In Search of Zero—from Interscan Corporation's Knowledge Base

As discussed in the Calibration Basics Knowledge Base article, Interscan's gas analyzers, and virtually all other direct-reading gas analyzers are not absolute methods. Rather, they employ "relative" [or "reference," but not necessarily EPA Reference] methods. That is, methods that produce some output that must be calibrated against a known standard.

Generally, these units must also be zeroed against a known zero gas.

Ideally, a zero gas should contain none of the particular chemical you will be testing for. However, "none" is a metaphysical concept, and in analytical chemistry, all parameters must be measured. Thus, a zero gas will be certified to contain less than a certain amount of compounds of interest.

For example, Scott-Marrin—a highly-respected specialty gas supplier—specifies its best grade of ultrapure air, verified with state-of-the-art analytical technology, at...

Total Hydrocarbons	< 0.01 ppm
CO	< 0.01 ppm
NO_x	< 0.001 ppm
SO_2	< 0.001 ppm
N_2O	< 0.001 ppm

Consider an application for carbon monoxide (CO) monitoring, using an EPA designated reference method. From the above figures, you already know that your zero gas will be introducing a 0.01 ppm error into the mix.

The lowest range offered by Thermo Scientific's Model 48i gas filter correlation CO analyzer is 0-1 ppm. Thus, if you choose to operate in this range, a 1% systematic [and additive] error is unavoidable.

This also means that operation at a more rational 0-10 ppm or 0-50 ppm range for CO measurement would introduce an insignificant error from the zero—assuming that the same high quality zero gas were to be used.

Two questions now come to the fore:

1. What if you want to measure a gas at low concentration levels that is not mentioned in a zero gas specification? After all, the five entities listed above barely scratch the surface of common applications, even if they do address certain major ones.

2. What means does the specialty gas supplier employ to zero the instruments they themselves use to certify the zero gas standards?

The answer to the first question is that you must contact the gas supplier and describe your

application, indicating the target gas, and the lowest measurement concentration level. Ask the supplier to state its guaranteed not-to-exceed maximum concentration of that target gas in the zero standard. In some cases it may not be possible to provide such a guarantee, especially if no suitably sensitive and accurate analytical technique exists for the target gas.

Contrary to popular opinion, there are not good, sensitive, and accurate wet chemical methods for all pollutant compounds of interest.

Getting an answer to the second question is your follow-up: Just how does the supplier do its analytical work for the target compound, and just how does it zero the instrument involved?

In other words, ask the tough questions! If you don't like the answers, find another supplier.

As always, Interscan and ETA are here to help you with all application and technical issues. Feel free to contact us at any time.

ETA Associates
119 Foster Street, Bldg #6 • Peabody, MA 01960
Tel: (978) 532-1330 • Fax: (978) 532 7325
www.ETAassociates.com • eta@ETAassociates.com