Thermo Scientific Delta Ray

Isotope Ratio Infrared Spectrometer

Thermo Scientific™ Delta Ray™ is a high performance, mid-infrared laser based, isotope ratio infrared spectrometer. It offers simultaneous determination of $\delta^{13}C$ and $\delta^{18}O$ in CO_2 at ambient concentrations with a precision as low as 0.05‰.

- $\delta^{13}C$ and $\delta^{18}O$ in CO_2
- Precision as low as 0.05‰
- Mid-infrared laser based isotope ratio infrared spectrometer
- Portable, field deployable
- Universal Reference Interface – URI
- Up to 1 Hz data
- 200 ppm to 100% CO_2 with dilution
- Global support

Precise, Verifiable Isotope Ratio Measurements

The Delta Ray analyzer comes with a universal reference interface (URI) that provides fully automated referencing and calibration for verifiable measurements and long term confidence. Smart referencing adjusts the reference gas concentration to the sample to achieve superior performance. With the optional dilution box, samples with CO_2 concentration from 200 ppm to 100% can be analyzed.

Isotope Ratios To-Go

The modular design, low weight and built-in referencing make the Delta Ray the analyzer of choice for demanding field applications such as greenhouse gas monitoring, ecology, plant science, carbon sequestration and storage research, or volcanic monitoring. No need to fill vials and wait for the analysis back in the laboratory. Instead feature rich data is acquired autonomously 24 hours a day, 7 days a week, with a time resolution as low as 1 second directly where the sample originates. A quickstart guide gets you going in no time.

Real-Time Results

Powered by the Thermo Scientific Qtegra™ Intelligent Scientific Data Solution™ (ISDS), the data acquisition is driven by powerful workflows. Select sample ports, drive external valves, or synchronize your measurements with external triggers all with a few clicks. Qtegra software then acquires the data into a Qtegra LabBook without user interaction. The fully referenced and calibrated results can be inspected immediately and are easily exported to a spreadsheet or your favorite data analysis package. Qtegra software runs on the on-board Windows 7 computer, which in connection with an internet connection allows you to control your Delta Ray analyzer from anywhere in the world.

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Simple, Robust, Powerful Mid-Infrared Technolgy

At the core of the analyzer is a difference frequency generation (DFG) laser that operates in the mid-infrared, where the absorption of CO_2 and its isotopologues are so strong, that 5 m path length are sufficient to achieve a precision as low as 0.05‰. It is simple, robust and powerful.

Sample gas is dried in the analyzer to prevent any interaction of water and CO_2 (isotope exchange) with the added benefit of providing dry mole fraction concentration data. In the measurement cell, where the laser analyzes the gas, pressure and temperature are precisely controlled.

Analytical Performance

Performance Specifications, in Air	$\delta^{13}C$	$\delta^{18}O$	CO_2 Concentration
Precision, 60 sec averaging, 30 replicates	0.15‰ 1 SD	0.2‰ 1 SD	70 ppb
External reproducibility*, 300 sec averaging, 10 replicates	0.07‰ 1 SD	0.1‰ 1 SD	
Reproducibility, 1 h resolution, 24 h	0.05‰ 1 SD	0.05‰ 1 SD	
Operating range	200 - 3,500 ppm		
Guaranteed specifications range without dilution (100% CO_2 with optional dilution)	380 - 1,500 ppm		
Measurement interval	1, 10, 60 sec		
Cell exchange time (response time)	35 sec @ 80 sccm sample flow		
Measurement technique	Tunable laser direct absorption in the mid infrared (4.3 µm) TDLAS		

*demonstrated with Zero enrichment template: sample and reference are the same gas, 5 min sample average, 5 min reference average, repeat at least 10 times.

Operating Conditions

Temperature range	10 - 35°C
Temperature gradient	0.2°C/min
Humidity	10 - 80% R.H. up to 31°C 10 - 50% R.H. at 35°C non condensing
Size	19" rack mount chassis Analyzer: 588 x 424 x 219 mm (D x W x H) URI: 588 x 424 x 131 mm (D x W x H)
Weight	Analyzer: 25 kg URI: 12 kg
Power consumption	100 - 240 V, 50 - 60 Hz Analyzer: 150 W typical / 500 W startup at 25°C URI: < 160 W
Sample temperature	-10 to 45°C
Sample pressure	Sensor input 700 - 1,200 mbar
Sample flow	Sensor input 80 sccm @ 1,000 mbar abs.
Pump	Internal, oil free
Qtegra ISDS licenses	Each Delta Ray system comes with a Qtegra license for installation on one (1) instrument and up to three (3) additional desktop installations for data review and manipulation. Additional desktop licenses can be purchased as an option

Connections

Electrical	Video: DVI port (incl. VGA) 4 USB ports 1 ethernet 1 Gbit 4 digital outs for 12 V or 24 V valves max 3.3 W each 2 digital in for trigger (TTL) 3 analog outs 0-5 V (0.5 mV resolution) 1 analog in 0-5 V (1 mV resolution)
Gas	Sample A (1 - 12 bar relative) Sample B (700 - 1,200 mbar (abs.)), passing through dryer. Carrier out: for external dilution User provided calibration gas: 2 x pure CO_2 with known $\delta^{13}C$ and $\delta^{18}O$, synthetic air (CO_2 < 0.2 ppm)
Fittings	1/16" Swagelok, 10 - 32 coned port

Transport

Vibration	MIL-STD 810 G
Temperature	-33 to 63°C non condensing

www.thermoscientific.com/DeltaRay

Thermo Fisher Scientific (Bremen) GmbH Management System Registered to ISO 9001:2008

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PS30277_E 11/13G

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