GG-R REFRIGERANT 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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General Description

The GG-R sensor is a +24 VDC, three-wire, 4/20 mA sensor for HFO, HFC, CFC and HCFC refrigerants which utilizes proven IR (infrared) sensor technology for very accurate and reliable leak detection. The GG-R provides real-time continuous monitoring of ambient refrigerant concentrations with three available detection ranges of 0-500, and 0-1,000 ppm.

The GG-R detects a wide variety of halocarbon gases. R22, R123a, R134a, R407, R404A R410A, R434A R448A, R449A, R507A and many others. (see Specifications section for longer list of detectable gases)

The sensor fault detection circuits are designed to detect sensor aging and provide a fault indication if there's any degradation of the IR source or optics, along with other critical sensor circuits and components. The output signal is not affected by drastic temperature and moisture variations that occur during washdown, defrost cycles, etc. The circuit board is sealed in potting compound, completely 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 cleaning crews.

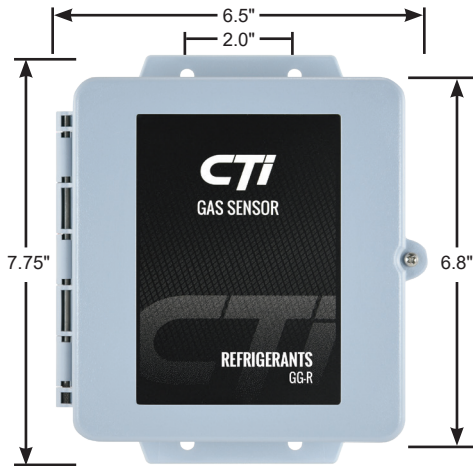## Installation

Locating the sensor

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

Since HFO/HFC/CFC/HCFC gases are heavier than air, they tend to accumulate at the floor level. For optimum leak detection, mount the sensor no higher than 2 feet off of the floor.

As a general rule of thumb, mount sensors within 30 feet of 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 leak detection, mount sensor 1' – 2' 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.
- Do not mount on a vibrating surface.
- Protect sensor from physical damage(forklifts, etc.).
- If mounting on a wall with studs, the mounting screws should be screwed into the studs.
- Mount sensor enclosures through the mounting holes as shown in Figure 1. Use the supplied self-tapping screws for mounting on sheet metal surfaces.
- Even though the sensor comes calibrated from the factory, it is always a good idea to calibrate the sensor to the environment in which it is installed. This will compensate for any inaccuracies caused by difference in temperature, altitude, etc.

Figure 1: Mounting Dimensions

Wiring

Electrical wiring must comply with all applicable codes.

Electrical Power: 24 VDC regulated, 300 mA.
Output: Linear 4/20 mA output. Monitoring equipment may have a maximum input impedance of 700 ohms.
Cable Recommendation: 18/3 shielded, stranded cable with drain wire (General Cable C2535A or equivalent).
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 3-conductor, insulate, 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.
- To maintain NEMA/IP 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
Before applying power, make a final check of all wiring. After power-up, allow at least 2 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 a gas sample or calibration gas.

2) 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.

Calibration
The GG-R 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.

Note: The adjustment response is dampened. Make slight adjustments (no more than ½ turn of the potentiometer) and wait for output response.

Zero Calibration: After the unit is installed and has been powered up for a minimum of 2 hours, the unit can be zero calibrated by the following:
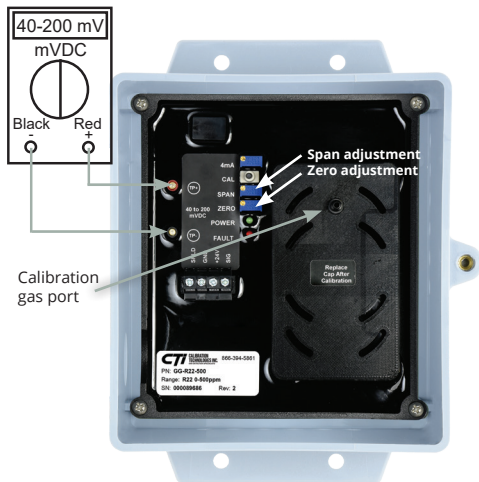
• Activate calibration mode by pressing the CAL MODE button (green LED will flash).
• Proceed to next step if certain the sensor is in clean air (no target gas present), otherwise apply Zero Air gas at 0.8 L/min.
• Adjust the zero pot until the sensor outputs 40 mVDC from test points [-] to [+] (see Figure 2).

Span Calibration: Perform zero calibration prior to spanning.

• Activate calibration mode.
• Connect tubing to the calibration port of the infrared tube. (see Figure 2)
• Apply span gas at 0.8 L/min.
• Sensor should react to gas within 20 seconds.
• Once the output signal has peaked (or 5 minutes maximum) adjust the span pot until the correct output is achieved.
• Exit calibration mode by pressing the CAL MODE button (green LED will stop flashing).
• Replace dust cap over calibration port.

Note: Calibration mode will automatically time-out after 6 minutes.

If the correct output cannot be achieved, contact CTI for technical help.

Figure 2: Sensor board components and zero/span adjustment

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.

• Check the true zero signal first by putting the sensor into calibration mode (green LED is flashing).
• Make sure the signal is 40 mVDC, +/- 5 mVDC, and adjust zero pot if necessary.
• Exit calibration mode (green LED is NOT flashing).
• Adjust the 4mA pot until the control panel reads zero.

Zero-filter mode (deadband mode)

The default operation mode of the GG-R Sensor has an active deadband to eliminate the display of signals within the zero noise of the sensor. To change or view the zero-filter mode, follow the procedure below:

• Press and hold the CAL switch for approximately 4 seconds (green LED will blink 4 times per second. The red LED will indicate the deadband mode of the sensor. Red LED lit for enabled, and red LED off for disabled.)
• Press the CAL switch to toggle the desired deadband mode (on or off).
• After 10 seconds of not pressing the CAL switch, the unit will return to normal mode, while storing the deadband mode that was selected.
• The deadband selection is stored in EEPROM and will remain until changed.

Maintenance

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

Sensor Life

Expected sensor life of the GG-R is seven to ten years. Failure of the infrared sensor happens normally when the infrared optics reach the end of their useful life. If this occurs, the sensor will produce a continuous fault indication signal of 0.5 mA and the fault LED will be lit. Field replacement of the sensor optics is not available at this time. Contact CTI for sensor repair or replacement.

Specifications

Input Power: +24 VDC, 300mA
Detection Principle: Infrared
Detection Method: Diffusion
Gases:
R22, R123a, R134a, R407, R404A, R410A, R422D, R434A, R438A, R448A, R449A, R507A, R513A, R1234ZE, R1234YF and many others.
Contact CTI for other gases.
Ranges:
0-500 ppm
0-1,000 ppm
Output Signal:
Linear 4/20 mA (max input impedance: 700 Ohms**)**
Response Time:
T_{50} = less than 90 seconds
T_{90} = less than 180 seconds
Accuracy: +/- 4% of full-scale
Resolution: 1% of full-scale
Zero Drift:
Less than 1% of full-scale per month, non-cumulative
Span Drift:
Less than 1% per month, non-cumulative
Linearity: +/- 3% of full-scale
Repeatability: +/- 6% of full-scale
Temperature Range: -50°F to +120°F (-45°C to +49°C)
Humidity Range: 0% to 100% condensing

Wiring Connections:
3-conductor, 18AWG, shielded, stranded cable with drain wire (General Cable C2535A or equal), up to 1500 ft.
Terminal Block Plug (Field Wiring):
26-12 AWG, torque 4.5 lbs-in.
Enclosure:
Injection-molded, NEMA 3RX 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.
Dimensions:
7.5" high x 6.5" wide x 3.8" deep
Weight: 3 lbs
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 two years, 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 and 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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