

# CRDS Analyzer CO<sub>2</sub> CH<sub>4</sub> H<sub>2</sub>O Measurements in Air Model G2301

# PICARRO

World's Leading Instruments for  
Carbon and Water Cycle Measurement

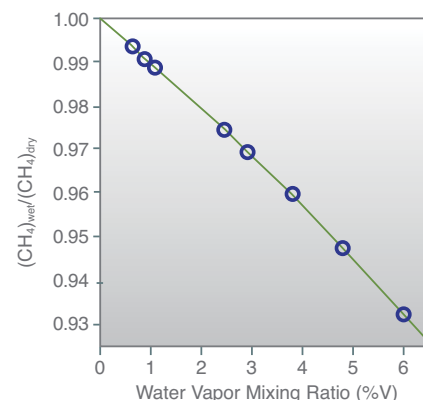
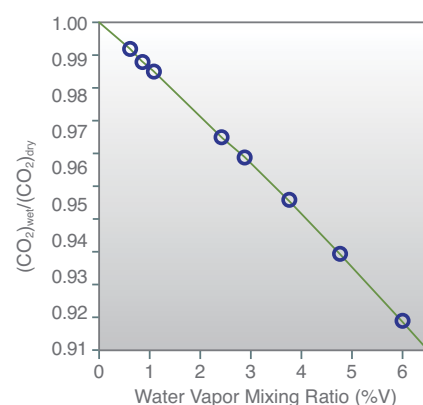
The world's highest precision analyzer for the top three greenhouse gases

- Global #1 in precision and accuracy, and portability
- The lowest guaranteed drift of any instrument
- Unique water correction feature automatically reports dry mol fraction
- Innovative software featuring intuitive user interface & customization tools
- World class customer service and technical support

**Advantage Note:** Our patented Cavity Ring-Down Spectroscopy (CRDS) technology is capable of measuring the three primary greenhouse gases, CO<sub>2</sub>, CH<sub>4</sub> and water, down to parts-per-billion (ppb) sensitivity with negligible long-term drift (months). In order to ensure measurement fidelity even over years of operation in the harshest environments, Picarro incorporates amazingly precise temperature and pressure control along with careful material selection and meticulous mechanical design. Scientists from the Ascension Islands to the oil spill zone in the Gulf of Mexico have reported the highest quality data, day in and day out, with fewer calibrations than other spectral absorption-based instruments.

**Picarro's Patented CRDS Technology:** The heart of the Picarro is a sophisticated time-based measurement that uses a laser to quantify spectral features of gas phase molecules in an optical cavity. Picarro's unique design enables an effective measurement path length of up to 20 kilometers in a compact cavity, which results in exceptional precision and sensitivity in a small footprint. Picarro uses a patented, high-precision wavelength monitor to maintain absolute spectral position, which combats the drift inherent in all lasers and ensures accurate peak quantification.

**Guaranteed Performance:** In order to ensure every analyzer meets our exacting performance standards in the lab and in the field, Picarro instruments undergo thorough precision and drift testing along with a rigorous set of thermal, shock & vibration tests.



Mixing ratios for carbon dioxide and methane are only meaningful when extrapolated back to dry-gas conditions. Picarro's G2301 analyzer enables you to measure dry-gas mixing ratios for carbon dioxide and methane directly in the wet gas stream. Only Picarro includes automated water vapor corrections which have been independently validated by top labs: NOAA, MPI, LSCE.

**Figure 1. On the top, Quadratic fit of CO<sub>2</sub>wet/CO<sub>2</sub>dry mixing ratios and on the bottom, quadratic fit of CH<sub>4</sub>wet/CH<sub>4</sub> dry vs. H<sub>2</sub>O mixing ratios.**

Picarro Environmental, Shock and Vibration Testing (Performed on Every Analyzer)	
Thermal Ramp Testing (whole instrument):	> 12 hours operational temperature step testing from 5 ° to 40 °C with 40 minute soak at each 5 °C increment. Performance specs verified throughout the testing range.
Long-Term Thermal Testing (whole instrument)	One week operational temperature step testing from 30 ° to 40 °C with 40 minute soak at each 5 °C increment. Performance specs verified throughout the testing range.
Storage Testing (whole instrument)	-10 °C & 50 °C soak (non-oper) + post test performance confirm
Vibration Testing	2 axis, 25 Hz, 1gp-p acceleration, 15 minutes on each axis
Shock Testing Using MIL-STD 810F	Pivoted edge drops onto a hard surface (lab bench), from 4" height, all 12 edges (x,y,z axes), 2 drops each edge
Power Interruption Testing	Minimum 5 successful AC power cycle startups

**Easy Data Management & Instrument Control:** The Picarro is customizable to deliver data in the format best suited to the application. Data is stored locally on the analyzer's hard drive, but can also be streamed in real time either via RS-232, or as analog output. Users can also choose to rout data via an Ethernet connection in real time or at user-defined intervals. Using standard Remote Desktop connection, users can remotely check and control the analyzer's internal, Windows-based PC.

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Guaranteed Performance Specifications, in air	CO <sub>2</sub>	CH <sub>4</sub>	H <sub>2</sub> O
<b>Precision (1-σ of: Raw 5 sec / 5 min avg data)</b> <i>Guaranteed over operating conditions specified below</i>	< 70 ppb / 25 ppb	< 0.5 ppb / 0.22 ppb	< 80 ppm / 30 ppm
<b>Max Drift at STP (over 24 hrs / 1 month)</b> *(peak-to-peak, 50-minute average) <i>Guaranteed over operating conditions specified below</i>	< 120 ppb / 500 ppb	< 1 ppb / 3 ppb	< 100 ppm ± 0.5% of reading
<b>Automated Determination of Dry Mol Fraction</b>	Included	Included	n/a
<b>Operating Range</b>	0 - 1000 ppm	0 - 20 ppm	0 - 7 %v (39 °C dew pt) non-condensing
<b>Guaranteed Specifications Range</b>	300 - 700 ppm	1 - 3 ppm	0 - 3 %v (25 °C dew pt) non-condensing
<b>Measurement Interval (Data Rate)</b>	< 5 seconds	< 5 seconds	< 5 seconds
<b>Gas Response: Rise/Fall time (10-90 % / 90-10 %)</b>	< 3 seconds	< 3 seconds	< 3 seconds
<b>Measurement Cell Control</b>	Temperature: +/- 0.005 °C & Pressure: +/- 0.0002 atm		

\* Picarro calculates drift by subtracting the min from the max of 50 min averages taken over 30 hrs of testing

Available Advanced Service and Monitoring		Guaranteed Operating Conditions	
<b>Technical Jumpstart</b>	Customized Start-up Assistance designed to get you and your staff and colleagues up and running as fast as possible	<b>Ambient Temperature Range</b>	+10 °C to +35 °C operating -10 °C to +50 °C storage
<b>Instrument Performance Verification (IPV)</b>	Confirm the validity of measured data via continuous and autonomous monitoring of multiple on-board sensors, automatic alerts, reporting and email notifications	<b>Ambient Humidity</b>	< 99 % R.H. non-condensing
<b>Performance Package (IPP)</b>	Service bundle of IPV subscription plus an extended 24-month factory warranty and 24-month supply of spares	<b>Sample Gas Pressure</b>	300 to 1000 Torr (40 to 133 kPa)
		<b>Sample Gas Humidity</b>	< 99 % R.H. non-condensing
		<b>Sample Gas Temperature</b>	-10 to 45 °C
		<b>Sample Gas Flow Rate Req.</b>	< 0.4 slm at 760 Torr No filtration required

**Included Accessories:** External vac pump, vac line & fittings, keyboard, mouse, LCD monitor, internal 160 GB hard drive

**Installation:** Bench-top (standard) or 19" rack mount (optional)

**Data Outputs:** RS-232, Ethernet, USB, Analog (optional) 0-10 V

**Optional Accessories:** Integrates seamlessly with Picarro's 16-Port Distribution Manifold to simplify multi-point sampling

System Specifications	
<b>Dimensions</b>	Analyzer: 17" w x 7" h x 17.5" d (43.2 x 17.9 x 44.5 cm) not inc. 0.5" feet, External pump: 7.5" w x 4" h x 11" d (19 x 10.2 x 28 cm)
<b>Weight</b>	56 lbs (25.4 kg), including external pump
<b>Power Requirements</b>	100 - 240 VAC, 47 - 63 Hz (auto-sensing), < 260 W total at start-up 110 W (analyzer) + 35 W (pump) at steady state
<b>Gas Inlet Fittings</b>	¼" Swagelok ®