

Portable Photosynthesis System

Portable photosynthesis system ideal for measuring photosynthetic rate, Stomatal conductance, transpiration, ambient and differential CO₂ and RH, Air Temperature, Leaf Temperature, PAR (Photosynthetically Active Radiation), Ci, Atmospheric pressure. Should be able to use in field and lab and include fluorescence measurement and gas exchange.

System to be supplied complete with following System Configuration:

- IRGA should be in the leaf chamber/cuvette, just below the leaf chamber/cuvette - for fast response
- System should have TOTAL 4 Infra-Red Gas Analyzers - Two Absolute CO₂ and two absolute H₂O Analyzers placed inside leaf chamber/cuvette to minimize time delay, fast equilibrium, avoid sorption of CO₂ Gas and H₂O (Water Vapor) through path tubing of sample chamber/leaf chamber to Analyzer.
- The instrument should display graphical and numerical measurement simultaneously in real time measurement.
- Leaf Chamber should be suitable for broadleaves as well as narrow leaves.
- Automated control for CO₂, light, temperature and RH
- Instrument should have Fast Response Measurements of at least 10Hz
- Instrument should be capable of simultaneously measuring photosynthesis and chlorophyll fluorescence
- Automated error notification and guided control settings
- Should be portable to use without field stand
- Instrument should have ETHERNET CONNECTIVITY for remote access over internet/networking.
- System should have Operating temperature range: 0 – 50 °C
- System should have Storage temperature range: -20 °C – 60 °C
- System should have high user controlled flow rate ranging from 0-1400 μmol s⁻¹
- System should have built in pressure sensor ranging 50-100 kPa
- Power requirements: 12 – 18 VDC or 24 VDC
- Battery Type: 2-3 Nos. Lithium Ion Batteries- 6800mAh with external charger and option of internal charging (more than 14 hours of performance).

IRGA (Infrared Gas Analyzer) Specification:

CO₂ Gas Analyzer:

- Measurement Range: maximum upto 3500 μmol mol⁻¹
- Precision: within 0.1 μmol mol⁻¹ at ambient level (Averaging at 400 μmol mol⁻¹).

- Accuracy: Within 1% of reading

H₂O Gas Analyzer:

- Measurement Range: Maximum upto 75 mmol mol⁻¹
- Precision: within 0.01 mmol mol⁻¹ (averaging at 10 mmol mol⁻¹)
- Accuracy: Within 1.5% of reading

CO₂ Control Specifications:

- CO₂ control range: 0 – >2000 μmol mol⁻¹
- CO₂ cartridge type: 8 gram
- CO₂ Scrubber: Soda lime

H₂O Control Specifications:

- H₂O control range: 0 – 90% RH (non-condensing)
- Humidifier substrate: System should have suitable humidifier substrate.
- Desiccant: Drierite

Temperatures Control:

Chamber Temperature Control Range: ±10 °C from ambient

- Air & Block Temperature Sensor:

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;

Light Measurement/control:

Light Source Uniformity should be ±10% with variation over 90% of aperture.

Leaf Chamber Internal PAR sensors:

- Range: 0 – 3000 μmol m⁻² s⁻¹
- Resolution: <1 μmol m⁻² s⁻¹
- Accuracy: ±5% of reading;

Ambient PAR Sensor:

- Detector: Silicon photodiode
- Range: 0-3000 μmol m⁻² s⁻¹
- Accuracy: ±5% of reading;

Chamber pressure control specification:

- Range: -2 – 2 kPa
- Resolution: <1 Pa typical

- Setpoint resolution: 1.0 Pa
- Control Range: 0 – 200 Pa (user selectable to avoid leakage from the chamber)

Chlorophyll Fluorescence Measurement/Control Specification:

- Modulated frequency: 1 Hz – 250 kHz
- Measuring light peak wavelength: 625 nm
- Actinic Light Output: 0-3000 $\mu\text{mol m}^{-2} \text{s}^{-1}$
- Red actinic and saturating flash peak wavelength: 625 nm
- Blue actinic peak wavelength: 475 nm
- Far-red peak wavelength: 735 nm
- Saturation light Intensity: 0 – 16,000 $\mu\text{mol m}^{-2} \text{s}^{-1}$
- Far-red light intensity: 0 – 20 $\mu\text{mol m}^{-2} \text{s}^{-1}$
- Uniformity: $<\pm 10\%$ over 92% of the aperture
- Leaf area: 6cm²; Round aperture

Console configuration:

- System Console with at least 512 MB RAM with at least more than 4GB Flash Memory for Data storage.
- All the microprocessor controls should be through software.
- High speed Processor: 800 MHz
- Display: Sunlight-readable TFT Color LCD Display with full touch screen.
- The system should be Capable of survey measurements in less than one minute, with batteries that can last all day.
- System must have User-cleanable optics and simple maintenance procedures to minimize down time and maintenance costs.

Accessories:

- Instrument should be supplied with 50 CO₂ cartridges, Chemicals, Air probe, Basic spares kit, operational manual and carrying case.

Warranty:

Warranty 1 year and CMC for 2 years