

# PICARRO A0217 Continuous Water Sampler

# PICARRO

Extreme science  
Ultimate simplicity  
Absolute transparency

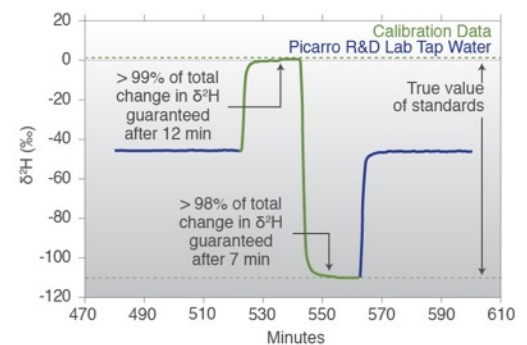
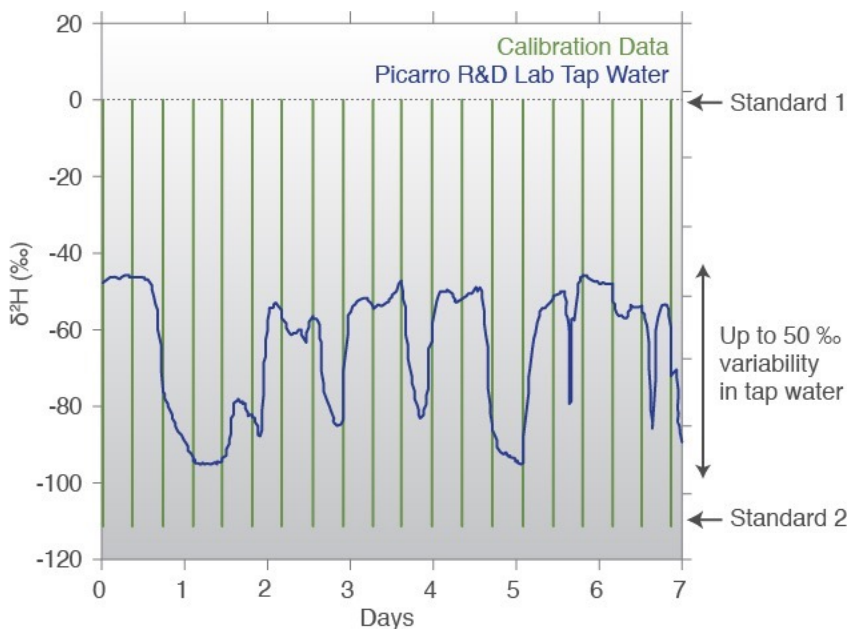
The first commercially-available device for real-time, continuous analysis of  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  in liquid water.

- No discrete sampling required. Pump directly from your water source – in a boat, on a river, from a rain collector.
- Continuously monitor real-time changes in water isotopes using a simple, automated solution coupled to a Picarro L2130-*i*.
- Probe estuary mixing, large-scale precipitation events, ocean dynamics and more.
- Automated switching from samples to standards for calibration.
- Quick and easy field deployment.

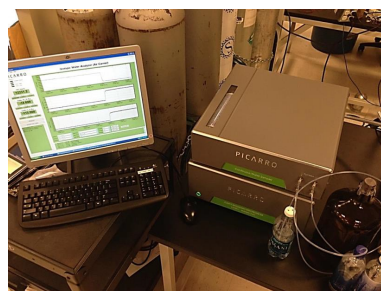


At the heart of the Picarro Continuous Water Sampler (CWS) is a porous membrane that enables diffusive sampling of water isotopes. By tightly controlling the physical factors that affect fractionation of liquid to vapor across a membrane, the CWS, when coupled to a Picarro L2130-*i*, achieves stable and repeatable results from an automated analysis system. Measure water isotopes continuously in estuaries, streams, on ocean transects and more! As a start, simply measure your local tap water to understand how your local municipality is sourced. The figure below shows a continuous time-series of tap water isotopes in Picarro's R&D lab enabling us to learn how our local water authority is switching between locally-sourced groundwater and imported water from an alpine dam. With guaranteed performance and low-calibration requirements, use your CWS in the lab or take it to the field and measure in real-time!

The stable isotopic composition ( $\delta^{18}\text{O}$  and  $\delta\text{D}$ ) of seawater and freshwater can be used to trace physical processes, including evaporation, precipitation, tidal mixing, submarine groundwater discharge and salt rejection during sea-ice formation. For laser-based absorption techniques, such as Picarro's Cavity Ring-Down Spectroscopy, typically water samples are discretely measured following a flash evaporation process that ultimately limits the throughput and frequency of measurements. However, high-resolution, real-time and continuous measurements of spatial and temporal features within water masses may be desired. The new CWS from Picarro now makes that a reality, opening new opportunities for scientist to study the global water cycle, including during tidal mixing, throughout a synoptic event, on a river, at an outlet glacier or during an ocean transect.



*Zoomed into version of a calibration period. The blue data represents tap water while the green data is the transition to high and low calibration waters. With guaranteed performance, you can calibrate for < 20 minutes per water, and dependent on your performance requirements, at a frequency of only 2-3 times per day.*



*On a dock, on a boat or  
in the lab!*

\* All Guaranteed Performance Specifications are applicable for coupling the CWS with a Picarro L2130-i, measuring in the Air mode, for  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$ .

Continuous Water Sampler Guaranteed Performance Specifications*	
Precision	0.1 / 0.2 ‰ for $\delta^{18}\text{O}$ / $\delta^2\text{H}$ ( $1\sigma$ of 5-minute average measurement)
Reproducibility	0.4 / 1.0 for $\delta^{18}\text{O}$ / $\delta^2\text{H}$ ( $1\sigma$ of the mean of 5-minute measurements over 12 hours when switching between two water sources; applicable to clean waters in laboratory setting)
Memory (sample-to sample)	Better than 99% / 98% ( $\delta^{18}\text{O}$ / $\delta^2\text{H}$ ) of the true difference between two standards after 7 minutes
Environmental Conditions	The CWS is subject to environmental chamber and vibration testing prior to shipment.

Application Considerations	
Filtration and Total Dissolved Solids	The user-replaceable expanded polytetrafluoroethylene (ePTFE) membrane used for diffusive sampling in the CWS is tolerant of variable dissolved solids and particulate matter. However, for waters with high particulate loads, Picarro recommends placing a 2 $\mu\text{m}$ water filter upstream of the CWS to protect the inlet sample selector and enhance membrane lifetime. The CWS is shipped with two spare user-replaceable membranes.
Calibration	Features automated switching between sample and standards using inlet four ports (two samples, two standards) and one outlet port. With a water consumption rate of $\sim 2$ to 3 mL / minute, Picarro recommends tertiary, large volume water standards are used for calibrating the CWS.
Interferences	The diffusive membrane used in the CWS is permeable to not only water vapor, but also other gas phase molecules. In particular, $\text{CH}_4$ and $\text{H}_2\text{S}$ may diffuse through the membrane and enter the inlet of the Picarro L2130-i. The Air mode of the L2130-i measures and corrects for $\text{CH}_4$ , and interference from $\text{H}_2\text{S}$ is unlikely, although possible at very high concentrations. However, spectral interference should be considered for other non-typical gas mixtures. Contact Picarro for further information.
Drierite consumption	The CWS combines a Drierite desiccant column with Nafion tubing to dry ambient air prior to contact with liquid water in the diffusion cell. Picarro recommends using Indicating Drierite to track desiccant activity via the viewing window on the top and side of the CWS.

Continuous Water Sampler System Specifications	
Analyzer Compatibility	Designed and tested with the Picarro L2130-i. Compatible with the 'normal' $\delta^{18}\text{O}$ and $\delta^2\text{H}$ mode of the Picarro L2140-i. Not compatible with the $^{17}\text{O}$ -excess mode of the Picarro L2140-i, or the Picarro L2120-i and earlier generation models.
Flow rate	Water: $\sim 2$ to 3 mL / minute Air: $\sim 0.5$ L / minute Analyzer: $\sim 40$ sccm at 760 Torr
Power Requirements	CWS: Powered via analyzer; 50 W maximum during start up; $\sim 30$ W in steady state Analyzer: 90-240 VAC, 50/60 Hz, $< 200$ W at steady state
Temperature Control	Dried gas stream, water stream and membrane are temperature-controlled to within $\pm 0.1$ °C
Dimensions	17" w x 7" h x 17" d ( $\sim 43.2$ cm w x 17.8 cm h x 43.2 cm d)
Weight	$< 10$ kg