Detecting Gas Saving Lives

Crowcon Technical Note

Document Reference: **GEN110**

Document applies to: **MPS Sensor**

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Subject: **MPS Sensor Calibration & Test Gases (Issue 2)**

The MPS™ (Molecular Property Spectrometer™) Flammable Gas sensor represents the biggest leap forward in combustible gas sensor technology for more than 40 years. The industrial safety market has, to date, relied on two established sensor types for detecting Methane, Hydrogen and general hydrocarbons: the Pellistor (Catalytic Bead) and Infrared (IR) sensors. Each of these sensors has significant drawbacks however:

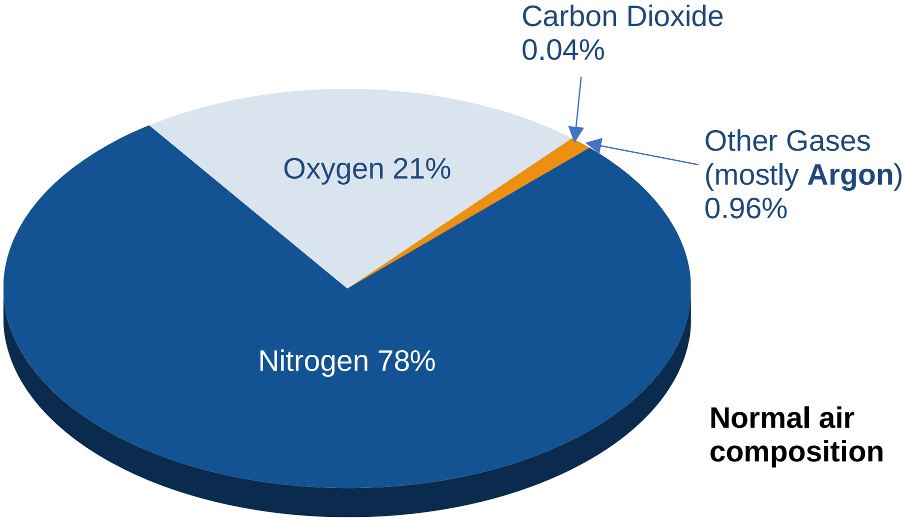
- Pellistors are easily poisoned, have only a 3-5 year life and do not fail safe.
- Pellistors are only accurate for the gas with which they are calibrated.
- IR sensors cannot detect Hydrogen.
- IR sensors are extremely inaccurate for gases/vapours other than the gas with which they are calibrated.

The MPS™ sensor resolves all of these issues:

- It cannot be poisoned.
- It lasts for more than 5 years.
- It detects Hydrogen and Hydrocarbons.
- It provides an accurate 'TrueLEL™' reading for over 20 gases/vapours with a standard Methane calibration.
- It does not need re-calibration.

The MPS™ sensor works by monitoring changes in the thermodynamic properties of the air/gas mix. It does not produce a catalytic reaction to gas like a pellistor, or measure infrared absorption like an IR sensor. As a result, **it should not be treated like these sensors when it comes to testing, calibration and maintenance**.

The MPS™ sensor references the normal composition of air as a baseline when monitoring. Importantly: as air contains almost 1% Argon and traces of CO_2, Krypton and other gases, the thermal conductivity properties of these gases is factored into the measurement algorithm. Argon, in particular, has a strong effect on the sensor reading. The sensor is also optimized for operation in a normal 20.9% oxygen concentration in air.



Normal air composition

Obtaining calibration gas with Methane in a true air background is not always possible. In order to make sensor testing on-site as simple as possible, the sensor algorithm has been adapted to produce a correct Methane response when a mixture of 2.2% Methane and 18% oxygen in a background of nitrogen is applied. The lower concentration of oxygen in the test gas offsets the sensor response in proportion to the absence of Argon, resulting in an accurate calibration.

MPS™ Sensor Testing

The MPS™ sensor does not require regular calibration throughout its lifetime. Under normal ambient conditions, calibration should be performed every 5 years. However, if it is appropriate to bump test or calibrate the sensor, there are specific gas compositions which must be used.

Important points to note:

- **Calibration and bump testing must only be performed with the gas mixtures stated in this document. Using other gases/mixes will result in inaccurate sensor readings.**
- **Correction factors (as used on Pellistors) must not be applied as they will result in inaccurate sensor readings.**
- **'Testing' the MPS™ sensor with other gases/vapours such as Propane or Butane applied from gas cylinders will result in inaccurate sensor readings. Cylinder/test gas does not contain the background gases such as Argon and thus the calculated sensor readings will be wrong.**

Because of the sensing technology, the accuracy of the MPS sensor is such that the Argon content of Ambient Air must either be present, or accounted for, in the test or calibration gas used. It is therefore essential to adhere to the calibration mixtures outlined in this technical note. **Failure to do so will affect the accuracy of the MPS sensor to all gases.**

NOTE: The MPS sensor must always be calibrated with an appropriate "Methane-based" gas mix.

Crowcon Detection Instruments Ltd
172 Brook Drive, Milton Park, Abingdon, Oxfordshire, OX14 4SD,
UK Tel: +44 (0) 1235 557700 Fax: +44 (0) 1235 557749
Email: technicalsupport@crowcon.com

Company registered no. 00978878
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The Ideal MPS Methane Calibration Gas Mix:

2.2%Vol Methane
20.44%Vol Oxygen
0.91%Vol Argon
Balanced in Nitrogen

Please note:
This gas mix **must** contain **0.91% Vol Argon** in order to replicate an Ambient Air background

The gas mix above can be achieved by adding **2.2 %vol CH_4** to a balance gas comprising of Atmospheric Air (**20.9 % Vol Oxygen**, **0.93 % Vol Argon**, **78.17% Vol Nitrogen**). This would need to be mixed into a Gas Bag (*see page 3 of this Technical Note for instructions*).

Quad Gas Mix:

The standard Crowcon Quad-Gas mix (**P/N: G4-QUAD-1-34**) is suitable for MPS calibration because the reduced (18%Vol) Oxygen plus the ppm levels of CO & H_2S provides the adjustment required to 'simulate' the presence of 0.9%Vol Argon.

Part Number: G4-QUAD-1-34:
2.2%Vol Methane
18%Vol Oxygen
15ppm Hydrogen Sulphide
100ppm Carbon Monoxide
Balanced in Nitrogen

Please note:
This cylinder must contain **18% Oxygen.**

Dual Gas Mix:

The Crowcon Dual Gas mix (**P/N: G2-Dual-4-34**) is also suitable for MPS calibration because the CO & H_2S content in the above mix is negligible & will make very little difference to the MPS response.

Part Number: G2-DUAL-4-34:
2.2%Vol Methane
18%Vol Oxygen
Balanced in Nitrogen

Please note:
This cylinder must contain **18% Oxygen.**

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A Halma company

Crowcon Standard Multi-gas Cylinders available:

P/N: G2-DUAL-4-34	**2.2% Methane (ATEX = 50% LEL) / 18% O2 (Balanced in Nitrogen)**
P/N: G4-QUAD-1-34*	**2.2% Methane (ATEX = 50% LEL) / 18% O2 / 15ppm H2S / 100ppm CO (Balanced in Nitrogen)**

** Also available in 60 Ltr / 112 Ltr cylinders – Contact sales@crowcon.com for details*.

Bump testing with other gases/vapours

If gas-testing the MPS sensor with a different flammable gas (e.g. Butane, Propane etc.) you will need to create a gas mix which includes the Argon content.

How to create a gas mix in a 10-litre Gas Bag.

Please note:

By using this method, the ambient air provides the appropriate background for the MPS sensor to respond correctly to the target gas.

1) Identify the %Volume equivalent of 50%LEL of the Target gas.
(*%Vol Target Gas x 10 Litres = CC of target gas required in a 10 Litre gas mix.*)

- **Examples:**
  Propane (LEL = 1.7%Vol)
  0.85%Vol = 50%LEL.
  Therefore; 0.85% x 10 Litres = 0.085 Litres = ***85CC*** *of Propane*

  Ethylene (LEL = 2.3%Vol)
  1.15% Vol = 50%LEL
  Therefore; 1.15% x 10 Litres = 0.115 Litres = ***115CC*** *of Ethylene*

2) **Fill** a 10-litre gas bag with 10 litres of '**ambient air**'.

3) Using a gas syringe, **extract** the appropriate CC of ambient air from the gas bag - equal to the CC of 'Target Gas' calculated (as per the above examples).

4) Use the gas syringe again, introduce the appropriate CC of **50%LEL of the target flammable gas** to get back to a 10-litre volume of gas and air mixture in the gas bag.

For more information, please contact +44 (0)1235 557711, technicalsupport@crowcon.com

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