Redefining the Boundaries of Life Science Research
Our mission is not unique. We share it with those committed to finding solutions for a better world.

The opportunity to support the plant and soil scientific communities in the discovery of those solutions inspires us to constantly innovate...

...to continually refine the role of instrumentation as a seamless extension of the thought process of each and every student of science...

...from the students just discovering their passion to the most accomplished pioneer whose life’s work has great global impact...

...providing the freedom to focus solely on the valuable work to be done.
**NEW!**

**CFLUX-1** A dedicated, self-contained automated system for long-term, unattended measurement of soil CO$_2$ flux.

*Ideal for both spatial & temporal analysis.*

- **Vent**
- **Independent, Calibrated Infrared Gas Analyzers (IRGAs) for CO$_2$ & H$_2$O**
- **Invertible All-Terrain Adjustable Legs**
- **Watertight Polycarbonate Enclosure**
- **Onboard WiFi Access Point to setup & monitor remotely via mobile device or desktop**
- **Articulating Chamber** for automated soil measurements with repeatable placement
- **Solar Radiation Shield**
- **Large Hemispherical Chamber (2500 cm$^3$)**
  ensures uniform air mixing & accurate measurement
- **20.7 cm diameter (ID) Soil Collar**
- **Rugged Aluminum Frame**

**NEW!**

A dedicated, self-contained automated system for long-term, unattended measurement of soil CO$_2$ flux.

*Ideal for both spatial & temporal analysis.*
No limit to where systems can be placed in the field.
No need for multiplexing chambers!

• Built-in CO₂ & H₂O Gas Analyzers
  Two independent, integral, non-dispersive infrared gas analyzers for CO₂ and H₂O in each system means:
  > Accurate measurement and fast response times regardless of location
  > No multiplexing devices are needed

• Unique Venting System
  Pressure differences are minimized upon closure and seal

• Expanded Measurement Range
  The CFLUX-1 can be calibrated up to 30000 ppm for measurement in high CO₂ environments

• Soil Moisture & Soil Temperature
  Optional sensors are available

• Easy Installation & Setup

• Fully Automatic, Programmable & Stand-alone Operation

• Full Data Storage
  Direct to a USB Flash Drive (memory stick) or external data logger

Software & Data Analysis
  > Easily view sensor data and information via computer or mobile device
  > Flux rates based on linear and quadratic fit are continuously calculated and displayed

Measurements were recorded every 30 minutes for a period of nine consecutive days.
CIRAS-3 Redefining “portability” for high-level field research. Eliminating the obstacles while elevating the research experience.

Fast & Accurate
A true differential analyzer featuring four independent gas analyzers for CO₂ and H₂O. It’s compact size and small system volume ensures the most rapid and accurate measurement of photosynthesis available.

Powerful, Customizable & Intuitive
Rely on the defaults or customize your own settings to monitor and display numerical and graphical data.

Switch Display Parameters
Remote Recording
Ambient Temperature Sensor
Meeting the demands of the serious researcher
driving the future of science.

Mobile
The first truly mobile system for simultaneous measurement of photosynthesis and chlorophyll fluorescence — the ideal choice for high-level field research.

True mobility (4.5 kg)
- Less site disturbance
- Easy access to hard-to-reach areas
- No assistance or tripod needed
- Reduced fatigue

RGBW LED Light Units are available for all PLC3 Leaf Cuvettes.
Photosynthesis

For Flat, Broad Leaves

PLC3 Universal Head Plates
25 mm x 7 mm 18 mm Diameter 25 mm x 18 mm

For Grasses, Long Needles & Narrow Leaves

PLC3 Narrow

For Conifers & Short Needle Vegetation

PLC3 Conifer

Versatility At Your Fingertips
The CIRAS-3 Portable Photosynthesis System is highly customizable externally as well. Expand the CIRAS-3’s measurement capabilities to include:
- Chlorophyll fluorescence
- Soil CO₂ efflux
- Net canopy flux

Prefer to use your own chambers? The CIRAS-3 can act as a stand-alone CO₂ and H₂O differential gas analyzer.

Our accessories are field-changeable as well — virtually plug and play!
Create rapid $A/C_i$ curves in minutes with the CIRAS-3 & our high-speed CO$_2$ ramping technique.

CIRAS-3 has always been capable of rapidly controlling CO$_2$ gas concentration while simultaneously and continuously recording data.

PP Systems’ latest version of our PC-based Scripts Editor makes it simpler to create and execute response scripts for measurement of rapid $A/C_i$ curves.

Generate ultra-fast $A/C_i$ curves in a fraction of the time it takes to perform traditional steady-state measurements with our innovative and programmable high-speed CO$_2$ ramping technique.

Post Processing
In just a few simple steps in Excel, $A/C_i$ curves can be created and analyzed.

Comparison of Non-Steady State, High-Speed CO$_2$ Ramping (blue points) to traditional point-by-point Steady State (green points) for a typical C$_3$ Sunflower.
CIRAS-3 simultaneously measure chlorophyll fluorescence & photosynthesis.

CFM-3 Chlorophyll Fluorescence Module features include:

- Built-in light source and fluorescence detection capability
- Actinic light source
- Pulse-amplitude modulated (PAM) fluorometer
- Saturating pulses up to 10,000 µmol m⁻² s⁻¹
- MultiPulse™ for estimation of Fm’ apparent

CIRAS-3 True mobility without sacrificing performance

- Truly mobile (4.5 kg)
- True differential analyzer
- High-speed CO₂ ramping for rapid A/Cᵢ curves
- Simultaneously measure photosynthesis and chlorophyll fluorescence
- Automated and programmable environmental controls for CO₂, H₂O, temperature and light
- Control proportion of light by wavelength (RGBW)
- Full color 7” transflective display
- Powerful user interface and software
- Customizable programming and data presentation capabilities
- Real-time data
- Unlimited data storage
TARGAS-1 The mobile photosynthesis system for teaching & basic research.

- Fully mobile and lightweight (2.1 kg)
- High-precision, non-dispersive infrared gas analyzers for both CO₂ and H₂O
- Automatic temperature and pressure compensation
- Control of CO₂, H₂O and light
- Large touch display, full sun readability
- Numerical and graphical data presentation
- Built-in air supply unit and sampling pump

The TARGAS-1’s high technical specification and user-friendly interface make it an ideal addition to the educational environment as well as the laboratory and field.

Multiple accessories and sensors are available to expand the TARGAS-1’s measurement capabilities. (See pg. 15 for more.)

Applications
- Photosynthesis
- Soil Respiration
- Net Canopy CO₂ Flux
- Environmental Monitoring
EGM-5 Versatility meets mobility — the perfect solution for soil CO$_2$ efflux & net canopy CO$_2$ flux.

**Accurate • Reliable • Stable**

For more than 30 years, our CO$_2$ infrared gas analyzers have been the standard for a wide variety of disciplines throughout the world.

Our innovative **Auto-Zero** measurement technique ensures the greatest accuracy, reliability and long-term stability that our customers have come to expect throughout the years.

Our powerful **GAS** software offers a user-friendly solution for monitoring, logging and recording environmental sensor data.

We offer a range of environmental probes and sensors for use with our analyzers, further enhancing their already extensive list of applications.

**Soil & Canopy Flux Chambers**

- SRC-2 Soil Respiration Chamber
- CPY-5 Canopy Assimilation Chamber

Our chambers are compatible with the EGM-5, CIRAS-3 & TARGAS-1
Expanding measurement capabilities.
Enhancing the process of discovery.

Rugged Transport Case
Highly field-durable & customized to hold the EGM-5 as well as the SRC-2 Soil Respiration Chamber & either the STP-2 Soil Temperature Probe or Hydra-Probe II Soil Moisture & Soil Temperature Probe

Available EGM-5 integration options:
• H₂O solid state sensor to accurately measure humidity
• O₂ electrochemical sensor for accurate O₂ measurement
• WiFi for remote, real-time monitoring

Applications
• Ambient air monitoring
• Soil CO₂ efflux
• Net canopy CO₂ flux
• Borehole CO₂ monitoring
• Global change studies
• Animal/insect respiration
• Environmental toxicology
• Volcanology
• Forest & agricultural meteorology
• CO₂ sequestration
• pCO₂ measurement

Sample Injection Kit

Quantum Sensor (PAR)

Soil Temperature

Soil Moisture/Soil Temperature

PAR Air Temperature
Unsurpassed accuracy & control for long-term continuous measurement of CO₂.

**Available WMA-5 options:**
- H₂O solid state sensor to accurately measure humidity
- O₂ electrochemical sensor for accurate O₂ measurement
- WiFi for remote, real-time monitoring

**Available SBA-5 options:**
- H₂O solid state sensor to accurately measure humidity
- Sampling pump
- Absorber column (for Auto-Zero)
- Anodized aluminum enclosure

**Applications**
- Open top chambers
- Greenhouses & nurseries
- Plant growth chambers
- Environmental control rooms
- Incubators
- Fruit storage
- FACE sites
- Breweries
- Ambient air monitoring
- CO₂ leakage monitoring
- Indoor air quality & safety
- Industrial monitoring

**The ideal solution for applications demanding a highly accurate CO₂ sensor.**
**CO₂ Gas Analyzer features by instrument**

<table>
<thead>
<tr>
<th>Feature</th>
<th>EGM-5</th>
<th>WMA-5</th>
<th>SBA-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>High precision, non-dispersive infrared gas analyzer for CO₂</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Accuracy: &lt;1 % of span over calibrated range</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>CO₂ ranges up to 100000 ppm (10%)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Automatic pressure &amp; temperature compensation</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Powerful GAS software</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Numeric &amp; graphical data display</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Data storage</td>
<td>USB</td>
<td>USB</td>
<td></td>
</tr>
<tr>
<td>Power requirements</td>
<td>AC/DC</td>
<td>AC/DC</td>
<td>6-18 VDC</td>
</tr>
<tr>
<td>Data outputs</td>
<td>V/D</td>
<td>V/C/D</td>
<td>V/C/D</td>
</tr>
<tr>
<td>High-contrast touch display</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Built-in sampling pump &amp; electronic flow sensor</td>
<td></td>
<td>●</td>
<td>Optional</td>
</tr>
<tr>
<td>External water trap</td>
<td></td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Visual &amp; audible warning (high/low CO₂)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

V=Voltage  C=Current (4 - 20 mA)  D=Digital
The global standard for CO$_2$ & H$_2$O gas analysis for research that commands accuracy, reliability & stability.

**CIRAS-3 SC**

The CIRAS-3 SC has two independent, non-dispersive infrared gas analyzers for CO$_2$ and H$_2$O for measurement from a single gas stream.

**CIRAS-3 DC**

The CIRAS-3 DC has four independent, non-dispersive infrared gas analyzers for CO$_2$ and H$_2$O for measurement from two gas streams.

**Common features**
- Built-in Auto-Zero
- Fully compensates for changes in temperature, pressure and foreign gas broadening
- Unlimited data storage
- Built-in sampling pump with mass flow controller
- Powerful, intuitive user interface and software
- Remote display capability
- Internal 7.2V Li-Ion rechargeable battery (optional) for portability

**Applications**
- Plant physiology
- Soil CO$_2$ efflux
- Net canopy CO$_2$ flux
- Forest & agriculture meteorology
- pCO$_2$ measurement
- Atmospheric studies
## Accessory Compatibility by instrument

### Chambers & Sensors

<table>
<thead>
<tr>
<th>Accessory</th>
<th>CIRAS-3+</th>
<th>TARGAS-1</th>
<th>EGM-5</th>
<th>WMA-5</th>
<th>SBA-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRC-2 Soil Respiration Chamber</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPY-5 Canopy Assimilation Chamber</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insect Respiration Chamber</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STP-2 Soil Temperature Probe</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantum Sensor (PAR)</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRP-3 Temperature/PAR Probe</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HydraProbe II (Soil Moisture &amp; Soil Temperature)</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Integrated Options

<table>
<thead>
<tr>
<th>Accessory</th>
<th>CIRAS-3+</th>
<th>TARGAS-1</th>
<th>EGM-5</th>
<th>WMA-5</th>
<th>SBA-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂O Solid State Sensor</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>O₂ Electrochemical Sensor</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>WiFi</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>

### Kits

<table>
<thead>
<tr>
<th>Accessory</th>
<th>CIRAS-3+</th>
<th>TARGAS-1</th>
<th>EGM-5</th>
<th>WMA-5</th>
<th>SBA-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Injection Kit</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

* Refers to the CIRAS-3 Portable Photosynthesis System
Your research partner since 1984

**PP Systems has proudly designed and manufactured instrumentation to meet the technology needs of plant and soil scientists since 1984.** Our extensive experience working closely with scientists to provide the best possible research tools, along with our drive to constantly enhance the research and educational experience, has afforded us the honor of being one of the most highly referenced global standards in more than 100 countries worldwide.

**Accurate, Reliable & Revolutionary**

Our instruments have long been trusted for their accuracy, reliability and stability.

PP Systems is recognized as a world leader and proven innovator in the design and manufacture of rugged photosynthesis, soil respiration, chlorophyll fluorescence and CO$_2$/H$_2$O gas analysis instrumentation for high-level research.

**Trusted & Tested Technology**
Training

Training is offered free of charge for all customers. Classes are provided throughout the year and can be arranged to fit within your schedule.

Classes are intentionally kept small to afford personalized attention and to ensure that everyone receives the maximum benefit of attending the course. The course is designed for the first time user as well as those who need a refresher course on operation and general maintenance.

Contact PP Systems to learn more about training options or to schedule a training class.

Your Research Partner

We want you to have the best possible experience as well as to fully utilize the instruments you purchase from us.

Customers receive direct technical support from our U.S. headquarters as well as through our extensive network of factory trained distributors.

If you would like to learn more about us, visit our website at ppsystems.com where you will find more detailed specifications about each product including data sheets as well as application notes that show how our amazing customers are using our instruments.

You are welcome to call to discuss your research needs with a member of our technical staff @ +1 978.834.0505.