GG-LEL2 COMBUSTIBLE GAS SENSOR

Installation and Operation Manual

CTi GAS DETECTION SPECIALISTS

Warning

Use this product only in the manner described in this manual.
If the equipment is used in a manner not specified by Calibration Technologies, the protection provided by the equipment may be impaired.

This equipment should be installed by qualified personnel.

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www.ctiengineering.com

General Description

The GG-LEL2 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 GG-LEL2 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 ¾" NPT thread on the sensor housing mates with the threaded entry on the explosion-proof transmitter enclosure.

Most codes specify an alarm notification at a level not higher than 25% LEL to remove potential ignition sources in the event of a gas leak.

Catalytic-bead gas sensors respond to and measure concentrations of a vast majority of flammable gases, with the notable exception of gases which poison catalytic oxidation catalysts, such as silicones and many sulfur bearing chemicals. More frequent calibrations may be necessary if operating in these conditions.

Installation

Locating the sensor

One of the most important considerations when installing GG-LEL2 sensors is that they should be easily accessible for calibration and maintenance.

When installing only one GG-LEL2 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, mount sensors within 30 feet of potential leak sources.

Installation Guidelines:

- Mount sensor enclosure through the mounting holes as shown in **Figure 1**.
- If mounting on a wall with studs, the mounting screws should be screwed into the studs.
- Must be easily accessible for calibration and maintenance.
- Mount the sensor vertically with the sensor pointing down.
- 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.

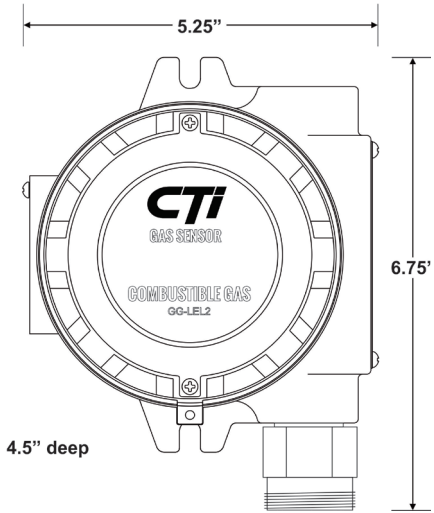

Figure 1: Mounting Dimensions

Wiring

Electrical wiring must comply with all applicable codes.

Electrical Power: 24 VDC regulated, 80 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. 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 disconnect power at the controller before performing any wiring at the sensor.
- 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.
- To maintain certification rating of the enclosure, conduit fittings of the same rating or better must be used.

Terminal Block Plug (Field Wiring):
SHLD: To case (earth) ground of monitoring equipment
GND: To ground terminal of power supply
+24V: To +24V terminal of power supply
SIG: To signal input of monitoring equipment

Operation

Start-Up

It is usually best to disconnect external alarms and other equipment from the sensor until the initial start-up procedures are completed. 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, is connected to the proper input and responds, causing appropriate alarm functions.

Calibration

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. **2.5% or 1% methane gas** can be used for calibration of the combustible transmitter when used for other gases. The voltage that you set at the transmitter test point will be different for each gas. The table below provides the voltage setting for various gases.

Relative Response Table (with 2.5% or 1.0% Methane)

Gas	Voltage (mVDC) (using 2.5% CH4)	Voltage (mVDC) (using 1% CH4)
Methane	120	72
Propane	163	89
n-Butane	163	89
n-Pentane	183	97
n-Hexane	200	104
n-Heptane	n/a	125
Hydrogen	111	68
Ethane	139	80
Ethylene	168	91
Ethanol	152	85
Methanol	111	68
Acetone	154	86
Isopropanol	160	88
Ethyl Acetate	163	89
MEK	n/a	108

Note: Ensure area is free from explosive gases before removing cover while sensor is energized.
The GG-LEL2 sensor comes factory calibrated and should require only minimal adjustments after installation. There are two pots on the preamp that are used for calibration. (see **Figure 2**)

Note: Never measure sensor output in mA. Always

use mVDC voltmeter settings.
Calibration Mode: Cal mode is required for calibrating the sensor. It clears the deadband (factory set at 4.8 mA) and averaging. Pressing the CAL switch enables cal mode and the green LED will flash. To exit out of cal mode, press the CAL switch or after 6 minutes it will automatically time out.

Zero Calibration: After the unit is installed and has been powered up for a minimum of 1 hour, the unit can be zero calibrated by the following:

- Press the CAL switch once to enter cal mode. Do not adjust the zero pot if the green LED is not flashing.
- Be sure the unit is in clean air. If unsure, apply zero air gas to the sensor to properly zero calibrate.
- Adjust the zero pot until the sensor outputs 40 mV from Test [-] to Test [+] (see **Figure 2**).

Span Calibration: If span adjustment is required, the following procedure will span the unit:

- Apply 2.5% CH4 span gas at 0.5 to 0.8 L/min (span gas must be in air, not nitrogen or other carrier).
- Sensor should react to gas within 15 seconds.
- Once the output signal has peaked (or 2 minutes maximum) adjust the span pot until the correct output is achieved (see **Relative Response Table** and **Figure 2**).
- Calibration is now complete.

4mA Adjustment: Sometimes a fine adjustment of the 4mA signal may be desired to compensate for a slight positive or negative zero-signal reading on the control panel.

- Make sure the sensor is NOT in calibration mode.
- Adjust the 4mA pot until the control panel reads zero.

Sensor replacement: If sensor replacement is required, follow the procedure below.

Note: Ensure area is free from explosive gases before proceeding.

- Unscrew the sensor cover.
- Unplug 3-position sensor plug from transmitter.
- Unscrew sensor head from enclosure and discard.
- Carefully install new sensor and plug into transmitter.
- Refer to calibration section on page 7 to calibrate new sensor.

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 may need to 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 if last calibration was 6 months ago or less.
- Unable to achieve correct output during calibration.

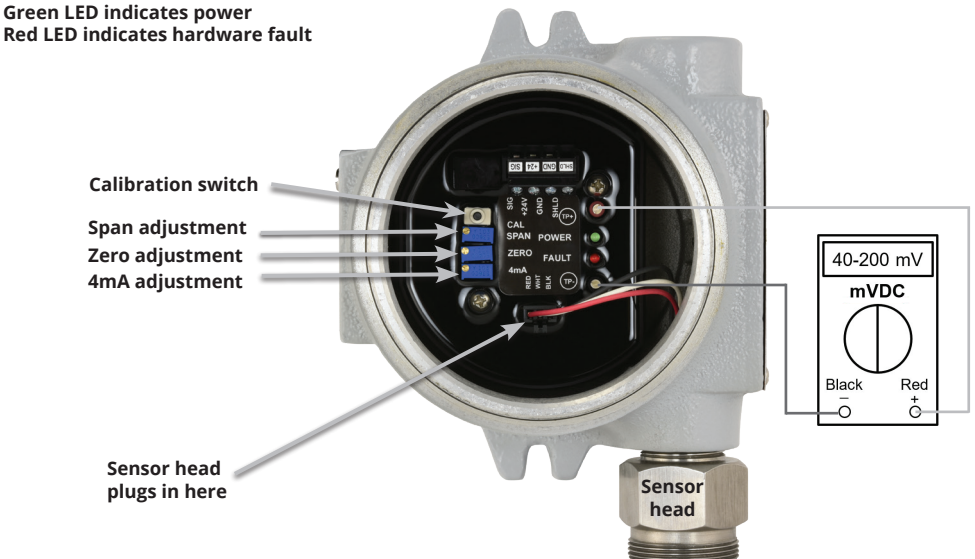

Figure 2: Sensor output and zero/span adjustment

Maintenance

The GG-LEL2 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 or where poisoning from silicones or sulfur compounds may be present, 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.
- All tests and calibrations must be logged.
- Always disconnect power at the controller before performing any wiring at the sensor.

Sensor Life: Typical sensor life of the GG-LEL2 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 reaches the end of its useful life, the unit will give no indication of failure other than that the sensor will not respond. Therefore, **it is absolutely essential that these sensors be calibrated on a regular basis.**

Sensor Replacement: Replacement sensors 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 the new one.

The sensor can be calibrated after a 1-hour warm-up period.

Replacement cell order#
GG-LEL2-RS

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, 80 mA
Response Time:
T_{50} = less than 30 seconds
T_{90} = less than 60 seconds
Accuracy: +/- 3% of full-scale
Zero Drift: Less than 0.1% of full-scale per month
Span Drift: Application dependent, 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 (General Cable C2525A or equivalent) up to 1500 ft.
Temperature Range:
-40°F to +140°F (-40°C to +60°C)
Dimensions: 6.75" high x 5.25" wide x 4.5" deep
Weight: 3.75 lbs
Sensor Head: Stainless steel flameproof enclosure constructed with an integral stainless-steel sinter filter for the safe entry of the atmosphere being detected.
ATEX Certificate CESI 01 ATEX 066 U
Enclosure: Copper-free aluminum body, epoxy powder coat finish, neoprene gasket, for hazardous areas.
NEC/CEC:
Class I, Division 1, Groups B, C, D
Class II, Division 1, Groups E, F, G
Class II, Division 2, Groups F, G
Class III
NEMA/EEMAC: 3, 4, 4X, 7BCD, 9EFG
UL Standard: 1203
CSA Standard: C22.2 No. 30
FM Classification No.: 3615
ATEX Certificate KEMA 02 ATEX 2265U
IEC Standards EN:60079-0, EN:60079-1, EN:60529

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 two years (including the sensor element), 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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