KNX AQS/TH-B-UP

Combined Indoor Sensor

Technical specifications and installation instructions

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1. Description

The **Indoor Sensor KNX AQS/TH-B-UP** measures CO_2 concentration, temperature and humidity and calculates the dew point. The sensor can receive external measured values via the bus and process them with the own data to overall vealues (mixed values, e. g. room average). The **KNX AQS/TH-B-UP** offers two push buttons that may be used for changing the ambient temperature (target value), for switching between day and night mode or as free programmable bus push buttons.

The **KNX AQS/TH-B-UP** provides eleven switching outputs with adjustable threshold values. The switching outputs and further communication objects can be linked by AND and OR logic gates. Additionally, an integrated actuating variable comparator can compare and output values that are received via communication objects.

Integrated PI controllers allows for control of a ventilation (depending on CO_2 concentration and air humidity) and a heating/cooling system (depending on temperature). The **KNX AQS/TH-B-UP** can can emit a warning to the bus as soon as the area of optimum comfort (according to DIN 1946) is left.

The integrated display shows the own values and data received from the bus (e. g. date, time). The housing is completed with a frame of the switching series installed in the building and thus merges with the interior.

Functions:

- Measurement of **CO_2 concentration** of the air, of **temperature** and **air humidity** (absolute, relative), calculation of the dew point
- **Mixed values** from own measured values and external values (proportions can be set in percentage)
- **Display** 1-3 rows (own values or values received from the bus) or display of temperature control (see *Mode display*, page 7)
- **2 push buttons**. Configuration as bus push button or for changing ambient temperature and switching between day/night mode (see *Change ambient temperature with the buttons*, page 7)
- **PI controller for heating** (one or two step) and **cooling** (one or two step) depending on temperature. Setting of target value for day, night and frost/heat protection (while windows are open)
- **PI controller for ventilation** depending on humidity and CO_2 concentration: dehumidification/humidification (one step) or dehumidification (one or two step)
- **11 switching outputs** with adjustable threshold values (Threshold values can be set by parameter or via communication objects)
- **8 AND and 8 OR logic gates** with each 4 inputs. Every switching incident as well as 8 logic inputs (in the form of communication objects) may be used as inputs for the logic gates. The output of each gate may optionally be configured as 1 bit or 2 x 8 bits
- **2 actuating variable comparators** for output of minimum, maximum or avarage values. Each with 5 inputs (for values received via communication objects)

Configuration is made using the KNX software ETS. The **programme file** (format VD), the data sheet and the manual can be downloaded from the Elsner Elektronik homepage on **www.elsner-elektronik.de** in the "Service" menu.

1.0.1. Scope of delivery

- Housing with display, buttons and sensor board
- CO_2 sensor unit
- Base plate

You will need *in addition* (not supplied):

- Socket Ø 60 mm, 42 mm deep
- Frame (for element 55 x 55 mm), suitable for the switching programme used in the building

1.1. Technical specifications

Housing	Plastic material (partly lacquered)
Colours	• White glossy (similar to RAL 9016 Traffic White) • Aluminium matt • Anthracite matt • Stainless steel • Special colours on request
Mounting	In-wall (in socket Ø 60 mm, 42 mm deep)
Protection category	IP 20
Dimensions	Housing approx. 55 x 55 (W x H, mm), mounting depth approx. 15 mm, base plate approx. 71 x 71 (W x H, mm)
Total weight	approx. 72 g
Ambient temperature	Operation -10…+50°C, storage -20…+60°C
Ambient air humidity	max. 95% R. H., avoid bedewing
Operating voltage	KNX bus voltage
Bus current	max. 10 mA
Data output	KNX +/- bus terminal plug
BCU type	Own micro controller
PEI type	0
Group addresses	max. 254
Allocations	max. 254
Communication objects	253
CO_2 measurement range	0...2000 ppm
CO_2 resolution	1 ppm
CO_2 accuracy*	± 50 ppm ± 3% of the measuered value
Temperature measurement range	-10…+50°C
Temperature resolution	0.1°C

Temperature accuracy*	± 0.4°C at 25°C
Humidity measurement range	0…95%
Feuchtigkeit resolution	0.1%
Feuchtigkeit accuracy	± 5% R. H.

* Mind the notes on *Accuracy of the measurement*, page 4

The following standards have been considered for the evaluation of the product in terms of electro magnetic compatibility:
- EN 50090-2-2: 1996/A2:2007
- EN 61000-6-1: 2007
- EN 61000-6-3: 2007

The product has been tested for the above mentioned standards by an accredited EMV laboratory.

1.1.1. Accuracy of the measurement

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). To ensure a correct CO_2 measurement, the device must be installed in a windproof socket.

The indicated **accuracy of the CO_2 measurement** will be achieved after a run-in period of 24 hours (without interruption of the bus voltage) if the sensor has been in contact with fresh air (350…450 ppm) at least once in this period.
After this, the CO_2 sensor will recalibrate every two weeks by defining the lowest measured value captured during that period (without interruption of the bus voltage) as a reference for fresh air.
The guarantee the accuracy on a sustained basis, the sensor should be provided with fresh air at least once in two weeks. This occurs normally during room ventilation.

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 commissioning

2.1. Notes on installation

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

Disconnect all lines to be assembled, and take safety precautions against accidental switch-on.

The device is exclusively intended for appropriate use. With each inappropriate change or non-observance of the instructions for use, any warranty or guarantee claim will be void.

After unpacking the device, check immediately for any mechanical damages. In case of transport damage, this must immediately notified to the supplier.

If damaged, the device must not be put into operation.

If an operation without risk may supposedly not be guaranteed, the device must be put out of operation and be secured against accidental operation.

The device must only be operated as stationary system, i.e. only in a fitted state and after completion of all installation and start-up works, and only in the environment intended for this purpose.

Elsner Elektronik does not assume any liability for changes in standards after publication of this instruction manual.

2.2. Installation position

The **Indoor Sensor KNX AQS/TH-B-UP** will be installed concealed within a socket (Ø 60 mm, 42 mm deep).

May be installed and operated in dry interior rooms only.
Avoid condensation.

For monitoring of the CO_2 content of the room air choose an installation position in height of head (standing or sitting, according to utilization of room). The CO_2 concentration in indoor rooms is highest near the floor and decreases towards the ceiling.

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
- Draft from ducts which lead from other rooms or from the outside 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 and ducts which lead from warmer or colder areas to the sensor

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

To ensure a correct CO_2 measurement, the device must be installed in a windproof socket.

2.3. Composition

2.3.1. Housing

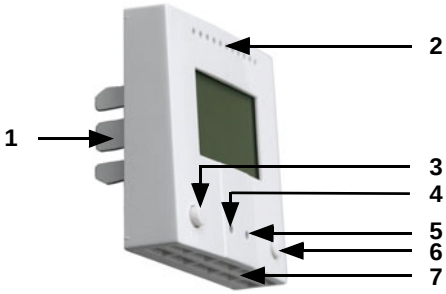

Fig. 1
1 Notches
2 Air circulation holes
3 Push button
4 Programming LED (recessed)
5 Programming button (recessed) for teaching instrument
6 Push button
7 Air circulation holes (BOTTOM)

2.3.2. Rear view of sensor board with connections

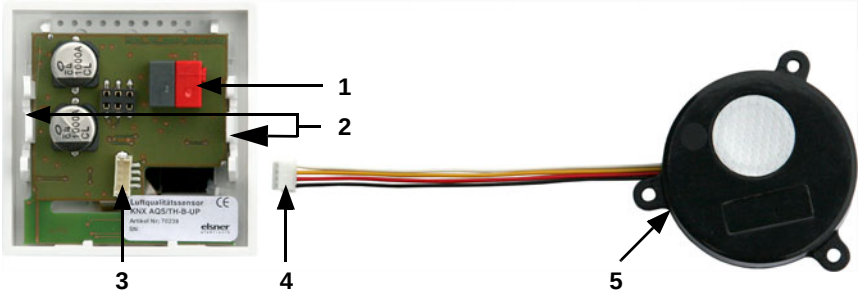

Fig. 2
1 KNX terminal BUS +/-
2 Notches
3 Slot for CO_2 sensor unit
4 Plug of CO_2 sensor unit
5 CO_2 sensor unit

2.4. Assembly of the sensor

First of all fit the windproof socket with connection. Also seal inlet pipes to avoid infiltration.

Place the CO_2 sensor unit in the socket. The side with the sensor membrane must face to front.

Fig. 3

Screw the base plate onto the socket and position the frame of the switching programme. Connect the CO_2 sensor unit and the bus line +/- (black-red plug) to the terminals provided on the board.

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

Sensor must not be exposed to water (rain) or dust. This could result in the electronic being damaged. A relative air humidity of 95% must not be exceeded. Avoid bedewing.

After the bus voltage has been applied, the device will enter an initialisation phase lasting 5 seconds. During this phase no information can be received via the bus.

3. Display and operation of the device

3.1. Mode display

The display can show the current mode with the target temperature. The menue “Display settings“ of the ETS software must be set to “Display mode: Temperature control“.

	Day mode. Target temperature day is used.		Night mode. Target temperature night is used.
	Heating mode. System is set to heating the room.		Cooling mode. System is set to cool the room.
	Window open. When heating, the lower value for frost protection is used as target value, when cooling, the higher value for heat protection is used as target value.		
	Heating and coling are blocked by a communication object.		

The current target temperature is displayed (not the measured value)!

3.2. Change ambient temperature with the buttons

Using the push buttons, the target temperature for the room as well as the day/night mode can be changed manually. The menue “Push buttons“ of the ETS software must be set to “Use push buttons: for temperature control“.

Decrease target temperature (-)	briefly press left button	Ambient temperature in the current mode is decreased. The sep-size is defined in the ETS software (0.1°C to 5°C).
Increase target temperature (+)	briefly press right button	Ambient temperature in the current mode is increased. The sep-size is defined in the ETS software (0.1°C to 5°C).

Switch to night mode	press left button longer than 2 secs.	The set night temperature is the new target temperature for the room, until the next switchover to day mode takes place (with button or via bus).
Switch to day mode	press right button longer than 2 secs.	The set day temperature is the new target temperature for the room, until the next switchover to night mode takes place (with button or via bus).
Extend day mode	in night mode: press both buttons at the same time longer than 2 secs.	Switches from night to day mode again for a certain time (e. g. if the rooms are used longer in the evening). The period is defined in the ETS software (up to 10 hours). The time remaining in day mode is displayed.