MRLDS-450
IP41 & IP66 Refrigerant Gas Detection

1. INTRODUCTION

The MRLDS-450 refrigerant gas detector is designed for use in refrigeration applications, it may be used as a stand-alone device or connected to a facility's building management system (BMS). It enables compliance with refrigerant safety codes (ASHRAE 15 and EN378) and features audible and visual alarms to alert personnel in the event of a refrigerant leak.

The complete MRLDS-450 manual is available to download scanning the QR code at the end of this Quick Refence Guide, or at the address: https://webapps.emerson.com/Dixell/Pages/Manuals

1.1   Safety Instructions

ℹ️	**IMPORTANT:** Before using this product, carefully read and strictly follow the instructions in the manual. Ensure that all product documentation is retained and available to anyone operating the instrument.
⚠️	**DANGER:** This instrument is neither certified nor approved for operation in oxygen-enriched atmospheres. Failure to comply may result in personal injury or death.
⚠️	**WARNING:** Use this product only for the purposes specified in this document and under the conditions listed.
⚠️	**WARNING:** This instrument has not been designed to be intrinsically safe for use in areas classified as being hazardous locations. For your safety, <u>DO NOT</u> use it in hazardous *(classified)* locations.
⚠️	**WARNING:** In the event of an alarm or over-range condition, the sensor must be recalibrated to ensure continued accuracy.
⚠️	**WARNING:** This product must be recalibrated if installed in a non-room condition environment *(i.e. temperature or humidity extremes)*.
⚠️	**WARNING:** The gas diffusion path can become occluded *(moisture, dust, debris, frozen condensation)* over time resulting in reduced or complete lack of gas detection and alarming function. Routine visual inspection of the gas detector and bump testing are suggested to ensure proper gas detection and alarm function.
⚠️	**CAUTION:** Except for maintenance detailed in this manual, these products should only be opened and / or serviced by authorized technical personnel. Failure to comply may void the warrant.
⚠️	**CAUTION:** Operator assumes responsibility for complying with all laws, rules and regulations governing the use of this product.
⚠️	**CAUTION:** Use only genuine parts and accessories. Failure to comply may impair the operation of the product and / or void the warranty.
⚠️	**CAUTION:** Only operate the product within the framework of a risk-based alarm signaling concept.

2. PRODUCT DESCRIPTION

2.1 Intended Uses / Applications

MRLDS-400 gas detectors are to be installed in non-classified, non-hazardous, permanent locations for the purpose of continuously monitoring ambient air *(indoor or outdoor)* for the following gas types:
- Refrigerants
- Oxygen
- Toxic and combustible gases

⚠ **WARNING:** This instrument is neither certified nor approved for operation in oxygen-enriched atmospheres. Failure to comply may result in EXPLOSION.

⚠ **WARNING:** This instrument has not been designed to be intrinsically safe for use in areas classified as being hazardous locations. For your safety, DO NOT use it in hazardous *(classified)* locations.

⚠ **WARNING:** It is possible to identify this instrument as a safety device only evaluating the final application and location, which defines the relevant local laws, applicable standards and required technical characteristics; therefore, the evaluation of the MRLDS-450 as a safety device will be ultimately assessed by the customer / installer.

2.2 Transmitter Construction

MRLDS-400 gas detectors may be purchased in the following configurations:

Enclosure	IP41	IP66
Relays	3	3
Communication	Modbus	Modbus
Output	Analog	Analog
Sensor	Integrated	Integrated

2.3 Technical Specifications

Category	Specifications	
Signals to Central Controller	Analog Current	Normal operation:... 4 to 20 mA
		Drift below zero:... 3.8 mA
		Measuring range exceeded:................................. 20.5 mA
		Instrument fault:... ≤ 1.2 mA
		Fault on analog interface:.................................... > 21 mA
		Offline mode/Maintenance signal:....... 3 mA steady signal
Signals to Central Controller	Analog Voltage	0 to 5V; 1 to 5V; 0 to 10V; 2 to 10V *(selectable)*. During fault condition, 1 to 5V and 2 to 10V outputs are 0V.
	Modbus RTU over RS-485	Baud rate:............................ 9,600 or 19,200 *(selectable)*
		Start bits:.. 1
		Data bits:.. 8
		Parity:.................................. None, odd, even *(selectable)*
		Stop bits:.. 1 or 2 *(selectable)*
		Retry time:.................... 500 ms, min time between retries
		End of message:............................... Silent 3.5 characters
Power Supply and Relays	Operating Voltage	19.5 to 28.5 VDC; 24 VAC ± 20%, 50/60 Hz
	Inrush Current	1.5 A
	Operating Current, Max.	4W, 170mA @ 24VDC
	Relay Rating	3 SPDT 1A at 30 VAC/VDC, resistive load
	Audible Alarm	Internal Buzzer ≥72 dB at 4" *(10 cm)*
	Alarm Delay	0 to 15 minutes *(selectable)*
Wiring	Power and Analog Signal	2-core shielded cable, 16 to 20 AWG *(0.5 to 1.5 mm^2)*
	Modbus Network	3-core, 2 twisted pair + ground, shielded cable with 120 Ω characteristic impedance, 16 to 24 AWG *(0.2 to 1.5mm^2)*
	Cable Gland	M20, 10-14mm cable outer diameter M16, 4-8mm cable outer diameter

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Physical Specifications	Enclosure Protection	IP41 / IP66
	Enclosure Size (W×H×D) (Approx.)	MRLDS-450 IP41: 6.5× 6.5×3.0" (165×165×77 mm) MRLDS-450 IP66: 6.5×6.5×3.4" (165×165×87 mm)
	Weight (Approx.)	1lb, 1oz (480 g)
Environmental	Temperature	- 40 to 120 ºF (-40 to 50 ºC)
	Storage Temperature	- 5 to 100 ºF (-20 to 40 ºC)
	Humidity	5 to 90 %RH, non-condensing (15 to 90 %RH, non-condensing, EC sensors excl. O2)
	Sensors	See paragraph Sensor Specifications for detailed information.
	Influences	For influences on the measurement performance and restrictions of a particular sensor see sensor data sheet.
Agency Approvals		CE, EN 50270:2015, UL/CSA/IEC/EN 61010-1

2.4   Components

⚠️ **CAUTION:** This product uses semiconductors which can be damaged by electrostatic discharge (ESD). When handling the printed circuit boards (PCBs), observe proper ESD precautions so that the electronics are not damaged.

2.4.1 MRLDS-450 Components

#	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)

Table 1 - Component Descriptions

Figure 2 - Component Locations

3. INSTALLATION

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

3.1 Mechanical Installation

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

1. Using the provided hardware, securely mount the MRLDS-400 gas detector according to the product dimensions, maximum wiring lengths and following considerations:
    a. Environment: the full range of environmental conditions when selecting a location.
    b. Application: the specifics of the application *(possible leaks, air movement / draft, etc.)* when selecting a location.
    c. Accessibility: the degree of accessibility required for maintenance purposes when selecting a location.
    d. 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-rated enclosures only)* aside to be reinstalled later.

3.2 Electrical Installation

3.2.1 Safe Connection of Electrical Devices

WARNING: Before connecting this instrument to electrical devices, consult the manufacturer or a qualified professional. Failure to comply may result in injury and / or damage to the product.

3.2.2 Preparations

IMPORTANT: Analog output is configured for 4 to 20 mA output by default. The MRLDS-450 have a jumper on the analog connection. This jumper MUST be removed to use the analog 4 to 20mA output signal. If the jumper is removed AND the 4 to 20mA signal is not used, the unit will go into fault. The analog output is designed as sourcing.

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

CAUTION: This product uses semiconductors which can be damaged by electrostatic discharge *(ESD)*. When handling the printed circuit boards *(PCBs)*, observe proper ESD precautions so that the electronics are not damaged.

3.2.3 Power & Signal Wiring

1. Locate the relevant connections *(Power, Analog, Modbus)* and remove the terminal block from the PCBA. *(The PCB terminal blocks are pluggable type and may be removed to aid termination).*

2. Remove plugs from the corresponding M16 cable glands.
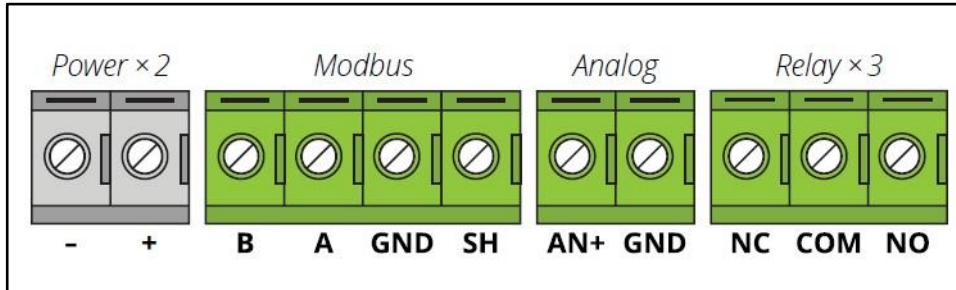
- The product comes with cable glands and plugs pre-installed. *(The power entry cable gland is shipped from the factory without a plug.)*

3. Using the appropriate cable glands, insert wires into the enclosure.
4. Secure the wires in each terminal block and, pressing firmly, reinstall the terminal block into the PCBA.
   - Polarity must not be reversed.
   - For 24 VAC installations in a daisy-chain configuration, the neutral polarity must be maintained for all instruments.
5. Remove all excess cable from the housing before securing the cable glands.

3.2.4 Relay Wiring

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

1. Locate the relevant connections *(Relay 1, Relay 2, Relay 3)* and remove the terminal block from the PCBA.
2. Remove plugs from the corresponding M16 cable glands.
3. Using the appropriate cable glands, insert wires into the enclosure.
4. Secure the wires in each terminal block and, pressing firmly, reinstall the terminal block into the PCBA.
5. Remove all excess cable from the housing before securing the cable glands.

3.3 Reinstall Sensor and Connect Lid

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

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

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.
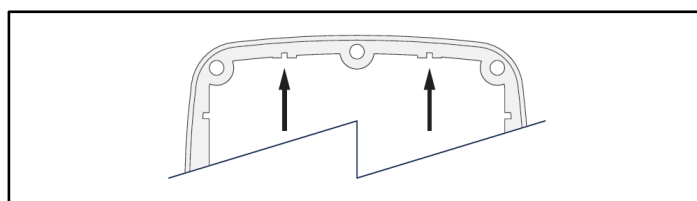
Figure 4 - Rubber Gasket Placement

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:

Figure 5 - Tightening Pattern

4. OPERATION

4.1   Status Indication

The MRLDS-400 gas detectors provide external indication of their current operational state via audible and visual feedback. *(MRLDS-450 gas detectors also provide relays outputs.)* Visual indication of the instrument status is provided by a single tri-color LED *(Green / Red / Orange)* as indicated below:

State	LED	Buzzer	Relay 1 *(LOW)*	Relay 2 *(HIGH)*	Relay 3 *(Fault)*
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

4.2   Switch Functions

User interaction with the MRLDS-400 gas detector is accomplished through the use of two magnetic switches located on the bottom of each unit. To actuate a magnetic switch *(referred to as MAG#1 or MAG#2)*, apply the supplied magnetic wand to the relevant switch location as indicated below:

Depending on the duration the switch is held, a short "TAP" or long "HOLD" will be detected:
- To carry out a tap function, tap the relevant switch location for 1 second, until a single "chirp" is heard, remove wand to confirm a "TAP."
- To carry out a hold function, do not remove the magnetic wand after the first chirp but continue to hold for >5 seconds, until a double "chirp" is heard, remove wand to confirm a "HOLD."
- If either switch is held for >30s, a stuck switch fault will be indicated.

To interact with the instrument without use of the magnetic wand, two internal push button tactile switches may be used. Remove lid without removing ribbon cable to access. Internal switches TACT#1 and TACT#2 mirror the functions of MAG#1 and MAG#2.

The function of each switch depends on the current state of the instrument as indicated in the following table:

State	Switch 1 (Tap)	Switch 1 (Hold)	Switch 2 (Tap)	Switch 2 (Hold)
Warm-up		-		-
Normal		Start Zero Calibration		Start Span Calibration
Low Alarm		Mute Buzzer		Ack. Latched Alarm
High Alarm	Enable Bluetooth® Connectivity	Mute Buzzer	Disable Bluetooth® Connectivity	Ack. Latched Alarm
Offline		-		-
Fault		Mute Buzzer		Ack. Latched Fault
Negative Gas Fault		Mute Buzzer		Start Zero Calibration
Zero Cal. Fault		Acknowledge Fault		-
Span Cal. Fault		-		Acknowledge Fault

4.3   Reset System to Factory Default Settings

To reset system to factory defaults, remove lid and hold TACT#1 and TACT#2 simultaneously for 30 seconds. Instrument will restart to confirm factory reset. Alternatively, see Section 4.2.3.4 "Reset to Factory Defaults", for instructions on resetting instrument configuration via the MRLDS-400 App.

4.4   MRLDS-400 Smartphone Application

To download the MRLDS-400 App, visit either the App Store or Google Play.
The companion smartphone application allows users to perform a variety of functions to configure and interact with the MRLDS-400 gas detector, including:

- View real-time measurements
- Configure instrument
- Test outputs
- Calibrate / bump test instrument
- Generate customizable calibration certificates

4.4.1 Enable Bluetooth® Connection

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 MRLDS-400 App and click the Bluetooth® icon at the bottom of the screen to initiate a scan.
3. Select the instrument from the list of available gas detectors.
    - MRLDS-450 default alias is "18TMAE"
4. When prompted, enter the passkey *(default is "123456").*

⚠️ **WARNING:** Default alias, passkey and unlock code can be changed via the MRLDS-400 App's configuration menu. Default values should be changed after instrument installation for security purposes.

4.4.2 Checking Status

Current instrument status can be viewed from the Home tab, including the following:
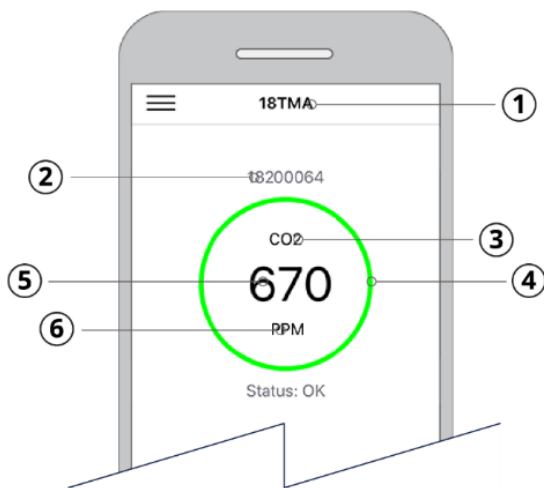
#	Description
1	**Alias** - user configured instrument name
2	**Serial Number** - instrument 8 digit serial number
3	**Gas** - gas type currently detected by instrument
4	**Status Ring** - provides visual indication of various instrument states *(expanded on below)*
5	**Live Measurement** - current measurement in given measurement units
6	**Measurement Unit** - displayed measurement unit *(PPM / PPB / %LEL / %VOL)*

The color code of the Status Ring is shown in the next page.

State	Status Ring	Description
Warm-up	Green	Gas detector stabilizing after power on or restart
Normal	Green	Normal operation
Low Alarm	Yellow	Gas measurement has exceeded low alarm setpoint
High Alarm	Red	Gas measurement has exceeded high alarm setpoint
Offline	Orange	Gas Detector in maintenance mode and is not actively monitoring gas
Fault	Orange	A fault has been detected
Negative Gas Fault	Orange	Gas detector calibration has drifted below zero, requires zero calibration
Zero Cal. Fault	Orange	Error occurred during zero calibration. Zero calibration has not be updated. Zero calibration required.
Span Cal. Fault	Orange	Error occurred during span calibration. Span calibration has not be updated. Span calibration required.

4.4.3 Instrument Configuration

For security, access to configuration and calibration options are restricted to authorized users only. Access to these functions require use of an unlock code. To unlock instrument configuration:

- Configure Tab ➔ When prompted, enter unlock code to access device configuration. *(The instrument's default code is "1234")*. Instrument will remain unlocked until Bluetooth® connection has ended.

WARNING: Default alias, passkey and unlock code can be changed via the MRLDS-400 App's configuration menu. Default values should be changed after instrument installation for security purposes.

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