MRLDS 450 Gas Detector

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Safety Instructions

Emerson devices are manufactured according to the latest U.S. and European Safety Standards. Emphasis has been placed on the user's safety. Safety icons are explained below and safety instructions applicable to the products in this bulletin are grouped on Page 3. These instructions should be retained throughout the lifetime of the device. **You are strongly advised to follow these safety instructions.**

Safety Icon Explanation

⚠ **DANGER**	**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠**WARNING**	**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠**CAUTION**	**CAUTION,** used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	**NOTICE** is used to address practices not related to personal injury.
CAUTION	**CAUTION,** without the safety alert symbol, is used to address practices not related to personal injury.
🔥**FLAMMABLE**	**FLAMMABLE,** Fire hazard! Sparking in a potentially explosive atmosphere! Explosion hazard!

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Instructions Pertaining to Risk of Electrical Shock, Fire, or Injury to Persons

⚠ WARNING	**PLEASE READ BEFORE USING THIS MANUAL** • This manual is part of the product and should be kept near the instrument for easy and quick reference. • The instrument shall not be used for purposes different from those described hereunder. It cannot be used as a safety device. • Check the application limits before proceeding. • Emerson reserves the right to change the composition of its products, even without notice, ensuring the same and unchanged functionality.
⚠ WARNING	**SAFETY PRECAUTIONS** • Verify that the supply voltage is correct before connecting the instrument. • Do not expose the gateway to water or moisture: use the devices only within the operating limits avoiding sudden temperature changes with high atmospheric humidity to prevent formation of condensation. • Warning: disconnect all electrical connections before any kind of maintenance. • Fit the transmitter where it is accessible by the End User for troubleshooting and replacement. The instrument must not be opened. • In case of failure or faulty operation send the instrument back to the distributor or to "Emerson" (see address) with a detailed description of the fault. • Cable glands are meant to accommodate one cable. Do not use cable glands for more than one cable. • If the analog output is 4-20mA, connect or short the connection to ensure that the gas detector does not go into fault. • Always ensure that all cable glands are properly tightened, and unused cable glands are plugged.

Safety Statements

•   The MRLDS-450 is NOT certified or approved for operation in oxygen-enriched atmospheres. Failure to comply may result in severe injury or death.

•   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.

•   The MRLDS-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.

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

•   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.

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Introduction

Emerson's MRLDS-450 (modular refrigerant leak detection system) Gas Detection Series instruments continuously monitor ambient air (indoor or outdoor) for the following gas types:

- Refrigerants
- Oxygen
- Toxic

This device makes compliance with refrigeration safety codes simple and easy, saving time and money on equipment and installation. Users can commission and maintain their gas detection system without the need for specialty training tools. Pre-calibrated sensor modules simplify maintenance, takes minutes to exchange and do not require the use of calibration gas. The MRLDS-450 sensors can trigger additional audio-visual alarms and act as a standalone gas detection system or can be easily integrated into a BMS via Modbus RTU interface. It enables compliance with refrigerant safety codes (ASHRAE 15 and EN378) and alarms to alert personnel in the event of a refrigerant leak.

1. Device Interface

2. MRLDS 450 Design Features

- Transmitter: IP66 rated ABS enclosure
- Power Options: 24VAC, 19.5 to 28.5 VDC
Diagnostic/Status LED (3 color): Green, Orange, and Red
- Configurable output signal options:
  a. 3x Relays (high alarm/low alarm/fault)
  b. 1x Analog Output (4 to 20mA, 0 to 5V, 0 to 10V, 1 to 5V, 2 to 10V)
  c. Digital Output (Modbus RTU signal)

Bluetooth communication allows for full instrument configuration, initiation of calibration, bump test and

functional test mode and viewing of status information via the corresponding MRLDS 400 iOS/Android app. Non-intrusive magnetic wand can be used to initiate calibration of the device.

3. Installation

3.1 Mounting

⚠ CAUTION 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 MRLDS 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" (4mm) hex key/allen wrench (not included), remove the lid and disconnect the ribbon cable from the base.

3. Set the lid and rubber gasket aside to be reinstalled later.

3.2 Wiring Connections

⚠ CAUTION Ensure wiring for relays and connections for sensor(s) are made before applying power.

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

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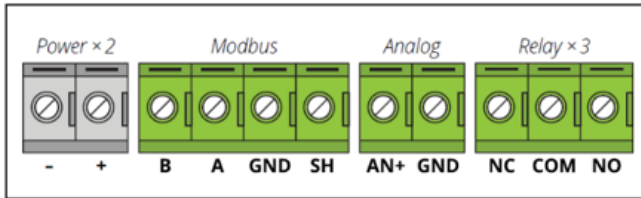
2. Remove plugs from the corresponding M16 cable glands and pass the cable through the opening.

3. Secure the 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.

5. Secure wires in each terminal block and, pressing firmly, reinstall the terminal block in the PCBA.

6. Remove all excess cable from the housing before firmly securing the cable glands.

3.3 Re-installing the sensor and lid

⚠ CAUTION Do not leave excess cable inside the gas detector housing. Failure to comply may result in damage to the product.

1. Reinstall the rubber gasket. Ensure that it is correctly seated by placing the side with two grooves face down and the edge with two bumps on the top.
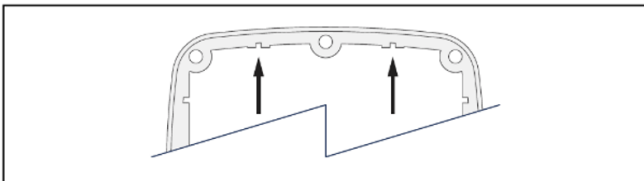
2. Reconnect the ribbon cable from the sensor to the PCBA.

3. Ensure no cables are interfering with the sensor module and close the lid.

4. Using a $^5/_{32}$" (4mm) hex key/allen wrench, tighten the lid screws in an X tightening pattern:

4. Supervisor/E2 Network Setup

The MRLDS 450 can communicate with the E2 Enhanced with a firmware version of 4.10F01 and above and with the Supervisor at or beyond firmware version 2.12F01. This gas detector is connected to the E2 with a straight polarity while in reverse with the Supervisor. For Modbus end-of-line termination, use a 150-Ohm resistor or termination block P/N 537-2711. Do not use MRLDS 120-Ohm on-board termination with the Supervisor or E2. Wiring diagrams are reflected on Figures X and X.

• For 24VAC installations sharing a transformer in a daisy-chain configuration, the neutral polarity must be maintained for all instruments.

• DC power supply polarity must not be reversed.

• For a more robust system, a dedicated transformer for each MRLDS is recommended to prevent damage caused by wiring errors.

• Securely fasten screw terminals.

5. MRLDS 400 App

The MRLDS 450 uses a smartphone application called MRLDS 400 to allow users to interface with the gas detector.

1. Enable Bluetooth® discovery by tapping MAG#1 (magnetic switch 1) for one second using the magnetic wand supplied with the sensor. (After 10 seconds, the device will indicate that it is discoverable with audible heartbeat until it has been paired, discovery has timed-out or has been cancelled.)

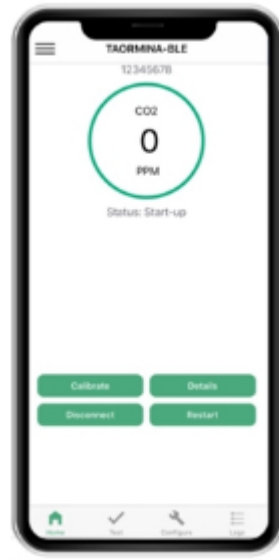2. Launch the MRLDS 400 app and click the Bluetooth® icon at the bottom of the screen to initiate a scan.

3. Select the instrument (default is 18TMA) from the list of available gas detectors.

4. When prompted, enter the passcode.

• The default value is 123456

5. Go to Configure tab to set the device up. When prompted, enter unlock to access device configuration (default 1234).

5.1. MRLDS 400 App Test Outputs (Check icon)

Note: When you enable this function, the MRLDS 450 will be offline from the supervisor controller (E2 or Supervisor) to avoid nuisance alarms.

In this screen, you will be able to test the functionality of the sensor's outputs and capabilities such as the LED state, relays, and analog outputs. Follow the steps below to be guided.

1. Activate this function by tapping the button beneath the Output Test Enable title.

Output Test Enable
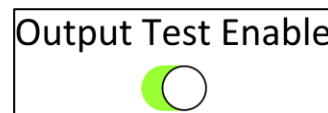
2. First, you can test the LED by flicking on the indicated tabs representing the colors Green, Red, and Orange. The LED color should change depending on what you activate.

LED	Off	Green	Red	Orange

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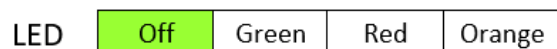
3. You may also test the activation of the buzzer and the three relays by tapping the buttons available for each:
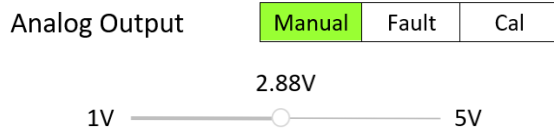
Buzzer

Relay 1

Relay 2

Relay 3

4. And finally, you can test the functionality of the analog output by choosing to manually set the value of the output or indicate a fault or calibration condition.

Analog Output

Manual	Fault	Cal

2.88V

1V ———————○——————— 5V

5.2. MRLDS 400 App Configuration (Wrench icon)

With the MRLDS 400 mobile app, the user may configure values such as the device name, passcodes, as well as how to restore to factory settings. The following steps will discuss how each is done.

Instrument Alias:
1. To set the Alias, go to Configure tab then to Alias.
2. Enter the new Alias then select OK once done.

MODBus Unlock Code:
1. Go to Configure tab then to Modbus Unlock Code.
2. Enter the new code then select OK once done.

Bluetooth Passcode:
3. Go to Configure tab then to Bluetooth Code.
4. Enter the new code then select OK once done.

Set Device to Factory Settings:
1. Go to Configure tab then to Reset to Factory Default.

2. Select OK once done.
3. The device should restart and re-initialize with default settings.

5.2.1. Configure Tab: Alarms

Users may also designate the alarm set points through the app. The following steps will discuss how it is done.

Low Alarm Set point:
1. Go to Alarm tab then to Low Alarm Set point.
2. Enter the desired value then select OK once done. Anytime the reading goes below this set point, a Low Alarm will be triggered.

High Alarm Set point:
3. Go to Alarm tab then to High Alarm Set point.
4. Enter the desired value then select OK once done. Anytime the reading goes above this set point, a High Alarm will be triggered.

Alarm Latching:
Note: If enabled, this function allows the fault condition of the sensor to remain even after returning to normal conditions.
1. Go to Alarm tab then to Alarm Latching.
2. Choose to Enable/Disable as needed.
3. Select OK once done.

5.2.2. Configure Tab: MODBus

Users may also configure the MODBus setup of the device through the app.

From the MODBus tab, enter/choose the values for the following:

- (MODBus) Address – Values can be set from 1 to 247.

- Baud Rate – Can be either 9600 or 19200.

- Stop Bits – Can be 1 or 2.

- Parity – Can be set to None, Odd, or Even.

5.2.3. Configure Tab: Outputs

In this tab, users may configure the analog output parameters. The steps below details how each value is set.

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Analog Output Range

1. Go to Outputs tab then to Analog Output Range.
2. Choose from the available range options (1-5V/0-10V/2-10V/4-20mA).

Alarm Buzzer

1. Go to Alarm tab then to Buzzer.
2. Choose to Enable/Disable as needed.

Relay Failsafe

Note: The function sets relay operations during power failures.

1. Go to Outputs tab then to Relay Failsafe.
2. Choose to Enable/Disable as needed.

Alarm Delay

1. Go to Outputs tab then to Alarm Delay.
2. Enter the alarm delay value in minutes.
3. Select OK once done.

5.3. MRLDS 400 App Logs (List icon)

This part of the app lists down all the fault indications logging all the details available. This log can be cleared by tapping the Clear button at the bottom.

6. Calibration Procedure

⚠ CAUTION Apart from CO2 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.

Notes:

- The MRLDS 450 may not be in an alarm or fault condition during calibration. Acknowledge any alarms or faults before attempting to begin the calibration process.
- Except for CO2 or O2 sensors, the calibration gas must be in a balance of air, not nitrogen (N_2).
- Calibration and/or bump testing requires the MRLDS 450 calibration adapter kit (809-1090).
- At elevations higher than 6,560 feet (2,000 meters), calibration will result in a lower reading. See the MRLDS 450 user manual (026-1316) 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.
3. Begin zero adjustment:
- MRLDS 400 App: Home tab > Calibrate > scan the barcode on the gas cylinder or manually enter the values for the zero gas.
- MRLDS 450 Device: Using the magnetic wand, push and hold MAG#1 (Magnetic switch 1) for more than 5 seconds. The LED will blink green twice and then to red indicating that the instrument is ready.
4. Apply the zero gas or ambient air.
5. Confirm the start of calibration:
- MRLDS 400 App: Press the Start Zero button
- MRLDS 450 Device: With the wand, tap MAG#1 within 30 seconds or the instrument will time-out and return to normal operation.
6. Complete zero adjustment:
- MRLDS 400 App: The app will start a countdown for the calibration. If calibration is successful, proceed to step 12.
- MRLDS 450 Device: The LED will blink into different color combinations until the calibration is complete. To abort, hold MAG#1 for more than 5 seconds, turn off gas flow and remove the calibration adapter. If calibration is successful (green LED is lit up), proceed to step 12. If calibration is unsuccessful (LED blinks twice second), tap MAG#1 to discard the calibration attempt and refer to the MRLDS 450 user manual (026-1316) for troubleshooting.
7. Turn off the gas flow from the zero gas.
8. Replace the zero gas with calibration gas in preparation for span adjustment.
9. Begin span adjustment:

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- MRLDS 400 App: Scan the barcode on the gas cylinder or manually enter the values of the calibration gas.
- MRLDS 450 Device: Hold MAG#2 (magnetic switch 2) for more than 5 seconds. The LED will blink green twice then orange to indicate that the instrument is ready.
10. Apply the calibration gas at the concentration listed on the calibration gas concentration label (located on top of the instrument).
11. Confirm the start of calibration:
- MRLDS 400 App: Press the Start Span button.
  MRLDS 450 Device: Tap MAG#2 within 30 seconds or the instrument will time out and return to normal operation.
12. Complete span adjustment:
- MRLDS 400 App: The app will start a countdown for the calibration. If calibration is successful, proceed to step 13.
- MRLDS 450 Device: The LED will blink into different color combinations until the calibration is complete. To abort, hold MAG#2 for more than 5 seconds, turn off the gas flow and remove the calibration adapter. If calibration is successful (LED blinked from green to orange to red), proceed to step 13. If calibration is unsuccessful (LED blinks orange twice per second), tap MAG#2 to discard the calibration attempt and refer to the MRLDS 450 user manual (026-1316) for troubleshooting.
13. Turn off the gas flow from the calibration gas and remove the calibration adapter.

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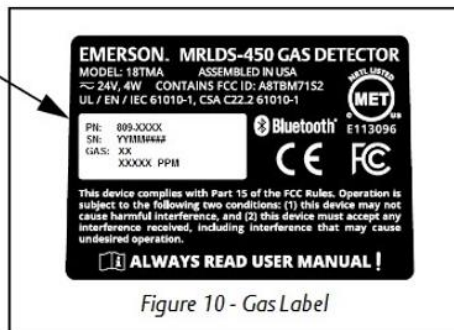

Figure 10 - Gas Label

Note: If the magnetic wand is unavailable and you cannot operate the magnetic switches, you may choose to use the tactile switches located inside the module. The manner of operating them follows closely how the magnetic switches are activated: by pressing or holding the switches.

7. Bump Test

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

1. Connect the adapter and gas cylinder according to the instructions in the General Calibration procedure.
2. If desired, disable/silence the external annunciators (for example, shutdown valves, notification of authorities, etc.):
- MRLDS-400 App: Home Tab > Calibrate > Bump > Toggle *Take Offline* to disable communications to external devices.
- Manually: Inform the building personnel when conducting tests 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 Butane lighters).
4. Once thresholds have been exceeded, relays should activate, digital outputs should transmit the gas concentration and:

MRLDS 400 App: Gas concentration should be displayed; the instrument status should be Low Alarm or High Alarm and the alarm state should be on.

MRLDS 450 Device: LED status should display Low Alarm or High Alarm.
5. Turn off gas flow and remove the calibration adapter.
6. Allow the sensor to recover/stabilize. The LED should turn green to indicate that it is in normal operation.

8. Troubleshooting

The MRLDS-450 Gas Detector by default has the analog output configured to 4-20mA. One of the features of the 4-20mA analog output is to alarm the sensor when

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an open-loop is detected on the 4-20mA circuit. If the +24VDC power is connected and the circuit is energized, the MRLDS-450 will detect an open-loop fault and alarm if:

• The 4-20mA circuit is not connected before the sensor is powered, or

• A jumper is not installed and tightened onto the analog output terminal block Procedure To avoid the open-loop fault on power up, the 4-20mA circuit can be deployed (wiring and configured to BMS or other) or install a jumper on the analog output terminal block as shown in Figure 5.

The fault can also be cleared by changing the Analog Output to a voltage (0-5V, 1-5V, 0-10V or 2-10V).

9. General Guidelines and More Information

For more information about the MRLDS 450, you may access the Emerson website, refer to the manuals listed below, or contact your Application Engineer.

- MRLDS 450 Quick Start Guide
- MRLDS 450 Cutsheet
- MRLDS 400 Google Play Store
- MRLDS 400 App Store

Figure 1 Component Overview
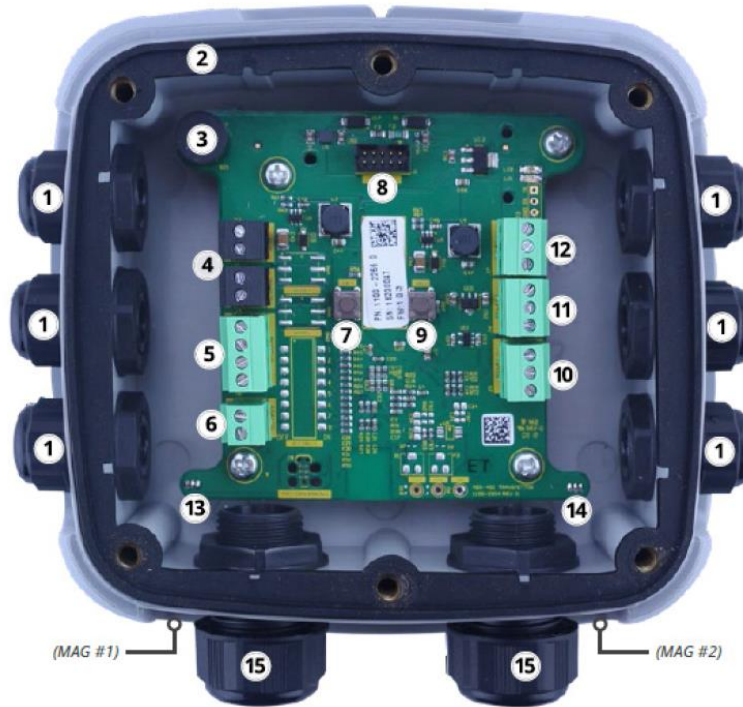
Table 1 Component Description

Item No.	Component Description
1	M16 Cable Glands (x6)
2	Rubber Gasket
3	Internal Alarm Buzzer
4	Power Connections (x2)
5	Digital Connection (Modbus)
6	Analog Connection
7	Tactile Switch #1
8	Ribbon Cable Connection (To Sensor)
9	Tactile Switch #2
10	Relay 3 Connection (FAULT)
11	Relay 2 Connection (HIGH)
12	Relay 1 Connection (LOW)
13	Magnetic (Mag) Switch #1
14	Magnetic (Mag) Switch #2
15	M20 Cable Glands (x2)

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Table 2 Technical Specifications

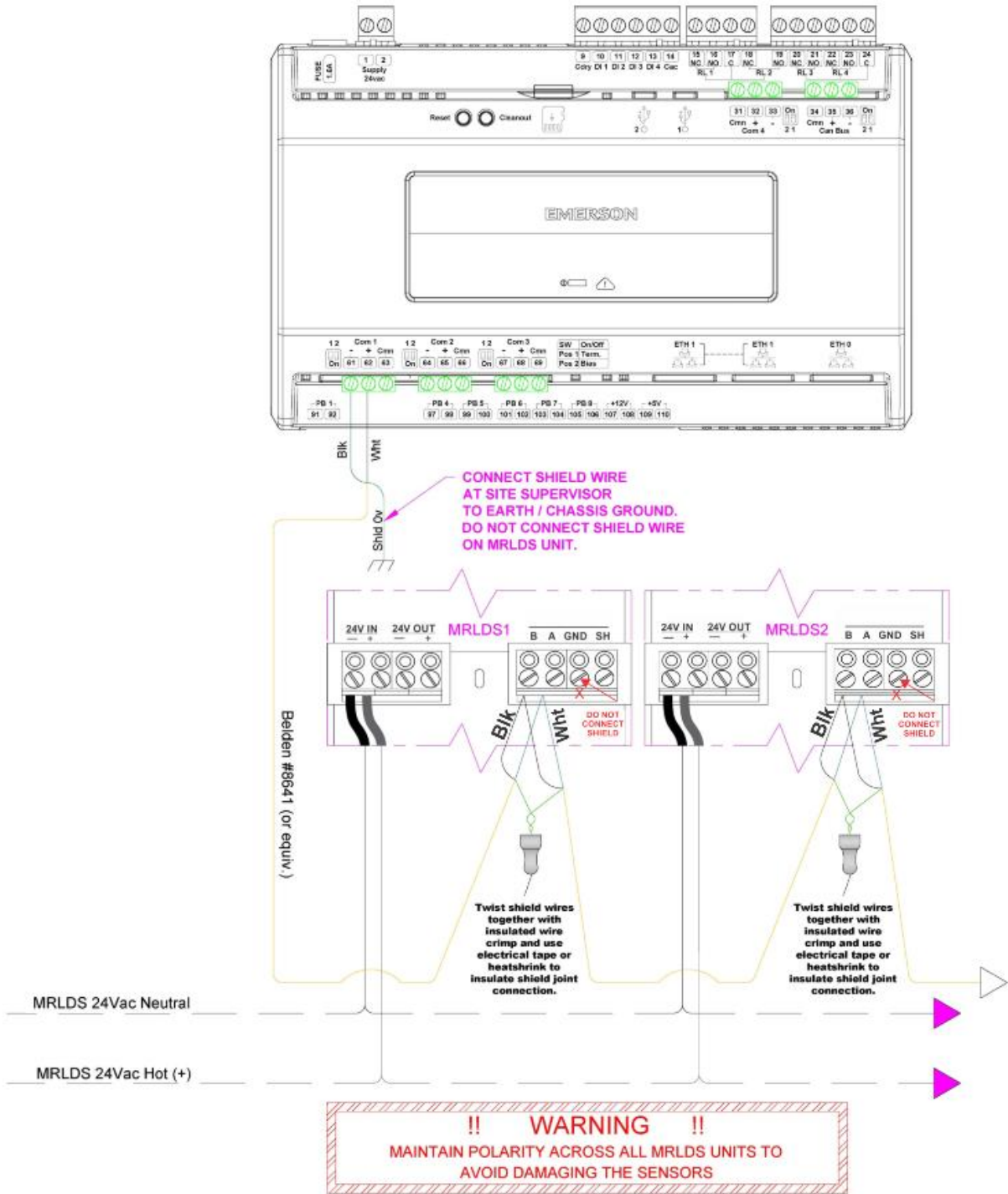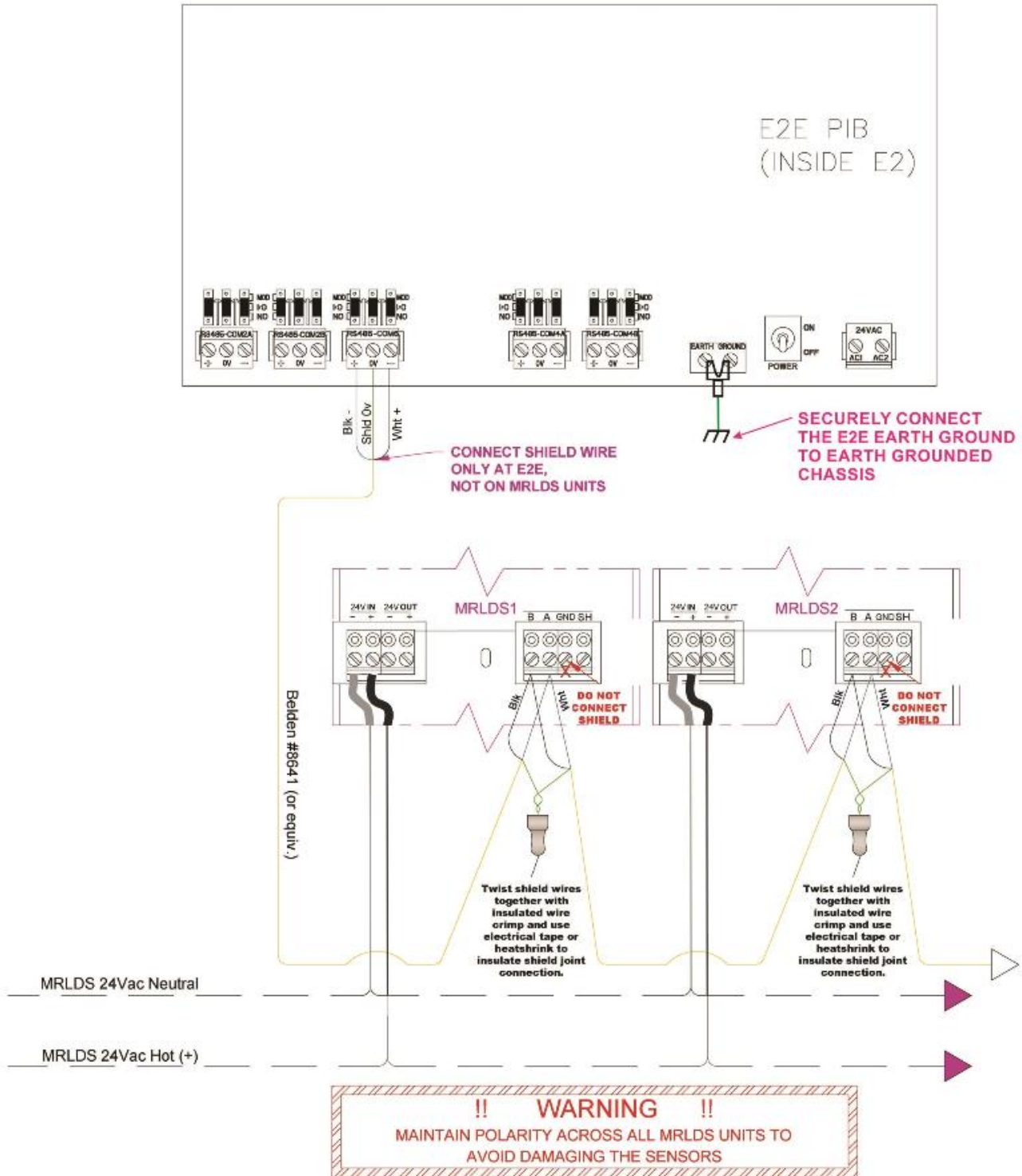| Description	Specifications
Size (HxWxD)	6.5"x6.5"x3.4" (165x165x87mm)
Weight	1.05 lbs (480g)
Indicators	Multi-color Status LED Internal Alarm Buzzer: 72dB @ 3.9" (10cm)
Alarm Delay	Configurable (0 to 15 minutes)
Inputs	Tactile Switches (x2), Magnetic Switches (x2)
Outputs	Analog Output: 4 to 20 mA, 0 to 5v, 0 to 10v, 1 to 5v, (default) or 2 to 10v
Bluetooth®	Bluetooth® Low Energy, BLE 4.2
Modbus	Connection: RS485 terminal block Baud Rate: 9600(default) or 19200 Data Bits: 8 Parity: None (default), odd, or even Stop Bits: 1 (default) or 2 Retry Time: 500 ms (minimum)
Power Supply	19.5 to 28.5Vdc or 24Vac +/- 20%; 4W
Wiring (Power)	2-core cable, 16 to 28 AWG
Wiring (Relays)	2-core cable, 16 to 28 AWG
Wiring (Modbus)	Recommended: Belden 3106A (or equivalent) 3-core, 2 twisted pair + ground, shielded cable with 120 Ohm characteristic impedance, 16 to 28 AWG
Enclosure	Material: ABS Protection: IP66
Temperature	Semiconductor: -40°F to 122°F (-40°C to 50°C) Electromechanical: Ranges vary by gas type and/or concentration, see the MRLDS 450 user manual (026-1316) for the full list of temperature ranges. Infrared: -40°F to 122°F (-40°C to 50°C) Catalytic Bead: -40°F to 122°F (-40°C to 50°C)
Humidity	5 to 90% RH, non-condensing
Pressure	23.6 to 32.5"Hg (800 to 1,100 mBar)
Elevation	0 to 6,560 ft (2000m) altitude

Figure 2 Supervisor to MRLDS 450 Communication

CONNECT SHIELD WIRE
AT SITE SUPERVISOR
TO EARTH / CHASSIS GROUND.
DO NOT CONNECT SHIELD WIRE
ON MRLDS UNIT.

Belden #8641 (or equiv.)

DO NOT CONNECT SHIELD

Twist shield wires together with insulated wire crimp and use electrical tape or heatshrink to insulate shield joint connection.

MRLDS 24Vac Neutral

MRLDS 24Vac Hot (+)

!! WARNING !!
MAINTAIN POLARITY ACROSS ALL MRLDS UNITS TO
AVOID DAMAGING THE SENSORS

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Figure 3 E2 to MRLDS 450 Communication

Figure 4 MRLDS 400 App Interface

Table 3 MRLDS 400 App Interface (Descriptions)

Item No.	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

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Figure 5 Open Loop Fault Troubleshooting

MRLDS 450 with lid removed

Analog Output

Analog Output terminal block removed with jumper and installed jumper

MRLDS 450 analog output details with jumper installed on terminal block

Analog output terminal block installed with jumper

Ensure that the terminals are tightened down onto the jumper securing it in place before reinstalling the analog output terminal block.

Placing a jumper on the analog output terminal block and placing the sensor under +24VDC power will not harm the sensor.

If choosing to place the jumper on the analog output to avoid an open loop fault, remember that the jumper will need to be removed in the future when deploying the 4-20mA circuit. Not removing the jumper will cause the 4-20mA circuit to be unresponsive; i.e., no output.

Table 4 MRLDS 400 App Interface (Outputs Status)

State	LED Status	Relay1	Relay2	Relay3	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	◁
Special Cal. Fault	🟠	OFF	OFF	OFF	◁

Table 5 MRLDS 400 App Interface (Inputs Status)

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 Buzzer
High Alarm		Mute Buzzer		Ack. Latched Buzzer
Offline		---		---
Fault		Mute Buzzer		Ack. Latched Buzzer
Negative Gas Fault		Mute Buzzer		Start Zero Cal.
Zero Cal. Fault		Ack. Fault		---
Special Cal. Fault		---		Ack. Fault

Table 6 Order Information

NOTICE	The type of the sensing element of the MRLDS 450 varies depending on the refrigerant it will be monitoring. This table reflects the part number, refrigerant description, and the sensor types.

Part #	Description	Sensor Type
809-1040	MRLDS-450, CO2 0-5,000ppm	IR
809-1041	MRLDS-450, CO2 0-10,000ppm	IR
809-1047	MRLDS-450, R404A 0-1,000ppm	SC
809-1048	MRLDS-450, R407A 0-1,000ppm	SC
809-1049	MRLDS-450, R410A 0-1,000ppm	SC
809-1050	MRLDS-450, R22 0-1,000ppm	SC
809-1056	MRLDS-450, R448A 0-1,000ppm	SC
809-1058	MRLDS-450, R513A, 0-1000 ppm	SC
809-1066	MRLDS-450, R422D 0-1,000ppm	SC
809-1068	MRLDS-450, R449A 0-1,000ppm	SC
809-1140	CO2, 0-5,000ppm, Replacement Sensor	IR
809-1141	CO2, 0-10,000ppm, Replacement Sensor	IR
809-1147	R404A 0-1,000ppm, Replacement Sensor	SC
809-1148	R407A 0-1,000ppm, Replacement Sensor	SC
809-1149	R410A 0-1,000ppm, Replacement Sensor	SC
809-1150	R22 0-1,000ppm, Replacement Sensor	SC
809-1156	R448A 0-1,000ppm, Replacement Sensor	SC

809-1158	R513A 0-1,000ppm, Replacement Sensor	SC
809-1166	R422D 0-1,000ppm, Replacement Sensor	SC
809-1168	R449A 0-1,000ppm, Replacement Sensor	SC
809-1190	Calibration Adapter Kit	N/A
809-1191	Horn + Strobe 24VDC; blue lens	N/A
809-1192	Horn + Strobe 24VDC; amber lens	N/A
809-1193	Horn + Strobe 24VDC; red lens	N/A
809-1194	Horn + Strobe; blue lens; MP120K 120VAC adapter	N/A
809-1195	Horn + Strobe; amber lens; MP120K 120VAC adapter	N/A
809-1196	Horn + Strobe; red lens; MP120K 120VAC adapter	N/A

Table 7 Sensor Maintenance and Lifetime

Sensor Type	Maintenance Interval	Typical Sensor Lifetime
Infrared	12 months	5-7 years
Semiconductor	6 months after commissioning 12 months thereafter	4-6 years
Electrochemical	12 months	2-3 years
Catalytic Bead	Zero calibration 1-3 months Span calibration 6 months	5-7 years

Table 8 AO Concentration Equivalent

Gas Concentration	1-5V	0-5V	2-10V	0-10V	4-20mA
0%	1V	0V	2V	0V	4mA
50%	3V	2.5	6V	5V	12mA
100%	5V	5V	20V	10V	20mA

Table 9 AO Values during Special States

Mode of Operation	1-5V	0-5V	2-10V	0-10V	4-20mA
Instrument Fault	≤0.3V	N/A	≤0.6V	N/A	≤1.2mA
Offline Mode	0.75V	N/A	1.5V	N/A	3mA
Drift Below Zero	0.95V	N/A	1.9V	N/A	3.8mA
Normal Operation	1-5V	0-5V	2-10V	0-10V	4-20mA
Reading Out of Range	5.12V	5.12V	10.25V	10.25V	20.5mA
Fault on Analog Interface	>5.2V	>5.2V	>10.5V	>10.5V	>21mA