



Technical Memo, PureAire MPS™ Flammable Gas Monitor Performance Comparison

Overview

The PureAire MPS™ Flammable Gas Monitor incorporates cutting-edge Molecular Property Spectrometer™ (MPS™) technology developed by NevadaNano. This sensor represents a significant advancement in gas detection, designed to address the limitation of traditional catalytic bead and nondispersive infrared (NDIR) sensors. The MPS™ sensor provides reliable, accurate detection for a broad range of flammable gases, including hydrogen, with a lifespan of over **15 years** without requiring calibration.

Key Advantages

- **No Calibration Required:** The sensor maintains its accuracy for over 15 years without recalibration, reducing maintenance costs and downtime.
- **Extended Lifetime:** Operating for over 15 years, the MPS™ sensor outlasts traditional sensors, which require more frequent replacements.
- **Fail-safe Operations:** Built-in diagnostics continuously monitor the sensor's performance to ensure it remains operational.
- **Accurate Detection of Multiple Gases:** The MPS™ sensor can detect a wide range of gases, including hydrogen and heavy hydrocarbons, without the need for separate sensors for each gas type.
- **TrueLEL™ Technology:** Accurately measures the %LEL (lower explosive limit) of both pure gases and gas mixtures, providing reliable gas detection across different environments.

Comparison of Sensor Technologies

The table below outlines the differences between the MPS™ sensor, catalytic bead sensors, and NDIR sensors. This comparison highlights why the PureAire MPS™ Flammable Gas Monitor is a superior option for industries requiring reliable, long-term gas detection.

Parameter	MPS™ Sensor (PureAire)	Catalytic Bead	NDIR Sensor
Responds to the full range of gases	Yes	Yes	No
TrueLEL™ Accuracy	Yes	No	No
Calibration Interval	None (15+ years)	0.25 years	1 year
Sensor Lifetime	15+ years	2 years	5 years
Hydrogen Detection	Yes	Yes	No
Resistance to Contamination	High	Low (susceptible to poisoning)	High
Environmental Impact Resistance	High (built-in compensation)	Moderate	Moderate

Limitations of Catalytic Bead Sensors:

- **Calibration Needs:** These sensors need frequent recalibration, typically every few months, to maintain accuracy. Over time, the sensor’s ability to measure gases deteriorates.
- **Sensor Poisoning:** Catalytic bead sensors are highly susceptible to poisoning from certain chemicals (e.g., silicones, chlorine), which can damage the sensor and render it inaccurate or non-functional. High concentrations of flammable gases can also “burn out” the catalyst, further reducing the sensor’s lifespan.
- **Single-Gas Calibration:** These sensors must be calibrated to one specific gas, often methane, which makes them inaccurate for other gases unless recalibrated.
- **Shorter Lifespan:** These sensors typically last around 2 years, requiring regular replacements which increases maintenance costs.

Limitations of NDIR Sensors:

- **Hydrogen Detection:** NDIR sensors cannot detect hydrogen, a major limitation for industries dealing with hydrogen or hydrogen-based mixtures.
- **Environmental Susceptibility:** NDIR sensors are sensitive to changes in temperature and humidity, which can interfere with readings. For example, moving from a cold outdoor environment to a warmer indoor space can cause inaccurate readings due to condensation or humidity changes.
- **Single-Gas Calibration:** Like catalytic bead sensors, NDIR sensors are calibrated to detect specific gases, such as methane. This reduces accuracy for other gases unless multiple sensors are deployed.

Gas Detection Performance

The PureAire MPS™ Flammable Gas Monitor uses its TrueLEL™ technology to accurately measure a wide range of flammable gases. It is calibrated using methane but can still provide reliable readings for other gases. The table below shows the %LEL error for various gases compared to catalytic bead and NDIR sensors:

Gas	%LEL Error MPS™ (PureAire)	%LEL Error Pellistor	%LEL Error NDIR
Methane	+ 3%LEL		
Propane	+ 5%LEL		
n-Butane	+ 5%LEL		
n-Pentane	+ 5%LEL		
n-Hexane	- 20%LEL		
n-Heptane	+ 12%LEL		
n-Octane	+ 5%LEL		
Acetone	+ 20%LEL		
MEK	+ 5%LEL		
Toluene	+ 12%LEL		
Hydrogen	+ 5%LEL		
Key			
±0-15 %LEL error			
±15-20 %LEL error			
>±20 %LEL error			

Conclusion

The PureAir MPS™ Flammable Gas Monitor offers a groundbreaking solution for long-term gas detection. With **15+ years of accurate performance** without calibration, and the ability to detect a wide range of gases, it surpasses traditional catalytic bead and NDIR sensors in both reliability and functionality. Its resistance to environmental factors and fail-safe operation makes it the ideal choice for industries that prioritize safety, accuracy, and long-term cost efficiency.

Figures below show the delivered vs. reported concentrations of selected gases, when calibrated to methane.

