

## Technical Specifications

Dimensions:	180mm (L) x 100mm (D) x 100mm (H).
Weight:	2.0 kg including battery
Light Sources:	Modulation Beam: Temperature compensated 594nm amber LED with 4 step frequency control (Optional 470nm blue LED) LED source: Actinic up to 3500 $\mu\text{mol m}^{-2} \text{s}^{-1}$ , saturating up to 20,000 $\mu\text{mol m}^{-2} \text{s}^{-1}$ . Far Red: 735nm LED
Detector:	PIN photodiode with >700 nm filter
Detection Method:	Rapid peak pulse tracking
Sampling Rate:	Variable 10 Hz to 20 kHz depending upon instrument mode
Electronics:	16 bit 165 microprocessor, 8 A/D channels 12 bit resolution, 4 external digital I/O lines, Single 12 bit buffered DAC (0 to 4095 mV)
Storage:	256 Kb backed up RAM storing up to 2,430 full trace or 12,850 parameter only Fv/Fm data sets
User Interface:	20 x 4 LCD display, 4 button keypad
Display:	8 line x 20 character LCD display
Power Supply:	5 x field replaceable 2.0 Ahr lead acid battery, 95 to 260V universal input mains supply.
Leafclips:	PAR/temperature clip with cosine corrected PAR sensor (0 to 20,000 $\mu\text{mol m}^{-2} \text{s}^{-1}$ ) and thermocouple (-10 to 90 °C). Remote trigger button and tripod mount. 10 x dark adaptation clips with fibre-optic adapter.



Hansatech Instruments is a British company that has been developing high quality scientific instrumentation for over 40 years. Our systems are used widely for teaching & research in cellular respiration & photosynthesis programs in more than 100 countries throughout the world. We have gained an enviable reputation for quality, reliability & excellent price/performance.



Our product range consists of a range of modular solutions for the measurement of oxygen using Clark type polarographic sensors. We also develop chlorophyll fluorescence measurement systems using both continuous excitation & pulse-modulated measurement techniques with further optical instrumentation for the measurement of sample chlorophyll content.



Purchasers of Hansatech Instruments products can be assured of ongoing support & prompt & efficient attention to enquiries at all times. Support is available both directly & from our global distributor network. Customers are encouraged to register their instruments on our website which allows access to our Support Ticketing System in addition to instruments manuals & software upgrades.

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# FMS 2+

## Fluorescence Monitoring System Manual



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# FMS 2+

## Field Portable Pulse Modulated Chlorophyll Fluorescence Monitoring System

- > Integral amber (594nm) modulating LED (optional 470nm blue LED), 735nm far-red LED & dual purpose tungsten-halogen light source
- > Field swappable battery system
- > Programmable by Hansatech Scripting Language (HSL)
- > FMS/PTL leaf-clip with integral PAR/temperature sensor
- > Temperature compensated electronics
- > Fibre-optic cable suitable for incorporation into O<sub>2</sub> electrode chambers & legacy IRGA systems
- > USB 2.0 Communications
- > Windows® data acquisition & data analysis software

### FMS 2+

#### Field Portable Pulse Modulated Chlorophyll Fluorescence

The FMS 2+ chlorophyll fluorometer consists of a control unit housing all of the electronics, optics and light sources necessary to derive most common chlorophyll fluorescence parameters.

These are optically linked to the sample by a statistically randomised fibre optic cable that is positioned in the FMS/PTL PAR/ Temperature leafclip

The fibre optic cable is also suitable for insertion into a range of sample containers such as oxygen electrodes, gas analysis chambers, petri dishes and microtitre plates.

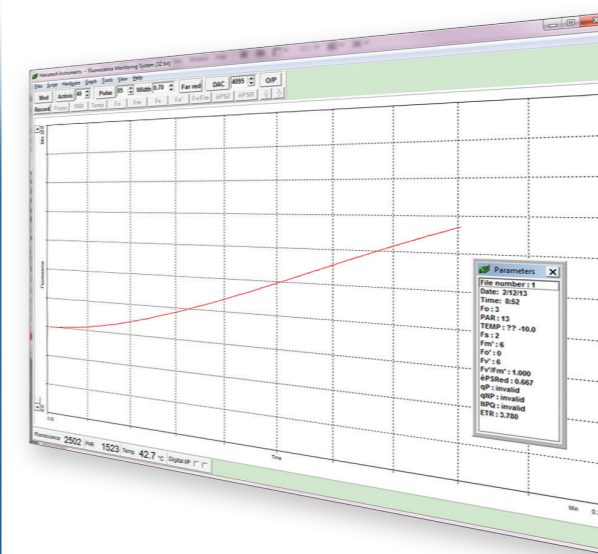


The system may be operated in 2 different modes. Connection to a Windows® PC via USB enables real-time instrument control and data presentation.

PC mode can be used to develop complex protocols using the simple drag and drop editor to generate user-defined scripts. Scripts can be developed and automated to reduce repetitive work.

Once created, scripts may be executed directly from the Modflour32 program and data viewed while the instrument automatically completes the user-defined experiment.

All measurement data and calculated parameters are saved to integral protected memory. The unit can store up to six experimental protocols, any one of which may be accessed and executed using the built-in menu system. When data collection is complete the results can be downloaded to the Windows® software for full analysis.



Once programmed, the FMS 2+ chlorophyll fluorometer can be operated as a stand alone system in either laboratory or field situations, running from internal field swappable batteries.

The PAR/temperature leafclip (FMS/PTL) allows measurements to be made under ambient light conditions.

A leafclip system has been developed for situations where ambient light is to be excluded from the sample during measurement using the FMS chlorophyll fluorometer. This is suitable for experiments requiring dark-adapted measurements e.g. screening applications measuring Fv/Fm or situations which require adaptation of tissue to standardised doses of actinic light.

