# HAZWOPER: Direct Reading Gas Detector Safety

Gases may be invisible or odorless. Even small amounts of some gases can be dangerous, rendering people ill or unconscious or causing dangerous fires or explosions. Direct reading gas detectors can provide life-saving data when you use them properly.

**NOTE**: Your employer will provide you with hands-on training about the specific equipment you will use. Your training may include reviewing manufacturer manuals or guides and practicing.

## Purpose and Function of Direct Reading Gas Detectors

Direct reading gas detectors help us identify and monitor gases that are asphyxiating, flammable/combustible, and toxic. The number of gases that direct reading gas detectors test for varies.

HAZWOPER responders use detectors to evaluate atmospheres and verify safe conditions. Detectors must be accurate (real-time measurements), durable (rugged, waterproof), reliable (audible/visual alarms) and routinely calibrated (daily and periodically).

Some direct reading gas detectors are permanently installed in a fixed location where employers know gas may be present. Most HAZWOPER operations use **portable detectors**:

- Area monitors (lightweight and easy to carry)
- Hand-held, wearable or clip-on (compact and attach to clothing)

Single-use, disposable detectors or badges usually detect one specific chemical and do not offer the full range of protection that HAZWOPER responders need.

## Maintenance, Care and Storage

It is vital to ensure that detectors function as expected and relay accurate information BEFORE you use them to protect people and property. Your employer has dedicated equipment, such as gases, devices and stations, that you will use to perform detector testing and calibration. Keep a record of testing activities, results and corrective actions.

During **functional testing**, the user exposes the sensor to gas at a specific, known concentration in a safe environment to ensure that the alarm activates as expected. If the alarm does not activate, it may not be calibrated correctly, there may be interference or there may be another problem with the detector. Follow your company's procedures, which may include resolving the problem and completing a full calibration or tagging the detector as out of service until repairs are complete.

**NOTE**: In the United States, functional testing is sometimes called "bump testing."

We perform **calibration** activities to ensure detectors are accurate. Calibration checks verify accuracy by exposing detectors to a known amount of gas. Full calibrations require the user to adjust the detector's readings to match known concentrations of test gases.

Factors that can cause detectors to be inaccurate include the age of the detector and specific sensors, operating conditions, their saturation in chemical environments, physical damage, temperature and humidity, and vibration or shock.

Follow guidance from the manufacturer and your employer about how often to complete functional testing and calibration. For example, your employer may require you to do a functional test and calibration check every day prior to using the detector.

If the detector fails, your employer may require repairs followed by a full calibration and another functional test before anyone may use the detector. Some devices may lock and become unusable when functional or calibration testing are due.

Detectors are sensitive, intrinsically safe instruments. Treat them with care. Gas detector sensors can be damaged by chemicals in cleaning and disinfecting products. Follow manufacturer recommendations for **cleaning**, which may include using a cloth dampened with soap and water and doing functional testing and calibration checks afterward.

Store detectors away from heat/sunlight, water/humidity and chemicals. When you take a detector out of storage, check the battery level and perform functional testing and a calibration check prior to use.

## Using Direct Reading Gas Detectors

Your employer must train you about the specific detector you will use. Detectors have gas parameters at which alarms will activate. Follow your employer's instructions about setting and checking these parameters.

Always test detectors in a clean and safe environment. Check the required calibration date, which is usually on a sticker on the detector or in the detector's start-up display. Perform functional (bump) testing with a known amount of calibration gas at a designated area or docking station. Review the testing log for any notes or abnormalities. Sensors are sensitive to temperature, humidity and contamination.

If the detector fails the functional test by receiving a reading outside the allowable margin of error, you may need to replace the sensor.

Make sure detectors have enough power to function for the duration of the HAZWOPER operation. If the detector has a clip, make sure it is functioning properly and secures tightly.

Verify that the detector is safe to use in the intended atmosphere. Most detectors are safe to operate in combustible atmospheres.

Test for oxygen and flammable gases and vapors first. Then, test for toxic atmospheres. Fluctuations in readings may indicate that a hazard is present or that conditions are interfering with the accuracy of the detector.

### *Sampling*

There are two ways HAZWOPER responders will use their detectors: sampling and diffusion. Detectors perform **sampling** by pumping in air from a tube or line, testing it, and then expelling it through a vent.

Sampling allows responders to check the air before they enter, and it allows others to monitor conditions remotely. Be aware that sample readings are not immediate. It may take 1-2 minutes for the detector to draw in air and test for gases depending on the length of the sampling probe

Confined or enclosed spaces may have **stratified atmospheres** that have varying concentrations of gas. To sample them accurately, you must move the tubing attached to the pump to various levels. Start at the lowest or farthest point that a person may be able to reach and sample for 1-2 minutes. Then, move a few feet (about a meter) and sample again for 1-2 minutes. For vertical spaces, remember to check atmospheric conditions in the breathing zone, which is typically 3-7 feet (1-2 meters) above the working surface.

Do not place the sampling probe or tubing into highly concentrated atmospheres. Avoid pulling liquid into the sampling port. When monitoring, take note of any fluctuations in the readings, especially for oxygen, which can increase or decrease to dangerous levels depending on the work or chemical reactions taking place.

***Diffusion***

In **diffusion** mode, detectors passively sample the air without suction. Hold or attach detectors in the breathing zone that is the 10 inches (25 centimeters) around the mouth and nose. Do not cover detectors or place them inside clothing or pockets.