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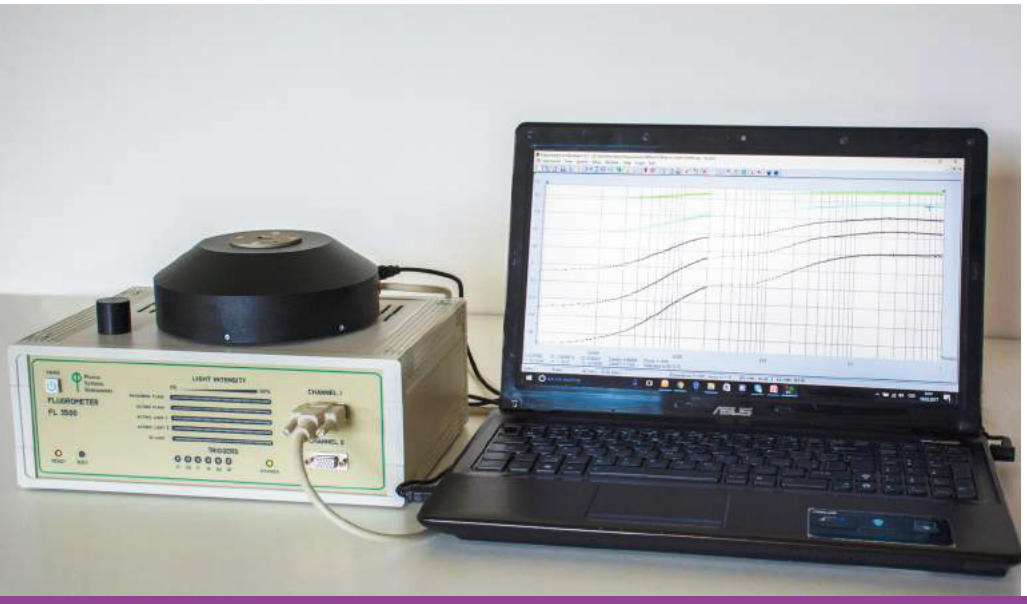
Fluorometer FL 3500 98

Double-Modulation **Fluorometer FL 3500** measures chlorophyll *a* fluorescence. Measured fluorescence emission is excited by a set of light-emitting diodes that generate measuring flashes of few microseconds in duration and low light intensity; the photochemistry is driven by single-turnover flashes or by continuous actinic irradiance. Chlorophyll *a* fluorescence is detected by a PIN photodiode and digitized by a 16-bit A/D converter.

Algae Online Monitor 100

Algal Online Monitor (AOM) is a portable and robust device for online detection and continuous monitoring of photosynthetic microorganisms in both natural and artificial water bodies. It detects variety of cyanobacteria, green and brown algae, diatoms, and other microbes.

REFERENCES 102



Fluorometer FL 3500

Double-Modulation **Fluorometer FL 3500** measures chlorophyll *a* (Chl*a*)--fluorescence. Measured fluorescence emission is excited by a set of light--emitting diodes that generate measuring flashes of few microseconds in duration and low intensity; the photochemistry is driven by single-turnover flashes or by continuous actinic irradiance. Chlorophyll fluorescence is detected by a PIN photodiode and digitized by a 16-bit A/D converter. The instrument supports Pulse Amplitude Modulation measurements and, at the same time, can capture fast OJIP transients or perform rapid measurements of Q_A- reoxidation kinetics, S-states. The fast version of FL 3500-F allows measuring Flash Fluorescence Induction (FFI) experiments which leads to a calculations of the effective antenna size, antenna connectivity and rapid lights curves. The major feature of this fluorometer is the capacity of the instrument to generate rectangular actinic flashes of extremely high power also with 620 nm excitation light source. This feature is helpful for cyanobacteria measurements. Full reduction of Q_A acceptor can be achieved within 25 µs and the instrument can measure fluorescence induction during such a single-turnover saturating flash. This technique is used to determine the effective antenna size of the Photosystem II as well as its heterogeneity and connectivity without disturbing the measured system by DCMU or other herbicides. Photosynthetically active samples, either suspensions, leaves, or even corals, can be investigated for their photochemical yields, quenching parameters, state transitions, or for the kinetics of photosynthetic redox reactions.

The FL 3500 has two input channels. First channel is used for Chl*a*-fluorescence measurements. The second channel can be optionally used for temperature reading or dissolved oxygen probe signal measurements. FAR-LED unit with 735 nm LEDs can be optionally connected to the SuperHead measuring unit. Thermoregulator TR 2000 or dissolved O_2 microelectrode A/D converter are optional accessories for measurements with SuperHead measuring unit.

Optional features and accessories	Specification
Thermoregulator TR 2000	· precise temperature control · range of 0 °C to +70 °C · accuracy of 0.1 °C · mode of regulation constant or temperature ramp
Magnetic stirrer	· continuous stirring to maintain constant temperature or prevent sedimentation
Oxygen detector with oxygen electrode	· online oxygen evolution measurement
Infra-Red LED Unit	· additional external light source · peak wavelength 730 nm · for correct F'_0 determination

APPLICATIONS

- Probing physiology of photoautotrophs suspensions
- Measurement of efficiency of PSII photochemistry
- Estimation of aquatic primary productivity
- Exploring photosynthetic performance and metabolic perturbations in phytoplancton
- Molecular biology – screening for photosynthetic mutants
- Detection of abiotic and biotic stress and stress tolerance
- Taxonomical studies
- Aquatic bloom detection

KEY FEATURES

- SuperHead measuring unit – measurements performed in standard cuvette for sample suspensions of algae or cyanobacteria
- Unified control unit for all FL 3500 versions, compatible with different measuring units.
- Four sets of LEDs:
  - measuring light 1 – red
  - measuring light 2 – blue
  - actinic light – red
  - single-turnover flash – red
- Light intensities and timings are software controlled separately for each LED set with 100 ns resolution
- PIN photodiode detector with 40× variable gain for signal acquisition with 1MHz/16-bit maximal accuracy
- Pulse Amplitude Modulation measurements

VERSIONS

FLUOROMETER FL 3500-S

- Time resolution up to 4 µs
- Detection limit 100 ng Chl*a*/l
- Supported fluorescence protocols:
  - Instantaneous fluorescence
  - Q_A^- reoxidation kinetics
  - Kautsky effect
  - Quenching parameters analysis
  - Fast OJIP transient
  - S-states

FLUOROMETER FL 3500-F

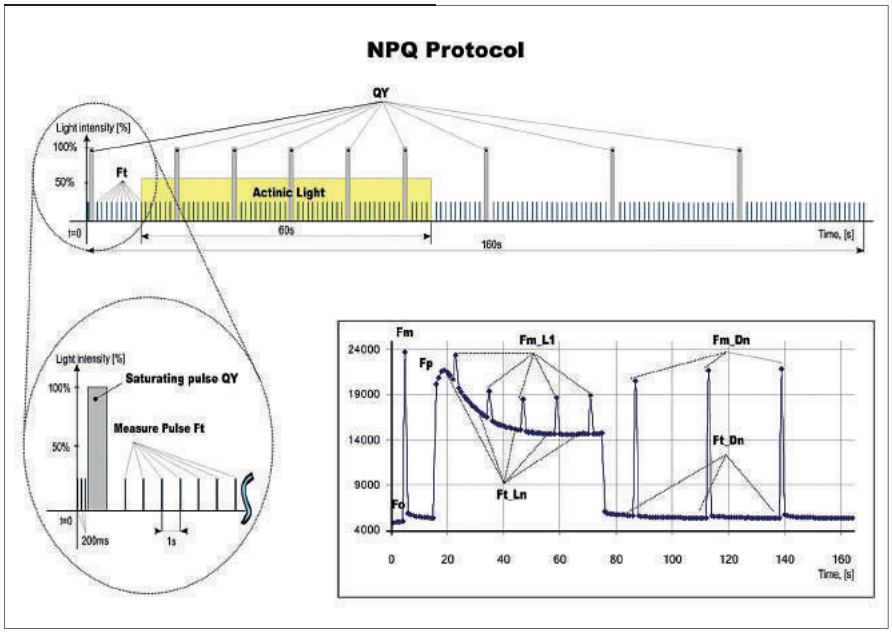
- Time resolution up to 1 µs
- Detection limit 1 mg Chl*a*/l
- Supported all standard protocols
- Special fluorescence protocol:
  - Flash Fluorescence Induction (FFI)

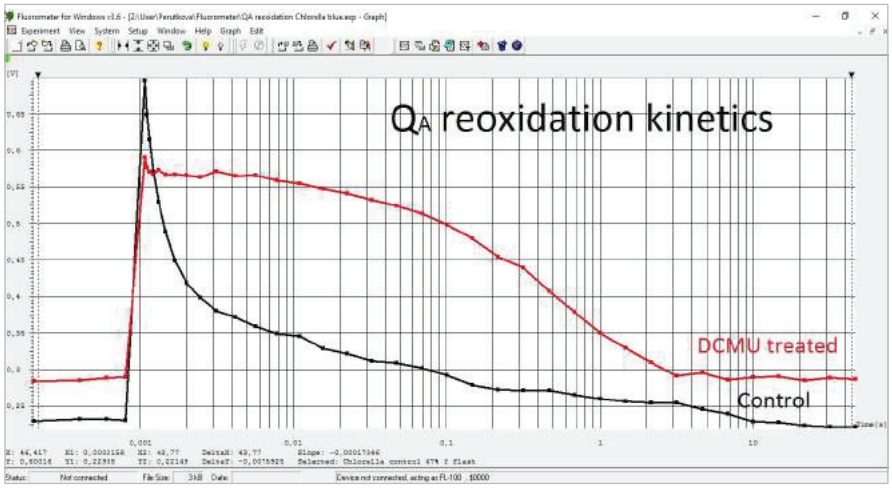
TECHNICAL SPECIFICATION

- **Measured fluorescence parameters:** F_0, F_M, F_V, F'_0, F'_M, F'_V, F_T
- **Light Sources:** 620 nm and 460 nm in standard versions; other wavelengths available
- **Single Turnover Flash:** 100,000 µmol.m^{-2}.s^{-1} (max. duration 150 µs)
- **Actinic Light Irradiance:** Up to 3,000 µmol.m^{-2}.s^{-1}
- **Custom-Defined Protocols:** Variable timing, special language and scripts
- **A/D bit Resolution:** 16 bit
- **Detector time response:** 1 µs (FL 3500-F), 4 µs (FL 3500-S)
- **Communication Port:** RS 232 with USB port converter
- **Control box FL 3500 dimension:** 29×20×11 cm
- **Measuring unit dimension:** SuperHead: diameter 16×6 cm;
- **Total weight:** Appr. 5 kg
- **Power Input:** 20 W
- **Electrical:** 90–240 V

SOFTWARE

- Creation and archivation of experimental protocols
- FluorWin Wizard for automated protocols
- Retrieval and export of experimental data
- Data manipulation and visualization
- Windows 7, or higher compatible





Algae Online Monitor

Algae Online Monitor (AOM) is a portable and robust device for online detection and continuous monitoring of photosynthetic microorganisms in both natural and artificial water bodies. It detects variety of cyanobacteria, green and brown algae, diatoms, and other photosynthetic microorganisms. Its **high sensitivity (30 ng Chl/l)** allows early detection of very low concentrations of these organisms.

APPLICATIONS

- Water treatment monitoring
- Early detection of potentially harmful algae blooms
- Effective control of water treatment chemicals

KEY FEATURES

- High sensitive, flow-through monitoring
- Detection limit 30 ng Chl/l
- Wide range of detected organisms: cyanobacteria, green and brown algae, diatoms, and other microorganisms
- Variable excitation colors
- Device modifications for phycoerythrin, bacteriochlorophyll or phycocyanin (optional)

VERSIONS

AOM 2800

- **2×16 characters LC display**

AOM 2700

- **without display**

MEASURED PARAMETERS

- **F_T:** Instantaneous Fluorescence
- **QY:** Quantum Yield
- **OJIP – Fix Area:** Total area above the OJIP fluorescence transient. This parameter correlates with total change of fluorescence signal in OJIP protocol, with total pigment content and hence with cell concentration.

TECHNICAL SPECIFICATION

- **Measured fluorescence parameters:** F_T, QY, OJIP – Fix Area
- **Detection Limit:** Algae – 10 cells/ml; Cyanobacteria – 100 cells/ml
- **Actinic and Saturating Illumination:** Adjustable from 0 to 3,000 µmol.m^{-2}.s^{-1}
- **Measuring Illumination:** Blue (455 nm) and Amber (590 nm) or Red (630 nm) measuring light adjustable by intensity
- **Detector Wavelength Range:** PIN photodiode with 660-750 nm bandpass filters
- **Sample Compartment:** Flow--through cuvette made of quartz glass (diameter 20 mm)
- **Software:** FluorPen 1.0
- **Communication:** Serial RS 232, RS 485
- **Memory Capacity:** 4 Mb – up to 100,000 data points (about 300 OJIP curves)
- **Power Supply:** 24 V (optionally 12 V)
- **Power Saving Mode:** Automatic
- **Case:** IP65
- **Dimensions:** 20×23×11 cm
- **Weight:** 3.4 kg

SOFTWARE

- Real-time data collection for online measurements
- Both internal data storage and external communication
- Data export to Excel for analysis or visualization applications
- Windows 7, or higher compatible

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