
# Methane

## Where is it found?

Methane ($CH_4$) is the most abundant organic molecule in the atmosphere, being one of the most important greenhouse gases. It is colourless, odourless and insoluble in water. The main anthropogenic emission sources are due to the production and transport of coal, natural gas, and oil.

$CH_4$ emissions also result from livestock and other agricultural practices, land use and solid waste landfills. Other natural sources include reduced, anoxic portions of wetlands and portions of ecosystems undergoing organic decomposition.

## Why is it harmful?

High levels of $CH_4$ can result in vision problems, memory loss, nausea, vomiting, and headache. In severe cases, there may be changes in breathing and heart rate, balance problems, numbness, and unconsciousness. Long-term or large quantity exposures to it may cause death. $CH_4$ contributes to the formation of tropospheric ozone and particulate pollution.

Moreover, methane is a much more potent greenhouse gas than $CO_2$ contributing significantly to global warming and climate change.

## $CH_4$ sensors

Various options are available for methane monitoring, each designed for different applications and measurement ranges:

- **Cartridge (Type C):** a state-of-the-art sensor designed for applications requiring high-sensitivity $CH_4$ monitoring. This sensor provides accurate measurements from low concentrations (2 ppm) to 300 ppm. Its compact design, cost-effectiveness and cutting-edge performance make it an ideal solution for continuous monitoring and leak detection. This sensor is sensitive to $H_2S$ concentrations (> 100 ppb); therefore, it is recommended to install the $H_2S$ cartridge in the same device in order to correct for this interference and ensure accurate $CH_4$ measurements.
- **Methane Laser Module (Type D):** leveraging Tunable Diode Laser Absorption Spectroscopy (TDLAS) technology, this module (320 x 150 x 120 mm) provides exceptional accuracy for methane measurements, with a range spanning from sub-ppm levels to 1,000 ppm. Its unique selectivity for methane, free from interference by other gases, water vapor, or dust particles, makes it an advanced solution for industries demanding the highest accuracy.

| | |
|---|---|
| **Type** | N. A. (C)<br>TDLAS (D) |
| **Unit of measurement** | mg/m³, ppm |
| **Measurement range** (1) | 2 - 300 ppm (C)<br>0 - 1,000 ppm (D) |
| **Resolution** (2) | 0.01 ppm (C)<br>0.1 ppm (D) |
| **Operating temp. range** (3) | -30 to 60°C |
| **Operating RH range** (4) | 10 to 99 %RH (C)<br>0 to 98 %RH (D) |
| **Recommended RH range** (5) | 15 to 90 %RH (C) |
| **Operating life** (6) | > 24 months (C)<br>> 5 years (D) (10 years manufacturer) |
| **Guarantee range** (7) | 10,000 ppm |

| | |
|---|---|
| **Limit of Detection (LOD)** (8) | < 0.05 ppm |
| **Repeatability** (9) | < 0.35 ppm (C)<br>< 0.30 ppm (D) |
| **Response time** (10) | < 120 sec (C)<br>< 30 sec (D) |
| **Typical accuracy** (12) | ±1 ppm + 10% of reading (C)<br>±0.5 ppm + 1% of reading (D) |
| **Typical precision $R^2$** (11) | > 0.85 (C)<br>> 0.90 (D) |
| **Typical slope** (11) | – |
| **Typical intercept (a)** (11) | – |
| **DQO - Typical U(exp)** (13) | – |
| **Typical Intra-model variability** (14) | < 0.3 ppm (C) |

* See notes on page 32