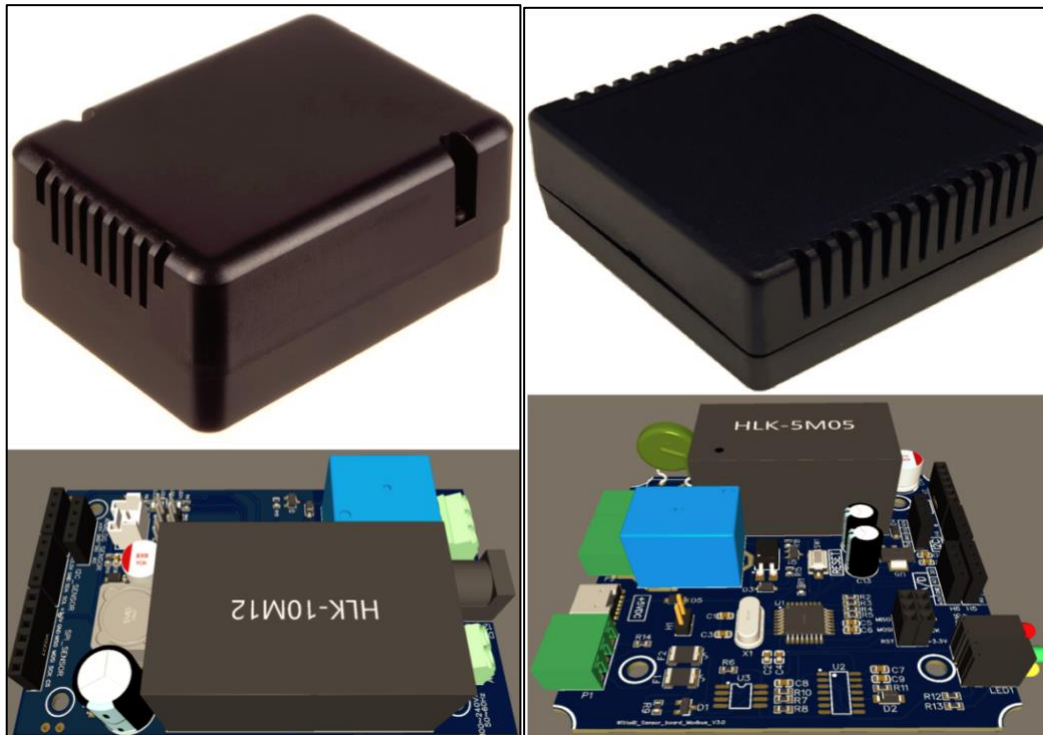


Technical Datasheet Temperature & Humidity Sensor with IAQ – 'Internal Air Quality' over WIFI / LORA / Modbus RTU / BLE

This is a highly accurate grade Temperature and Humidity sensor and IAQ sensor with flexibility to be powered by different power sources, AC / DC / Battery. The sensor is onboard and is a very good sensor for Indoor applications. The API can be customized for integration with Gateways.

Temperature Sensor Enclosure Sizes: - (94mm x 68mm x 38mm)& (85mm x 85mm x 35.5mm)



The details of the enclosure and the probe are referred below.

Specifications

General –

I/O Connectors	ON-OFF SW & C-Type connector for DC Power.
Dimensions	94 x 68 x 38 & 85 x 85 x 35.5mm
Power	Input Power – DC 5 V or AC 230 V or 3.7V Battery Typical – 1 W
Operating Temperature	0 – 50° C (32 ~ 176°F)
Storage Temperature	-20 - 70° C (-4 ~ 158°F)
Storage Humidity	5 ~ 95 % RH, non – Condensing



Certifications

Sensor Details –

Temperature	- 40 to + 85° C
Accuracy @25°	± 0.3° C
Humidity	0 – 100% RH
Accuracy RH	± 2%
Air Pressure	300-1100 hPa
Communication	Wifi / BLE / LoRA / Modbus RTU RS485 (Options are feasible)

There are two sensors that can be deployed on the same Hardware as per the requirement

Option 1 - BME680 (The detail of this sensor is provided below)

- The product is RoHS compliant, halogen-free, MSL1
- Apart from the above the sensor also gives an IAQ, 'Internal Air Quality' value based on levels of Multiple Gases. Pls refer table below: -

Molar fraction	Compound	Production tolerance	Certified accuracy
5 ppm	Ethane	20 %	5%
10 ppm	Isoprene /2-methyl-1,3 Butadiene	20 %	5%
10 ppm	Ethanol	20 %	5%
50 ppm	Acetone	20 %	5%
15 ppm	Carbon Monoxide	10 %	2%

IAQ Sensor Index

IAQ Index	Air Quality	Impact (long-term exposure)	Suggested action
0 – 50	Excellent	Pure air; best for well-being	No measures needed
51 – 100	Good	No irritation or impact on well-being	No measures needed
101 – 150	Lightly polluted	Reduction of well-being possible	Ventilation suggested
151 – 200	Moderately polluted	More significant irritation possible	Increase ventilation with clean air
201 – 250 ⁹	Heavily polluted	Exposition might lead to effects like headache depending on type of VOCs	optimize ventilation
251 – 350	Severely polluted	More severe health issue possible if harmful VOC present	Contamination should be identified if level is reached even

			w/o presence of people; maximize ventilation & reduce attendance
> 351	Extremely polluted	Headaches, additional neurotoxic effects possible	Contamination needs to be identified; avoid presence in room and maximize ventilation

Option 2 – ENS160 (The detail of this sensor is provided below)

Air Quality Signal Output Characteristics

Parameter	Range	Resolution	Unit	Comment
TVOC	0 - 65 000	1	ppb	For requirements outside these specified ranges please contact us
eCO ₂	400 - 65 000	1	ppm CO ₂ .equiv.	
AQI-UBA ¹	1 to 5	1	-	

TVOC – Total Volatile Organic Compounds

More than 5000 VOCs exist, and they are two to five times more likely to be found indoors than outdoors. Indoor VOCs are various types of hydrocarbons from mainly two sources: bio- effluents, i.e. odors from human respiration, transpiration and metabolism, and building material including furniture and household supplies. VOCs are known to cause eye irritation, headache, drowsiness or even dizziness – all summarized under the term Sick Building Syndrome (SBS). Besides industrial applications, comfort aspects (e.g. temperature), or building protection (humidity), VOCs are the one and only root cause for ventilation.

To group and classify VOCs, regional guidelines and industry-preferences define a series of compounds and mixtures as reference. E.g. ethanol, toluene, acetone, combinations of the various groups of VOCs (e.g. ISO16000-29), and others.

The ENS160 supplies calibration to ethanol for best, most balanced TVOC-results.

eCO₂ – Equivalent CO₂

Due to the proportionality between VOCs and -CO₂ generated by humans, CO₂-values historically served as an air quality indicator, reflecting the total amount of VOCs (=TVOCs) produced by human respiration and transpiration. This law (first revealed by Max von Pettenkofer² in the 19th century) and the unavailability of suitable VOC measurement technology made CO₂ the surrogate of inhabitant-generated air-pollution in confined living spaces of the past *and* the present, i.e. today's standard air quality reference for demand- controlled ventilation – as adopted by most HVAC industry standards.

Output		Comment / Recommendation
eCO ₂ / CO ₂	Rating	
>1500	Bad	Heavily contaminated indoor air / Ventilation required
1000 - 1500	Poor	Contaminated indoor air / Ventilation recommended
800 - 1000	Fair	Optional ventilation
600 - 800	Good	Average
400 - 600	Excellent	Target

AQI-UBA – Air Quality Index of the UBA

The AQI-UBA air quality index is derived from a guideline by the German Federal Environmental Agency based on a TVOC sum signal. Although a local, German recommendation, this guideline is referenced and adopted by many countries and organizations.

AQI-UBA		Hygienic Rating	Recommendation	Exposure Limit
#	Rating			
5	Unhealthy	Situation not acceptable	Use only if unavoidable Intensified ventilation recommended	hours
4	Poor	Major objections	Intensified ventilation recommended Search for sources	<1 month
3	Moderate	Some objections	Increased ventilation recommended Search for sources	<12 months
2	Good	No relevant objections	Sufficient ventilation recommended	no limit
1	Excellent	No objections	Target	no limit

Note: - Both the sensor board have been designed with a relay of 230V 10Amps so that it can be programmed to automatically control an external device like a Fan or Aircon based on the Temperature, Humidity or IAQ Threshold limits. This helps to create an automation system without the use of an Aggregator Gateway etc.

Communication Interface: Based on the requirement of the customer, we can provide the following communication options for the sensor

1. **WIFI – web interface or API based**
2. **BLE – Bluetooth based communication to a Mobile App**
3. **LORA – Long Range communication 433Mhz or 868 Mhz.**
4. **Modbus RTU RS485 – Wired Communication as Modbus Slave**

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