LI-6800 Portable Photosynthesis System

The worldwide standard for photosynthetic gas exchange and chlorophyll *a* fluorescence measurements

Answer questions with confidence

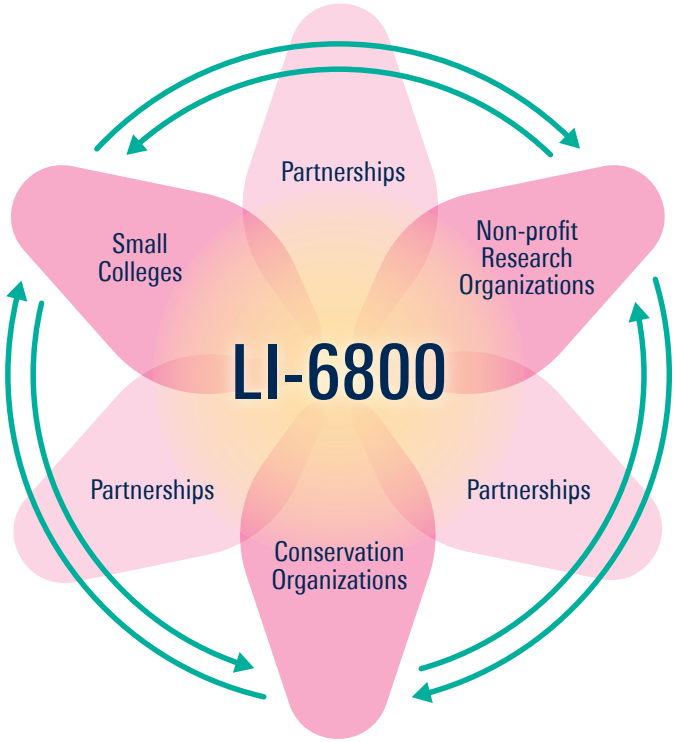
The LI-6800 Portable Photosynthesis System measures photosynthetic gas exchange and chlorophyll *a* fluorescence from plants and aquatic samples. It is highly extendable, providing capabilities to measure gas exchange from soil, insects, and many other sample types in an innumerable range of experiments.

With automated adjustments of experimental variables combined with stable control of non-experimental parameters, the LI-6800 empowers operators to test hypotheses with high confidence.

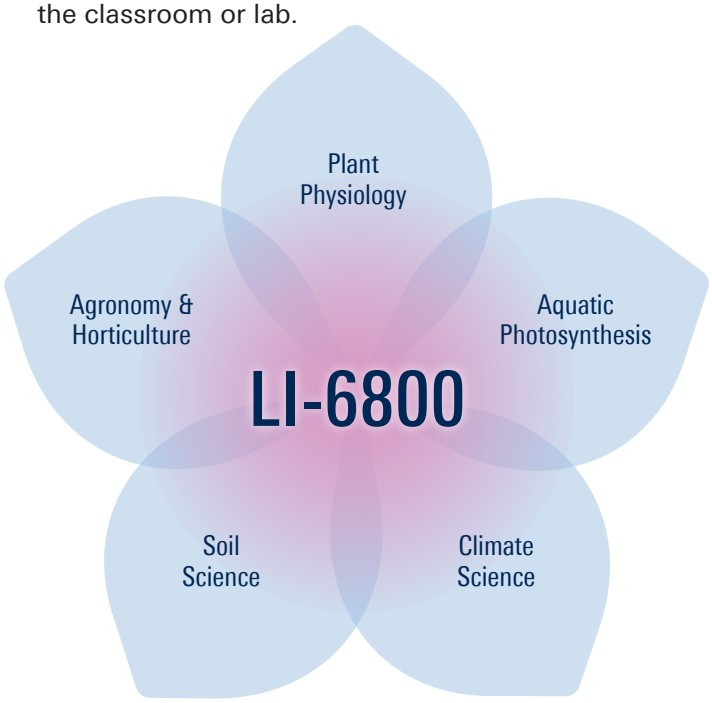
- Scientist-friendly utilities to keep your focus on data collection and research questions.
- Experiment-friendly flexibility for extended applications, with support for custom gas mixtures, auxiliary sensors, custom chambers, and extensive programming capabilities.
- Person-friendly portability for field work, with ergonomic grips, a carrying harness, tripods, and a monopod for the sensor head.

Build value together

Undergraduate teaching colleges, research institutions, and non-profit organizations can build lasting partnerships and extend their reach by coming together around shared interests and the LI-6800.



Educators and researchers in different academic departments, such as plant physiology, aquatic photosynthesis, climate science, soil science, and agronomy, can use the LI-6800 to answer important questions and demonstrate concepts in the classroom or lab.



Tell the story of your research

Publications in scientific journals are the stories of your research. The LI-6800 is your partner in research storytelling — it reveals biological processes with its measurements so you can create compelling publications with the data. How does it help you publish?

- Automated startup and system tests ensure the instrument is in top form, for a good start to every day.
- Real-time status information keeps you informed of the instrument operating status so you can quickly address any issues, should the need arise.
- Long lasting, hot swappable batteries keep up with you on the longest days of data collection. Battery charge status is given on the instrument display and each battery; low battery warnings ensure you can keep going non-stop until the measurements are done.
- Powerful graphics processor for a responsive touch screen.
- Charts of live and logged data show multiple parameters at once. Live charts auto-scale by default, but you can zoom in and rescale charts to let the data tell its story.
- Configurable data logging capabilities to ensure you get all the data you need for robust, thorough analysis.
- Data are recorded in plain text files and Microsoft® Excel® spreadsheet files with embedded equations so you can easily recompute datasets with altered parameters.
- Configuration management tools make it easy to store and load configurations for different protocols and researchers.

The advantage of experience

The LI-6800 was developed by the most experienced team of photosynthesis researchers and engineers in the industry, in collaboration with leading academic and commercial plant physiologists. It combines patented technologies with proven techniques, giving you the advantage of experience.

LI-COR photosynthesis instruments are the most cited in published literature, earning the trust of researchers for decades. The LI-6800 continues this tradition — your research will stand out because of the pedigree of the instrument.

Get experience

At LI-COR, we want you to put your best work forward. We offer ample resources to help you learn about photosynthesis and its measurement. You can become an expert with the LI-6800 through in-person training, online training, online videos, and excellent technical support. Each LI-6800 purchase includes two training certificates.*

*Some restrictions apply.

Share your experience

Whether you teach in a lecture hall, a small classroom, the lab, or the field, the LI-6800 can depict biological concepts by plotting sample responses in real time. You can connect to the LI-6800 with your computer, tablet, or phone using a VNC viewer to change settings, view charts, or show an entire classroom the instrument screen on an overhead projector.

Designed like your data depend on it

You can depend on the LI-6800 every time you turn it on. Precise measurements and highly responsive feedback loops quickly establish target conditions in the sample chamber. The instrument holds parameters at setpoints, providing performance that you can trust from sample to sample and experiment to experiment.

Stable measurements

- High-precision non-dispersive infrared gas analyzers (IRGAs) are stable over time, ensuring that measurements can be trusted, whether it is your 1st or 1000th.
- Differential gas exchange system features small volume IRGAs for fast response, advanced optics for dependable measurements, and a patented flow splitting mechanism — technologies that are not available in any other photosynthesis system.
- IRGAs are open to the sample chamber for fast response and tight coupling of measurements, controls, and sample responses.
- Precise leaf temperature measurements accurately represent the leaf temperature at the contact point. Versatile measurement options — one thermocouple, two thermocouples, or energy balance — support numerous sample types and chamber configurations.

CO_2 control

- Responsive CO_2 control leads to faster assimilation measurements, that in turn, enable the Dynamic Assimilation™ Technique.
- For a CO_2 source, it uses common 8-gram cylinders that are easily available worldwide. One cylinder provides up to 8 hours of CO_2 control under normal operating conditions.
- Compatible with tank gases for a CO_2 source or custom gas blends.
- Extended CO_2 control range from 0 to 3,100 µmol mol^{-1} CO_2 for more experiment protocols.

H_2O control

- Precise water vapor control to maintain ideal conditions in the sample chamber. The LI-6800 adjusts quickly to setpoints when set manually or with programs.
- Automatic condensation protection. It alerts you when there is a risk and overrides setpoints to protect sensitive components.
- No harmful chemicals for water control. The humidifier column uses Nafion tubes in water to humidify the air stream — just add water. The desiccant column uses indicating silica gel beads to remove water vapor from the air stream.

Temperature control

- Control leaf temperatures up to ±10 °C from ambient with the built-in heat exchanger.
- Providing fast response, the heat exchanger quickly adjusts to setpoints.
- Temperature can be controlled at a setpoint, ramp, or computed value to raise or lower sample temperature according to your experimental requirements.

Light control

- Highly uniform illumination of the sample to minimize artifacts that cause errors in gas exchange measurements and confound the understanding of processes that require comparison of gas exchange and PAM chlorophyll *a* fluorescence parameters.

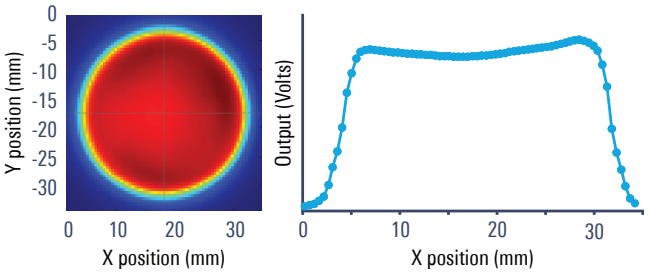


Figure 1. The 6800-01A Fluorometer provides uniform illumination, with light intensities within ±10% of the mean over 90% of the leaf area.

- Ambient light measurements from the included LI-190R Quantum Sensor are logged with the dataset and used when light sources track ambient.
- In-chamber light measurement above the leaf surface ensure the leaf is illuminated at the setpoint.
- Small and large light sources measure their own output before the chamber to account for losses due to transparent film and other sources of interference, ensuring that the leaf is illuminated at the setpoint.

Optimum flow

- Measurements of primary system flow rate, sample IRGA flow, and reference IRGA flow ensure computed values are dependable and that the system is providing air flow at your setpoint.
- Secondary flow rate measurements provide real-time leak measurements that can be accounted for in the assimilation equation.
- A durable, variable speed pump provides air flow through the partitioning valves, followed by the sample and reference IRGAs, with flow rates from 1 to 2.5 liters per minute.

Chlorophyll *a* fluorescence

The 6800-01A Fluorometer chamber is for combined gas exchange and fluorescence measurements of leaves and aquatic samples. Featuring a Pulse-Amplitude Modulation (PAM) fluorometer, the chamber measures chlorophyll *a* fluorescence and gas exchange simultaneously over the same leaf area. It includes 2 cm² or 6 cm² aperture inserts.

The 6800-01A Fluorometer enables the Dynamic Assimilation™ Technique. It is the light source for the aquatic chamber for algae and aquatic samples. For any sample, it can function as full fluorometer or simple light source.

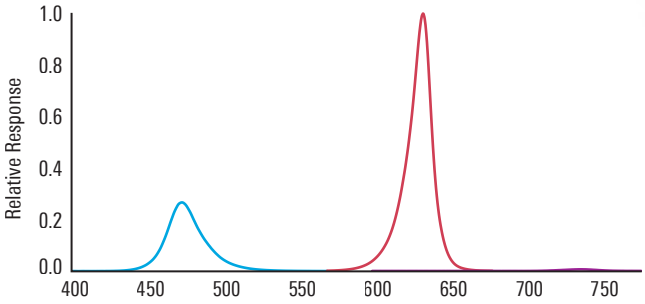


Figure 2. The 6800-01A fluorometer peak outputs are at 475 nm for blue, 625 nm for red modulating and actinic, and 735 nm for far-red.

Why the 6800-01A?

- Combined gas exchange and fluorescence over the same sample for simultaneous insights into the energy-producing and energy-consuming reactions of photosynthesis.
- Highly uniform optical output over the entire sample area for more controlled measurements.
- User configurable modulation rate and intensity for different research questions and sample material.
- Capable of both rectangular and multiphase flashes — to achieve maximum fluorescence yield and save time.
- High speed detection and logging of fluorescence emission, with sufficiently high frequency for induction kinetics.

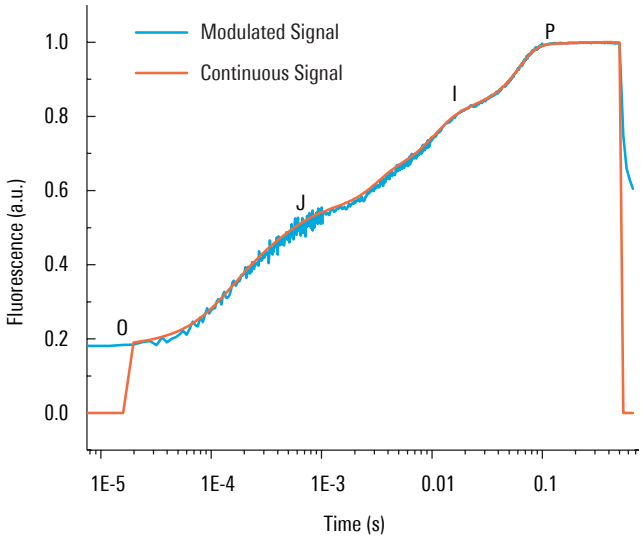


Figure 3. Fluorescence induction transient plotted on a logarithmic time scale, measured on a dark-adapted leaf.

Gas exchange at the leaf level and beyond

The LI-6800 measures leaf-level gas exchange with the steady-state assimilation equation

$$A = \frac{\mu(c_1 - c_2)}{S}$$

where A is CO_2 assimilation, μ is the flow rate, c_1 and c_2 are the CO_2 concentration before and after the sample, and S is leaf area.

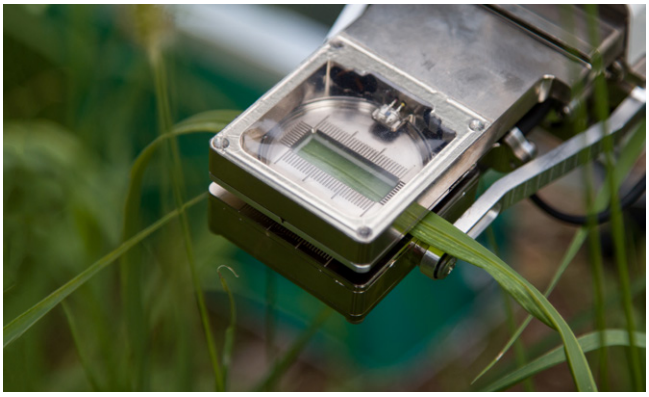
Features and benefits

- Long-lasting, durable Advanced Polymer leaf gaskets ensure a good seal around irregular leaf surfaces, while rebounding quickly between measurements.
- High flow rates enable the system to characterize photosynthesis from large leaves, while precise gas analyzers enable the measurement of very low photosynthesis rates.
- IRGAs in the head, excellent mixing of sample air, and high flow rates through the sample volume and IRGA tightly couple the leaf's response and the LI-6800's measurement, enabling the Dynamic Assimilation™ Technique with the 6800-01A chamber.

- IRGA matching to remove offsets, so you measure the true differential between sample and reference cells. Matching can be done manually, automatically, or across a range of CO_2 and H_2O concentrations (range matching) to save time and suit your experimental protocols.

Leaf Chambers

The Multiphase Flash™ Fluorometer chamber (6800-01A) can function as full fluorometer or simple light source. The fluorometer chamber enables the Dynamic Assimilation™ Technique.



The Clear-top Chamber (6800-12A) is compatible with the small light source.

The Large Leaf and Needle Chamber (6800-13) is compatible with the large light source.

The Dynamic Assimilation™ Technique

Based on a reformulation of the steady-state gas exchange equation, the Dynamic Assimilation Technique allows measurements of photosynthetic gas exchange in non-steady-state conditions, as shown by the equation

$$A = \frac{\mu(c_1 - c_2) - {dC}/{dt}}{S}$$

where A is CO_2 assimilation, μ is the flow rate, c_1 and c_2 are the CO_2 concentration before and after the sample, S is the leaf area, and dC/dt is the rate of change of CO_2 in the system. The dynamic assimilation equation shows that the steady-state equation is simply a special case of the mass balance equation where dC/dt is equal to 0 (Saathoff and Welles, 2021).

The LI-6800, equipped with the 6800-01A Fluorometer, is the only instrument capable of the Dynamic Assimilation Technique.

Why use the Dynamic Assimilation Technique?

The Dynamic Assimilation Technique allows you to collect data for full response curves in a fraction of the time required by steady state measurements. In contrast with the RACiR method, the Dynamic Assimilation Technique does not depend on empirical corrections and is traceable to the first principles of gas exchange measurements.

Dynamic assimilation data

Measurements taken with the Dynamic Assimilation™ Technique have uncertainty that is comparable to traditional survey measurements. Any increase in variability typically is offset by higher data density.

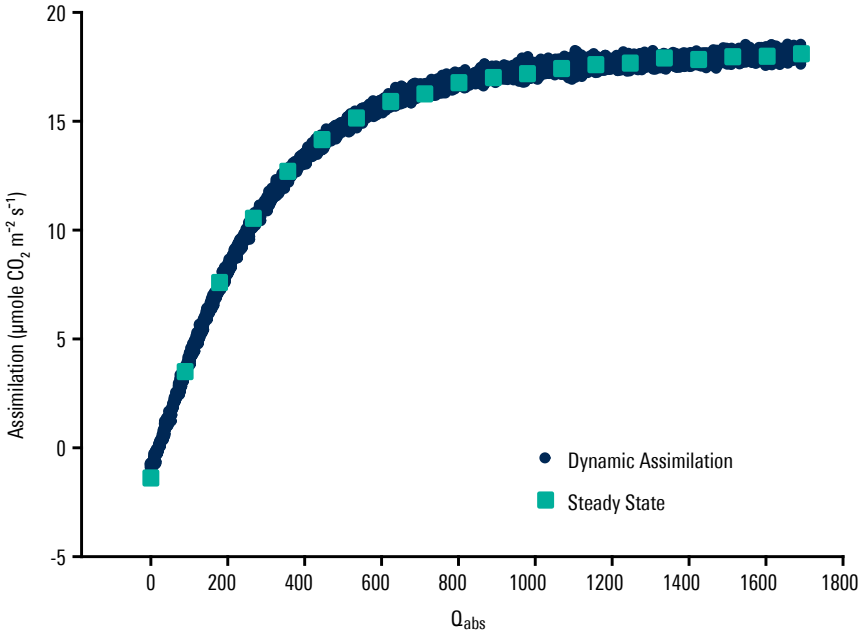


Figure 4. Comparison of dynamic and steady-state methods for an A-Q curve using soybean. For the dynamic method, actinic light was ramped from 2,000 to 0 µmol m^{-2} s^{-1} over 40 minutes. The steady-state method changed the actinic light level every 2 minutes.

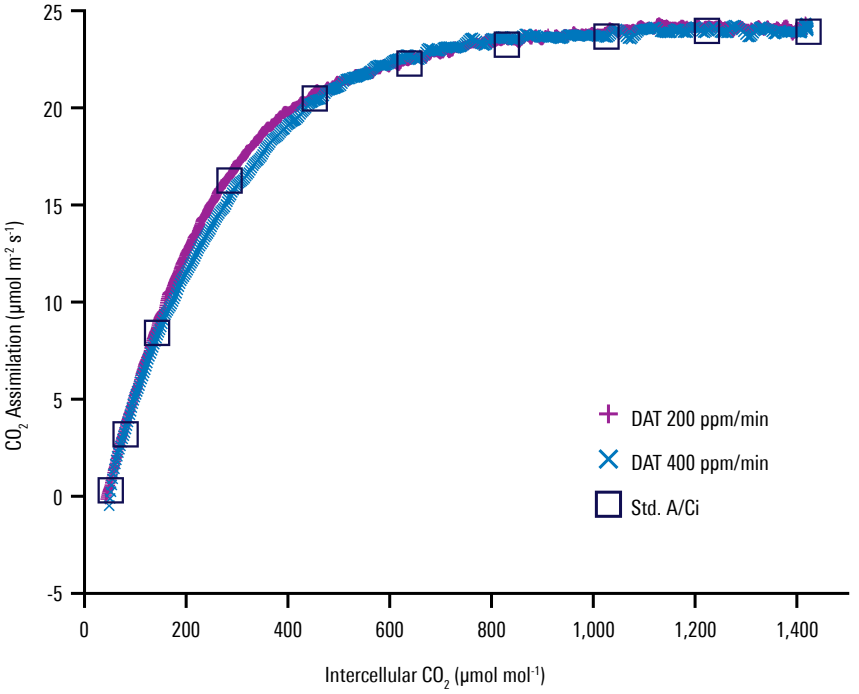


Figure 5. Soybean A-Ci curve comparing dynamic assimilation and steady-state measurements. The 400 ppm/minute curve was collected in 4 minutes and the 200 ppm/minute curve was collected in 8 minutes. In contrast, data for steady state curves may take up to 35 minutes to collect under ideal circumstances.

Ready for details?

See Saathoff and Welles (2021) at **https://doi.org/10.1111/pce.14178**

Saathoff, A.J. and Welles, J. (2021). Gas exchange measurements in the unsteady state. Plant, Cell & Environment, 44(11), pp.3509–3523.

Small leaf measurements

The Clear-top Chamber (6800-12A) is ideal for measuring gas exchange of small to mid-sized leaves under ambient or controlled light. To accommodate leaves of different shapes and sizes, aperture inserts restrict the sample area to 1×3, 2×3, or 3×3 cm, in either side-to-side or front-to-back orientations.

- For leaves that do not fill the apertures, the opening features 1-mm graduations around the perimeter to simplify leaf area estimation.
- Compatible with the Small Light Source (6800-02) for controlled red and blue light.
- The system provides independent control of light intensities and spectral blends — both for steady state and programmatically controlled measurements.

Light options include ambient light on one side, ambient light on both sides, one light source on one side, or light sources on both sides with the Light Source Extension Cable (9968-243).

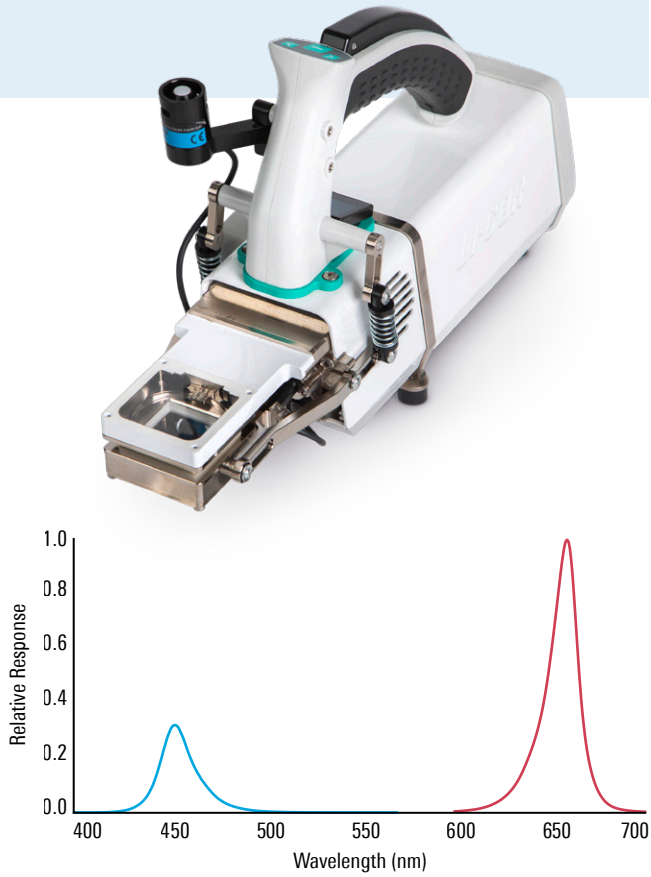
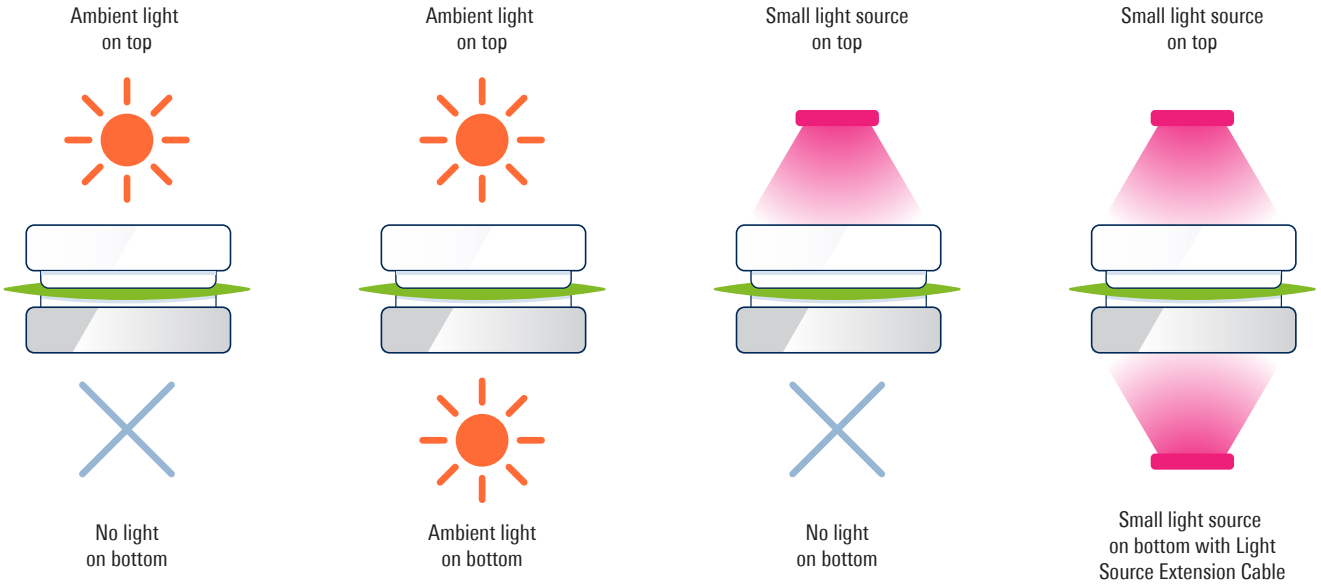


Figure 6. The small light source features peak emission at 453 nm for blue and 660 nm for red.



Large leaf and needle measurements

The Large Leaf and Needle Chamber (6800-13) is used for gas exchange measurements from large leaves, sprigs, and shoots. It offers a spacious 6×6-cm opening with 1-mm scale lines to assist with area estimation of leaves that do not fill the aperture.

- The optional Conifer Sprig Kit (9968-271) expands the chamber volume to accommodate shoots and sprigs that do not fit readily into the chamber.
- For measurements under controlled lighting, the large leaf and needle chamber is compatible with the Large Light Source (6800-03) in any configuration — with or without the conifer sprig kit.
- The large light source offers fully configurable red, green, blue, and white illumination with intensities up to 2400, 1000, 2000, and 1500 µmol m^{-2} s^{-1} respectively.
- The system provides independent control of light intensities and spectral blends — both for steady state and programmatically controlled measurements.

Light options include ambient light on top, ambient light on both sides, one light source on top, or light sources on both sides with the Light Source Extension Cable (9968-243). Dual light source operation is supported by the chamber alone and with the Conifer Sprig Kit (9968-271).

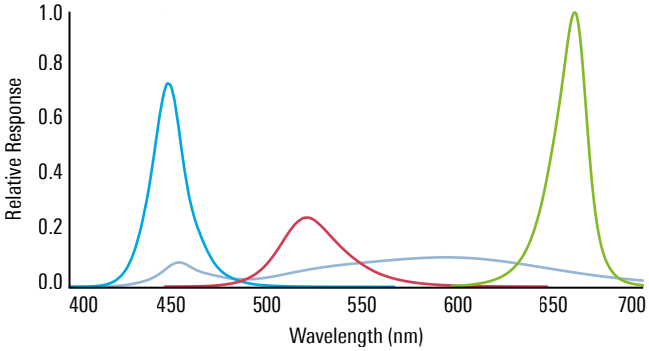
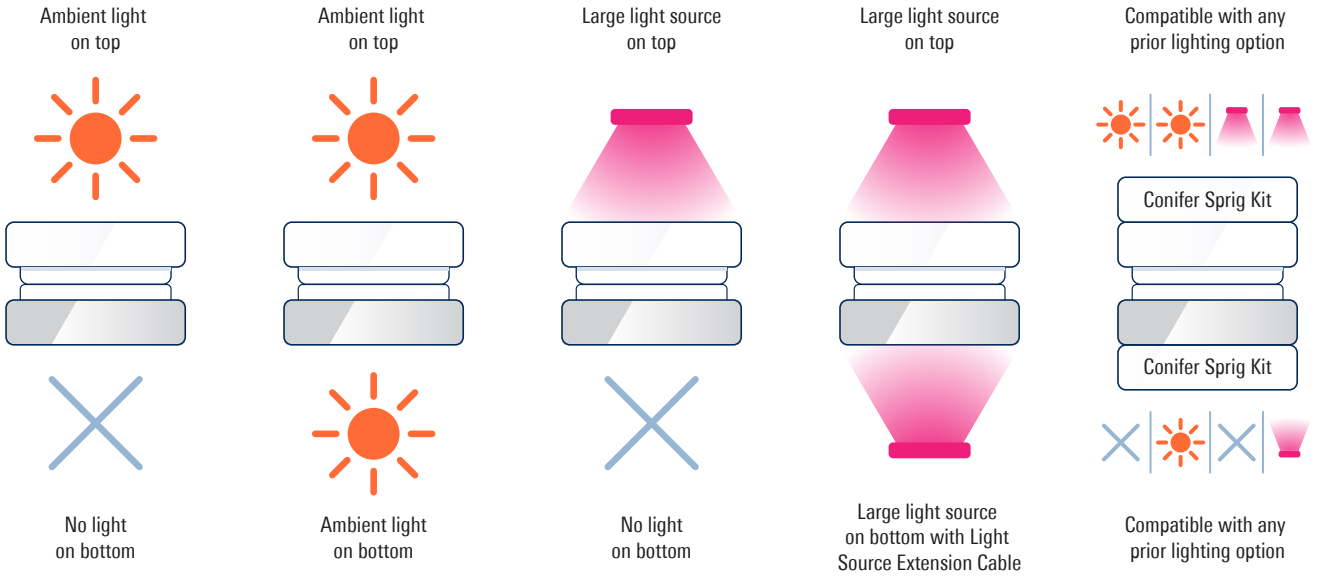


Figure 7. The large light source provides peak emission at 453 nm for blue, 523 nm for green, 660 nm for red. White is nominally at a 4000 K color temperature.



Aquatic photosynthesis

The Aquatic Chamber (6800-18) provides measurements of CO_2 exchange and chlorophyll *a* fluorescence from samples in liquid water, such as algal suspensions, or samples that require high ambient humidity, such as bryophytes. Assimilation is computed from the concentration differences and flow rate

$$A = \mu\left(c_1 - c_2\frac{1-w_1}{1-w_2}\right)$$

where A is CO_2 assimilation, μ is the flow rate, c_1 and c_2 are the CO_2 concentration before and after the sample, and w_1 and w_2 are water vapor before and after the sample.

The mass balance computation gives flux of CO_2 between the liquid sample and the cuvette headspace. Flux is coupled to the true carbon assimilation rate by mass transfer at the air-liquid interface and the kinetics of the carbonate system for the aquatic sample. When normalized to cell density, mass, or chlorophyll content, the aquatic chamber provides measurements as µmol CO_2 $cell^{-1}$ s^{-1}, µmol CO_2 mg^{-1} s^{-1}, or µmol CO_2 μg^{-1} s^{-1}.

Features and benefits

- Achieves rapid equilibration of CO_2 in air and CO_2 in water in the sample chamber.
- Humidity equilibrator minimizes the water vapor differential between sample and reference IRGAs to optimize computation of the CO_2 differential.
- Condensation protection for the system — by measuring temperatures and humidity and adjusting setpoints to prevent condensation.
- Compatible with an external recirculating water bath for temperature control over an extended range.
- Support for common pH probes; pH measurements are recorded with dataset.
- Septum port allows ancillary sensors and probes to access the sample during a measurement.
- With samples in water, you can compute optical throughput to estimate photosynthetic absorption.

Measurements

With the aquatic chamber, you can measure the photosynthetic responses of a sample to controlled parameters such as light, CO_2, pH, or temperature. It includes the Aquatic Sample Adapter Kit (9968-338) that accommodates non-liquid samples that require humid air, such as coral, macro algae, sea grasses, and roots.

Ready for more details?

Dive into the recent publication by Hupp, et al. at **https://doi.org/10.1016/j.algal.2021.102399**

Hupp, J., McCoy, J.I.E., Millgan, A.J. and Peers, G. (2021). Simultaneously measuring carbon uptake capacity and chlorophyll *a* fluorescence dynamics in algae. Algal Research, 58, p.102399.

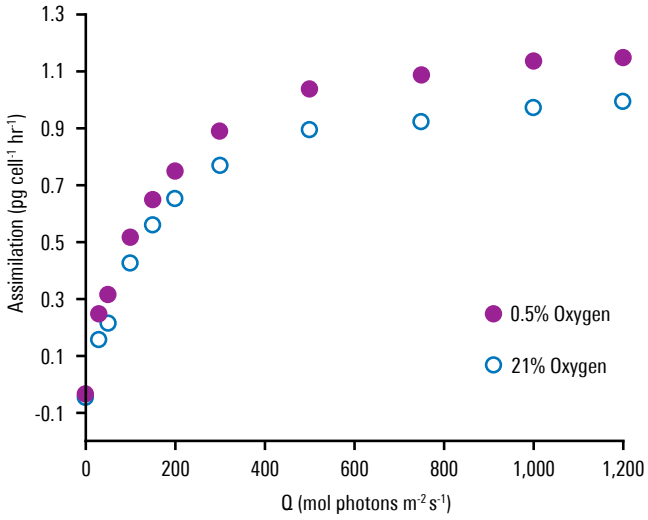


Figure 8. Assimilation measurements on *Chlorella* at ambient oxygen (21%) and low oxygen (0.5%) in response to light (Q). The CO_2 concentration entering the chamber was held constant at 400 µmol mol^{-1} by the LI-6800. Chamber temperature was held constant at 25 °C using an external water bath. Cells were measured in a saltwater media at 17 ppt salinity.

A chamber for every application

Soil CO_2 flux measurements

For survey measurements with the Soil CO_2 Flux Chamber (6800-09), the LI-6800 operates as a closed system. It computes gas exchange using the familiar soil gas flux equation

$$F_c = \frac{10VP\left(1 - {}^{W}/_{1000}\right)}{RST}\frac{dC'}{dt}$$

where F_c is flux of CO_2, V is system volume, P is atmospheric pressure, W is water mole fraction in the chamber, R is the gas constant, S is the soil area, T is chamber air temperature, and dC'/dt represents the change in dry CO_2 concentration over time (t).

Why use the LI-6800 for soil measurements?

- Patented technologies that are only available in LI-COR soil gas flux systems ensure that soil CO_2 flux measurements represent the true flux.
- Patented pressure equilibrator vent to prevent wind from creating pressure excursions that affect measurements.
- Excellent mixing inside the chamber to avoid dead volumes, ensuring an accurate measurement.
- Bellows mechanism to avoid artifacts that may arise from chamber placement.
- Soil moisture/soil temperature measurements recorded with dataset to assist with computations and interpretation.
- Data processing in SoilFluxPro™ Software to evaluate.

Small plant chamber

The Small Plant Chamber (6800-17) enables the measurements of whole *Arabidopsis thaliana* plants, other small rosettes, or short canopies such as turf in 65 mm (2.5 inch) pots or 38 mm (1.5 inch) Cone-tainers™. Software includes a rosette leaf-area model to compute leaf area based on representative shapes, using settable stem length, leaf width, and leaf length.

The small plant chamber features a transparent film top for measurements under ambient light or controlled lighting with the large light source.

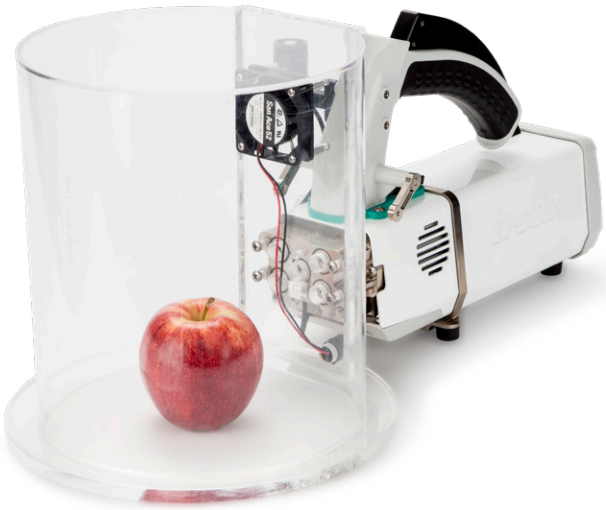
Bryophyte chamber

The Bryophyte Chamber (6800-24) is used to measure CO_2 gas exchange from mosses, hornworts, liverworts, and lichens based on mass. The chamber holds loose sample material in a shallow well during the measurement. It features a transparent film top for ambient lighting or controlled lighting with the large light source.

We recommend the Aquatic Chamber (6800-18) for samples that require high humidity.

Insect respiration chamber

The Insect Respiration Chamber (6800-89) is used to measure CO_2 respiration from insects, other very small animals, fruits, or irregularly shaped samples. The LI-6800 directs conditioned air through the insect respiration chamber and computes a flux based on the difference between reference and sample air. Respiration is computed based on mass.



Custom chamber adapter

The Custom Chamber Adapter (6800-19) allows you to construct a chamber to meet your needs, such as whole plant chambers, large chambers for fruits, or soil chambers for combined soil-plant gas exchange. The custom chamber kit includes the adapter and hardware, tube connectors, type ‘E’ thermocouple adapter cable, and a template to provide guidance for mounting the custom chamber to the sensor head.

Expandable, extendable, and customizable

Tank adapter kit

For a CO_2 supply from tank gases, the Tank Adapter Kit (9968-109) makes the connection simple.

Custom air supply

Connect a custom gas blend to the air inlet — either before or after the console pump — for low O_2 measurement or other experiments. Hardware is included with the spares kit.

Advanced programming

The LI-6800 is fully configurable — you can create custom configurations with the graphical programming interface on the instrument and you write programs from scratch, all in the Python Programming Language. You can write complex control algorithms, control peripherals, create custom interface prompts, or keep it simple and customize existing programs to suit your application.

Extendable with auxiliary additions

Easily add peripheral sensors, mixing fans, and more to the LI-6800. To control peripherals and record their data in with your dataset, the LI-6800 provides the following options:

- Digital inputs and outputs to control and read data from digital devices.
- Analog inputs and outputs to control and record data from analog sensors.
- Auxiliary power options — 12 V and 5 V from the console and 5 V from the head for mixing fans, pumps, and more.
- 5 V excitation voltage for active sensors.
- Auxiliary Power Cable (9968-242) to power the LI-6800 from external DC power, such as a deep cycle battery.

Background programs open the full capabilities of the LI-6800 for customization.

Complementary measurements with the LI-600 and LI-6800

The LI-6800 Portable Photosynthesis System provides detailed measurements in controlled conditions, including measurements of CO_2 response, light response, and high-frequency chlorophyll *a* fluorescence. In contrast, the LI-600 Porometer/Fluorometer provides high-speed leaf-level measurements of stomatal conductance and chlorophyll *a* fluorescence in ambient conditions.

By combining the fast survey measurements from the LI-600 with detailed data from the LI-6800, you can record larger, more informative data sets while saving time.

- Screen a population quickly with the LI-600 to identify individuals for detailed measurements with the LI-6800.
- Characterize stomatal ratio with the LI-600 and use these measurements in the LI-6800 to improve calculation of important parameters related to stomatal ratio.

Ready to learn more?

Ready to learn more? See the webinar at **licor.com/600-6800-webinar**

Specifications

CO_2 Gas Analyzer

Type: Absolute non-dispersive infrared gas analyzer
Measurement Range: 0 – 3100 µmol mol^{-1}
Precision (signal noise) RMS 4-second signal averaging at 10 µmol mol-1: ≤0.1 µmol mol^{-1}
Accuracy: Within 1% of reading at 200 µmol mol^{-1} or above, ±2 µmol mol^{-1} at <200 µmol mol^{-1}
Orientation Sensitivity: ≤±1 µmol mol^{-1} variation at 400 µmol mol^{-1} from any orientation

H_2O Gas Analyzer

Type: Absolute non-dispersive infrared gas analyzer
Measurement Range: 0 – 75 mmol mol^{-1}
Precision (signal noise) RMS 4-second signal averaging at 10 mmol mol^{-1}: ≤0.01 mmol mol^{-1}
Accuracy: Within 1.5% of reading at >5 mmol mol^{-1}; ±0.08 mmol mol^{-1} at <5 mmol mol^{-1}

Temperatures

Operating Temperature Range: 0 – 50 °C
Storage Temperature Range: -20 – 60 °C
Temperature Control Range:
- **Leaf Temperature:** ±10 °C from ambient
- **Setpoint Resolution:** 0.1 °C

Chamber exhaust air temperature and temperature control block:
- **Type:** Thermistor
- **Range:** -10 – 60 °C
- **Accuracy:** ±0.15 °C

Leaf temperature sensor:
- **Type:** Type E fine-wire thermocouple
- **Sensitivity Range:** -10 – 60 °C
- **Accuracy:** <±0.5 °C total; ±0.2 °C cold junction reference; ±0.3 °C thermocouple when within ±10 °C of cold junction temperature

Communication

RJ-45 Ethernet; IP/TCP for networks and computers: 1
Head Connections: 2
Accessory Connections: 2

Air Flow Rates

Bulk Flow Rate: 680 – 1700 µmol s^{-1} at SATP*
Leaf Chamber Flow Rate: 0 – 1400 µmol s^{-1} at SATP

Pressure

Console Pressure Sensor:
- **Operating Range:** 50 – 110 kPa
- **Accuracy:** ±0.4 kPa
- **Resolution:** 1.5 Pa typical

Signal Noise: ≤0.004 kPa peak-to-peak with 4-second signal averaging
Chamber Pressure Sensor:
- **Range:** -2 – 2 kPa
- **Resolution:** <1 Pa typical
- **Signal Noise:** 1 Pa peak-to-peak with 4-second signal averaging
- **Setpoint Resolution:** 1.0 Pa
- **Control Range:** 0 – 0.1 kPa (dependent on flow rate through the chamber)

Batteries

Weight: 0.435 kg
Capacity: 6800 mAh
Type: Lithium Ion
Storage: -20 – 60 °C; ≤80% RH

CO_2 Control

CO_2 Control Range: 0 – >2000 µmol mol^{-1} (with pump set to low; dependent on bulk flow rate)
CO_2 Cartridge: 8 gram
Cartridge Lifetime: >8 hours after puncture (dependent on setpoint)
CO_2 Scrubber: Soda lime

H_2O Control

H_2O Control Range: 0 – 90% RH (noncondensing)
Humidifier Substrate: Nafion
Desiccant: Silica Gel (BASF Sorbead® Orange CHAMELEON®)

Light Measurement

Chamber and light source PAR sensors:
- **Sensitivity Range:** 0 – 3000 µmol m^{-2} s^{-1}
- **Resolution:** <1 µmol m^{-2} s^{-1}
- **Calibration Accuracy:** ±5% of reading; Traceable to the U.S. National Institute of Technology (NIST)

External LI-190R PAR Sensor:
- **Detector:** Silicon photodiode
- **Sensitivity:** 5 – 10 µA per 1000 µmol s^{-1} m^{-2}
- **Calibration Accuracy:** ±5% of reading; Traceable to NIST

Console

Processor: Arm® Cortex® A9 Quad Core running at 1 GHz
Memory: 2 GB RAM; 8 GB Flash memory
Display: Sunlight-readable TFT LCD with capacitive touch screen
Resolution: 1024 × 600 pixels
Dimensions: 26 cm diagonally
Size: 18.5 × 27.5 × 21 cm; (D × W × H)
Weight: 6.1 kg
Power Requirements: 12 – 18 VDC or 24 VDC

Head

Size with 3×3 cm Clear Leaf Chamber: 37 × 11.5 × 21.6 cm (L × W × H)
Weight: 2.15 kg without chamber
Display Resolution: 128 × 128 pixels
Display Dimensions: 3.15 cm corner-to-corner
Head Inputs:
- **Leaf Temperature Thermocouple:** 2
- **LI-190R Light Sensor:** 1

Head Light Source connections: 1

Aquatic Chamber

Sample Cuvette:
- **Wetted Materials:** 316 stainless, float glass, Viton, PTFE, silicone, acetal
- **Cuvette Working Volume:** 0 – 20 mL, 15 mL recommended sample volume

Temperature:
- **Operating Temperature:** 0 to 50 °C with no solar load (non-freezing)
- **Storage Temperature:** -20 to 60 °C with chamber clean and dry
- **Temperature Control:** User provided water bath. #10-32 threaded connections to chamber.

Operating Fluid Environment:
- **Temperature:** non-freezing to 50 °C
- **Salinity:** 0 – 35%

Auxiliary Ports:
- **pH (probe not included):** 12 mm diameter O-ring sealed port and integrated amplifier. Passive glass-electrode based pH probe with BNC connector (nominal -59 mV/pH slope, user calibrated).
- **Septa:** Silicone-PTFE septa

Clear-top Chamber

Maximum Leaf Area: 9 cm^2
Size: 15.4 × 11.5 × 5.9 cm (L × W × H)
Weight: 0.3 kg

Small Light Source

Total Output Range: 0 – >2000 µmol m^{-2} s^{-1} at 25 °C
Blue Output Range: 0 – >400 µmol m^{-2} s^{-1} at 25 °C
Red Output Range: 0 – >1600 µmol m^{-2} s^{-1} at 25 °C
Red Peak Wavelength: 660 nm
Blue Peak Wavelength: 453 nm
Uniformity:
±10% Over 90% of the aperture with white top gasket, typically
±10% Over 77% of the aperture with black gasket, typically
Power Consumption: 2000 µmol m^{-2} s^{-1} <5 watts
Operating Temperature Range: 0 – 50 °C
Size: 6.6 × 5.9 × 5.8 cm (L × W × H)
Weight: 0.21 kg

Large Light Source

Total Output Range:
0 – >2500 µmol m^{-2} s^{-1} at 25 °C
Blue Output Range:
>2000 µmol m-2 s-1 at 25 °C
Green Output Range:
>1000 µmol m^{-2} s^{-1} at 25 °C
Red Output Range:
>2400 µmol m^{-2} s^{-1} at 25 °C
White Output Range:
>1500 µmol m^{-2} s^{-1} at 25 °C
Blue Peak Wavelength: 453 nm
Green Peak Wavelength: 523 nm
Red Peak Wavelength: 660 nm
White Color Temperature: 4000 K
Uniformity: ±10% over 90% of the aperture
Power Consumption: 15 W at 2000 µmol m^{-2} s^{-1} equal parts red, green, blue, and white
Operating Temperature Range: 0 – 50 °C
Operating Relative Humidity Range: 0 – 85%
Size: 11.7 × 11 × 13 cm (L × W × H)
Weight: 0.54 kg

Small Plant Chamber

Chamber Volume: 193.2 cm^3 (internal volume)
Internal Dimensions: 7 cm diameter; 4.46 cm deep
External Dimensions: 8.4 cm wide (chamber block) × 12.7 cm long (chamber manifold interface to tip of chamber) × 6.47 cm (bottom of chamber manifold to top of chamber)
Weight: 0.60 kg

Custom Chamber Adapter

Chamber Volume: 34.2 cm^3 (internal volume)
External Dimensions: 1.25 × 7.67 × 5.85 cm (L × W × H)

Insect Respiration Chamber

Chamber Volume: 49.9 cm^3 (not including tubing)
Exterior Dimensions: 11.25 cm length; 3 cm diameter
Interior Dimensions: 10.1 cm length; 2.5 cm diameter
Weight: 0.07 kg

Multiphase Flash™ Fluorometer

Modulated Light: Software controlled and software selectable frequencies of 1 Hz – 250 kHz
Measuring Light Peak Wavelength: 625 nm
Red Actinic and Saturating Flash Peak Wavelength: 625 nm
Blue Actinic Peak Wavelength: 475 nm
Far-red Peak Wavelength: 735 nm
Actinic Light Output:
0 – 3000 µmol m^{-2} s^{-1} total at 25 °C
0 – 1000 µmol m^{-2} s^{-1} blue at 25 °C
0 – 2000 µmol m^{-2} s^{-1} red at 25 °C
Saturation Light: Software controlled intensity; 0 – 16,000 µmol m^{-2} s^{-1} at 25 °C
Far-red Light: Software controlled intensity; 0 – 20 µmol m^{-2} s^{-1} at 25 °C
Fluorescence Signal Temperature Dependence: -0.25% per °C
Uniformity:
<±10% over 92% of the aperture with white top gasket
<±10% over 90% of the aperture with black top gasket
Power Consumption:
<18 W at 25 °C with 3000 µmol m^{-2} s^{-1} actinic light
<60 W at 25 °C with 16,000 µmol m^{-2} s^{-1} saturating flash
Leaf Area: 6 cm^2 or 2 cm^2; Round apertures
Size: 16.6 × 11.5 × 13.6 cm (L × W × H)
Weight: 0.86 kg

Large Leaf and Needle Chamber

Maximum Leaf Area: 36 cm^2
External Dimensions: 11.5 cm wide (spring to spring) × 16.8 cm long (front of chamber to back of chamber link) × 5.9 cm tall (bottom of chamber manifold to top of chamber)
Weight: 0.35 kg

Large Leaf and Needle Chamber with Conifer Sprig Blocks

Maximum Planar Leaf Area: 36 cm^2
Internal Chamber Height: 6.7 cm
External Dimensions: 11.5 cm wide (spring to spring) × 16.8 cm long (front of chamber to back of chamber link) × 7.2 cm tall (bottom to top of chamber)
Volume: 25.68 in3 or 420.8 cm^3

Bryophyte Chamber

Chamber Volume: 193.2 cm^3 (internal volume)
Internal Dimensions: 7 cm diameter; 4.45 cm deep
External Dimensions: 8.4 cm wide (chamber block) × 12.7 cm long (chamber manifold interface to tip of chamber) × 6.47 cm (bottom of chamber manifold to top of chamber)
Weight: 0.60 kg

Soil CO_2 Flux Chamber

Chamber Volume: 4244.1 cm^3
IRGA Volume: 57 cm^3
Soil Area: 317.8 cm^2
Air Temperature Thermistor:
Operating Range: -20 – 45 °C
Accuracy: ±0.5 °C from 0 °C – 70 °C
Weight: 4.06 kg

*SATP is defined as Standard Ambient Temperature (25 °C) and Pressure (100 kPa).

Specifications subject to change without notice.

Ordering information

LI-6800F Portable Gas Exchange and Fluorescence System

A complete gas exchange and fluorescence system. This package is ideal for field or lab work that includes fluorescence measurements. Includes:

- Console, sensor head, and cable assembly
- Multiphase Flash™ Fluorometer
- Bluestem Operating Software
- Instrument case
- Accessory case
- Carrying harness
- Tripod and panhead mount
- Lithium-ion batteries (3)
- AC to DC power supply (110 to 240 VAC input; 24 VDC output; capable of charging 2 batteries in the console)
- Single-bay battery charger
- Sorbead® Orange CHAMELEON® silica gel and soda lime for gas conditioning
- 8-gram CO_2 cartridges (3 boxes of 25)
- Spares kit

LI-6800P Portable Photosynthesis System

A complete gas exchange system. This package is ideal for basic lab or survey measurements with natural or controlled light. Includes:

- Console, sensor head, and cable assembly
- Clear-top chamber and small light source
- Bluestem Operating Software
- Instrument case
- Accessory case
- Carrying harness
- Tripod and panhead mount
- Lithium-ion batteries (3)
- AC to DC power supply (110 to 240 VAC input; 24 VDC output; capable of charging 2 batteries in the console)
- Single-bay battery charger
- Sorbead® Orange CHAMELEON® silica gel and soda lime for gas conditioning
- 8-gram CO_2 cartridges (3 boxes of 25)
- Spares kit

LI-6800S Portable Photosynthesis System

A complete gas exchange system with components for field and survey measurements. This basic package is ideal for measurements under natural light conditions. Includes:

- Console, sensor head, and cable assembly
- Clear-top chamber
- Bluestem Operating Software
- Instrument case
- Carrying harness
- Lithium-ion batteries (3)
- AC to DC power supply (110 to 240 VAC input; 24 VDC output; capable of charging 2 batteries in the console)
- Single-bay battery charger
- Sorbead® Orange CHAMELEON® silica gel and soda lime for gas conditioning
- 8-gram CO_2 cartridges (3 boxes of 25)
- Spares kit

LI-6800AQ Portable Photosynthesis System with Aquatic Chamber

A complete gas exchange and fluorescence system for humid or liquid samples. Includes:

- Console, sensor head, and cable assembly
- Multiphase Flash™ Fluorometer
- Aquatic chamber and accessories
- Bluestem Operating Software
- Instrument case
- Lithium-ion batteries (2)
- AC to DC power supply
- Sorbead® Orange CHAMELEON® silica gel and soda lime for gas conditioning
- 8-gram CO_2 cartridges (3 boxes of 25)
- Spares kit

Light Sources and Chambers

Description	Part number
Multiphase Flash™ Fluorometer and Chamber	6800-01A
Small Light Source	6800-02
Clear-top Chamber	6800-12A
Clear-top Chamber and Small Light Source	6800-02P
Large Light Source	6800-03
Large Leaf and Needle Chamber	6800-13
Lighted Conifer Chamber	6800-13L
Small Plant Chamber	6800-17
Lighted Small Plant Chamber	6800-17L
Aquatic Chamber	6800-18
Aquatic Chamber and Fluorometer	6800FAQ
Bryophyte Chamber	6800-24
Lighted Bryophyte Chamber	6800-24L
Soil CO_2 Flux Chamber	6800-09
Custom Chamber Adapter	6800-19
Insect Respiration Chamber	6800-89

Consumables

Description	Part number
8-gram CO_2 cartridges (25)	9968-227
*Drierite – Indicating	622-04299
Drierite – Non-Indicating	622-10509
Soda lime	9964-090
Intake air filter	9968-211
Sorbead® Orange CHAMELEON® Silica Gel	622-16951

*Not available in Europe

Accessories

Part	Description	Part number
Lithium-ion battery		442-11807
Single-bay battery charger	Charges one battery at a time	590-11830
AC to DC power supply	110 to 240 VAC input; 24 VDC output	591-11973
Carrying harness	Shoulder and waist straps for carrying the console	9968-221
Tripod	For the console or head	609-15790
Panhead mount	Securely holds the sensor head, while pivoting to a full range of positions	609-15791
Monopod	Monopod for the sensor head	609-15792
Head cable assembly	Cable and hose that connects the head to the console	9968-092
Replacement chemical column	For the H_2O scrubber and CO_2 scrubber, Includes labels	9968-225
Humidifier column	Nafion tubing in a column, to add H_2O	9968-317
Sub-sampling kit	To collect gas samples from the intake or exhaust gas stream	9968-210
CO_2 tank adapter kit	To connect an external CO_2 tank to the CO_2 injector	9968-109
Zero kit	Used to chemically zero CO_2 or H_2O IRGA	9968-230
1×3-cm aperture for clear-top chamber	Two aperture inserts are needed for operation. Gaskets are included	6800-54
2×3-cm aperture for clear-top chamber	Two aperture inserts are needed for operation. Gaskets are included	6800-53
3×3-cm aperture for clear-top chamber	Two aperture inserts are needed for operation. Gaskets are included	6800-52
2-cm^2 aperture for fluorometer	Two aperture inserts are needed for operation. Gaskets are included	6800-51
6 cm^2 aperture for fluorometer	Two aperture inserts are needed for operation. Gaskets are included	6800-50
Thermocouple adapter cable	Allows direct LI-6800 connection to Type 'E' thermocouple	9968-162
Conifer sprig kit	Blocks used to expand the volume of the Large Leaf and Needle Chamber	9968-271
Aquatic Chamber Adapter Assembly for 6800-18	For use with samples such as sea grasses, macro algae, coral and bryophytes.	9968-338

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