$\delta^{13}C$ in CH_4 and CO_2 Gas Analyzer

PICARRO

- Only field-deployable analyzer for simultaneous high-precision $\delta^{13}C$ measurements in CH_4 and CO_2
- Less calibration, less maintenance, no consumables
- Excellent precision at a fraction of IRMS operating cost

The **Picarro G2201-*i* Analyzer** combines capabilities of two Picarro carbon isotope instruments for CO_2 and CH_4 into a single instrument. Now it's easy and fast to capture the insights that only stable isotope ratios offer. Researchers can follow carbon as it moves from source to sink with a single instrument. The dual-purpose analyzer brings simplicity and speed to research. Its small size and robustness make it easy to transport to the field, where immediate results allow researchers to change course on-the-fly and achieve optimal results from limited-time field campaigns.

The analyzer operates in one of three modes: 1) CO_2 only, 2) CH_4 only and 3) CO_2 and CH_4 combined. In the combined mode, the measurement of CO_2 and CH_4 are interleaved every few seconds to produce a sampling rate that is faster than the gas turn-over time in the cavity. When the analyzer is in CO_2-only mode or CH_4-only mode, the precision improves, because more time is devoted to one molecule. In all modes, the analyzer precisely measures CO_2, H_2O and CH_4 concentrations, with fewer calibration events than other spectral absorption-based instruments.

G2201-*i* Performance Specifications

$\delta^{13}C$ Precision (1-σ, 1-hour window, 5-minute average)	**CO_2** Isotope-only mode	**CH_4** Isotope-only mode	**CO_2– CH_4** Simultaneous mode
$\delta^{13}C$-CO_2	<0.12‰	NA	<0.16‰
$\delta^{13}C$-CH_4	NA	**High Precision mode:** <0.8‰ **High Dynamic Range mode:** <0.4‰	**High Precision mode:** <1.15‰ **High Dynamic Range mode:** <0.55‰
$\delta^{13}C$ Max Drift (peak-to-peak, 1-hour average interval over 24 hours at STP)	**CO_2** Isotope-only mode	**CH_4** Isotope-only mode	**CO_2–CH_4** Simultaneous mode
$\delta^{13}C$-CO_2	<0.6‰	NA	<0.6‰
$\delta^{13}C$-CH_4	NA	**High Precision and High Dynamic Range mode:** <1.15‰ at 10 ppm CH_4	

Concentration Precision (1-σ, 30-sec average)	**CO_2** Isotope-only mode	**CH_4** Isotope-only mode	**CO_2– CH_4** Simultaneous mode
CO_2	200 ppb + 0.05% of reading (^{12}C) 10 ppb + 0.05% of reading (^{13}C)	1 ppm + 0.25% of reading (^{12}C)	200 ppb + 0.05% of reading (^{12}C) 10 ppb + 0.05% of reading (^{13}C)
CH_4	50 ppb + 0.05% of reading (^{12}C)	**High Precision mode:** 5 ppb + 0.05% of reading (^{12}C), 1 ppb + 0.05% of reading (^{13}C) **High Dynamic Range mode:** 50 ppb + 0.05% of reading (^{12}C), 10 ppb + 0.05% of reading (^{13}C)	
H_2O	100 ppm		

G2201-*i* Performance Specifications (continued)

Dynamic Range	CO_2 Isotope-only mode	CH_4 Isotope-only mode	CO_2–CH_4 Simultaneous mode
CO_2 Guaranteed Spec Range	380–2,000 ppm	200–2,000 ppm	380–2,000 ppm
CO_2 Operational Range	100–4,000 ppm	0–4,000 ppm	100–4,000 ppm
CH_4 Guaranteed Spec Range	1.8–500 ppm	**High Precision mode:** 1.8–12 ppm **High Dynamic Range mode:** 10–1,000 ppm	**High Precision mode:** 1.8–12 ppm **High Dynamic Range mode:** 10–500 ppm
CH_4 Operational Range	0–1,000 ppm	**High Precision mode:** 1.2–15 ppm **High Dynamic Range mode:** 1.8–1,500 ppm	
H_2O Guaranteed Spec Range	0–2.4%		
H_2O Operational Range	0–5%		

General	CO_2 Isotope-only mode	CH_4 Isotope-only mode	CO_2–CH_4 Simultaneous mode
Measurement Interval	≈3 sec		≈5 sec
Ambient Temperature Dependence	Guaranteed <±0.06‰/°C, typical <±0.025‰/°C		
Rise/Fall Time (10–90%/90–10%)	Typical ≈30 sec		
Applications Considerations	Interference can occur for concentrations of H_2O and CO_2 well outside of the defined dynamic range, as well as other organics, ammonia, ethane, ethylene, or sulfur containing compounds. Users should verify with prepared lab samples. Please contact us to discuss the experimental conditions. Pressure drops in the instrument's gas path can draw external air when this system is used in recirculating applications.		

G2201-*i* System Operating Specifications

Measurement Technique	Cavity Ring-Down Spectroscopy (CRDS)
Measurement Cell Temp. and Pressure Control	±0.005°C; ±0.0002 atm
Shock and Vibration Testing	Meets MIL-STD-810F test method standards and operates as specified afterward.
Sample Temperature	-10 to 45°C
Sample Pressure	300 to 1000 Torr (40 to 133 kPa)
Sample Flow Rate	<50 sccm (typical ≈25 sccm) at 760 Torr, no filtration required
Sample Humidity	<99% RH non-condensing @40°C, no drying required
Ambient Temperature Range	10 to 35°C (operating), -10 to 50°C (storage)
Ambient Humidity	<99% RH non-condensing
Accessories	Pump (external), keyboard, mouse, LCD monitor (optional)
Data Outputs	RS-232, Ethernet, USB
Fittings	¼" Swagelok®
Installation	Benchtop or 19" rack-mount chassis
Dimensions (single box system)	17"w x 18"d x 7"h (43 x 46 x 18 cm)
Weight	56 lbs (25.4 kg), includes external pump
Power Requirements and Consumption	100–240 VAC, 47–63 Hz (auto-sensing), <260W start-up (total), 125W (analyzer), 35W (pump) at steady state
Optional Compatible Modes	*S0506 - Enriched ^{13}C Isotopic CO_2 Calibration (up to 6500permil) *S0507 - High Concentration Isotopic CO_2 (2000-4000ppm) in Air *S0509 - High Concentration Isotopic CO_2 (2000-4000ppm) in N_2 *S0511 - Low Concentration Isotopic CO_2 (200 ppm) *S0512 - Additional N_2 Background Gas Mode for Standard Analyzer Isotopic CO_2 Concentration Range (380-2000ppm) *CO_2 only mode*

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