

PICARRO G2508 CRDS Analyzer $\text{N}_2\text{O} + \text{CH}_4 + \text{CO}_2 + \text{NH}_3 +$ H_2O in Air

Revolutionary soil flux analyzer provides complete view of greenhouse gas exchange between soil and air.

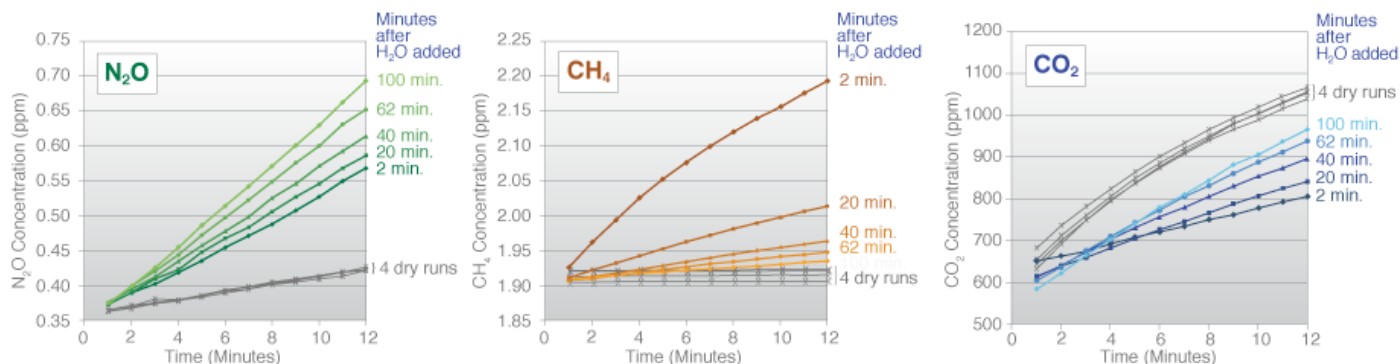
- Simultaneously measures five gases -- N_2O , CH_4 , CO_2 , NH_3 , and H_2O .
- Parts-per-billion sensitivity brings excellent rate-of-rise quantification.
- Rapid response time and continuous measurements provide data at high temporal resolution.
- Integrates easily with chamber systems. Field-proven platform.
- Automatically corrects data for presence of water vapor



Soil – Critical, but complicated. Greenhouse gas exchange between soil and the atmosphere is a critical step in the global nitrogen and carbon cycles, yet quantifying these fluxes is laborious. The Picarro G2508 analyzer radically simplifies such studies by providing a complete picture of greenhouse gas soil emissions by simultaneously measuring five gases -- N_2O , CH_4 , CO_2 , NH_3 , and H_2O . The G2508's precise cavity ring-down technology is capable of measuring concentrations down to parts-per-billion (ppb) sensitivity with negligible drift, which enable excellent rate-of-rise quantification, even of very small fluxes.

The G2508 integrates easily with soil chambers -- No need to assemble and synchronize separate gas analyzers to observe the behavior of all the major greenhouse gases. The gas rapidly recirculates through the soil chamber and the 35ml optical cavity to provide a continuous record of the rate-of-rise at high temporal resolution, which is critical to validating rate-of-rise models. The optical cavity is housed within a small, rugged, field-proven platform to measure fluxes in the field without hauling samples back to lab. This allows immediate experimental optimization to get the right data the first time. The temperature and pressure of the optical cavity is precisely controlled to provide high quality data collection even with challenging and dynamic field conditions.

The G2508 features Picarro's unique algorithms for automatic water correction of N_2O , CH_4 , and CO_2 . Picarro's water correction methods have been validated by the atmospheric science community. The analyzer also continuously assesses the data for spectral interference, and flags deviations. The analyzer contains a Windows-based PC and can be accessed remotely via a remote desktop connection. It can be configured to deliver data automatically at user defined intervals or output in real-time.



Simulated rain event in closed-system chamber lab study: Concentration time series for dry and wet dirt measurements of N_2O , CH_4 and CO_2 are shown. After adding water, N_2O emission rate triples in 2 min and continues to rise, while CH_4 emission rate spikes and then decreases, and CO_2 emission rate is suppressed but recovers slowly. Contact Picarro for more details and the latest data related to this study.

Performance Specifications in Air	N ₂ O	CH ₄	CO ₂	NH ₃	H ₂ O
Precision Raw (1σ)	< 25 ppb + 0.05 % of reading	< 10 ppb + 0.05 % of reading	< 600 ppb + 0.05 % of reading	< 5 ppb + 0.05 % of reading	< 500 ppm
Precision 1 min (1σ)	< 10 ppb + 0.05 % of reading	< 7 ppb + 0.05 % of reading	< 300 ppb + 0.05 % of reading	< 3 ppb + 0.05 % of reading	< 250 ppm
Precision 5 min (1σ)	< 5 ppb + 0.008 % of reading	< 5 ppb + 0.02 % of reading	< 200 ppb + 0.05 % of reading	< 1 ppb + 0.05 % of reading	< 100 ppm
Guaranteed Spec Range	0.3-200 ppm	1.5-12 ppm	380-5000 ppm	0-300 ppb	0-3 %
Operating Range	0-400 ppm	0.5-15 ppm	0.02-2 %	0-2 ppm	0-7 %
Measurement rate	< 8 seconds	< 8 seconds	< 8 seconds	< 8 seconds	< 8 seconds
Typical Gas Response (Rise-Fall 10-90%, 90-10%)	~8 seconds	~8 seconds	~8 seconds	See Note below	See Note below
Report dry mole fraction	Yes	Yes	Yes	No	N/A

Note: The response of H₂O and NH₃ are limited by the adsorption of these species to the surfaces of the experimental apparatus. While the analyzer will accurately measure the concentration of NH₃ and H₂O within the cavity, calculating the actual flux of NH₃ and H₂O from the soil with these measurements will be convolved by the adsorption dynamics within the system.

Analyzer specificity: Picarro's CRDS technology utilizes extremely narrow spectral regions, which greatly reduces the likelihood of interference from other gas species when compared to other spectral measurement techniques. However, in real-world samples, interferences can happen. Picarro has included interference detection software and has tested and characterized the effects of the following species for this analyzer:

Trace Gases	N ₂ O Sensitivity
Carbon Dioxide	None - Automated correction good to 20,000 ppm CO ₂
Methane	None - Automated correction good to 200 ppm CH ₄
Ammonia	None - Automated correction good to 2 ppm NH ₃
Ethane	0.2 ppb N ₂ O / ppm C ₂ H ₆ tested up to 120 ppm
Ethylene	0.5 ppb N ₂ O / ppm C ₂ H ₄ tested up to 16 ppm
Acetylene	Not for use with acetylene experiments
Background Gas	Designed for use in ambient air, not for use with highly varying or enriched N ₂ , O ₂ , H ₂ , or He
ChemDetect™ Software	Unique Picarro algorithms detect and flag data which may be inaccurate due to spectroscopic interference

System Operation Parameters	Specifications
Ambient Temperature	10-35°C
Ambient Humidity	< 99% RH, non-condensing
Sample Pressure	300 to 1,000 Torr (40 to 133 kPa)
Sample Flow Rate	~230 sccm
Sample Humidity	< 99% RH, non-condensing, Water correction tested to 25 °C dew point
Sample temperature	-10-45°C
Cavity temperature control	+/- 0.005 °C
Cavity pressure control	+/- 0.0002 atm
Closed-loop / Recirculation Capability	Compatible with Picarro Closed System Pump A0702
Inlet Fittings	1/4" Swagelok®
Dimensions	Analyzer: 17" w x 7" h x 17.55" d (43.18 x 17.78 x 44.57 cm) not incl. 0.5" feet External Pump: 5.6" w x 6.4" h x 11.9" d (14.3 x 16.3 x 30.3 cm)
Weight	64.4 lbs (29.2 kg), includes external pump
Power	100 - 240 VAC, 47 - 63 Hz (auto-sensing), < 260 W start-up (total); 110 W (analyzer) + 80 W (pump) at steady state
Installation	Benchtop (standard) or 19" rack mount chassis (optional)
Accessories	Included: Vacuum pump, keyboard, mouse. Optional: LCD monitor, 16-port valve manifold

About Picarro CRDS

The heart of the Picarro analyzer is a sophisticated time-based measurement that uses a Telecom, Near-Infrared (NIR) 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.

The Picarro's small size makes it easy to transport in any vehicle to the field or lab, 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.