



**MGS-450**

# Refrigerant Gas Detector

*for Machinery Rooms, Cold Rooms & Freezers*



## Refrigerant Leak Detection

O/N: 1100-2291 | January 2020 Revision 1

**Quick Start  
Guide**

# Languages

This quick start guide has been translated into the following languages: Deutsch, Español, Français, Italiano and Nederlands. To download a translated document, scan here or visit <http://bit.ly/2RSrzur>.



## 1. Introduction

The MGS-450 refrigerant gas detector is designed for use in refrigeration applications and may be used as a standalone device, connected to the MGS-408 controller, or connected to a facility's BMS / BAS. It enables compliance with refrigerant safety codes (*ASHRAE 15 and EN 378*) and features audible and visual alarms to alert personnel in the event of a refrigerant leak.

## 2. Safety Instructions



**DANGER:** The MGS-450 is NOT certified or approved for operation in oxygen-enriched atmospheres. Failure to comply may result in severe injury or death.



**WARNING:** Use this product ONLY for the purposes and under the conditions listed in the user manual. Failure to comply may result in injury and / or damage to the product.



**WARNING:** The MGS-450 has not been designed to be intrinsically safe for use in areas classified as being hazardous locations. For your safety, DO NOT use in hazardous locations.



**WARNING:** Consult a qualified professional before connecting the MGS-450 to devices not mentioned in this manual. Failure to comply may result in injury and / or damage to the product..



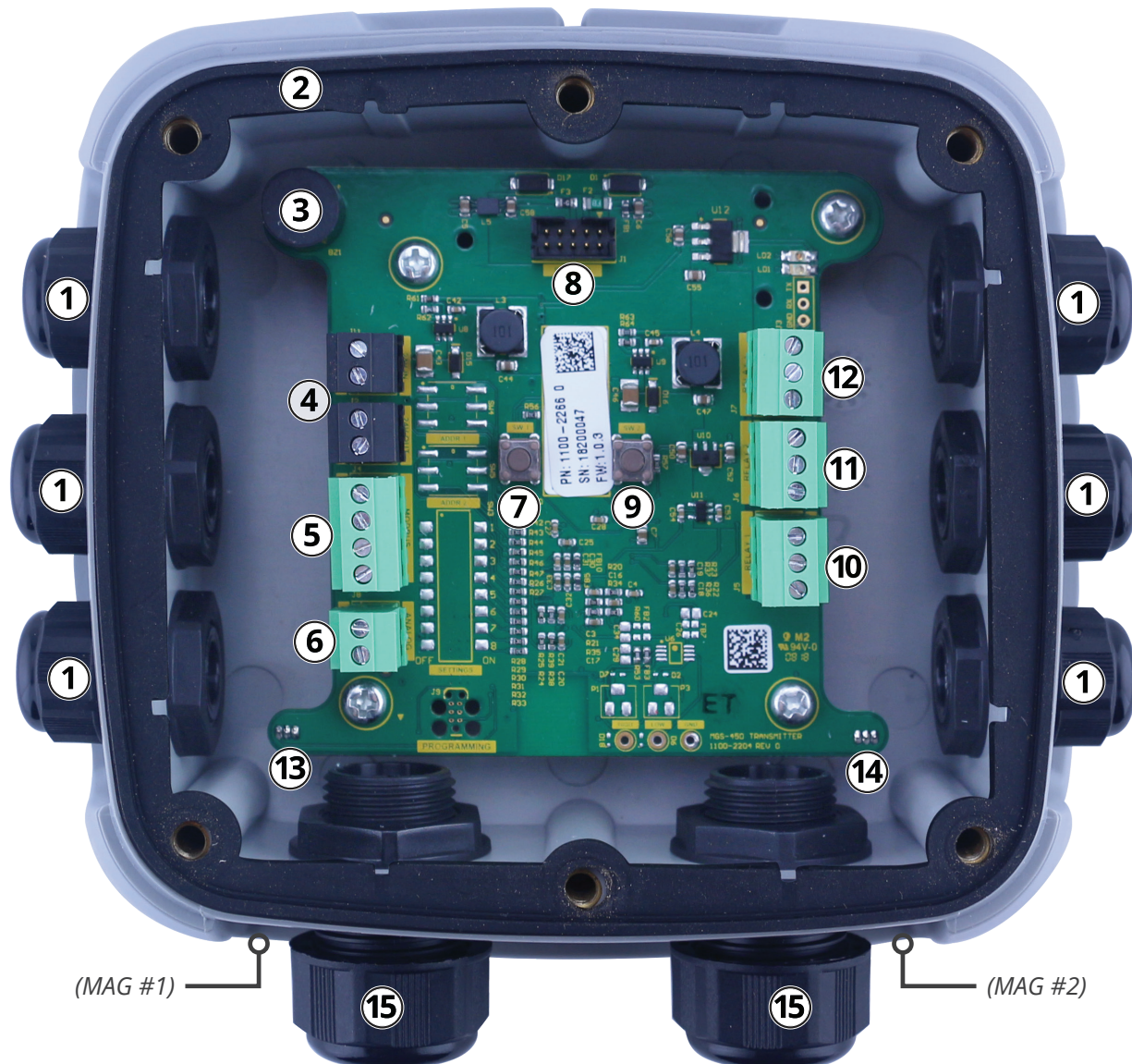
**CAUTION:** Except for the maintenance detailed in this manual, this product should ONLY be opened and / or serviced by authorized personnel. Failure to comply may void the warranty.

**CODE COMPLIANCE:** Comply with all local and national laws, rules and regulations associated with this equipment. Operators should be aware of the regulations and standards in their industry / locality for the operation of the MGS-450.

**TECHNICIAN USE ONLY:** The MGS-450 must be installed by a suitably qualified technician who will install this unit in accordance with these instructions and the standards in their particular industry / locality. This document is only intended as a guide and the manufacturer bears no responsibility for the installation or operation of this unit.

Failure to install and operate the unit in accordance with these instructions and with industry guidelines may cause serious injury or death and the manufacturer will not be held responsible in this regard.

### 3. Component Overview



#	COMPONENT DESCRIPTION
1	M16 Cable Glands (×6)
2	Rubber Gasket ( <i>IP66 Version Only</i> )
3	Internal Alarm Buzzer
4	Power Connections (×2)
5	Digital Connection ( <i>Modbus</i> )
6	Analog Connection
7	Tactile Switch #1
8	Ribbon Cable Connection ( <i>To Sensor</i> )
9	Tactile Switch #2
10	Relay 3 Connection ( <i>FAULT</i> )
11	Relay 2 Connection ( <i>HIGH</i> )
12	Relay 1 Connection ( <i>LOW</i> )
13	Magnetic Switch #1
14	Magnetic Switch #2
15	M20 Cable Glands (×2)

## 4. Product Specifications

<b>Size (H×W×D):</b>	8.3" × 8.9" × 3.4" (210 × 225 × 85 mm)
<b>Weight:</b>	1.05 lbs (480 g)
<b>Indicators:</b>	Multi-color Status LED Internal Alarm Buzzer: 72dB @ 3.9" (10 cm)
<b>Alarm Delay:</b>	Configurable (0 to 15 minutes)
<b>Inputs:</b>	Tactile Switches (×2), Magnetic Switches (×2)
<b>Outputs:</b>	Analog Output: 4 to 20 mA, 0 to 5V, 0 to 10V, 1 to 5V ( <i>default</i> ) or 2 to 10V
<b>Bluetooth®</b>	Bluetooth® Low Energy, BLE 4.2

<b>Modbus:</b>	<p><b>Connection:</b> RS-485 terminal block</p> <p><b>Baud Rate:</b> 9,600 (<i>default</i>) or 19,200</p> <p><b>Data Bits:</b> 8</p> <p><b>Parity:</b> None (<i>default</i>), odd or even</p> <p><b>Stop Bits:</b> 1 (<i>default</i>) or 2</p> <p><b>Retry Time:</b> 500 ms (<i>minimum</i>)</p>
<b>Power Supply:</b>	19.5 to 28.5 VDC or 24 VAC ±20%; 4W
<b>Wiring (Power):</b>	2-core cable, 16 to 28 AWG
<b>Wiring (Relays):</b>	2-core cable, 16 to 28 AWG
<b>Wiring (Modbus):</b>	<b>Recommended:</b> Belden 3106A ( <i>or equivalent</i> ) 3-core, 2 twisted pair + ground, shielded cable with 120 Ω characteristic impedance, 16 to 28 AWG
<b>Enclosure:</b>	<p><b>Material:</b> ABS</p> <p><b>Protection:</b> IP41 or IP66</p>
<b>Temperature:</b>	<p><b>Semiconductor:</b> -40 to 122°F (-40 to 50°C)</p> <p><b>Electrochemical:</b> Ranges vary by gas type and / or concentration, see the MGS-400 User Manual (P/N 1100-2294) for a full list of temperature ranges.</p> <p><b>Infrared:</b> -40 to 122°F (-40 to 50°C)</p> <p><b>Catalytic Bead:</b> -40 to 122°F (-40 to 50°C)</p>
<b>Humidity:</b>	5 to 90% RH, non condensing
<b>Pressure:</b>	23.6 to 32.5"Hg (800 to 1,100 mbar)
<b>Elevation:</b>	0 to 6,560' (2,000 m) altitude

## 5. Installation



**IMPORTANT:** The manufacturer of this product requires that a bump test or calibration be performed following installation to verify instrument functionality.


### STEP 1 | Mount Gas Detector & Remove Lid





**WARNING:** DO NOT allow the lid / sensor to hang from the ribbon cable. Failure to comply may result in damage to the product.


1. Mount the MGS-450 according to the product dimensions, maximum wiring lengths and following considerations:
  - **Environment:** the full range of environmental conditions when selecting a location.
  - **Application:** the specifics of the application (*possible leaks, air movement / draft, etc.*) when selecting a location.
  - **Accessibility:** the degree of accessibility required for maintenance purposes when selecting a location.
  - **Target Gas:** the specific gravity of the target gas when selecting the height of the instrument.
2. Using a 5/32" (4 mm) hex key / allen wrench (not included) remove the lid and disconnect the ribbon cable from the base.
3. Set the lid and rubber gasket (IP66 version only) aside to be reinstalled later


## STEP 2 | Wire Connections

 **WARNING:** Ensure that all wiring connections are made BEFORE applying power.

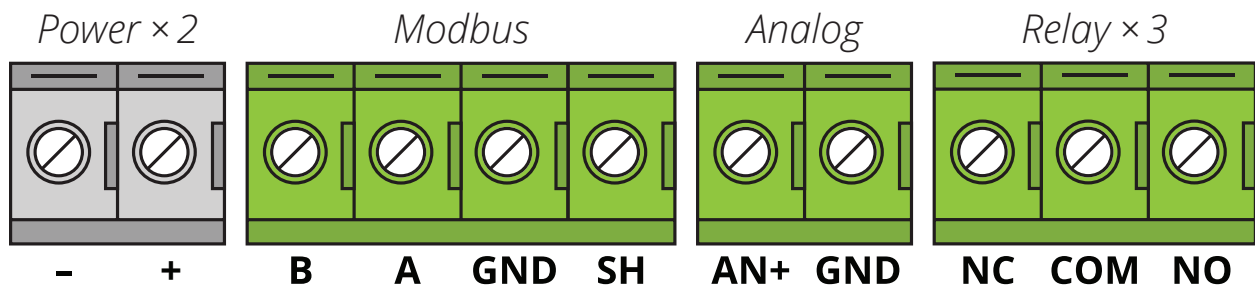
 **WARNING:** Relays are rated for 0 to 30V. DO NOT apply mains power onto these relays.

 **IMPORTANT:** Cable glands are meant to accommodate one cable. DO NOT use cable glands for more than one cable.

 **IMPORTANT:** If analog output is 4 to 20 mA, connect or short the connection to ensure that the gas detector doesn't go into fault.

 **IMPORTANT:** ALWAYS ensure that all cable glands are properly tightened and unused cable glands are plugged.

1. Locate connections (*Power, Analog, Modbus, Relays*) and remove terminal blocks from the PCBA.



2. Remove plugs from the corresponding M16 cable glands and pass the cable through the opening.
3. Secure wires in each terminal block and, pressing firmly, reinstall the terminal block in the PCBA.
4. Remove all excess cable from the housing before firmly securing the cable glands.

## STEP 3 | Reinstall Sensor & Connect Lid



**WARNING:** DO NOT leave excess cable inside of the gas detector housing. Failure to comply may result in damage to the product.

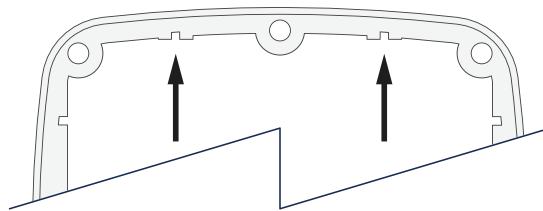


**CAUTION:** When installing the sensor ribbon cable, care must be taken to ensure the proper orientation of the connector at both ends of the cable. Failure to ensure proper orientation may result in loss of functionality and / or product damage.



**IMPORTANT:** To achieve proper seal in the IP66 version, the lid screws should be torqued to 15 to 20 lbf in (1.5 to 2.0 Nm.)

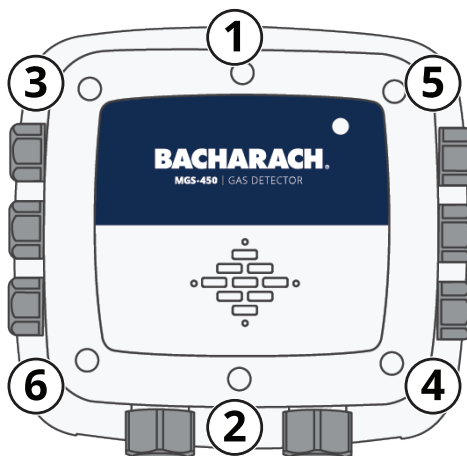
1. Reinstall the rubber gasket (IP66 version only). Ensure that it is correctly seated by placing the side with two grooves face down and the edge with two bumps on the top.



2. Reconnect the ribbon cable from the sensor to the PCBA as shown.



3. Ensure no cables are interfering with the sensor module and close the lid.
4. Using a 5/32" (4 mm) hex key / allen wrench, tighten the lid screws in an "X" tightening pattern:





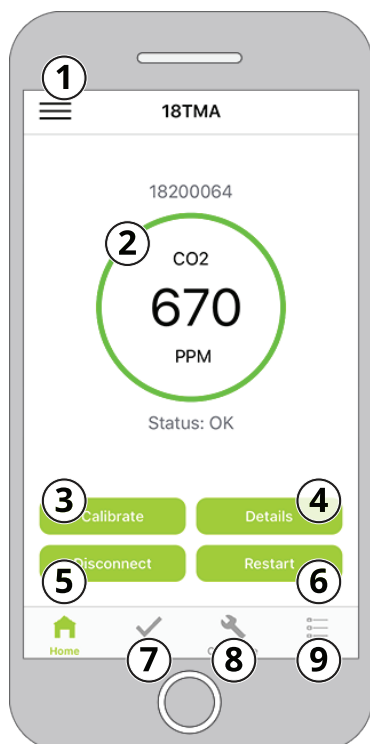
## 6. Connect MGS-450 to MGS-400 App (User Discretion)

The MGS-450 uses a smartphone application to allow users to interface with the gas detector. To download the app, scan here or visit [www.mybacharach.com/apps](http://www.mybacharach.com/apps).



**i** **IMPORTANT:** Default alias, passkey and unlock code can be changed via the MGS-400 App's configuration menu.

1. Enable Bluetooth® discovery by tapping **MAG #1** for 1-second. (After 10-seconds, device will indicate that it is discoverable with audible heartbeat until it has been paired, discovery has timed-out or has been cancelled.)
2. Launch the MGS-400 App and click the Bluetooth® icon at the bottom of the screen to initiate a scan.
3. Select the instrument (default is "18TMA") from the list of available Bacharach gas detectors.
4. When prompted, enter the passkey (default is "123456").
5. Go to configure tab to setup device. When prompted, enter unlock code to access device configuration. (default is "1234")




#	APP DESCRIPTION
1	Main Menu (App Settings)
2	Status (Gas Concentration)
3	Calibrate (Calibration / Bump Test)
4	Details (Instrument Information)
5	Disconnect Bluetooth®
6	Restart Connected Device
7	Test Mode (LED / Buzzer / Relays / Analog Output)
8	Device Configuration
9	Logs


# 7. Operation Overview


STATE	OUTPUT				
	LED	RELAY 1	RELAY 2	RELAY 3	Buzzer
Warm-up		OFF	OFF	OFF	◁
Normal		OFF	OFF	OFF	◁
Low Alarm		ON	OFF	OFF	◁
High Alarm		ON	ON	OFF	◁
Offline		OFF	OFF	OFF	◁
Fault		OFF	OFF	ON	◁
Negative Gas Fault		OFF	OFF	ON	◁
Zero Cal. Fault		OFF	OFF	OFF	◁
Span Cal. Fault		OFF	OFF	OFF	◁


STATE	INPUT			
	MAG #1 TRAP	MAG #1 HOLD	MAG #2 TRAP	MAG #2 HOLD
Warm-up	Enable Bluetooth® Connectivity	—	Disable Bluetooth® Connectivity	—
Normal		Start Zero Cal.		Start Span Cal.
Low Alarm		Mute Buzzer		Ack. Latched Alarm
High Alarm		Mute Buzzer		Ack. Latched Alarm
Offline		—		—
Fault		Mute Buzzer		Ack. Latched Fault
Negative Gas Fault		Mute Buzzer		Start Zero Cal.
Zero Cal. Fault		Ack. Fault		—
Span Cal. Fault		—		Ack. Fault

## 8a. General Calibration Procedure

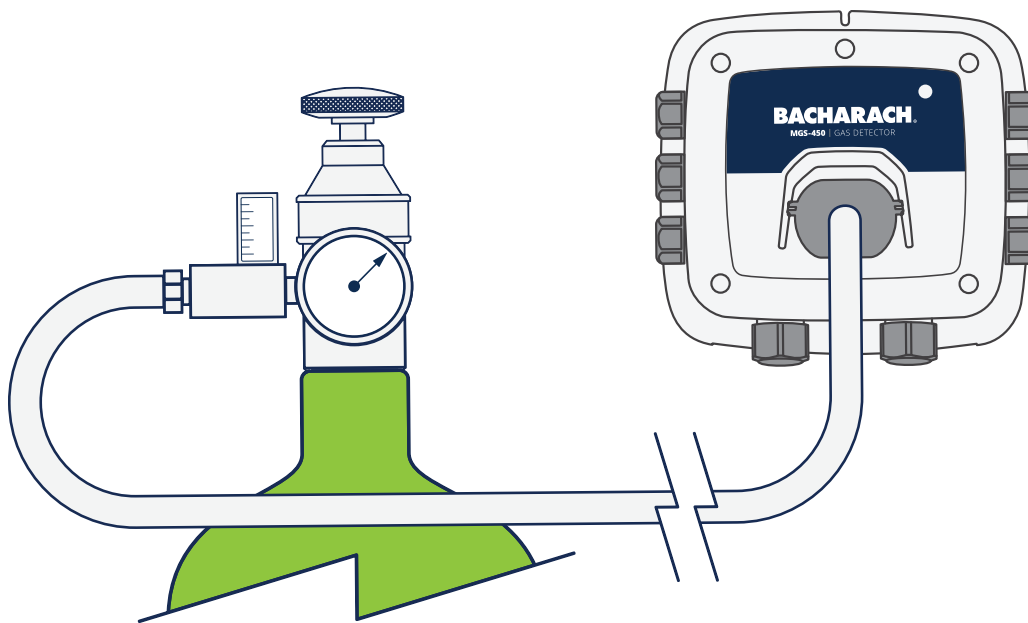
 **WARNING:** The MGS-450 MAY NOT be in an alarm or fault condition during calibration. Acknowledge any alarms or faults BEFORE attempting to begin the calibration process.

 **WARNING:** Except for CO<sub>2</sub> or O<sub>2</sub> sensors, calibration gas must be in a balance of air, not nitrogen (N<sub>2</sub>).

 **IMPORTANT:** Calibration and / or bump testing requires the MGS-400 calibration adapter kit (P/N 6302-9990).

 **IMPORTANT:** At elevations higher than 6,560' (2,000 m), calibration will result in a lower reading. See the MGS-400 User Manual (P/N 1100-2294) for additional information.

1. Fit calibration adapter to the gas detector lid.



2. If using a variable flow regulator, adjust the gas flow to approximately 0.3 L/min.

## 8b. Zero Adjustment



**WARNING:** Except for CO<sub>2</sub> or O<sub>2</sub> sensors, ambient air may be used instead of zero gas if the area is known to be free of the target gas or any gases to which the sensor may be cross-sensitive.

### 3. Begin zero adjustment:

- ▶ **MGS-400 App:** *Home Tab* → *Calibrate* → scan barcode on gas cylinder or manually enter values for zero gas.
- ▶ **Manual:** hold  $MAG\#1$  for >5-seconds. The LED will blink green-green-red when the instrument is ready.

### 4. Apply zero gas (or ambient air per warning above).

### 5. Confirm the start of calibration:

- ▶ **MGS-400 App:** press the *Start Zero* button.
- ▶ **Manual:** tap  $MAG\#1$  within 30-seconds or the instrument will time-out and return to normal operation.

### 6. Complete zero adjustment:

- ▶ **MGS-400 App:** app will countdown to completion. If calibration is successful, proceed to Step 12.
- ▶ **Manual:** the LED will blink green-red, green-red-red, green-red-red-red, etc. until calibration is complete. To abort, hold  $MAG\#1$  for >5-seconds, turn off gas flow and remove the calibration adapter. If calibration is successful (*green LED*), proceed to Step 12. If calibration is unsuccessful (*LED blinks orange @ 2 Hz*), tap  $MAG\#1$  to discard the calibration attempt and see the MGS-400 User Manual (P/N 1100-2294) for troubleshooting.

### 7. Turn off gas flow from zero gas.

### 8. Replace zero gas with calibration gas in preparation for span adjustment.

## 8c. Span Adjustment

### 9. Begin span adjustment:

- ▶ **MGS-400 App:** scan barcode on gas cylinder or manually enter values for calibration gas.
- ▶ **Manual:** hold  $MAG\#2$  for >5-seconds. The LED will blink green-green-orange when the instrument is ready.

### 10. Apply calibration gas at the concentration listed on the cal gas concentration label (located on top of the instrument).

Part Number  
Serial Number  
Sensor Type  
Max Range



### 11. Confirm the start of calibration:

- ▶ **MGS-400 App:** press the *Start Span* button.
- ▶ **Manual:** tap MAG#2 within 30-seconds or the instrument will time-out and return to normal operation.

### 12. Complete span adjustment:

- ▶ **MGS-400 App:** app will countdown to completion. If calibration is successful, proceed to Step 18.
- ▶ **Manual:** the LED will blink green-orange, green-orange-orange, green-orange-orange-orange, etc. until calibration is complete. To abort, hold MAG#2 for >5-seconds, turn off gas flow and remove the calibration adapter. If calibration is successful (*LED blinks green-orange-red*), proceed to Step 18. If calibration is unsuccessful (*LED blinks orange @ 2 Hz*), tap MAG#2 to discard the calibration attempt and see the MGS-400 User Manual (P/N 1100-2294) for troubleshooting.

### 13. Turn off gas flow from calibration gas and remove the calibration adapter.

### 14. Allow sensor to recover / stabilize before the instrument returns to normal operation (*green LED*).

## 9. Bump Test

**i IMPORTANT:** The manufacturer of this product requires that a bump test or calibration be performed following installation to verify instrument functionality.

1. **Connect adapter and gas cylinder according to the instructions in the General Calibration Procedure.**

2. If desired, disable / silence external annunciators (e.g., shutdown valves, notification of authorities, etc.):
  - ▶ **MGS-400 App:** *Home Tab* → *Calibrate* → *Bump* → toggle *Take Offline* to disable communications to external devices.
  - ▶ **Manual:** Inform building personnel of test so that external devices can be disabled / silenced.
3. Apply a sufficiently high concentration of the target gas to trigger alarms, but NOT pure refrigerant or hydrocarbons (e.g., do not use a butane lighter).
4. Once thresholds have been exceeded, relays should activate, digital outputs should transmit the gas concentration and:
  - ▶ **MGS-400 App:** gas concentration should be displayed, the instrument status should be "Low Alarm" or "High Alarm" and alarms states should be "On."
  - ▶ **Manual:** LED status should display "Low Alarm" or "High Alarm."
5. Turn off gas flow and remove the calibration adapter.
6. Allow sensor to recover / stabilize before the instrument returns to normal operation (*green LED*).

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