

## Datasheet

Subject to technical alteration  
Issue date: 23.10.2018 • A003



Illustration similar

## Application

Duct air quality sensor for detection of CO<sub>2</sub>, VOC, optional temperature and humidity. With a mix output, a mixture of CO<sub>2</sub> and VOC signals can be realized. The mixing ratio can be configured with the USE app or via BACnet. LCD models with RGB background light have a transparent cover. Display configuration and threshold values for color changes can be parameterized via Thermokon USEapp. Designed for duct mounted applications with up to 2 configurable 0..10 V outputs.

## Types Available

**Duct sensor CO<sub>2</sub> + VOC or mix optional with display – active RS485 BACnet MS/TP**

LK+ CO<sub>2</sub>+VOC LCD RS485 Modbus

**Duct sensor CO<sub>2</sub> + VOC + temp optional with display – active RS485 BACnet MS/TP**

LK+ CO<sub>2</sub>+VOC LCD Temp RS485 Modbus

**Duct sensor CO<sub>2</sub> + VOC + temp +rH optional with display – active RS485 BACnet MS/TP**

LK+ CO<sub>2</sub>+VOC LCD Temp\_rH RS485 Modbus

## Security Advice – Caution



The installation and assembly of electrical equipment should only be performed by authorized personnel.

The product should only be used for the intended application. Unauthorised modifications are prohibited! The product must not be used in relation with any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals or assets. Ensure all power is disconnected before installing. Do not connect to live/operating equipment.

Please comply with

- Local laws, health & safety regulations, technical standards and regulations
- Condition of the device at the time of installation, to ensure safe installation
- This data sheet and installation manual

## Notes on Disposal



As a component of a large-scale fixed installation, Thermokon products are intended to be used permanently as part of a building or a structure at a pre-defined and dedicated location, hence the Waste Electrical and Electronic Act (WEEE) is not applicable. However, most of the products may contain valuable materials that should be recycled and not disposed of as domestic waste. Please note the relevant regulations for local disposal.

## Build-up of Self-Heating by Electrical Dissipative Power

Temperature sensors with electronic components always have a dissipative power, which affects the temperature measurement of the ambient air. The dissipation in active temperature sensors shows a linear increase with rising operating voltage. This dissipative power has to be considered when measuring temperature. In case of a fixed operating voltage ( $\pm 0,2$  V) this is normally done by adding or reducing a constant offset value. As Thermokon transducers work with a variable operating voltage, only one operating voltage can be taken into consideration, for reasons of production engineering. Transducers 0..10 V / 4..20 mA have a standard setting at an operating voltage of 24 V =. That means, that at this voltage, the expected measuring error of the output signal will be the least. For other operating voltages, the offset error will be increased by a changing power loss of the sensor electronics. If a re-calibration should become necessary later directly on the sensor, this can be done by means of a trimming potentiometer on the sensor board.

**Remark: Occurring draft leads to a better carrying-off of dissipative power at the sensor. Thus temporally limited fluctuations might occur upon temperature measurement.**

## Information about Indoor Air Quality CO<sub>2</sub>

EN 13779 defines several classes for indoor air quality:

Category	CO <sub>2</sub> content above the content in outdoor air in ppm		Description
	Typical range	Standard value	
IDA1	<400 ppm	350 ppm	Good indoor air quality
IDA2	400.. 600 ppm	500 ppm	Standard indoor air quality
IDA3	600..1.000 ppm	800 ppm	Moderate indoor air quality
IDA4	>1.000 ppm	1.200 ppm	Poor indoor air quality

## Information about Self-Calibration Feature CO<sub>2</sub>

Virtually all gas sensors are subject to some sort of drift. The degree of drift is partially dependent on the use of quality components and good design. But even with good components and excellent design, a small amount of drift can still occur in the sensor that may ultimately result in the need for a sensor to be recalibrated.

The natural drift of the sensor is caused by:

• **Dust/dirt** • **Aggressive chemicals absorbed inside chamber / optical elements** • **Corrosion inside chamber (high rh, condensation)** • **Temperature cycles causing mechanical stress** • **Electron/hole migration in the photo detector's semiconductor** • **Drift of photo amplifiers** • **External mechanical stress on chamber** • **Light source wear-off**

Most of the effects listed above will be compensated by the automatic self-calibration of the sensor's dual channel technology. In contrast to commonly used ABC-Logic self-calibrating sensors with dual channel technology are suitable for all applications including those operating 24 hours, 7 days a week, for example hospitals.

However some effects cannot be compensated automatically and may result in a very gradual natural drift of a few ppm per month. This natural drift is not covered by Thermokon's 5-year warranty.

## Application Notice for Air Quality Sensors VOC

Unlike CO<sub>2</sub> sensors, which specifically measure CO<sub>2</sub>, mixed gas sensors detect a wide range of gases. The sensor signal does not indicate the type of gas or its concentration in ppm. Mixed gas sensors detect gases and vapours consisting of carbohydrates, or more generally gases that can be oxidised (burnt): Odours, perfume, cleaning fluid scent, tobacco smoke, new materials fumigations (furniture, carpets, paint, glue ...).

Unlike CO<sub>2</sub>, which humans cannot sense, the amount of odours (VOC) indicates the level of air quality. VOC sensors have proven their value in a multitude of applications for many years.

### Measuring principle:

Similar to a catalyst converter the organic molecules are burnt (oxidized) when in contact with the sensor's heated -dioxide surface, adding a small amount of heat combustion. The increased temperature is measured providing a signal proportional to the number of molecules being burnt. CO<sub>2</sub> cannot be detected as it cannot be further oxidized.

**Refrain from touching the sensor's element sensitive surface. Touching the sensitive surface element will void warranty.**

## Information about Calibration VOC

Similar to a catalyst converter the VOC sensor will deteriorate over time, which will affect the sensitivity. This VOC sensor automatically compensates the decrease in sensitivity by dynamic auto-calibration.

The reference level of air quality is derived from the ambient conditions over a 72h period. The lowest reading within this 72h time period will be used as reference level, representing the "clean and fresh air level".

## Technical Data

Measuring values	VOC, CO <sub>2</sub> , temperature + humidity, each output can be set to get a variable mix of CO <sub>2</sub> and VOC by configuration	
Output voltage	2x 0..10 V or 0..5 V, min. load 10 kΩ (live-zero configuration via Thermokon USEapp)	
Network technology	RS485 BACnet MS/TP	
Power supply	15..35 V = or 19..29 V ~	
Power consumption	max. 2,3 W (24 V =)   max. 4,3 VA (24 V ~)	
Measuring range temp.	0..+50 °C (default setting), optionally configured via Thermokon USEapp	
Measuring range humidity	<b>Temp_rH</b> 0..100% rH non-condensing, optionally configured via Thermokon USEapp (enthalpy, absolute humidity, dew point)	
Measuring range CO <sub>2</sub>	0..2000 ppm (default), 0..5000 ppm (optionally configured via Thermokon USEapp)	
Accuracy temperature	<b>Temp   Temp_rH</b> ±0,5 K (typ. at 21 °C)	
Accuracy humidity	<b>Temp_rH</b> ±2% between 10..90% rH (typ. at 21 °C)	
Accuracy CO <sub>2</sub>	±50 ppm +3% of reading (typ. at 21 °C, 50% rH)	
Air speed	min. 0,3 m/s, max. 12 m/s	
Calibration	self-calibration, Dual Channel	
Sensor	<b>CO<sub>2</sub></b> NDIR (non-dispersiv, infrared)	<b>VOC</b> VOC sensor (heated metal oxide semiconductor)
Display	LCD 29x35 mm with RGB backlight	
Enclosure	enclosure USE-M, PC, pure white, cover PC, transparent, with removable cable entry	
Protection	IP65 according to EN 60529	
Cable entry	M25, for wire max. Ø=7 mm, seal insert for fourfold cable entry	
Connection electrical	<b>Mainboard</b> removable plug-in terminal, max. 2,5 mm <sup>2</sup>	<b>Plug-in card</b> removable plug-in terminal, max. 1,5 mm <sup>2</sup>
Pipe	<b>CO<sub>2</sub>+VOC</b> PA6, black, Ø=19,5 mm, length 150 mm	<b>Temp   Temp_rH</b> PA6, black, Ø=19,5 mm, length 180 mm
Ambient condition	0..+50 °C, max. 85% rH short term condensation	
Mounting	installation is also possible using mounting base	
Notes	mixed gas sensors detect gases and vapours which can be oxidised (burnt): Body odours, tobacco smoke, exhalations emitted by materials (furniture, carpets, paint, glue ...)	



### Declaration of conformity

The declaration of conformity of the products can be found on our website <https://www.thermokon.de/>.

## Configuration



**The Thermokon bluetooth dongle with micro-USB is required for communication between USEapp and USE-M / USE L (Item No.: 668262). Commercial bluetooth dongles are not compatible.**



Application-specific reconfiguration of the devices can be carried out using the Thermokon USEapp. The configuration is carried out in the voltage-supplied state.



**The configuration-app and the app description can be found in the Google Play Store or in the Apple App Store.**

## Application notice

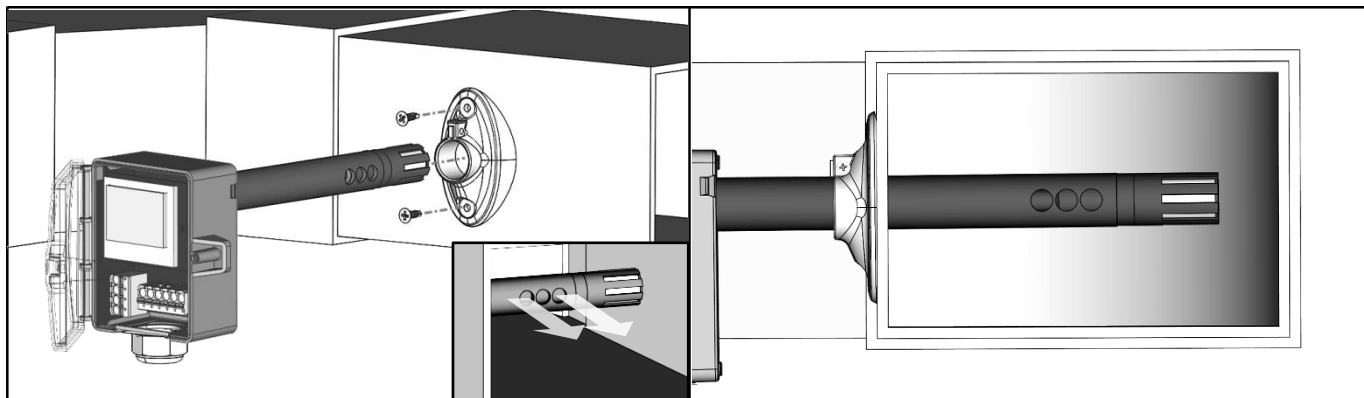


The housing cover must be completely closed in order to ensure the accuracy and reproducibility of the measured values during a test or service log via USEapp.

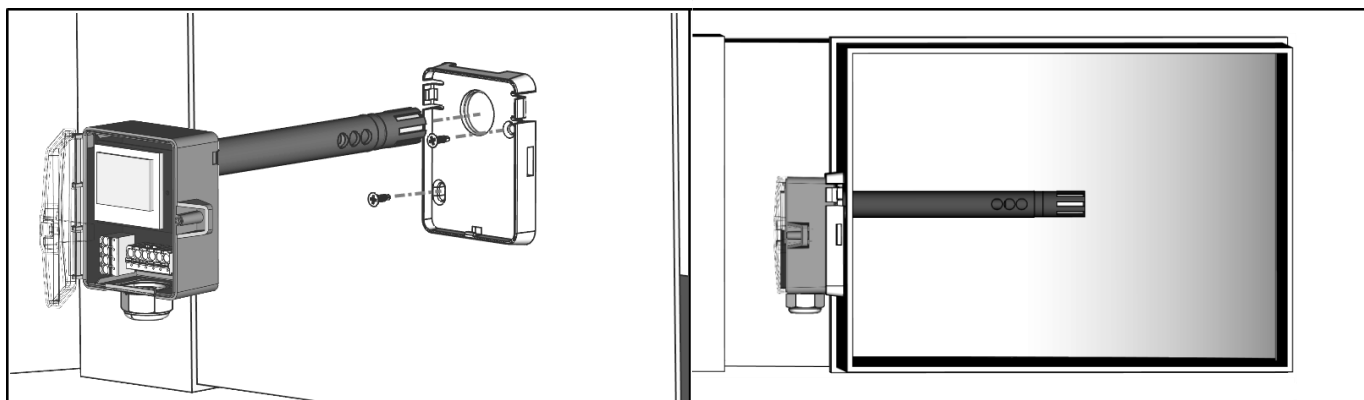
The Bluetooth dongle snaps into the socket easily. When removing, please fix the plug-in card (option PCB) so that it is not unintentionally pulled out.

## Mounting Advices

The sensor can be mounted on the ventilation duct by means of the mounting flange MF20 TPO (optional with mounting base). Align the openings on the sensor tube according to the flow direction.



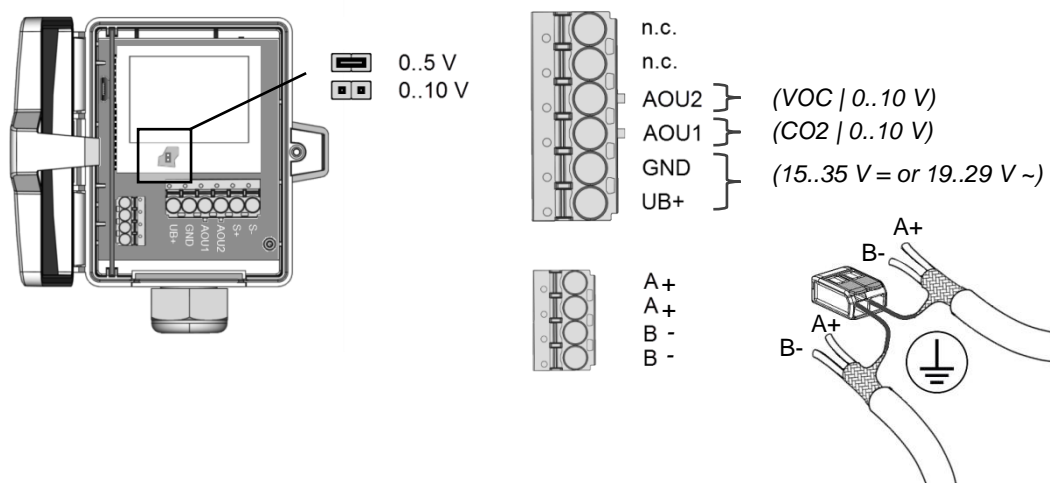
Optional mounting with mounting base (Item No. 631228), please note the installation depth of the sensor pipe.



## Connection Plan

To change the output voltage range (default 0..10 V to 0..5 V) via jumper, the display must be removed from the board first. If the RS485 cable is looped through, connect both cable shields using the enclosed 2-pol. Connect terminal as shown.

LK+ CO2+VOC RS485 BACnet



The BACnet address of the device is set binary coded in the range of 1 ... 127 via 7 dip-switches. (the address 0 is reserved and cannot be selected).



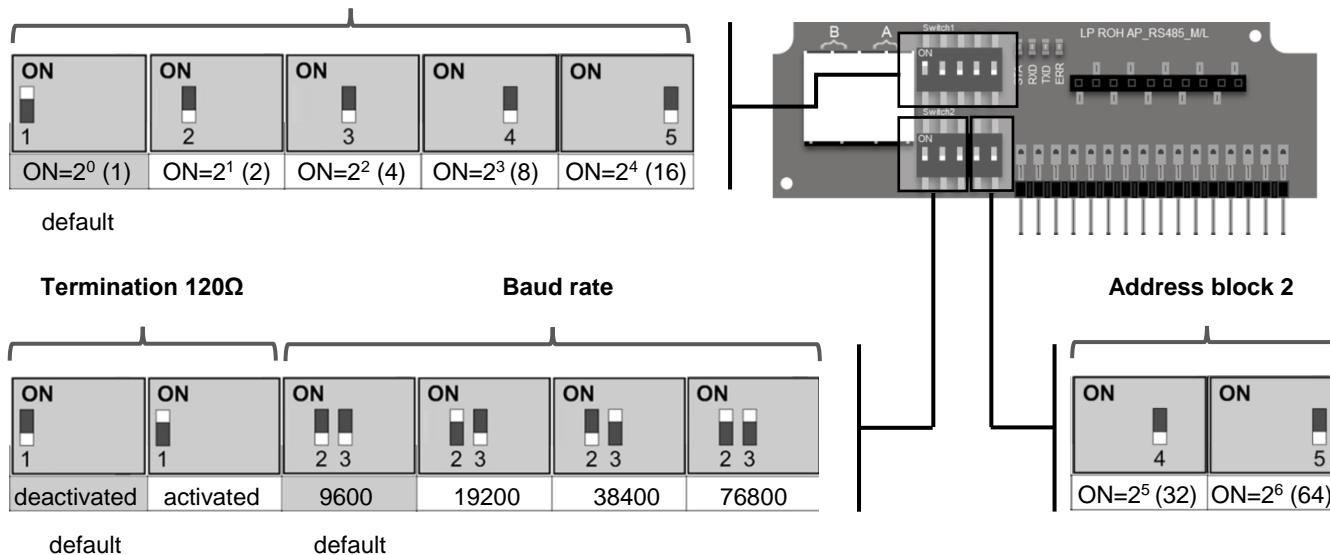
#### BACnet Objects:

USE-RS485 BACnet interface

A detailed description of the BACnet interface can be found at the following link:

→ [Download](#)

#### Address block 1



#### Measuring values

Object	Access	Description	Unit
AI-1	R	relative humidity	%rF
AI-5	R	CO2	ppm
AI-6	R	VOC	%
AI-7	R	CO2 VOC Mix	

#### Object AV-38 = 1 (Unit SI)

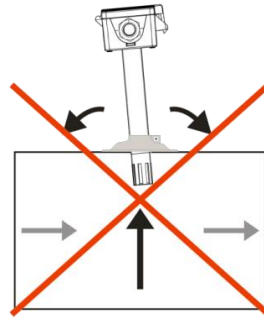
Objects	Access	Description	Unit
AI-0	R	temperature	SI °C
AI-2	R	absolute humidity	SI g/m <sup>3</sup>
AI-3	R	enthalpy	SI KJ/kg
AI-4	R	dew point	SI °C

#### Object AV-38 = 2 (Unit Imperial)

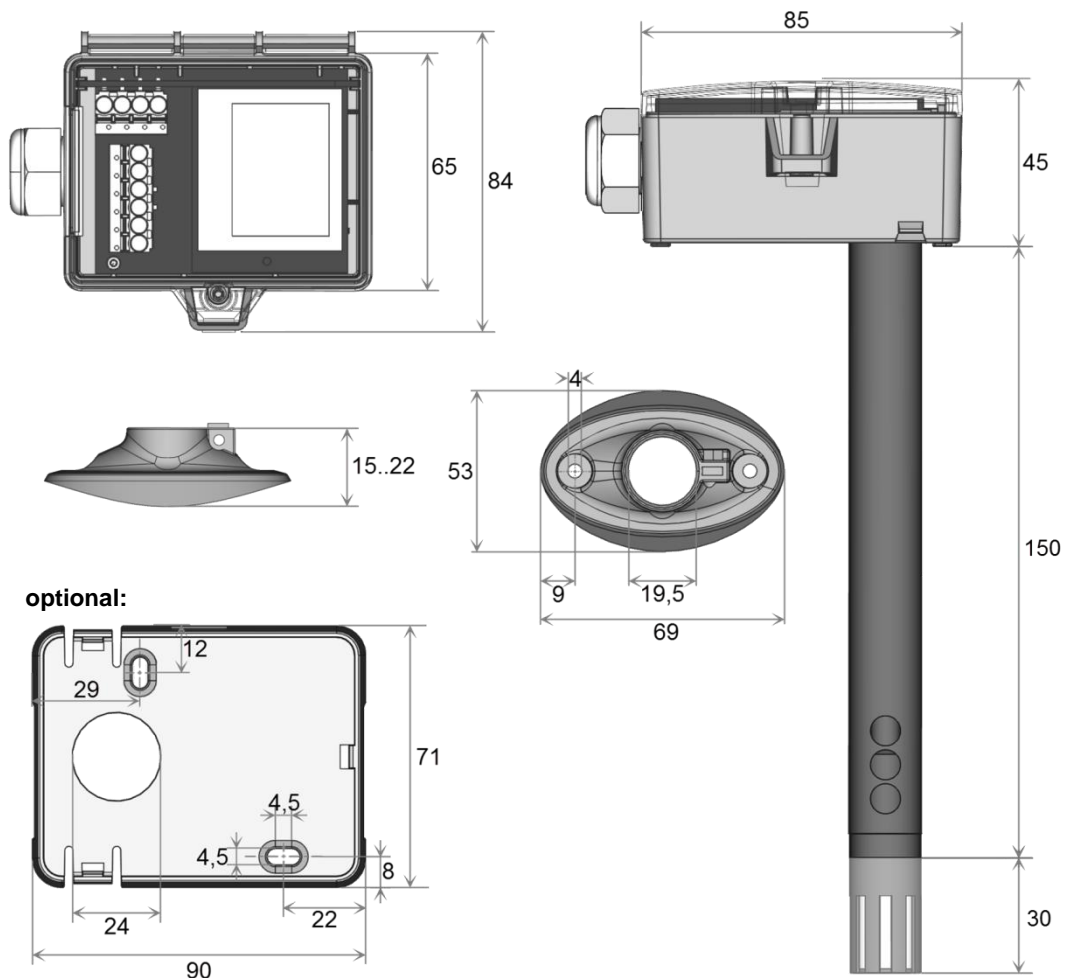
Objects	Access	Description	Unit
AI-0	R	temperature	Imperial °F
AI-2	R	absolute humidity	Imperial gr/ft <sup>3</sup>
AI-3	R	enthalpy	Imperial BTU/lb
AI-4	R	dew point	Imperial °F

## Dismounting Advices

Remove the lower section of the sensor carefully and pulling straight out. **Pay close attention to the correct dismantling of the component!**



## Dimensions (mm)



Note: Pipe length depending on device type (see technical data)

## Accessories (included in delivery)

Mounting flange MF20 TPO

Item No. 612562

Mounting kit universal

Item No. 698511

• Cover screw + screw cover • 2 Rawlplugs • 2 Screws (countersunk head) • 2 Screws (rounded head)

## Accessories (optional)

Mounting base

Item No. 631228

Filter stainless steel, wire mesh

Item No. 231169