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AN121 – Understanding Accuracy and Repeatability

To properly determine the sensor best suited for your application a basic understanding of how we present the accuracy and repeatability of our sensors is required. The purpose of this document is to introduce the conventions used on CO2Meter.com for displaying these values, and provide a brief overview of the context they give to the measured values of the sensor.

Accuracy

The accuracy of a unit is defined as the tolerance between the actual absolute gas concentration and the measured value. For example if a unit has a specified accuracy of ±30ppm, this implies that the displayed value will be within 30 parts-per-million of the actual gas concentration under standard ambient operating conditions. If the gas concentration in a room is 400ppm, then the sensor is operating within rated parameters if it reads anywhere between 370ppm and 430ppm on average.

Repeatability

Repeatability is closely related to precision. Repeatability is defined as the variance in measured values of a known, unchanging gas sample upon repeat measurements. To put it another way repeatability is the range of acceptable values the sensor will read, relevant to a previous measurement, when measuring a gas, independent of the actual gas concentration.

For example, if the gas concentration in a room is 400ppm and the sensor has a rated repeatability of ±10ppm, then if originally the sensor reads 420ppm, upon future measurements the sensor will read between 410ppm and 430ppm.

Repeatability is generally specified as having a tighter tolerance than accuracy. Even if a sensor is reading a value that is slightly high when compared to the actual gas concentration, it is likely that it will read close to the same slightly higher value upon repeat measurements.

How values are presented on our website

Values for accuracy and repeatability on our website are presented in pairs. The two values correspond to an absolute value, and then a percentage of the currently measured value, with the larger of the two values being considered to be the actual rating at that concentration. For example, for the SenseAir K33-ICB CO2 sensor, the following values are given for accuracy:

Accuracy: ± 0.2% vol. CO2, ± 3% of measured value

This implies that accuracy is bounded by both an absolute minimal, and by a percentage of the measured value. When calculating the accuracy of the measurement, we must always take the looser specification.

For example, when reading values below approximately 6.5% we notice that 3% of the measured value is actually less than 0.2% of the volume of CO2, so the accuracy of the unit is ±0.2%. Once we climb above CO2 concentrations of 6.5% we notice that 3% of the measured value is actually greater than 0.2%, so this becomes the looser rating and the correct measurement of accuracy. At 10% CO2 the accuracy of the unit would be ±3%.