



# POCKET PEA

## CHLOROPHYLL FLUORESCENCE SYSTEM

- Ultra-portable Chlorophyll Fluorimeter.
- Rapid screening capability with single button operation & storage of up to 200 full data sets.
- Automatic calculation of parameters including Fv/Fm & OJIP analysis.
- Robust enclosure with sealed, high intensity optics.
- 100kHz sampling frequency with 16bit resolution.
- Bluetooth wireless data transfer as standard.
- Powerful Windows data transfer & analysis software included.

### Overview

The Pocket PEA has been designed specifically as a tool enabling both academic and commercial bodies alike to record key fluorescence data from samples.

Fluorescence data is beautifully presented by custom Windows® software allowing differentiation between fluorescence signatures and key parameters to be easily demonstrated using various graphical and numerical data presentation methods.

The Pocket PEA Chlorophyll Fluorimeter is suitable for teaching, research and a wide variety of commercial applications. The robust yet compact hand-held design provides ease of use and reliable operation.

Samples are conveniently dark adapted prior to measurement using the leafclips supplied. Easy single key operation fully automates the complete measurement process from data capture through to calculation and display of the key Fv/Fm and Performance Index (PI) parameters. The rapid 1 second measurement capability and 200 measurement memory capacity make Pocket PEA an invaluable tool in large plant screening programs.

The fluorescence signal received by the sensor during recording is digitised in the control unit using a fast 16 bit Analogue/Digital converter ensuring excellent precision and repeatability of results. The fluorescence signal is digitised at different rates dependent upon the different phases of the induction kinetic.

Initially, data is sampled at 10  $\mu\text{s}$  intervals for the first 300  $\mu\text{s}$  seconds. This provides excellent time resolution of  $F_o$  and the initial rise kinetics. The time resolution of digitisation is then switched to slower acquisition rates as the kinetics of the fluorescence signal slow. This process provides excellent time resolution of the overall measurement whilst minimising the size of the data set and thus maximising memory capacity.

Bluetooth wireless transfer conveniently allows records to be transferred in the field to a suitable PDA/IPAQ or PC for detailed review and analysis using our custom Windows® Mobile and Windows PC software.

The Pocket PEA optical interface is mounted directly on to the front of the Pocket PEA control unit. It consists of a single high intensity focused LED which is positioned vertically above the sample and provides up to 3500  $\mu\text{mol m}^{-2} \text{s}^{-1}$  intensity with a peak wavelength of 627nm at the sample surface. The light emitted from the LED is filtered using an NIR filter to block any infra red content which could be seen by the detector (known as optical breakthrough). An optical feedback circuit monitors and corrects changes in the output intensity of the LED which are caused by internal heat build up in the LED itself. The circuit also compensates for intensity changes caused by variation in ambient temperature.



The detector is a highly sensitive PIN photodiode and associated amplifier circuit. The optical design and filtering ensure that it responds maximally to the longer wavelength fluorescence signal and blocks the reflected shorter wavelength LED light used as the source of illumination. The entire optical assembly is sealed behind a clear glass window which creates a barrier against moisture and dirt which are inherent problems for field based instruments.

The latest Lithium Polymer battery technology ensures a full day of field usage and the convenience of rapid (<4hrs) recharge to full capacity using either the mains charger provided or an optional 12v DC vehicle charger.

### Leafclips and Sample Dark Adaptation

The first step in the measurement process is to cover the sample area to be analysed, with a small, lightweight leafclip. The clip has a small shutter plate which should be closed over the leaf when the clip is attached so that light is excluded and dark adaptation

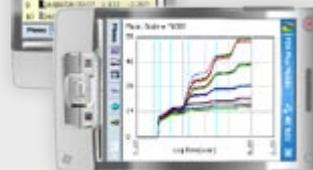
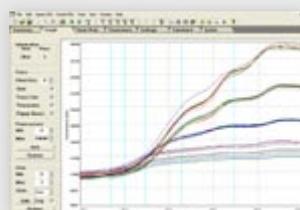


takes place. The body of the clips are constructed from white plastic to minimise the effects of heat build-up on the leaf during the period when the clip is in place. The locating ring section of the clip which interfaces with the fluorimeter optical assembly is constructed from black plastic. This ensures that the measurement is unaffected when measuring during conditions of high ambient light intensity.

The leaf or needle rests on a foam pad whilst in the clip in order to minimise damage to the structure of the leaf. The shutter plate should be closed to exclude light from the sample during dark adaptation.

During dark adaptation, all the reaction centres are fully oxidised and available for photochemistry and any fluorescence yield is quenched. This process takes a variable amount of time and depends upon plant species, light history prior to the dark transition and whether or not the plant is stressed. Typically, 15 - 20 minutes may be required to dark adapt effectively. In order to reduce waiting time before measurement, a number of leaves may be dark adapted simultaneously using several leafclips. Some users even make measurements at night, thus ensuring an adequate supply of readily dark adapted samples and zero waiting time!

### PEA Plus Software



PEA Plus provides a comprehensive tool for in-depth analysis of data recorded by the Pocket PEA chlorophyll fluorimeter. Several different data presentation techniques have been combined in order to effectively demonstrate subtle differences in the fluorescence signature of samples which could be indicative of stress factors affecting the photosynthetic efficiency of the plant.

A suitable IPAQ/PDA running Windows Mobile 5.0 or 6.0® may be used in the field for data storage and limited review of parameters and traces using the PEA Plus Mobile software. Records are downloaded via Bluetooth wireless communication.

## Technical Specifications

Dimensions	175 (l) x 75 (w) x 35mm (d). Weight: 250g
Communications	Bluetooth wireless communications
Operating Conditions	0 - 40°C. Non-condensing humidity
Battery	Environmentally friendly (0% lead, cadmium mercury) lithium polymer 3.7V, 570 mAh
Battery Charger	Integral switch mode charger 8-13.5V input (nominal 12V input)
Display	2 line x 12 character LCD display
Illumination	Optically stabilised, focused, ultra-bright red LED with NIR short pass cut-off filters. Peak wavelength 627nm. Max. intensity at leaf surface up to 3500 $\mu\text{mol m}^{-2} \text{s}^{-1}$
Detector	Fast response PIN photodiode with RG9 long pass filter
Electronics	High performance 16 bit microcontroller, 16 bit resolution A/D 10 $\mu\text{sec}$ acquisition rate, 8 bit DAC for light source control, real time clock
Record Length	1, 3 or 10 seconds
Memory	256Kbits non-volatile memory. Sufficient for up to 200, 10 second duration recordings with full trace data