

Formaldehyde (H₂CO) Gas Concentration Analyzer

PICARRO



- Real-time (2 sec), continuous measurements
- Best-in-class precision (100 ppt)
- Excellent long-term stability for infrequent calibration
- High-precision methane (CH₄) and water (H₂O) measurements for correction and validation
- Small footprint, field and lab deployable with no consumables required

The Picarro G2307 gas concentration analyzer delivers ultra-precise and stable measurements of formaldehyde (H₂CO) gas. The analyzer features a 300 parts-per-trillion (ppt) lower limit of detection, and impressive stability with drift at <1.5 parts-per-billion (ppb) over 72 hours of continuous operation. Zero drift corrections using ultra-high purity gases or cartridges are not required to meet instrument specifications. Coated (SilcoNert®) and Teflon™ components in the critical gas pathway reduce the propensity of H₂CO molecules to adsorb onto pathway surfaces, improving the measurement response time (<5 sec) and eliminating measurement biases. An additional high-precision methane (CH₄) measurement is used for surrogate validation replacing the need for complex calibration procedures using difficult to use standards (see page 2).

Patented Picarro cavity ring-down spectroscopy (CRDS) technology makes the G2307 analyzer ideal for atmospheric research and monitoring of formaldehyde from automobile and aircraft exhaust, photochemical smog, and incinerator emissions. These applications require high sensitivity measurements which are unattainable by traditional technologies such as Fourier-Transform Infrared Spectroscopy (FTIR). The analyzer can also be used to measure sensitive trace and ambient formaldehyde for indoor air quality. Indoor sources of formaldehyde in residential and industrial structures include out-gassing from foam installation and from particleboard and plywood used in building and furniture construction.

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.

H₂CO Stability and Precision

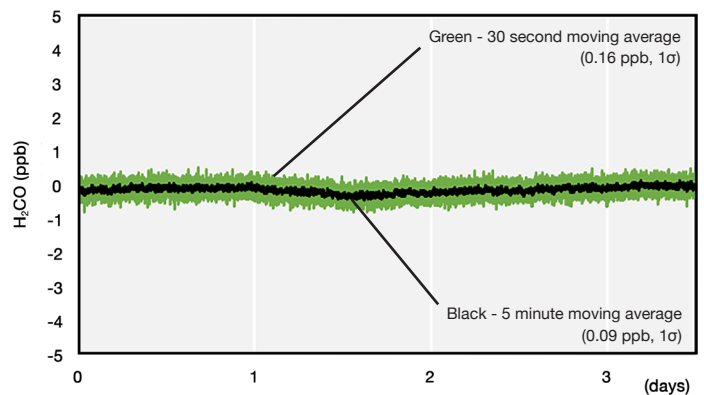


Figure 1 - Typical continuous three-day measurements of a reference source with zero H₂CO. Peak-to-peak drift of the 5-minute average (over 72 hours) is at 0.56 ppb. No zero correction was applied on the analyzer or this dataset.

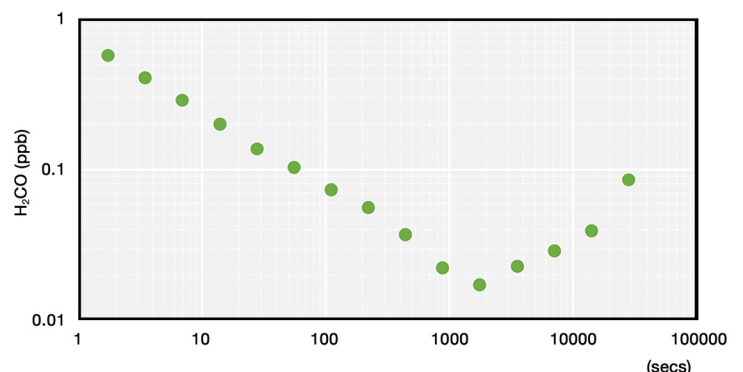


Figure 2 - Typical Allan standard deviation of H₂CO on the G2307. Longer averaging times enable ppt-level precision and limit of detection (LOD).

G2307 Formaldehyde	Typical Performance**	Specifications***
Lower Detection Limit (3 σ , 300 sec)	0.18 ppb	0.3 ppb
Zero Drift (72 hrs)* (peak-to-peak, 50-minute average)	0.33 ppb	1.5 ppb
Precision (1 σ , 2 sec)	0.7 ppb + 0.1% of reading	1.2 ppb + 0.1% of reading
Precision (1 σ , 10 sec)	0.31 ppb + 0.05% of reading	0.6 ppb + 0.05% of reading
Precision (1 σ , 300 sec)	0.06 ppb + 0.02% of reading	0.1 ppb + 0.02% of reading
Measurement Interval	<2 sec	<2 sec
Response Time (0–20 ppb) (Rise/Fall Time 10–90% / 90–10%)	<5 sec	<5 sec
Measurement Range	0–30 ppm	0–30 ppm

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

** Typical performance is defined as the median of testing results from ten sequentially built G2307 analyzers in 2019. Results available upon request.

*** Specifications and an instrument-specific testing report (Certificate of Compliance) provided with every analyzer purchase.

G2307 Formaldehyde Calibration

Calibrating any gas-phase analyzer using formaldehyde standards is challenging. Methane (CH₄) is a commercially available gas that has an absorption spectra adjacent to formaldehyde, making it an excellent surrogate gas for the validation of accuracy and linearity. Successful validation on a Picarro G2307 using CH₄ removes the need for calibration with H₂CO standards. To learn more about Picarro's novel and robust approach to surrogate gas validation, please contact a Picarro representative at: sales@picarro.com

G2307 System Specifications

Measurement Technique	Cavity Ring-Down Spectroscopy (CRDS)
Measurement Cell Temp. and Pressure Control	±0.005°C; ±0.0002 atm
Sample Temperature	-10 to 45°C
Sample Flow Rate and Pressure	~ 400 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	<99% R.H. non-condensing
Other Gases Measured (Specifications)	CH ₄ (0–20ppm; 20 ppb + 0.2% of reading at 2 sec, 2 ppb + 0.05% of reading at 300 sec, 1 σ); H ₂ O (0–3%; 10 ppm + 0.1% of reading at 2 sec, 1 σ)
Accessories	Included: pump (external), keyboard, mouse Optional: LCD monitor, 16-port Sampling Manifold (A311-S)
Data Outputs	Windows 10 OS (RS-232, Ethernet, USB, data streaming; optional analog 0–10 V)
Fittings	¼" Swagelok® PFA 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: 7.5" w x 4" h x 11" d (19 x 10.2 x 28 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), <260 W start-up (total): 110 W (analyzer), 80 W (pump) at steady state

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3105 Patrick Henry Drive, Santa Clara, CA 95054 | 408-962-3900 | sales@picarro.com | picarro.com