

CRDS Analyzer CO + CO₂ + CH₄ + H₂O for Flight PICARRO G2401-*m*

The world's only 4-species greenhouse gas analyzer – ready for continuous in-flight measurements

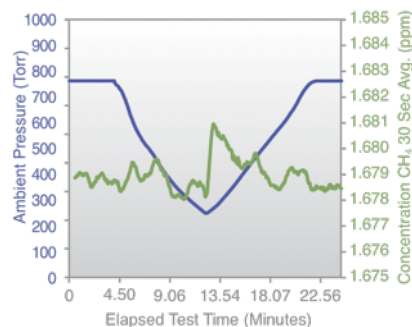
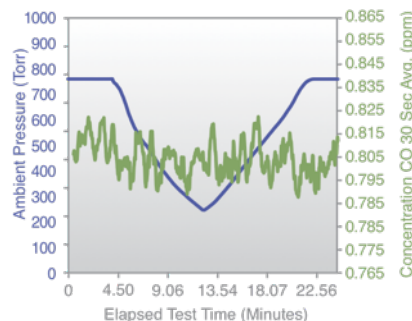
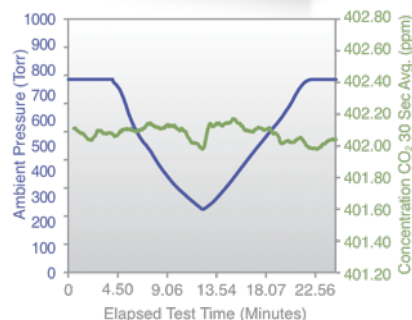
- Global #1 in precision, accuracy, and portability
- Guaranteed lowest drift of any continuous greenhouse gas measurement instrument
- Unique water correction automatically reports dry gas mol fractions

Advantage Note: The G2401-*m* utilizes Picarro's Cavity Ring-Down Spectroscopy (CRDS) technology to enable measurements of the anthropogenic tracer gas CO along with the green house gases CO₂, CH₄ and water vapor down to parts-per-billion (ppb) sensitivity. The G2401-*m* also features Picarro's unique water correction software, which automatically reports dry gas mol fractions to help reduce research complexity and consumable costs. And with Picarro's guaranteed drift spec, months of flights can be made with negligible drift. From airborne measurements over the Amazon Rainforest to vertical profiles in the Central Valley of California, Picarro flight analyzers have been field-proven to reliably provide high quality data.

Picarro's Patented CRDS Technology: The heart of the Picarro analyzer is a sophisticated time-based measurement that uses a laser to quantify spectral features of gas phase molecules in an optical cavity. Picarro's patented CRDS technology enables an effective measurement path length of up to 20 kilometers in a compact cavity, which results in exceptional precision and sensitivity with a small footprint. Because lasers drift in all instruments, Picarro uses a patented, high-precision wavelength monitor to maintain absolute spectral position and the most accurate peak quantification of any instrument. For researchers, Picarro analyzers deliver a best-in-class combination of precision, accuracy, and ease of use.

Portable, Rugged & Easy to Use: The Picarro's small size makes it easy to transport in any vehicle to the field, lab, or plane, where it can be running within minutes out of the box, and can operate for months without user interaction. In order to ensure measurement fidelity over long periods of time, even in the harshest environments, Picarro's optical cavities incorporate amazingly precise temperature and pressure control along with careful material selection and meticulous mechanical design. Scientists using these systems have reported the highest quality data, day in and day out, with fewer calibrations than other spectral absorption-based instruments.

Easy Data Management & Instrument Control: The analyzer can be configured to automatically deliver data in the format best suited to the application. Digital (RS-232) data can be transmitted via Ethernet at user-defined intervals or output in real-time and there is also an analog data output option. Using a standard Remote Desktop connection, users can remotely check and control the analyzer's internal, Windows-based PC.



Picarro pressure tests all flight analyzers in a hyperbaric chamber to guarantee performance at altitude. During the test, the chamber pressure cycles between 760 and 250 Torr as the analyzer measures a constant-concentration gas stream delivered at the same pressure as the hyperbaric chamber. Pressure test results for CO, CO₂ and CH₄ of an actual production analyzer are shown.

Performance Specifications	CO ₂ Specification	CH ₄ Specification	CO Specification	H ₂ O Specification
Raw Precision (1-σ over 300 secs, vibration @ 20 Hz, 1g): <i>Guaranteed over below range & operating conditions</i>	≤ 200 ppb	≤ 2 ppb	≤ 30 ppb	≤ 150 ppm
Drift at STP (over 24 hrs) <i>(Peak to peak 50 min average: Guaranteed over below range & operating conditions)</i>	≤ 200 ppb	≤ 1.5 ppb	≤ 15 ppb	≤ 100 ppm ± 5% of reading
Drift with Changing Temp <i>(Peak to peak 30 sec average over 3 hrs; 15°C/hr for below operating conditions):</i>	≤ 7.5 ppbv/°C	≤ 0.05 ppbv/°C	≤ 1.5 ppb/°C	N/A
Drift with Changing Pressure <i>(Peak to peak 30 sec average; < 1.4 Torr/sec for below operating conditions):</i>	≤ 700 ppb	≤ 7.5 ppb	≤ 50 ppb	N/A
Operating Range	0 - 1000 ppm	0 - 20 ppm	0 - 5 ppm	0 – 7 %v H ₂ O / 39 °C dew pt (non-condensing)
Guaranteed Specifications Range	300 – 500 ppm	1 ppm – 3 ppm	0 – 1 ppm	0 – 3 %v H ₂ O / 25 °C dew pt (non-condensing)
Measurement Interval	≤ 3.5 seconds	≤ 3.5 seconds	≤ 3.5 seconds	≤ 3.5 seconds
Rise/Fall time (10-90%/90-10%)	≤ 3 seconds	≤ 3 seconds	≤ 3 seconds	N/A

System Specifications	
Parameter	Value
Measurement Technique	CRDS
Measurement Cell Temperature Control	+/- 0.005 °C
Measurement Cell Pressure Control	+/- 0.0002 atm
Sample Temperature	-10 °C to 45 °C
Sample Flow Rate	< 0.6 slm over 250 - 1000 Torr, no filtration required
Sample Pressure	250 to 1000 Torr (40 to 133 kPa)
Sample Humidity	< 99% R.H. non-condensing @ 40°C (oil free)
Ambient Temperature Range	+10 °C to +35 °C operating (-10 to 50 °C storage)
Max Rate of Change in Ambient Temp.	15 °C/hr
Ambient Humidity	< 99% R.H. non-condensing
Maximum Altitude	Altitude @ 250 Torr
Max Rate of Change in Altitude	1,000 meters / minute
Accessories (Included)	Pump (external), Keyboard, Mouse, LCD monitor (optional)
Outputs	RS-232, Ethernet, USB, Analog (optional) 0-10 V
Inlet Fittings	¼" Swagelok ®
Dimensions	Analyzer: 17.55" L x 7" h x 17" w (44.57 x 17.78 x 43.18 cm) not incl. 0.5" feet External Pump: 12.8" L x 8.9" h x 6.2" w (32.4 x 22.6 x 15.8 cm)
Weight	70 lbs (31.75 kg) including pump
Power Requirements	100 – 240 VAC, 47 – 63 Hz (auto-sensing), < 260 W start-up (total): 110 W (analyzer), 120 W (pump) at steady state
Steady State Power Dissipation	≤ 370 Watts