GG-CO-NO2 VEHICLE EMISSIONS GAS SENSOR

Installation and Operation Manual

CALIBRATION TECHNOLOGIES INC.
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.

Table of Contents

For technical support, contact:

Calibration Technologies
920 N Tradewinds Pkwy
Columbia, MO 65201
866-394-5861
Sales@ctiengineering.com
www.ctiengineering.com

General Description

The GG-CO-NO2 sensor is a +24 VDC, four-wire, 4/20 mA sensor for carbon monoxide and nitrogen dioxide which utilizes proven electrochemical sensor technology for fast and accurate detection.

The standard detection ranges of the GG-CO-NO2 provides real-time continuous monitoring of carbon monoxide levels accurately down to 10 ppm, with an upper detection limit of 200 ppm. It will monitor Nitrogen Dioxide accurately down to 1 ppm, with an upper detection limit of 10 ppm.

The GG-CO-NO2 provides two (2) industry standard linear 4/20 mA output signals compatible with most gas detection systems and PLCs. The output signals are not affected by drastic temperature and moisture variations, or by other atmospheric variations.

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 GG-CO-NO2 sensors is that they must be easily accessible for calibration and maintenance.

Carbon monoxide is almost the same molecular weight as air and will diffuse throughout the space equally. Nitrogen dioxide is heavier than air and will accumulate at the floor level. Even though these heated gases may rise once they exit the vehicle exhaust system, they will quickly cool and sink (particularly NO2 gas). Therefore, it is best to always install the sensor in the breathing zone, approximately 3-6 feet from the floor. This mounting location will provide the best personnel protection. In maintenance garages, the height at which employees will be working should also be taken into consideration.

As a general rule of thumb for vehicle exhaust, install sensors no further than 50 feet from CO and NO2 gas sources (7,500 sq feet coverage). See the installation guidelines on the next page for more details.

Caution: Remove protective label.
The sensor is shipped with labels installed over the electrochemical cells to preserve cell life. The cells will not detect gas with this label installed. Remove labels and discard during installation.

Installation Guidelines:

- Remove and discard protective cell labels.
- Always mount the sensor vertically.
- Must be easily accessible for calibration and maintenance.
- Mount the sensor close to the potential gas source. Distance between sensors shouldn't exceed 100 ft.
- For parking garages, try to mount sensors alternating/staggered on pillars/walls.
- An optional pillar/column mounting kit with protective cage is available.
- For optimum personnel protection, mount sensor in breathing zone (approx 3-6 feet from 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.
- If mounting on a wall with studs, the mounting screws should be screwed into the studs.
- Never mount the sensor in CA (controlled atmosphere) rooms because normal atmospheric levels of oxygen are required for operation.
- For highly critical locations more than one sensor should be installed in each room.
- Mount sensor enclosures through mounting holes as shown in Figure 1. Use the supplied self-tapping screws for mounting on sheet metal surfaces.

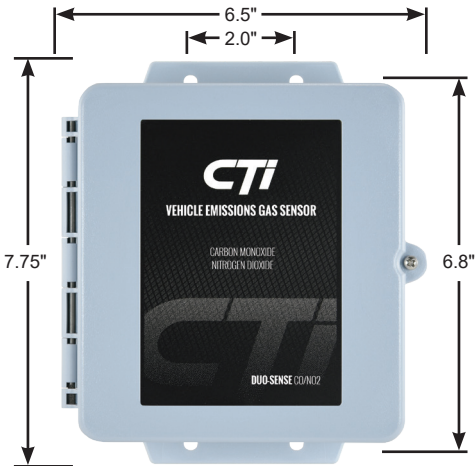

Figure 1: Mounting Dimensions

Wiring

Electrical wiring must comply with all applicable codes.

Electrical Power: 24 VDC regulated, 130 mA.
Output: (2) Linear 4/20 mA outputs. Monitoring equipment may have a maximum input impedance of 700 ohms.
Cable Recommendation: 18/4 shielded cable (General Cable C2543A 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 5% of full-scale range.

Wiring Guidelines:

- Always use 4-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
SIG1 CO: To signal input of monitoring equipment
SIG2 NO2: To signal input of monitoring equipment

Operation

Start-up

Allow 60 seconds for power-up time delay of sensor to end (green power LED will flash during power up). Sensor can then be response-tested immediately after power up.

Start-Up Test:

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

LED functions (see page 10)

Calibration

The GG-CO-NO2 sensor comes factory calibrated and should require only minimal adjustments after installation. There are four pots on the preamp that are used for calibration (see Figure 2). Span calibration can be performed within 5 minutes after power-up, although best to wait 1 hour before adjusting the zero pot. Repeat zero and span calibration steps for CO and NO2.

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

Zero Calibration: After the sensor is installed and has been powered up for at least 1 hour, the unit can be zero calibrated by the following:

- Be sure the unit is in clean air. If unsure, apply Zero Air gas at 0.5 to 0.8 L/min.
- Adjust the zero pot until the sensor outputs 40 mV from Test [-] to Test [+] (see **Figure 2**).

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:

- Apply 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 10 seconds
- Once the output signal has peaked (or 2 minutes maximum for CO, 5 minutes maximum for NO2) adjust the span pot until the correct output is achieved (see **Figure 2)**.

Zero and span calibration must be done for both CO and NO2 sensor elements individually.

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.
- Failure of the output to reach 50% of the calibration gas value prior to span adjustment if sensor was calibrated 6 months ago or less.
- Unable to achieve correct output during span adjustment.

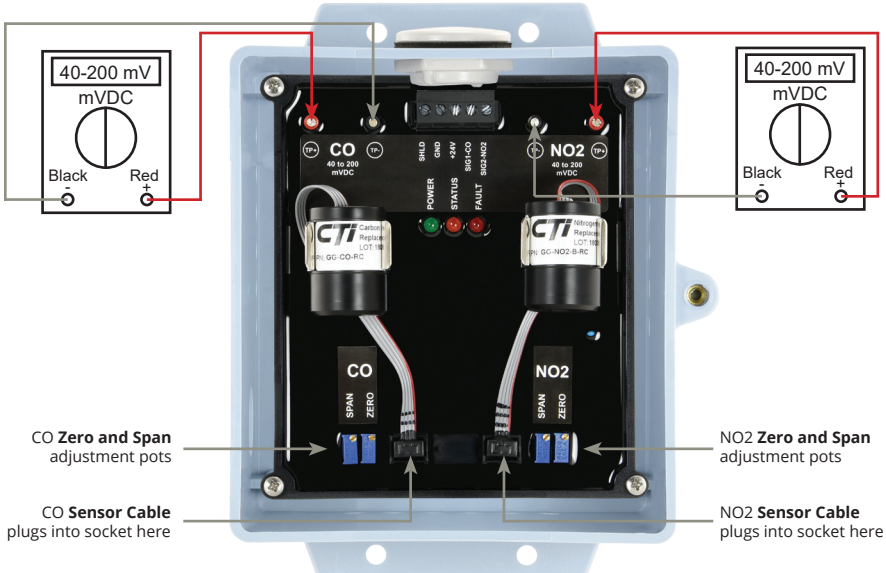

Figure 2: Sensor board components and zero/span adjustment

Maintenance

The GG-CO-NO2 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 sensor 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.
- Always disconnect power at the controller before performing any wiring at the sensor.

Sensor Life: These electrochemical cells are extremely reliable, but several things can cause the cell chemicals to become depleted including:

- a period of time
- exposure to high temperatures
- continuous, long term exposure to carbon monoxide or nitrogen dioxide gases

When the cells 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.**

Typical cell life in most vehicle exhaust applications is 5-7 years for CO, and 2-3 years for NO2. When a 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 warm-up period.

Replacement cell order#:
GG-CO-RC
GG-NO2-B-RC

Specifications

Input Power: +24 VDC, 130 mA
Detection Principle: Electrochemical
Detection Method: Diffusion
Gases:
Carbon Monoxide (CO)
Nitrogen Dioxide (NO2)
Range:
0-200 ppm (CO)
0-10 (NO2)
Output Signal:
(2) Linear 4/20 mA (max input impedance: 700 Ohms)
Response Time:
T_{50} = less than 30 seconds (CO)
T_{90} = less than 60 seconds (CO)
T_{50} = less than 60 seconds (NO2)
T_{90} = less than 120 seconds (NO2)
Accuracy:
+/- 5% of full-scale value, but dependent on calibration gas accuracy and time since last calibration
Zero Drift: Less than 0.1% of full-scale per month, non-cumulative
Span Drift: Generally less than 2% per month (CO). Generally less than 5% per month (NO2)
Linearity: +/- 1% of full-scale
Repeatability: +/- 1% of full-scale
Wiring Connections: 4-conductor, shielded, stranded, ≥ 18 AWG cable (General Cable C2543A or equivalent) up to 1500 ft.
Terminal Block Plug (Field Wiring): 26-12 AWG, torque 4.5 lbs-in.
Power (green) LED: Blinks once per second for 60 seconds during power-up. If supply voltage is too low (<10VDC) or improperly grounded, will blink once per second continuously. Stays on steady to indicate power. Blinks twice per second in calibration mode (4-minute timeout delay).
Status (amber) LED: Blinks once per second if RFI (radio frequency interference) is detected.
Fault (red) LED: Stays on steady if supply voltage is too low (<10VDC).
Enclosure: Injection-molded, NEMA 12 Washdown-Duty, polycarbonate sensor housing with hinged lid and captive screw. For non-classified areas. Optional 18 GA, NEMA 3RX Washdown-Duty stainless steel enclosure with hinged lid and captive screw. For non-classified areas.
Temperature Range:
-20°F to +120°F (-29°C to +49°C)
Humidity Range: 5% to 100% condensing
Dimensions: 7.7" high x 6.7" wide x 3.8" 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 two years (including cell), 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 LOSSOF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.

[redacted]

CALIBRATION TECHNOLOGIES INC.
GAS DETECTION SPECIALISTS

GG-CO-NO2-DOC1-0
20190604