

F_V/F_M Meter - Reliable & Affordable

The most affordable modulated fluorometer for use with *dark clips*



F_V/F_M Meter: modulated light chlorophyll fluorometer

- Measures F_V/F_M & F_V/F_O , F_M , & F_O
- Affordable dark adaption clips make measurements of large plant populations in the field much more fun!
Price includes 10 dark clips!
- The F_V/F_M Meter is *field proven*
- Graphic display of measurement
- 2 Gigabyte memory
- USB port data transfer
- Automated modulated light intensity set up option
- Screen visible in bright sun light
- Red 660 nm modulated light source
- Up to 6,000 $\mu\text{mols m}^{-2} \text{s}^{-1}$ saturation intensity
- USB battery - 8 hour charge life

F_V/F_M is the **gold standard** of chlorophyll fluorescence measurement

Why is F_V/F_M considered the gold standard of chlorophyll fluorescence measurement?

Because F_V/F_M allows the comparing of plant samples using a normalized ratio at the same known common dark adapted state and values generally correlate to photosynthesis measurement.

For specific results on different types of plant stress measurement, a Plant Stress Guide is available for free from our website. www.optisci.com

Using F_V/F_M

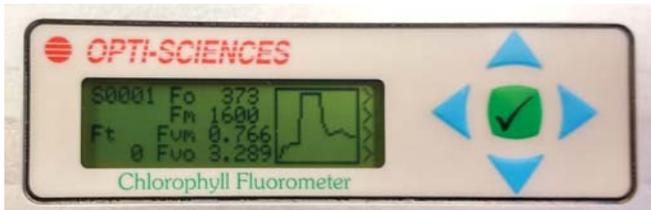
While optimal F_V/F_M values vary by plant species between 0.79 to 0.83, lower F_V/F_M values indicate that plant stress is affecting photosystem II.

For a review of specific F_V/F_M results on all types of plant stress measurement, a Plant Stress Guide is available from our website.

Normalized ratio: $F_V/F_M = (F_M - F_O) / F_M$

With *affordable dark adaption clips* it is possible to measure the “equivalent” of “predawn dark adaption” samples at more practical times of day. They are also handy for shorter dark adaptation periods during the day. Dark clips allow rapid measurement of more *statistically significant plant populations*.

F_V/F_M meter



Measuring display and control panel



Dark adaption clips - The F_V/F_M meter comes with 10 clips. Clips are available individually or in packages of fifty.



F_V/F_M meter with 36 inch USB cable and USB battery.

The F_V/F_M meter and the battery will fit in clothing pockets

Journal references:

Boris LAZAREVIĆ, Tomáš LOŠÁK, Ahmad M. MANSCHADI (2018) Arbuscular mycorrhizae modify winter wheat root morphology and alleviate phosphorus deficit stress, *Plant Soil Environ.*, Vol. 64, 2018, No. 1: 47–52, doi: 10.17221/678/2016-PSE

Fernández-Marín, B., Gago, J., Clemente-Moreno, M.J. et al. "Plant pigment cycles in the high-Arctic Spitsbergen" *Polar Biol* (2019). <https://doi.org/10.1007/s00300-019-02463-x>.

Zohreh Heydarian, Min Yu, Margaret Gruber, Cathy Coutu, Stephen J. Robinson & Dwayne D. Hegedus (2018) "Changes in gene expression in *Camelina sativa* roots and vegetative tissues in response to salinity stress" *Scientific Reports* vol 8, Article number: 9804 (2018).

Specifications:

Measuring Parameters:

F_V/F_M: Maximum photochemical efficiency of PSII

F_V/F_O: A more sensitive detector of stress than F_V/F_M but it does not measure plant efficiency or correlate to photosynthesis measurements.

F_O: Minimum fluorescence

F_M: Maximal fluorescence

F_V: Variable fluorescence

F_t: Detected fluorescence signal, used to set up modulated light intensity and gain.

Light Sources:

Saturation pulse: - Red 660 nm LED with 690 nm short pass filter. Intensity up to 6,000 μmol m⁻² s⁻¹. Adjustable saturation pulse width.

Modulated light: Red: 660 nm LED with 690 nm short pass filter.

Other Specifications:

Detector & Filters: A PIN photodiode with a 700 ~ 750 nm bandpass filter

Sampling Rate: Auto-switching from 1 to 10,000 points per sec.

Storage Capacity: 2 gigabyte of non-volatile flash memory,

Special Algorithm: 8 point rolling 25 ms average to determine highest F_M, eliminates saturation pulse NPQ & any electronic noise as an issue.

Special Algorithm: Optimally sets the modulated light intensity. It may also be adjusted manually.

Output: CSV comma delineated files may be opened in any spread sheet software program. No special software is required.

User Interface: Display: Graphic black and white display, menu driven with arrows. 132 x 32 pixels. Designed for use in sunlight.

Power Supply: 8-hour USB lithium ion battery is standard. However, it will also work with most USB batteries. The F_V/F_M meter also works with mains current. It comes with a universal Voltage and frequency USB charger. It also comes with a US plug. The size of the battery allows easy insertion into clothing pockets.

Dimensions: The meter is 9 in. long, USB cable from meter to battery is 36 in. long, Protective transport case is 14"x 11"x 6"

Weight: F_V/F_M meter w/bat. & USB cable are 12.8 oz. Meter with transport case and accessories weigh 3.65 lbs.

Operating temperature range: 0°C to 50°C

Dark adaption clips: 10 supplied with F_V/F_M meter .