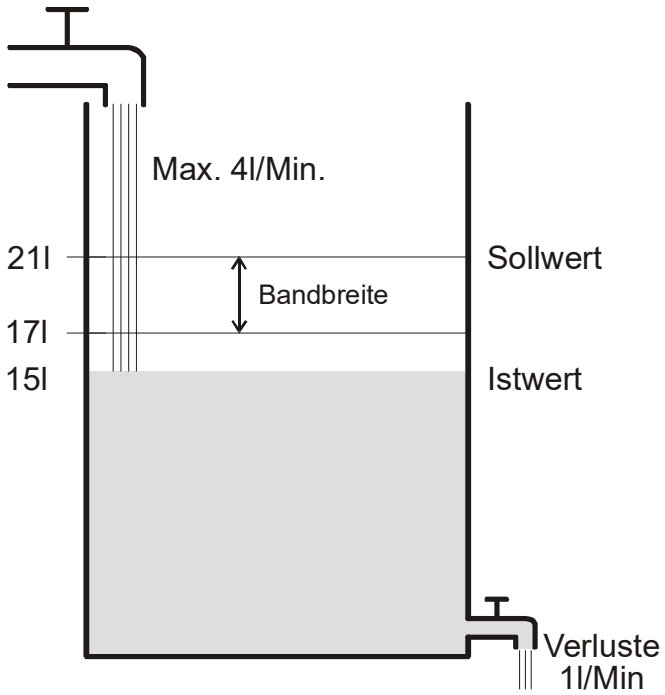
In our example, the maximum feed quantity is assumed to be 4 litres per minute, which at the same time represents the maximum heating output of the radiator for us.
This maximum output is achieved with an actuating value of 100%.
Accordingly, with an actuating value of 50% only half of the water volume, i.e. 2 litres per minute, would flow into our vessel.

The bandwidth is 4 l.
This means, the controller will control at 100%, as long as the actual value will be smaller or equal (21 l – 4 l) = 17 l.

Task:

Desired filling volume:
21 litres (= setpoint)
When should the feed be gradually reduced, in order to prevent an overflow? :
4 l below the desired filling volume, i.e. at 21 l – 4 l = 17 l (= bandwidth)
Original filling volume
15 l (=actual value)
The losses are 1 l/minute

8.6.2 Response of the P controller



If the filling quantity is 15 l, there is a control deviation of 21 l – 15 l = 6 l
As our actual value lies outside the bandwidth, the control will operate the feed at 100%, i.e. with 4 l/minute.

The feed quantity (= actuating value) is calculated from the control deviation (set point – actual value) and the bandwidth.
Actuating value = (control deviation/bandwidth) x 100

The following table illustrates the response and also the limits of the P controller.
Table 1

Filling level	Actuating value	Feed	Losses	Increase of filling level
15 l	100%	4 l/min	1 l/min	3 l/min
19 l	50%	2 l/min		1 l/min
20 l	25%	1 l/min		0 l/min

The last line shows that the filling level cannot be increased anymore, because the inlet feeds as much water as can be discharged by the losses.
The result is a permanent control deviation of 1 l. The setpoint can never be achieved.
If the losses were increased by 1 l, the permanent control deviation would be increased by the same amount, and the filling level would never exceed the 19 l mark.
In case of a room, this would mean that the control deviation increases with decreasing outdoor temperature.

P controller as temperature controller

Just as in the previous example, the P controller behaves in a heating control.
The set temperature (21 °C) can never be completely reached.

The permanent control deviation is increased the higher the heat losses, i.e. the colder the outdoor temperatures.

8.6.3 Response of the PI controller

In contrast to the pure P controller, the PI controller functions dynamically.
With this type of controller, the actuating value remains unchanged, even at a constant deviation.

At the first moment, the PI controller sends the same actuating value as the P controller.
However, this will be increased further the longer the setpoint will not be reached.
This increase is time-controlled over the so-called integration time.
During this calculation method, the actuating value will not be changed anymore when the setpoint equals the actual value.
In our example, this results in the balance between feed and discharge.

A good control depends on the adjustment of bandwidth and integration time with the room to be heated.
The bandwidth influences the increment of the actuating value change:
Large bandwidth = finer increments for the actuating value change.
The integration time influences the response time to temperature changes:
Long integration time = slow response.
Poor adjustment can result in either the setpoint being exceeded (overshoot), or the controller taking too long to reach the setpoint.

The best results are generally achieved using the standard settings or with the settings via installation type.

8.7 Continuous and switching control

A switching (2-point) control recognises only 2 statuses, On or Off.
A continuous control works with an actuating value between 0% and 100% and can thus exactly dose the energy input. This provides a pleasant and precise degree of control.

Table 2: Overview of control functions

Operating mode/stage	Type of control	Hysteresis
Heating	2-point/PI controller	positive
Cooling	2-point/PI controller	negative
Additional stage	2-point/P controller	negative

8.8 Hysteresis

Hysteresis determines the difference between a controller's switching on and off temperature.

It can be both positive and negative.
With a combination of heating and cooling control, it influences the amount of the dead zone.

Without hysteresis, the controller would activate and deactivate continuously, as long as the temperature lies within the range of the setpoint.

8.8.1 Negative hysteresis:

Heating: Is provided until the setpoint has been reached.
Afterwards, the heating is only switched on again if the temperature falls below the "Hysteresis setpoint value" threshold.
Cooling: Lasts until the "Hysteresis setpoint" threshold has been achieved.
Afterwards, it is only switched on again if the temperature rises above the setpoint.

Example of additional heating stage:
Additional stage with a setpoint of 20 °C, hysteresis 0.5 K and starting temperature 19 °C.
The additional stage is switched on and does not switch off again until the setpoint (20°) is reached.
The temperature decreases, and the additional stage only switches on at 20 °C-0.5 K= 19.5 °C.

Cooling example:
Cooling with setpoint of 25 °C, hysteresis = 1 °C and ambient temperature 27 °C.
The cooling is switched on and switches off again only when a temperature of 24 °C (25 °C − 1 °C) is reached.
It switches on again when the temperature rises above 25 °C.

8.8.2 Positive Hysteresis

Heating lasts until the temperature reaches the "setpoint + hysteresis " threshold.
The heating is only switched on again, when the temperature falls below the setpoint.

Heating example:
Heating with setpoint 20 °C, hysteresis = 1 °C and ambient temperature 19 °C.
The heating is switched on and only switches off again when a temperature of 21 °C (= 20 °C + 1 °C) is reached.
It switches on again, as soon as the temperature falls below 20 °C.

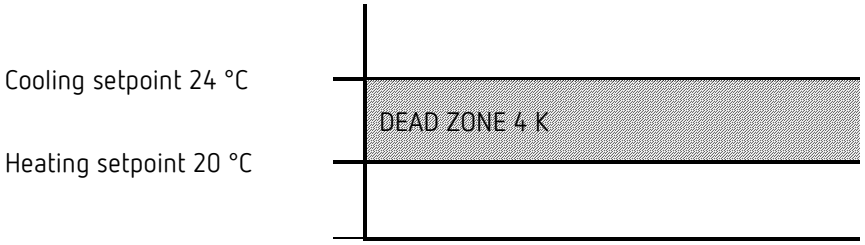
8.9 Dead zone

The dead zone is a buffer area between heating and cooling mode.
Within this dead zone, neither heating nor cooling occurs.

Without this buffer area, the system would permanently switch between heating and cooling. As soon as the setpoint was fallen below, the heating would be activated. After hardly reaching the setpoint, the cooling would immediately start, the temperature would fall below the setpoint and switch on the heating again.

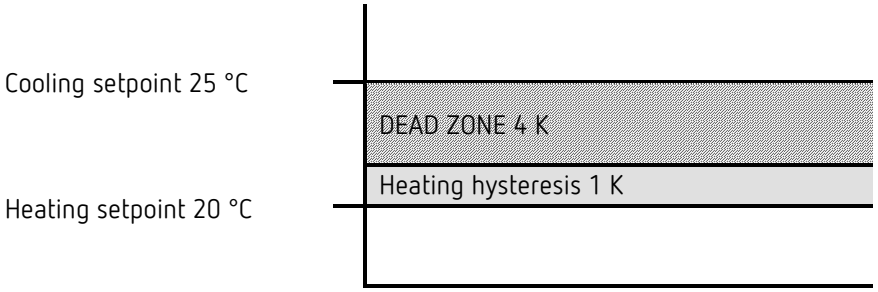
Depending on the type of control, the dead zone can be extended by the value of the hysteresis.

Case 1: Heating and cooling with continuous control



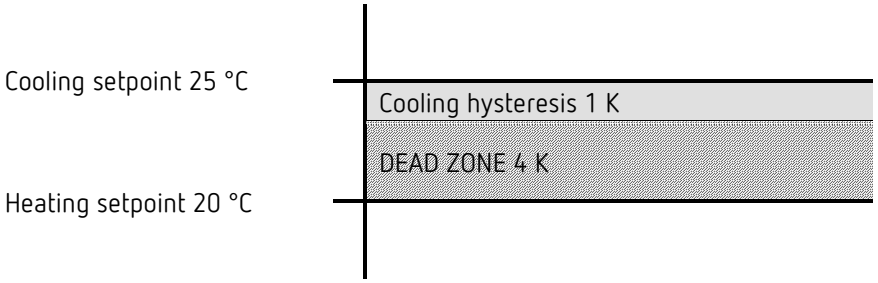
The dead zone (4 K) is not affected.

Case 2: Heating with 2-point control and cooling with continuous control



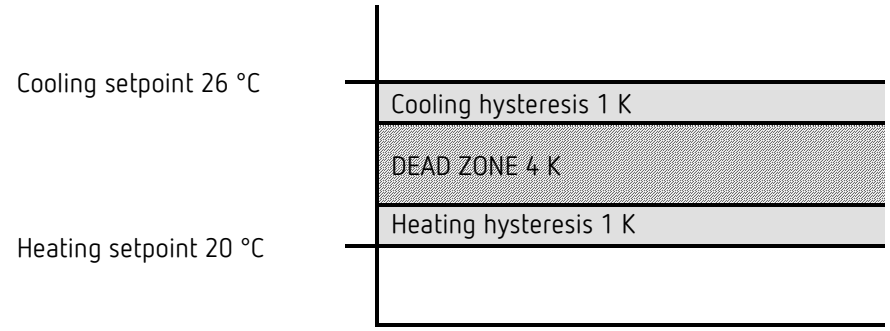
The dead zone (4 K) is increased by the value of the hysteresis (1 K) and offsets the cooling set point value to 25 °C.

Case 3: Heating with continuous control and cooling with 2-point control



The dead zone (4 K) is increased by the value of the hysteresis (1 K) and offsets the cooling set point value to 25 °C.

Case 4: Heating and cooling with 2-point control



The dead zone (4 K) is increased by the value of both hysteresis (2 K) and offsets the cooling setpoint to 26 °C.

8.10 Operating mode selection

8.10.1 Priorities in operating mode selection

The operating mode selection between comfort, standby, night mode and frost protection can happen in 3 different ways:

- Via the object *Operating mode preset*
- Manually at the device
- Via scene controls

These 3 options are all on the same priority level.

ⓘ In principle the following applies: The last instruction overwrites the previous one.
Exception: Frost mode via window contact has priority over all other operating modes.

Upon selection of the *presence button* parameter, the following also applies:
If a new operating mode is received on the object with the presence object set (*operating mode preset)*, it is accepted and the presence object is reset (only with presence button).

Reception of the same operating mode as prior to the presence status
(e.g. via cycl. sending) is ignored.

If the *presence object* is set during night/frost mode, it is reset after the configured comfort extension has expired (see below).

If the *presence object* is set during standby mode, the comfort operating mode is accepted without time restriction.

8.10.2 Determining the current operation mode

The current setpoint can be adjusted to the relevant requirements by selecting the operating mode.
The operating mode can be specified via the objects *operating mode preset, presence, and window position*.

Obj. Operating mode preset	Obj. Presence	Obj. Window position	Obj. Current operating mode
User-defined	User-defined	1	Frost/heat protection
User-defined	1	0	Comfort
Comfort	0	0	Comfort
Standby	0	0	Standby
Night	0	0	Night
Frost/heat protection	0	0	Frost/heat protection

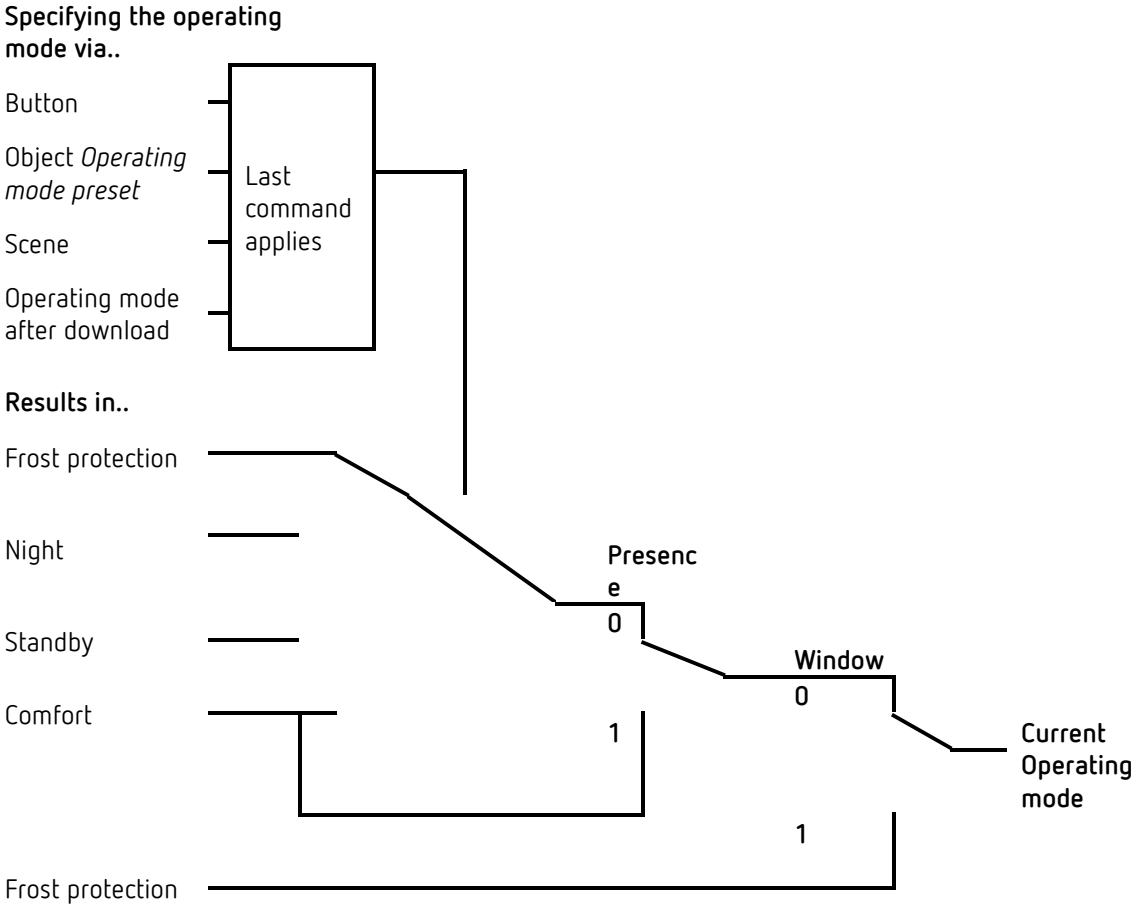
Typical application:

In the morning, the *Operating mode* object activates "Standby" or "Comfort", and in the evening "Night" via a time switch (e.g. TR 648).
During holiday periods, frost/heat protection is selected via another channel, also via the same object.

The *Presence* object is linked to a presence detector. If presence is detected, the controller switches to comfort operating mode (see table).

The *Window status o*bject is linked to a window contact via the bus (external input).
As soon as a window is opened, the controller switches to frost protection operating mode.

Determining the operating mode when using a presence detector



8.11 Determination of the setpoint

8.11.1 Setpoint calculation in heating mode

See also: *Base setpoint and current setpoint*

Current setpoint during heating:

Operating mode	Current setpoint
Comfort	Base setpoint +/- setpoint offset
Standby	*Base setpoint* +/- setpoint offset – *reduction in standby mode*
Night	*Base setpoint* +/- setpoint offset – *reduction in night mode*
Frost/heat protection	configured *setpoint for frost protection mode*

Example: Heating in comfort mode.

Parameter page	Parameter	Setting
Setpoints	*Base setpoint after reset*	*21 °C*
	Reduction in standby mode (during heating)	*2 K*
Heating setpoints	*Maximum valid setpoint offset*	*+/- 2 K*

The setpoint was previously increased by 1 K using the + button.

Calculation:

Current setpoint = base setpoint + setpoint offset
= 21 °C + 1 K
= 22 °C

If operation is switched to standby mode, the current setpoint is calculated as follows:

Current setpoint = base setpoint + setpoint offset – reduction in standby mode
= 21 °C + 1 K – 2 K
= 20 °C

8.11.2 Setpoint calculation in cooling mode

Current setpoint during cooling:

Operating mode	Current setpoint
Comfort	Base setpoint + setpoint offset + dead zone
Standby	Base setpoint + setpoint offset + dead zone + increase in standby mode
Night	Base setpoint + setpoint offset + dead zone + increase in night mode
Frost/heat protection	configured setpoint for heat protection mode

Example: Cooling in comfort operating mode.
The room temperature is too high, the controller has switched to cooling mode

Parameter page	Parameter	Setting
Heating setpoints	*Maximum valid setpoint offset*	*+/- 2 K*
	Base setpoint after loading the application	*21 °C*
Cooling setpoints	*Dead zone between heating and cooling*	*2 K*
	Increase in standby mode (during cooling)	*2 K*

The setpoint was previously lowered by 1 K on the device.

Calculation:

Current setpoint = base setpoint + setpoint offset + dead zone
= 21 °C - 1 K + 2 K
= 22 °C

Changing to standby mode causes a further increase in the setpoint (energy saving), resulting in the following setpoint.
Setpoint = base setpoint + setpoint offset + dead zone + increase in standby mode
= 21 °C - 1 K + 2 K + 2 K
= 24 °C

8.12 Setpoint offset

With this function, the user can increase or reduce the room temperature individually, as desired.

The current setpoint can either be offset via the *Manual setpoint offset* object, or via the rotary control.
See *Parameter: Rotary control function*.

The offset limits are defined on the ***Setpoints*** parameter page via the *Maximum valid setpoint offset* parameter.

The offset always refers to the set base setpoint and not to the current setpoint.

Example Base setpoint of 21 °C, *function of the rotary control = base setpoint*:

If the value of +2 K is received, the new setpoint is calculated as follows:
21 °C + 2 K = 23 °C.
In order to afterwards take the setpoint to 22 °C, the difference to the set base setpoint (here 21 °C at the rotary control) is resent to the object, in this case 1 K (21 °C + 1 K = 22 °C).
See object *Manual setpoint offset/setpoint offset at rotary control*.

8.13 Base setpoint and current setpoint

The *base setpoint* is the standard temperature for comfort mode and the reference temperature for reduction in standby and night modes.
The base setpoint can be defined directly at the rotary control, or via the Base setpoint object (see *Function of the rotary control* parameter).

The configured base setpoint (see *Base setpoint after loading application*) is stored in the *Base setpoint* object and can be changed any time via the bus by sending a new value to this object (only when *function of the rotary control = manual offset*).
After reset (restoration of the bus supply), the previously used base setpoint will be restored.

The *current setpoint* is the setpoint that is actually used for control. It is the result of all reductions or increases associated with the operating mode and control function.

Example: At a base setpoint of 22 °C and a reduction in night mode of 4 K, the current setpoint (in night mode) is: 22 °C - 4 K = 18 °C. During the day (in comfort mode), the current setpoint is 22 °C (in heating mode).

The formation of the current setpoint on the basis of the base setpoint can be seen in the block diagram on the next page:
The base setpoint on the left is specified via object, or set on the device.
The current setpoint is on the right, i.e. the value to which the room temperature is actually controlled.

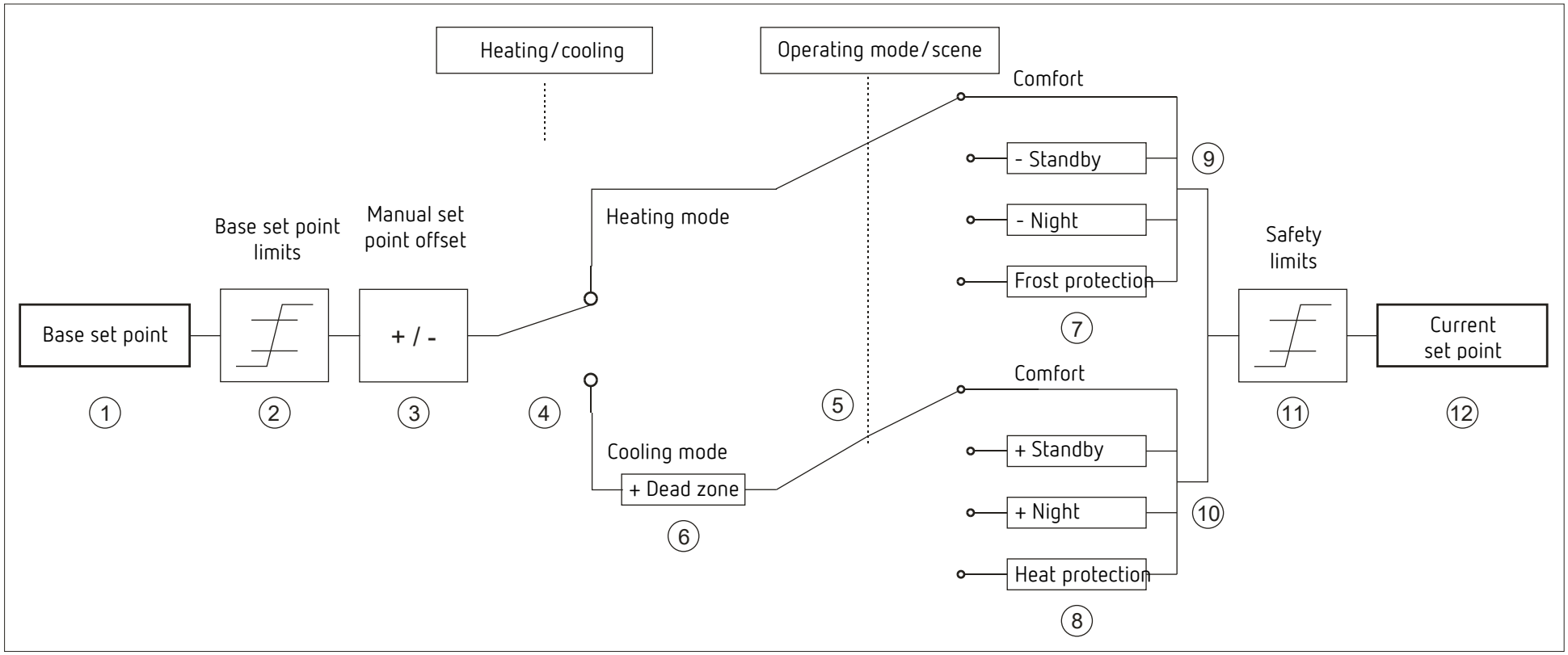
As you can see in the block diagram, the current setpoint depends on the operating mode (5) and the selected control function (4).

The base setpoint limits (2) prevent an incorrect base setpoint from being specified at the object.
These are the following parameters:

- *Minimum valid base setpoint*
- *Maximum valid base setpoint*

If the setpoint is outside the configured values for frost and heat protection, because of a setpoint offset, it is restricted to these values by the safety limits (11).

8.13.1 set point calculation



1 Fixed base set point of object or rotary control (only RAMSES 718 P)
2 Max. and min. valid base set points
3 Manual set point offset
4 Change between heating and cooling: Automatically or via object
5 Selection of operating mode, by operator, object, switching program or scene.
6 The set point is increased in cooling mode by the amount of the dead zone
7 The set point is replaced by the set point for frost protection mode
8 The set point is replaced by the set point for heat protection mode
9 set point after reductions caused by the operating mode
10 set point after increases caused by the operating mode
11 The limits for frost and heat protection must be adhered to
12 Current set point after increases, reductions and limits caused by the operation

9 Release notes

A firmware update is possible with the ETS app "Theben Update Tool".

Devices from version	Change
Only for devices with firmware from V1.1.0 and application programme from V2.0.	For function *Display value,* further object types • Switching (1 bit) and texts for ON and OFF • Value 0-255 (1 byte) • Percentage value (1 byte) • Value -32768...32767 DPT8.x (2 bytes) • Value 0-65535 (2 bytes)
	New parameters for • *Activate Bluetooth* • *Activate room temperature controller (RTC)* • *RTC display and operation on the device*
	For function *Switching,* two new telegram types • top OFF/bottom OFF • top ON/bottom ON
	New function, controller substation
	Ranges for reduction or increase in night or standby mode extended to 0K to 8K
	Long button push starting at + 1,5 s .. 3s
Only for devices with firmware from V1.2.3 and application program from V2.2.	• Parameter: swap upper and lower display lines • Dead zone between heating and cooling always adjustable from 0 K • Floor temperature limitation can be activated • Reporting of current setpoint offset via object