



Integrated fluorometer and gas exchange system

The most automated and accurate combined photosynthesis system for advanced plant physiology research

- Complete and full automation of multiple protocols (Inc. Laisk protocol and subsequent measurements of g_m and C_c)
- Truly portable
- Measurement of leaf absorbance, transmittance and chamber leakage for more accurate and reliable data
- Large touch screen, colour, graphic display
- Use as combined system, advanced gas exchange system or powerful chlorophyll fluorometer



The most advanced system for plant physiology research

ADC BioScientific Ltd introduces the new iFL Integrated fluorometer and gas exchange system. Designed to provide researchers with the most advanced, accurate and reliable plant physiology experimental capabilities.

The iFL features a highly accurate, miniaturised infra red gas analyser (IRGA) and a fully integrated pulse modulated chlorophyll fluorometer; providing researchers with a direct readout of additional photosynthetic parameters than with a standard gas exchange system. These include Γ^* and R_d , which can be used to subsequently measure J , g_m and C_c .



Additional photosynthetic parameters[#] include:

- Γ^* : CO₂ compensation point
- R_d : CO₂ respiration in the light (by Laisk, Kok or Yin protocols)
- Flexas chamber leakage protocol
- Leaf absorbance
- Leaf transmittance
- g_m : Mesophyll conductance
- C_c : CO₂ at site of carboxylation
- A/C_C curves
- J : Electron transport rate
- Fluorescence stress tests including: Fv/Fm, Yield Y (II) with multflash, quenching tests and Rapid light curves

[#] compared to standard gas exchange systems

Full automation

The unique differential in time design of the ADC IRGA means that experiments such as entire Laisk protocols may be performed, fully automatically, without any interruption for cell "matching", or any other intervention. Simply set up an experiment, walk away and return when the experiment is finished.

Several hours of automated experimentation can be initiated with one press of the screen. For example a complete Laisk may be performed together with post processing, directly followed by automated experiments to measure g_m and C_c including A/C_C curves. The highly power efficient iFL operates continuously from a single battery charge for up to 8 hours.

Measurement of leaf absorbance

The iFL provides the most highly accurate and reliable photosynthesis data. The iFL is the **first** plant physiology system to measure leaf absorbance, leaf transmittance and chamber leakage (Flexas protocol) and thus removing any errors that these variable factors could introduce.

Leaf temperature is measured by a new miniaturised IR sensor positioned inside the leaf chamber.

One PAR sensor is positioned inside the leaf chamber to monitor the constant actinic light source during routines. A second PAR sensor positioned on top of the fluorometer allows ambient light to be measured and automatically matched inside the chamber if required.

Colour touch screen display



A large, colour, touch screen display makes the iFL both interactive and simple to use. Set up is easy whether loading or editing an existing protocol, or building a new protocol. Real time data, calculations and graphs are clearly presented on screen. Sub screens can be blown up to full screen size for even easier viewing.

Gas exchange measurements can be presented in either ppm/mbar or μmol mol⁻¹/mmol mol⁻¹.

Data, protocols and graphs can be stored on the internal 2Gb flash memory or on SD cards. Downloading is either directly from the SD cards or via USB. For class or group presentations the iFL features a video HDMI output.

Versatile and truly portable for field research

Weighing only 5.2kg (including battery) the iFL is a truly portable and versatile instrument for field plant physiology research.

The iFL can be used as a combined system, or an independent advanced gas exchange system, or as an independent powerful chlorophyll fluorometer.

Researchers can also conduct standard gas exchange experiments under ambient or controlled conditions.

A variety of highly accurate fluorescence plant stress tests can be performed including: Fv/Fm, Yield (Y) II with Multiflash-Fm' correction, rapid light curves and a selection of quenching protocols such as Hendrickson model, Kramer lake model and Puddle model.

iFL provisional specification

Gas exchange provisional specification

Measurement range, technique and control:

CO₂: 0-3000ppm, 1ppm resolution Infrared gas analyser. Differential, open system with auto zero. Programmed control 0-2000ppm

H₂O: 0-75mbar, 0.1mbar resolution dual laser trimmed, fast response sensors. Programmed control above and below ambient dependent on ambient conditions

PAR: External 0-3000μmols m⁻² s⁻¹ Silicon photocell. Programmed control 0-7500μmols m⁻² s⁻¹
Internal leaf chamber PAR sensor 0-7500μmols m⁻² s⁻¹

Temperature:

Leaf: -5°C to 50°C IR sensor

Chamber: -5°C to 50°C precision thermistor
Programmed control typically +/- 14°C from ambient

Flow rate: 100-500ml min⁻¹

Warm up: 5 minutes@20°C

Fluorometer provisional specification

Excitation sources:

Saturation

pulse: White LED with 690nm filter.
0-7,500 μmols m⁻² s⁻¹

Modulating

light: 660nm LED with 690nm short pass filter

Actinic light: White LED 0-2,000μmols m⁻² s⁻¹

Far red: 740nm LED

Blue/red/green absorbance sensors

Detection method: Pulse modulation

Automated setting of modulated light intensity: Adjustable On/Off

Automated Multi-Flash Fm' correction for all light adapted protocols: Adjustable On/Off

Detector: PIN photodiode with 700-750nm filter

Sampling rate: 10 to 10,000 points per second, dependent on phase of test

Test duration: Adjustable 20 seconds - 4,000 hours

System provisional specification

Data storage: 2Gb internal memory for thousands of data sets and traces. Removable SD cards

Digital output: SD cards, USB and HDMI

User interface: Large, colour, menu driven, graphic touch screen display (14.5cm x 8.5cm)

Battery: 7.0Ah 12 V lead acid battery. Up to 8 hours of battery life as iFL system

Total console dimensions: 31cm x 11cm x 24cm

Total leaf chamber dimensions: 30cm x 8cm x 16cm

Total console weight: 5.2kg (including battery)



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