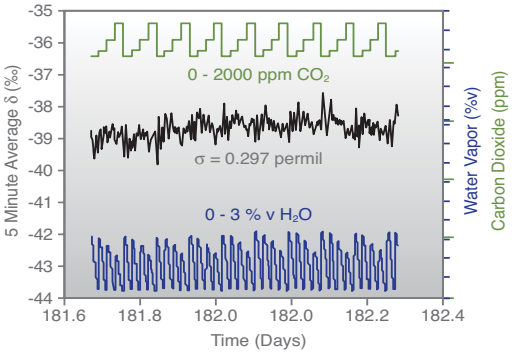
# CRDS Analyzer for Isotopic $CO_2$ in Ambient Air - Model G2101-*i*

PICARRO

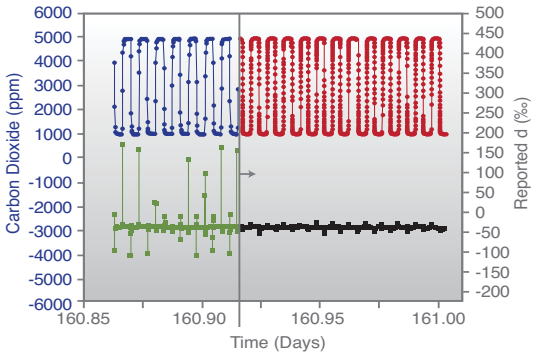
The World's Highest Performing and Easiest to Use Analyzers

## The world's best analyzer for isotopic $CO_2$ measurements just got a whole lot better - and smaller.


- Global #1 in precision, accuracy, and portability
- Only analyzer with guaranteed drift specifications
- 30% smaller, 30% lower power draw for easier field deployment
- 8x faster measurement rate for optimal response to rapid concentration changes
- Unique water correction feature eliminates need for gas drying
- Advanced electronics lower noise, improve data quality, increase reliability




*In optical spectroscopy, water vapor concentration can cause spectral broadening and direct interference with either the $^{12}CO_2$ or $^{13}CO_2$ spectral lines. The effect on each of the two lines is not necessarily identical, leading to a potential systematic error in the reported isotope ratio as a function of water vapor concentration This data shows the high quality of Picarro's water correction algorithm in operation. Measurement of delta as a function of water vapor concentration and carbon dioxide, the standard deviation of the entire data set is 0.297 ‰.*




*Fast concentration fluctuations can cause unwanted systematic errors in the reported $\delta^{13}C$ isotope ratio from $CO_2$. Picarro's G2101-i instrument has a faster measurement rate and an algorithm designed to minimize cross-talk between $^{12}CO_2$ and $^{13}CO_2$ spectral features, thereby producing high quality data, even under challenging conditions of rapidly changing $CO_2$ concentration.*

**Advantage Note:** Picarro's G2101-*i* analyzer is the world's most advanced instrument for measurement of $\delta^{13}C$ of $CO_2$ in ambient air. Picarro's Cavity Ring-Down Spectroscopy (CRDS) technology is capable of high precision $\delta^{13}C$ measurements from environments as diverse as ships in the Gulf of Mexico to bat caves in the Scandinavian tundra.

In the G2101-*i*, a breakthrough water correction software package eliminates the need to dry sample gas, reducing research complexity and consumable costs. Picarro has also improved onboard electronics for higher data quality, and reduced the size, weight, and power draw of the system for better field deployability. Unlike any other analyzer, the G2101-*i* carries slots for up to four different laser cards, allowing for further measurement capability.

The heart of the G2101-*i* is a sophisticated time-based measurement system that uses a laser to quantify spectral features of gas phase molecules in an optical cavity. Leveraging Picarro's patented CRDS technology, the G2101-*i* offers significant performance, ease of use and cost of ownership benefits compared to other absorption-based technologies. An effective path length of up to 20 kilometers provides exceptional precision and sensitivity. A patented, high-precision wavelength monitor maintains absolute spectral position, thereby ensuring accurate peak quantification. In addition, this technology guarantees that only the spectral features of interest are being monitored, greatly reducing the analyzer's sensitivity to interfering species.

©2010 PICARRO, INC. · 480 Oakmead Parkway, Sunnyvale, CA 94085 · T 408.962.3900 · E info@picarro.com · W www.picarro.com

Picarro's optical cavities incorporate precise temperature and pressure control systems to ensure measurement fidelity over long periods of time, even in the harshest environments. Because molecular spectroscopy is fundamentally affected by temperature and pressure, these parameters must be carefully controlled to provide a trustworthy quantitative measurement along with high linearity, precision, and accuracy.

From the desert to the tundra, scientists using Picarro systems have reported the highest quality data, day in and day out. They have concluded that calibration is required far less frequently with Picarro than with other absorption-based instruments. For researchers, the G2101-*i* delivers a best-in-class combination of precision, accuracy and ease of use that sets a new standard for ecological and other $CO_2$ monitoring applications. Easily transportable from site to site, these instruments can be running within minutes out of the box and can operate for many months without user interaction.

PICARRO

The World's Highest Performing and Easiest to Use Analyzers

The analyzer can be configured to automatically transmit data at regular intervals via the Ethernet or optional modem, and can output real-time data in digital and analog formats. Users can connect remotely with the analyzer's internal Windows-based PC and control the instrument through a standard Internet connection. The analyzer can also use an Internet connection to automatically synchronize with an atomic clock time service. The G2101-*i* integrates seamlessly with Picarro's Small Sample Isotope Module for for $\delta^{13}C$ analysis of small volume gas samples

| **Performance Specifications, in air** | **$\delta^{13}C$** | **$CO_2$ Concentration** |
|---|---|---|
| **Precision, $\delta^{13}C$ (5 min, 1-$\sigma$, 1 Hr window)** | < 0.3 ‰ | |
| **Precision, concentration (30 sec, 1-$\sigma$)** | | 200 ppb ($^{12}C$)/ 10 ppb ($^{13}C$) |
| **Max Drift at STP (over 24 hrs) (peak-to-peak, 1 hr average)** | < 2.0 ‰ | |
| **Automated Determination of Dry Mol Fraction** | | Included |
| **Operating Range** | 200-3500 ppm | 200-3500 ppm |
| **Guaranteed Specifications Range** | 380-500 ppm | 380-500 ppm |
| **Measurement Interval (includes periodic water measurement)** | ~ 2 secs | ~ 2 secs |
| **Response Time** | 60 secs | 60 secs |

| **System Specifications** | |
|---|---|
| **Measurement Technique** | CRDS |
| **Measurement Cell Temp. Control** | +/- 0.005 °C |
| **Measurement Cell Pressure Control** | +/- 0.0002 atm |
| **Sample Temperature** | -10 to 45 °C |
| **Sample Flow Rate** | < 0.05 slm at 760 Torr, no filtration required |
| **Sample Pressure** | 300 to 1000 Torr (40 to 133 kPa) |
| **Sample Humidity** | < 99% R.H. non-condensing @ 40 °C, no drying required |
| **Temperature** | 10 to 35 °C (operating) -10 to 50 °C (storage) |
| **Humidity (ambient)** | < 99% R.H. non-condensing |
| **Accessories** | Pump (external), keyboard, mouse, LCD monitor (optional) |
| **Outputs** | RS-232, Ethernet, USB, analog (optional) 0 – 10 V |
| **Fittings** | ¼" 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<br>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** | 56 lbs (25.4kg), includes external pump |
| **Power Requirements** | 100 - 240 VAC, 47 - 63 Hz (auto-sensing), < 260 W start-up (total); 110 W (analyzer), 35 W (pump) at steady state |
| **Applications Considerations** | Interference can occur for above ambient concentrations of $H_2O$, $CO_2$, $CH_4$, other organics or sulphur containing compounds. Users should verify with prepared lab samples.<br>Pressure drops in the instrument's gas path can draw external air when this system is used in recirculating applications. |

©2010 PICARRO, INC. · 480 Oakmead Parkway, Sunnyvale, CA 94085 · T 408.962.3900 · E info@picarro.com · W www.picarro.com