

4 isotopologues, 3 isotopic ratios, 2 phases, 1 instrument

World's Best Triple Isotopic Water Analyzer



Isotopic Water Analyzer ($\delta^2\text{H}$, $\delta^{17}\text{O}$, $\delta^{18}\text{O}$, d-excess, ^{17}O -excess)

Features and Benefits

- Comprehensive system provides unparalleled performance for both isotopic liquid water and water vapor measurements
- Reports $\delta^2\text{H}$, $\delta^{17}\text{O}$, $\delta^{18}\text{O}$, d-excess, ^{17}O -excess (and H_2O in vapor mode) in real time
- High Throughput and High Performance modes in 1 system
- Switch between liquid and vapor measurements in seconds
- Highest accuracy water vapor
- Isotopic water vapor reported at high and low mole fractions
- Fast time response allows isotopic water vapor flux studies
- Enhanced Performance series provides unsurpassed stability and lowest drift
- Low power: 180 W (steady state)
- Widest temperature range: 0 - 45 °C (EP model)

LGR's Isotopic Water Analyzer (model IWA-45EP) is the only instrument for isotopic water measurements (liquid water and water vapor) capable of reporting all major isotopologues (H_2O , H^2HO , H_2^{17}O , H_2^{18}O) simultaneously. The IWA combines the features of LGR's Liquid Water Isotope Analyzer and Water Vapor Isotope Analyzer (Enhanced Performance model) in a single instrument. For liquid water samples, the IWA-45EP reports $\delta^2\text{H}$, $\delta^{17}\text{O}$, $\delta^{18}\text{O}$, d-excess and ^{17}O -excess measurements at the highest rate available. Specifically, with the typical operating procedure (6 injections per sample), this measurement rate yields 110 unknowns and 22 reference samples per day. For measurements of water vapor, the IWA-45EP reports $\delta^2\text{H}$, $\delta^{17}\text{O}$, $\delta^{18}\text{O}$, ^{17}O -excess and d-excess, and water vapor mole fraction at up to 2 Hz over a range of mole fractions greater than 60000 ppm H_2O in air (or any other background). Changing between operational modes could not be simpler. With a simple toggle switch, the user can quickly change from measuring liquid water to water vapor, or vice versa.

LGR's new "Enhanced Performance series" incorporates proprietary internal thermal control for ultra-stable measurements with essentially no drift, unsurpassed precision and highest accuracy. The IWA-45EP uses LGR's patented Off-axis ICOS technology, a fourth-generation cavity ringdown spectroscopy (CRDS) technique, which employs an optical cavity to greatly enhance spectral absorption and enable the fastest and highest precision measurements of any laser absorption technique. LGR's patented technology has many proven advantages over conventional CRDS techniques. As a result, LGR analyzers are simple to build, inherently robust and reliable, and easy to operate.

As with all LGR analyzers, the IWA-45EP provides users with the entire fully resolved absorption spectra for comprehensive performance validation and diagnostics in real time. Similarly, the IWA-45EP has an internal computer (Linux OS) that can store data practically indefinitely on an internal hard disk drive and send real time data to a data logger via the digital (RS232) or Ethernet outputs. The Analyzer includes advanced post-processor software which provides many features that increase user productivity, decrease data processing time, and provide data and system diagnostics. The LGR software offers a seamless interface with LIMS for Light Stable Isotopes for one-stop reference normalization, sample data storage, and client management.

LGR's Post Analysis Software automatically performs many analysis procedures on liquid measurements that were previously done by researchers after the data was collected. Among the capabilities of LGR's software package are to automatically apply calibration standard measurements made during the sample run, to graphically display all results, and to diagnose instrument operation. Moreover, the Post Analysis Software includes LGR's proprietary Spectral Contamination Identifier (SCI) technology, which detects, accurately quantifies, and can correct for the presence of contaminants in water samples based on a detailed analysis of the measured high-resolution absorption spectra.

LGR analyzers may be controlled remotely via the Internet. This capability allows users to operate the Analyzer using a web browser anywhere internet access is available. Furthermore, remote access provides the opportunity to obtain and share data and to diagnose the instrument operation without being on site.

Isotopic Water Analyzer (models IWA-35EP, IWA-45EP)

Liquid Water Specifications

Precision:

High Performance Mode

$\delta^2\text{H}$: 0.2‰ (200 per meg)

$\delta^{17}\text{O}$: 0.03‰ (30 per meg)

^{17}O -excess: 20 per meg

$\delta^{18}\text{O}$: 0.03‰ (30 per meg)

Typical: High Performance Mode

$\delta^2\text{H}$: 0.15‰ (100 per meg)

$\delta^{17}\text{O}$: 0.02‰ (20 per meg)

^{17}O -excess: 15 per meg

$\delta^{18}\text{O}$: 0.02‰ (20 per meg)

High Throughput Mode

$\delta^2\text{H}$: 0.4‰ (500 per meg)

$\delta^{17}\text{O}$: 0.1‰ (100 per meg)

$\delta^{18}\text{O}$: 0.1‰ (100 per meg)

Typical: High Throughput Mode:

$\delta^2\text{H}$: 0.3‰ (300 per meg)

$\delta^{17}\text{O}$: 0.08‰ (80 per meg)

$\delta^{18}\text{O}$: 0.08‰ (80 per meg)

Throughput:

over 800 injections per day
(with Autoinjector)

Sample Volume:

1 μL per injection

Salinity:

less than 4%

Temperatures:

Sample Temperature: 5 – 50 °C

Operating Temperature: 0 – 45 °C

Outputs:

Digital (RS232), Ethernet, USB

Power Requirements:

115/230 VAC, 50/60 Hz

180 watts total (steady state)

Dimensions (analyzer):

11" H x 38" W x 22" D

Weight (analyzer):

50 kg

Water Vapor Specifications

Precision (12,000 ppm, 10 sec / 100 sec):

$\delta^2\text{H}$: 0.5‰ / 0.2‰

$\delta^{17}\text{O}$: 0.15‰ / 0.05‰ (IWA-45EP only)

$\delta^{18}\text{O}$: 0.15‰ / 0.05‰

$[\text{H}_2\text{O}]$: 0.2% / 0.07%

Measurement Rates:

Up to 2 Hz (optional external pump
required for 1/e flow time < 6 seconds)

Maximum Drift:

(15 min average at STP over 24 hrs)

$\delta^2\text{H}$: 0.8‰

$\delta^{17}\text{O}$: 0.2‰ (IWA-45EP only)

$\delta^{18}\text{O}$: 0.2‰

$[\text{H}_2\text{O}]$: 0.1%

Measurement Range:

4000 to 60000 ppm (non-condensing)
(low-range option to 500 ppm or lower)

Operating Range:

0 to 70000 ppm

Sampling Conditions:

Sample Temperature: -20 – 50 °C

Operating Temperature: 0 – 45 °C

Ambient Humidity:

0-100% RH (non-condensing)

Ordering Information

Part Number IWA-912

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Options

Low-range option – extends lower range of
water vapor mole fraction to 500 ppm in air

Accessories

ACC-AUTOINJECT: Autoinjector –
Provides automated injection of liquid samples

WVSS:

Water Vapor Isotope Standard Source –
Provides controllable flow of water vapor with
known humidity and isotope ratios for absolute
calibration of isotopic water vapor measurements

MIU-16: Multiport Inlet Unit – Automated
control of 16 inlet ports (for vapor)

MIU-8: Multiport Inlet Unit – Automated
control of 8 inlet ports (for vapor)

OPT-DATALOG: Data Logging System – multi-
channel data logging system records and
synchronizes serial (RS-232) outputs from LGR
analyzers and other devices (GPS,
anemometers)



Instrument complies with 21 CFR 1040.10 and 1040.11