KNX T-UP basic
Temperature Sensor

Article number 70350 (white)

elsner elektronik

Installation and Adjustment

Installation, inspection, commissioning and troubleshooting of the device must only be carried out by a competent electrician.

This manual is amended periodically and will be brought into line with new software releases. The change status (software version and date) can be found in the contents footer. If you have a device with a later software version, please check **www.elsner-elektronik.de** in the menu area "Service" to find out whether a more up-to-date version of the manual is available.

Clarification of signs used in this manual

Safety advice.

Safety advice for working on electrical connections, components, etc.

DANGER! ... indicates an immediately hazardous situation which will lead to death or severe injuries if it is not avoided.

WARNING! ... indicates a potentially hazardous situation which may lead to death or severe injuries if it is not avoided.

CAUTION! ... indicates a potentially hazardous situation which may lead to trivial or minor injuries if it is not avoided.

ATTENTION! ... indicates a situation which may lead to damage to property if it is not avoided.

ETS In the ETS tables, the parameter default settings are marked by underlining.

1. Description

The **Temperature sensor KNX T-UP basic** measures the room temperature. Via the bus, the sensor receives an external measuring value and processes it to an overall temperature (composite result) together with its own data.

The **KNX T-UP basic** provides switching outputs with adjustable threshold values. The switching outputs and further communication objects can be linked by AND and OR logic gates. In addition, an integrated control variable comparator compares and outputs variables that were received via communication objects. The sensor features a PI control for heating and cooling.

The housing is supplemented with a frame of the switch series used in buildings, and thus fits seamlessly into the interior fittings.

Functions:

- **Temperature** measurements
- **Composite value** from own measured value and external value (proportions are adjusted as a percentage)
- **PI-controller for heating** (one or two-stage) and **cooling** (one or two-stage) according to temperature. Regulation according to separate setpoints or basic setpoint temperature
- **Threshold values** can be adjusted per parameter or via communication objects
- **8 AND and 8 OR logic gates**, each with 4 inputs. All switching events as well as 16 logic inputs (in the form of communications objects) are used as inputs for the logic gates. The output from each gate can be configured optionally as 1-bit or 2 x 8-bit
- **2 control variable comparators** to output minimum, maximum or average values. 5 inputs each for values received via communication objects

Configuration is made using the KNX software ETS. The **product file** can be downloaded from the Elsner Elektronik website on **www.elsner-elektronik.de** in the "Service" menu.

1.1. Deliverables

- Housing with sensor PCB
- Baseplate

Additionally required (not included in the deliverables):

- Junction box Ø 60 mm, 42 mm depth
- Frame (for insert 55 x 55 mm), compatible with the switch scheme used in the building

1.2. Technical specifications

Housing	Plastic (partially painted)
Colours	• White, glossy (similar to RAL 9016 Traffic White)

Assembly	Flush mounting (Wall mounting in junction box Ø 60 mm, 42 mm depth)
Protection category	IP 20
Dimensions	Housing approx. 55 x 55 (W x H, mm), Mounting depth approx. 15 mm Baseplate approx. 71 x 71 (W x H, mm),
Total weight	approx. 45 g
Ambient temperature	Operation -25…+80°C, storage -40…+85°C
Ambient humidity	max. 95% RH, avoid condensation
Operating voltage	KNX bus voltage
Bus current	max. 6 mA, max. 10 mA when programming LED active
Data output	KNX +/- bus plug-in terminals
BCU type	Integrated microcontroller
PEI type	0
Group addresses	max. 254
Assignments	max. 254
Communication objects	151
Measurement range	-25…+80°C
Resolution	0.1°C
Accuracy*	±0.5°C at -25…+25°C ±1.5°C at -25…+45°C

* Please note the information on *Measuring accuracy*, Page 4

The product is compliant with the provisions of EU guidelines.

1.2.1. Measuring accuracy

Measurement variations from sources of interference (see chapter *Installation position*) must be corrected in the ETS in order to ensure the specified accuracy of the sensor (offset).

When **measuring temperature**, the self-heating of the device is considered by the electronics. The heating is compensated by reducing the measured temperture by the self-heating of 1.8°C. The indicated indoor temperature measured value approches the actual room temperature during a 2 hours heating period.

2. Installation and start-up

2.1. Installation notes

Installation, testing, operational start-up and troubleshooting should only be performed by an electrician.

CAUTION!
Live voltage!
There are unprotected live components inside the device.
- National legal regulations are to be followed.
- Ensure that all lines to be assembled are free of voltage and take precautions against accidental switching on.
- Do not use the device if it is damaged.
- Take the device or system out of service and secure it against unintentional use, if it can be assumed, that risk-free operation is no longer guaranteed.

The device is only to be used for its intended purpose. Any improper modification or failure to follow the operating instructions voids any and all warranty and guarantee claims.

After unpacking the device, check it immediately for possible mechanical damage. If it has been damaged in transport, inform the supplier immediately.

The device may only be used as a fixed-site installation; that means only when assembled and after conclusion of all installation and operational start-up tasks and only in the surroundings designated for it.

Elsner Elektronik is not liable for any changes in norms and standards which may occur after publication of these operating instructions.

2.2. Installation position

The sensor will be installed concealed within a socket (Ø 60 mm, 42 mm deep).

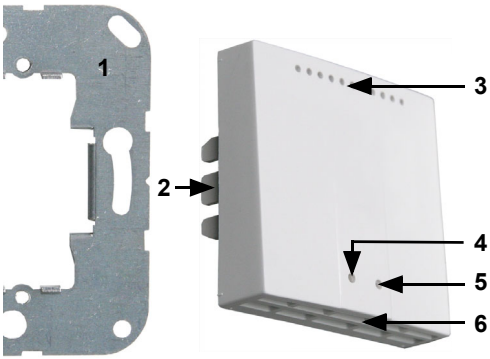
The sensor may be installed and operated in dry interior rooms only. Avoid condensation.

When selecting an installation location, please ensure that the measurement results are affected as little as possible by external influences. Possible sources of interference include:
- Direct sunlight
- Drafts from windows and doors
- When mounted in-wall: Draft from ducts which lead from other rooms to the junction box in which the sensor is mounted
- Warming or cooling of the building structure on which the sensor is mounted, e.g. due to sunlight, heating or cold water pipes
- Connection lines which lead from warmer or colder areas to the sensor

Temperature variations from such sources of interference must be corrected in the ETS in order to ensure the specified accuracy of the sensor (temperature offset).

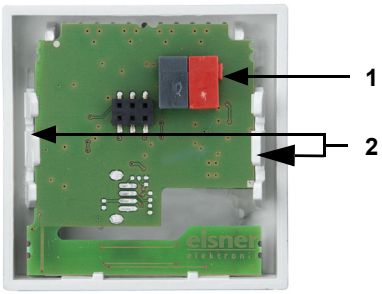
2.3. Construction of the sensor

2.3.1. Housing



Ill. 1
1 Baseplate
2 Catches
3 Openings for air circulation
4 Programming LED (recessed)
5 Programming button (recessed) for teaching the device
6 Openings for air circulation (LOWER)

2.3.2. Rear view sensor plate with connection



Ill. 2
1 KNX terminal BUS +/-
2 Catches

2.4. Assembly of the sensor

First of all fit the socket with connection. Seal inlet pipes to avoid infiltration.
Then screw the base plate onto the socket and position the frame of the switching programme. Connect the bus line +/- (black-red plug) to the terminals provided on the sensor board of the sensor. Pin the sensor with the notches on to the metal frame, so that sensor and frame are fixed.

2.5. Notes on mounting and commissioning

Never expose the device to water (e.g. rain) or dust. This can damage the electronics. You must not exceed a relative humidity of 95%. Avoid condensation.

After the bus voltage has been applied, the device will enter an initialisation phase lasting a few seconds. During this phase no information can be received or sent via the bus.

3. Addressing of the device at the bus

The device is supplied with the bus address 15.15.255. You can program another address into the ETS by overwriting the 15.15.255 address or by teaching via the programming button.

4. Transfer protocol

Units:

Temperatures in degrees Celsius
Variables in %

4.1. List of all communications objects

Abbreviation flags:

C Communication
R Read
W Write
T Transfer
U Update

No.	Name	Function	DPT	Flags
0	Software version	readable	217,001	C R T
1	Temperature malfunction sensor	Output	1,001	C R T
3	Outside temperature reading	Input	9,001	C W
4	Inside temperature reading	Output	9,001	C R T
5	Overall temperature reading	Output	9,001	C R T
6	Min./max. temperature value request	Input	1,017	C W
7	Minimum temperature reading	Output	9,001	C R T
8	Maximum temperature reading	Output	9,001	C R T
9	Reset min./max. temperature value	Input	1,017	C W
10	Temp. threshold value 1: Absolute value	Input/Output	9,001	C R W T U
11	Temp. threshold value 1: (1:+ | 0:-)	Input	1,002	C W
12	Temp. threshold value 1: Switching delay from 0 to 1	Input	7,005	C W
13	Temp. threshold value 1: Switching delay from 1 to 0	Input	7,005	C W
14	Temp. threshold value 1: Switching output	Output	1,001	C R T
15	Temp. threshold value 1: Switching output block	Input	1,002	C W
16	Temp. threshold value 2: Absolute value	Input/Output	9,001	C R W T U
17	Temp. threshold value 2: (1:+ | 0:-)	Input	1,002	C W
18	Temp. threshold value 2: Switching delay from 0 to 1	Input	7,005	C W

No.	Name	Function	DPT	Flags
19	Temp. threshold value 2: Switching delay from 1 to 0	Input	7,005	C W
20	Temp. threshold value 2: Switching output	Output	1,001	C R T
21	Temp. threshold value 2: Switching output block	Input	1,002	C W
22	Temp. threshold value 3: Absolute value	Input/Output	9,001	C R W T U
23	Temp. threshold value 3: (1:+ | 0:-)	Input	1,002	C W
24	Temp. threshold value 3: Switching delay from 0 to 1	Input	7,005	C W
25	Temp. threshold value 3: Switching delay from 1 to 0	Input	7,005	C W
26	Temp. threshold value 3: Switching output	Output	1,001	C R T
27	Temp. threshold value 3: Switching output block	Input	1,002	C W
28	Reserve			
29	TR_1_ Eco-Standby HVAC 1	Input	1,003	C W
30	TR_1_ Comfort Activation HVAC 2	Input	1,003	C W
31	TR_1_ Frost/Heat activation	Input	1,003	C R W T
32	TR_1_ Blocking object	Input	1,003	C W
33	TR_1_ Target value, current	Output	9,001	C R T
34	TR_1_ Switching object (0:Heat | 1:Cool)	Input	1,002	C W
35	TR_1_ Target value, comfort heating	Input/Output	9,001	C R W T
36	TR_1_ Target value, comfort heating (1:+ | 0:-)	Input	1,002	C W
37	TR_1_ Target value, comfort cooling	Input/Output	9,001	C R W T
38	TR_1_ Target value, comfort cooling (1:+ | 0:-)	Input	1,002	C W
39	TR_1_ Target value_Basic offset	Input/Output	9,001	C R W T
40	TR_1_ Target value, Standby heating	Input/Output	9,001	C R W T
41	TR_1_ Target value, Standby heating (1:+ | 0:-)	Input	1,002	C W
42	TR_1_ Target value, Standby cooling	Input/Output	9,001	C R W T
43	TR_1_ Target value, Standby cooling (1:+ | 0:-)	Input	1,002	C W
44	TR_1_ Target value, Eco heating	Input/Output	9,001	C R W T
45	TR_1_ Target value, Eco heating (1:+ | 0:-)	Input	1,002	C W
46	TR_1_ Target value, Eco cooling	Input/Output	9,001	C R W T

No.	Name	Function	DPT	Flags
47	TR_1_ Target value, Eco cooling (1:+ | 0:-)	Input	1,002	C W
48	TR_1_ Control variable heating (stage 1)	Output	5,001	C R T
49	TR_1_ Control variable heating stage 2	Output	5,001	C R T
50	TR_1_ Control variable cooling (stage 1)	Output	5,001	C R T
51	TR_1_ Control variable cooling stage 2	Output	5,001	C R T
52	TR_1_ Status heating 1 (1=ON | 0=OFF)	Output	1,002	C R T
53	TR_1_ Status heating 2 (1=ON | 0=OFF)	Output	1,002	C R T
54	TR_1_ Cooling status 1 (1=ON | 0=OFF)	Output	1,002	C R T
55	TR_1_ Cooling status 2 (1=ON | 0=OFF)	Output	1,002	C R T
56	TR_1_ Comfort Delay Status	Input/Output	1,002	C R W T
57	TR_1_Comfort extension time (in sec)	Input/Output	7,005	C R W T
58	TR_1_Belimo_Control variable	Output	5,001	C R T
135	Comparator 1 actuating variable: Input 1	Input	5,010	C W
136	Comparator 1 actuating variable: Input 2	Input	5,010	C W
137	Comparator 1 actuating variable: Input 3	Input	5,010	C W
138	Comparator 1 actuating variable: Input 4	Input	5,010	C W
139	Comparator 1 actuating variable: Input 5	Input	5,010	C W
140	Comparator 1 actuating variable: Output	Output	1,001	C R T
141	Comparator 1 actuating variable: Block	Input	1,002	C W
142	Comparator 2 actuating variable: Input 1	Input	5,010	C W
143	Comparator 2 actuating variable: Input 2	Input	5,010	C W
144	Comparator 2 actuating variable: Input 3	Input	5,010	C W
145	Comparator 2 actuating variable: Input 4	Input	5,010	C W

No.	Name	Function	DPT	Flags
146	Comparator 2 actuating variable: Input 5	Input	5,010	C W
147	Comparator 2 actuating variable: Output	Output	1,001	C R T
148	Comparator 2 actuating variable: Block	Input	1,002	C W
149	AND logic 1: 1-bit switching output	Output	1,002	C R T
150	AND logic 1: 8-bit output A	Output	5,010	C R T
151	AND logic 1: 8-bit output B	Output	5,010	C R T
152	AND logic 1: Block	Input	1,002	C W
153	AND logic 2: 1-bit switching output	Output	1,002	C R T
154	AND logic 2: 8-bit output A	Output	5,010	C R T
155	AND logic 2: 8-bit output B	Output	5,010	C R T
156	AND logic 2: Block	Input	1,002	C W
157	AND logic 3: 1-bit switching output	Output	1,002	C R T
158	AND logic 3: 8-bit output A	Output	5,010	C R T
159	AND logic 3: 8-bit output B	Output	5,010	C R T
160	AND logic 3: Block	Input	1,002	C W
161	AND logic 4: 1-bit switching output	Output	1,002	C R T
162	AND logic 4: 8-bit output A	Output	5,010	C R T
163	AND logic 4: 8-bit output B	Output	5,010	C R T
164	AND logic 4: Block	Input	1,002	C W
165	AND logic 5: 1-bit switching output	Output	1,002	C R T
166	AND logic 5: 8-bit output A	Output	5,010	C R T
167	AND logic 5: 8-bit output B	Output	5,010	C R T
168	AND logic 5: Block	Input	1,002	C W
169	AND logic 6: 1-bit switching output	Output	1,002	C R T
170	AND logic 6: 8-bit output A	Output	5,010	C R T
171	AND logic 6: 8-bit output B	Output	5,010	C R T
172	AND logic 6: Block	Input	1,002	C W
173	AND logic 7: 1-bit switching output	Output	1,002	C R T
174	AND logic 7: 8-bit output A	Output	5,010	C R T
175	AND logic 7: 8-bit output B	Output	5,010	C R T
176	AND logic 7: Block	Input	1,002	C W
177	AND logic 8: 1-bit switching output	Output	1,002	C R T
178	AND logic 8: 8-bit output A	Output	5,010	C R T
179	AND logic 8: 8-bit output B	Output	5,010	C R T
180	AND logic 8: Block	Input	1,002	C W
181	OR logic 1: 1-bit switching output	Output	1,002	C R T
182	OR logic 1: 8-bit output A	Output	5,010	C R T

No.	Name	Function	DPT	Flags
183	OR logic 1: 8-bit output B	Output	5,010	C R T
184	OR logic 1: Block	Input	1,002	C W
185	OR logic 2: 1-bit switching output	Output	1,002	C R T
186	OR logic 2: 8-bit output A	Output	5,010	C R T
187	OR logic 2: 8-bit output B	Output	5,010	C R T
188	OR logic 2: Block	Input	1,002	C W
189	OR logic 3: 1-bit switching output	Output	1,002	C R T
190	OR logic 3: 8-bit output A	Output	5,010	C R T
191	OR logic 3: 8-bit output B	Output	5,010	C R T
192	OR logic 3: Block	Input	1,002	C W
193	OR logic 4: 1-bit switching output	Output	1,002	C R T
194	OR logic 4: 8-bit output A	Output	5,010	C R T
195	OR logic 4: 8-bit output B	Output	5,010	C R T
196	OR logic 4: Block	Input	1,002	C W
197	OR logic 5: 1-bit switching output	Output	1,002	C R T
198	OR logic 5: 8-bit output A	Output	5,010	C R T
199	OR logic 5: 8-bit output B	Output	5,010	C R T
200	OR logic 5: Block	Input	1,002	C W
201	OR logic 6: 1-bit switching output	Output	1,002	C R T
202	OR logic 6: 8-bit output A	Output	5,010	C R T
203	OR logic 6: 8-bit output B	Output	5,010	C R T
204	OR logic 6: Block	Input	1,002	C W
205	OR logic 7: 1-bit switching output	Output	1,002	C R T
206	OR logic 7: 8-bit output A	Output	5,010	C R T
207	OR logic 7: 8-bit output B	Output	5,010	C R T
208	OR logic 7: Block	Input	1,002	C W
209	OR logic 8: 1-bit switching output	Output	1,002	C R T
210	OR logic 8: 8-bit output A	Output	5,010	C R T
211	OR logic 8: 8-bit output B	Output	5,010	C R T
212	OR logic 8: Block	Input	1,002	C W
213	Logic input 1	Input	1,002	C W
214	Logic input 2	Input	1,002	C W
215	Logic input 3	Input	1,002	C W
216	Logic input 4	Input	1,002	C W
217	Logic input 5	Input	1,002	C W
218	Logic input 6	Input	1,002	C W
219	Logic input 7	Input	1,002	C W
220	Logic input 8	Input	1,002	C W
221	Logic input 9	Input	1,002	C W

No.	Name	Function	DPT	Flags
222	Logic input 10	Input	1,002	C W
223	Logic input 11	Input	1,002	C W
224	Logic input 12	Input	1,002	C W
225	Logic input 13	Input	1,002	C W
226	Logic input 14	Input	1,002	C W
227	Logic input 15	Input	1,002	C W
228	Logic input 16	Input	1,002	C W

5. Parameter setting

5.1. Behaviour on power failure/ restoration of power

Behaviour following a failure of the bus power supply:

The device sends nothing.

Behaviour on bus restoration of power and following programming or reset:

The device sends all outputs according to their send behaviour set in the parameters with the delays established in the "General settings" parameter block. The "Software version" communications object is sent once after 5 seconds.

5.2. General settings

Set the basic data transfer characteristics and select whether or not malfunction objects should be sent.

Send delay after power-up and programming for:	
Measured values	5 s • ... • 2 h
Threshold values and switching outputs	5 s • ... • 2 h
Controller objects	5 s • 10 s • ... • 2 h
Logic outputs	5 s • 10 s • ... • 2 h
Maximum telegram quota	• 1 message per second • ... • 5 messages per second • ... • 20 messages per second
Use temp./humidity malfunction object	Yes • No
Use CO2 malfunction object	Yes • No

5.3. Temperature measured values

Use **Offsets** to adjust the readings to be sent.

Offset in 0.1°C	-50…50; 0

The unit can calculate a **mixed value** from its own reading and an external value. Set the mixed value calculation if desired.

Use external reading	Yes • No
Ext. Reading proportion of the total reading	5% • 10% • ... • 50% • ... • 100%
Send internal and total reading	• never • periodically • On change • on change and periodically
From change of *(if sent on change)*	0.1°C • 0.2°C • ... • 5.0°C
Send cycle *(if sent periodically)*	5 s • ... • 2 h

Note: if an external portion is used, all of the following settings (threshold values, etc.) are related to the overall reading!

The **minimum and maximum readings** can be saved and sent to the bus. Use the "Reset temperature min/max. value" objects to reset the values to the current reading.

Use minimum/maximum value	Yes • No

Note: The values are not retained after a reset.

5.4. Temperature threshold values

Activate the threshold values that you want to use here. The **Sensor KNX T-UP basic** provides three threshold values for temperature.

Use threshold value 1/2/3	Yes • No

5.4.1. Temperature threshold value 1, 2, 3

Threshold value

Set the threshold values directly in the application program using parameters, or define them via the bus using a communications object.

Threshold value setpoint using parameter:

Set the threshold values and hysteresis directly.

Threshold value setpoint using	**Parameter** • Communications object
Temperature: Threshold value in 0.1°C *Humidity:* Threshold value in % rH	-300 … 800; 200 0...100; 70
Hysteresis of the threshold value in %	0 … 50; 20

Threshold value setpoint using a communications object:

Beforehand, enter how the threshold value will be received from the bus. Basically, a new value can be received, or simply a command to increase or decrease.

During initial commissioning, a threshold value must be defined which will be valid until the 1st communication of a new threshold value. For units which have already been taken into service, the last communicated threshold value can be used. Basically, a temperature range is given in which the threshold value can be changed (object value limit).

A set threshold value will be retained until a new value or a change is transferred. The current value is saved in EEPROM, so that this is retained in the event of a power supply failure and will be available once the power supply is restored.

Threshold value setpoint using	Parameter • **Communications object**
The last communicated value should be retained	• never • after restoration of power • after restoration of power and programming
Start threshold value in 0.1°C valid till 1st communication	-300 ... 800; 200
Object value limit (min) in 0.1°C	-300…800
Object value limit (max) in 0.1°C	-300…800
Type of threshold change	Absolute value • Increase/decrease
Step size *(upon increase/decrease change)*	0.1°C • ... • 1°C • ... • 5°C
Hysteresis of the threshold value in %	0 ... 50; 20

Switching output

Set the behaviour of the switching output when a threshold value is exceeded/undercut. The output switching delay can be set using objects or directly as a parameter.

When the following conditions apply, the output is (LV = Threshold value)	• LV above = 1 |LV - hysteresis below = 0 • LV above = 0 |LV - hysteresis below = 1 • LV below = 1 |LV + hysteresis above = 0 • LV below = 0 |LV + hysteresis above = 1
Delays can be set via objects (in seconds)	No • Yes
Switching delay from 0 to 1 *(when delay is not set using objects)*	None • 1 s • 2 s • 5 s • 10 s • ... • 2 h
Switching delay from 1 to 0 *(when delay is not set using objects)*	None • 1 s • 2 s • 5 s • 10 s • ... • 2 h

Switching output sends	• on change • on change to 1 • on change to 0 • on change and periodically • on change to 1 and periodically • on change to 0 and periodically
Send cycle *(is only sent if "periodically" is selected)*	5 s • 10 s • 30 s... • 2 h

Block

The switching output can be blocked using an object. Define specifications here for the behaviour of the output when blocked.

Use switching output block	No • Yes
Analysis of the blocking object	• At value 1: block | At value 0: release • At value 0: block | At value 1: release
Blocking object value before 1st communication	0 • 1
Behaviour of the switching output	
With blocking	• Do not send message • send 0 • send 1
On release (with 2 seconds release delay)	[Dependent on the "Switching output sends" setting]

The behaviour of the switching output on release is dependent on the value of the parameter "Switching output sends" (see "Switching output")

Switching output sends on change	• Do not send message • Send switching output status
Switching output sends on change to 1	• Do not send message • If switching output = 1 ➔ send 1
Switching output sends on change to 0	• Do not send message • If switching output = 0 ➔ send 0
Switching output sends on change and periodically	Send switching output status
Switching output sends on change to 1 and periodically	If switching output = 1 ➔send 1
Switching output sends on change to 0 and periodically	If switching output = 0 ➔send 0

5.5. Temperature PI control

For an adequate regulation of the indoor temperature, comfort, standby, eco and building protection modes may be used.
Comfort when present,
Standby during short absences,
Eco as a night-time mode and

Frost/heat protection (building protection) during longer absences.

The settings for the temperature control include the set point temperatures for the individual modes. Objects are used to determine which mode is to be selected. A change of mode may be triggered manually or automatically (e.g. by a timer, window contact).

The **mode** may be switched with two 8 bit objects of different priority. Objects
"... HVAC mode (Prio 2)" for switching in everyday operation and
"... HVAC mode (Prio 1)" for central switching with higher priority.
The objects are coded as follows:

ID	Name	Encoding	Range	Use
20,102	DPT_HVACMode	field1 = HVACMode 0 = Auto 1 = Comfort 2 = Standby 3 = Economy 4 = Building Protection	[0 ... 4]	HVAC

Alternatively, you can use three objects, with one object switching between eco and standby mode and the two others are used to activate comfort mode or frost/heat protection mode. The comfort object then blocks the eco/standby object, and frost/heat protection objects have the highest priority. Objects
"... Mode (1: Eco, 0: Standby)",
"... comfort activation mode" and
"... frost/heat protection activation mode"

Switch mode via	• two 8-bit objects (HVAC modes) • three 1-bit objects

Select the mode to be activated after reset (e.g. power failure, reset of the line via the bus). (Default).
Then configure a block of the temperature control by the blocking object.

Mode after reset	• Comfort • Standby • Eco • Building protection
Behaviour of the blocking object at value	• 1 = block | 0 = release • 0 = block | 1 = release
Blocking object value before 1st communication	0 • 1

Determine when the current settings of the controls are to be transmitted to the bus. Periodic transmission is safer if a message does not reach a recipient. You may also set up periodical monitoring by the actuator with this setting.

Send actuating variables	• on change • on change and periodically
cycle *for periodical transmission only*	5 s • ... • 5 min • ... • 2 h

The status object shows the current status of the output variable (0 = OFF, >0 = ON) and may, for example, be used for visualisations or to switch off the heating pump as soon as the heating is off.

Send status objects	• on change • on change to 1 • on change to 0 • on change and periodically • on change to 1 and periodically • on change to 0 and periodically
cycle *for periodical transmission only*	5 s • ... • 5 min • ... • 2 h

Then define the type of setting. Heating and/or cooling may be controlled in two levels.

Type of control	• One-stage heating • Dual-speed heating • Single-speed cooling • Single-speed heating + Single-speed cooling • Dual-speed heating + Single-speed cooling • Dual-speed heating + Dual-speed cooling

5.5.1. General set point values

You may enter separate set point values for each mode or use the comfort set point as a basic value.
If you are using the controls for both heating *and* cooling, you may also select the setting "separately with switching object". Systems used for cooling in the summer and for heating in the winter can thus be switched from one to the other.
If you are using the basic value, only the deviation from the comfort set point value is listed for the other modes (e. g., 2°C less for standby mode).

Setting the nominal values	• separate with switching object • separate without switching object • with comfort set point as a basis
Behaviour of the switching object at value *only if switching object is used*	• 0 = Heating | 1 = Cooling • 1 = Heating | 0 = Cooling
Switching object value before 1st communication *only if switching object is used*	0 • 1

The grades for the set point changes is predefined. Modifications may only remain active temporarily (do not save) or remain saved even after voltage recovery (and programming). This also applies to a comfort extension.

Grading for set point changes (in 0.1 °C)	1... 50; 10

Saving set point value(s) and comfort extension time	• not • after voltage recovery • after voltage recovery and programming (do not use for first start-up!)

The control may be manually reset to comfort mode from eco, or night mode. This allows the user to maintain the daily nominal value for a longer time, e.g. when having guests. The duration of this comfort extension period is set. After the comfort extension period is terminated, the system returns to eco mode.

Comfort extension time in seconds (can only be activated from eco mode)	1…36000; 3600

Set point Comfort

Comfort mode is usually used for daytime mode when people are present. A starting value is defined for the comfort set point as well as a temperature range in which the nominal value may be modified.

Initial heating/cooling set point (in 0.1 °C) valid till 1st communication *not upon saving the set point value after programming*	-300…800; 210
Min. object value heating/cooling (in 0.1 °C)	-300…800; 160
Max. object value heating/cooling (in 0.1 °C)	-300…800; 280

If the comfort set point is used as the basis, a dead zone is determined for the control mode "heating *and* cooling" to avoid direct switching from heating to cooling.

Dead zone between heating and cooling *only if both heating AND cooling are used.*	1…100; 50

Set point for standby

Standby mode is usually used for daytime mode when people are absent.

If set point values are entered separately:

A starting set point value is defined as well as a temperature range in which the nominal value may be modified.

Initial heating/cooling set point (in 0.1 °C) valid till 1st communication	-300…800; 210
Min. object value heating/cooling (in 0.1 °C)	-300…800; 160
Max. object value heating/cooling (in 0.1 °C)	-300…800; 280

If the comfort set point value is used as a basis:

If the comfort set point value is used as a basis, the deviation from this value is set.

Reduce nominal heating value (in 0.1°C) *for heating*	0…200; 30
Increase nominal cooling value\r\n (in 0.1°C) *for cooling*	0…200; 30

Eco set point

Eco mode is usually used for night mode.

If set point values are entered separately:

A starting set point value is defined as well as a temperature range in which the nominal value may be modified.

Initial heating/cooling set point (in 0.1 °C) valid till 1st communication	-300…800; 210
Min. object value heating/cooling (in 0.1 °C)	-300…800; 160
Max. object value heating/cooling (in 0.1 °C)	-300…800; 280

If the comfort set point value is used as a basis:

If the comfort set point value is used as a basis, the deviation from this value is set.

Reduce nominal heating value (in 0.1°C) *for heating*	0…200; 50
Increase nominal cooling value\r\n (in 0.1°C) *for cooling*	0…200; 60

Set point values for frost/heat protection (building protection)

The building protection mode is used during longer absences. Set points for frost protection (heating) and heat protection (cooling) are determined which may not be modified from outside (no access via operating devices etc.). The building protection mode may be activated with delay, which allows you to leave the building before the controls switch to frost/heat protection mode.

Nominal value frost protection\r\n (in 0,1°C)	-300…800; 70
Nominal value heat protection (in 0,1°C)	-300…800; 350
Activation delay	no • 5 s • ... • 5 min • ... • 2 h

General variables

This setting appears for the control types "Heating *and* Cooling" only. This is where you can decide whether to use a common variable for heating and cooling. If the 2nd level has a common variable, this is also where you determine the control mode of the 2nd level.

For heating and cooling	• separate variables are used • common variables are used for Level 1 • common variables are used for Level 2 • common variables are used for Level 1+2
Control type *only for level 2*	• 2-point control • PI control
Regulating variable of the 2nd Stage is on *only for level 2*	• 1-bit object • 8-bit object

5.5.2. Heating control level 1/2

If a heating control mode is configured, one or two setting sections for the heating levels are displayed.

On the 1st level, heating is controlled by a PI control which allows to either enter control parameters or select predetermined applications.

On the 2nd level (therefore only in case of a 2 level heating), heating is controlled via a PI or a 2-point-control.
On level 2, the set point deviation between the two levels must furthermore be determined, i. e. the lowest set point value from which the 2nd level is then added (when values exceed this set point).

Set point difference between levels 1 and 2 (in 0.1°C) *only for level 2*	0…100; 40
Control type *only for level 2 and if no common variables are used*	• 2-point control • PI control

PI control with control parameters:

This setting allows individual input of the parameters for PI control.

Control type	• **PI control**
Set control using	• **Controller parameter** • provided applications

Determine the deviation from the set point value which reaches maximum variable value, i. e. the point at which maximum heating power is activated.
The reset time shows how quickly the controls react to deviations from the set point value. In case of a short reset time, the controls react with a fast increase of the varia-

ble. In case of a long reset time, the controls react somewhat more gently and needs longer until the necessary variable for the set point deviation is reached.
You should set the time appropriate to the heating system at this point (note manufacturer instructions).

Maximum control variable is reached at set point/actual difference of (in °C)	0...5
Reset time (in min.)	1…255; 30

Now determine what should be transmitted when the control is blocked. Set a value greater 0 (=OFF) to receive a basic heating level, e.g. for floor heating.
Upon release, the control variable follows the rule again.

When blocked, the variable shall	• not be transmitted • send a specific value
Value (in %) *only if a value is transmitted*	0...100

In case of a common variable for heating and cooling, 0 is always transmitted as a fixed value.

PI control with predetermined application:

This setting provides fixed parameters for frequent applications.

Control type	• **PI control**
Set control using	• Controller parameter • **provided applications**
Application	• Warm water heating • Floor heating • Convection unit • Electric heating
Maximum control variable is reached at set point/actual difference of (in °C)	Warm water heating: 5 Floor heating: 5 Convection unit: 4 Electric heating: 4
Reset time (in min.)	Warm water heating: 150 Floor heating: 240 Convection unit: 90 Electric heating: 100

Now determine what should be transmitted when the control is blocked. Set a value greater 0 (=OFF) to receive a basic heating level, e.g. for floor heating.
Upon release, the control variable follows the rule again.

When blocked, the variable shall	• not be transmitted • send a specific value
Value (in %) *only if a value is transmitted*	0...100

In case of a common variable for heating and cooling, 0 is always transmitted as a fixed value.

2-point-rule (only level 2):

The 2-point-rule is used for systems which are only set to ON or OFF.

Control type *is determined at a higher level for common variables*	• **2-point control**

Enter the hysteresis that prevents frequent on/off switching of temperatures in the threshold range. Then determine whether a 1 bit object (on/off) or an 8 bit object (on with percentage/off) should be used.

Hysteresis (in 0.1°C)	0…100; 20
Actuating variable is a	• 1-bit object • 8-bit object
Value (in %) *only for 8 bit objects*	0...100

Now determine what should be transmitted when the control is blocked. Set a value greater 0 (=OFF) to receive a basic heating level, e.g. for floor heating.
Upon release, the control variable follows the rule again.

When blocked, the variable shall	• not be transmitted • send a specific value
Value (in %) *only if a value is transmitted*	0...100

5.5.3. Cooling control level 1/2

If a cooling control mode is configured, one or two setting sections for the cooling levels are displayed.

On the 1st level, cooling is controlled by a PI control which allows to either enter control parameters or select predetermined applications.

On the 2nd level (therefore only in case of a 2 level cooling), cooling is controlled via a PI or a 2-point-control.
On level 2, the set point deviation between the two levels must furthermore be determined, i. e. the highest set point value from which the 2nd level is then added (when values exceed this set point).

Set point difference between levels 1 and 2 (in 0.1°C) *only for level 2*	0…100; 40
Control type *only for level 2 and if no common variables are used*	• 2-point control • PI control

PI control with control parameters:

This setting allows individual input of the parameters for PI control.

Control type	• **PI control**

Set control using	• **Controller parameter** • provided applications

Determine the deviation from the set point value which reaches maximum variable value, i. e. the point at which maximum cooling power is activated.
The reset time shows how quickly the controls react to deviations from the set point value. In case of a short reset time, the controls react with a fast increase of the variable. In case of a long reset time, the controls react somewhat more gently and needs longer until the necessary variable for the set point deviation is reached.
You should set the time appropriate to the cooling system at this point (note manufacturer instructions).

Maximum control variable is reached at set point/actual difference of (in °C)	0...5
Reset time (in min.)	1...255; 30

Now determine what should be transmitted when the control is blocked.
Upon release, the control variable follows the rule again.

When blocked, the variable shall	• not be transmitted • send a specific value
Value (in %) *only if a value is transmitted*	0...100

In case of a common variable for heating and cooling, 0 is always transmitted as a fixed value.

PI control with predetermined application:

This setting provides fixed parameters for a cooling ceiling

Control type	• **PI control**
Set control using	• Controller parameter • **provided applications**
Application	• Cooling ceiling
Maximum control variable is reached at set point/actual difference of (in °C)	Cooling ceiling: 5
Reset time (in min.)	Cooling ceiling: 30

Now determine what should be transmitted when the control is blocked.
Upon release, the control variable follows the rule again.

When blocked, the variable shall	• not be transmitted • send a specific value
Value (in %) *only if a value is transmitted*	0...100

2-point-rule (only level 2):

The 2-point-rule is used for systems which are only set to ON or OFF.

Control type *is determined at a higher level for common variables*	• **2-point control**

Enter the hysteresis that prevents frequent on/off switching of temperatures in the threshold range. Then determine whether a 1 bit object (on/off) or an 8 bit object (on with percentage/off) should be used.

Hysteresis (in 0.1°C)	0…100; 20
Actuating variable is a	• 1-bit object • 8-bit object
Value (in %) *only for 8 bit objects*	0...100

Now determine what should be transmitted when the control is blocked.
Upon release, the control variable follows the rule again.

When blocked, the variable shall	• not be transmitted • send a specific value
Value (in %) *only if a value is transmitted*	0...100

In case of a common variable for heating and cooling, 0 is always transmitted as a fixed value.

5.6. Variable comparator

The two integrated control variable comparators can output maximum, minimum and median values.

Use comparator 1/2	No • Yes

5.6.1. Control variable comparator 1/2

Determine what the control variable comparator should output, and activate the input objects to be used. Send behaviour and blocks can also be set.

Output delivered	• Maximum value • Minimum value • Average value
Use input 1/2/3/4/5	No • Yes
Output sends	• on change of output • on change of output and periodically • when receiving an input object • when receiving an input object and periodically
Send cycle *(is only sent if "periodically" is selected)*	5 s • 10 s • 30 s • ... • 5 min • ... • 2 h
From change of *(is only sent if "on change" is selected)*	1% • 2% • 5% • 10% • 20% • 25%

Analysis of the blocking object	• at value 1: block | at value 0: release • at value 0: block | at value 1: release
Blocking object value before 1st communication	0 • 1
Behaviour of the switching output	
With blocking	• do not send message • Send value
Sent value in %	0 ... 100
on release, output is sent (with 2 seconds release delay)	• the current value • the current value after receipt of an object

5.7. Logic

Activate the logic inputs and assign object values up to 1st communication. Then, activate the required logic outputs.

Use logic inputs	No • **Yes**
Object value prior to 1. communication for:	
Logic input 1... 16	0 • 1

AND logic

Logic 1/2/3/4/5/6/7/8	not active • active

OR logic

Logic 1/2/3/4/5/6/7/8	not active • active

5.7.1. AND and/or OR logic 1/2/3/4/5/6/7/8

AND- and OR logic gates provide the same setting options. Assign the inputs to a switching event and set the send behaviour.

1. / 2. / 3. / 4. Input	• do not use • all switching events which are available to the sensor (siehe *AND logic connection inputs*, Seite 28)“)
Logic output sends	• one 1-bit object • two 8-bit objects

If the logic output sends one 1-bit object:

Logic output sends	**one 1 bit object**
if logic = 1 ➔ object value	1 • 0
if logic = 0 ➔ object value	0 • 1

If the logic output sends two 8-bit objects:

Logic output sends	**two 8 bit objects**
Type of objects	• Value (0 ... 255) • Percent (0% ... 100%) • Angle (0°... 360°) • Scenario load (0 ... 127)
if logic = 1 ➔ object A value	Setting dependent on "type of object"
if logic = 0 ➔ object A value	Setting dependent on "type of object"
if logic = 1 ➔ object B value	Setting dependent on "type of object"
if logic = 0 ➔ object B value	Setting dependent on "type of object"

Send behaviour	• on change of logic • on change of logic to 1 • on change of logic to 0 • on change of logic and periodically • on change of logic to 1 and periodically • on change of logic to 0 and periodically • on change of logic + receipt of object • on change of logic + receipt of object and periodically
Send cycle *(is only sent if "periodically" is selected)*	5 s • 10 s • 30 s • 1 min • ... • 2 h

Block

Logic outputs can also be blocked using objects.

Analysis of the blocking object	• at value 1: block | at value 0: release • at value 0: block | at value 1: release
Blocking object value before 1st communication	0 • 1
Behaviour of the switching output	
With blocking	• do not send message • send value for logic = 0 • send value for logic = 1

Behaviour on release of the switching output is dependent on send behaviour

Value of the parameter "Send behaviour":	Settings options "Behaviour of the switching output on release":
on change of logic	• do not send message • send value for current logic status
on change of logic to 1	• do not send message • if logic = 1 ➔ send value for 1
on change of logic to 0	• do not send message • if logic = 0 ➔ send value for 0
on change of logic and periodically	send value for current logic status (no selection)

on change of logic to 1 and periodically	if logic = 1 ➔ send value for 1 (no selection)
on change of logic to 0 and periodically	if logic = 0 ➔ send value for 0 (no selection)
on change of logic and receipt of object	• do not send message • Status object/s send/s
on change of logic and receipt of object and periodically	send value for current logic status (no selection)

5.7.2. AND logic connection inputs

do not use
Logic input 1
Logic input 1 inverted
Logic input 2
Logic input 2 inverted
Logic input 3
Logic input 3 inverted
Logic input 4
Logic input 4 inverted
Logic input 5
Logic input 5 inverted
Logic input 6
Logic input 6 inverted
Logic input 7
Logic input 7 inverted
Logic input 8
Logic input 8 inverted
Logic input 9
Logic input 9 inverted
Logic input 10
Logic input 10 inverted
Logic input 11
Logic input 11 inverted
Logic input 12
Logic input 12 inverted
Logic input 13
Logic input 13 inverted
Logic input 14
Logic input 14 inverted
Logic input 15
Logic input 15 inverted
Logic input 16
Logic input 16 inverted
Temperature sensor malfunction = ON
Temperature sensor malfunction = OFF
Switching output temperature 1
Switching output temperature 1 inverted

Switching output temperature 2
Switching output temperature 2 inverted
Switching output temperature 3
Switching output temperature 3 inverted
Switching output temperature 4
Switching output temperature 4 inverted
Temp. control status changeover switching object
Temp. control status changeover switching object inverted
Temp. control status heating 1
Temp. control status heating 1 inverted
Temp. control status heating 2
Temp. control status heating 2 inverted
Temp. control status cooling 1
Temp. control status cooling 1 inverted
Temp. control status cooling 2
Temp. control status cooling 2 inverted
Temp. control status night reduction
Temp. control status night reduction inverted
Temp. control status window
Temp. control status window inverted

5.7.3. Connection inputs of the OR logic

The OR logic connection inputs correspond to those of the AND logic. In addition the following inputs are available for the OR logic:

AND logic 1
AND logic output 1 inverted
AND logic output 2
AND logic output 2 inverted
AND logic output 3
AND logic output 3 inverted
AND logic output 4
AND logic output 4 inverted
AND logic output 5
AND logic output 5 inverted
AND logic output 6
AND logic output 6 inverted
AND logic output 7
AND logic output 7 inverted
AND logic output 8
AND logic output 8 inverted

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