Volatile Organic Compounds (VOC) Sensor

Additional Information

Introduction

Aeroqual sensors utilize Analytical GSS Technology, also referred to as Gas Sensitive Semiconductor technology. This offers rapid response, high sensitivity, excellent accuracy, long term stability and low drift characteristics. Aeroqual's Sensor Heads are designed to clip on and off our standard range of bases. The base software recognizes which head is attached. The heads are easily removed for calibration or replacement.

The VOC sensor will respond to a wide variety of gases and solvents with particular sensitivity toward oxygenated hydrocarbon compounds. It exhibits excellent temperature and humidity stability and requires minimal maintenance. Aeroqual's technology enables custom calibrations and cross-sensitivity tuning to customer requirements – please contact Aeroqual. The standard VOC sensor is pre-calibrated to isobutylene.

VOC Sensor Life

Sensor head factory warranty: 6 months
Sensor design life: 50,000 hours

Subject to condition sensor heads can be recalibrated and/or refurbished.

VOC Sensor Shelf-life

Sensor heads can be safely stored in a clean, dry environment between 0 to 50^{o}C for more than 5 years.

Other Features

On board “sensor failure” diagnostics

VOC Detection

- The sensor can be used for the detection of a wide variety of volatile organic compounds.
- The best way to calibrate the sensor to a particular gas is to use a standard of the gas of interest. However, correction factors have been determined which enable the user to quantify a range of gases.
- The default sensor concentration reading is in units of ppm of Isobutylene. The user can convert this into ppm of another gas for which the correction factor (CF) is known by multiplying the reading by the CF value. For example, the VOC head is calibrated against Isobutylene and is being used to measure the concentration of heptane. The reading in ppm of Isobutylene is 10ppm. Therefore the concentration of heptane is 10 ppm x 1.7 = 17 ppm. The accuracy of the correction factor is < ± 30%.
- The VOC sensor can also be used to qualitatively indicate the total VOC level. The units of measurement are ppm Isobutylene equivalent.

VOC Sensor Specifications*

Range (ppm)	Maximum Exposure (ppm)	Lowest Detection Limit	Accuracy of Calibration	Resolution (ppm)	Response Time (T_{90})	Sampling Method	Operational Range	
							Temp.	RH non condensing
0 - 25	50	0.1 ppm	<± 10% 0.1-25 ppm	0.1	< 60 s	Fan	-20 to 40°C	5 to 95%
0 - 500	1000	1 ppm	<±10%	1	< 60 s	Fan	0 to 40°C	30 to 70%

* Other specific VOC calibrations are available – contact Aeroqual

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VOC Sensor Correction Factors

Gas	Molecular formula	Isobutylene Correction factor (CF)	Toluene Correction factor (CF)
Benzene	C_6H_6	3.2	3.8
Butane	C_4H_{10}	42	50
Carbon monoxide	CO	10	12
Dodecane	$C_{12}H_{26}$	2.1	2.5
Ethanol	CH_3CH_2OH	0.13	0.15
Ethyl acetate	$C_4H_8O_2$	0.17	0.2
Heptane	C_7H_{16}	1.7	2.0
Hydrogen sulphide	H_2S	0.017	0.02
Hydrogen	H_2	17	20
Isobutylene	C_4H_8	1.0	1.2
Isopropanol (IPA)	C_3H_8O	0.06	0.07
Methanol	CH_3OH	0.45	0.54
Methyl ethyl ketone (MEK)	C_4H_8O	0.017	0.02
Propane	C_3H_8	67	80
Styrene	C_8H_8	0.3	0.36
Sulphur dioxide	SO_2	0.8	1.0
Toluene	C_7H_8	0.8	1.0
Xylene	C_8H_{10}	0.25	0.30

Other correction factors can be supplied on request.

Technology Comparison

PID (Photo-Ionisation Detector) is sensitive but is expensive and lacks specificity. Lamps can fail and are affected by high humidity. Aeroqual's VOC sensor has an element of non-specificity but it is more cost effective and conversion factors can be used to determine the level of a specific VOC of interest.

FID (Flame Ionisation Detector) is sensitive but also bulky and non-specific. It requires a combustible gas for the flame source to operate and maintenance costs are high.

GC (Gas Chromatograph) technology is specific with high sensitivity but is expensive and primarily aimed at spill analysis and environmental monitoring.

Solid State (tin-oxide) sensors are low cost but also low reliability.

IR (infra-red) technology incurs expensive lamp maintenance but offers low cross-sensitivity.

Note:

The isobutylene conversion factor from ppm to mg/m3:
1 ppm = 2.29 mg/m3

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