Aerodyne Mini-TILDAS CO_2 Isotope Monitor for $\Delta^{17}O - CO_2$

Direct Spectroscopic Measurement of $\Delta^{17}O - CO_2$ with No Chemical Processing or Separation.

Features:

- < 0.15 ‰ precision for $\delta^{18}O$ in 1 s
- < 0.15 ‰ precision for $\delta^{17}O$ in 1 s
- Fast time response (10 Hz)
- Direct measurement of CO_2 isotopes in air without sample processing
- Repeatability exceeding 0.03 ‰ for $\Delta^{17}O$ for a 30 minute measurement including balanced working reference measurements
- Suitable for CO_2 samples derived from carbonate via acid digestion

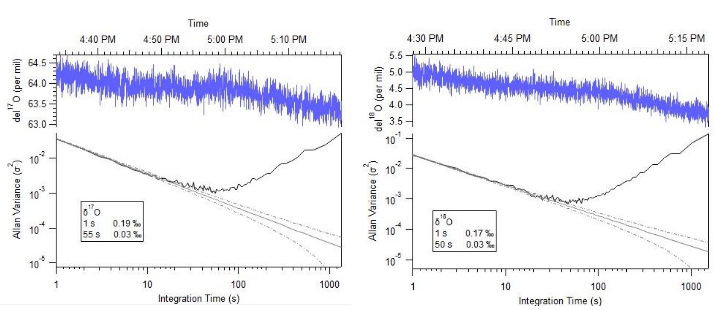
Rugged, field-ready instruments

Direct absorption spectroscopy allows for highly specific and accurate gas detection

Mid-IR detection enables maximum measurement sensitivity

TILDAS Technology

Aerodyne instruments use tunable infrared laser direct absorption spectroscopy (TILDAS) at mid-IR wavelengths to probe molecules at their strongest "finger-print" transition frequencies. We further enhance sensitivity by employing a patented multi-pass broad-band absorption cell that provides optical path lengths up to 76 m. Direct absorption spectroscopy allows for fast (<1 sec) absolute trace gas concentrations without need for elaborate calibration procedures. Moreover, TILDAS instruments are free of measurement interference from other molecular species, enabling extremely specific detection.



Instrument precision for a column density equivalent to 400ppm CO_2 mixing ratio and 36 meter optical path length.

Applications

- Determination of atmospheric sources, sinks, and transport through CO_2 isotopic ratios.
- Biosphere exchange.
- Analysis of CO_2 samples derived from marine carbonate samples.
- Stratosphere-troposphere exchange.

Aerodyne CO_2 Isotope Advantages

- Direct measurement of $^{17}O-CO_2$ which is not possible by IRMS.
- Optional automated sample handling systems.
- Time response up to 10 Hz enables eddy covariance studies.
- Powerful TDLWintel software provides flexible instrument control, and real-time data analysis.
- Valve control capable of complex scheduling, and automatic backgrounds and calibrations.
- 19" rack mountable for easy installation.
- Turn-key design allows unattended operation in remote field sites.

Performance Specifications:

Continuous Air Measurement Specifications – High Speed

	CO_2	$\delta CO^{18}O$	$\delta CO^{17}O$
0.1 Second	0.15 ppm	0.6 ‰	0.6 ‰
1 Second	0.05 ppm	0.2 ‰	0.2 ‰
60 Second	0.015 ppm	0.04 ‰	0.04 ‰

Note: These measurements are not referenced to a working reference. This configuration supports 10 Hz eddy covariance measurements with a modest sized pump (120 lpm) and a flow rate of 6 slpm.

Discrete Air Sample Specifications – High Precision

	CO_2	$\delta CO^{18}O$	$\delta CO^{17}O$
One air sample (~15 ml). 3 min measurement	0.03 ppm	0.06‰	0.06‰
10 Air samples (total of ~150ml) 30 min measurement	0.01 ppm	0.02‰	0.02‰

Dynamic Range (air)

	min	max
CO_2	0 ppm	1,000 ppm

Related Instruments

Single laser isotope monitor for $\delta\,^{13}C$ and $\delta\,^{18}O$ of CO_2

Dual laser isotope monitor for $\delta\,^{13}C$, $\delta\,^{18}O$ and $\Delta\,^{17}O$ of CO_2

Dual laser monitor for CO_2 ($\delta\,^{13}C$, $\delta\,^{18}O$) and water ($\delta\,^{18}O$, δ D) isotopes

Installation

19” rack mountable or benchtop

Instrument Operations

Operating temperature: 10 to 35 ^{o}C
Sample flow rate: 0 to 20 slpm

Instrument Components

Core instrument
Thermoelectric chiller
Keyboard, mouse, and monitor
Vacuum pump (customer specified)
Inlet sampling system (customizable)

Data Outputs

RS-232, USB drive, ethernet

Size, Weight, Power

Dimensions: 440 mm x 660 mm x 6U (267mm) (W x D x H)
Weight: 35 kg (core instrument) + 15 kg (chiller) + pump weight
Electrical Power: 250 W, 120/240 V, 50/60 Hz (without pump)

Aerodyne specializes in collaboration and custom design. Please contact us if you would like to discuss additional measurement options and applications.

REFERENCES:

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