GasGuard H_2-1% Hydrogen Sensor

Operating & Installation Manual

Calibration Technologies Inc.

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General Description

The GasGuard H2 1% sensor is a +24 VDC, three-wire, 4/20 mA sensor for hydrogen. It is designed to detect and monitor potentially explosive levels of hydrogen gas in air over the range of 0-10,000 ppm (25%LEL). It provides an industry standard linear 4/20 mA output signal compatible with most gas detection systems and PLCs. Typical sensor life is 5 years.

The GasGuard H2 1% provides real-time continuous monitoring of high concentrations of hydrogen utilizing catalytic bead sensor technology. The transmitter circuit board is sealed in potting compound, protecting sensitive electronic components and copper tracing from corrosion. The specially vented enclosure is made of a highly impact and chemical resistant polycarbonate to protect the sensor.

Hydrogen gas becomes explosive at 4% or 40,000 ppm. Calibration Technologies recommends an alarm setpoint at no higher than 1% (25% LEL). While the primary application for the GasGuard H2 1% sensor is exhaust fan activation for battery charging rooms, it can be used almost anywhere high concentrations of hydrogen vapors need to be detected or monitored.

Installation

Locating the sensor

One of the most important considerations when installing the GasGuard H2 1% sensor is that it must be easily accessible for calibration and maintenance.

Since hydrogen gas is lighter than air, careful consideration must be given where hydrogen pockets will be formed. The ceiling is where hydrogen gas will typically accumulate. This mounting location will usually provide the best personnel and property protection.

As a general rule of thumb, try to 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 detection, mount sensor close to ceiling (1' – 3' below ceiling level).
- 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(forklifts, etc.).
- If mounting sensor outdoors, consider prevailing wind direction and proximity to the most likely source of leaks. Protect the sensor from sun and rain as much as possible.
- 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 the mounting holes as shown in **Figure 1.** Use the supplied self-tapping screws for mounting on sheet metal surfaces.

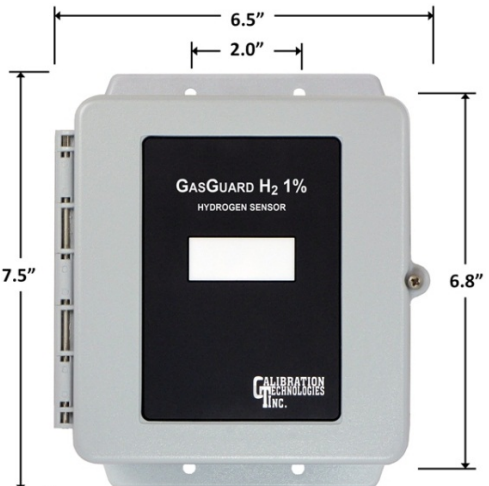

Figure 1: Mounting Dimensions

Wiring

Electrical wiring must comply with all applicable codes.

Electrical Power: 24 VDC regulated, 250 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 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*.
- 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 24 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 hydrogen calibration gas.
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 GasGuard H2 1% Sensor comes factory calibrated and should require only minimal adjustments after installation. Calibration should be performed six months 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.

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 4 minutes it will automatically time-out.

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, or use zero air gas.
- Press the CAL switch once 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 mV from Test [-] to Test [+] (see **Figure 3**).

Span Calibration: DO NOT ADJUST THE SPAN POT WITHOUT CERTIFIED CALIBRATION GAS! Do not remove sensor housing cap during calibration. If span adjustment is required, the following procedure will span the unit:

- Press the CAL switch once to enter cal mode.
- Apply span gas at 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 two minutes maximum) adjust the span pot until the correct output is achieved (see **Figure 3**).
- Calibration is now complete.

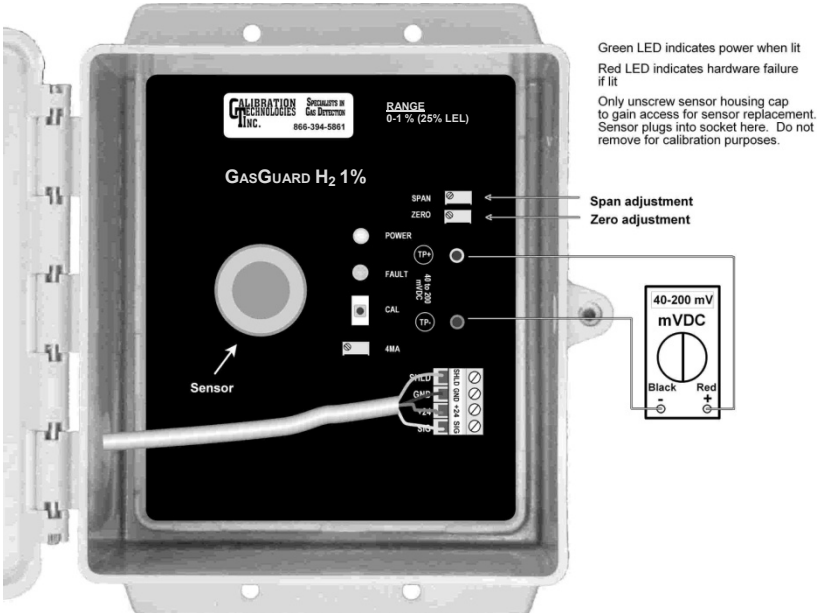

Figure 3: Sensor board components and zero/span adjustments

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.

- Since any arcing could be an ignition source, ensure that the sensor location is clear of any explosive concentrations of hydrogen.
- Unscrew the sensor housing cap.
- Remove the sensor from the socket by pulling straight out with it. Discard old sensor.
- Notice orientation dot on backside of new sensor. The dot on the sensor needs to be facing upwards.
- Carefully plug in new sensor.
- 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 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 span adjustment.

Maintenance

The GasGuard H2 1% 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.

Sensor Life: This catalytic bead sensor exhibits long life and is very reliable. Typical sensor life is five years. As with all gas detectors, regular 6-month calibration intervals are essential to correct for sensor aging characteristics.

Replacement sensors can be obtained from Calibration Technologies. Simply unplug the sensor from the transmitter, discard the old sensor and replace it with a new one. Refer to the sensor replacement section on page 9. The sensor can then be calibrated after a 24 hour warm-up period.

Specifications

Detection Principle: Catalytic Bead
Detection Method: Diffusion
Gases: Hydrogen (H2)
Ranges: 0/1% (0/10,000 ppm)(0/25%LEL)
Output Signal:
Linear 4/20 mA (max input impedance: 700 Ohms)
Power Supply: +24 VDC, 250 mA
Response Time:
T_{50} = less than 30 seconds
T_{90} = less than 60 seconds
Accuracy:
+/- 5% of value, but dependant on calibration gas accuracy and time since last calibration
Zero Drift: Less than 0.1% of full-scale per month, non-cumulative
Span Drift: Application dependant, but generally less than 2% per month
Linearity: +/- 0.5% of full-scale
Repeatability: +/- 1% of full-scale
Wiring Connections:
3 conductor, shielded, stranded, 20 AWG cable (General Cable C2525A or equivalent) up to 1500 ft.
Enclosure: Injection-molded NEMA 4X polycarbonate sensor housing. Captive screw in hinged lid. For non-classified areas.
Temperature Range: -40°F to +120°F (-40°C to +49°C)
Humidity Range: 5% to 100% condensing
Dimensions: 7.5" high x 6.5" wide x 3.8" deep
Weight: 2.0 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 (gas sensor also covered for 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) 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.

[redacted]

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CALIBRATION TECHNOLOGIES INC.

SPECIALISTS IN GAS DETECTION