

# *FMS 2 Pulse-Modulated Chlorophyll Fluorescence Monitoring System*

*InfoSheet*



**Hansatec**  
Instrument

- Pulse-Modulated System.*
- Compact Field Design.*
- Temperature Compensated Electronics.*
- Programmable by Hansatech Scripting Language (HSL).*
- Leaf-clip with Integral PAR/Temperature Sensor.*
- Field Swappable Battery System.*
- Windows® Data Acquisition & Data Analysis Software*

*FMS 2 is a lightweight, field portable chlorophyll fluorimeter using the pulse-modulated principle. It is suitable for non-invasive sampling under natural light conditions & may be combined with other techniques such as infra-red gas analysis (IRGA) for simultaneous measurements.*

*Instrumentation for Cellular Respiration & Photosynthesis Studies.*

### System.

At the heart of the system is the FMS2 control unit; this housing is light enough (2.0 Kg) to be carried & operated from its shoulder bag. All light sources, fluorescence detectors & temperature compensated electronics are housed within the field-rugged enclosure. The light sources used are:

- 594 nm amber modulating beam (Optional 470 nm blue LED)
- dual-purpose halogen actinic / saturating pulse lamp
- 735 nm far-red LED source for preferential PSI excitation.

A detachable fibre-optic is used to optically link the control unit to the sample which is typically supported in a leaf-clip. The FMS2 is supplied with two leaf-clip systems.

The PAR / Temperature Leaf-Clip has an integral cosine corrected PAR & temperature sensors. Simultaneous logging of fluorescence, incident PAR & leaf temperature can be initiated from the remote trigger button. A dark-adaptation clip system is also supplied.

The system is powered by a 2.0 Ahr lead-acid battery, capable of 1 hour maximum actinic illumination or approximately 800 saturating pulses. Up to four batteries may be charged simultaneously in the Multicharger overnight & easily changed in the field as they become discharged.

### Operating the FMS2.

The system is operated from either a Windows® based PC via an RS232 connection or locally from the four button keypad on the control unit. When in PC Mode, the

"Modflour" software allows manual control over all light sources & measurement functions via a

graphical-user interface. Recordings are plotted as a chart

recorder emulation with derived parameters presented in a

separate window. Experimental protocols can be automated for execution on demand using either the Script Recorder to log control events or the Script Editor to generate a command sequence from an iconised library of control elements. A maximum of six experimental protocols can be downloaded to FMS memory for local operation.

When in "Local Mode", pre-loaded experiments can be run without a PC. The four tactile "soft" keys on the control unit allows selection of appropriate experiments from a simple menu structure which is presented on the LCD display. Scripts are run, validated & stored to internal memory with only two key presses.

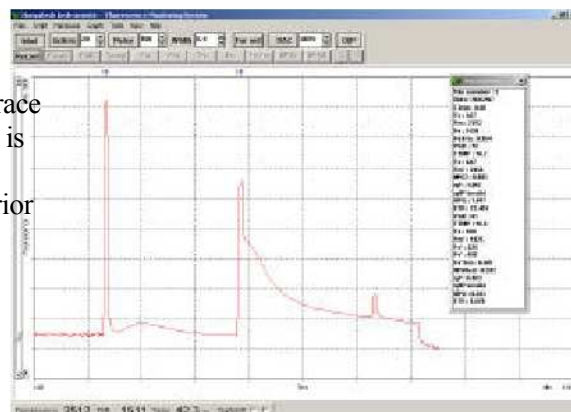
The number of experiments that can be stored depends on the length of the experiment & whether full trace data or parameter only information is required (selectable on the control unit). Full trace data is uploaded directly into the "Modflour" software while parameter- only data is uploaded into a separate utility - "Parview" where parameters may be sorted & displayed in columns according to type against experimental replicate (row) prior to comma delimited ASCII export for further spreadsheet analysis.

### Parameters Measured.

**Dark Adapted Parameters:** Fo, Fm, Fv, Fv/Fm.

**Light Adapted Parameters:** Fs, Fm', Fo', Fv', Fv'/Fm',  $\Phi$ PSII, ETR.

**Quenching Coefficients:** QP, qNP, NPQ.



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