LK+ CO2+VOC (LCD) (Temp_rH) RS485 Modbus

Duct sensor for air quality
Optional: Temperature | Humidity

thermokon®
HOME OF SENSOR TECHNOLOGY

Data sheet

Subject to technical changes
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The following illustrations show the version with LCD

»APPLICATION

Air quality sensor for measuring VOC air quality, CO_2, temperature and humidity in outdoor areas with two 0..10 V output. LCD models with RGB background light have a transparent cover.

»TYPES AVAILABLE

Duct sensor CO2 + VOC + temp + rH (opt.), optional with display – active, RS485 Modbus MS/TP

- LK+ CO2+VOC (LCD) RS485 Modbus
- LK+ CO2+VOC (LCD) Temp RS485 Modbus
- LK+ CO2+VOC (LCD) Temp_rH RS485 Modbus

Optionally with shortened sensor tube, Type 100

- LK+ CO2+VOC (LCD) 100 RS485 Modbus
- LK+ CO2+VOC (LCD) 100 Temp RS485 Modbus
- LK+ CO2+VOC (LCD) 100 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. Unauthorized modifications are prohibited! The product must not be used in relation to any equipment that in case of 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 installation. Do not connect to live/operating equipment.

Please comply with

- Local laws, health & safety regulations, technical standards and regulations
- The state of the technology at the time of installation
- This data sheet and installation manual

»PRODUCT TESTING AND CERTIFICATION

Declaration of conformity
The declaration of conformity of the products is available on our website:
https://www.thermokon.de/direct/en-gb/categories/lkplus

»NOTES ON DISPOSAL

The crossed-out wheelie bin symbol indicates that the product or removable batteries must not be disposed of with household or commercial waste. Within the EU, you are legally obliged to dispose of the product separately and appropriately in accordance with the national laws of your country. Alternatively, please contact your supplier or Thermokon Sensortechnik GmbH. Further information can be found at: www.thermokon.com

»GENERAL REMARKS CONCERNING SENSORS

Especially regarding passive sensors in two-wire conductor versions, the wire resistance of the supply wire must be considered. If necessary, the wire resistance must be compensated by the follow-up electronics. Due to self-heating, the wire current affects the measurement accuracy, so it should not exceed 1 mA.

When using lengthy connection wires (depending on the cross section used) the measuring result might be falsified due to a voltage drop at the common GND-wire (caused by the voltage current and the line resistance). In this case, 2 GND-wires must be wired to the sensor – one for supply voltage and one for the measuring current.

Sensing devices with a transducer should always be operated in the middle of the measuring range to avoid deviations at the measuring end points. The ambient temperature of the transducer electronics should be kept constant. The transducers must be operated at a constant supply voltage (±0,2 V). When switching the supply voltage on and off, onsite power surges must be avoided.

»BUILD-UP OF SELF-HEATING BY ELECTRICAL DISSIPATIVE POWER

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 must be considered when measuring temperature. In case of a fixed operating voltage (±0,2 V) this is normally done by adding or reducing a constant offset value.

Thermokon transducers can be operated with variable operating voltages. The transducers are set at the factory with a reference operating voltage of 24 V =.

At this voltage, the expected measuring error of the output signal will be the least. Other operating voltages can cause a measurement deviation changing power loss of the sensor electronics.

A recalibration can be carried out directly on the unit or via a software variable (app or bus).

»APPLICATION NOTICE FOR HUMIDITY SENSORS

At regular environmental conditions, it is recommended to calibrate the sensor annually to check the compliance with the accuracy required in the application. The following conditions can damage the sensor element or lead in long term to loss of the specified accuracy:

- Mechanical stress
- Contamination (e.g. dust or fingerprints)
- Aggressive chemicals
- Ambient conditions (e.g. condensation on measuring elements)

Do not touch the sensor elements!

Re-calibration or exchange of the sensor elements are not subject of the general warranty.

»INFORMATION ABOUT SELF-CALIBRATION FEATURE CO_2

All gas sensors are subject to drift. The degree of drift is dependent on the use of components and product design. In addition, the following environmental conditions, among others, can accelerate/favor the aging and wear of the sensors:

- Mechanical stress (also due to temperature fluctuation)
- Contamination (e.g. dust or fingerprints)
- Aggressive chemicals
- Ambient conditions (high humidity or condensation on measuring elements)

An internal self-calibration function with dual channel technology compensates for the caused drift. Thermokon sensors are for permanent use (e.g. hospitals).

»INFORMATION ABOUT INDOOR AIR QUALITY CO_2

EN 13779 defines several classes for indoor air quality:

Category	CO_2 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

» USER INFORMATION FOR VOC AIR QUALITY SENSORS

Volatile organic compounds (VOC) are gaseous and vaporous substances of organic origin present in the air. VOC sensors detect the major portion of air quality that is perceived olfactorily (through the sense of smell) by humans (e.g. body odors, tobacco smoke, emissions from materials such as furniture, carpets, paints, adhesives, etc.).

The VOC value is an application-specific indicator of indoor air quality and does not provide any information about the composition of the substances present.

A VOC sensor oxidizes the organic molecules that come into contact with it, causing the resistance of the semiconductor to change. The VOC index (0...500) describes the air quality relative to the learned indoor air conditions. A value of 100 corresponds to “normal” indoor air quality (reference value determined dynamically over approximately 8 days); values below 100 indicate an improvement, while values above 100 indicate a deterioration in air quality. If the room is not ventilated despite high index values, the value will gradually approach 100 again, as the sensor learns the poor air as the new “normal”.

The sensor must not be exposed to direct drafts, as these can significantly influence and distort the measurement result. Any contact with the sensitive sensors must be avoided and will void the warranty.

VOC index	Classification	Meaning	Recommendation
0 – 100	Better air quality	Lower VOC load than the learned reference level of the previously measured indoor air quality (see Section 4.2), e.g. after ventilation, when using an air purifier, or with low room occupancy.	No action needed
100	Reference value (baseline)	Corresponds to the “normal” indoor air quality learned by the algorithm. On Thermokon devices, this reference is determined dynamically over approx. 8 days (see Section 4.2).	Normal condition
100 – 500	Worse air quality	Higher VOC load than the learned reference level, e.g. due to cooking, cleaning agents, high occupancy, or emissions from new furniture or fresh paint.	Ventilation or air purification are recommended; at high values (> 350) intense ventilation is recommended

» TECHNICAL DATA

Measuring values *(type-dependent)*	CO_2, VOC, temperature, humidity	
Output voltage	2 x 0..10 V or 0..5 V, min. load 10 kΩ (live-zero configuration via Thermokon USEapp)	
Network technology	RS485 Modbus, RTU, half-duplex, baud rate 9.600, 19.200, 38.400 or 57.600, parity: none (2 stopbits), even or odd (1 stopbit), **Fail-safe Biasing required**	
Power supply*	15..35 V = or 19..29 V ~ SELV *With alternating voltage, the correct polarity must be ensured*	
Power consumption	Max. 2,3 W (24 V =) | max. 4,3 VA (24 V ~)	
Display *(optional)*	**LCD** LCD 1.14” × 1.37” mm with RGB backlight	
Enclosure *(type-dependent)*	Enclosure: USE-M, PC, pure white, with removable cable entry	**LCD** Cover: PC, transparent
Degree of Protection	IP65, according to EN 60529	
Cable entry	M25, for wire max. Ø = 0.27”, seal insert for fourfold cable entry	
Pipe *(type-dependent)*	**CO_2 + VOC** PA6, black, Ø = 0.77” mm; length: 6” **Type 100** Length: 2.7”	**Temp | Temp_rH** PA6, black, Ø = 0.77”; length: 7.1” **Type 100** Length: 3.9”
Electrical connection	**Mainboard** Removable plug-in terminal, max. 14 AWG	**Plug-in card** Removable plug-in terminal, max. 15 AWG
Ambient condition	32..+122 °F, max. 85 % rH (short term condensation)	
Notes	VOC sensors detect gases and vapours which can be oxidised (burnt): Body odours, tobacco smoke, exhalations emitted by materials (furniture, carpets, paint, glue ...)	

Power supply
When several BUS devices are supplied by one 24 V AC voltage supply, it is to be ensured that all "positive" operating voltage input terminals (+) of the field devices are connected with each other and all "negative" operating voltage input terminals (-) (= reference potential) are connected together (in-phase connection of field devices). In case of reversed polarity at one field device, a supply voltage short-circuit would be caused by that device. ***The consequential short-circuit current flowing through this field may cause damage to it. Therefore, pay attention to correct wiring.***

AC voltage requires higher power consumption. This results in greater self-heating and requires an on-site offset adjustment. Therefore, we recommend using a DC power supply.

» Temperature

Measuring range temp. *(type-dependent)*	**Temp | Temp_rH** 32..+122 °F (default setting), optionally configured via Thermokon USEapp
Accuracy temperature *(type-dependent)*	**Temp | Temp_rH** ±0,5 K (typ. at 70 °F)

» Humidity *(optional)*

Measuring range humidity *(type-dependent)*	**Temp_rH** 0..100 % rH (non-condensing), optionally (enthalpy, absolute humidity, dew point)
Accuracy humidity *(type-dependent)*	**Temp_rH** ±2 % between 10..90 % rH (typ. at 70 °F)

» CO_2

Measuring range CO_2	0..2000 ppm (default), 0..5000 ppm (optionally configured via Thermokon USEapp)
Accuracy CO_2	±50 ppm +3 % of reading (typ. at 70 °F, 50 % rH)
Calibration	Self-calibration dual channel
Sensor	NDIR (non-dispersive, infrared)

» VOC

Measuring range VOC	VOC index: 0..500
Sensor	Heated metal oxide semiconductor

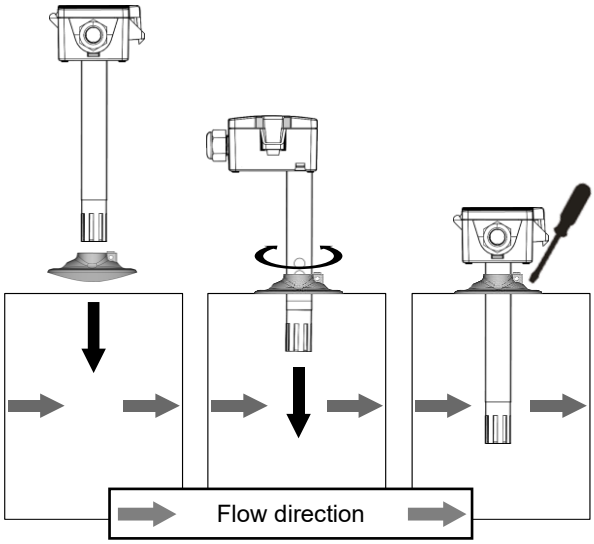
» Current

Air speed	Min. 0.9 ft/s, max. 39.4 ft/s

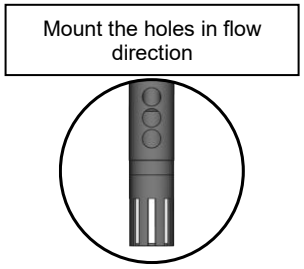
» MOUNTING ADVICE

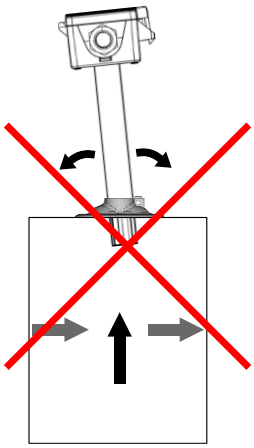
The sensor can be mounted on the ventilation duct by means of the mounting flange MF20 TPO (optional with mounting base). **Align the openings on the sensor tube according to the flow direction.** To prevent condensate permeation the pipe must be installed in an orientation that occurring condensate can run off.

Carefully remove the lower section of the sensor and pull it out straight.



Don't tilt the sensor during mounting/dismounting!

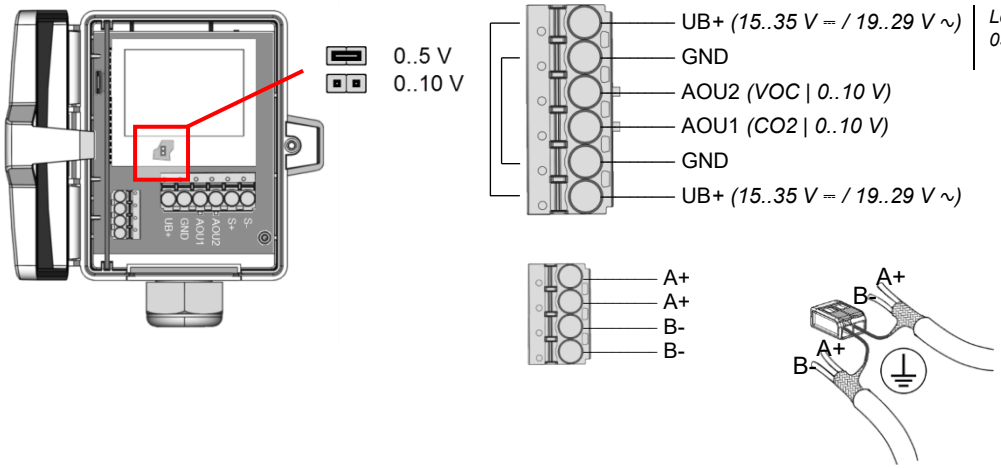




»WIRING DIAGRAM

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.

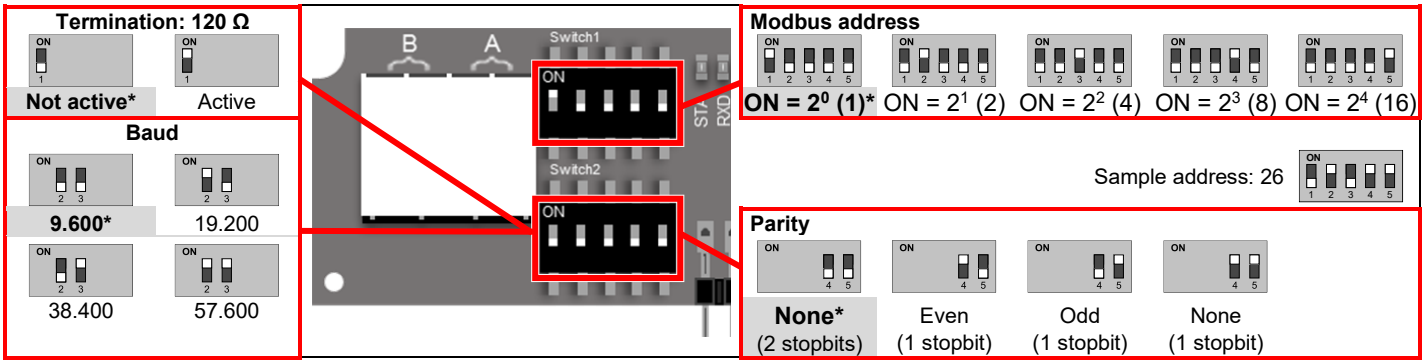
LK+ CO2+VOC (Temp_rH) (LCD) RS485



»DIP SWITCHES, PLUG-IN CARD

The Modbus address of the device is set in the range of 1..31 (binary encoded) using a 5-pole DIP switch. With address 0 via DIP, an extended address range (32..247) is available via USEapp.

*** factory default settings**



Address	Access	Description	Resolution/unit	
1	R	**Relative humidity**	0.1	% rF
5	R	**CO_2**	1.0	ppm
6	R	**VOC**	1.0	Index
7	R	**CO_2/VOC Mix**	0.1	%

Adress	Access	Description	Resolution/unit					
			Register 400 = 1			Register 400 = 2		
0	R	**Temperature**	SI	0.1	°C	Imperial	0.1	°F
2	R	**Absolute humidity**	SI	0.01	g/m³	Imperial	0.01	Gr/ft³
3	R	**Enthalpy**	SI	0.1	kJ/kg	Imperial	0.1	BTU/lb
4	R	**Dew point**	SI	0.1	°C	Imperial	0.1	°F

Available measured values are type dependent.

Modbus addresses:
USE RS485 Modbus interface
A detailed description of the Modbus addresses can be found under the following link: → **Download**

»APPLICATION NOTICE

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.

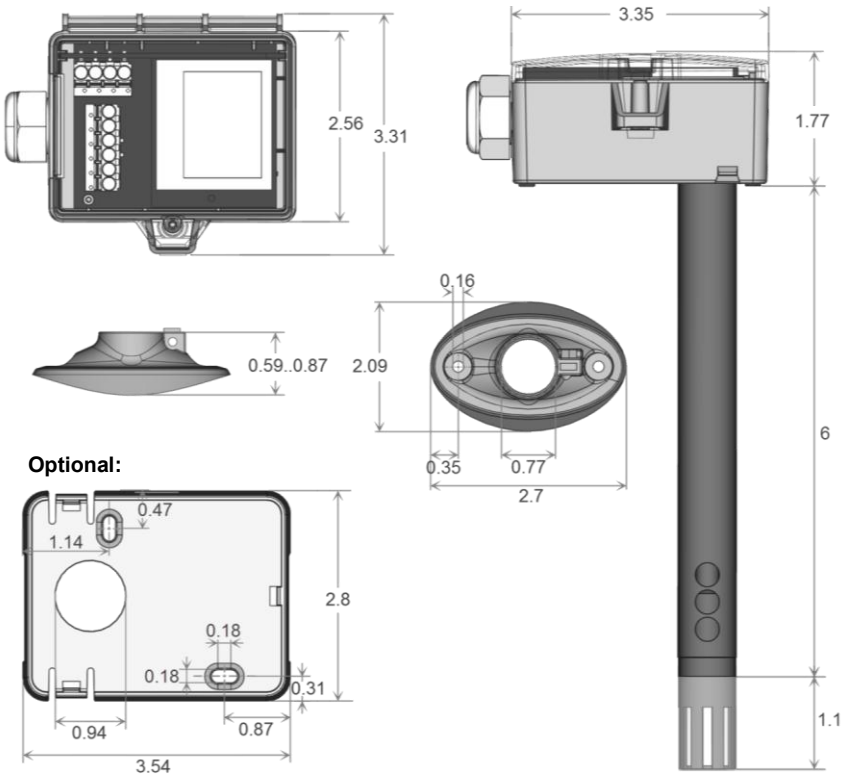
»CONFIGURATION

The Thermokon bluetooth dongle with micro-USB (Item No.: 668262) is required for communication between USEapp and USE-M/USE-L products. 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.

»DIMENSIONS (MM)



»ACCESSORIES (INCLUDED IN DELIVERY)

Mounting base	Item No. 631228
Mounting kit universal	Item No. 698511

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

»ACCESSORIES (OPTIONAL)

Bluetooth dongle	Item No. 668262
Filter stainless steel, wire mesh	Item No. 231169
RS485 Biasing adapter	Item No. 811378
USB RS485 Modbus RTU Logger	Item No. 809917
USB interface RS485 (incl. driver CD)	Item No. 668293