



# **BOXED GASCARD<sup>®</sup>**

## **INFRARED GAS SENSOR INSTALATION MANUAL**

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A DIVISION OF EDINBURGH INSTRUMENTS Ltd



## Warning!

The BOXED GASCARD is not suitable for the detection of flammable gases or mixtures of gases that are flammable or will become flammable if mixed with Air. If the device that will use the BOXED GASCARD is to be used with flammable Gases or flammable gas mixtures appropriate safeguards must be put in place to make the device suitable for such use including but not limited to, flame proof housing, flame arrestors and appropriate certification (ATEX of equivalent) for the intended use.

The BOXED GASCARD is NOT hermetically sealed and will leak small quantities of the sample gas in to its surroundings. Gases such as Carbon monoxide are extremely **TOXIC** and so potentially harmful levels may build up inside enclosures and suitable measures such as forced ventilation to a safe area need be taken to avoid this risk. Similarly potentially explosive levels of Methane or other flammable sample gases may build up inside enclosures and appropriate precautions should be taken when working on equipment of this type.

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BOXED GASCARD® is a registered trademark of Edinburgh Instruments Ltd.

The product described in this manual is subject to continuous development and, while every effort has been taken to ensure that the information given is correct, Edinburgh Instruments Limited cannot accept any liabilities for errors and omissions or their consequences.

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## 1. Introduction

Please take a few minutes to read this manual to ensure ease of installation with other equipment and to maximise the use of the facilities available.

The BOXED GASCARD infrared gas sensor is designed to be a basic benchtop gas sensor, housing a Gascard NG sensor module, for those requiring accurate and reliable measurement of carbon dioxide gas concentrations in a background that is Air or Air like. (Other background gases are available upon request).

The sole use of the BOXED GASCARD is the detection of the specified gas in the specified background over the specified range and within the specified conditions and for no other purpose.

The BOXED GASCARD uses a dual wavelength infrared sensing head with no moving parts. The result is a low drift, high accuracy sensor with a fast response time and low power consumption.

Each BOXED GASCARD is supplied fully tested and calibrated, with a 1-year warranty against defective workmanship and parts.

## 2. Mechanical Installation

The sensor head and electronics are mounted in a standard extruded aluminium box ~190mm x 105mm x 50mm. The BOXED GASCARD is supplied with a PG7 cable gland and two gas ports. The gas ports are labelled “IN” indicating the sample gas input port and “OUT” indicating the sample gas exhaust port. Both are suitable for connection to 4mm ID soft plastic or synthetic rubber tube. The PG7 cable gland supports electrical cables between 3mm and 6.5mm diameter and is used to supply power to the BOXED GASCARD and connect the current output of the gas measurement value to external devices. An optional 9 pin sub ‘D’ connector may also be fitted to provide an RS232 output of the sensor data.

## 3. Parts identification

### 3.1. Front view

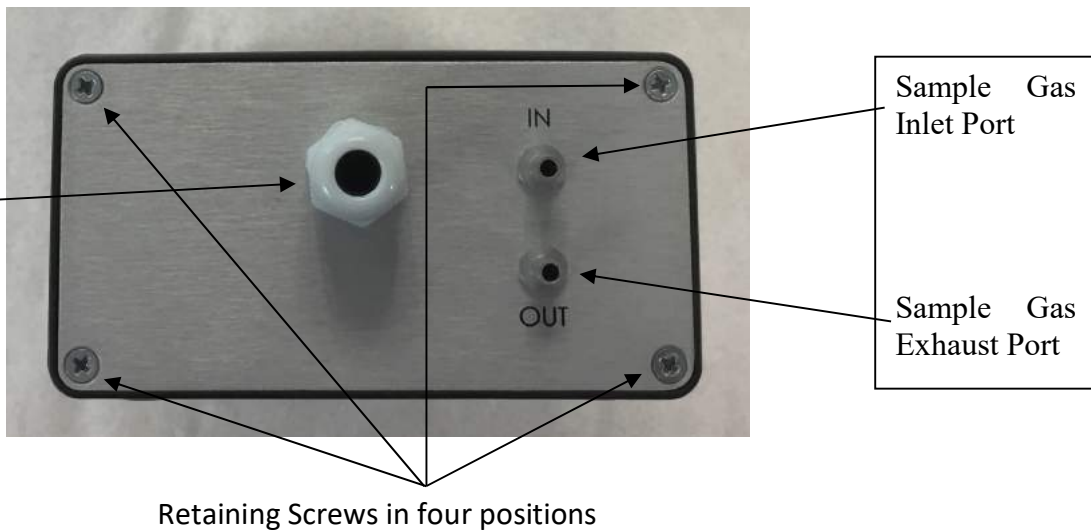


Figure 1 Front View of BOXED GASCARD

### 3.2. Rear View

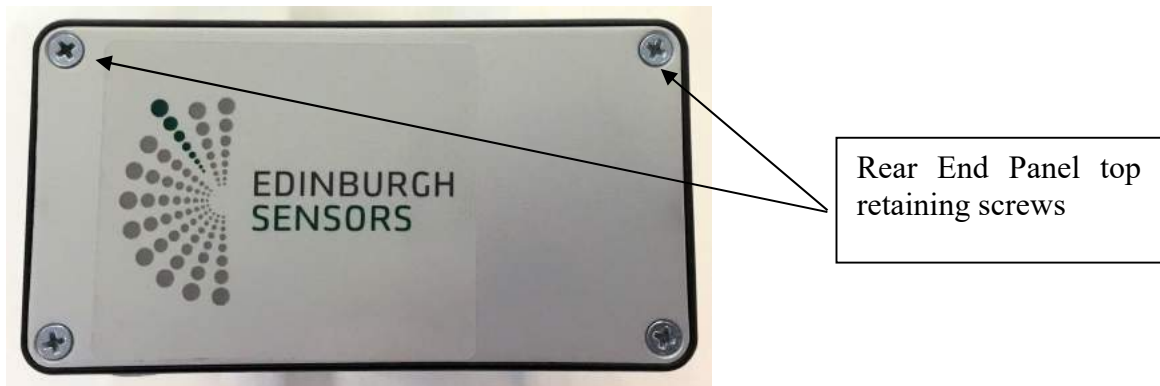


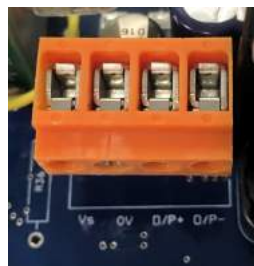
Figure 2 Rear view of BOXED GASCARD

## 4. Electrical Requirements

### 4.1. Power In

Access to the electrical connections is obtained by removing the four retaining screws from the front panel and moving it forward and down slightly to reveal the orange connector (J5) see Figures 1 above and 4 below. It is recommended that 4 core and screen cable be used for the electrical connections to the BOXED GASCARD. The cable should be threaded through the PG7 Cable Gland, the Orange plug removed from its socket and the cable connected to it in the order described below.

The BOXED GASCARD requires a supply voltage ( $V_s$ ) of +24V dc (+7 to +30V), fused 1500mA ANTISURGE supply connected between pins 1 ( $V_s$ ) and 2 (0V) on the orange terminal block plug (J5) shown in Figure 3 (the legend is shown in front of the connector near the board edge). The power supply should maintain the voltage between 7V and 30V dc for all load conditions (see below). The BOXED GASCARD has an on board 1500mA anti-surge resettable fuse for added protection.





**Figure 3 Power Input and Current Output Connection with and without the plug inserted**

**Note: The plug wiring is not the same as the standard Gascard NG Plug**

The load current taken by the sensor is not constant and in particular contains significant components at the source modulation frequency (8Hz for the BOXED GASCARD). The average power required during normal operation is ~4W (e.g. 350mA at 12V) at room temperature but this increases for colder environments.

The in-rush current at start up may have peaks up to 30A and an average of up to 2A for the first 40ms and the power supply should be capable of supplying this although the supply voltage need not be maintained during this time. The peak current then falls to that needed to supply 7W (e.g. 700mA at 10V) for a few minutes until the sensor thermostat has reached its operating temperature. The average power consumption during this period is 6W.

On powering up the BOXED GASCARD unit, the system enters a software upload, self-test and warm-up period of 30 seconds duration during which the current output is indeterminate. Once the 30 seconds have elapsed, the output signal is proportional to the measured gas concentration. Any fault within the BOXED GASCARD will then be indicated by the signal returning to either 0mA for the 4-20mA option or >24mA if 0-20mA is selected.

#### **4.2. Signal-Out**

The analogue output (current) is available at the terminals marked O/P+ and O/P- on terminal block J5 (see Figure 3). The O/P- terminal is connected to the 0V terminal thereby referencing the analogue output to the negative power rail.

The instrument is supplied with a 4-20mA linear analogue output as standard. Other outputs are available see Gascard NG User's Manual for details.

The maximum load that may be driven at 20mA is dependent on the supply voltage and may be calculated from the diagram below: -

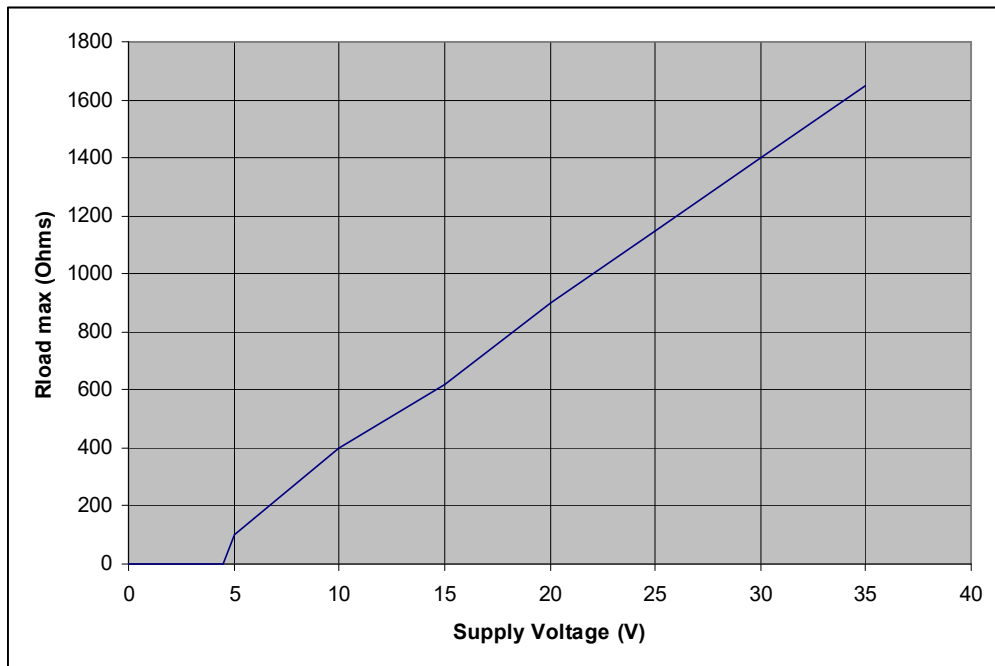


Figure 4 Maximum load Resistance vs. supply voltage

#### 4.3. Output Resolution

The Gascard NG is fitted with a 15-bit digital to analogue converter (DAC). This gives an output resolution (steps) of 0.0006mA.

#### 4.4. Temperature Correction

The BOXED GASCARD indicated concentration is in True % V/V and almost independent of temperature in the range 0 to 40°C.

#### 4.5. Pressure Correction

The concentration indicated is in True % V/V and almost independent of pressure variation in the range 800 to 1150 mb.

## 5. Attaching a Power and Output Cable

### 5.1. Open the Front Panel

To attach the Power/Signal cable to the BOXED GASCARD open the front panel by removing the four retaining screws (see Figure 1) and pulling on the cable gland (the front panel should remain attached by the internal gas sample lines), see Figure 5 below.

### 5.2. Connecting the Cable to the Input/output Connector J5

Remove the orange plug from connector J5. The plug terminals accept wire sizes from 0.5 – 1.5mm<sup>2</sup>. Pass the Power/Signal cable through the cable gland, strip the outer insulation back by ~20mm and remove ~3mm of insulation from the individual wires. Attach the orange plug to the cable by inserting the stripped ends of the cable wires into the receptacles on the plug (noting which wire is which) and tightening the clamping screws.

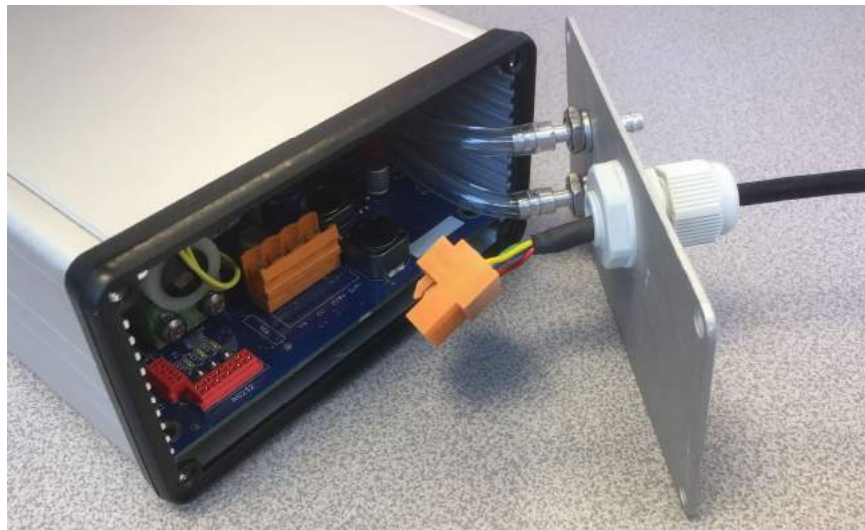


Figure 5 Front Panel Open showing the cable connected to the Plug

Insert the orange plug into connector J5 as shown in Figure 6 below.

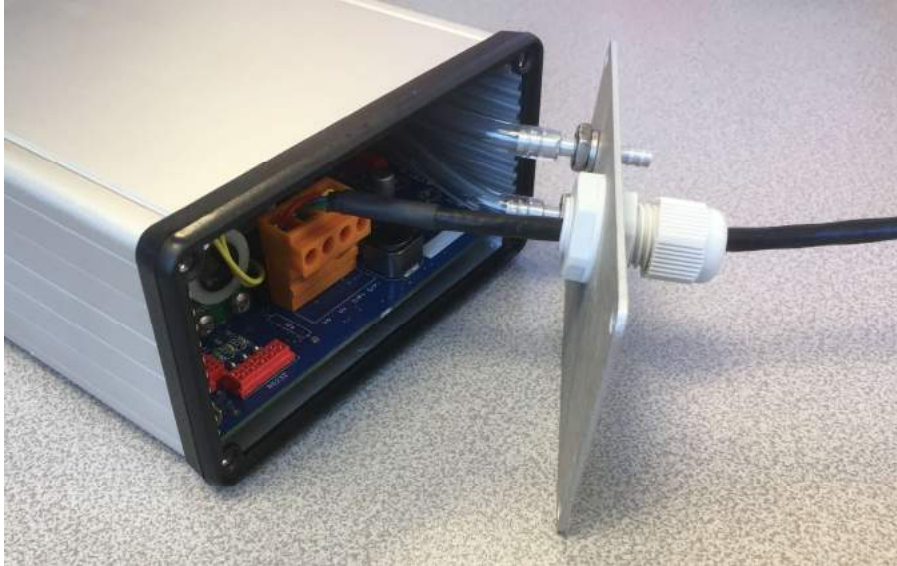


Figure 6 Front Panel Open showing the Plug inserted into J5

### 5.3. Re-Fitting the Front Panel

Close the front panel and refit the four retaining screws then tighten the Cable Gland so that it grips the cable as shown in Figure 7 below.



Figure 7 Front Panel closed and Cable Gland tightened

## 6. Sample Gas Requirements

It is the customer's responsibility to ensure that the gas supplied to the BOXED GASCARD is clean and free from particulate matter. Even in relatively clean "office" environments, the air will contain significant amounts of particulate matters that should be removed by external filtering. It should also be noted that although the Gascard NG's measurement system is insensitive to water vapour, the relative humidity must remain below that required for condensation to occur.

The BOXED GASCARD is fitted with an internal hydrophobic particle filter, which will protect the sensor head against the ingress of water and particulate matter. However, in the event that the equipment is operated without adequate filtration, this internal filter may become blocked and require replacement.

Care should be taken to ensure that the gas supply pipes are connected in accordance with the input/output directions to ensure that the internal filter is utilised.

Replacement filter capsules are available from Edinburgh Sensors sales.

<p style="text-align: center;"><b>IMPORTANT</b></p> <p style="text-align: center;"><b>DO NOT OPERATE THE BOXED GASCARD WITHOUT A FILTER</b></p>
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## 7. Pump Aspiration

Edinburgh Sensors recommend that, should a pump be required to aspirate the sensor head, only an oil free type should be used.

## 8. Gas Flow Rates

The BOXED GASCARD calibration is insensitive to the actual flow rate used so long as it falls within the range 0.2 litres per minute to 1.2 litres per minute. The minimum usable flow rate is determined by the response time of the unit and should not be less than 0.2 litres per minute. The maximum flow rate is determined by the consideration that very high flow rates will cause a pressure increase and turbulence in the sensor head, which may lead to incorrect pressure measurement and inaccurate indication.

The BOXED GASCARD is calibrated at the prevailing room temperature and pressure within our factory at the time of calibration and with a flow rate of 1 litre per minute.

If the flow rate is higher than 1 litre per minute or there is any restriction or blockage of the sample gas exhaust an error in the indicated pressure may be caused leading to inaccurate readings especially if the internal pressure exceeds the range of the pressure sensor. Care should therefore be taken not to restrict the exhaust flow or use excessively high or low flow rates.

## 9. Safety Note

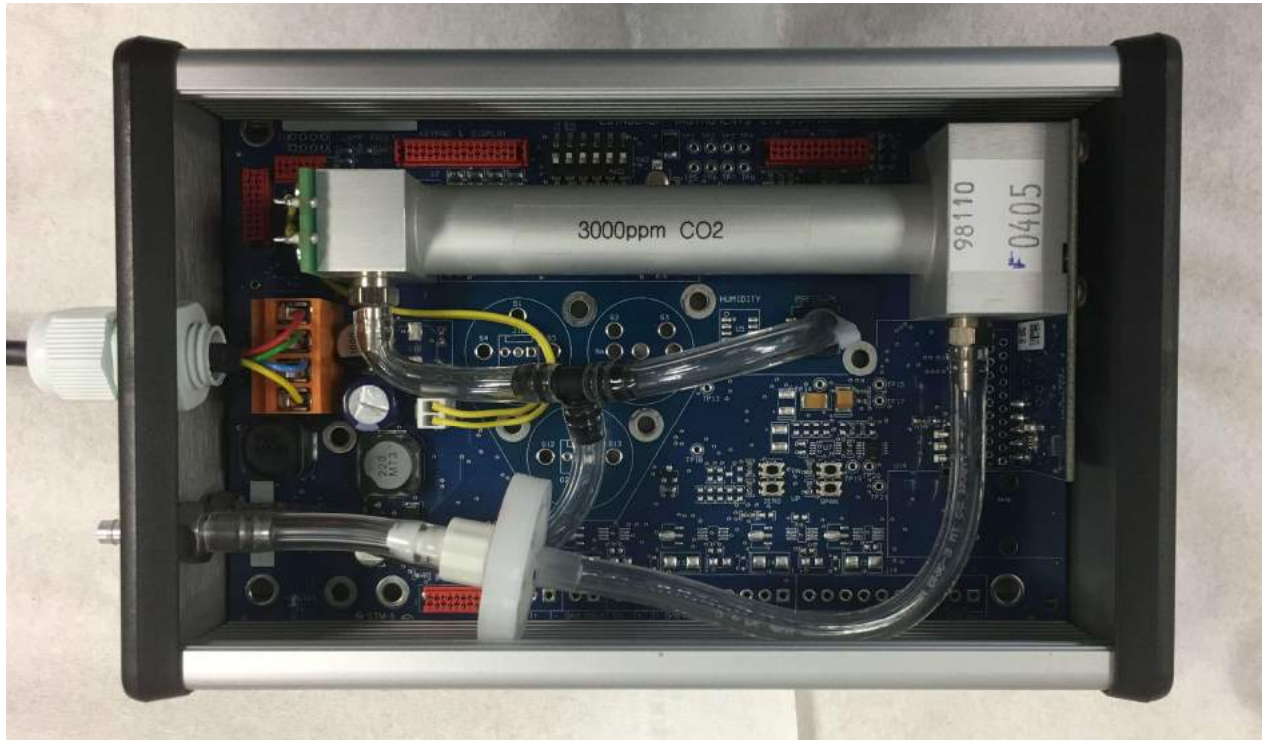
Where the Gascard NG is to be used in carbon dioxide monitoring applications it should be noted that since CO<sub>2</sub> is heavier than air, the gas sampling point should be positioned at the lowest point in a system, to ensure accurate gas sampling.

## 10. Calibration

The BOXED GASCARD contains a modified Gascard NG dual wavelength sensor which is inherently stable and will maintain its calibration over extended periods with minimal maintenance. We recommend that the calibration is checked every 12 months. Any adjustment required should be small.

The instructions for calibration checking and calibrating the BOXED GASCARD may be found in the Gascard NG User Manual.

Access to the Gascard NG within the BOXED GASCARD is obtained by removing the four screws from the front panel and loosening the top two screws on the rear panel lowering the front panel and sliding the top cover out.



**Figure 8 Internal view of the BOXED GASCARD with a Power/Signal cable attached and the Top Cover Removed**

### **10.1. Calibration Accuracy**

The accuracy of the calibration will depend on the accuracy of the gas composition used. Calibration gas is available in a range of specified accuracy and the user should ensure that the accuracy of gas used is appropriate to the application requirements.

## 11. Specification

<b>Measuring Range:</b>	<b>CO<sub>2</sub></b>	0-3000ppm to 0-100%
<b>Accuracy:</b>		$\pm 2\%$ of range <sup>1</sup> $\pm < 0.015\%$ of range per mbar
<b>Zero Stability:</b>		$\pm 2\%$ of range (over 12 months) <sup>1</sup>
<b>Repeatability:</b>		
at zero		$\pm 0.3\%$
at span		$\pm 1.5\%$
<b>Response Time:</b>		bit switch selectable T <sub>90</sub> = 10s or programmable RC
<b>Operating Temperature:</b>		0-40 C
<b>Operating Pressure:</b>		800-1150 mbar
<b>Zero Drift at Constant Temp.</b>		$\pm 2\%$ per year
<b>Zero Drift due to Ambient Temp.</b>		$\pm 0.03\%$ of range per C (Standard Head) $\pm 0.1\%$ of range per C (Plus Head)
<b>Warm-up Time:</b>		
Operational		1 min
Full Specification		30 mins
<b>Humidity:</b>		measurement unaffected by 0-99% RH, non-condensing
<b>Output:</b>		linear 4-20mA, load dependent on supply voltage (see Figure 4)
<b>Controls:</b>		zero and span adjust buttons

Note:

<sup>1</sup> At 1013mbar, 25C and excluding calibration gas tolerance.

<b>Power Consumption:</b>	6W (max) (supply voltage dependent)
<b>Input Voltage Requirement:</b>	24V dc (7-30V)
<b>Weight:</b>	0.6kg
<b>Dimensions:</b>	~190mm x 105mm x 50mm



## **12. EXPANSION FACILITIES**

### **12.1. Serial Communications Port**

An optional serial communications (RS232) port offers access to the information stored in the microprocessor's memory and allows some internal parameters to be modified.

### **13. Warranty**

Edinburgh Instruments Ltd. guarantees the equipment against defective materials or workmanship for a period of one year from the date of the delivery. In no event shall the Company be liable for any consequential loss or damage arising from failure of the equipment under warranty.

At the end of the one-year period, all claims upon and all liability from failure of the equipment shall be absolutely at an end.

No warranty is made or implied as to the suitability of any equipment for the Purchaser's intended use beyond such performance specifications.

#### **The Purchaser warrants**

That they will carefully examine and list all parts of the equipment supplied by Edinburgh Instruments Ltd. and notify Edinburgh Instruments Ltd. in writing of any shortage, defect or failure to comply with the contract, which is or ought to be apparent upon such examination and test, within 48 hours of the equipment being delivered to or collected by the Purchaser.

That the equipment will be operated in accordance with the instructions and advice detailed in the appropriate operating instruction manual, or any other instructions that may be provided by Edinburgh Instruments Ltd. Edinburgh Instruments Ltd. shall not be held responsible for any defect arising from the Purchaser's failure to comply with these recommendations and instructions or from damage arising from negligence or exposure to adverse environmental conditions.

The warranty is effective only if: -

The equipment has been paid for in accordance with the normal payment terms.

Any defects in the equipment supplied are notified immediately by the Purchaser to Edinburgh Instruments Ltd.

The equipment is returned to Edinburgh Instruments Ltd. at its Livingston premises, transportation and insurance prepaid, and undamaged by the failure to provide sufficient packaging.

The warranty covers: -

Engineer costs to inspect and repair.

Materials or components, which require to be replaced.

Return carriage costs to the Purchaser.

The timing of the inspection and repair of the equipment will be determined entirely at the discretion of Edinburgh Instruments Ltd.

## 14. Declaration

### EC Declaration of Conformity

We: Edinburgh Instruments Ltd.

Of: 2 Bain Square, Kirkton Campus, Livingston EH54 7DQ, UK

declare that:

Equipment: Gas Monitor

Model Names: BOXED GASCARD

in accordance with the following Directives:

2014/30/EU Conforms with the essential requirements of the Electromagnetic Compatibility Directive and its amending directives

has been designed and manufactured to the following specifications:

BS EN 61000-6-1:2007 EMC immunity for residential, commercial and light-industrial environments

BS EN 61000-6-3:2007 + A1:2011 EMC emission standard for residential, commercial and light-industrial environments

I hereby declare that the equipment named above has been found to comply with the relevant sections of the above referenced specifications. The unit complies with all essential requirements of the Directives.

Signed by:

Name: Gerald Gilligan

Position: Company Secretary

June 2018



## 15. DOCUMENT CHANGE HISTORY

<b>Version</b>	<b>E.C.N</b>	<b>Date</b>
1.00	Original	June 18