



Excellence Since 1953



WR Series Refrigerant Detector

INSTRUCTION AND MAINTENANCE MANUAL (IOM)

SAFETY PRECAUTIONS

Please read this manual carefully before installing, operating, or maintaining the equipment.

- Pay particular attention to all warnings and cautions.
- Installation and operation must strictly comply with all applicable local electrical standards.
- Any internal operations on the WR Series must be performed by trained personnel only.
- Before opening the WR housing, disconnect the power supply to reduce the risk of igniting hazardous gases.
- Never open the junction box/housing or replace components when hazardous gases may be present.
- The detector must be properly earthed (grounded) to prevent external electromagnetic interference. There is one grounding point inside the unit and one outside. Ensure all shields are reliably grounded at the controller star-ground point or at the sensor ground point — but NOT at both simultaneously, as this creates a ground loop which can cause measurement inaccuracies.
- Some sensors may contain corrosive solutions. Take special care when replacing them.
- Never disassemble sensors without Winters' authorisation.
- Do not expose the sensor to temperatures outside the recommended range.
- Do not expose the sensor to organic solvents or flammable liquids.
- When the sensor reaches end of life, dispose of it safely in accordance with local waste management and environmental regulations, or return it to our company for centralised safe disposal.

INFORMATION NOTICES

The following alert types are used throughout this manual:

WARNING:

Identifies any danger or unsafe condition that could cause serious accidents, personal injury, or death.

CAUTION:

Identifies any danger or unsafe condition that could cause personal injury or product/property damage.

NOTE:

Identifies useful or supplementary information.

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Our company is committed to continuous improvement and innovation. We are dedicated to enhancing product performance and sincerely welcome any constructive feedback regarding errors or omissions in this manual.

PRODUCT OVERVIEW

The WR Series industrial and commercial refrigerant leak sensor (hereafter referred to as “detectors”) are designed for on-site measurement of refrigerant gas concentrations.

The detector uses infrared remote control for programming and control, and outputs a standard 4–20mA signal proportional to gas concentration. The product features a 4-digit LED display that ensures clear readability in bright sunlight and at low temperatures down to -40°C / -40°F . It includes a power-reverse protection circuit.

The detector uses a modular design that can be freely disassembled to facilitate: hot-swappable sensor replacement; cable routing and terminal connections; operation/maintenance; and installation of accessories. The product includes built-in audible and visual alarm output interfaces.

The detector housing is made of die-cast aluminium and fitted with one M20 cable entry. All wiring is completed via terminals inside the detector housing. The top cover of the housing can be removed for wiring or other safe operations.

TECHNICAL SPECIFICATIONS

- Alarm Settings: Two-level alarm — Low-limit alarm point: 25% FS; High-limit alarm point: 50% FS.
- Alarm Output: Relay normally-open contact output; rated output 3A/220VAC, 3A/24VDC. Relay action can be programmed to activate on fault, low-limit alarm, or high-limit alarm.
- Display: 4-digit ultra-bright LED display.
- Full-scale accuracy: $\pm 5\%$ FS.
- Signal Output: 4–20mA (fault output: 0mA; over-range alarm output: 22mA).
- Alarm Indication: Optical alarm via 3 LEDs — Normal: green LED flashes once every 3 seconds. Alarm: red LED flashes continuously (low-limit: 1Hz; high-limit: 2Hz). Fault: yellow LED flashes continuously at 1Hz.
- Operating Voltage: 18–28VDC.
- Power Consumption: $\leq 3\text{W}$.
- Mounting: Fixed installation.
- Operating Temperature: -40°C to 70°C / -40°F to 158°F .
- Humidity Range: 10–95%RH (non-condensing).
- Storage Temperature: -25°C to 55°C / -13°F to 131°F .
- Pressure Range: 86 kPa – 108 kPa.
- Sensor Service Life: ≥ 2 years (Product Warranty is 1yr).

STRUCTURE

The WR Series detector consists of a main housing, a sensor, and a sensor cover. The housing is primarily composed of a base shell, a top cover, an O-ring seal, and cable entry components. The housing provides protection and environmental sealing. The sensor consists of the gas sensing circuit and its outer casing, connected to the housing by a potted/encapsulated joint.

Standard accessories:

- WR Series Gas Detector — 1 unit
- Product User Manual — 1 copy
- Certificate of Conformity — 1
- Dedicated blanking plug for detector cable entry — 1

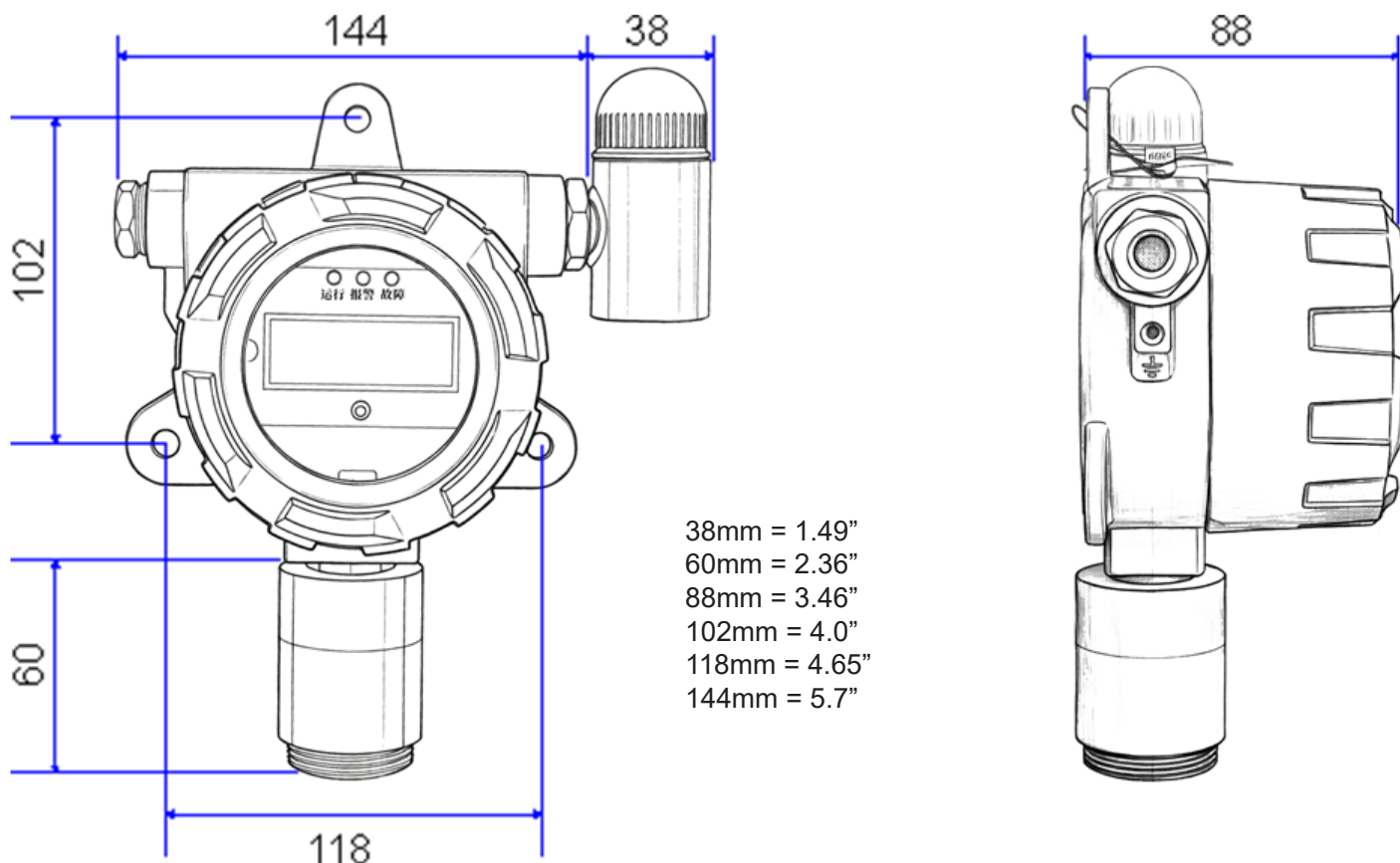
Optional accessories:

- Remote Control — WRPJRC
- Expansion bolts or U-bolt mounting bracket — WRM42

⚠ WARNING: The infrared remote control must only be used in safe (non-hazardous) areas. Do not bring it into explosion-proof locations

INSTALLATION

Detector dimensions and mounting layout:



Detector Mounting Dimensions

Installation Location:

In accordance with the applicable national standards, for indoor spaces of moderate size, detectors should be positioned evenly based on the protection radius — i.e., within 3-4m / 9.8-13.1ft horizontal distance from a potential leak point, or within 6-8 m / 19.69-26.25 ft between two detectors. For large indoor spaces or areas with extensive ventilation, outdoor-style placement practices may be followed, but detectors should not be installed where air movement is excessively strong.

Select installation locations at potential leak points or areas where gas tends to accumulate. It is recommended to install within 1m / 3.281 feet of a probable gas leak source (above or below depending on gas type) to ensure faster sensor response. Also consider airflow velocity and direction, relative positions of potential leak sources, and ventilation conditions when determining the installation location. The location must also be accessible for maintenance and calibration.

Note: Do NOT install the detector directly on heat sources or vibration sources.

For outdoor installations, position detectors based on leak source locations and ensure they are placed downwind of the leak point. The installation height should be within 1.5m / 4.921ft of the likely leak location, based on the density of the target gas (installation near walls is also an option as gas can accumulate there). If the required installation height cannot be met outdoors, fabricate a suitable mounting bracket.

Installation Method:

When mounting the detector, the gas sensor must face downward to prevent dust or rainwater from accumulating on or entering the sensor. The installation location of each detector should normally be recorded. Adjust the mounting bracket and fix the detector to a wall or to a horizontal or vertical pipe/column of 50–80 mm / 1.969-3.150 in diameter.

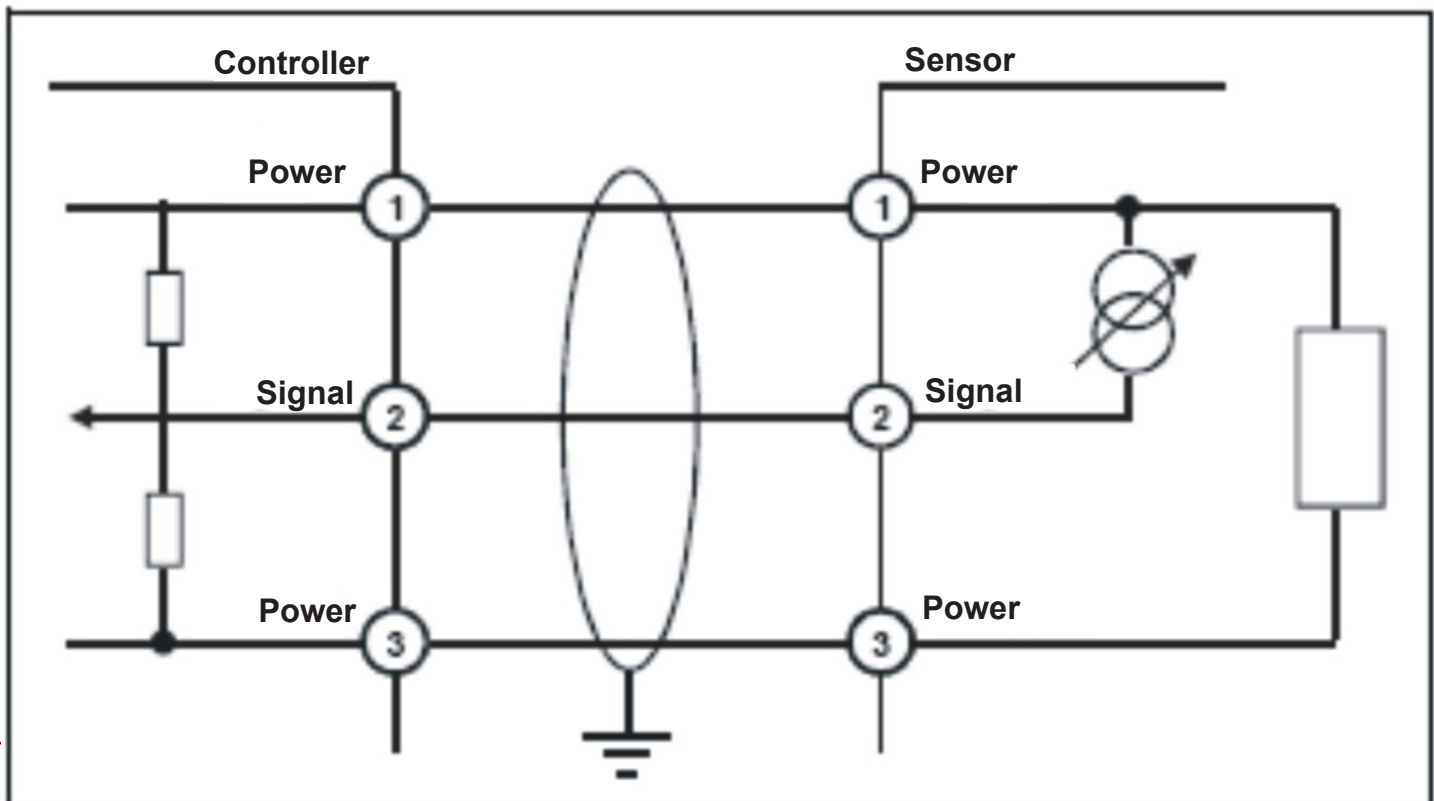
WIRING

Cable Selection

The detector power supply must be between 18–30VDC. Due to voltage drop caused by cable resistance, ensure the minimum supply voltage at the detector terminals is 18VDC.

Recommended cable types include RVV (or KVV) PVC-insulated PVC-sheathed control cable, or RVVP (or KVVP) PVC-insulated PVC-sheathed shielded control cable — both 3-core shielded. Connect the cable shield to the controller housing and ground it. When using unshielded RVV cable, run it through a metal conduit and connect the conduit to the controller housing for grounding. At the detector end, the shield can be connected to the grounding post on the detector housing. Note: ensure single-end grounding for both the detector and the controller. Minimum cable outer diameter: 6.8 mm / 0.268 in. The detector has internal and external earth points; the earth conductor cross-section must equal the power cable cross-section.

Refer to the wiring diagram below for connecting the controller to the detector:



Maximum Cable Length

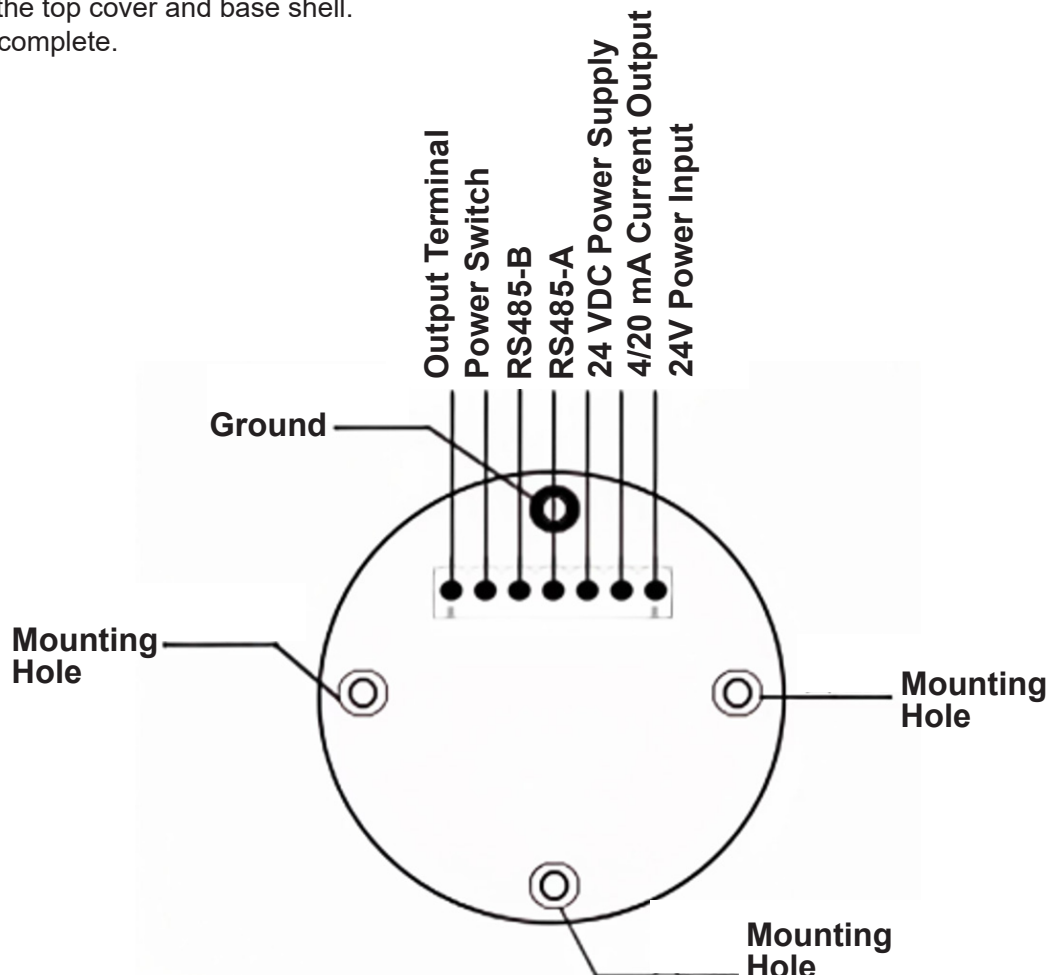
- The detector and controller are in a one-to-one correspondence. Once installed and commissioned, do not swap them.
- Maximum distributed capacitance and distributed inductance of the transmission cable must not exceed 0.2 μF and 0.3 mH respectively.
- The WR Series detector maximum signal transmission distances are shown below:

Table 2 - Maximum Cable Transmission Distances

Cable Cross-Section	Max. Transmission Distance
0.75 mm ² / 0.0012 in ²	500 m / 1,640.4 ft
1 mm ² / 0.0016 in ²	700 m / 2,296.6 ft
1.5 mm ² / 0.0023 in ²	1,000 m / 3,280.8 ft
2.5 mm ² / 0.0031 in ²	1,700 m / 5,577.4 ft

Wiring Procedure

- Loosen the top cover locking screw.
- Rotate the top cover counter-clockwise to remove it.
- Pull out the circuit board module (containing the control board and terminal board).
- The wiring terminals will be visible as shown in the figure below. Wire according to the terminal markings and the detailed descriptions below.
- After wiring is complete, reinstall the detector main board.
- Replace the housing top cover. Ensure the O-ring on the base shell is undamaged to maintain a reliable seal between the top cover and base shell.
- Wiring is complete.



PRODUCT OPERATION

- The WR Series gas detector uses a high-brightness 4-digit LED display for real-time monitoring information.
- Green, red, and yellow LED indicators show power, alarm, and fault status respectively.
- Use the infrared remote control to query and configure detector parameters — simple and convenient.

Power On

When power is applied, the detector performs a self-test: the green, red, and yellow LEDs light up in sequence, and the display illuminates fully and flashes, as shown below.



Power On Screen

Output	Status
Power indicator	All three LEDs light up in sequence
Alarm indicator	
Fault indicator	
Current output	4mA
Relay	Not activated
Modbus comms	Responding

Warm Up

After the power-on self-test, the detector enters warm-up mode. The green LED stays on continuously and the display shows the remaining warm-up time, as shown below.



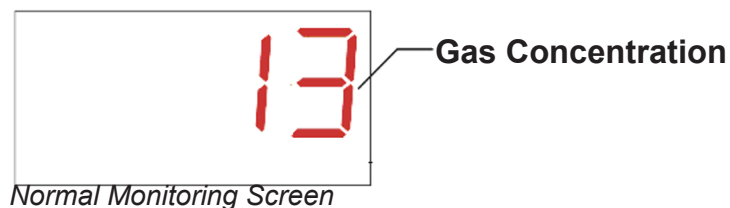
Warm Up Screen

Detector output status during warm-up

Output	Status
Power indicator	Green — on solid
Alarm indicator	Off
Fault indicator	Off
Current output	4mA
Relay	Not activated
Modbus comms	Responding

Normal Monitoring State

In normal monitoring mode, the display shows the current gas concentration in %LEL, as shown below.



Detector output status in normal monitoring state

Output	Status
Power indicator	Green — flashing (3-second period)
Alarm indicator	Off
Fault indicator	Off
Current output	4–20mA proportional to gas concentration
Relay	Not activated
Modbus comms	Responding

A1 (Low-Limit) Alarm State

When the gas concentration is greater than or equal to the low-limit alarm setpoint but less than the high-limit setpoint, the detector enters the low-limit alarm state. The alarm indicator flashes, the relay activates (if configured for low-limit alarm), and the display shows the gas concentration and units.

Detector output status in A1 alarm state

Output	Status
Power indicator	Green — flashing (3-second period)
Alarm indicator	Red — flashing (1-second period)
Fault indicator	Off
Current output	4–20mA proportional to gas concentration
Relay	Activates when configured for "low-limit alarm"
Modbus comms	Responding

When the gas concentration drops below the low-limit alarm setpoint (or for oxygen detectors: rises above the low-limit setpoint and remains below the high-limit setpoint), the detector automatically returns to normal monitoring state. The alarm indicator and relay revert to their normal output states.

A2 (High-Limit) Alarm State

When the gas concentration is greater than or equal to the high-limit alarm setpoint, the detector enters the high-limit alarm state. The alarm indicator flashes, the relay activates (if configured for high-limit alarm), and the display shows the gas concentration and units.

Detector output status in A2 alarm state

Output	Status
Power indicator	Green — flashing (3-second period)
Alarm indicator	Red — flashing (0.5-second period)
Fault indicator	Off
Current output	4–20mA proportional to gas concentration
Relay	Activates when configured for "high-limit alarm"
Modbus comms	Responding

When the gas concentration drops below the high-limit alarm setpoint, the detector exits high-limit alarm and returns to normal monitoring state or low-limit alarm state, as appropriate. The alarm indicator and relay revert to their corresponding output states.

Over-Range Alarm State

When the gas concentration exceeds the detector's full measurement range, the display shows "FULL", as illustrated below. The alarm indicator and relay outputs are the same as for the high-limit alarm state, and the current output is 22mA.



Over-Range Display ("FULL")

Auto-Recovery Function

When the gas concentration in the monitored environment drops below the alarm threshold setpoint, the detector automatically returns to normal monitoring state and the alarm relay resets.

Fault Alarm State

If the gas-sensing element fails or becomes defective, the fault indicator flashes, the relay activates (if configured for fault), and the display shows "F1", as illustrated below.



Sensor Fault Display ("F1")

Detector output status in fault state

Output	Status
Power indicator	Green — flashing (3-second period)
Alarm indicator	Off
Fault indicator	Yellow — flashing (1-second period)
Relay	Activates when configured for "fault"
Modbus comms	Responding

When the connection between the detector and the gas sensor is restored to normal, the detector exits the fault state and re-enters warm-up mode.

Detector Information Query

Point the FHIR-1 infrared remote control at the detector's infrared receiver (within $\pm 30^\circ$ and 3 metres). Press the "Query" button (all three LEDs light up simultaneously when any remote control key is pressed). Parameters that can be queried include: low-limit alarm setpoint, high-limit alarm setpoint, relay configuration, and firmware version number.

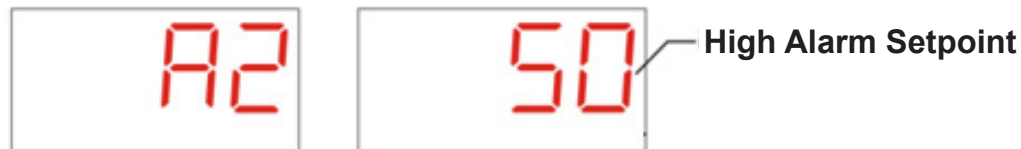
Remote control key usage in the query menu:

- Press "▲" / "▼" to scroll through the available parameters.
- Press "CONFIRM" to enter and view a parameter.
- Press "EXIT" to leave the menu and return to the monitoring display.

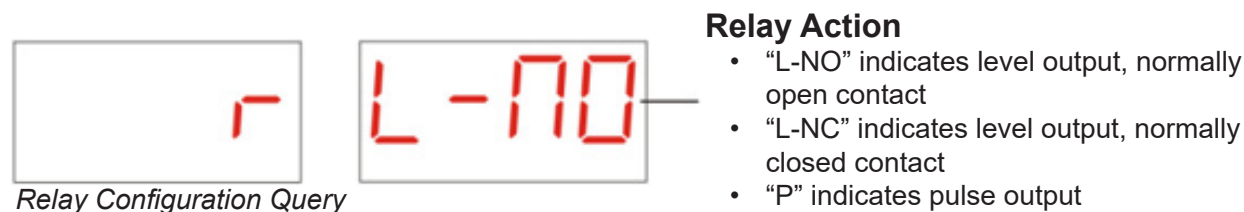
Query screens for each parameter are shown below:



Low Limit Alarm Setpoint Query



High Limit Alarm Setpoint Query



Relay Configuration Query

Relay Action

- "L-NO" indicates level output, normally open contact
- "L-NC" indicates level output, normally closed contact
- "P" indicates pulse output



Firmware Version Query

Version Number

- "dx.xx" = sensor version number

Notes:

- From any menu, pressing the EXIT key returns the system to the previous menu level.
- From any menu, if no key is pressed for 10 minutes, the system automatically exits to normal monitoring state.

Settings

⚠ These settings must only be performed by qualified personnel!

In monitoring mode, press the “SET” button on the infrared remote control to enter the password input screen (all three LEDs light up simultaneously), as shown below. Enter the password “1111” using the remote control, then press “CONFIRM” to enter the settings menu.



Password Entry Screen

Configurable detector parameters include: low-limit alarm setpoint, high-limit alarm setpoint, relay configuration, zero calibration, span calibration, and others, as listed below:

Settings Menu Functions

Menu Names	Function
C-0	Zero calibration
C-S	Span calibration
C-t	Temperature calibration
A1	Low-limit alarm setpoint
A2	High-limit alarm setpoint
r	Relay settings

Remote control key usage in the settings menu:

- Press “▲” / “▼” to scroll through parameters.
- Press “CONFIRM” to enter and configure a parameter.
- Press “EXIT” to leave the menu and return to the monitoring display.

Adjusting numerical values in the settings menu:

- When entering numeric adjustment mode, the leftmost (most significant) digit begins flashing.
- Press digit keys “0–9” to directly enter a value for the flashing digit; the cursor automatically moves to the next digit.
- During adjustment, pressing “▲” or “▼” jumps directly to the 4th (least significant) digit and adjusts it in steps of 1.
- If an entered value exceeds the permitted upper limit, it is automatically clamped to the maximum; similarly for the minimum. After setting, press “CONFIRM” to save; or press “EXIT” to discard

Zero Calibration

- Enter the zero calibration function. The display flashes “0”, prompting confirmation of the zero operation, as shown below.
- Press “CONFIRM” to execute zero calibration and wait for the result — “SUCC” (success) or “FAIL” (failure).
- If zero calibration fails, repeat steps 1–2.
- Press “EXIT” to return to the settings menu.

Note: When performing zero calibration, the detector must be placed in clean air or pure nitrogen.



Zero Calibration Screen



Zero calibration confirmation prompt

Span Calibration

- Enter the span calibration function. The display shows the current concentration value; the leftmost digit flashes to indicate the value can be modified, as shown below.
- Adjust the value to match the actual concentration of the calibration gas sample.
- Press “CONFIRM” to execute span calibration and wait for “SUCC” or “FAIL”.
- If calibration fails, repeat steps 1–3.
- Press “EXIT” to return to the settings menu.

Note: For accurate calibration, use a calibration gas sample with a concentration between 40%–60% of the full measurement range (50% is optimal). Set the gas flow rate to 500 mL/min.



Span Calibration Screen



Calibration confirmation

Temperature Calibration

- Enter the temperature calibration function. The display shows the current temperature value; the leftmost digit flashes to indicate the value can be modified, as shown below.
- Adjust the value to the actual measured temperature.
- Press “CONFIRM” to execute calibration and wait for “SUCC” or “FAIL”.
- If calibration fails, repeat steps 1–3.
- Press “EXIT” to return to the settings menu.

Note: For accurate calibration, it is recommended to calibrate at temperatures between 10°C and 40°C / 50°F and 104°F. Calibration below 0°C/32°F is not permitted by the product firmware — the display will show “9999” at negative temperatures.



Temperature Calibration Screen



Temperature confirmation

Low-Limit Alarm Setpoint

- Enter the low-limit alarm setpoint configuration function, as shown below.
- Adjust the low-limit setpoint to the desired value.
- Press “CONFIRM” to save; or press “EXIT” to discard.

Note: The low-limit alarm setpoint can be set within the range: 1 to (high-limit setpoint – 1).



Low-Limit Alarm Setpoint Screen

High-Limit Alarm Setpoint

- Enter the high-limit alarm setpoint configuration function, as shown below.
- Adjust the high-limit setpoint to the desired value.
- Press “CONFIRM” to save; or press “EXIT” to discard.

Note: The high-limit alarm setpoint can be set within the range: (low-limit setpoint + 1) to the detector full scale.



Low-Limit Alarm Setpoint Screen

Relay Configuration

- (1) Enter the relay configuration function, as shown below.
- (2) Press “▲” / “▼” to change the relay setting. Three output modes are available:
 - L-NO: Level output, normally open contact.
 - L-NC: Level output, normally closed contact.
 - P: Pulse output.
- (3) Press “CONFIRM” to save; or press “EXIT” to discard.



PRODUCT MAINTENANCE

- Under normal operating conditions, the sensor element service life is 2 years.
- Do not install the detector in locations with heavy water vapour or prolonged water exposure.
- Provide a continuous and stable power supply. Avoid frequent switching of the power supply on and off, as this may damage the detector.
- Operation, maintenance, and calibration of the detector should be managed by a dedicated responsible person.
- When operating in a networked system, verify that the wiring between the detector and the host controller is correct and that a stable power supply is provided.
- The detector should be calibrated regularly; calibration records must be maintained. Before calibration, the detector must have been running for at least 3 hours and have stabilised. (Calibration interval should be based on the operating environment; monthly calibration is recommended.)
- The detector probe should be cleaned regularly. Dust and debris blocking the gas inlet will reduce sensor sensitivity.
- Replace the sensor when it approaches the end of its service life. After replacing the sensor, the product must be recalibrated.

COMMON FAULTS AND REMEDIES

Fault Symptom	Cause	Remedy
Detector displays “F1”	Gas-sensing element failure, open circuit, or short circuit	Replace the sensor
No 4–20mA current output	Wiring error	Re-wire correctly
	Sensor fault (fault alarm active on detector)	Re-seat or replace the sensor
	Circuit fault	Return to manufacturer for repair
Alarm relay does not activate when detector alarms	Check relay setting is correct	Reconfigure the relay setting
	Circuit fault	Return to manufacturer for repair
Concentration reading too high	Calibration not performed properly	Recalibrate
	Sensor failure	Replace the sensor
Unstable readings	Insufficient sensor warm-up time	Allow warm-up for more than 2 hours
	Sensor failure	Replace the sensor
	Circuit fault	Repair to manufacturer for repair
Slow detector response	Inappropriate test gas	Select appropriate gas
	Sensor fault	Return to manufacturer for repair
Unable to zero-calibrate or span-calibrate	Sensor failure	Replace the sensor
	Circuit board fault	Return to manufacturer for repair

⚠ CAUTION: Before servicing any components, disconnect the upstream power supply. In flammable/explosive environments, opening the cover with power on is strictly prohibited. When disassembling, take care to protect the explosion-proof threads — do not chip or scratch them. Apply anti-rust oil to the explosion-proof threads on reassembly.

PRODUCT WARRANTY TERMS

The product warranty period is one year. Sensor service life is approximately 2 years. When components reach end of life, they must be replaced. The detector operating environment must not contain corrosive gases or prolonged gas leaks. When used in locations with long-term minor leaks or as specified by applicable national standards, the detector must be periodically calibrated and maintained in accordance with relevant regulations.

Note: For accurate and consistent calibration, use a calibration gas sample with a concentration between 40%–60% of the full measurement range (50% is optimal). Set the gas flow rate to 500 mL/min.

Products with quality issues arising during the warranty period will be repaired or replaced free of charge by our company. Outside the free warranty period, paid repair or replacement services apply.

For warranty repair, please bring this manual or your purchase invoice to the nearest authorised service centre.

The following circumstances are NOT covered by the free warranty:

- Faults or damage caused by failure to follow the instructions in this manual, or by installation in an inappropriate location.
- Faults caused by dropping or physical impact.
- Faults caused by flooding, lightning, earthquakes, or other natural disasters, or by abnormal supply voltage or other external causes.
- Products disassembled, modified, or repaired without the consent of our company.