

Measure  $\delta^{13}\text{C}$  *and*  $\delta^{18}\text{O}$   
in samples with elevated  
 $\text{CO}_2$  levels



Precisely.

## Carbon Dioxide Isotope Analyzer - Elevated $\text{CO}_2$

### Features and Benefits

- Measures  $\delta^{13}\text{C}$ ,  $\delta^{18}\text{O}$ ,  $^{12}\text{C}^{16}\text{O}_2$ ,  $^{13}\text{C}^{16}\text{O}_2$ ,  $^{12}\text{C}^{18}\text{O}^{16}\text{O}$  at 1 Hz
- $^{12}\text{CO}_2$ ,  $^{13}\text{CO}_2$ , and  $\text{C}^{18}\text{OO}$  from 2% to 100%  $\text{CO}_2$
- Analysis of carbonate minerals
- Analysis of breath (mice, humans)
- Simultaneous measurements of all gases provides maximum accuracy even when  $\text{CO}_2$  levels vary rapidly
- High-resolution absorption spectra are viewable for real-time diagnostics
- Low power: ideal for field apps
- Enhanced Performance package provides unprecedented stability, precision and low drift.
- (Option) Manual injection of discrete gas samples

LGR's new "Carbon Dioxide Isotope Analyzer - Elevated  $\text{CO}_2$ " provides many features that researchers need when measuring isotopic carbon dioxide from samples containing high levels of  $\text{CO}_2$  including:

- LGR's Enhanced Performance package provides ultra-low drift and high precision
- Ability to measure  $\text{CO}_2$  as well as  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  in  $\text{CO}_2$  from 2% to 100%  $\text{CO}_2$
- Ability to analyze acidified carbonates
- Ability to analyze breath (human, mice)

The stable isotope composition of carbonate minerals has been of interest for decades, with initial research focusing on measurements of carbonates in the ocean for paleoceanography applications. Stable isotope studies of carbonates have also been used extensively to explore the role of fluid-rock reaction and geosphere-hydrosphere-atmosphere interactions in the earth and environmental sciences. To date, conventional analyses involve acidification of a carbonate sample to produce  $\text{CO}_2$ , followed by measurements with IRMS. While effective, IRMS requires a trained operator, is expensive, and cannot be performed in the field.

LGR's new "Carbon Dioxide Isotope Analyzer - Elevated  $\text{CO}_2$ " provides measurements of  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  as well as mixing ratios of  $^{13}\text{CO}_2$ ,  $^{12}\text{CO}_2$ , and  $^{12}\text{C}^{18}\text{O}^{16}\text{O}$  in gas samples with high precision in measurement times

of less than a minute in an easy-to-use, field portable unit. Due to its inherently fast time response, the instrument provides  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  measurements over a wide range of even when  $\text{CO}_2$  values change rapidly as often happens during field studies.

The new Analyzer meets all of the needs for effective measurements of isotopic carbon dioxide, including: (1) accurate measurements over a wide range of mole fractions, (2) high precision, (3) ability to report reliable values even if mixing ratios are rapidly changing, (4) portability (low power), (5) user-friendly interface, (6) low drift / high stability.

In addition, the availability of many value-added options extends the abilities of the unit to include discrete samples (collected in bags or vials, for example) and to automatically handle multiple inlet sources.

The Analyzer uses LGR's patented Off-axis ICOS technology, a fourth-generation cavity enhanced absorption technique. Off-axis ICOS has many advantages over conventional Cavity Ringdown Spectroscopy (CRDS) techniques such as being more robust mechanically and thermally, having a much shorter measurement time, and not requiring expensive and power consuming auxiliary components. As a result, LGR instruments provide unsurpassed performance, durability and ease of use.

# Carbon Dioxide Isotope Analyzer - Elevated CO<sub>2</sub>

## Performance Specifications

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### Precision (1 $\sigma$ , 100 sec):

$\delta^{13}\text{C}$ : 0.2‰  
 $\delta^{18}\text{O}$ : 0.6‰  
C<sup>16</sup>O<sub>2</sub>: 20 ppm

### Measurement Rates:

All parameters measured simultaneously at rates up to 1 Hz

### Measurement Range (meets all specs):

CO<sub>2</sub>: 2% – 100% (benchtop package; model 912-0021)  
CO<sub>2</sub>: 4% – 100% (rackmount package; model 911-0021)

### Operational Range

CO<sub>2</sub>: 0 – 100%

### Max Drift at STP (1 $\sigma$ , 1 hr average over 24 hours):

$\delta^{13}\text{C}$ : < 0.5‰

### Sampling Conditions:

Sample Temperature: -20 – 50 °C  
Operating Temperature: 0 – 45 °C  
Ambient Humidity: non-condensing (0-100% RH)

### Outputs:

digital (RS232), Ethernet, USB

### Power Requirements:

115/230 VAC, 50/60 Hz 165 W

### Dimensions:

11" x 38" x 22" (benchtop package)  
14" x 19" x 24" (rackmount package)

### Weight:

50 kg (benchtop package)  
40 kg (rackmount package)

## Ordering Information

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### Part Number:

912-0021 (benchtop package)

911-0021 (rackmount package)

## Accessories

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908-0003-9001: Multiport Inlet Unit – automated 16-port multiplexer

908-0003-9002: Multiport Inlet Unit – automated 8-port multiplexer

908-0001-9009: N920 vacuum pump – for flow-through time <2 sec

908-0005-9002: Syringe Injection –

Allows measurements of discrete samples via manual injection



Instrument complies with 21 CFR 1040.10 and 1040.11