

# LI-7200RS Enclosed CO<sub>2</sub>/H<sub>2</sub>O Gas Analyzer

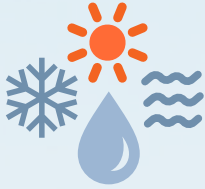
The next generation of the CO<sub>2</sub>/H<sub>2</sub>O gas analyzer  
chosen by leading flux networks around the world.



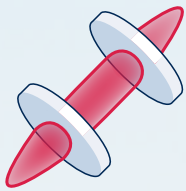
**LI-COR**<sup>®</sup>

## Why the LI-7200RS?

The LI-7200RS Enclosed CO<sub>2</sub>/H<sub>2</sub>O Gas Analyzer is designed for high-speed CO<sub>2</sub> and H<sub>2</sub>O vapor gas exchange measurements. It combines the performance of a closed path analyzer with the ruggedness and low power demands of an open path instrument.



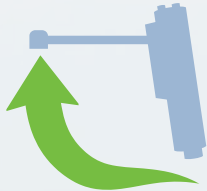
Minimizes data gaps with continuous measurements through rain, snow, and fog.



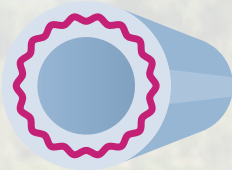
Improved optics and temperature controls increase stability and reduce sensitivity to dust and other contaminants—even when the instrument is not cleaned for weeks at a time.



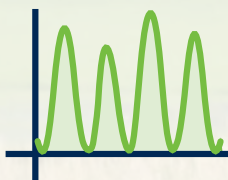
Temperature-regulated optical filter housing and detector provide stable measurements, even with large ambient temperature variations.



Air intake is designed to install close to or away from the sonic anemometer to minimize flow distortion and the resulting flux errors.



Insulated intake tube and optional heated intake tube ensure high frequency response of water vapor measurements.



Logs complete eddy covariance data sets—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

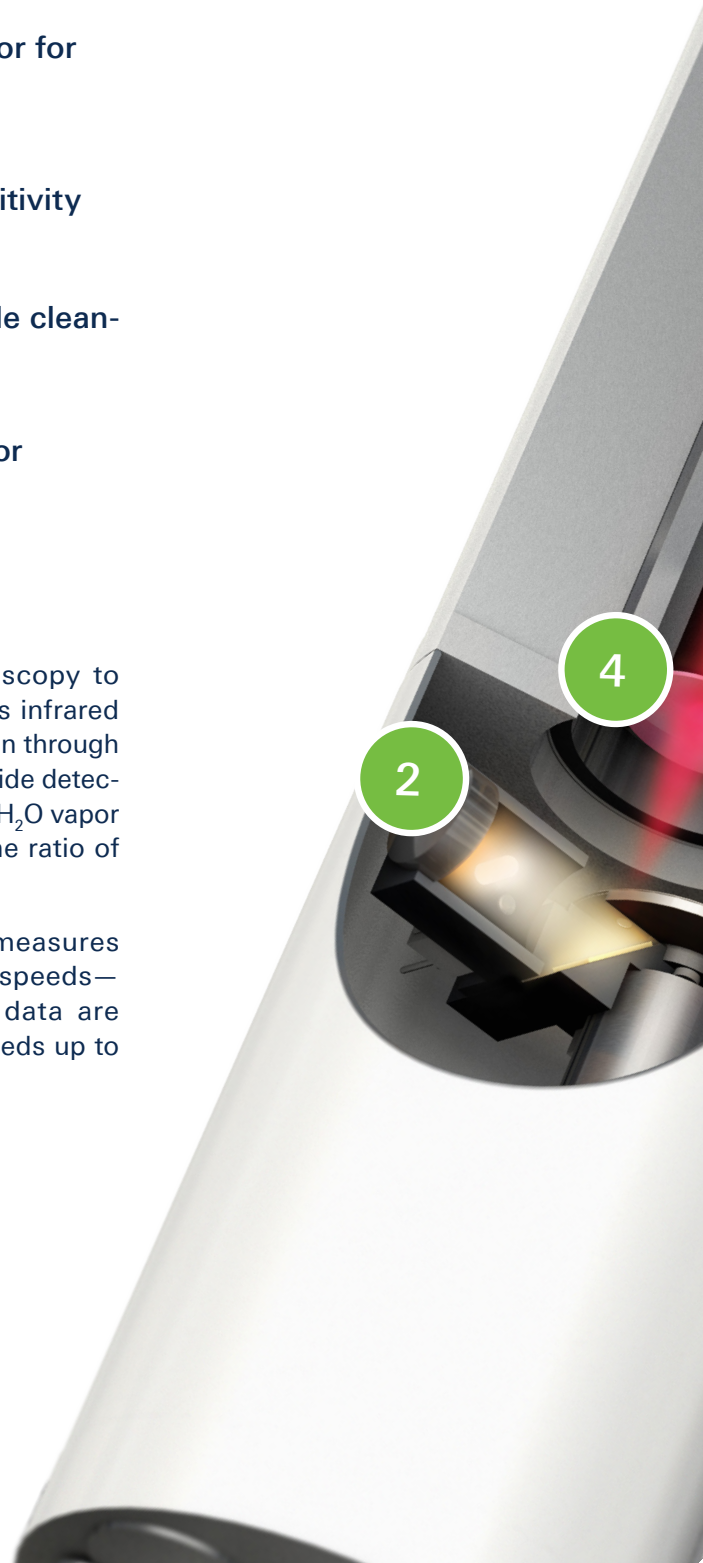
Specifically designed for long-term eddy covariance measurements, the LI-7200RS combines the ruggedness of a field-ready instrument with the precision needed for flux measurements.

- 1** Patented system of high-speed temperature and pressure measurements of the sampled air provide true mole fraction for the most accurate flux measurements.
- 2** Temperature-controlled source and detector for stable measurements—even in wide temperature fluctuations.
- 3** Precision optical components reduce sensitivity to contamination in dusty environments.
- 4** Scratch-resistant sapphire lenses for simple cleaning in the field.
- 5** High-performance brushless chopper motor provides dependable long-term operation.

## How It Works

The LI-7200RS 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 closed sample 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 sample path. Gas densities are computed from the ratio of absorbed radiation to a reference.

Using a patented configuration, the analyzer also measures temperature and pressure of the sampled air at high speeds—synchronously with the gas measurements. These data are combined to compute wet and dry mole fractions at speeds up to 20 measurements per second.







## LI-7550 Analyzer Interface Unit

Included with each LI-7200RS, 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-7200RS with FluxSuite™ Software.



# Software that Simplifies Eddy Covariance Measurements

The LI-7200RS computer 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-7200RS runs EddyPro Software on the SMARTFlux System.



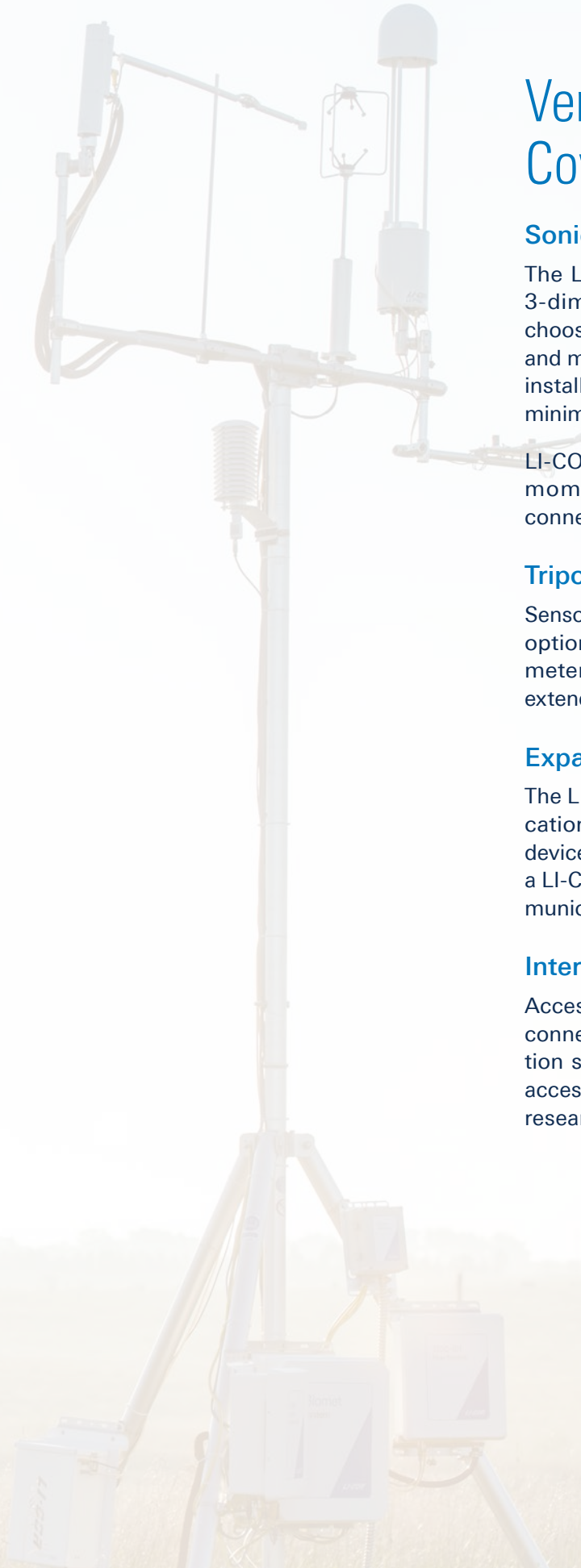
## The SMARTFlux System

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-7200RS.



## FluxSuite™ Software

Every LI-7200RS is ready to connect to FluxSuite Software. FluxSuite is a cloud-based eddy covariance site management tool. It enables networking to facilitate collaboration between researchers and groups, and provides real-time results, instrument status information, and email notifications when there is an issue at a site.



## Versatility for any Eddy Covariance System Setup

### Sonic Anemometer Compatibility

The LI-7200RS 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 sample inlet can be installed under or beside the sonic anemometer—to minimize flow distortion and increase 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-7200RS 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 and networking between sites and research groups.

# Stability and Drift Resistance

The accumulation of dust, pollen, chemical residues, and other contaminants on the optics of an unfiltered enclosed gas analyzer can lead to measurement drift and cause gaps in datasets. This is not a significant problem if an instrument is filtered and regularly maintained. If an instrument is unfiltered or unmaintained, however, there is risk that contaminants will affect measurements.

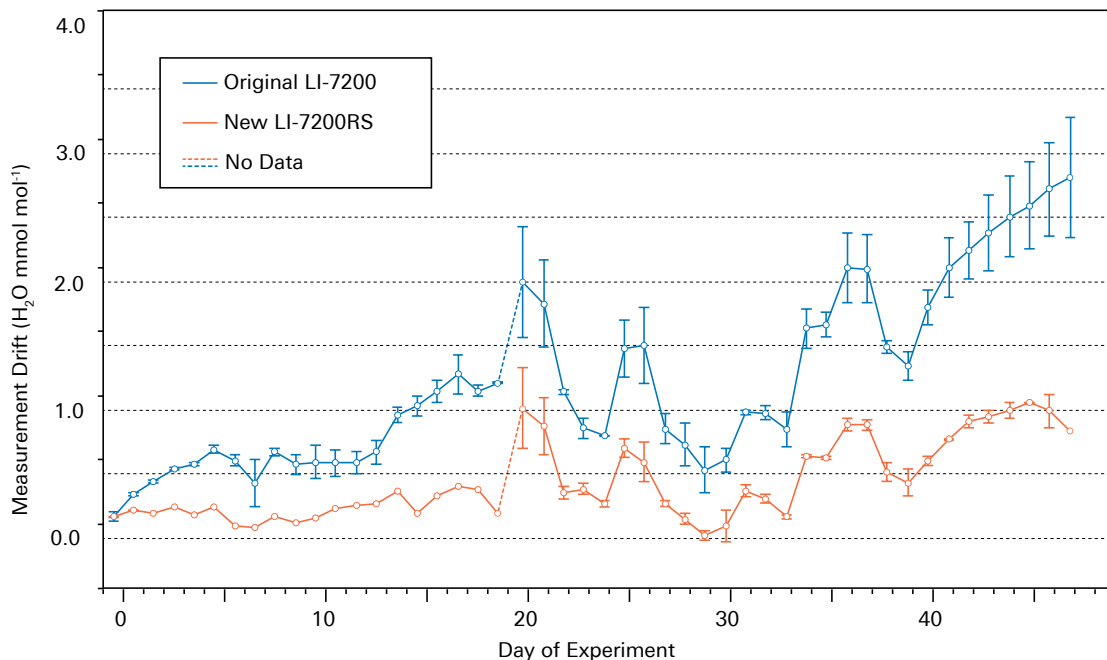
Innovations to the optics and electronics ensure that the LI-7200RS collects more accurate and dependable data—even as contaminants begin to accumulate on the optics.

Data from numerous instruments at a variety of sites—with exposure to different levels of contamination—consistently show that the LI-7200RS provides more stable water vapor measurements than the LI-7200 (Figure 1). CO<sub>2</sub> measurements (not shown) are similar to or slightly better than those of the original LI-7200.

## High Speed Temperature and Pressure Measurements

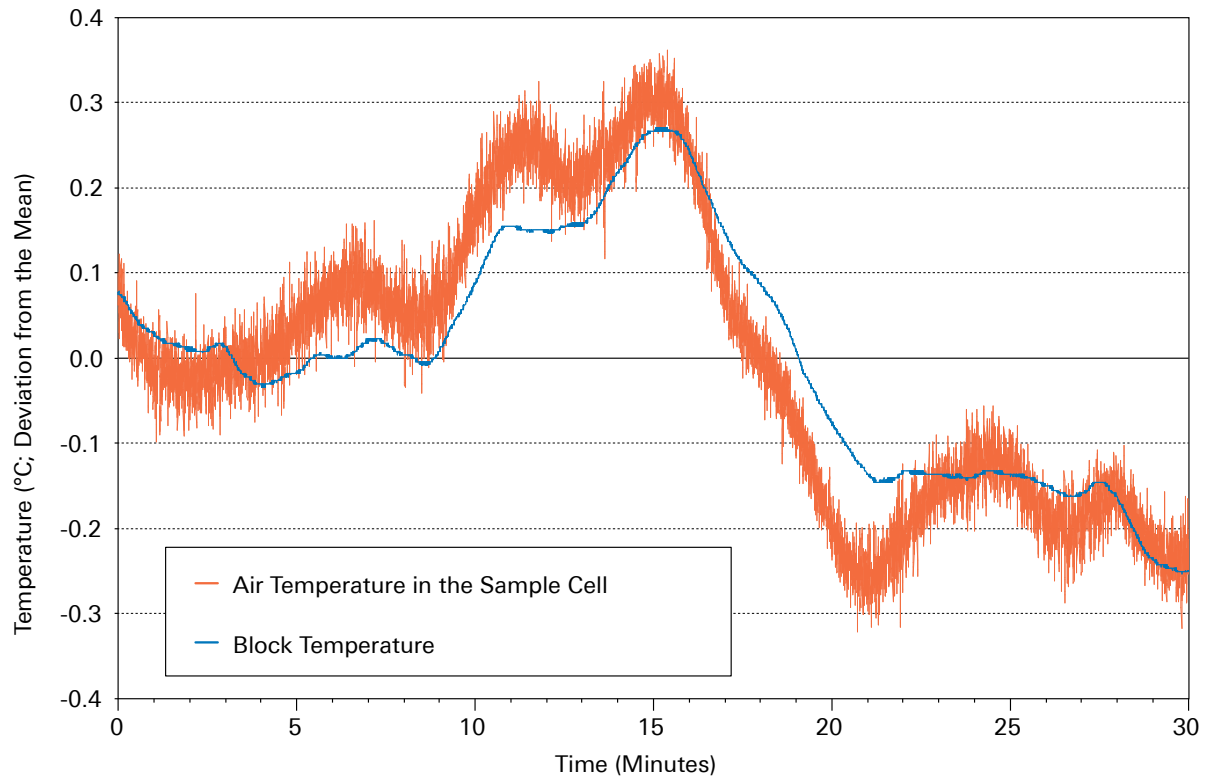
High-speed temperature and pressure measurements of sampled air—the actual air in the gas analyzer cell—provide the data required to compute fast dry mole fraction, and thus compute accurate fluxes. The LI-7200RS measures air temperature and pressure with a sophisticated system of thermocouples and pressure sensors. This patented configuration ensures true alignment of temperature, pressure, and gas densities, to ensure the most accurate flux results.

Although the absence of fast air temperature and pressure measurements may appear negligible on half-hourly fluxes, the problems become apparent when computing carbon budgets (Figure 3), which can accrue large differences.

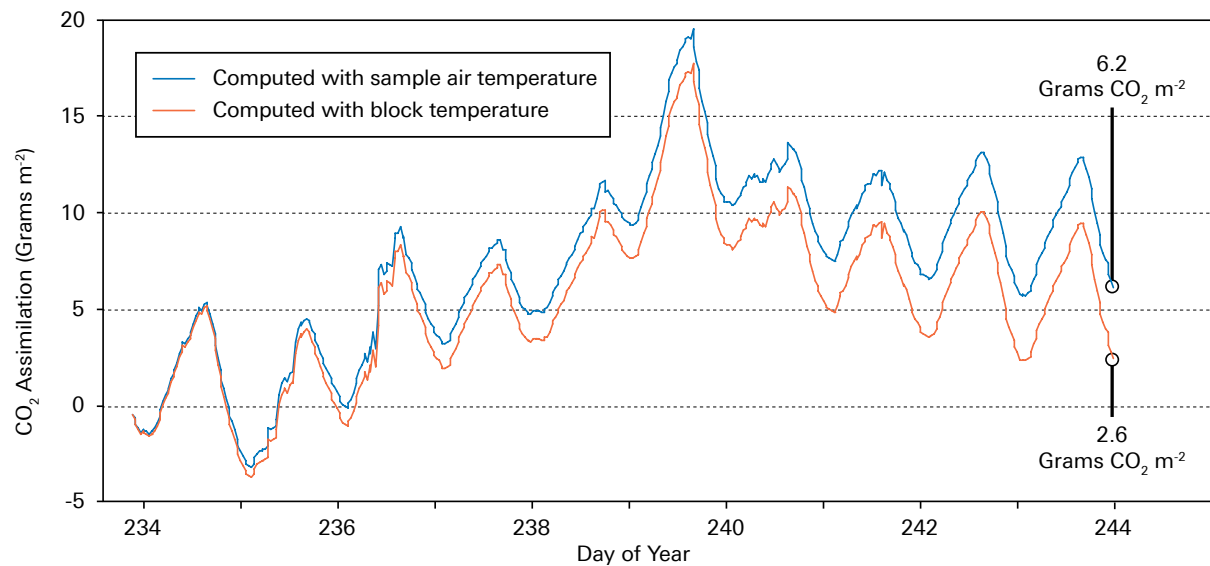


**Figure 1.** Water vapor measurements from two unfiltered LI-7200RS instruments and two unfiltered LI-7200 analyzers (average and spread). The y-axis shows deviation from a control reference. Measurements from the LI-7200RS analyzers drifted several times less and have smaller instrument-to-instrument variability than those from the original LI-7200.





**Figure 2.** The LI-7200RS measures the sample air temperature and pressure with every gas density measurement. Dampened, low-speed temperature measurements of block temperature will not provide the data required to correctly compute fast dry mole fractions.



**Figure 3.** Errors from slow, dampened temperature measurements, rather than fast measurements of sampled air, accumulate quickly and become significant after a few days of data collection at this site. By day 10, fluxes were underestimated by 2.4 times.

## Case Studies

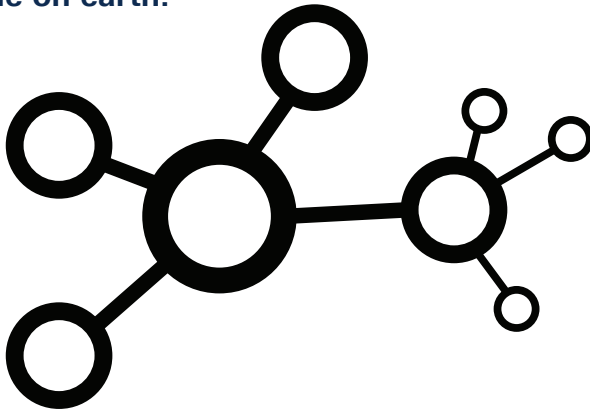
Collects reliable data in rapidly changing weather conditions and over complex terrain.

Tested and selected by major research networks worldwide, including the Integrated Carbon Observatory System (ICOS) in Europe and the National Ecological Observatory Network (NEON) in the United States.



Researchers in over 50 countries depend upon data from the LI-7200 and LI-7200RS analyzers.

Working tirelessly on all 7 continents, the LI-7200 and LI-7200RS analyzers are designed for every terrestrial biome on earth.



Published 300 times and counting. Data from an LI-7200 is cited almost once per week in peer-reviewed journals.

For a list of publications that cite the LI-7200 or LI-7200RS go to [www.licor.com/EC-references](http://www.licor.com/EC-references)

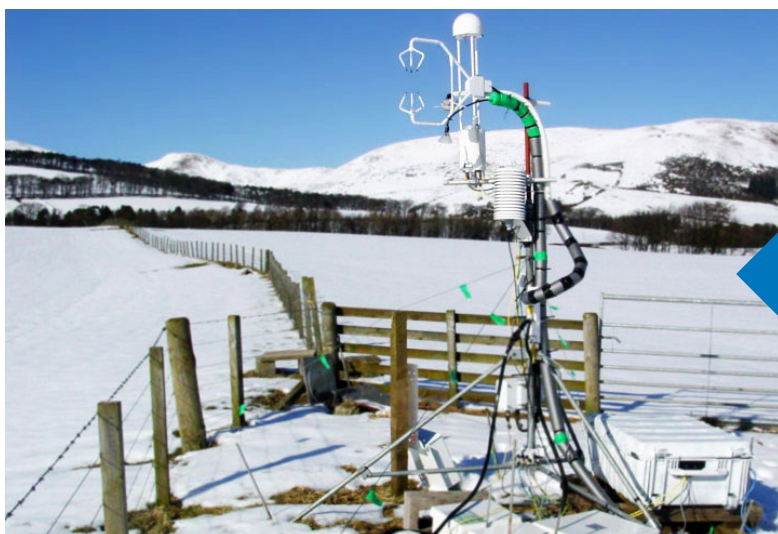
Researchers  
In Over  
**50**  
Countries

Published  
**300**  
Times And  
Counting



### Alaska, USA

Designed to perform in the most demanding environments, like this black spruce bog in Alaskan permafrost. Research by T. Nakai of Nagoya University of Japan, carried out in Alaska, USA.



### Scotland, UK

There is an LI-7200 in nearly every habitat type on the planet. Here, one measures carbon dioxide and water vapor fluxes over grazing land in Edinburgh, Scotland, UK.



### Rehovot, Israel

Tolerating extreme temperatures, winter storms, and blowing dust, the LI-7200RS can operate through the most difficult weather conditions. Here, an LI-7200 is deployed by the Department of Environmental Sciences and Energy Research, Weizmann Institute of Science, Rehovot, Israel.



# Specifications\*

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

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

**Accuracy:** 1% of reading nominal

**Zero drift (per °C):**

$\pm 0.1$  ppm typical

$\pm 0.3$  ppm maximum

**RMS noise:** (typical @370  $\mu\text{mol mol}^{-1}$  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  $\mu\text{mol mol}^{-1}$ ):

$\pm 0.02\%$  typical

$\pm 0.1\%$  maximum

**Direct sensitivity to H<sub>2</sub>O**

(mol CO<sub>2</sub>/mol H<sub>2</sub>O):

$\pm 2.00\text{E-}05$  typical

$\pm 4.00\text{E-}05$  maximum

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

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

**Accuracy:** Within 1.5% of reading

**Zero drift (per °C):**

$\pm 0.03$  mmol mol<sup>-1</sup> typical

$\pm 0.05$  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>):

$\pm 0.15\%$  typical

$\pm 0.30\%$  maximum

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

$\pm 0.02$  typical

$\pm 0.05$  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;  $\pm 5$  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:** 7.5 cm (36") diameter, 31 cm (12.2") length

**Weight:** 1.8 kg (3.95 lbs.)

### **LI-7550 Analyzer Interface Unit**

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

**Weight:** 4.4 kg (9.7 lbs.)

### **7200-101 Flow Module (Optional)**

**Operating Temperature Range:** -25 to 50 °C

**Power Requirements:** 10.5 to 30 VDC

**Power Consumption:** <16 W nominal

**Flow rate:** 15 LPM nominal

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

**Weight:** 6.15 kg (13.55 lbs.)

### **Insulated Intake Tube**

**Length:** Up to 1 meter

**Inside Diameter:** 5.33 mm

**Outside Diameter:** 6.35 mm

### **Heated Intake Tube (Optional)**

**Length:** 71.1 cm

**Inside Diameter:** 5.33 mm

**Outside Diameter:** 6.35 mm

**Operating Temperature Range:** -40 to 50 °C

**Output Wattage:** 0.1 to 6 W

**Heat Density Ratio**  
(short tube to long tube): 2:1

**Weight:** 0.54 kg (1.2 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-7200RSF

This configuration has the LI-7200RS and 7200-101 Flow Module. In addition to the gas analyzer, it includes:

**LI-7550 Analyzer Interface Unit**

**7200-101 Flow Module**

**The SMARTFlux System**

**Accessories Kit**

- Insulated intake tube
- Inlet cap and screen
- Dust filter
- 5-meter cables (sensor head, RS-232 serial, auxiliary input, SDM cables)
- 16 GB industrial grade USB flash drive
- Windows® software
- Instruction manuals

## LI-7200RS Enclosed CO<sub>2</sub>/H<sub>2</sub>O Gas Analyzer

This configuration has the LI-7200RS without the Flow Module. A user-supplied pump or flow module is required. 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
- Windows® software
- Instruction manuals

## LI-7200RSD

This configuration has the LI-7200RS, 7200-101 Flow Module, and LI-610 Dew Point Generator. In addition to the gas analyzer, it includes:

**LI-7550 Analyzer Interface Unit**

**7200-101 Flow Module**

**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
- Windows® software
- Instruction manuals

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

The GHG-RS2 package combines the LI-7700 and LI-7200RS 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**

**7200-101 Flow Module**

**The SMARTFlux System**

**Accessories Kit**

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



# LI-7200 to LI-7200RS Upgrade

If you have an LI-7200, upgrade to the LI-7200RS to take advantage of the improved design. The factory upgrade includes new components and a full factory calibration of the instrument.

You can combine the upgrade with additional 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.

## Accessories

### Inlet Cap

Aerodynamic design to minimize interference with wind flow. Maximizes frequency response by minimizing dead volumes in the intake tube. A standard component of the LI-7200RS, it is compatible with both the insulated intake tube and optional heated intake tube.

### Insulated Intake Tube

Included with each LI-7200RS. It is ideal for measurements in environments with low to moderate humidity.

- Compatible with the 2-micron particle filter.
- Minimizes attenuation of CO<sub>2</sub> and H<sub>2</sub>O vapor, while attenuating temperature by 90% to 99%.

### Heated Intake Tube

Optional heated intake tube is recommended for measurements in high humidity environments. Eliminates potential condensation inside the intake tube and improves frequency response of water vapor measurements by reducing water vapor sorption to the intake tube walls.

- User-settable control from 0 to 6 watts.
- Compatible with the 2-micron particle filter.
- Minimizes attenuation of H<sub>2</sub>O by the intake tube and improves frequency response of water vapor measurements.

### Particle Filter

2-micron Swagelok® particle filter is included with each LI-7200RS. Reduces the need to clean the intake tube and gas analyzer cell, improving the stability of measurements in dusty environments. Compatible with both the insulated and heated intake tubes.

### 7200-101 Flow Module

Provides a precisely controlled airflow rate through the LI-7200RS optical path. Flow data, including liters per minute and motor drive percent, are logged in datasets and provide an indication of the intake filter condition. Draws less than 16 watts in normal operation.

# 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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