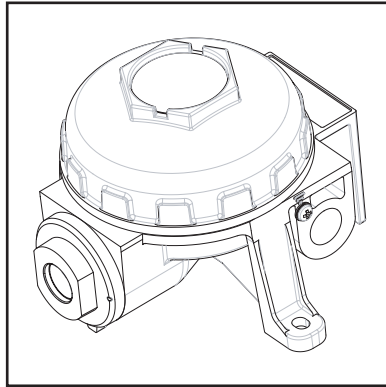


# Xsafe

## Gas Detector



### Installation, operating and maintenance instructions

M07626  
June 2004



## Safety information

- Xsafe gas detectors must be installed, operated and maintained in strict accordance with these instructions, warnings, label information, and within the limitations stated.
- The Junction box lid must be kept tightly closed until power to the detector is isolated otherwise ignition of a flammable atmosphere can occur. Before removing the cover for maintenance or calibration purposes, ensure the surrounding atmosphere is free of flammable gases or vapours.
- Maintenance and calibration operations must only be performed by qualified service personnel.
- Only genuine Crowcon replacement parts must be used, substitute components may invalidate the warranty of the detector.
- Xsafe detectors must be protected from extreme vibration, and direct sunlight in hot environments as this may cause the temperature of the detector to rise above its specified limits and cause premature failure.
- This equipment must not be used in a Carbon Disulphide atmosphere.

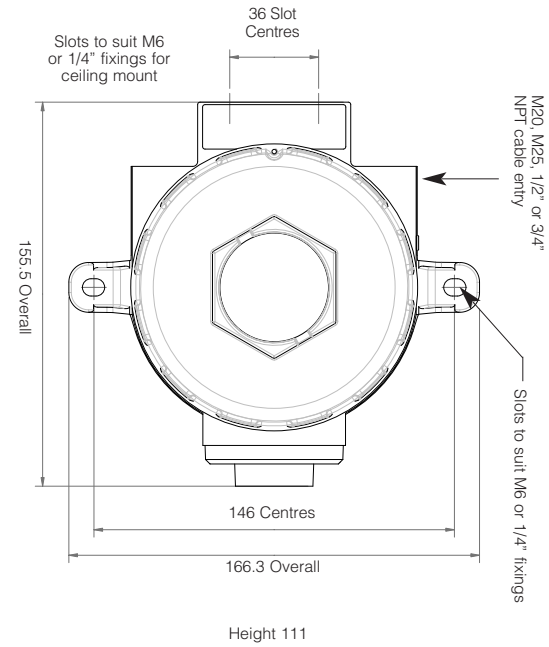
## 1. Introduction

### 1.1 Flammable gas detector

Xsafe is designed to detect flammable gas present in ambient air, at concentrations not exceeding the Lower Explosive Limit (LEL) of the target gas for which it is calibrated. Xsafe operates using pellistors and is available in two versions; the mV version operates as part of a 3-wire Wheatstone Bridge (WB) circuit, and must be connected to a suitable control card. The mA version is powered by 24vDC (nominally) and provides a 4-20mA signal (sink or source) proportional to the gas concentration.

The junction box is manufactured from marine grade aluminium with a durable polyester coating. It is supplied with 1 x M20, M25, 1/2" or 3/4" NPT cable gland entry, on the right hand side for customer use. The junction box is suitable for fixing on the wall or ceiling using M6 fixings. Cable gland adaptors are available if required (see Spare parts and accessories section).

## 1. Introduction



All dimensions in millimetres

Diagram 1: Xsafe dimensioned view

## 1. Introduction

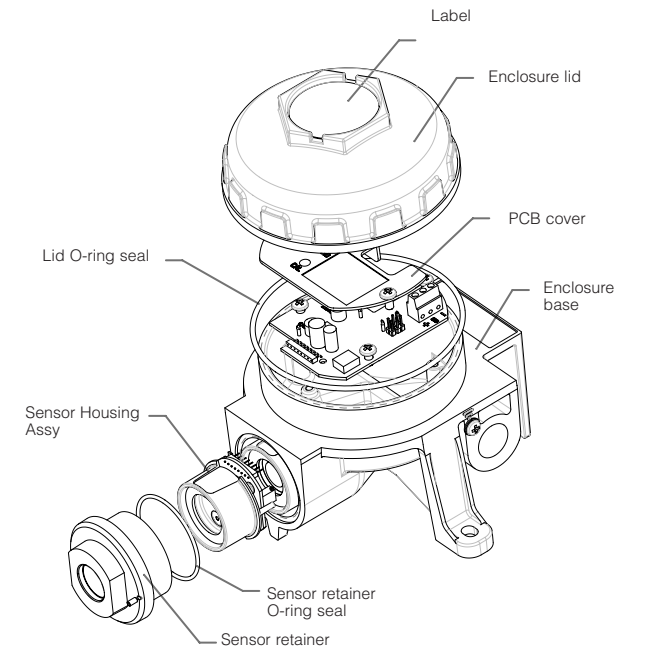


Diagram 2: Xsafe exploded view

## 2. Installation

### WARNING

Xsafe is not designed for use in hazardous areas. Crowcon provide a wide range of gas detectors for use in these locations, please contact Crowcon for further information. Prior to carrying out any installation work ensure local regulations and site procedures are followed.

### 2.1 Location

The detector should be mounted where the gas to be detected is most likely to be present. The following points should be noted when locating gas detectors:

- To detect gases which are lighter than air, detectors should be mounted at high level and Crowcon recommend the use of a collector cone (Part No. C01051) and accessory adaptor (Part No. M04666).
- To detect heavier than air gases, detectors should be mounted at low level.
- When locating detectors consider the possible damage caused by natural events e.g. rain or flooding. For detectors mounted outdoors Crowcon recommend the use of a Spray Deflector (Part No. C01052) and accessory adaptor (Part No. M04666).
- Consider ease of access for functional testing and servicing.
- Consider how the escaping gas may behave due to natural or forced air currents. Mount detectors in ventilation ducts if appropriate.
- Consider the process conditions. For example, butane is normally heavier than air, but if released from a process which is at an elevated temperature and/or pressure, the gas may rise rather than fall.

The placement of sensors should be determined following advice of experts having specialist knowledge of gas dispersion, the plant processing equipment as well as safety and engineering issues. The agreement reached on the locations of sensors should be recorded. Crowcon would be pleased to assist in the selection and siting of gas detectors.

## 2. Installation

### 2.2 Mounting

Xsafe should be installed at the designated location with the sensor pointing down. This ensures that dust or water will not collect on the sensor and stop gas entering the cell. The mounting detail is shown in Diagram 1. Care should be taken when installing the detector to avoid damaging the painted surface of the junction box and sensor retainer.

### 2.3 Cabling requirement

Cabling to Xsafe must be in accordance with the recognised standards of the appropriate authority in the country concerned and meet the electrical requirements of the detector.

Crowcon recommend the use of steel wire armoured (SWA) cable and suitable glands must be used. Alternative cabling techniques, such as steel conduit, may be acceptable provided appropriate standards are met.

Maximum permissible cable lengths depend on the cable resistance and sensor being used.

**mV version** It is important that the correct bridge voltage be applied to the detector. Xsafe mV requires a supply of 2V dc +/- 0.1Vdc, measured at the detector

C.S.A.		Resistance (Ohms per km)		Max. Distance (km)
mm <sup>2</sup>	Awg	Cable	Loop	2.0 volt pellistors
1.0	17	18.1	36.2	1.47
1.5	15	12.1	24.2	2.2
2.5	13	7.4	14.8	3.6

Table 1: maximum cable distances for typical cables mV version

**mA version** requires a dc supply of 10-30 volts, at up to 100mA. Ensure there is a minimum of 10 volts at the detector, taking into account the voltage drop due to cable resistance. For example, a nominal dc supply at the control panel of 24 volts has a guaranteed minimum supply of 18 volts. The maximum voltage drop is therefore 8 volts. Xsafe mV can demand up to 100mA and so the maximum loop resistance allowed is 80 Ohms.

## 1. Introduction

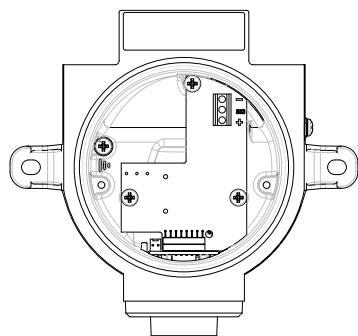


Diagram 3: Xsafe mV PCB layout (Shown with PCB cover removed).

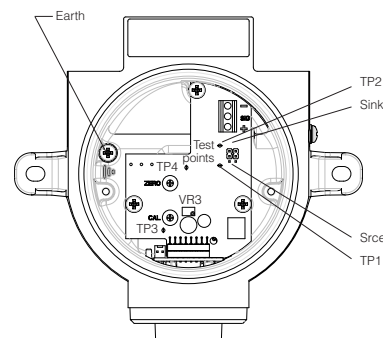


Diagram 4: Xsafe mA PCB layout (Shown with PCB cover removed).

## 2. Installation

A 1.5mm<sup>2</sup> cable will typically allow cable runs up to 3.3km. Table 2 shows the maximum cable distances given typical cable parameters.

C.S.A.		Resistance (Ohms per km)		Max. Distance (km)
mm <sup>2</sup>	Awg	Cable	Loop	(km)
1.0	17	18.1	36.2	2.2
1.5	15	12.1	24.2	3.3
2.5	13	7.4	14.8	5.4

Table 2: maximum cable distances for typical cables mA version

The acceptable cross sectional area of cable used is 0.5 to 2.5mm<sup>2</sup> (20 to 13awg). The table is provided for guidance only, actual cable parameters for each application should be used to calculate maximum cable distances.

### 2.4 Electrical connections

All connections are made via the screw terminal block mounted on the PCB in the junction box. The terminals are marked '+', 'sig' and '-' and correct polarity should be observed when connecting the detector to control equipment.

**mV version** operates as part of a 3-wire mV Wheatstone bridge circuit and must be connected to a suitable control card.

Note: The junction box and cable armour must be earthed at the control panel to limit the effects of radio frequency interference. Ensure the earth connection is provided in a safe area only, so as to avoid earth loops.

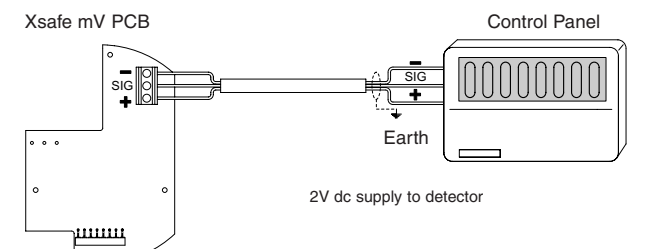


Diagram 5: Xsafe mV electrical connections

## 2. Installation

### 2.4 Electrical connections

**mA version** is factory set as a 'current sink' device unless otherwise specified when ordering. To reset to 'current source', open the junction box and move the two links on the amplifier PCB from the 'sink position to the 'srce' position, as shown in Diagram 4.

Note: The junction box and cable armour must be earthed at the control panel to limit the effects of radio frequency interference. Ensure the earth connection is provided in a safe area only, so as to avoid earth loops.

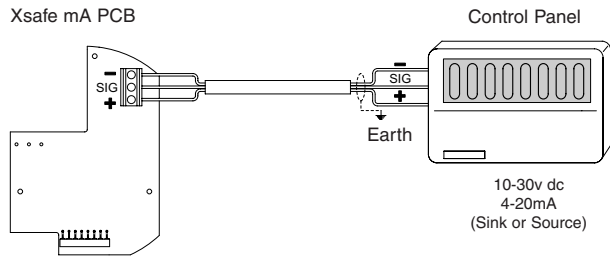


Diagram 6: Xsafe mA electrical connections

## 3. Operation

**WARNING**  
Prior to carrying out any work ensure local regulations and site procedures are followed. Never attempt to open the detector or junction box when flammable gas is present. Ensure that the associated control panel is inhibited so as to prevent false alarms.

### 3.1 Commissioning procedure-mV version

1. Open the junction box of the detector by unscrewing the lid in an anti-clockwise direction (having loosened the retaining grub-screw first).
2. Check that all electrical connections have been made and are correct as per Diagram 5.
3. Measure the voltage across the '+' and '-' terminals and adjust to 2V dc +/- 0.1V dc.

8

## 3. Operation

4. Leave the detector to stabilise for at least 1 hour.
5. Balance the WB circuit at the control panel if necessary. Refer to the control equipment instruction manual.

### Zeroing the detector

6. Ensure you are clean air. Adjust the control equipment to read zero.

### Calibrating the detector

7. Apply calibration gas (concentration should be 50% LEL) to the detector at a flow rate of 0.5 - 1 litre/minute via a flow adaptor (**Part No. C03005**). Contact Crowcon for the supply of calibration gas.
8. Allow the gas reading to stabilise (usually 30 to 60 seconds) and adjust the control equipment to read 50% LEL.
9. Remove the gas and allow the sensor to completely settle before re-checking the zero setting.
10. Close the junction box of the detector ensuring that the lid is securely tightened, and the grub-screw is secured.
11. The detector is now operational.

### 3.2 Commissioning procedure-mA version

1. Open the junction box of the detector by unscrewing the lid in an anti-clockwise direction (having loosened the retaining grub-screw first).
2. Check that all electrical connections have been made and are correct, as shown in Diagram 6.
3. Measure the voltage across the '+' and '-' terminals and check a minimum supply of 10V d.c. is present.
4. Leave the detector to stabilise for at least 1 hour.
5. Before calibration of the detector can commence, the pellistors must be balanced. To do this remove the PCB cover, and connect a digital volt meter (DVM) to the test points marked 'TP3' and 'TP4' on the amplifier PCB, as shown in Diagram 4. The DVM should be set to the dc mV range, and the potentiometer marked 'VR3' should be adjusted until the DVM reads 0.00mV. The PCB cover can now be replaced.
6. To zero the detector, reconnect the DVM to the test points marked 'TP1' and 'TP2' on the amplifier PCB, as shown in Diagram 4.  
Note: At the test points, Zero will read 40 mV = 4 mA.  
Full scale deflection (100% LEL) will read 200 mV = 20 mA. There is a current clamp of 25mA on the 4-20mA output.

9

## 4. Spare parts and accessories

Please refer to the Sensor Type section on the main junction box label for the correct replacement sensor part number.

Description Part	Number
M20 to 1/2" NPTF adaptor	M02125
M20 to 3/4" NPTF adaptor	M02281
Calibration adaptor	C03005
Accessory adaptor	M04666
Weatherproof cap	C01442
Collector cone	C01051
Spray deflector	C01052
Flow adaptor (for sampling applications)	C01339
Duct mounting kit	M01844
Sensor retainer c/w sinter	M01814
Sensor retainer O-ring	M04828
Junction box lid O-ring	M04829
Amplifier PCB (mV version)	S011477
Amplifier PCB (mA version)	S011242
PCB Cover	M04770
Replacement Sensor module	S011251/S

13

## 3. Operation

### Zeroing the detector

7. **Ensure you are clean air.** Adjust the 'ZERO' pot on the amplifier (which is accessible via a hole in the PCB cover) until the DVM reads 40 mV. Check that the control equipment display reads zero.

### Calibrating the detector

8. Apply calibration gas (concentration should be 50% LEL) to the detector at a flow rate of 0.5 - 1 litre/minute via a flow adaptor (**Part No. C03005**). Contact Crowcon for the supply of calibration gas.
9. Allow the gas reading to stabilise (usually 30 to 60 seconds) and adjust the 'CAL' pot until the DVM reads the appropriate reading (ie 120mV = 12mA = 50% LEL). If the concentration of the calibration gas used is not 50% LEL, the following formula can be used to calculate the reading:

$$\left( \frac{160}{\text{Range}} \times \text{Gas} \right) + 40 = \text{mV setting}$$

Example: calibrating using 25% LEL test gas

$$\left( \frac{160}{100} \times 25 \right) + 40 = 80 \text{ mV}$$

10. If the control equipment display requires adjustment consult the operating manual for the equipment.
11. Remove the gas and allow the sensor to completely settle before re-checking the zero setting.
12. Close the junction box of the detector ensuring that the lid is securely tightened, and the grub-screw is secured.
13. The detector is now operational.

### 3.3 Routine maintenance

Pellistors can suffer from loss of sensitivity when there is a presence of poisons or inhibitors such as silicones, sulphides, chlorine, lead or halogenated hydrocarbons. Crowcon use poison resistant pellistors to maximise the operational life of **Xsafe**. In applications where such compounds are continuously present we recommend the use of Crowcon's fixed point infrared flammable gas detectors, which are immune to such poisons and inhibitors. Please contact Crowcon for further details.

The operational life of the pellistors depends on the application and amount of gas to which the pellistor has been exposed. Under normal conditions (6 monthly calibration with periodic exposure to CAL gas) the life expectancy is 3-5 years.

10

## Warranty

This equipment leaves our works fully tested and calibrated. If, within a period of one year from the date of purchase, it is proved to be defective by reason of faulty workmanship or material we undertake, at our option, either to repair or replace it, free of charge, subject to the conditions below.

1. If the purchaser wishes to make any claim for repair or replacement under this guarantee, he shall contact our Customer Care department and obtain a claim number using the contact information detailed below. The purchaser should then return the complete instrument to us at his risk, adequately packed and carriage paid, and include a note of the complaint along with the allotted claim number. The guarantee will be rendered invalid if the instrument is found to have been altered, modified, dismantled, or tampered with.
2. We accept no liability for consequential or indirect loss or damage howsoever arising (including any loss or damage arising out of the use of the instrument) and all liability in respect of any third party is expressly excluded.
3. The guarantee does not cover the accuracy of calibration after the system has been put into use.
4. The guarantee does not include the cosmetic finish of the product, and is dependant upon installation and maintenance of the product in accordance with the procedures set out in the Installation, Operating and Maintenance Instructions.
5. Our liability in respect of defective equipment shall be limited to the obligations set out in the guarantee and any further warranty, condition or statement, express or implied statutory or otherwise as to the merchantable quality of our equipment or its fitness for any particular purpose is excluded except as prohibited by statute. This guarantee shall not affect a customer's statutory rights.
6. Detectors that are returned to Crowcon as faulty, and are subsequently found to be fault-free may be subject to a small handling charge to cover inspection and return shipping costs.

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14

## 3. Operation

Site practices will dictate the frequency with which detectors are tested. Crowcon would recommend that detectors be gas tested at least every 6 months and re-calibrated as necessary. To re-calibrate a detector follow the steps given in 3.1 and 3.2.

The sinter should be inspected regularly, and replaced if it has become contaminated. A blocked sinter may prevent gas from reaching the sensor.

When performing maintenance on **Xsafe**, ensure that the sensor retainer and junction box lid O-rings are present and in good condition to maintain the ingress protection of the product. See the 'Spare parts and accessories' section for the part numbers of replacement O-rings.

### 3.4 Sensor replacement/servicing of detectors

**Xsafe** uses a modular design, which makes replacement of sensors, or sinters extremely simple. Replacement sensors are supplied fitted to a sensor PCB to allow simple plug-in installation. An exploded view of **Xsafe** is given in Diagram 2. The following procedure may be followed when servicing a **Xsafe** detector.

**WARNING**  
This work should be carried out by Crowcon or an approved service centre unless suitable training has been received.

1. Switch off and isolate power to the detector requiring attention.
2. Open the junction box of the detector by unscrewing the lid in an anti-clockwise direction (having loosened the retaining grub-screw first).
3. Unscrew the sensor retainer and remove the sensor and sensor PCB.
4. Fit the replacement sensor (having checked that the part number matches that stated on the detector junction box label), taking care to align the locating pins correctly with the slots in the junction box.
5. Re-fit the sensor retainer having first inspected the sinter to make sure that it has not become contaminated. Contaminated items should be replaced (see Spare Parts section for replacement part numbers), as any blockages may result in slow sensor response to gas, and reduced sensitivity.
6. Follow the Commissioning Procedure given in 3.1 and 3.2.

11



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12