

Ethylene Oxide (C₂H₄O) Stack and Indoor Air Quality Gas Concentration Analyzer

PICARRO



- Best-in-class sensitivity, designed to meet the most demanding regulatory requirements (ppt LOD)
- Real-time measurements for real-time emission feedback (sec)
- Excellent stability and continuous operation minimizes downtime and data gaps
- Easy operation and no consumables or pre-concentration results in significant cost savings
- Small footprint installs within minutes, enabling a wide variety of new deployments

The **Picarro G2910 Stack and Indoor Air Quality Analyzer** enables ultra-precise and stable measurements of ethylene oxide (EtO) gas. The analyzer features a 250 parts-per-trillion (ppt) lower limit of detection, and impressive stability with peak-to-peak zero drift of less than 750 ppt over 72 hours. The G2910 has been configured to enable measurements of EtO at the source of emission. Quantification of EtO from stacks, abatement systems, sterilization rooms, aeration warehouses and building ventilation has never been easier.

High quality stainless steel components, a cavity operating temperature of 80°C, along with a small cavity volume and minimizing wetted surface area reduces the propensity of C₂H₄O to adsorb and desorb on the sample handling. This gives a measurement response time of less than 10 seconds and minimizes sample handling biases. Additional high-precision carbon dioxide (CO₂), methane (CH₄), water vapor (H₂O) and other volatile organic compound (VOC) measurements are used to ensure interference-free operation.

In applications where there is a need for real-time measurements with ppt levels of detection, Picarro excels over traditional technologies, such as Fourier-Transform Infrared Spectroscopy (FTIR) or Gas Chromatography (GC). Zero drift corrections using ultra-high purity gases or cartridges are not required to meet instrument specifications, and expensive consumables (e.g. liquid N₂) are not required to keep the analyzer operational.

The analyzer has a small footprint, low power requirements, and can be unpacked and installed within minutes, whether in a laboratory or in the field. Integration of the analyzer into existing systems is seamless with several easy-to-read data outputs and minimal connections.

Picarro Performance Beyond the Datasheet

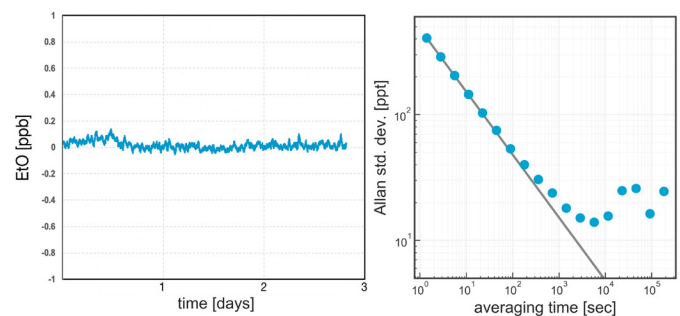


Figure 1 - (Left) Typical, continuous three-day measurements of a humidified, reference source with zero C₂H₄O (15-minute running mean). (Right) Typical, Allan deviation of C₂H₄O. Longer averaging times enable <100 ppt-level precision and limit of detection (LOD). No zero correction was applied on the analyzer or this dataset.

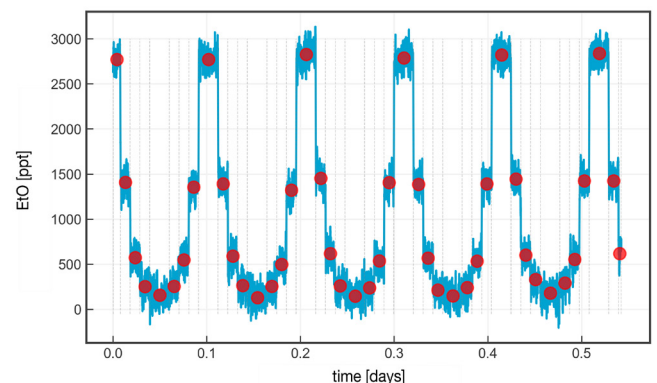


Figure 2 - Limit of detection test. The blue line indicates a 30-second moving average of the measurement, and the red circles indicate the average of each 15-minute step. The standard deviation of the 15-minute steps is just 34 ppt. From the dataset above, a typical detection limit of 75 ppt can be determined (k=2, 95% confidence).

G2910 Ethylene Oxide Specifications	Mole Fraction	Mass Density
Lower Detection Limit (3 σ , 300 sec)	250 ppt	0.45 $\mu\text{g}/\text{m}^3$ **
Zero Drift (72 hrs)* (peak-to-peak, 50-minute average)	750 ppt	1.35 $\mu\text{g}/\text{m}^3$
Precision (1 σ , 2 sec) Precision (1 σ , 300 sec)	800 ppt + 0.1% of reading 70 ppt + 0.02% of reading	1.44 $\mu\text{g}/\text{m}^3$ + 0.1% of reading 0.13 $\mu\text{g}/\text{m}^3$ + 0.02% of reading
Measurement Interval	<2 sec	<2 sec
Response Time (Rise/Fall Time 10–90%/90–10%)	<10 sec	<10 sec
Guaranteed Measurement Range	0–30 ppm	0–5.4E ⁻² g/m ³
Operational Measurement Range	0–60 ppm	0–1.1E ⁻¹ g/m ³
Compatible Air Matrix: • Background • Carbon Dioxide • Methane • Water Vapor • Ammonia • Ethylene • Methanol	(~99% N ₂ to Ambient) (0–10,000 ppm) (0–10 ppm) (0–30,000 ppm) (0–0.04 ppm) (0–1.5 ppm) (0–20 ppm)	(~99% N ₂ to Ambient) (0–17.9 g/m ³) (0–6.0 E ⁻³ g/m ³) (0–22.1 g/m ³) (0–2.8 E ⁻⁵ g/m ³) (0–2.0 E ⁻³ g/m ³) (0–2.6 E ⁻² g/m ³)

*Picarro analyzers do not require a zero reference gas or zero cartridge to operate or meet specifications.

**Conversion to $\mu\text{g}/\text{m}^3$ and g/m^3 at 1 atm and 25°C.

G2910 Ethylene Oxide Operating Specifications	
Measurement Technique	Cavity Ring-Down Spectroscopy (CRDS)
Measurement Cell Temp. and Pressure Control	$\pm 0.005^\circ\text{C}$; ± 0.0002 atm
Sample Temperature	-10 to 80°C
Sample Flow Rate and Pressure	~ 250 sccm at 760 Torr; 300 to 1000 Torr (40 to 133 kPa)
Sample Humidity	<99% R.H. non-condensing @40°C, no drying required
Ambient Temperature Range	10 to 35°C (operating); -10 to 50°C (storage)
Ambient Humidity	<85% R.H. non-condensing
Other Gases Measured (expected performance)	CO ₂ [Range: 0–10,000 ppm; Precision (1 σ , 2 sec): 2 ppm]; CH ₄ [Range: 0–10 ppm; Precision (1 σ , 2 sec): 2 ppb]; H ₂ O [Range: 0–30,000 ppm; Precision (1 σ , 2 sec): 100 ppm]
Accessories	Included: Pump (external), keyboard, mouse Optional: LCD monitor (A0901), 16-port sampling manifold (A0311, A0311-S), rack mount (A0950)
Operating System and Data Outputs	Windows 10 OS (RS–232, Ethernet, USB, data streaming; optional analog 0–10 V)
Fittings	¼" Swagelok® SS fittings
Dimensions	Analyzer: 17" w x 7" h x 17.5" d (43.2 x 17.9 x 44.6 cm), not including 0.5" feet External Pump: 6.1" w x 8.7" h x 13.6" d (15.5 x 22 x 34.5 cm)
Installation	Benchtop or 19" rack mount chassis
Weight	47.0 lbs (21.3 kg) for analyzer and 14.3 lbs (6.5 kg) for external pump
Power Requirements	100–240 VAC; 47–63 Hz (auto-sensing); <375 W at start-up (total). Steady-state operation: 120 W (analyzer), 150 W (pump).