General information on indoor air quality and the measurement of VOC and CO

Various devices (e.g. MultiSensor-TI) are equipped with special sensors for measuring air quality and various gases. This article takes a closer look at the general topic of assessing indoor air quality.

We spend around 80 percent of our time indoors. For us to feel comfortable and be able to work productively, the air quality in these rooms must be right.

Air quality has a direct impact on people: In schools with good air quality, pupils perform better and teachers have fewer sick days. For employees, it affects both productivity and satisfaction. To ensure good air quality, rooms need to be ventilated regularly.

Ideally, air contains around 21% oxygen and 78-79% nitrogen. Air also contains natural trace gases such as carbon dioxide (CO_2) and – depending on the ambient conditions – pollutants such as carbon monoxide (CO) and volatile organic compounds (VOCs).

Volatile organic compounds (VOC)

VOCs are volatile organic compounds, i.e. carbon-containing substances with a high vapor pressure. There are between 5,000 and 10,000 different VOCs.

They come mainly from:

- biological sources (e.g. by humans themselves)
- Building materials
- Furniture
- technical devices
- Cleaning agents
- Perfumes or cosmetics

VOCs can cause eye irritation, headaches, dizziness or nausea. An increased VOC concentration is often perceived as unpleasant or “stuffy” indoor air.

The concentration of VOCs changes dynamically. Activity, excitement or the use of fragrances and cleaning agents can lead to short-term increases. Emissions from new furniture or building materials – especially in new buildings – also play a role.

A VOC sensor can be used to react flexibly to these influences. Ventilation systems can be controlled as required and only operated when it is actually necessary. In many applications, a low level of continuous basic ventilation is sufficient to ensure a permanently good level of

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air quality.

Carbon monoxide (CO)

Carbon monoxide (CO) is a colorless and odorless, but highly toxic gas. It is produced during incomplete combustion processes, for example by:

- Defective heating systems
- Fireplaces and stoves
- Gas boilers
- Vehicles in attached garages

In contrast to VOCs, the focus with CO is not on the comfort or feel-good quality, but on the **safety aspect**. Even low concentrations can be harmful to health, higher concentrations are life-threatening.

The measurement of CO is therefore used for active personal protection and enables early intervention, for example through alarms or automatic countermeasures.

Assessment of air quality via the iAQ index

Most people have little idea what VOC values alone mean. This is why the values are summarized in the so-called iAQ index (intelligent Air Quality).

Defined threshold values can be used to:

- the air quality presented in an understandable way
- Automatic ventilation levels activated
- Targeted measures implemented to improve the indoor air

become.

Various substances that influence air quality and their origin

	Origin	Substance
Human	Breathing	Acetone, ethanol, isoprene, CO2, water
	Skin respiration and transpiration	Nonanal, decanal, alpha-pinene, water
	Flatus	Methane, hydrogen

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	Origin	Substance
	Cosmetics	Limonene, eucalyptol
Combustion	Motors, cigarettes, …	CO, CO2, water
Building materials, furniture, appliances	Solvents, paints, varnishes,…	Formaldehyde, alkanes, alcohols, carbonyls, ketones, siloxanes
	PVC	Toluene, xylene, decane
	Printer/copier	Benzene, styrene, phenols

The following table shows the different levels of air quality rated according to your Indoor Air Quality Index (IAQ)

IAQ Index	Air quality	Effects (long-term exposure)	Proposed measure
0 – 50	Excellent	Clean air; the best for the well-being	No measures required
51 – 100	Good	No irritation or effects on well-being	No measures required
101 – 150	Lightly soiled	Reduction of the well-being possible	Ventilation proposed
151 – 200	Moderately dirty	Clearer irritation possible	Increase ventilation with clean air
201 – 250	Heavily soiled	Depending on the type of VOCs, exposure can lead to effects such as headaches	Improve ventilation
> 250	Very heavily soiled	More serious health problems possible if harmful VOCs are present	Contamination should be identified when level is reached even without people present; maximize ventilation & reduce presence

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