Are All Carbon Monoxide Sensors the Same?

by Gregg Bako | Feb 27, 2017 | Sensor Technology

The short answer is – no, all carbon monoxide (CO) sensors are not the same. CO sensors are found in gas monitors used by workers conducting their jobs in environments where toxic CO gas might be present. With CO being a result of incomplete combustion, it can be found in the majority of industries and poses a big threat to workers today. While most CO sensors are based on the same electro-chemistry, there are many different types of CO sensors. Understanding the different types and the specific advantages and disadvantages of each is critical to selecting the proper CO sensor for your application.

If you've been in the market for a gas detector that monitors for CO, you've

probably come across the following CO sensor names; CO, CO high, COSH, CO/H2 low, and CO/H2 null. What's the difference, you ask? In this article, each type of CO sensor will be defined, followed by applications in which the use of a particular kind is ideal.

The standard **CO** sensor is the most commonly used CO sensor type. While it will measure CO and usually includes a hydrogen sulfide (H2S) filter to eliminate H2S cross-interference, it is susceptible to cross-interference from other gases, most notably hydrogen. When using the standard CO sensor, one should consider if there could be other gases present in the facility that might interfere with this sensor's readings. Something else to consider is the sensor's measuring range. A standard CO sensor measures up to 1,000 or 1,500 ppm (parts per million), which might not be sufficient for all applications and industries such as mine rescue applications or the steel industry.

The **CO high** or **CO high range** sensor is not as commonly used in general industry, but is commonly used in industries such as mining/mine rescue and steel. Rather than the typical measuring range of 1,000 or 1,500 ppm, this sensor is capable of measuring carbon monoxide up to concentrations of 9,999 ppm. When facilities have processes that give off high concentrations of CO and workers perform operations under supplied air, these sensors are often the sensor of choice.

The **COSH sensor, otherwise known as CO/H2S,** is commonly used to detect for CO. This sensor is a combination of both a carbon monoxide sensor plus a hydrogen sulfide sensor, with both sensors being built into a single housing. This sensor includes one sensing electrode dedicated to detecting carbon monoxide and a second sensing electrode dedicated to detecting hydrogen sulfide. These sensors are commonly used to detect for four gases using three sensor slots or to detect for six gases using five sensor slots. While this is extremely convenient and helpful in achieving smaller size gas monitors, remember that since this sensor must allow both gases to diffuse into it, it will not include the H2S filter. The H2S filter is included in all other CO sensors mentioned in this article. In this instance, there is a trade-off between gas monitor size and the sensor's cross-sensitivity to hydrogen sulfide.

The **CO/H2 low sensor** and **CO/H2 null sensor** terms are often used interchangeably, but they are in fact different. They both indicate that the sensor is designed to reduce the cross-interference of hydrogen (H2) on the CO sensor's reading. The CO/H2 low sensor achieves this reduced cross-interference of hydrogen using two electrodes and a special catalyst with a lower sensitivity to hydrogen. The CO/H2 null sensor uses four electrodes and is actually a combination sensor (similar to the COSH sensor). It includes one sensing electrode dedicated to detecting CO and a second sensing electrode dedicated to detecting H2. The CO/H2 null sensor measures both the CO and H2 gas concentrations separately and then mathematically subtracts the H2 gas reading from the CO gas reading.

CO can be present during welding activities.

It is critical that in environments where significant levels of hydrogen are present, you measure for CO using either a CO/H2 low or CO/H2 null sensor. Let's do a little math to show why. If 100 ppm of H2 were exposed to a CO sensor that was neither a CO/H2 low nor CO/H2 null type sensor, the sensor would interpret the 100 ppm of H2 as 60 ppm of CO based on the CO sensor's cross-sensitivity to H2. Steel mills and power plants are examples of facilities in which a CO/H2 low or CO/H2 null sensor is commonly used.

A few more notes about the CO/H2 low sensor. A CO/H2 low sensor typically has 5% or less H2 gas cross-interference. Going back to the example, a standard CO sensor would interpret and display 60 ppm of CO if 100 ppm of H2 was present in the environment. A CO/H2 low sensor with 5% or less H2 gas cross-interference would display 5 ppm or less of CO if 100 ppm of H2

was present in the environment.

Next, a few more notes about the CO/H2 null sensor. The CO/H2 null sensor does its best to completely nullify the effect of H2 on the CO sensor. In practice, a CO/H2 null sensor will typically have 1% or less H2 cross-interference. Going back to the example again, a standard CO sensor exposed to 100 ppm H2 would interpret it as 60 ppm CO. A CO/H2 low sensor exposed to 100 ppm H2 would interpret it as and display 5 ppm or less CO. The CO/H2 null sensor exposed to 100 ppm H2 would interpret it as and display 1 ppm or less CO.

Clearly, for environments with high H2 concentrations, both the CO/H2 low and CO/H2 null sensors can avoid false alarms and provide an increased level of confidence that the CO reading being displayed has not been compromised by background H2 gas levels.

Now that you understand the differences between the different kinds of CO sensors, you might be wondering – what if I'm using the wrong CO sensor for my application? What is the risk? Well, if your CO sensor does not have sufficient range for your application, you might not have sufficient data regarding potential exposure should an operator working under supplied air become ill. And with regard to false alarms from cross-interfering gases, a major concern is that the false alarms will cause workers to lose confidence in the gas readings and ultimately continue to work in areas without the proper personal protective equipment or not evacuate the area when needed.

After reading this article, you probably have a greater understanding of CO sensors, but there is no doubt that sensors are complex and it can be challenging to select the right one. So, in simpler terms, there are three things to consider when choosing a CO sensor – **your application, your CO gas levels, and the potential background cross-interfering gases that could be present**. If you're still in doubt about which CO sensor to use, it is always best to consult your gas detection supplier so that they can make the best recommendation for you.

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