

# LI-7500RS Open Path CO<sub>2</sub>/H<sub>2</sub>O Gas Analyzer

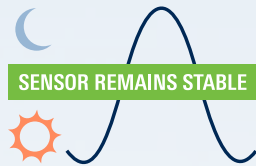
The next generation of the most trusted open path CO<sub>2</sub>/H<sub>2</sub>O analyzer for carbon dioxide flux and evapotranspiration measurements.



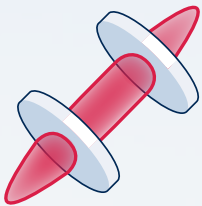
**LI-COR**<sup>®</sup>

# Why the LI-7500RS?

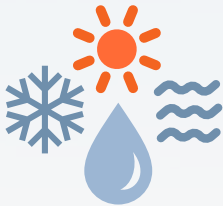
The LI-7500RS Open Path CO<sub>2</sub>/H<sub>2</sub>O Gas Analyzer is designed to provide dependable eddy covariance flux measurements in the most demanding outdoor environments.



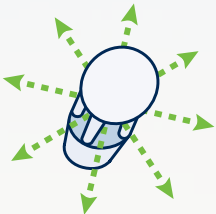
Provides dependable CO<sub>2</sub> and H<sub>2</sub>O vapor measurements for eddy covariance flux systems.



Improved optics and temperature controls reduce sensitivity to dust and other contamination—even when the instrument is not cleaned for weeks at a time. In some conditions, drift is reduced by orders of magnitude.



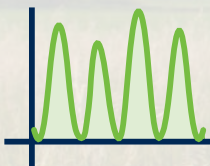
Temperature-regulated optical housing and detector provide stable measurements under large ambient temperature variations.



Versatile installation options for omnidirectional sampling and continuous data coverage.



Designed to be installed away from the sonic anemometer to minimize flow distortion near the anemometer and related flux errors.



Logs complete eddy covariance datasets—including wind speed measurements from a sonic anemometer, data from an LI-7700 Open Path CH<sub>4</sub> Analyzer, and supporting meteorological, radiation, and soil data from a LI-COR Biomet System.

# Now Includes the SMARTFlux<sup>®</sup> System

The SMARTFlux System runs EddyPro<sup>®</sup> Software on a powerful microcomputer to calculate final flux results as data are logged. No preliminary estimates. No legacy programming language. Just final, fully processed flux results. The same dependable results you get from EddyPro Software on a desktop computer, only computed in real time

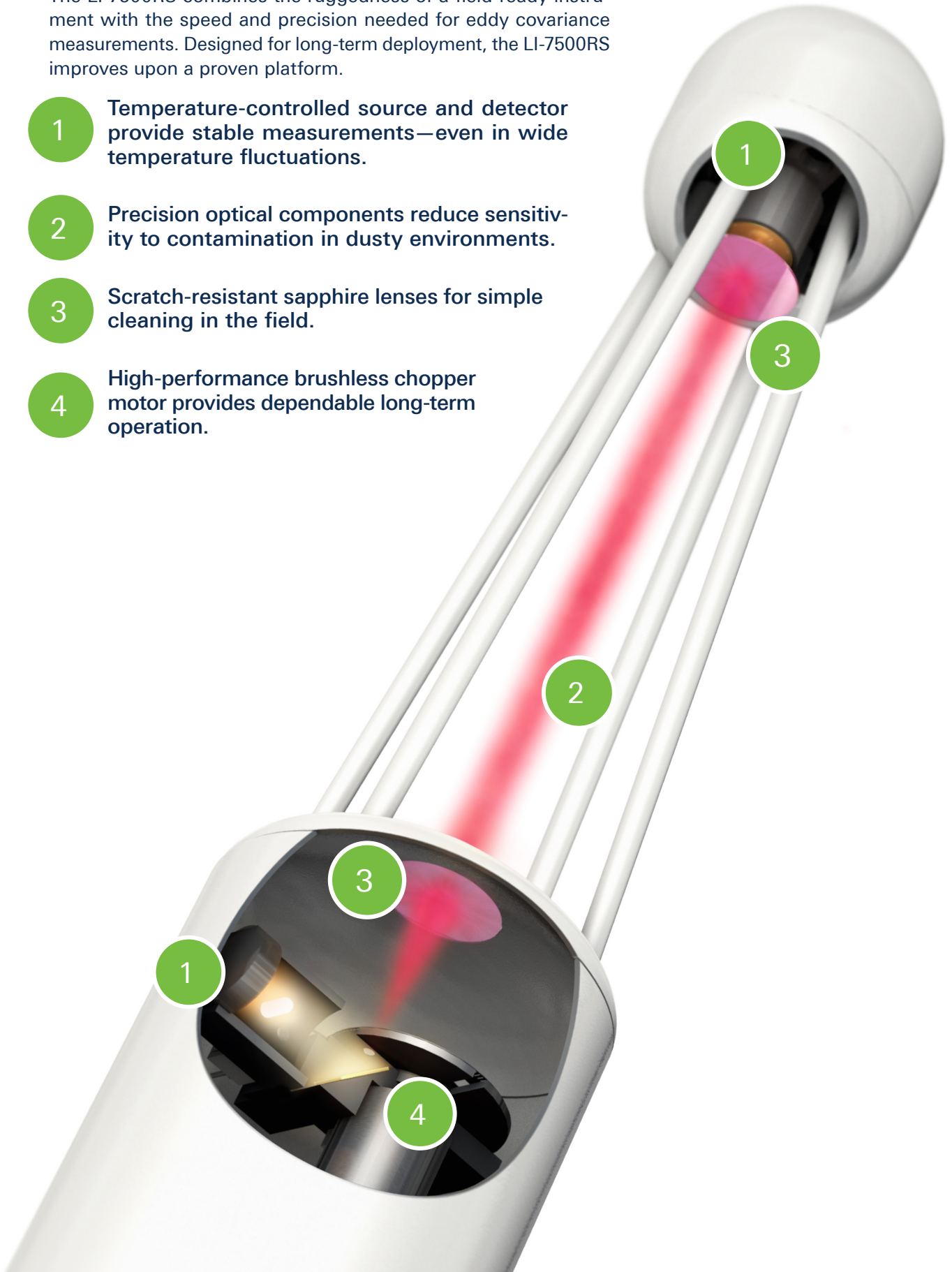
at the site. SMARTFlux is ready to connect with FluxSuite<sup>™</sup> Software—to put your results and system performance information online. In FluxSuite, you can view results, get email notifications, and check the performance of your instruments from computers and smartphones.



# Instrument

The LI-7500RS combines the ruggedness of a field-ready instrument with the speed and precision needed for eddy covariance measurements. Designed for long-term deployment, the LI-7500RS improves upon a proven platform.

- 1 Temperature-controlled source and detector provide stable measurements—even in wide temperature fluctuations.
- 2 Precision optical components reduce sensitivity to contamination in dusty environments.
- 3 Scratch-resistant sapphire lenses for simple cleaning in the field.
- 4 High-performance brushless chopper motor provides dependable long-term operation.



# How It Works

The LI-7500RS uses non-dispersive infrared spectroscopy to measure CO<sub>2</sub> and H<sub>2</sub>O vapor densities in air. It transmits infrared radiation through temperature-controlled optical filters, then through the optical path to a thermally regulated lead selenide detector. Some of the infrared radiation is absorbed by CO<sub>2</sub> and H<sub>2</sub>O vapor in the optical path. Gas densities are computed from the ratio of the absorption band to a reference band.



## LI-7550 Analyzer Interface Unit

Included with each LI-7500RS, it houses the gas analyzer electronics, a 16 GB USB drive for data logging, and the SMARTFlux® System. It has connections for a 3-dimensional sonic anemometer and provides Ethernet communication, making it easy to connect the LI-7500RS with FluxSuite™ Software.



# Software that Simplifies Eddy Covariance Measurements

The LI-7500RS software simplifies eddy covariance system setup, while enabling easy access to calibration and diagnostic information for the gas analyzer.



## Analyzer Dashboard

The instrument dashboard shows diagnostics for the analyzer, connection status, measurements, and real-time eddy covariance results. The intuitive interface brings the essential eddy covariance settings together, making it easy to record information about the site.



## EddyPro® Software

Processing eddy covariance data in express or advanced mode, EddyPro Software computes fully processed flux results in real time on the SMARTFlux® System. Every LI-7500RS runs EddyPro Software on the SMARTFlux System.



## The SMARTFlux System

A powerful, field-ready microcomputer, the SMARTFlux System brings the power of EddyPro Software to your field site. It provides fully processed eddy covariance results as your data are logged. It is included with every LI-7500RS analyzer.



## FluxSuite™ Software

Every LI-7500RS is ready to connect to FluxSuite Software. FluxSuite puts EddyPro results and instrument performance information online for access from your computer and smart-phone. It is a cloud-based site management tool that enables networking and collaboration between different researchers and provides email notifications when there is an issue at a site.

# Versatility for any Eddy Covariance Setup

## Sonic Anemometer Compatibility

The LI-7500RS can be used with many high-speed 3-dimensional sonic anemometers—so you can choose the ideal anemometer for your site conditions and measurement objectives. The analyzer can be installed under or next to the sonic anemometer to minimize flow distortion and optimize data coverage.

LI-COR provides a variety of compatible sonic anemometers and data cables to simplify this connection.

## Tripod and Tower Installations

Sensor head cables are available in five- and ten-meter options. You can install the sensor head up to ten meters from the LI-7550. The Ethernet cable can extend up to several hundred meters from the LI-7550.

## Expansion Capabilities

The LI-7500RS supports standard network communication protocols so you can easily add networked devices, including an LI-7700 Open Path CH<sub>4</sub> Analyzer, a LI-COR Biomet System, and cellular or satellite communication devices.

## Internet-Enabled

Access the instrument over the Internet with a direct connection, cellular modem, or satellite communication system—and connect with FluxSuite for online access to your site, automated email alerts, and networking between different sites and research groups.

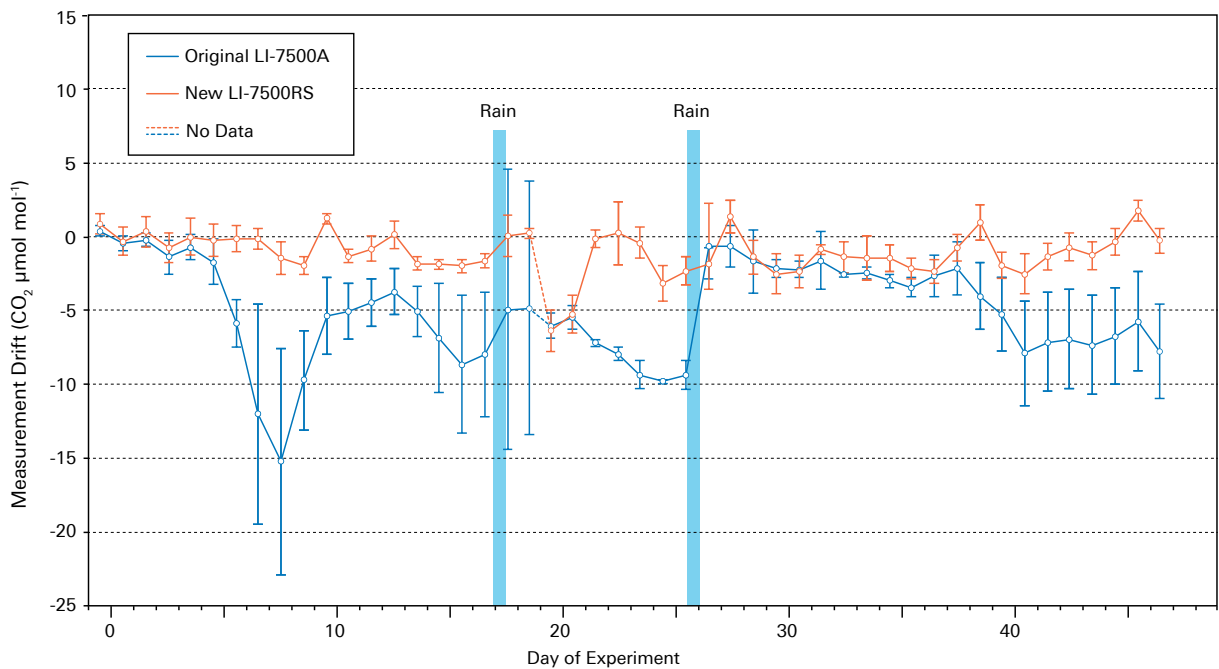


# Stability and Drift Resistance

The accumulation of dust, pollen, chemical residues, and other contaminants on optical components can lead to measurement drift and cause gaps in datasets. Typically, this is not a problem when an instrument is regularly maintained. If an instrument is not maintained, however, there is risk that the accumulation will affect measurements.

Innovations to the optics and electronics ensure that the LI-7500RS collects more accurate and dependable data—even as contaminants begin to accumulate on the optics.

Data from numerous instruments at a variety of sites with a wide range of contamination levels consistently show that the LI-7500RS provides significantly more stable measurements than the LI-7500A for both CO<sub>2</sub> and H<sub>2</sub>O vapor. Figures 1 and 2 show contamination-related drift data from an urban site adjacent to heavy road traffic.



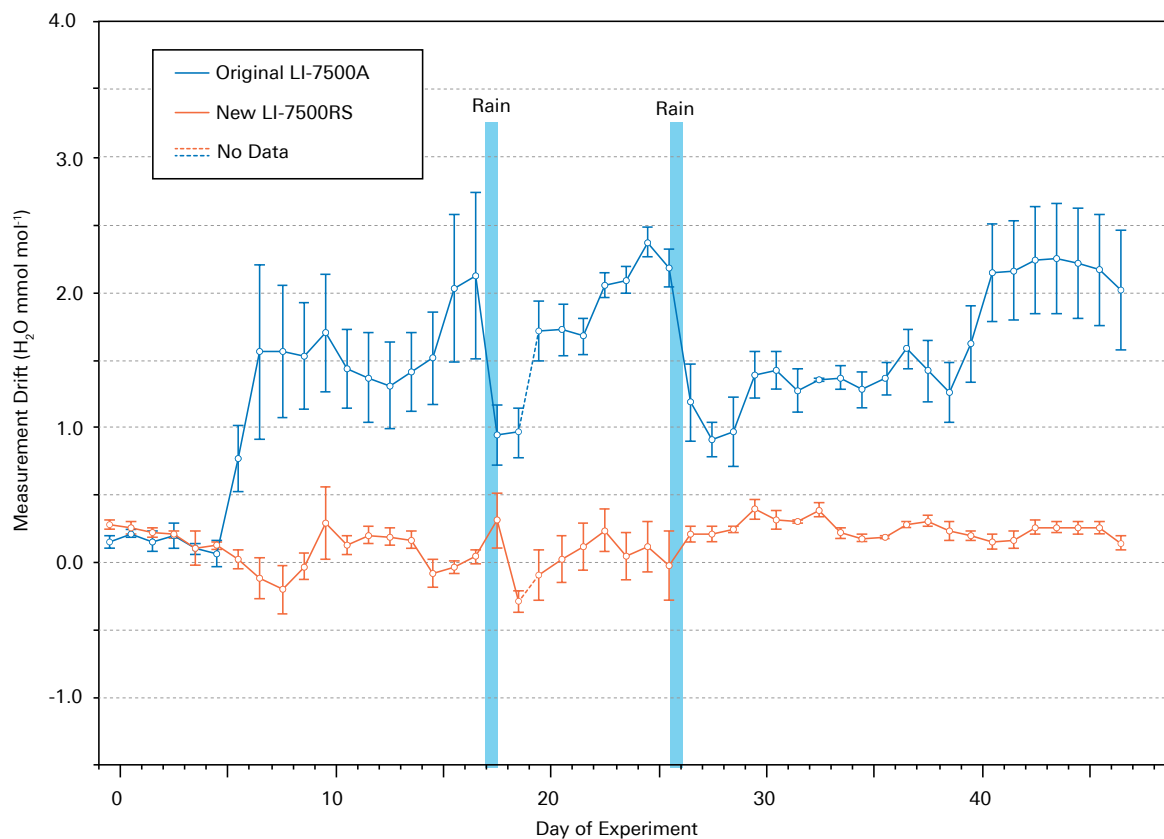
**Figure 1.** CO<sub>2</sub> measurements from three LI-7500RS analyzers and three LI-7500A analyzers (average and spread). The y-axis shows the deviation from a control reference. CO<sub>2</sub> measurements from the LI-7500RS analyzers drifted considerably less and had smaller instrument-to-instrument variability than those from the original LI-7500A models. Data show the typical improvement expected from the LI-7500RS analyzer.



## Minimized Flow Distortion

In eddy covariance systems, airflow distortion can occur when a gas analyzer is inside or too close to the sonic anemometer path. If the gas analyzer is too close, it can disrupt airflow before wind enters the anemometer, leading to errors in the computation. If it is too far away, the instruments will sample different eddies, which can also lead to errors.

The LI-7500RS can be positioned at the ideal distance from the anemometer, either downwind or under it. This makes it possible to minimize wind flow distortion and maximize frequency response, ensuring that flux results are minimally affected by flow distortion.



**Figure 2.** Water vapor measurements from three LI-7500RS analyzers and three LI-7500A analyzers (average and spread). The y-axis shows the deviation from a control reference. Measurements from the LI-7500RS analyzers drifted several times less, and had smaller instrument-to-instrument variability when compared with original LI-7500A models.

## Case Studies

The open path LI-7500RS is ideal for power-limited deployments.

The LI-7500 and LI-7500A are the most trusted open path CO<sub>2</sub>/H<sub>2</sub>O analyzers in the world. Since 1999, the analyzers have been cited in over 3500 scientific publications. That's four new citations every week.

Deployed over seven continents and every ocean.



Selected by more than 20 networks worldwide over the last 15 years—from CarboEurope to the Chinese Ecological Research Network.



The LI-7500—predecessor to the LI-7500RS—was used by many scientists from the Intergovernmental Panel on Climate Change, which was awarded a Nobel Prize in 2007.

For a list of publications that cite the LI-7500A or LI-7500RS go to [www.licor.com/EC-references](http://www.licor.com/EC-references)

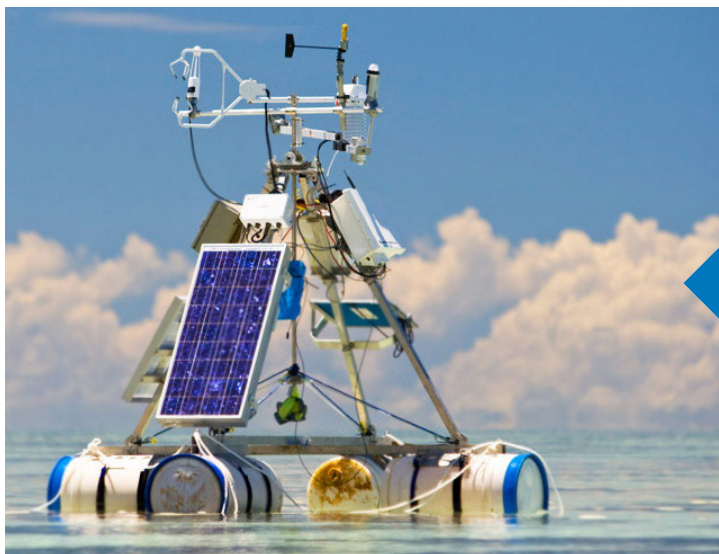
**Cited In Over  
3500  
Scientific  
Publications**

**More than  
20  
Networks  
Worldwide**



### Alaska, USA

On the northern coast of Alaska, USA, conditions are challenging for any instrument system. Here, The LI-7500A measures  $\text{CO}_2$  and  $\text{H}_2\text{O}$  vapor flux in combination with  $\text{CH}_4$  flux measurements from an LI-7700 Open Path  $\text{CH}_4$  Analyzer.



### Great Barrier Reef, Australia

Deployed over seven continents. Deployed over oceans too. Afloat over the southern Great Barrier Reef, this station measures energy and carbon exchange for researchers at the School of Geography, Planning, and Environmental Management, the University of Queensland, Australia.



### Qinghai-Tibetan Plateau, China

Measurements of  $\text{CO}_2$  and water vapor flux over an alpine wetland on the Qinghai-Tibetan Plateau in China. This site includes  $\text{CH}_4$  flux measured with an LI-7700 Open Path  $\text{CH}_4$  Analyzer.

# Specifications\*

## CO<sub>2</sub> Measurements

**Calibration range:** 0-3000  $\mu\text{mol mol}^{-1}$

**Accuracy:** Within 1% of reading

**Zero drift (per °C):**

±0.1 ppm typical

±0.3 ppm maximum

**RMS noise (typical @ 370 ppm CO<sub>2</sub>):**

@5 Hz: 0.08 ppm

@10 Hz: 0.11 ppm

@20 Hz: 0.16 ppm

**Gain drift (% of reading per °C @ 370 ppm):**

±0.02% typical

±0.1% maximum

**Direct sensitivity to H<sub>2</sub>O (mol CO<sub>2</sub>/mol H<sub>2</sub>O):**

±2.00E-05 typical

±4.00E-05 maximum

## H<sub>2</sub>O Measurements

**Calibration range:** 0 - 60 mmol mol<sup>-1</sup>

**Accuracy:** Within 1.5% of reading

**Zero drift (per °C):**

±0.03 mmol mol<sup>-1</sup> typical

±0.05 mmol mol<sup>-1</sup> maximum

**RMS noise (typical @ 10 mmol mol<sup>-1</sup> H<sub>2</sub>O):**

@5 Hz: 0.0034 mmol mol<sup>-1</sup>

@10 Hz: 0.0047 mmol mol<sup>-1</sup>

@20 Hz: 0.0067 mmol mol<sup>-1</sup>

**Gain drift**

(% of reading per °C @ 20 mmol mol<sup>-1</sup>):

±0.15% typical

±0.30% maximum

**Direct sensitivity to CO<sub>2</sub> (mol H<sub>2</sub>O/mol CO<sub>2</sub>):**

±0.02 typical

±0.05 maximum

## General

**Analysis Type:** Absolute, non-dispersive infrared spectroscopy

**Data Storage:** 16 GB removable industrial grade USB storage device included

**Data Communication:** Ethernet, Synchronous Devices for Measurement (SDM; >50 Hz), RS-232 (115,200 baud; 20 records per second max), 6 DACs (0-5 V; 300 Hz)

**Inputs:** Four analog input channels (differential; bi-polar; ±5 V; 300 Hz)

**Operating Temperature Range:** -25 to 50 °C (-40 to 50 °C verification test available on request)

**Power Requirements:** 10.5 to 30 VDC

**Power Consumption:** 12 W nominal (up to 30 W during startup)

**Detector:** Thermoelectrically cooled lead selenide

**Bandwidth:** 5, 10, or 20 Hz, user-selectable

**User Interface:** Windows® based

**Cable length:** 5 meters (all cables); 5-meter head cable extension available

### Analyzer Head

Size: 6.5 cm (2.6" diameter), 30 cm (12") length

Weight: 0.75 kg (1.65 lbs.)

### LI-7550 Analyzer Interface Unit

Size: 35 cm × 30 cm × 15 cm (13.8" × 12" × 6")  
external dimensions

Weight: 4.4 kg (9.7 lbs.)

### 7550-101 Auxiliary Sensor Interface

Size: 11.5 cm × 6.5 cm × 4.2 cm  
(4.5" × 2.6" × 1.7")

Weight: 0.39 kg (0.85 lbs.) including mounting  
bracket

\*Specifications subject to change without notice.



# Ordering Information

## LI-7500RS Open Path CO<sub>2</sub>/H<sub>2</sub>O Gas Analyzer

This configuration is the LI-7500RS analyzer. In addition to the gas analyzer, it includes:

### LI-7550 Analyzer Interface Unit

#### The SMARTFlux System

#### Accessories Kit

- 5-meter cables (sensor head, RS-232 serial, auxiliary input, SDM cables)
- 16 GB industrial grade USB flash drive
- Calibration fixture
- Windows® software
- Instruction manuals

## LI-7500RSD

This configuration includes the LI-7500RS and LI-610 Dew Point Generator. In addition to the gas analyzer, it includes:

### LI-7550 Analyzer Interface Unit

#### The SMARTFlux System

#### LI-610 Dew Point Generator

#### Accessories Kit

- 5-meter cables (sensor head, RS-232 serial, auxiliary input, SDM cables)
- 16 GB industrial grade USB flash drive
- Calibration fixture
- Windows® software
- Instruction manuals

## CH<sub>4</sub>, CO<sub>2</sub> and H<sub>2</sub>O Flux Analyzer Packages

The GHG-RS1 package combines the LI-7700 and LI-7500RS at discount pricing. In addition to the gas analyzer, it includes:

### LI-7700 Open Path CH<sub>4</sub> Analyzer

### LI-7550 Analyzer Interface Unit

#### The SMARTFlux System

#### Accessories Kit

- 5-meter cables (sensor head, RS-232 serial, auxiliary input, SDM cables)
- 16 GB industrial grade USB flash drive
- Calibration fixture
- Windows® software
- Instruction manuals

## Sonic Anemometer Connection Cables

Cables provide a direct connection between the sonic anemometer and LI-7550 Analyzer Interface Unit.



## LI-7500A to LI-7500RS Upgrade

Upgrade an existing LI-7500A to the LI-7500RS to take advantage of the improved optics and temperature controls. The factory upgrade includes new hardware, software, and a full factory calibration of the instrument.

For additional discounts, combine the upgrade with eddy covariance sensors, such as the LI-7700, biomet system, a sonic anemometer, tripod and more. Contact LI-COR or your local distributor for upgrade information.

# LI-COR Biosciences

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The LI-COR board of directors would like to take this opportunity to return thanks to God for His merciful providence in allowing LI-COR to develop and commercialize products, through the collective effort of dedicated employees, that enable the examination of the wonders of His works. "Trust in the LORD with all your heart and do not lean on your own understanding. In all your ways acknowledge Him, and He will make your paths straight." — Proverbs 3:5,6

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