# $\delta^{18}O$, $\delta^{17}O$, $\delta D$ and $^{17}O$-excess Isotopic Water Analyzer

PICARRO


- Streamlined, simple and simultaneous measurements of $\delta^{18}O$, $\delta^{17}O$, $\delta D$ and $^{17}O$-excess in liquids and vapor
- Average to <15 per meg precision on $^{17}O$-excess for 1 hour vapor measurements
- Repeat measurements demonstrate 15 per meg precision on $^{17}O$-excess for liquids

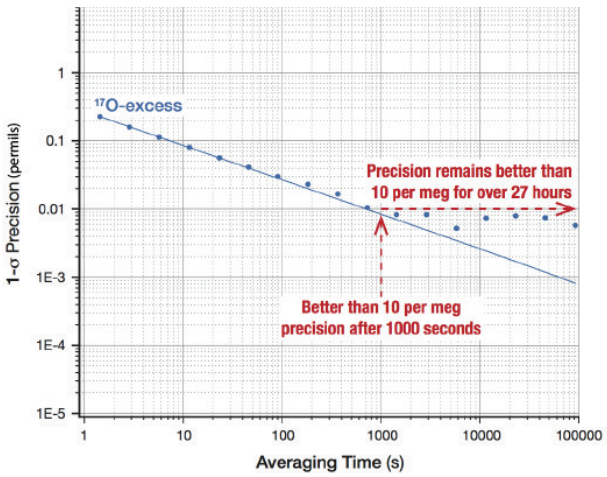
The **Picarro L2140-*i* isotopic water analyzer** enables simultaneous measurements of $\delta^{18}O$, $\delta^{17}O$, and $\delta D$, and determines $^{17}O$-excess to sub 15 per meg (<0.015‰) precision. Scientists now have a simpler, less expensive option for high-precision measurements of water stable isotopes in liquids and vapor.

Measurements of $^{17}O$-excess in conjunction with high precision measurements $\delta^{18}O$ and $\delta D$ enable geoscientists to enhance our understanding of present day climate and the interactions between the hydrosphere and biosphere, and to help reconstruct climates of the past. The ability to quantify extremely small deviations in $\delta^{17}O$ (i.e., $^{17}O$-excess), typically less than 0.1‰ in nature, is essential for paleoclimate, (eco) hydrology, and atmospheric science applications.

High-precision measurements of all three oxygen isotopes ($^{16}O$, $^{18}O$ and $^{17}O$) was once limited to highly specialized labs with expensive, complex sample preparation systems for analysis by isotope ratio mass spectrometry (IRMS). The Picarro L2140-*i* analyzer delivers precisions of 15 per meg or better on $^{17}O$-excess at the touch of button. Introduce water directly into the analyzer—either directly as vapor or using a vaporization process that converts liquid water to vapor. Streamlined, simple and simultaneous measurement of $\delta^{18}O$, $\delta^{17}O$, $\delta D$, and $^{17}O$-excess increases the accessibility of triple oxygen isotope research. This enables scientists to easily expand $^{17}O$-excess data sets and probe the natural world through targeted laboratory experiments and field campaigns.

Patented Picarro cavity ring-down spectroscopy (CRDS) technology enables an effective measurement path length of up to 20 kilometers in a compact cavity, which results in exceptional precision and sensitivity with a small-footprint analyzer. A meticulously designed small optical cavity incorporates precise temperature and pressure control. As a result, the analyzer delivers a best-in-class combination of precision, accuracy, low drift and ease-of-use.

**Allan Deviation Plot: $^{17}O$-Excess Vapor Performance**



# L2140-*i* Technical Specifications

| L2140-*i* Vapor Specifications* | |
|---|---|
| **Measurement Range** | 1,000 to 50,000 ppm |
| **Guaranteed Precision** (1σ) **at 12,500 ppm** ('Normal' mode) | 0.12/0.04‰ for $\delta^{18}O$ at 10/100 sec<br>0.3/0.1‰ for δD at 10/100 sec |
| **Guaranteed Precision** (1σ) **at 12,500 ppm** ('$^{17}O$-excess' mode) | 0.04‰ for $\delta^{18}O$ at 300 sec<br>0.04‰ for $\delta^{17}O$ at 300 sec<br>0.1‰ for δD at 300 sec<br>0.015‰ for $^{17}O$-excess at 3,600 sec |
| **Measurement Rate** | ~1 Hz |

| L2140-*i* Liquids Specifications* | |
|---|---|
| **Guaranteed Precision** (1σ) | 0.025‰ ($\delta^{18}O$), 0.025‰ ( $\delta^{17}O$), 0.1‰ (δD) and 0.015‰ ($^{17}O$-excess) |
| **Maximum 24-hour Drift** (vapor & liquid) | 0.2‰ ($\delta^{18}O$), 0.2‰ ($\delta^{17}O$), 0.8‰ (δD) and 0.2‰ ($^{17}O$-excess) |
| **Throughput** | Up to 160 injections per day |
| **Memory** (within X % of final value after 4 injections) | 99% ($\delta^{18}O$), 99% ($\delta^{17}O$), 98% (δD) and 99% ($^{17}O$-excess) |

*specifications are tested for each unit and based on specific accessories. Please contact Picarro to learn more about the rigorous testing process and application specific accessories.

| L2140-*i* Analyzer Specifications | |
|---|---|
| **Ambient Temperature Range** | -10 to 45°C (vapor sample); 10 to 35°C (liquid sample & system operation); -10 to 50°C (storage) |
| **Sample Pressure** | 300 to 1000 Torr (40 to 133 kPa) |
| **Sample Flow Rate** | ~40 sccm at 760 Torr, no filtration required |
| **Installation** | Benchtop or 19" rack mount chassis |
| **Analyzer Dimensions** | Analyzer: 17" w x 7.5" h x 17" d (43.2 x 19.1 x 43.2 cm) |
| **Analyzer Weight** | Analyzer: 45 lbs (20.4 kg) |
| **Power** | 90–240 VAC, 50/60 Hz, <150 W steady state (analyzer), 80 W (external pump) |
| **Measurement Cell Temperature Control** | ±0.005°C |
| **Measurement Cell Pressure Control** | ±0.0002 atm |
| **Accessories** | Pump (external), keyboard, mouse, LCD monitor (optional) |
| **Data Outputs** | RS-232, Ethernet, USB, analog (optional), 0–10 V |

| L2140-*i* Applications | Peripherals |
|---|---|
| **For Automated Liquid Discrete Sample Analysis** | Autosampler (A0325) + Vaporizer (A0211) |
| **For Removal of Organic Contaminants in Liquid Discrete Sample** | Micro-Combustion Module (A0214) (requires A0211) |
| **For Continuous Liquid Sample Analysis** | Continuous Water Sampler (A0217) |
| **For Continuous Ambient Vapor Analysis (Calibration)** | Standard Delivery Module (A0101) + Vaporizer (A0211) |
| **For Water-Bound Matrix Analysis** | Induction Module (A0213) |

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