NevadaNano’s MPS Flammable Gas Sensor is the next generation of gas detection and quantification for worker safety and leak detection in drilling, transportation, and production of oil & gas and chemical products. The smart sensor, with built-in environmental compensation, detects and accurately quantifies a dozen gases and gas mixtures. The MPS Flammable Gas Sensor is intrinsically safe, robust, extremely poison-resistant, and calibrated for all gases by performing only a single calibration with methane. Sensor readings are output on a standard digital bus or industry-standard analog output – no added electronics are required. With a 5-year lifetime and no calibration required, the MPS Flammable Gas Sensor delivers industry-leading performance and a low cost of ownership.

### GAS DETECTION

<table>
<thead>
<tr>
<th>Gas</th>
<th>Detection Range</th>
<th>Accuracy (at 50% LEL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>butane (C₄H₁₀)</td>
<td>0-100 %LEL</td>
<td>±5 %LEL</td>
</tr>
<tr>
<td>ethane (C₂H₆)</td>
<td>0-100 %LEL</td>
<td>±5 %LEL</td>
</tr>
<tr>
<td>ethylene (C₂H₄)</td>
<td>0-100 %LEL</td>
<td>±15 %LEL</td>
</tr>
<tr>
<td>hexane (C₆H₁₄)</td>
<td>0-100 %LEL</td>
<td>±8 %LEL</td>
</tr>
<tr>
<td>hydrogen (H₂)</td>
<td>0-100 %LEL</td>
<td>±5 %LEL</td>
</tr>
<tr>
<td>isopropanol (C₃H₈O)</td>
<td>0-100 %LEL</td>
<td>±5 %LEL</td>
</tr>
<tr>
<td>methane (CH₄)</td>
<td>0-100 %LEL</td>
<td>±3 %LEL</td>
</tr>
<tr>
<td>pentane (C₅H₁₂)</td>
<td>0-100 %LEL</td>
<td>±5 %LEL</td>
</tr>
<tr>
<td>propane (C₃H₈)</td>
<td>0-100 %LEL</td>
<td>±5 %LEL</td>
</tr>
<tr>
<td>propylene (C₃H₆)</td>
<td>0-100 %LEL</td>
<td>±10 %LEL</td>
</tr>
<tr>
<td>toluene (C₇H₈)</td>
<td>0-100 %LEL</td>
<td>±5 %LEL</td>
</tr>
<tr>
<td>xylene (C₈H₁₀)</td>
<td>0-100 %LEL</td>
<td>±10 %LEL</td>
</tr>
</tbody>
</table>

Accuracy guaranteed for methane across full environmental range. Other gases will typically meet the published tolerances across the full environmental range, but are guaranteed only at standard conditions¹.

The MPS Flammable Gas Sensor is capable of detecting many common flammable gases/vapors. Contact NevadaNano for more information.

### PERFORMANCE

- **Resolution**: 0.1 %LEL (methane)
- **Response time (T90)**: < 20 seconds (methane)
- **Calibration**: Factory calibrated

### ENVIRONMENTAL OPERATING RANGE

- **Temperature**: -40° to 75° C
- **Humidity**: 0% to 100% RH
- **Pressure**: 80 to 120 kPa

### FEATURES

- Automatic multi-gas accuracy in real-time
- Built-in environmental compensation
- Extremely poison-resistant
- No calibration required
- 5+ year lifetime
- Low power — 29 mW average
- Intrinsically safe
- ATEX/IS certified
- Built-in self-test for fail-safe operation

### OPERATING PRINCIPLE

The Molecular Property Spectrometer (MPS) Flammable Gas Sensor’s transducer is a micro-machined membrane with an embedded Joule heater and resistance thermometer. The MEMS transducer is mounted on a PCB and packaged inside a rugged enclosure open to ambient air. Presence of a flammable gas causes changes in the thermodynamic properties of the air/gas mixture that are measured by the transducer. Sensor data are processed by patent-pending algorithms to report accurate concentration and classify the flammable gas.

### NOTES

¹ Standard conditions: 20° C, 50 %RH
**GAS CLASSIFICATION**

**The old way:** Conventional sensing technologies (e.g. catalytic bead, NDIR) use a “k-factor” multiplier to convert raw sensor signals to gas concentrations in % LEL. These “k-factors” are based on known relative sensitivities of these sensors to different gases. A single “k-factor”, corresponding to a particular gas, must be selected manually during system setup; if the sensor is then exposed to a gas other than the one selected, significant errors in reported concentration can occur.

**The MPS way:** The MPS Flammable Gas Sensor applies a real-time conversion factor automatically, using the latest measured thermal properties of the ambient air/gas and the environmental conditions. The %LEL values reported for the bulk, which may contain a mixture of gases, achieves the same high levels of accuracy achieved with single gases. Additional smart algorithms enable determination of the class of gas present, according to the following categories:

**CLASS 1: Hydrogen**
Molecular weight: 2.0 [g/mol]  
Density: 0.09 [kg/m^3]  
# carbons: 0

**CLASS 2: Hydrogen Mixture**  
Avg. Mol. weight: 1-14 [g/mol]  
Avg. Density: 0.1-0.6 [kg/m^3]  
# carbons: varies  
*This classification is unique as it guarantees the presence of hydrogen and another flammable gas

**CLASS 3: Methane/Natural Gas**  
Avg. Mol. weight: 16 to 19 [g/mol]  
Avg. Density: 0.6-0.9 [kg/m^3]  
Typical # carbons: 1-2

**CLASS 4: Light Gas (or Light Gas Mixture)**
Avg. Mol. weight: 25 to 75 [g/mol]  
Avg. Density: 1.2-2.5 [kg/m^3]  
Typical # carbons: 1-4  
Example Gases: Ethane, Propane, Butane, Isopropanol

**CLASS 5: Medium Gas (or Medium Gas Mixture)**
Avg. Mol. weight: 50 to 120 [g/mol]  
Avg. Density: 1.5-4.0 [kg/m^3]  
Typical # carbons: 2-8  
Example Gases: Pentane, Hexane

**CLASS 6: Heavy Gas (or Heavy Gas Mixture)**
Avg. Mol. weight: 80+ [g/mol]  
Avg. Density: 3.5+ [kg/m^3]  
Typical # carbons: 6+  
Example Gases: Octane, Toluene, Xylene
Molecular Property Spectrometer™
MPS™ Flammable Gas Sensor

MECHANICAL

Dimensions 16.6 mm (H) x 20.0 mm (D)
Mass 8.0 ± 0.5 grams
Body material Ultem PEI

ELECTRICAL

Operating voltage 3.3 - 5.0 ±5% VDC
Current consumption [mA] Average 8.9 Operating Range 5.0-21.0

Digital Input/Output
Communication: 4 or 5 pin UART
Logic level: 3.3 V
Baud rate: 38,400. 8 data, 1 stop bits. No parity
Programmable Analog out (optional)

3-pin Pellistor Replacement Programmable Output
Industry standard 0.4 to 2.0 volt linearized, compensated for temperature, humidity and pressure.

CERTIFICATION

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<td>Ex ia IIC Ga</td>
<td>Ex ia IIIC Da</td>
<td>Ta = -40°C to 75°C</td>
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For additional information on certifications, refer to the MPS Hazardous Locations User Guide here: www.nevadanano.com/downloads

Specifications are preliminary and subject to change without notice.

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