



The binary input/sensor is a flush-mounted device and is used for the potential-free connection of conventional push buttons and switches. The device is suitable for insertion in a 60 mm flush-type box.

The connection of the 5 binary inputs is carried out via the prefabricated cable set supplied. This can be extended up to 10 m. A separate power supply is not required as the scanning voltage of the binary inputs is made available.

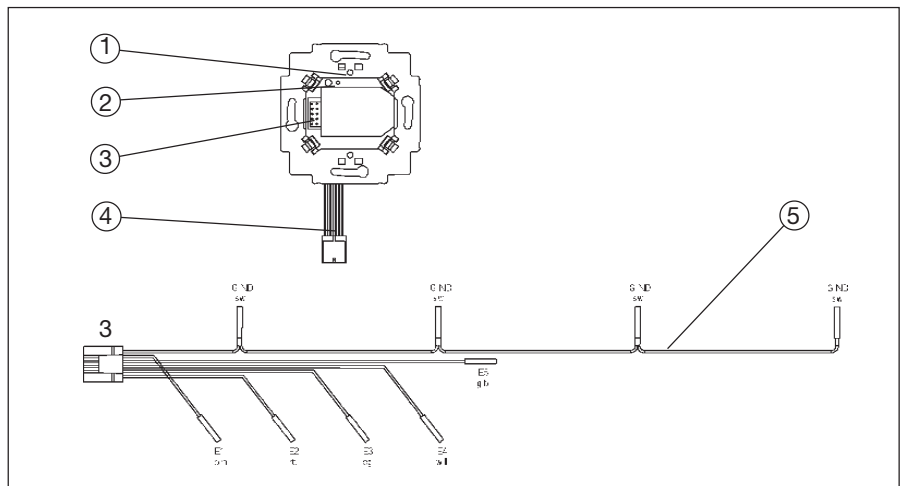
The device can also be used in connection with the room thermostat for the commercial sector or the watchdog sensor. These devices are simply plugged onto the 10-pole interface.

Technical data

Power supply	- EIB	24 V DC, via the bus line
Inputs	- Binary inputs	6 black cores on a fixed attachment plug
	- Scanning voltage	5 V DC, made available via the device
Operating and display elements	- Red LED and push button	for assigning the physical address
Connections	- Cable harness (supplied)	Prefabricated cable set I1: brown, bn I2: red, rd I3: orange, og I4: white, wh I5: yellow, ye GND: black, bl
	- Permitted cable length	max. 10 m
	- EIB	via supplied bus connecting terminal on the back of the device
Type of protection	- IP 20, EN 60 529	
Ambient operating temperature	- Operation	- 5 °C ... 45 °C
Mounting	- in 60 mm flush-type box	
Dimensions	- 50 x 45 x 33 mm (H x W x D) - 71 x 71 mm (retaining ring)	
Weight	- 0.05 kg	
Certification	- EIB-certified	
CE norm	- in accordance with the EMC guideline and the low voltage guideline	

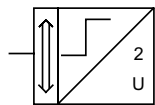
Application programs	Number of communication objects	Max. number of group addresses	Max. number of associations
without operating element:			
Switch Edge Dim Shutter Value /1	11	20	33
with watchdog sensor:			
Movement Switch Edge Dim Shutter Value /1	15	21	25
with thermostat for the commercial sector:			
Switch Edge Dim Shutter Value Heat Cool /1	20	21	20

Circuit diagram



- 1 Plug for bus terminal (at the back)
- 2 Programming LED and push button
- 3 10-pole physical external interface
- 4 Connecting cable for binary inputs I1 ... I5
- 5 Prefabricated cable set supplied with device

Switch Edge Dim Shutter Value /1



Selection in ETS2

- ABB
 - └ Input
 - └ Binary input, 5-fold

The application is used if no application modules have been plugged onto the binary input. It detects changes at the inputs and converts them into telegrams according to the parameterisation. Each input has its own set of parameters and can either be used for switching, dimming or shutter control.

The function of the inputs is set with the parameter "Operation mode of input ...".

To enable a clearer assignment of parameters, several parameters are not visible in the "Low Access" view. It is possible to display all the options at any time so that the full functionality of the device can be used. To do so, it is necessary to change to the "High Access" view. The additional parameters can only now be modified.

Switch, Edge

If the operating mode "Edge (switching)" is selected, a communication object "Input ... - Telegr. switch" is available for all the inputs.

If the parameter "Reaction on input ..." is set to "TOGGLE", an "On" or "Off" telegram is sent alternately after each operation of the input i.e. it toggles on rising and on falling edge.

If the parameter "Reaction on input ..." is set to "switch defined", the individual pulse edges of the input signal are evaluated. The telegrams are sent according to the parameter "Switching function of the input ...". The setting "rising = ON, falling = OFF" can be selected for example for conventional switches. When the switch contact is closed, an "On" telegram ("1") is sent on the bus while an "Off" ("0") telegram is sent when the contact is opened.

With the parameter "Sending condition for cyclical sending", the inputs can send their telegrams cyclically. If "TOGGLE" is selected as the reaction to the input signal, cyclical sending will always be carried out or only if the communication object contains the value "0" (=Off) and/or "1" (=On). If "switch defined" is selected, the cyclical sending behaviour is not determined by the object value but by the status at the input: either always ("at rising and falling edge") or only on rising or falling edge.

The cyclic time is entered separately for each input and is calculated using the parameters "Time base for cyclical sending ..." and "Time factor for cyclical sending ...".

$$\text{Cyclic time} = \text{Base} * \text{Factor}$$

Switch, Value

If the operating mode "Edge (value)" is selected, a communication object "Input ... - Telegr. value" is available for all the inputs. Two 1 byte values can be sent to this communication object either alternately or defined.

If the parameter "Reaction on input ..." is set to "TOGGLE (between value 1 and 2)", after each operation of the input i.e. on rising and falling edge, the first value and second values are sent alternately. The value that is sent is defined by the setting "Value ... sends".

The individual pulse edges of the input signal are evaluated with the setting "switch defined" for the parameter "Reaction on input ...". The telegrams are sent according to the parameter "Switching function of the input ...". It can therefore be set whether only one value is sent on rising or falling edge or if both values are sent when the pulse edges differ.

In the same way as the operating mode "Edge (switching)", the inputs can send their telegrams cyclically via the parameter "Sending condition for cyclical sending". If the reaction to the input signal is set to "TOGGLE (between value 1 and 2)", it is possible to send either value 1, value 2 or both values. If "switch defined" is selected as the reaction to the input signal, the cyclical sending behaviour is determined by the status at the input: either always ("at rising and falling edge") or only on rising or falling edge.

The cyclic time is entered separately for each input and calculated using the parameters "Time base for cyclical sending ..." and "Time factor for cyclical sending ...".

$$\text{Cyclic time} = \text{Base} * \text{Factor}$$

Enable

If the parameter window is switched to "High Access", it is possible to disable all the inputs together via the communication object "Inputs 1-5 / Activation". This means that the states of the inputs have no significance while the common activation object is set. The inputs can either be disabled with an "On" or "Off" telegram.

If an input is assigned the operating mode "Edge ...", it is possible to activate a further communication object "Input ... - Activation" via the parameter "Activation object for inputs ...". This object is only available to the associated input. If this activation object has the value "0", the input is disabled i.e. no switching or value telegrams are sent when the input is operated. If the activation object has the value "1", switching or value telegrams may be sent by the respective input.

It is possible to set the behaviour of the common activation object on bus voltage recovery. By default, it is "enabled" after bus voltage recovery but it can alternatively be "disabled".

If individual activation objects are enabled for the operating mode "Edge ...", they are also activated on bus voltage recovery.

Dim

Each of the inputs can be parameterised as a dimming sensor. To do so, the parameter "Operation mode of input ..." must be set to "Dimming". The communication objects "Input ... short - Telegr. switch" (1 bit) and "Input ... long - Telegr. rel. dimming" (4 bit) are displayed.

The input operates as a one-touch dimmer i.e. the function changes after each push button action. After a short operation (< 0.5 s), the input sends alternate "On" or "Off" telegrams. After a long operation, the input sends alternate "Dimming brighter" and "Dimming darker" telegrams. When the push button is released, the corresponding "Stop dimming" telegram is sent.

Shutter

If either input 1 or input 3 is selected as a shutter sensor, inputs 1 and 2 or inputs 3 and 4 are combined. The operation of the input 1(3) generates "Up" telegrams; operation of the input 2(4) produces "Down" telegrams. The application displays the communication objects "Input 1/2(3/4) long - Telegr. move up/down" (1 bit) and "Input 1/2(3/4) short - Telegr. lamella adj./stop" (1 bit).

In the default setting, the parameter "Operation mode" is set to "long = move, short = stop".

If "short = move, long = stop" is selected for this parameter, the designation and the function of the communication objects is adapted accordingly. Moreover, additional parameters are displayed for specifying a cyclic time for cyclical sending. The louvre adjustment function can thus be individually tailored to the requirements of the user: telegrams for louvre adjustment are now sent after a long push button action for the duration of the operation at the input. To be able to use this function to the optimum level, the cyclic time should be shorter than the louvre adjustment time in the actuator.

Limit number of telegrams

It is possible to limit the number of telegrams that the device can send in 17 s to avoid loading the bus with too many telegrams. If the indicated number of telegrams is reached during the time period, the device adjusts its sending behaviour for the remainder of the interval i.e. operations at the inputs are ignored. Once the 17 s has elapsed, telegrams are sent as usual.

Note: The limit set for the number of telegrams refers to all the inputs together i.e. if the telegram limit has been reached by the operation of only one input, all the inputs are disabled.

Once the commissioning has been carried out successfully (=downloading of the user program), the initialisation phase is active. During this phase, changes at the inputs are registered but not sent. The telegrams are only sent once the initialisation period (approx. 17 s) has elapsed.

Communication objects
for "Edge (switching)" operating mode

No.	Type	Object name	Function
1	1 bit	Input 1	Teleg. switch
3	1 bit	Input 2	Teleg. switch
5	1 bit	Input 3	Teleg. switch
7	1 bit	Input 4	Teleg. switch
9	1 bit	Input 5	Teleg. switch

Communication objects
for "Edge (switching)" operating mode
with activation object

No.	Type	Object name	Function
0	1 bit	Input 1-5	Activation
1	1 bit	Input 1	Teleg. switch
2	1 bit	Input 1	Activation
3	1 bit	Input 2	Teleg. switch
4	1 bit	Input 2	Activation
5	1 bit	Input 3	Teleg. switch
6	1 bit	Input 3	Activation
7	1 bit	Input 4	Teleg. switch
8	1 bit	Input 4	Activation
9	1 bit	Input 5	Teleg. switch
10	1 bit	Input 5	Activation

Communication objects
for "Edge (value)" operating mode

No.	Type	Object name	Function
1	1 byte	Input 1	Teleg. value
3	1 byte	Input 2	Teleg. value
5	1 byte	Input 3	Teleg. value
7	1 byte	Input 4	Teleg. value
9	1 byte	Input 5	Teleg. value

Communication objects
for "Dimming" operating mode

No.	Type	Object name	Function
1	1 bit	Input 1 short	Teleg. switch
2	4 bit	Input 1 long	Teleg. rel. dimming
3	1 bit	Input 2 short	Teleg. switch
4	4 bit	Input 2 long	Teleg. rel. dimming
5	1 bit	Input 3 short	Teleg. switch
6	4 bit	Input 3 long	Teleg. rel. dimming
7	1 bit	Input 4 short	Teleg. switch
8	4 bit	Input 4 long	Teleg. rel. dimming
9	1 bit	Input 5 short	Teleg. switch
10	4 bit	Input 5 long	Teleg. rel. dimming

Communication objects
for "Shutter" operating mode and
normal shutter function

No.	Type	Object name	Function
1	1 bit	Input 1/2 long	Teleg. move up/down
2	1 bit	Input 1/2 short	Teleg. lamella adj./stop
3	1 bit	Input 3/4 long	Teleg. move up/down
4	1 bit	Input 3/4 short	Teleg. lamella adj./stop

Communication objects

for "Shutter" operating mode and inverted shutter function

No.	Type	Object name	Function
1	1 bit	Input 1/2 short	Teleg. move up/down
2	1 bit	Input 1/2 long	Teleg. lamella adj./stop
3	1 bit	Input 3/4 short	Teleg. move up/down
4	1 bit	Input 3/4 long	Teleg. lamella adj./stop

Parameters

The default setting for the values is **printed in bold type**.

Parameters for "Low Access":	
Common for all inputs:	
- Debounce time	30 ms / 50 ms / 70 ms / 100 ms
Separate for all inputs:	
- Operation mode of input ...	Edge (switching) Edge (value) Dimming Shutter
Only for "Edge (switching)" operating mode:	
- Reaction on input ...	TOGGLE switch defined
Only if "TOGGLE" is selected:	
- Cyclical sending	yes / no
Only if "yes" is selected:	
- Sending conditions for cyclical sending	send OFF cyclically send ON cyclically send ON/OFF cyclically
- Time base for cyclical sending	130 ms / ... / 34 s / ... / 1,2 h
- Time factor for cyclical sending (2...127)	19
Only for "switch defined":	
- Switching function of the input ...	no reaction rising = OFF falling = OFF rising = OFF, falling = OFF rising = ON falling = ON rising = ON, falling = OFF rising = OFF, falling = ON rising = ON, falling = ON
- Cyclical sending	yes / no
Only if "yes" is selected:	
- Sending conditions for cyclical sending	at falling edge at rising edge at rising and falling edge
- Time base for cyclical sending	130 ms / ... / 34 s / ... / 1,2 h
- Time factor for cyclical sending (2...127)	19

Parameters

The default setting for the values is **printed in bold type**.

Only for "Edge (value)" operating mode:	
- Reaction on input...	TOGGLE (between value 1 and 2) switch defined
Only if "TOGGLE" is selected:	
- Value 1 sends (0...255)	0
- Value 2 sends (0...255)	255
- Cyclical sending	yes / no
Only if "yes" is selected:	
- Cyclical sending of	Value 1 Value 2 Value 1 and 2
- Time base for cyclical sending	130 ms / ... / 34 s / ... / 1.2 h
- Time factor for cyclical sending (2...127)	19
Only for "switch defined":	
- Switching function of the input ...	no reaction rising = value 1 falling = value 1 rising = value 1, falling = value 1 rising = value 1, falling = value 2
- Cyclical sending	yes / no
Only if "yes" is selected:	
- Sending condition for cyclical sending	at falling edge at rising edge at rising and falling edge
- Time base for cyclical sending	130 ms / ... / 34 s / ... / 1.2 h
- Time factor for cyclical sending (2...127)	19
Only for "Dimming" operating mode:	
- short = ON/OFF; long = dim	
Only for "Shutter" operating mode:	
At input 1 (or 3):	
Input 1/2 (3/4):	
- Operation mode	long = move, short = stop short = move, long = stop
Only if "short = move, long = stop" is selected:	
- Time base for repeating a telegram	0.5 ms / 8.2 ms / 130 ms / 2.1 s / 34 s
- Time factor for repeating a telegram (2...255)	38
Input 1(3) = DOWN / Input 2(4) = UP	

Parameters with “High Access”.
The default setting for the values
is **printed in bold type**.

Additional parameters for “High Access”:

Common for all inputs:

- Push button action interpreted as long from	130 ms / 260 ms / 520 ms / 650 ms / 780 ms / 910 ms
- Number of telegrams within 17 s (5...63)	30

Enabling the inputs:

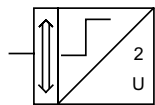
- Activation object for inputs 1-5	available not available
------------------------------------	-----------------------------------

Only if activation object is “available”:

- enabling inputs 1-5 at	ON telegram OFF telegram
- behaviour at mains recovery	enabled disabled

Separate for all inputs:

- Activation object of input ... (only active, if inputs 1-5 are enabled)	yes (enabling at ON/enabled at bus recovery) no
---	---

Movement Switch Edge Dim Shutter Value /1**Selection in ETS2**

- ABB
 - └ Input
 - └ Binary input, 5-fold

- ABB
 - └ Phys. Sensors
 - └ Watchdog for 5BI

The application is used if the watchdog sensor is plugged onto the 5-fold binary input.

To enable a clearer assignment of parameters, several parameters are not visible in the “Low Access” view. It is possible to display all the options at any time so that the full functionality of the device can be used. To do so, it is necessary to change to the “High Access” view. The additional parameters can only now be modified.

Note: The descriptions for

- Switch, Edge
- Switch, Value
- Dim and
- Shutter

have already been outlined in the application description for “Switch Edge Dim Shutter Value /1”.

The functions of the watchdog sensor are described in the following section.

Movement

With this application, the watchdog sensor can detect motion in its detection area and send switching or value telegrams.

The setting of the threshold for the light sensor as well as the recovery time, can be carried out using the potentiometer on the rear of the watchdog sensor. There is a separate setting tool available for this. Alternatively, the settings can be carried out in the ETS program. To do so, the parameter setting “Potentiometer” should be changed to “ETS”. With the parameter “Threshold”, it is possible to indicate the level of brightness at which the watchdog sensor is triggered. The value “0” means “dark” while the value “255” means “maximum brightness”. The recovery time can be set with the two parameters “Time base for recovery time” and “Time factor for recovery time”. The period is then produced from the base and factor:

$$\text{Recovery time} = \text{Base} * \text{Factor}$$

The operating mode of the watchdog sensor can be set via the slide switch. If the slide switch is moved to position “1”, the watchdog sensor sends a “1” to its communication object “Movement / Telegr. switch”. If it is moved to the position “0”, it sends a “0”. The modified operating mode is thus transferred on the bus. The signal function is inactive in both cases.

The current status of the slide switch is sent on the bus via the object “Movement / Activation”. It is thus guaranteed that other watchdog sensors adopt the operating mode simultaneously.

Switch

The watchdog sensor sends switching telegrams to its communication object “Movement / Telegr. switch” if it records any movement in its detection area. The value of the switching telegram can be set with the parameter “Sending at detection”. It is possible to send an “ON telegram”, an “OFF telegram” or “no telegram” on detection of movement. The “On” or “Off” telegram can also be sent cyclically.

If the watchdog sensor does not detect any further movement once the recovery time has elapsed, it is possible to send an “ON telegram”, “OFF telegram” or “no telegram”. It is also possible here to send the “On” and “Off” telegrams cyclically. The behaviour is specified with the parameter “Telegram after recovery time”.

It is also possible to disable the watchdog sensor. The communication object “Movement / Activation” is used for this purpose. It is visibly switched with the parameter “Activation object movement”.

If the watchdog sensor receives a telegram at its object, the sensor is activated or deactivated. With the parameter “At ... the movement”, it is possible to select whether to “send telegram at movement once”, “send telegram after movement once” or “do not send a telegram” via the communication object “Movement / Telegr. switch”.

Example:

All the watchdog sensors in a functional building should be enabled at a specific time in the mornings. A "1" is sent with the time switch to a central location and received at the communication object "Movement / Activation". In this example, the parameter "Enabling movement at" is set to "ON telegram".

Value

It is also possible to send values on detection of movement. To do so, the parameter "Type of movement object" must be changed from "Switching (EIS 1)" to "Value (EIS 6)". Dimming actuators can for example be dimmed to a value that is lower than the maximum value.

The parameter setting "Sending at detection" defines the size of the value that is sent. It can also be set that no telegrams may be sent.

Cyclic

All the switching telegrams can be sent cyclically. It should be noted that the respective parameter is set to send "ON telegrams cyclically" or "OFF telegrams cyclically".

The total cyclic time can be calculated with the parameters "Time base for cyclical sending" and "Time factor for cyclical sending".

The period in which a telegram is repeated cyclically is therefore produced from a base and a factor:

$$\text{Cyclic time} = \text{Base} * \text{Factor}$$

Communication objects
for watchdog sensors with activation object

No.	Type	Object name	Function
...			
11	1 bit	Movement	Telegr. switch
12	1 bit	Movement	Activation

Communication objects
for watchdog sensors with value sending and activation object

No.	Type	Object name	Function
...			
11	1 byte	Movement	Telegr. value
12	1 bit	Movement	Activation

Communication objects
for watchdog sensors with activation object for brightness-dependent switching

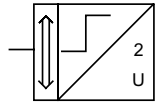
No.	Type	Object name	Function
...			
13	1 bit	Brightness dependent switching	Activation

Parameters for the watchdog sensor. The default setting of the values is **printed in bold type**.

Parameters of the watchdog sensor for "Low Access":	
- Activation object movement	not available available
Only if activation object for movement is "available"	
- enabling movement at	ON telegram OFF telegram
- at disabling the movement	do not send a telegram send telegram at movement once send telegram after movement once
- at enabling the movement	do not send a telegram send telegram at movement once send telegram after movement once
- Type of movement object	Switching (EIS 1)
- Sending at detection	ON telegram OFF telegram ON telegram cyclically OFF telegram cyclically no telegram
- Telegram after recovery time	ON telegram OFF telegram ON telegram cyclically OFF telegram cyclically no telegram
- Time base for cyclical sending	130 ms / 2.1 s / 34 s / 9 min
- Time factor for cyclical sending	100
Additional parameters for "High Access":	
General:	
Behaviour on bus voltage recovery: (communication objects)	
- Brightness dependent switching	enabled disabled
- Movement	enabled disabled

Parameters for the watchdog sensor.
The default setting of the values
is **printed in bold type**.

Movement sensor:	
- Activation object brightness dependent switching	not available available
- Type of movement object	Switching (EIS 1) Value (EIS 6)
Only for "Switching (EIS 1)":	
- Sending at detection	ON telegram OFF telegram ON telegram cyclically OFF telegram cyclically no telegram
- Telegram after recovery time	ON telegram OFF telegram ON telegram cyclically OFF telegram cyclically no telegram
- Time base for cyclical sending	130 ms / 2.1 s / 34 s / 9 min
- Time factor for cyclical sending	100
Only for "Value (EIS 6)":	
- Sending at detection	100 % / 90 % / ... / 20 % / 10 % / OFF / no telegram
- Telegram after recovery time	100 % / 90 % / ... / 20 % / 10 % / OFF / no telegram
Adjustments:	
- Threshold of light sensor is adjustable with	Potentiometer ETS
Only if "ETS" is selected:	
- Threshold (0: dark / 255: bright)	100
- Recovery time adjustable with	Potentiometer ETS
Only if "ETS" is selected:	
- Potentiometer should not be at TEST	
- Time base of recovery time	0.5 ms / 8.2 ms / 130 ms / 2.1 s / 34 s / 9 min
- Time factor of recovery time	100

Switch Edge Dim Shutter Heat Cool /1**Selection in ETS2**

- ABB
 - └ Input
 - └ Binary input, 5-fold

- ABB
 - └ Heating
 - └ Thermostat for 5BI

The application is used when the room thermostat for the commercial sector is plugged onto the 5-fold binary input.

To enable a clearer assignment of parameters, several parameters are not visible in the “Low Access” view. It is possible to display all the options at any time so that the full functionality of the device can be used. To do so, it is necessary to change to the “High Access” view. The additional parameters can only now be modified.

Note: The descriptions for

- Switch, Edge
- Switch, Value
- Dim and
- Shutter

have already been outlined in the application description for “Switch Edge Dim Shutter Value /1”.

The functions of the room thermostat are described in the following section.

Temperature, Setpoint

The room thermostat has two communication objects for modifying the current setpoint. With the 2 byte communication object “Base setpoint / Telegr. temperature”, the setpoint defined in the parameters is modified via a telegram.

With the 1 byte communication object “Setpoint adjustment / Temperature adjustment”, the current setpoint is shifted (in a similar way to previous thermostats via the setpoint adjustment button or via the rockers). The value range of the 1 byte communication object (0... 128... 255) corresponds to the following temperature changes: -12.8 K...0 K...+12.7 K. The parameter “Range for external setting of the setpoint” defines the limit for the setpoint adjustment. This can be between ± 1 K and ± 5 K.

Example:

A building houses several small companies. These companies share a conference room. A small visualisation program is used to enable the various companies to make optimum use of the room. In the menu item “Heating control” of the visualisation, a field is displayed where the user can enter the current setpoint directly. Using a slide rule, the preselected setpoint can be modified by a further ± 3 K.

Shutter

With the parameter “Automatic shading”, it is possible to integrate shutters into the cooling function. The parameter must therefore be changed from its default setting “inactive” to “send ON telegram” or “send OFF telegram”. The decision as to whether an “On” or “Off” telegram is sent is dependent on the shutter actuator types used. A shutter is normally always lowered with an “On” telegram (see also “Heat and Cool”).

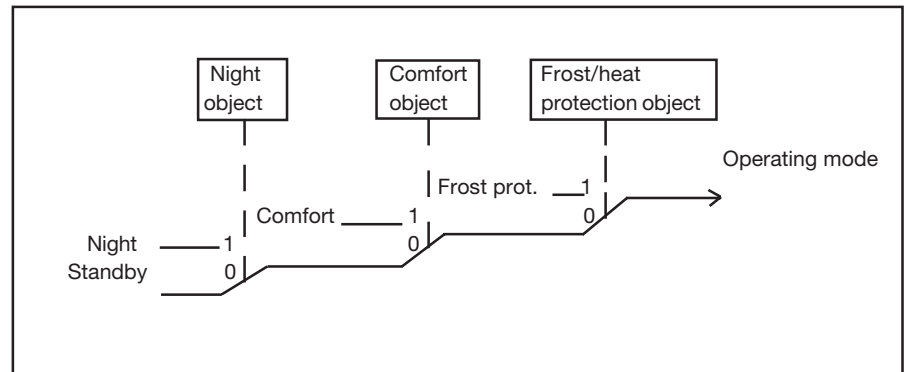
Controller

Three controller functions can be set: “Heat”, “Heat and cool” and “2-step heat”. Once the controller functions have been selected, the necessary parameters are displayed with further settings.

The room thermostat has four operating modes. The frost protection mode has the highest priority i.e. if frost protection mode is active, it is not possible to switch to another operating mode. The frost protection mode must first be deactivated e.g. by closing an open window. Comfort mode has the next highest priority, followed by night operation. If none of these three operating modes is active, the room thermostat is in standby mode (see also the diagram of the operating modes).

The external adjustment of the setpoints (1 byte object “Setpoint adjustment / Temperature adjustment”) can be disabled or enabled for a certain temperature range via the parameter “Range for external setting of the setpoint”. An adjustment of the setpoint influences all the setpoints that are dependent on the comfort temperature. If the comfort temperature is increased for example by 1 K, all the setpoints for standby mode and night operation are likewise increased by 1 K. The setpoints for frost and heat protection modes cannot be modified via the setpoint adjustment.

The base setpoint can also be modified as often as required via the bus. To do so, a 2 byte temperature value must be sent to the object “Base setpoint”.



Heat and Cool

The following setpoints can be set for the heating mode: “Base setpoint in °C (16...31) (comfort temperature)”, “Reduced heating in standby mode in K (1...8)”, “Reduced heating during the night in K (1...8)” and “Setpoint frost protection in °C (5...10)”.

The comfort temperature for the cooling mode can be set via the “Insensitive range between heat and cool in K (1-8)”. The setpoints for standby and night operation also refer to this value: “Increased cooling in standby mode in K (1...8)” and “Increased cooling during the night in K (1...8)”.

If cooling should take place at 25°C e.g. with a base setpoint of 22°C in comfort mode, an insensitive zone of 3 K must be set. If cooling should then take place in standby mode at 27°C, the value must be increased by 2 K. An increase of 4 K is required for cooling during night operation from 29°C.

A setpoint can be preselected for heat protection mode whereby cooling takes place in spite of an open window. If the heat protection mode is not required, the cooling can be switched off. In this case, the value 51°C is sent via the setpoint object on receipt of an “On” telegram at the frost/heat protection object, instead of the current setpoint.

The change to heating and cooling is carried out automatically by the room thermostat in the default setting. If this is not required, the changeover can be implemented by an external, central controller. To do so, the parameter “Toggle between heat and cool” must be set to “external ...”. If this option is activated, the object “Setpoint

adjustment / Temperature adjustment” changes to “Operation mode / Heat/ Cool”. If a telegram with the value “1” is received, the heating mode is activated while the value “0” activates the cooling mode. Heating mode is active after a reset.

It should be noted that it is possible to set either the automatic toggling between heating and cooling or the external setpoint.

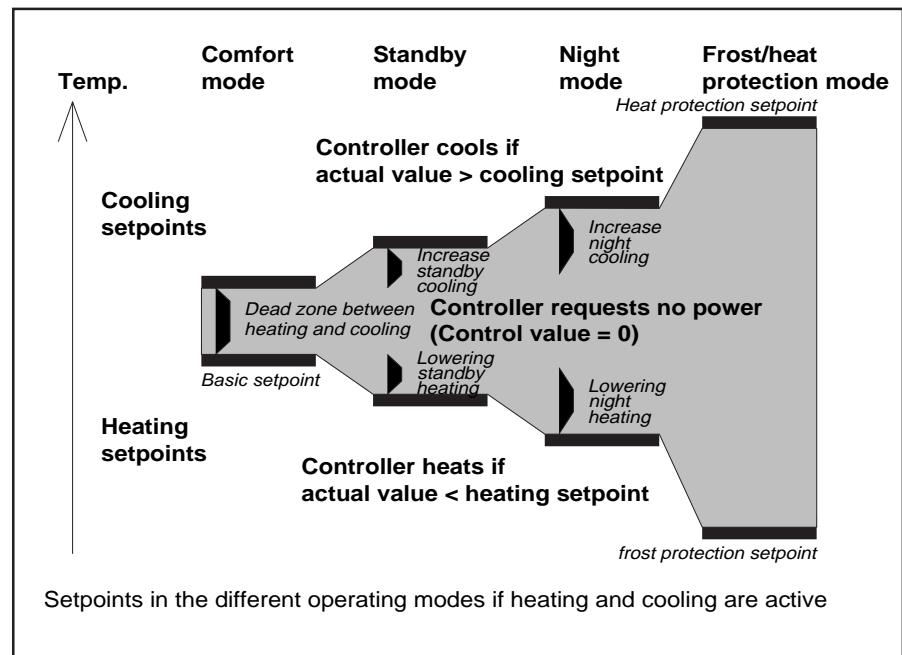
If the automatic toggling is selected, the room thermostat decides when to switch between heating and cooling.

With the setting “Behaviour when receiving a base setpoint value”, it is defined whether the external setpoint should be reset or not on receipt of a new setpoint (1 byte object “Setpoint adjustment / Temperature adjustment”).

If a base setpoint should be sent e.g. by a central time switch, it is advisable to reset the values that have been set locally (e.g. + 3 K). All the room thermostats that are addressed thus have the same setpoint.

In the operating mode “Heat and cool”, both control values are sent cyclically.

To avoid any further increases in temperature in cooling mode due to sunlight, automatic shading can take place by lowering the shutter with the operation of at least one binary input as a shutter sensor. The setpoint is set via the parameter “Automatic shading ...”. The parameter “Automatic shading” must also be activated for the shutter sensor inputs that will be involved in the shading function (see also “Shutter”).



The parameter “Change of actual temperature for automatic sending” defines the temperature change from which a new temperature value should be sent.

By default, the current setpoint is sent after the transmission of a new temperature. It is possible to deactivate the sending of the setpoint.

A cyclic time also defines when the room thermostat sends the current temperature, independent of a temperature change.

If the measured temperature is adjusted by the bus coupler warming up, an “Offset for temperature measurement” can be set. The default setting “0” is recommended as the offset for the combination of the thermostat with the 5-fold binary input.

To be able to address the different types of controllers for heating or cooling mode, the room thermostat can be parameterised as a continuous or switching controller. In the case of a switching controller, it is possible to select between a PWM controller and a two-step controller.

For a switching PWM controller, the output value of the controller (0...255) is converted into ON/OFF control. For example, if a control value of 70% should be sent, the ON time should be set at 7 minutes and the OFF time at 3 minutes with a preset cyclic period of

10 minutes. The dynamic range can be restricted as with the continuous controller.

In the case of a continuous control response and a switching PWM controller, the preset control parameters can be used for the type of heating or cooling system. If other control parameters are required, they can be set individually via more detailed parameterisation. This should only be used if you have sufficient experience in the control technology.

The continuous controller issues its control value to a 1 byte object. In the case of specific control valves that do not use the full dynamic range (0...255) because their own range only extends from 25 to 180, the minimum or maximum control value of the controller can be adapted. The dynamic range of the system (controller + control valve) is thereby increased. The control value “0” is sent to close the control valve.

To prevent unnecessary loading of the bus, it is possible to specify the size that the change at the control value must reach in order to be sent on the bus. The setting is carried out as a percentage value. The sending of the control value is also restricted by a cyclic period e.g. every 30 minutes.

To optimise the control characteristics of the heating or cooling system, the “Cyclic time of the switching control value” can be set. The type of heating or cooling as well as the valve drive used must be taken into consideration when setting the cyclic time. The following recommendations can be implemented:

- a) Thermoelectric valve drive
To open a thermoelectric valve drive fully takes approx. 2-3 minutes. A shorter cyclic time than 15 minutes is therefore not advisable.
- b) Floor heating
The time constant for floor heating is very large. A cyclic time of 20 minutes is therefore sufficient.
- c) Warm water heating
Thermoelectric valve drives are often used in this case. A cyclic period of 15 minutes produces extremely good results.
- d) Electric convector heating
Cyclic times between 10 and 15 minutes are recommended, depending on the electric heating and conditions in the room.

If a two-step controller is used for heating or cooling, various levels can be selected for the hysteresis. For example, if the setpoint during heating mode is at 20°C and the hysteresis is at 0.5 K, the controller switches on at 19.5°C and off again at 20.5°C. The hysteresis is then based on how quickly the heating system can warm up the room or how quickly the cooling system can lower the temperature in the room as well as the customer's sensitivity to temperature levels. The hysteresis should not be set too low as otherwise the valve drive continually opens and closes. It should also not be set too high as the temperature fluctuations in the room are then fairly considerable.

The parameter “Reduction of hysteresis” is used to increase the level of accuracy of the controller. If this parameter is activated, the hysteresis is reduced for example every minute by 0.1 K until it reaches 0 K, if required. There is an effective decrease in the temperature fluctuations during the closed-loop control as a result of the reduction in the hysteresis. The reduction should be selected at less than a fifth of the hysteresis.
e.g. Hysteresis 0.5 K =>
Reduction < 0.1 K/min

In certain cases (floor heating), it can be necessary to install a fast-acting additional level for the heating control in order to be able to heat the room up quickly. In the setting “2-step heat”, the room thermostat can control a second heating system via a switching controller (1 bit) or via a semi-continuous controller with the 1 byte values of 0% and 100%.

With the parameters “Setpoint difference of basic heating to additional heating” and “Hysteresis (one-sided)”, it is determined when the additional level is switched off. As for the basic level, an unnecessary bus load can be avoided by selecting a sensible cyclic period.

As some valve drives close in the event of a 1 byte value of “255” or a 1 bit value of “1” and open at other corresponding values, the “Mode of control output” can also be inverted.

If a power failure arises, it can be set which operating mode the controller should have after bus voltage recovery or after a reset.

Communication objects
for room thermostat, heating and cooling function with continuous control

No.	Type	Object name	Function
...			
11	1 bit	Operation mode	Frost/heat protection
12	1 bit	Operation mode	Night mode
13	1 bit	Operation mode	Comfort mode
14	1 bit	Control value	Heat (switching)
15	1 bit	Control value	Cool (switching)
16	2 byte	Current temperature	Room temperature
17	2 byte	Base setpoint	Telegr. temperature
18	2 byte	Current setpoint	Telegr. temperature
19	1 byte	Setpoint adjustment	Temperature adjustment

Communication objects
for continuous control

No.	Type	Object name	Function
...			
14	1 byte	Control value	Heat (continuous)
15	1 byte	Control value	Cool (continuous)
...			

Communication objects
for switching control

No.	Type	Object name	Function
...			
14	1 bit	Control value	Heat (switching)
15	1 bit	Control value	Cool (switching)
...			

Communication objects
for two-step heating (switching)

No.	Type	Object name	Function
...			
14	1 bit	Control value	Heat (switching)
15	1 bit	Control value	Additional heating (switching)
...			

Communication objects
for 2-step heating (continuous)

No.	Type	Object name	Function
...			
14	1 byte	Control value	Heat (continuous)
15	1 byte	Control value	Additional heating (continuous)
...			

Parameters for the thermostat
The default setting for the values
is **printed in bold type**.

Some parameters are only visible after
switching from “Low Access” to “High
Access”.

Controller general:	
- Used control functions	Heat and cool Heat 2-step heat
- Operation mode after reset	Standby Comfort Night Frost/heat protection
- Service LEDs active	yes / no

Room temperature:	
- Change of actual temperature for automatic sending	inactive at 0.2 K at 0.4 K at 0.6 K at 0.8 K at 1.0 K at 1.5 K at 2.0 K
- Send current setpoint if changes	inactive active
- Cyclic time for automatic sending of temp. difference	inactive every 3 min every 5 min every 10 min every 15 min every 20 min every 30 min every 60 min
- Offset for temperature measurement (-128 ... 127) x 0.1 K	0
- Measurement of current temperature	internal external

Setpoints	
- Base setpoint in °C (16..31) (comfort temperature for heating)	16 °C / ... / 21 °C / ... / 31 °C
- Reduced heating in standby mode in K (1..8)	1 K / 2 K / ... / 8 K
- Reduced heating during the night in K (1..8)	1 K / ... / 4 K / ... / 8 K
- Setpoint frost protection in °C	5 °C / ... / 7 °C / ... / 10 °C
- Automatic shading	current temp. > comfort setpoint heating + 2 K current temp. > comfort setpoint heating + 2 K

Only for “Heat and Cool” control function:	
- Insensitive range between heat and cool in K (1..8)	1 K / 2 K / ... / 8 K
- Increased cooling in standby mode in K (1..8)	1 K / 2 K / ... / 8 K
- Increased cooling during the night in K (1..8)	1 K / 4 K / ... / 8 K
- Setpoint heat protection	Cooling disabled 30 °C 35 °C 40 °C 44 °C

Parameters for the room thermostat
The default setting for the values is **printed in bold type**.

Some parameters are only visible after switching from "Low Access" to "High Access".

- Toggle between heat and cool	automatically / object "external setpoint" external / object "heat/cool"
For "Heating and Cooling" mode:	
- Output of control value	continuous switching
Only for "switching" control value:	
- Control mode	Two-step control PWM control
Only if "PWM control" is selected:	
- Control parameter	by installation type more detailed
Only for "Heating" mode:	
- Type of heating	Warm water heating (1.5 K/100 min) Electric heating (1.5 K/50 min) Floor heating (4 K/200 min)
Only for "Cooling" mode:	
- Type of cooling	Cooling ceiling (5 K/240 min) SplitUnit/Fan coil (4 K/90 min)
Only if "more detailed" is selected:	
- Proportional range	1 K / 1.5 K / 2 K / 2.5 K / 3 K / 4 K / 8 K / 10 K
- Readjust time in min.	0 min / 10 min / ... / 100 min / ... / 240 min
- Cyclic time of the switching control value	3 min / 5 min / 10 min / 15 min / 20 min / 30 min
- PWM cycle is 0 % up to a control value	0% / 5% / 10% / 15% / ... / 30%
- PWM cycle is 100 % up to a control value	70% / 75% / ... / 90% / 95% / 100%
Only for "Two-step" control:	
- Hysteresis	0.3 K / 0.5 K / 0.7 K / 1.0 K / 1.5 K / 2 K
- Reduction of hysteresis	inactive 0.2 K/min 0.1 K/min 0.066 K/min 0.05 K/min 0.04 K/min 0.033 K/min 0.029 K/min
- Cyclic time for automatic sending	every 3 min every 5 min every 10 min every 15 min every 20 min every 30 min every 60 min
Only for "continuous" control value:	
- Control parameter	by installation type more detailed
Only for "Heating" mode:	
- Type of heating	Warm water heating (1.5 K/100 min) Electric heating (1.5 K/50 min) Floor heating (4 K/200 min)
Only for "Cooling" mode:	
- Type of cooling	Cooling ceiling (5 K/240 min) SplitUnit / Fan coil (4 K/90 min)
Only if "more detailed" is selected:	
- Proportional range	1 K / 1.5 K / 2 K / 2.5 K / 3 K / 4 K / 8 K / 10 K
- Readjust time in min.	0 min / 10 min / ... / 100 min / ... / 240 min
- Minimum control value	0% / 5% / 10% / 15% / ... / 30%

Parameters for the room thermostat
The default setting for the values is **printed in bold type**.

Some parameters are only visible after switching from “Low Access” to “High Access”.

– Maximum control value	70% / 75% / ... / 90% / 95% / 100%
– Change for automatic sending of control value	2 % / 5 % / 10 % / inactive
– Cyclic time for automatic sending of control output	every 3 min every 5 min every 10 min every 15 min every 20 min every 30 min every 60 min
– Mode of control output	normal inverted

Only for “Two-step control”:

Additional heating:

– Setpoint difference of basic heating to additional heating	1 K / 2 K / 3 K
– Hysteresis (one-sided)	0.3 K / 0.5 K / 0.7 K / 1.0 K / 1.5 K / 2 K
– Cyclic time for automatic sending of control output	inactive every 3 min every 5 min every 10 min every 15 min every 20 min every 30 min every 60 min
– Type of control output	continuous (1 byte : 0% or 100%) switching (1 bit)
– Mode of control output	normal inverted

External setpoint adjustment:

– Range for external setting of the setpoint	disabled +/- 1 K +/- 3 K +/- 5 K
--	--

Only if enabled:

– Behaviour when receiving a base setpoint value	unchanged external setpoint reset external setpoint
--	---

Additional parameters for shutter sensor input with “High Access”:

– Automatic shading (see also at setpoints)	inactive send ON telegram (normal) send OFF telegram
--	---