

# GASGUARD LEL

Combustible Gas Sensor



## OPERATING & INSTALLATION MANUAL

**CALIBRATION  
TECHNOLOGIES  
INC.**



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## General Description

The GasGuard LEL sensor is a +24 VDC, three-wire, 4/20 mA sensor for combustible gases. It is designed to detect and monitor potentially explosive levels combustible vapors in air over the range of 0-100% LEL. It provides an industry standard linear 4/20 mA output signal compatible with most gas detection systems and PLCs.

The GasGuard LEL provides real-time continuous monitoring of high concentrations of combustible gases utilizing catalytic bead sensor technology housed in a corrosion resistant stainless steel shell with a sintered metal flame arrestor isolating the sensing element from the ambient air. A 3/4" NPT thread on the sensor housing mates with the threaded entry on the explosion-proof transmitter enclosure.

Most codes specify an electrical shunt-trip of the mechanical room at a level not higher than 25% LEL to remove potential ignition sources in the event of a gas leak.

While primary applications for the GasGuard LEL sensor are electrical shunt-trip activation for boiler rooms, it can be used almost anywhere combustible gases need to be detected or monitored.

## Installation

### Locating the sensor

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

When installing only one GasGuard LEL sensor in a room or area, centrally locate the sensor in the center of all potential leak sources.

If the target gas is lighter than air, mount sensor closer to the ceiling where the gas will likely accumulate. If the target gas is heavier than air, mount sensor closer to the floor.

As a general rule of thumb, try to mount sensors within 30 feet of potential leak sources.

## Installation Guidelines:

- Must be easily accessible for calibration and maintenance.
- Mount the sensor within 30 feet of the potential leak source.
- 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.
- If mounting sensor outdoors, consider prevailing wind direction and proximity to the most likely source of leaks. Protect the sensor from sun and rain.
- For highly critical locations more than one sensor should be installed in each room.
- Use conduit structure or straps to support enclosure. Do not drill thru enclosure.

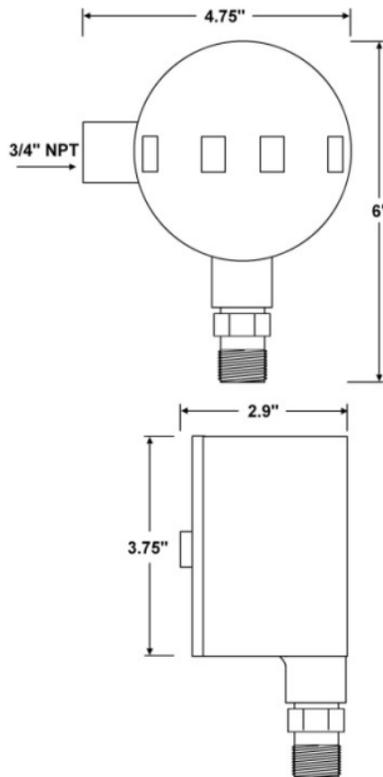


Figure 1: Mounting dimensions

## Wiring

Electrical wiring must comply with all applicable codes.

**Electrical Power:** 24 VDC regulated, 100 mA.

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

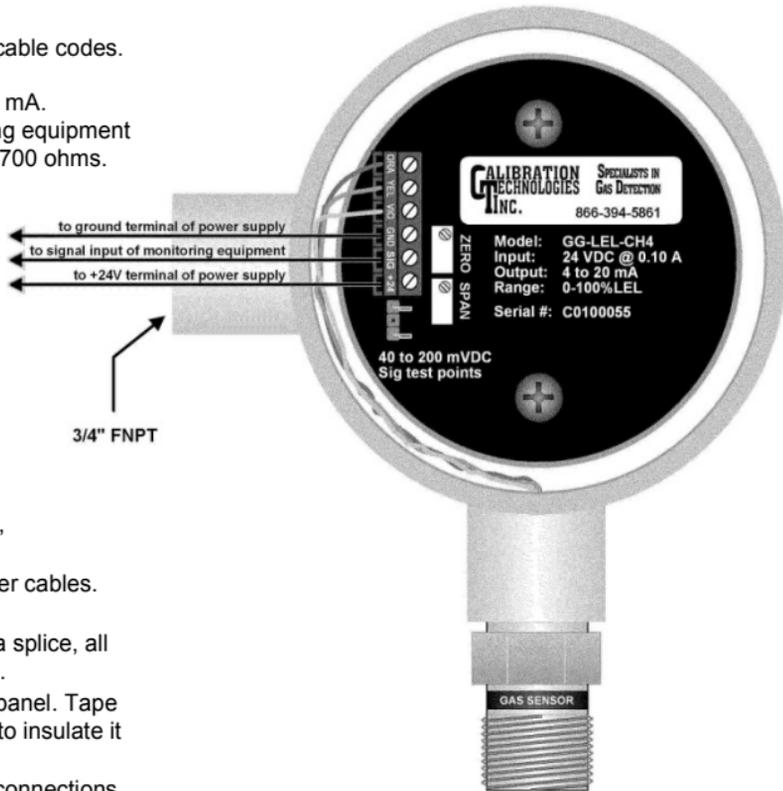
**Cable Recommendation:** 20/3 shielded cable (Alpha #2413c or equivalent).

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. All signals over 20 mA must be considered high gas concentrations. Alarm setpoints should not be lower than 10% of full-scale range.

## 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. Tape the exposed shield wire at the sensor to insulate it from the enclosure.
- 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 or gas sample such as propane or butane.
- 2) The second person stays at the control unit to determine that each sensor, when exposed to the gas fumes, is connected to the proper input and responds, causing appropriate alarm functions.

### Calibration

The GasGuard LEL Sensor comes factory calibrated and should require only minimal adjustments after installation. 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.**

**Zero Calibration:** After the unit is installed and has been powered up for a minimum of 24 hours, the unit can be zero calibrated by the following:

- Be sure the unit is in clean air.
- Adjust the zero pot until the sensor outputs 40 mV from Test [-] to Test [+] (see **Figure 3**).

**Span Calibration:** The unit is factory calibrated and normally does not need to be spanned upon initial installation. If span adjustment is required, the following procedure will span the unit:

- Perform zero calibration before spanning.
- Refer to the gas table on the following page for the correct span value for the target gas.
- Apply span gas at 0.8 L/min.
- Sensor should react to gas within 5 seconds
- Once the output signal has peaked (or two minutes maximum) adjust the span pot until the correct output is achieved (see **Figure 3**).

The combustible gas sensor has a slightly different response to each combustible gas or vapor. Because of these factors, a combustible transmitter must be adjusted differently if the system is meant to detect a gas or vapor other than methane. A 1% methane gas standard may still be used for calibration of combustible transmitters when used for other gases. However, the voltage that you set at the transmitter test point will be different for each gas. The table below provides the

## GasGuard LEL

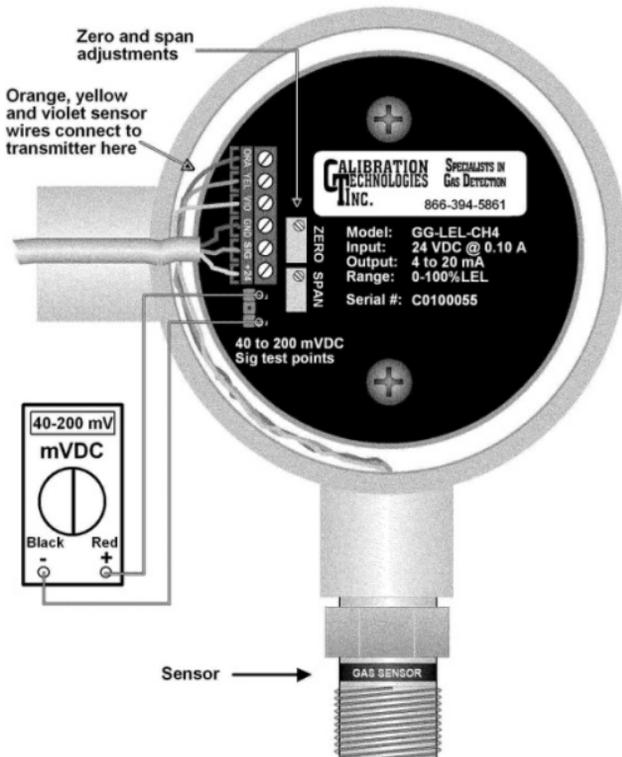
### Operating and Installation Manual

voltage setting for various gases, and the corresponding percent LEL reading for each.

Gas	Voltage (mVDC)	% LEL
Methane	72	20
Propane	98	36
n-Butane	96	35
n-Pentane	109	43
n-Hexane	127	56
Hydrogen	82	26
Methanol	77	23
Ethanol	83	27
Isopropyl Alcohol	109	43
Acetone	102	39
Methyl Ethyl Ketone	118	49
Benzene	120	50
Toluene	120	50
Acetylene	98	36
Di-ethyl Ether	109	43
Ammonia	67	16
n-Heptane	125	53

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 sensor should be replaced:

- Slow response to / recovery from calibration gas.
- Failure of the output to reach 50% of the calibration gas value prior to span adjustment.
- Unable to achieve correct output during calibration.



**Figure 3: Sensor output and zero/span adjustments**

## Maintenance

The GasGuard LEL 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.
- In highly critical areas, a response test should be performed between calibrations to verify proper sensor response and alarm functions. This can be done with calibration gas or a gas sample such as propane or butane. The response test is not required if multiple LEL sensors are installed in the same room.
- All tests and calibrations must be logged.

**Sensor Life:** Typical sensor life of the GasGuard LEL sensor is five years. Although extremely reliable, a few things can cause the sensor to become depleted including:

- a long period of time
- continuous exposure to high concentrations of silicon vapors and lead compounds

When the sensor becomes depleted, the unit will give no indication of failure other than that the sensor will not respond. For this reason it is **absolutely essential that these sensors be calibrated on a regular basis.**

**Sensor Replacement:** When the sensor becomes depleted, a replacement sensor can be obtained from Calibration Technologies. Disconnect the sensor from the transmitter, unscrew the sensor from the enclosure, discard the old sensor and replace it with a new one.

The sensor can be calibrated after a 12 hour warm-up period.

## Specifications

**Detection Principle:** Catalytic Bead

**Detection Method:** Diffusion

**Gas:** Combustible Gases

**Range:** 0/100% LEL (lower explosive limit)

**Output Signal:**

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

**Power Supply:** +24 VDC, 100 mA

**Response Time:**

T<sub>50</sub> = less than 3 seconds

T<sub>90</sub> = less than 10 seconds

**Accuracy:**

+/- 5% of value, but dependant on calibration gas accuracy

**Zero Drift:** Less than 0.1% of full-scale per month

**Span Drift:** Application dependant, but generally less than 3% per month

**Linearity:** +/- 0.5% of full-scale

**Repeatability:** +/- 1% of full-scale

**Sensitivity:** 1% LEL

**Wiring Connections:**

3 conductor, shielded, stranded, 20 AWG cable (Alpha 2413c or equivalent) up to 1500 ft.

**Enclosure:** Explosion proof. Class I, Div 1, Groups B, C & D. CSA, UL approved

**Temperature Range:**

-40°F to +150°F (-40°C to +66°C)

**Dimensions:** 6" high x 4.75" wide x 2.9" deep

**Weight:** 3 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, 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) gas sensors that have been subject to extended exposure to high gas concentrations;
- b) routine replacement of parts due to the normal wear and tear of the product arising from use;
- c) any product which in CTI's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
- d) 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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