

# GASGUARDIAN EM

Entrance Monitor



## OPERATING & INSTALLATION MANUAL

**CALIBRATION  
TECHNOLOGIES  
INC.**

## **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

Powered by 24VDC, the GasGuardian Entrance Monitor terminates the gas sensor's 4/20 mA signal, and re-transmits the 4/20 mA signal to another analog input device such as gas detection controller or plant PLC. If no connection is made to the signal output terminal, the unit will act as a stand-alone device. Multiple units can be installed in series, providing flexible remote viewing options.

The GasGuardian EM is assembled into a wall mounted enclosure designed for non-classified locations. The gas sensor (not included) is installed at the location where gas is to be detected, up to 1,500 feet from the readout via a three conductor cable.

The GasGuardian EM provides continuous real-time monitoring of the sensor. Gas concentrations are indicated by the 10 segment LED bargraph display. The status LED provides an at-a-glance status of power, including an alarm or fault condition.

A calibration mode setting allows for sensor maintenance and calibration without tripping the relay. The onboard relay has a 10 second on/off time delay to prevent unnecessary cycling during a fault or alarm condition. The alarm setpoint is adjusted by a ten position rotary switch on the display board.

## Installation

### Locating the GasGuardian EM

The important consideration when installing the GasGuardian EM readout is that it must be easily accessible for operating personnel.

### Installation Guidelines:

- Mount readout on solid surface with minimal vibration
- Mount readout in a general-purpose location only. Do not install in a hazardous environment.
- Mount readout away from electromagnetic interference.
- Protect readout from physical damage.
- If mounting on a wall with studs, the mounting screws should be screwed into the studs.



**Figure 1: Dimensions**

## Wiring

Electrical wiring must comply with all applicable codes.

### Wiring Guidelines:

- Always use 3-conductor, insulated, stranded, shielded copper cable for all sensor cables.
- Do not pull sensor wiring with AC power cables. This can cause electrical interference.
- Be sure to land the shield conductors of the sensor cables at the shield terminals of the sensor connectors.
- Bonding between metallic conduit connections is not automatic with the non-conductive enclosure. Separate bonding must be provided.
- Use stranded, copper wire/cable with a minimum of 75°C rating (167°F).
- To maintain NEMA 4X / IP rating of the enclosure, conduit fittings of the same rating or better must be used.

### DC Power:

- Requires 24VDC, 125 mA (not including other connected devices)

### Sensor Wiring: 4/20 mA, 100 Ohm input impedance.

- Refer to sensor manual for cable recommendations (typically 20/3 shielded cable (Belden #8772 or equivalent)).
- Length of cable should not exceed 1,500 feet.

### Relay Wiring:

- AC wiring must be run in separate conduit from the sensor cables.
- If a separate relay cable conduit hole is needed, do not drill or punch hole on hinge side of enclosure due to close proximity of cable connectors.
- The alarm relay has Form C dry contacts, and is rated 10 A @ 240 VAC or 8 A @ 24 VDC. (dry contacts require external power connection)
- The alarm relay is normally energized. It will de-energize to the alarm state upon sensor alarm, fault or loss of power. (continuity between NC and C upon sensor alarm, fault or loss of power)
- The alarm relay has a status LED to show the state of the relay. During normal operation, the green status LED is on, indicating the relay is energized.

### Stand-Alone and Feed-Through Applications

The GasGuardian EM terminates the gas sensor's 4/20 mA signal, and re-transmits the 4/20 mA signal to another analog input device such as gas detection controller or plant PLC. If no connection is made to the signal output terminal, the unit will act as a stand-alone device.

### Feed-through application wiring specifications:

- Maximum input impedance: 700 Ohms
- Cable recommendations: 20/3 shielded cable (Belden #8772 or equivalent).
- Length of cable should not exceed 1,500 feet.

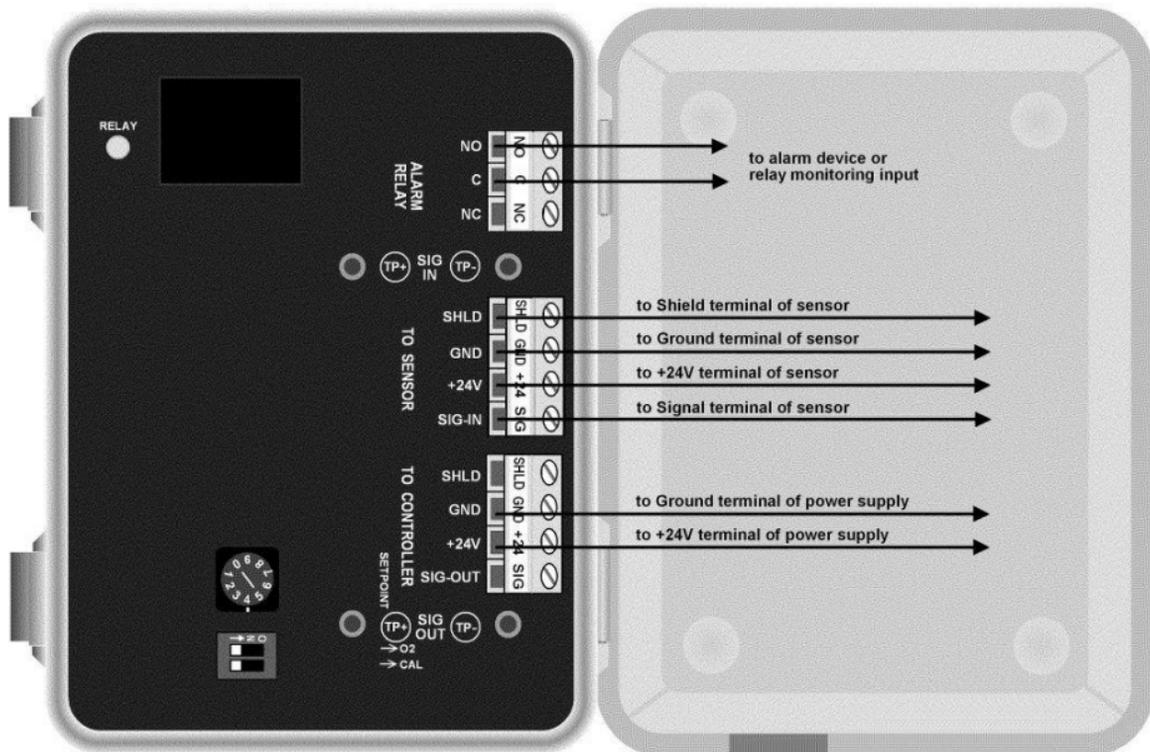


Figure 2: Wiring Diagram (Stand-Alone application)

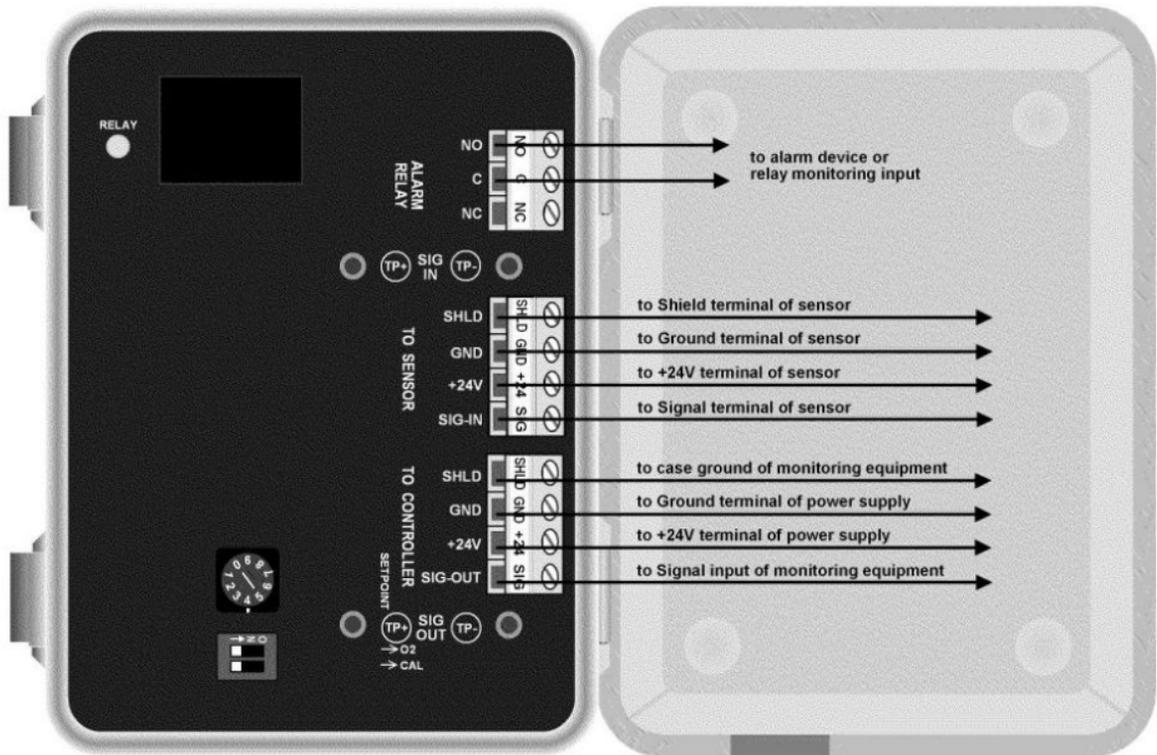


Figure 3: Wiring Diagram (Feed-Through application)

## Operation

### Sensor Range Label

The GasGuardian EM is shipped with various range labels. If the range of the sensor is not the default range of 0/100 ppm, select the proper range label and affix it over the default label.

### 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 GasGuardian EM until the initial start-up procedures are completed.

Refer to sensor manual for proper warm-up time of sensor prior to any sensor test.

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 the sensor to calibration or test gas.
- 2) The second person stays at the control unit to determine that the sensor, when exposed to the gas, causes appropriate alarm functions.

### Alarm Setpoint

The GasGuardian EM has one adjustable alarm setpoint. The 10-position rotary switch allows for alarm setpoint adjustments in 10% increments. Once the sensor signal has exceeded the alarm setpoint, the alarm LED will light immediately, and the alarm relay will set after a 10 second time delay. Once the signal has decreased lower than the alarm setpoint, the relay will clear after a 10 second time delay. For oxygen alarm setpoint instructions, see oxygen downscale-alarm mode section on following page.

### Relay/Alarm Test

The relay test function allows for testing of the relay output function without gassing the sensor. To test the relay, put unit into "calibration mode" (see below), and turn the 10-position rotary switch to the "0" setting. After the short time delay, the relay will "set" into the alarm condition. To "clear" the relay, adjust the setpoint to the intended alarm position.

## Calibration Mode

Calibration mode allows for sensor calibration and maintenance without causing external alarm conditions. To activate calibration mode, slide the Cal switch to the on position. To deactivate, slide switch to off position.

In calibration mode, the following conditions apply:

1. The green power LED will flash twice per second
2. The relay will remain locked in the clear, non-alarm condition.
3. The analog output will remain locked at 4 mA.

## Oxygen Downscale-Alarm Mode

The oxygen downscale mode provides downscale alarming for oxygen level monitoring. To activate downscale alarm mode, slide the O2 switch to the on position.

When the unit is set to “downscale” alarm mode, there are two custom settings. For 15-25% range: If the rotary switch is set to position 1, then the setpoint is 11.2 mA (19.5%). For 0-25% range: If the rotary switch is set to position 9, then setpoint is 16.48 mA (19.5%).

## Status LED's

The GasGuardian EM is equipped with the following status LEDs:

**Gas Concentration Bargraph:** The 10-segment yellow LED bargraph will display the gas concentration in 10% increments. Use the tick-marks on the full-scale range label to the left of the display to determine the concentration.

**Power:** The green power LED will remain on solid to indicate power

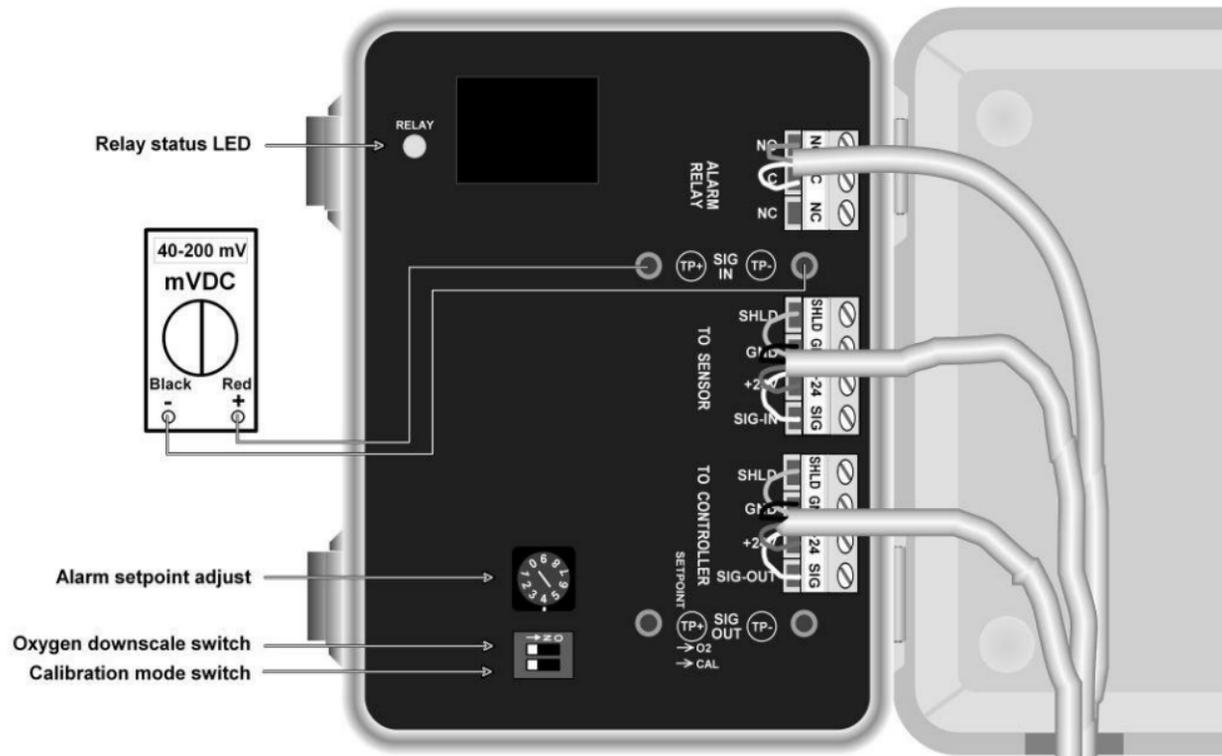
**Alarm:** The red alarm LED will flash once per second during an alarm condition.

**Fault:** The red fault will light and remain on solid in the event of a sensor fault condition. Since the GasGuardian EM is constantly monitoring the sensor signal, any signal below 1 mA will be considered a sensor fault.

**Relay Status:** (see page 10 for LED location) The green relay LED will remain on solid, in the “clear” position, during normal operation.

## Signal Voltage Testpoints

There are two sets of signal testpoints for signal verification and troubleshooting purposes. These signals are measured in mVDC, and range from 40 to 200 mV. The SIG IN testpoints indicate the 4/20 mA signal coming from the sensor. The SIG OUT testpoints indicate the 4/20 mA signal being re-transmitted to another control panel or PLC if used as a feed-through device.

**Figure 4: Components and Operation**

## Maintenance

All gas detection systems should be calibrated with certified calibration gas once every six months. At this interval, all alarm functions and outputs should be tested, verified and documented.

If sensor span or zero cannot be adjusted, refer to the sensor manual. The sensor may be approaching its end of life and may need to be replaced. Keep an operation log of all maintenance, calibrations and alarm events.

To clean the controller, use a mild cleaning solution and soft cloth.

## Specifications

**Power Requirements:** 24 VDC, 125 mA (not including other connected devices).

**Dimensions:** 6.2" high x 4" wide x 3" deep

**Weight:** 1 lb

**Enclosure:** Injection-molded NEMA 4X (IP66) polycarbonate gasketed housing. Hinged lid with (2) latching clasps. For non-classified areas. Rated for outdoors and washdown locations. Anodized aluminum mounting plate.

**Temperature Range:** -40°F to +122°F

**Humidity Range:** 0% to 100% condensing

**Sensor Inputs:** (1) 4/20 mA, 100 Ohm input impedance

**Analog Output:** 4/20 mA (max input impedance: 700 Ohms)

**Relay Outputs:** (1) SPDT relay, Form C dry contacts. 8 A @ 24 VDC or 10 A @ 240 VAC.

**Wiring Connections:** 3 conductor, shielded, stranded, 20 AWG cable (Belden 8772 or equivalent) up to 1500 ft (for sensor and analog output wiring).

**Terminal Block Plugs (Field Wiring):**

26-16 AWG, torque 4.5 lbs-in.

**Visual Status Indications:** (1) Yellow 10-segment LED bargraph gas concentration display. (1) Green power LED. (1) Red alarm LED. (1) Red fault LED. (1) Green relay status LED.

**Certification:**

ETL Listed: Confirms to UL 61010-1

Certified to CSA C22.2 No. 61010-1

# GasGuardian EM

## Operating and Installation Manual

<b>NH<sub>3</sub></b> PPM 250 200 150 100 50	<b>NH<sub>3</sub></b> PPM 300 240 180 120 60	<b>NH<sub>3</sub></b> PPM 500 400 300 200 100	<b>O<sub>2</sub></b> % 25 23 21 19 17	<b>CO</b> PPM 200 160 120 80 40	<b>CO<sub>2</sub></b> % 3.0 2.4 1.8 1.2 0.6	<b>R22</b> PPM 3000 2400 1800 1200 600	<b>R507a</b> PPM 1000 800 600 400 200	<b>R507a</b> PPM 3000 2400 1800 1200 600
<b>NH<sub>3</sub></b> % 1.0 0.8 0.6 0.4 0.2	<b>NH<sub>3</sub></b> % 2.0 1.6 1.2 0.8 0.4	<b>NH<sub>3</sub></b> %LEL 100 80 60 40 20	<b>R404a</b> PPM 1000 800 600 400 200	<b>R404a</b> PPM 3000 2400 1800 1200 600	<b>H<sub>2</sub></b> % 1.0 0.8 0.6 0.4 0.2	<b>H<sub>2</sub></b> PPM 2000 1600 1200 800 400	<b>CO<sub>2</sub></b> % 1.0 0.8 0.6 0.4 0.2	<b>CO<sub>2</sub></b> % 5.0 4.0 3.0 2.0 1.0
<b>NH<sub>3</sub></b> PPM 1000 800 600 400 200	<b>R22</b> PPM 500 400 300 200 100	<b>R404a</b> PPM 500 400 300 200 100	<b>R134a</b> PPM 3000 2400 1800 1200 600	<b>R507a</b> PPM 500 400 300 200 100	<b>H<sub>2</sub>S</b> PPM 50 40 30 20 10	<b>CL<sub>2</sub></b> PPM 5.0 4.0 3.0 2.0 1.0	<b>O<sub>3</sub></b> PPM 1.0 0.8 0.6 0.4 0.2	<b>NO<sub>2</sub></b> PPM 10 8 6 4 2
<b>H<sub>2</sub></b> %LEL 25 20 15 10 5	<b>R134a</b> PPM 500 400 300 200 100	<b>R134a</b> PPM 1000 800 600 400 200	<b>R410a</b> PPM 500 400 300 200 100	<b>O<sub>2</sub></b> % 25 20 15 10 5	<b>R22</b> PPM 1000 800 600 400 200	<b>%LEL</b> 100 80 60 40 20	<b>CH<sub>4</sub></b> %LEL 100 80 60 40 20	<b>H<sub>2</sub></b> %LEL 100 80 60 40 20

Gas/Range labels included with unit

## **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 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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