

## Canopy photosynthesis System



### LCpro T: The Intelligent Canopy Photosynthesis System

Model: F.LCpro T-001

The LCpro T by ADC BioScientific Ltd. is a state-of-the-art portable photosynthesis system designed for precise and efficient analysis of gas exchange and photosynthesis. With advanced features, unparalleled portability, and robust performance, it is ideal for researchers in plant science and environmental studies. Key Features

- **Enhanced Portability:** Weighs only 4.1 kg and comes with an adjustable strap for convenient use in the field.
- **Long Battery Life:** Powered by a 12V Lithium-ion rechargeable battery, providing up to 16 hours of continuous operation.
- **User-Friendly Design:** Equipped with a color, touch-sensitive LCD, providing instant data entry and real-time graphing.

- Environmental Stability: Sealed LCD and rugged construction ensure performance in harsh field conditions.
- Integrated GPS: Automatically records location, elevation, and UTC for each data point.

### Advanced Measurement Capabilities

#### 1. CO<sub>2</sub> and H<sub>2</sub>O Control:

- CO<sub>2</sub> Range: 0-3000 ppm with a resolution of 1 ppm.
- H<sub>2</sub>O Control: Individual or sequential humidity control from 0-75 mbar.

#### 1. Photosynthetically Active Radiation (PAR):

- Maximum intensity: 2400  $\mu\text{mol m}^2/\text{s}$  (RGB LED) or 2500  $\mu\text{mol m}^2/\text{s}$  (White LED).
- Fully programmable for light response curves (LRCs).

#### 1. Temperature Control:

- Dynamic range:  $\pm 15^\circ\text{C}$  above or  $-10^\circ\text{C}$  below ambient temperature.

#### 1. Auto-Zero Cycling: Ensures stable and accurate gas exchange measurements with a rapid 4-second cycle time.

### Chamber Options

- Broad Leaf Chamber: For a wide variety of plant species.
- Narrow Leaf Chamber: Designed for long grasses and narrow leaves (<1 cm width).
- Soil/Small Plant Chamber: For analyzing net carbon exchange in soil or small plants.
- Conifer Leaf Chamber: Specially designed for pine needles and small fruits.
- Fruit Chamber: For measuring gas exchange in fruits up to 11 cm diameter and 10.5 cm height.

## Data Handling and Programming

- Unlimited Storage: Stores data on SD cards up to 32 GB.
- Simple Programming: Intuitive menu-driven software for rapid experiment setup.
- Real-Time Data Visualization: Parameters can be plotted dynamically on the LCD.
- USB and RS232 Outputs: For data transfer and connection to external devices.

## Applications

- Plant physiology and photosynthesis research
- Carbon cycle and crop resilience studies
- Soil respiration and environmental monitoring

## LCpro T: Technical Specifications

### Measurement Ranges and Techniques

- CO<sub>2</sub> Range: 0–3000 ppm (1 ppm resolution)
- Technique: Infrared gas analysis (IRGA), differential open system with auto-zero and automatic compensation for atmospheric pressure and temperature.
- H<sub>2</sub>O Range: 0–75 mbar (0.1 mbar resolution)
- Sensors: Two laser-trimmed, fast-response water vapor sensors.
- Photosynthetically Active Radiation (PAR):
- Range: 0–3000  $\mu\text{mol m}^2/\text{s}$ .
- Sensor: Silicon photocell.
- Temperature Control:

- Range: -5°C to 50°C.
- Accuracy:  $\pm 0.2^\circ\text{C}$ .
- Method: Precision thermistor or self-positioning microchip thermistor.
- Direct Leaf Temperature:
- Options: Self-positioning thermistor, manual placement, or Energy Balance Equation.

#### Environmental Control and Programming

- Flow Rate: 100–500 ml/min to the leaf chamber.
- CO<sub>2</sub> Control:
- Range: Up to 2000 ppm via the integral elevated CO<sub>2</sub> supply system.
- Temperature Control:
- Micro-Peltier element for automatic regulation:  $\pm 15^\circ\text{C}$  and  $-10^\circ\text{C}$  from ambient.
- H<sub>2</sub>O Control:
- Achieved using self-indicating conditioning chemicals in dedicated removable columns.

#### Display and Data Management

- Display: Color WQVGA touch-sensitive LCD.
- Data Storage:
- Removable SD cards (up to 32 GB capacity).
- Compatible with automatic and manual data recording modes.
- Real-Time Graphing: Dynamic plotting with automatic scaling.
- Connectivity:

- USB Connection: Functions as a mass storage device.
- RS232 Output: Configurable up to 230400 baud for computer or printer.

#### Power and Battery

- Battery Type: 7.5Ah 12V Lithium-ion rechargeable.
- Battery Life: Up to 16 hours of continuous operation.
- Charger: Universal input voltage with fixed output.

#### Physical Characteristics

- Console Dimensions: 230 x 110 x 170 mm (H x W x D).
- Leaf Chamber Dimensions: 300 x 80 x 75 mm (H x W x D).
- Weight:
  - Console: 4.1 kg.
  - Leaf Chamber: 0.8 kg.
- Operating Temperature: 5°C to 45°C.

#### PAR Control

- Light Units:
  - RGB LED Array: 0–2400  $\mu\text{mol m}^2/\text{s}$ .
  - White LED Array: 0–2500  $\mu\text{mol m}^2/\text{s}$ .
- Programming: Automatic light response curves and adjustable RGB ratios.

#### Automatic Environmental Control: LCpro T

The LCpro T offers sophisticated environmental control, ensuring precise and consistent conditions for photosynthesis and gas exchange experiments. The system is fully programmable through its intuitive, menu-driven software and supports automatic adjustments of key parameters. **Key Features of Environmental Control**

#### 1. CO<sub>2</sub> Control:

- Range: 0–2000 ppm.
- Mechanism: Integral elevated CO<sub>2</sub> supply system using a 4g pure CO<sub>2</sub> cartridge.
- Capability: Maintains stable CO<sub>2</sub> concentrations for up to 32 hours of continuous operation.
- Functionality: Supports automatic "A/Ci curves" by programming sequential control levels with specified dwell times.

#### 1. H<sub>2</sub>O (Humidity) Control:

- Range: 0–75 mbar.
- Mechanism: Utilizes self-indicating conditioning chemicals in dedicated, removable columns.
- Applications:
  - Increases humidity to counteract excessively dry experimental conditions.
  - Reduces humidity when working with moist samples, preventing condensation within the chamber.

#### 1. Temperature Control:

- Range:  $\pm 15^{\circ}\text{C}$  above and  $-10^{\circ}\text{C}$  below ambient temperature.
- Mechanism: Compact Peltier heat transfer system for dynamic and responsive regulation.
- Modes: Can maintain a constant temperature or track ambient air temperature.

#### 1. Photosynthetically Active Radiation (PAR) Control:

- Light Units:
  - RGB LED Array: 0–2400  $\mu\text{mol m}^2/\text{s}$ .
  - White LED Array: 0–2500  $\mu\text{mol m}^2/\text{s}$ .

- Features: Fully integrated light units with programmable light response curves (LRCs).
- Customizable: Allows adjustment of RGB light ratios or total PAR for specific experimental needs.

#### Programming and Automation

- Software Integration:
  - All environmental parameters (CO<sub>2</sub>, H<sub>2</sub>O, temperature, PAR) are controlled through the LCpro T console.
  - Parameters can be programmed for constant values or sequential levels.
  - Sequential Programming: Enables multiple parameters to change automatically in pre-set sequences with defined dwell times.
  - Energy Efficiency: Incorporates power-efficient components to maximize battery life, allowing up to 16 hours of operation.