

# GG-VL2-CO2 CARBON DIOXIDE VENT LINE SENSOR



## Installation and Operation Manual

## **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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For technical support, contact:

**Calibration Technologies**

920 N Tradewinds Pkwy  
Columbia, MO 65201

**866-394-5861**

[sales@ctiengineering.com](mailto:sales@ctiengineering.com)  
[www.ctiengineering.com](http://www.ctiengineering.com)

## General Description

The GG-VL2-CO2 sensor is a +24 VDC, three-wire, 4/20 mA vent line sensor for carbon dioxide. It provides an industry standard linear 4/20 mA output signal compatible with most gas detection systems and PLCs.

The GG-VL2-CO2 provides real-time continuous monitoring of carbon dioxide gas in refrigeration system vent lines. Utilizing a long-life carbon dioxide selective NDIR sensor, the GG-VL2-CO2 sensor can withstand exposures to high concentrations of carbon dioxide without any effect on the life of the sensor.

The sensor element can be accessed from inside of the stainless-steel enclosure, and is sealed from the vent line to prevent carbon dioxide from entering the enclosure. The transmitter circuit board is sealed in potting compound, protecting sensitive electronic components and copper tracing from corrosion.

Recommended alarm setpoints for carbon dioxide system vent lines are typically 2.5% to 5% CO2 (12 to 20 mA).

## Installation

### Locating the sensor

Note: The ½" nipple of the supplied mounting kit should be welded to the relief header to allow airflow to the sensor.

### Discharging to Atmosphere

The GG-VL-CO2 sensor can be installed on the CO2 vent header anywhere between the safety relief valves (SRV's) and the discharge to atmosphere. Since the sensor is infrared, no fresh air is necessary for long term operation. Since CO2 is heavier than air, keep in mind that any weeping valve or even small release may cause high concentrations of CO2 to remain in the pipe for long periods of time. The deeper the sensor is mounted inside of the relief header and farther from fresh air, the longer it may take to clear out.

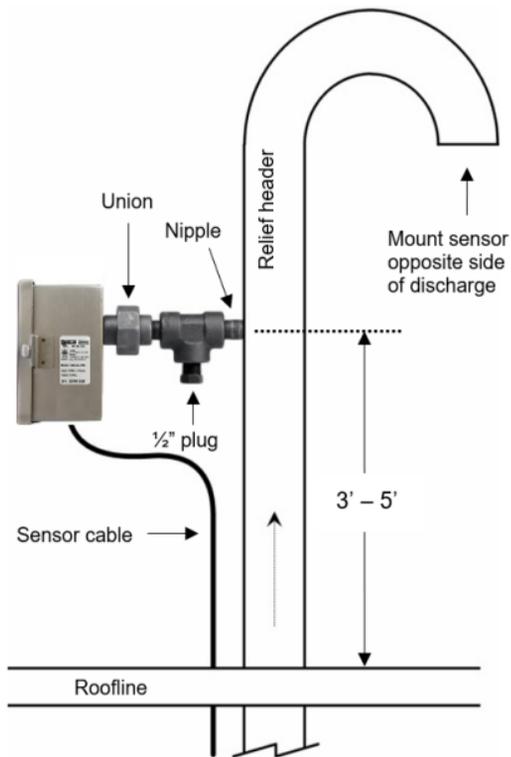


Figure 1: Discharge to Atmosphere

### Installation Guidelines:

- Always assume system could discharge at any moment. Stay clear of discharge path and have escape route planned.
- Make sure carbon dioxide does not discharge onto sensor assembly or personnel working on sensor (i.e. mount sensor opposite side of discharge).
- Install sensor enclosure with conduit hole facing down.
- **Figure 1** shows the sensor installed above the roofline. However, the sensor can be mounted below the roofline closer to the safety relief valves.

## Wiring

Electrical wiring must comply with all applicable codes.

**Electrical Power:** 24 VDC regulated, 80 mA.

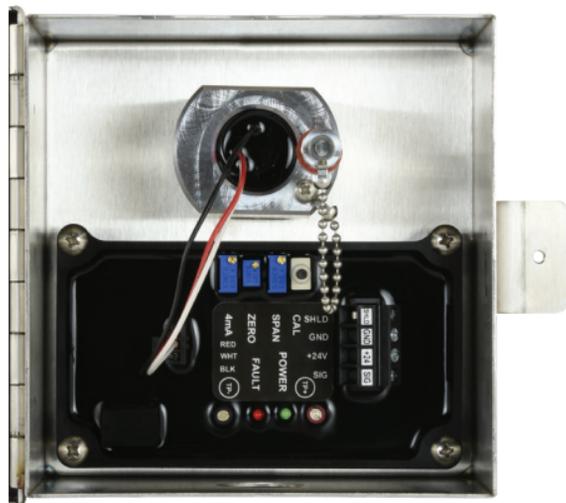
**Output:** Linear 4/20 mA output. Monitoring equipment may have a maximum input impedance of 700 ohms.

**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.

### Wiring Guidelines:

- Use only the existing conduit hole for connections to 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. Connect the shield wire in the sensor terminal block labeled SHLD.
- Always disconnect power at the controller before performing any wiring at the sensor



### 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

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.

Sensor can be response tested with 1% or greater CO<sub>2</sub> calibration gas immediately after power up.

Recommended sensor stabilization time is 1 hour before making zero or span adjustments to ensure a solid 4mA zero-signal and optimal span accuracy. However, span adjust can be made after 5 minutes with minimal full-scale accuracy error.

### Response Test:

1. One person exposes each sensor to calibration gas.
2. The second person stays at the control panel to determine that each sensor, when exposed to the gas, is connected to the proper input and responds, causing appropriate alarm functions.

### Calibration

The GG-VL2-CO<sub>2</sub> sensor comes factory calibrated and should require only minimal adjustments after installation. Calibration should be performed every six months. There are three pots on the preamp that are used for calibration (see **Figure 2**).

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

**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.

**Calibration Mode:** Cal mode is required for calibrating the sensor. It clears the averaging and deadband (factory set to 7.2 mA). 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 back to normal mode.

**Zero Calibration:** After the unit is installed and has been powered up for a minimum of 5 minutes, the unit can be zero calibrated by the following:

- Apply Zero Air calibration gas at 0.5 - 0.8 L/min.
- Press the CAL switch to enter cal mode. Do not adjust the zero pot if the green LED is not flashing.
- Adjust the zero pot until the sensor outputs 40 mVdc from Test [-] to Test [+] (see **Figure 2**).

**Span Calibration:** If span adjustment is required, use the following procedure (see **Figure 2**):

- Unscrew calibration port cover and connect cal gas hose to hose barb fitting.
- Press the CAL switch once to enter cal mode.
- Apply 5% CO<sub>2</sub> span gas at 0.5 - 0.8 L/min.
- 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 (200 mVdc).
- Shut-off gas, remove hose and replace cover.
- Press the CAL switch to exit cal mode.
- Calibration is now complete.

**Note:** Depending on sensor's proximity to fresh air, allow up to an hour for the signal to return back to 4 mA after exposure to high concentrations. Applying Zero Air calibration gas to the sensor will help purge the CO<sub>2</sub> gas from the sensor element, and return the signal back to normal.

**Note:** If correct output during span adjustment is unachievable, replace sensor element. See sensor replacement procedure on page 10 if a replacement sensor element is needed.

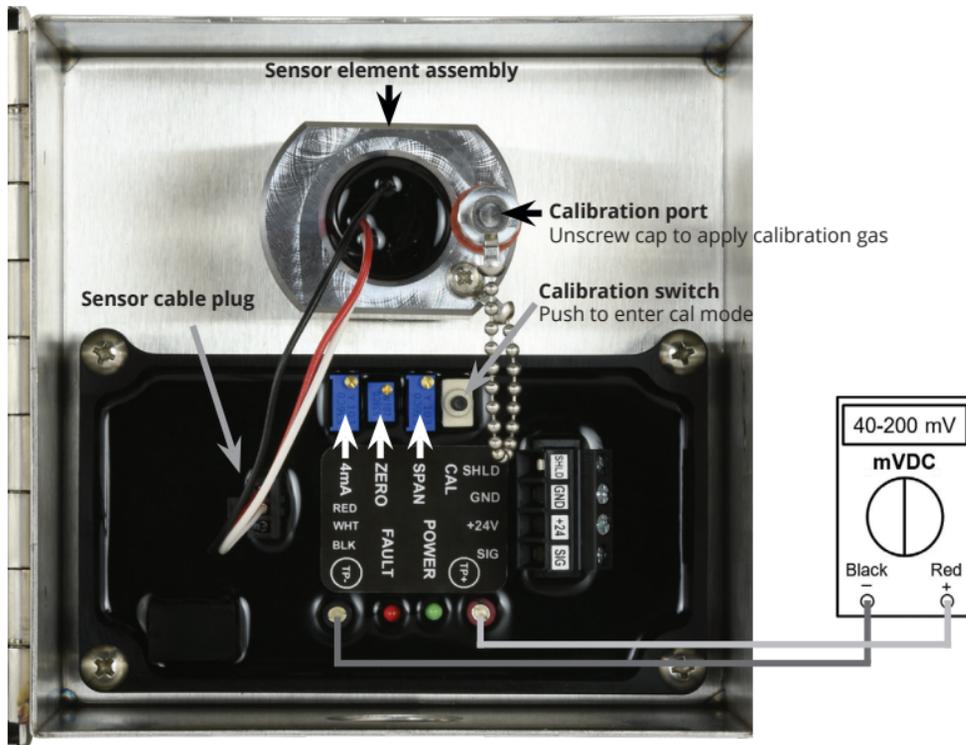


Figure 2: Transmitter and sensor assembly

## Maintenance

The GG-VL2-CO2 was designed for long life and minimal maintenance. For proper operation, it is essential that the calibration schedule be adhered to. Calibration Technologies recommends the following maintenance schedule:

### Maintenance Guidelines:

- Sensor should be calibrated at 6 month intervals.
- 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.
- Always disconnect power at the controller before performing any wiring at the sensor.

**Sensor Life:** This infrared sensor exhibits long life and is very reliable. Typical sensor life is 5-7 years. As with all gas detectors, regular 6-month calibration intervals are essential to correct for sensor aging characteristics. A few conditions can cause the sensor to become faulty, including:

- exposure to liquid carbon dioxide.
- high vibration or blunt force impact.

### Sensor Replacement: (part #: GG-VL2-CO2-RS)

When the sensor becomes faulty, a replacement sensor element can be obtained from Calibration Technologies.

To replace the sensor, refer to **Figure 2** and the following procedure.

Caution: Always assume the system could discharge at any moment. Stay clear of discharge path and have an escape route planned.

1. Be prepared for fault/alarm conditions during this process.
2. Remove power from sensor. This can be done by unplugging the 4-position power plug from the transmitter.
3. Unplug sensor cable from transmitter.
4. Unscrew the sensor element assembly and discard old sensor.
5. A replacement O-ring is included in case existing O-ring is damaged or lost.
6. Screw in new replacement sensor assembly (do not overtighten).
7. Plug in sensor cable to transmitter.
8. Re-apply power to sensor.
9. The sensor can then be calibrated after 5-minute warmup period.

## Troubleshooting

### Sensor Fault: (0.5 mA signal output)

Indications: (any or all)

- Red LED on transmitter lit.
- Voltage signal at testpoints is 5 mVdc (.5 mA output).
- PLC displays negative value (e.g. -10,000 ppm).
- Controller indicates sensor fault or sensor failure.

Possible Cause / Solution:

- Low supply voltage.
- Loose connection. Check all sensor wires.

### Constant or Intermittent high signal or alarms:

Indications:

- Erratic or constant high concentration reading at controller or PLC.

Possible Cause / Solution:

- Weeping relief valve. Check valve by drawing a sample from the header with an accurate portable CO2 detector. Be sure to sample 1' to 3' from inside the header to ensure a good reading.
- Or loosen union nut and remove sensor assembly from header. If signal returns to normal in fresh air, investigate relief valve(s) and replace if necessary.

## Specifications

**Input Power:** +24 VDC, 60 mA

**Detection Principle:** Infrared (NDIR dual beam)

**Detection Method:** Diffusion

**Gas:** Carbon dioxide (CO2)

**Range:** 0-5% CO2 (50,000 ppm) with 1% CO2 deadband

**Output Signal:**

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

**Response Time:** T90 = less than 30 seconds

**Accuracy:** +/- 2% of full-scale.

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

**Span Drift:** Less than 2% of full-scale per month

**Linearity:** +/- 3% of full-scale

**Repeatability:** +/- 2% of full-scale

**Wiring Connections:**

3-conductor, shielded, stranded, 20 AWG cable

(General Cable C2525A or equivalent) up to 1500 ft

Terminal Block Plug (Field Wiring): 26-16 AWG, torque 4 lbs-in

**Enclosure:** 18-gauge stainless steel housing. Captive screw in hinged lid. For non-classified areas

**Mounting Kit:** Schedule 80 NPT pipe fittings

**Temperature Range:** -40°F to +140°F (-40°C to +60°C)

**Humidity Range:** 0-95% non-condensing

**Dimensions:** 4.8" high x 4.72" wide x 3.35" deep

**Weight:** 4 lbs (includes mounting kit)

**Certification:**

SGS Listed:

Conforms to UL 61010-1.

Certified to CSA C22.2 No. 61010-1







### 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 2 years (including 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) gas sensors that have been wetted by liquid ammonia, oil or water;
- 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.



GG-VL2-CO2-DOC1-2  
20211103

[ctiengineering.com](http://ctiengineering.com) | 866-394-5861