



GD231 FREON SENSOR

DIFFUSION GAS MONITOR

OPERATING MANUAL



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CONTENTS		PAGE
	Proprietary	3
	Copyright	3
	Warning, Cautions and Notes	3
	Safety Warnings	4
Section 1	Description	
	1.1 General description	5
	1.2 Sensor unit	5
	1.3 Gases monitored	5
	1.4 Performance specifications	6
	1.5 Sensor type	7
	1.6 Storage	7
Section 2	Installation	
	2.1 Installation Guidelines	8
	2.2 Mechanical installation	9
	2.3 Electrical installation	10
Section 3	Operation	
	3.1 General	12
	3.2 Start up	13
	3.3 General Operation	13
	3.3.1 Internal and External Control Buttons	13
	3.3.2 Auto Zero	9,14
Section 4	Maintenance	
	4.1 Routine maintenance	15
	4.2 Warranty	15
Section 5	Spares	15

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WARNINGS, CAUTIONS AND NOTES



Warnings identify an operating or maintenance procedure, practice, condition, or statement that, if not strictly followed, could result in death or injury to personnel.



Cautions, which appear elsewhere in this manual, identify an operating or maintenance procedure, practice, condition, or statement that if not strictly followed could result in equipment damage or serious impairment of system operation.

Notes highlight certain operating or maintenance conditions or statements that are essential but not of known hazardous nature as indicated by Warnings and Cautions.

Warnings, Cautions and Notes are included throughout this manual, as required. Additionally, this section contains important Warnings that may not be contained elsewhere within this instruction manual.



SAFETY WARNINGS

- **THE GD231 FREON SENSOR MUST ONLY BE USED IN AREAS WHERE POTENTIALLY FLAMMABLE GASES ARE NOT PRESENT.**
- **FOR SAFETY REASONS, THE GD231 SENSOR MUST BE INSTALLED, OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY.**
- **READ AND UNDERSTAND THIS INSTRUCTION MANUAL COMPLETELY BEFORE OPERATING THE GD231 SENSOR.**

SECTION 1 - DESCRIPTION

1.1 GENERAL DESCRIPTION – Part Number 231-022

The **GD231 FREON Sensor** is a highly reliable infra-red (IR) absorption type sensor and may be used to detect the presence of Refrigerant (Freon) gas in the presence other non-combustible gases.

In a typical application, the sensor unit is electrically connected to a system capable of indicating the concentration of the gas detected by the sensor. It could also raise audible and/or visual alarms when the concentration reaches a predetermined level. Alternatively, the **GD231 FREON Sensor** may operate as a stand alone unit using the LED array to indicate the approximate concentration of gas present and the internal relays to generate concentration alarms.

The **GD231 FREON Sensor** is used for diffusion sensing applications. These are applications in which the sensor continuously monitors that part of the environment with which it is in contact and the gas diffuses through the sensor's optical path. This technical manual covers the use of the **GD231 FREON Sensor** as a diffusion type sensor.

1.2 SENSOR UNIT DESCRIPTION. Refer to Figure 1.

The fully assembled **GD231 FREON Sensor** has dimensions of:-
158mm (Height) X 97mm (Width) X 57mm (Depth).

The main components of the **GD231 FREON Sensor** unit are:

- Flame retardant ABS enclosure which may be mounted onto a wall into which fits
- The Sensor Assembly mounted onto the hinged lid of the enclosure

1.3 GASES MONITORED.

The **GD231 FREON Sensor** is designed only to sense and monitor refrigerant gases and in normal applications is not expected to monitor any other gas or vapour.

1.4 PERFORMANCE SPECIFICATIONS.

FACTOR	SPECIFICATION
Detection Method:	IR Absorption
Sampling Method:	Continuous Diffusion
Measuring Range:	0 – 2000ppm (default), or 0 – 1000ppm on request
Accuracy:	± 2% Full Scale (FS) Linearised using 4-20mA
Repeatability:	± 1% FS
Operating Pressure	Atmospheric pressure only
Response Time:	The response time is limited by the movement of gas within the area being monitored. For a rapid change in gas concentration an alarm at 50% of the range will occur within 30s.
Flow Rate:	Not applicable to a diffusion type sensor
Temperature Range:	-20°C to +50°C
Humidity Range:	0 - 99% Relative Humidity (Non-condensing)
Mean Time Between Failures:	Electronics: 10 Years, IR Source: 7 Years
Warranty:	12 Months
Operating Voltage:	12 to 24 Vdc
Operating Current:	135mA at 12 Vdc/75mA at 24 Vdc
Weight:	0.35kg
Electrical Hazardous Area Certifications:	None
Output:	2 concentration alarms (indicated by red LEDs) each being set independent of the other, and normally open relay contacts rated at 2A at 12 or 24V DC. Also a 4-20mA output, and if factory set, a RS485 output.

Table 1. Performance Specifications.

1.5 SENSOR TYPE

The sensor type is denoted by the serial number on the case. After the serial number is a letter it is this letter that indicates the sensor type. It has the following format.

Serial number XXXX-YYYYY TT L

Where **TT** is the sensor type and is one of the following options

C =RS485 Fitted

R= relays fitted

CR= RS485 and relays fitted

and **L** indicates the level

1 – Calibrated for 1000ppm Freon

2 – Calibrated for 2000ppm Freon

Example Serial Number: 1406-35999 CR

This sensor is fitted with RS485 (by request only) and calibrated to 0-2000ppm

1.6 STORAGE

The **GD231 Freon Sensor** is a sensitive instrument and as such should be stored properly when not in use. The **GD231 Freon Sensor** contains static sensitive devices and should not be stored in an area of high static electrical charge. The environment it is stored in should not involve direct sunlight and be dust free. The temperature should be between 0-50 degrees Celsius.

The unit should not be stored more than 2 years under these conditions.

SECTION 2 - INSTALLATION

2.1 INSTALLATION GUIDELINES

The **GD231 FREON Sensor** is designed to be installed in a vertical position.

The sensor should be sited in a position out of direct sunlight and in an area not subject to washing with jets of water.

To ensure continued reliable operation of the **GD231 FREON Sensor**, the following installation guidelines should be observed:



CAUTION

The calibration of the sensor may be affected by excessive direct sunlight. If it is necessary to install the sensor unit in a sunlit area, provide an adequate sunshade for the sensor unit.

- For the monitoring of heavier-than-air gases, mount the sensor unit as close as practical to the floor or ground. **Refrigerant gas is heavier than air.**
- For air conditioning systems, mounting the sensor next to the FCU or chiller unit in roof void is acceptable.
- The sensor unit should be installed in a location where it is easily accessible for repairs.
- Mount the sensor unit in a position that minimises the risk of mechanical damage.
- For the best performance the sensor should be mounted where there is movement of air.

2.2 MECHANICAL INSTALLATION

The enclosure is provided with four 5mm predrilled holes for mounting on a wall etc. It is important that screws used for mounting the enclosure should not be tightened excessively thus damaging the enclosure.

The hole positions are shown in Figure 1.

Access to the inside of the enclosure is gained by removing the 2 screws at the top and bottom, carefully opening the hinged front.

Protect the exposed printed circuit board components during installation.

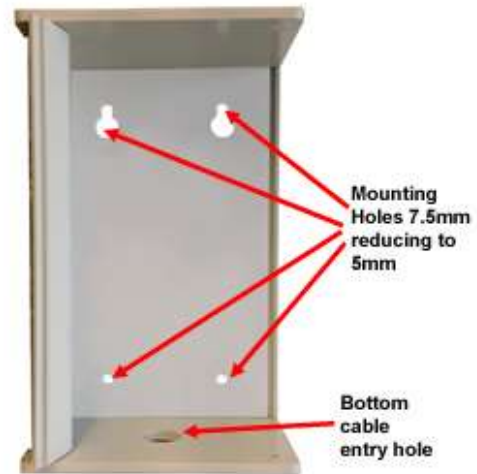


Figure 1:- Inside the Case

INITIAL START-UP PROCEDURE (Standard Commissioning)

Please ensure that at least 2 (minimum) '**Auto Zero**' procedures have been performed within the first 24 hours of operation and before connecting to any plant/pump trips or shut downs.

HOW TO 'AUTO ZERO'

Press and hold the internal control button.

This button is located in the top right hand corner on the main circuit board – see Figure 2.

All LED are lit.

Continue to hold until red LEDs go out leaving the green LEDs lit. When only the green LEDs are lit, release the internal control button.

'**Auto Zero**' has commenced and only the '**Z**' green LED will be lit briefly. After a few seconds this LED will go out and the next green LED in the '**LO**' range will be lit indicating normal operating mode.

2.3 ELECTRICAL INSTALLATION

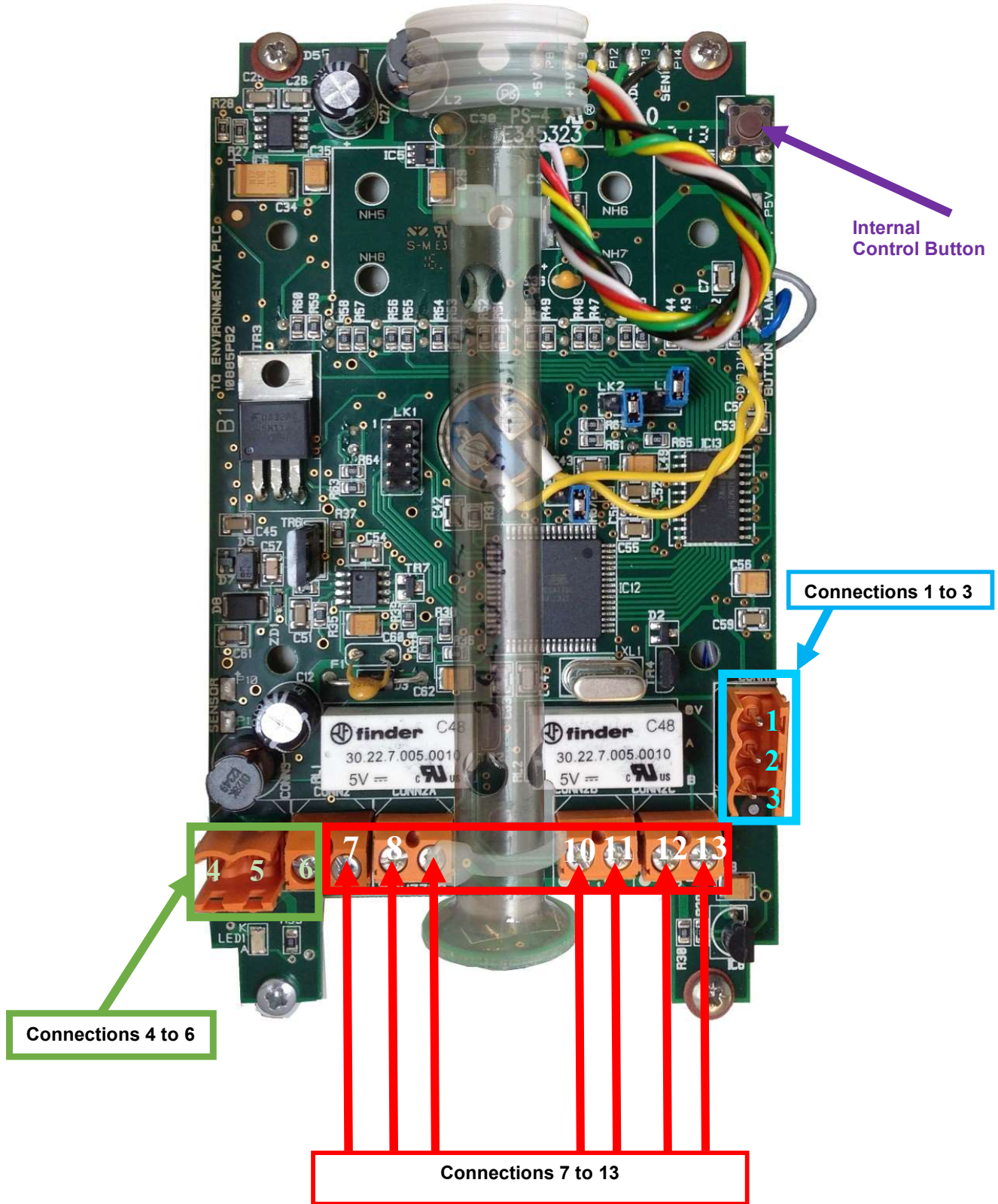


Figure 2 Electrical Connections

Table 2:- Connection & Terminal Functions.

Connection	Function
1	RS485 ground
2 (Note a below)	RS485 "A"
3	RS485 "B"
4	Power 0v
5 (Note c below)	Power +12 to +24 v DC
6	4 – 20 mA, +ve
7	4 – 20mA, -ve
8 (Note b below)	Connection for external buzzer (+ve)
9	Connection for external buzzer (-ve)
10 (Note b below)	Volt free alarm contact (AL1)
11	Volt free alarm contact (AL1)
12	Volt free alarm contact (AL2)
13	Volt free alarm contact (AL2)

Notes:-

The sensor type is indicated by the serial number. This is described in section 1.5 above.

a). The option of RS485 output is factory fitted.
Two core cable with overall screen should be used for the RS485 connection.

b). An internal buzzer is available as a factory fitted option.

Any externally fitted buzzer connected should be rated according to the relays and power supply used, i.e. 2A max. at 12 or 24v dc.

c) If the Unit has a 4-20mA output then 24vdc is required.

Figure 2 & Table 2 show the electrical connections. Electrical cable entry to the enclosure should be through the predrilled hole at the bottom of the enclosure.

The circuit in the PCB supplies a 4-20mA output signal, which is a current source only. Total circuit load and cable resistance should be less than 600 Ohms for the 4-20mA loop and the unit should be powered from 24v dc for correct operation

After wiring the lid with sensor assembly should be closed and secured by the 2 screws, top and bottom, ready for commissioning.

SECTION 3 – OPERATION

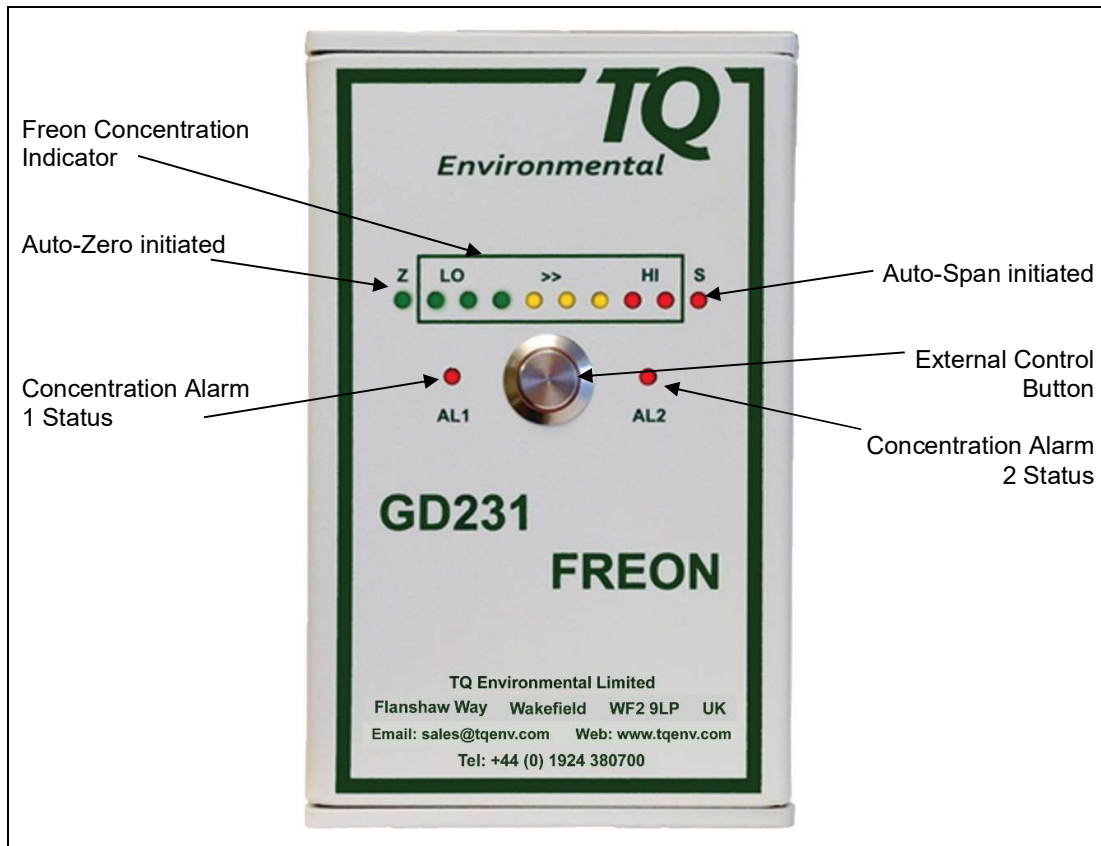


Figure 3:- Front Panel Functions

3.1 GENERAL

Please refer to Figure 3 for the position of LEDs and button.

The Freon concentration is displayed visually on the “**Freon Concentration Indicator**”. Lower Freon concentrations are displayed by the green LEDs at the left of the display (marked “LO”) and the highest on the red LEDs at the right of the display (marked “HI”). As the concentration of Freon increases the number of LEDs illuminated will increase from left to right (8 in total). All 8 LEDs will illuminate when the concentration reaches and exceeds the range of the GD231.

The red LEDs marked “**Concentration Alarm 1**” (AL1) and “**Concentration Alarm 2**” (AL2) will illuminate when the Freon concentration exceeds the set point value. At the same time the alarm relays (if fitted) will actuate and the associated contacts for buzzer and alarms will change state. The set points for the alarms and latch facility are factory set only.

3.2 STARTUP.

Ensure the voltage applied to the PCB is between 12 and 24v dc.

On application of power, the LEDs associated with the “**Freon Concentration Indicator**” will flash in sequence for a few seconds and the sensor will commence its warm up procedure. This is indicated by the flashing of the green “**Auto-Zero initiated**” LED.

At the end of the warm up period (approx.5 minutes) the 4-20mA output and the “**Freon Concentration Indicator**” will be “steady”.

SEE SECTION 2 - INSTALLATION relating to essential Auto-Zero procedure.

The **GD231 FREON Sensor** has been calibrated at the factory and is ranged in accordance with the application. Both the “**Freon Concentration Indicator**” and 4-20mA output is set to this range (0 - 1000ppm, or 0 – 2000ppm), depending on the sensor type. The 4-20mA is linear over the range of the instrument.

The zero point (0ppm FREON) has been established in the factory using nitrogen or Freon free air. In its intended application the **GD231 FREON Sensor** may have its zero point set using clean air with no Freons present. Please refer to Auto-Zero Initiation in **3.3.2 and Page 9**.

3.3 OPERATION.

3.3.1 Internal & External Control Buttons

These buttons may be used to initiate Auto-Zero, Auto-Span and cancel any latched concentration alarms. The “**Internal Control Button**” (see Figure 1 for location) will perform all the above functions. However, the “**External Control Button**” will only allow any concentration alarms to be reset unless fully activated at the factory.

All alarms are factory set to be non-latching.

The functions of the Control Buttons are activated as follows:-

Press the appropriate control button. This will colour sequence the “**Freon Concentration Indicator**”. The “**Freon Concentration Indicator**” will continue to sequence its colours whilst the button remains pressed. Releasing the button when the appropriate sets of coloured LEDs are illuminated will initiate the appropriate action.

The sequence of colours on the display is as follows:-

All LEDs on the **“Freon Concentration Indicator”** illuminated.

The **GD231 Freon Sensor** will return to normal operation, no action will have been initiated.

All 4 **RED** LEDs illuminated.

This will cancel all latched concentration alarms. NB the alarms will immediately be reactivated if the Freon concentration is above its alarm set point after cancellation.

All 3 **GREEN** LEDs illuminated.

This will start the Auto_Zero procedure. The green LED marked “Z” will illuminate during this automatic procedure. This will not operate or show if the “External Control Button” is pressed.

All 3 **YELLOW** LEDs illuminated.

This will start the Auto_Span – this procedure **must only** be carried out by trained personnel.

This will not operate or show if the “External Control Button” is pressed.

3.3.2 Auto-Zero

This function will set the output to 0ppm Freon (0% Freon), 4.0 mA based upon the concentration of Freon inside the enclosure. If a true zero-point at 0ppm Freon is required instead of the Freon concentration inside the enclosure then nitrogen gas should be used to fill the enclosure.

See Page 10 – How to Auto Zero



Only Auto-Zero when there is no refrigerant gas present

SECTION 4 - MAINTENANCE

4.1 ROUTINE MAINTENANCE.

The sensor unit is designed so that no adjustment or calibration is necessary for extended periods of 2 years or longer. However, a system function check can be performed by introducing a small amount of refrigerant to the enclosure through the side vents.

The resulting alarm can be cancelled in the usual way – See 3.3.1

Refer the unit to TQ Environmental Limited for service.

If the unit ever becomes defective then it is necessary to refer the unit to a local TQ representative or contact TQ directly.

See the front cover of this manual for details on how to contact TQ.

Please note there are no User Serviceable parts on the **GD231 FREON Sensor**.

4.2 WARRANTY

When the **GD231 FREON Sensor** is operated in accordance with conditions described in this Manual the Standard Warranty is 12 months from the date of purchase of the instrument from TQ Environmental Limited.

SECTION 5 - SPARES

There are no spare parts associated with the **GD231 FREON Sensor**

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