

GASGUARD O₂

Oxygen Sensor



OPERATING & INSTALLATION MANUAL

**CALIBRATION
TECHNOLOGIES
INC.**

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General Description

The GasGuard O2 sensor is a +24 VDC, three-wire, 4/20 mA sensor for oxygen which utilizes proven galvanic electrochemical sensor technology for fast and accurate monitoring of oxygen levels in ambient air. The industry standard linear 4/20 mA output signal is compatible with most gas detection systems and PLCs.

The standard 15-25 % range is designed for optimum resolution in oxygen depletion applications where typical warning and alarm levels are 19.5 % and 18.0 %, respectively. The GasGuard O2 exhibits excellent accuracy and precision, with negligible response to common interference gases and dramatic changes in relative humidity. Reliable trip levels at 19.5 % can be expected with the sensor.

The transmitter circuit board is sealed in potting compound, protecting sensitive electronic components and copper tracing from corrosion. The specially vented chemical-resistant polycarbonate enclosure protects the sensor from accidental damage, weather and direct hose-hits from clean-up crews.

Installation

Locating the sensor

One of the most important considerations when installing GasGuard O2 sensors is that they must be easily accessible for calibration and maintenance.

For optimum personnel protection (representative concentration reading that an employee would be exposed to), mount the sensor at a height in the breathing zone of the employees. It would typically be about five feet off the ground, which also allows easy access. As a general rule of thumb, mount the sensor no further than 30 feet from potential leak sources.

Installation Guidelines:

- Always mount the sensor vertically.
- Must be easily accessible for calibration and maintenance.
- Mount the sensor close to the potential leak source.
- For optimum personnel protection, mount sensor in the “breathing zone” (4’ – 5’ above floor).
- Take air movement and ventilation patterns into account.
- To prevent electrical interference, keep sensor and wire runs away from mercury vapor lights, variable speed drives, and radio repeaters.
- Protect sensor from physical damage (forklifts, etc.).
- If mounting sensor outdoors, consider prevailing wind direction and proximity to the most likely source of leaks. Protect the sensor from sun and rain as much as possible.
- For highly critical locations more than one sensor should be installed in each room.
- Mount sensor enclosure through the mounting holes as shown in **Figure 1**.

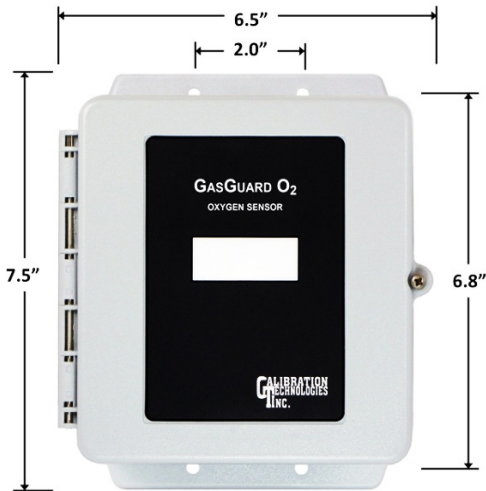


Figure 1: Enclosure dimensions

Wiring

Electrical wiring must comply with all applicable codes.

Electrical Power: 24 VDC regulated, 250 mA.

Output: Linear 4/20 mA output. Monitoring equipment may have a maximum input impedance of 700 ohms.

Cable Recommendation: 20/3 shielded cable (General Cable C2525A or equivalent). Length of cable to sensor should be no greater than 1,500 feet.

Monitoring: Monitoring equipment must be configured to indicate a fault if the signal is below 1 mA.

Wiring Guidelines:

- Always use three conductor, insulated, stranded, shielded copper cable.
- Do not pull sensor wiring with AC power cables. This can cause electrical interference.
- If cable runs cannot be made without a splice, all splice connections should be soldered.
- Ground the shield at the main control panel. Connect the shield wire in the sensor terminal block labeled *SHLD*.
- Use only the existing conduit hole for connections to the sensor.



Figure 2: Wiring diagram

Operation

Start-up

Before applying power, make a final check of all wiring for continuity, shorts, grounds, etc. It is usually best to disconnect external alarms and other equipment from the sensor until the initial start-up procedures are completed.

After power-up, allow at least 12 hours for the system to stabilize before testing the sensors. Because sensors are normally located at a distance from the main unit, the test time required and accuracy of the response checks will be improved if two people perform the start-up procedures and use radio contact.

Start-Up Test:

- 1) One person exposes each sensor to calibration gas (nitrogen or 15% oxygen, depending on range).
- 2) The second person stays at the control unit to determine that each sensor, when exposed to the gas, is connected to the proper input and responds, causing appropriate alarm functions.

Calibration

After the unit is installed and has been powered up for a minimum of 24 hours, the unit can be calibrated. There are two pots on the preamp that are used for calibration.

Note: Never measure sensor output in mA. Always use mVDC or VDC voltmeter settings.

Span Calibration: The unit is factory calibrated but may require minimal adjustment upon initial installation. If span adjustment is required, the following procedure will span the unit:

- Apply 20.9% O₂ span gas at 0.8 L/min.
- Once the output signal has peaked (or three minutes maximum) adjust the span pot until the correct output is achieved (see **Figure 3**).

Zero Calibration: After the sensor has been spanned, perform the zero calibration as follows:

- Apply zero calibration gas (nitrogen or 15% oxygen, depending on full-scale range of sensor) at 0.8 L/min.
- Sensor should react to gas within 30 seconds.
- Adjust the zero pot until the sensor outputs 40 mV from Test [-] to Test [+] (see **Figure 3**).

Note: Below are a few response characteristics which may be an indication that the gas sensor is at or near the end of its useful life. If any of these are observed, the cell should be replaced:

- Slow response to / recovery from calibration gas.
- Unable to achieve correct output during zero or span adjustment.

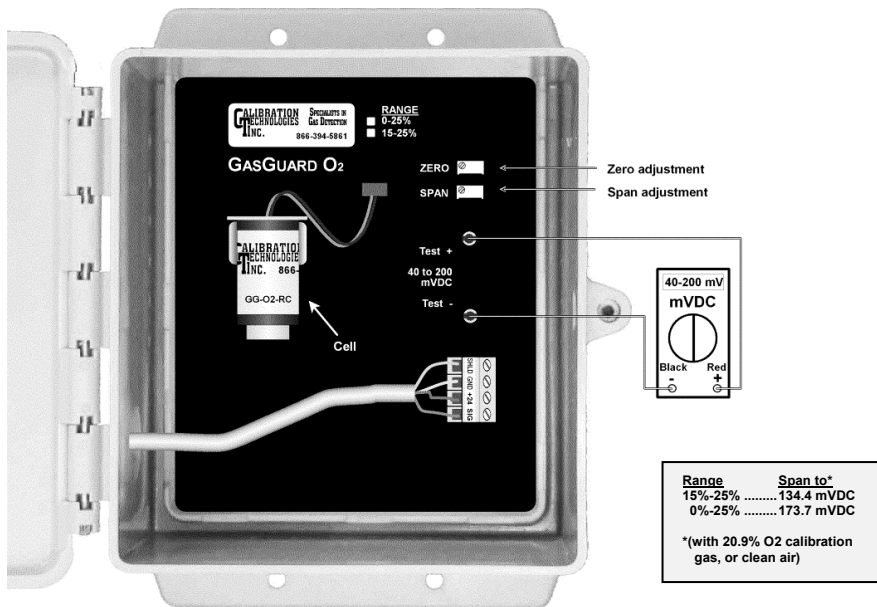


Figure 3: Sensor board components and zero/span adjustments

Maintenance

The GasGuard O2 was designed for long life and minimal maintenance. For proper operation it is essential that the test and calibration schedule be adhered to. Calibration Technologies recommends the following maintenance schedule:

Maintenance Guidelines:

- The sensor is shipped with a factory calibration. Sensor should be calibrated 6 months from purchase date.
- Calibrate the detector at least once every 6 months.
- Calibration should be performed with certified calibration gas. Calibration kits and replacement cylinders are available from Calibration Technologies.
- All tests and calibrations must be logged.

Sensor Life: These galvanic electrochemical cells are long-life sensors, but several things can cause the cell chemicals to become depleted including:

- a period of time
- exposure to high temperatures

Typical sensor life in 20.9% oxygen is seven years. When the cell becomes depleted, a replacement cell can be obtained from Calibration Technologies. Simply unplug the cell's ribbon cable from the transmitter, pull the old cell from the spring clip, discard the old cell and replace it with a new one. The sensor can be calibrated after a 24 hour warm-up period.

Specifications

Detection Principle: Galvanic Electrochemical

Detection Method: Diffusion

Gases: Oxygen (O₂)

Ranges:

15/25% (standard)

0/25%

Output Signal:

Linear 4/20 mA (max input impedance: 700 Ohms)

Power Supply: +24 VDC, 250 mA

Response Time:

T₅₀ = less than 30 seconds

T₉₀ = less than 60 seconds

Accuracy:

+/- 2% of value, but dependent on calibration gas accuracy and time since last calibration

Zero Drift: Less than 0.5% of full-scale per month, non-cumulative

Span Drift: Less than 2% per month

Linearity: +/- 0.5% of full-scale

Repeatability: +/- 1% of full-scale

Wiring Connections:

3 conductor, shielded, stranded, 20 AWG cable (General Cable C2525A or equivalent) up to 1500 ft.

Enclosure: Injection-molded NEMA 4X polycarbonate sensor housing. Captive screw in hinged lid. For non-classified areas.

Temperature Range:

+10°F to +125°F (-12°C to +52°C)

Humidity Range: 5% to 100% condensing

Dimensions: 7.7" high x 6.7" wide x 3.8" deep

Weight: 1.0 lbs

Limited Warranty & Limitation of Liability

Calibration Technologies, Inc. (CTI) warrants this product to be free from defects in material and workmanship under normal use and service for a period of one year (gas sensor covered for six months), beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. CTI's warranty obligation is limited, at CTI's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a CTI authorized service center within the warranty period. In no event shall CTI's liability hereunder exceed the purchase price actually paid by the buyer for the Product.

This warranty does not include:

- a) routine replacement of parts due to the normal wear and tear of the product arising from use;
- b) any product which in CTI's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
- c) any damage or defects attributable to repair of the product by any person other than an authorized dealer or contractor, or the installation of unapproved parts on the product

The obligations set forth in this warranty are conditional on:

- a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of CTI;
- b) the buyer promptly notifying CTI of any defect and, if required, promptly making the product available for correction. No goods shall be returned to CTI until receipt by the buyer of shipping instructions from CTI; and
- c) the right of CTI to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CTI SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.

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