



# Testing and Calibrating Fixed Gas Detectors

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BRASCH ENVIRONMENTAL TECHNOLOGIES WHITE PAPERS

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# Introduction



- One of the most common questions about gas detectors is: “How do I know it’s working?”
- Whether it is a brand new unit or a seasoned veteran, knowing that a gas detector will perform its job is of paramount importance
- Red lights and alarms are a good indication that something is wrong, but waiting for them before taking action could have disastrous consequences
- Likewise, green lights and zeros on a display does not necessarily mean the detector is good to go
- Proper care and maintenance is necessary to get the most out of any gas detector, and this requires periodic tests and checks
- The more frequently these are performed, the quicker any issues can be caught and resolved
- This paper will cover the different types of tests and checks, why they are important, and when to perform them

# Bump Test

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- A bump test is a qualitative function check during which sensors are exposed to gas at both a high enough concentration and for a long enough time to activate alert and/or alarm indicators
- The goal is to assess the response of a sensor and verify that the equipment is working as intended
- A bump test does not check the accuracy of a sensor; it only checks that the sensor is functioning
  - As a result, having a known concentration of test gas is not necessary
- In many cases, using a common source of unmeasured gas will be adequate



# Bump Test (continued)



- For example, carbon monoxide detectors can be tested by running a gasoline engine in the vicinity
- A detector that passes a bump test will respond quickly to the gas with all indicators and alarms activating at the appropriate time
- These factors will vary depending on the make and model of the gas detector being tested, but guidelines can often be found in manufacturer documentation
- A detector that fails a bump test will either not respond to gas, or respond to gas in an unreasonable amount of time
- This can be the result of debris blocking the sensor from measuring the gas, or it could be that the sensor is out of calibration

# Calibration Check

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- A calibration check is a quantitative test with a known concentration of gas that demonstrates the sensor responds to gas within the manufacturer's specified tolerances
- Every calibration check starts by evaluating the reference point in clean air
  - This is typically zero for most toxic and combustible gases, but some gases differ, like oxygen at 20.9%.
- Once this reference point is established, a known concentration of test gas is applied to the sensor
- The concentration should ideally be high enough to trigger some alert or alarm state without exceeding the maximum range of the detector
- The gas should also meet NIST standards.
- If the detector reads a value or displays an alert/alarm status within an acceptable range of the test gas concentration (usually  $\pm 10-15\%$ ), then the calibration is considered to be valid
  - If not, the sensor needs to be recalibrated



# Recalibration

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- Recalibration is the adjustment of sensor response to achieve a desired value based on a known concentration of test gas
- These adjustments account for sensitivity drift, sensor degradation, and other environmental factors
- The recalibration process depends heavily on the make and model of a gas detector and should only be performed by trained, qualified personnel
- Consulting the manufacturer is the best way to determine the process for a specific model of detector

# Testing Frequency

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- Manufacturer guidelines, internal policies, and regulatory recommendations and requirements all contribute to the testing frequency
- Most fixed detectors are suggested to be bump tested on a bi-yearly, quarterly, or monthly basis
- The more frequent the testing, the quicker any potential issues can be addressed
- Regardless of the scheduled frequency, a bump test should always be performed after exposure to any of the following:
  - Change in work environment
  - Extreme environmental conditions
  - Highly concentrated target gas
  - Solvent vapors
  - Corrosive gases
  - Poisons
  - Inhibitors
- Consult the detector's instruction manual or manufacturer for more details on abnormal operating conditions or events



# Testing for an Inspection

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- Outside of regularly scheduled testing, it is sometimes necessary to perform a special test to pass an inspection
- The type of testing will depend on the type of inspection
- Below are the three most common inspections and the associated tests required for completion
  - Visual Inspection – No Test
  - Maintenance Inspection – Bump Test
  - Analytical Inspection – Calibration Check
- The exact requirements and pass/fail criteria will depend on regulations and the inspector, but the vast majority of inspections will fall into at least one of these categories
- Being prepared and knowing what to expect will greatly increase the likelihood of passing an inspection
- In some cases, an inspector may accept a certificate of calibration from the detector manufacturer in place of analytical testing

# Other Considerations

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- Performing any test or check requires simulating an environment
- This may involve placing a calibration cup over the sensor or sealing an area around the sensor to limit the amount of gas that is needed
- In either case, always clean the detector of any dirt or debris and inspect it for any signs of wear or corrosion before applying gas
- If performing a bump test with an unknown or unregulated gas mixture, be careful not to damage the sensor with too high a concentration or with a mixture containing contaminants or poisons
- If performing a calibration check, do not use expired gas as some gases may deteriorate over time and drift away from the indicated concentration
- Regardless of the maintenance, keep a record
- Tracking tests and checks over time provides a picture of the detector's overall health and can predict when service like recalibration may be needed

# Conclusion

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- In short, bump tests verify the functionality of a detector while calibration checks verify the accuracy
- If the primary concern is knowing that the detector will respond to gas and activate some ventilation equipment, a bump test is the way to go
- This method of testing requires the least time and materials to perform, and in most cases, is sufficient for demonstrating the continued operation of the detector
- However, if determining the accuracy of the detector is more important, performing a calibration check will be necessary
- Should any test or check fail, the detector will need to be recalibrated
- Regular maintenance and evaluations are key to extending the life of a detector and ensuring that it is always ready to save lives

# Contact the Experts

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Learn more about Brasch Environmental Technologies entire gas detection meter line by going to <http://www.technicalair.com/brasch-envi-tech>

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