DATASHEET

MicroSTAF

Single Turnover Active Fluorometer

A new generation of instruments for the autonomous assessment of phytoplankton primary productivity

Chelsea Technologies

MicroSTAF is a deployable Single Turnover Active Fluorometer (STAF) based on Chelsea's established LabSTAF system. The high level of automation available with LabSTAF has made it the platform of choice for the continuous interrogation of phytoplankton photosynthesis through integration with ship-based underway systems and has been used to run tens of thousands of Fluorescence Light Curves (FLCs). STAF-based assessment of Primary Productivity by phytoplankton has significantly been improved by the incorporation of Photochemical Excitation Profiles (PEPs) and Dual Waveband Measurements (DWMs), which provide fully automated spectral correction and adjustment for the package effect, respectively.

MicroSTAF maintains the extreme sensitivity and high level of automation provided by LabSTAF in a compact, deployable, format with a typical power requirement of only 2 W (typical). It follows that MicroSTAF has the potential to further increase both spatial and temporal scales of measurement, through integration with Marine Autonomous Systems (MAS).

The MicroSTAF system includes a dedicated pump for automated sample exchange plus an optional Spectral PAR (SPAR) sensor. In addition to providing spectral PAR at the point of sampling, the SPAR sensor data are used to optimize the FLC protocol and apply real time spectral correction.

Key Features

- Windows 11-based graphic interface for protocol design and post-processing of data
- Programmable for autonomous sample acquisition and real time analysis
- Low power requirement of 2.7 to 4 W
- Real time, user-configured CSV output of processed data via RS232
- Internal logging of all primary data for post-processing
- Accurate measurements in extreme oligotrophic conditions
- Seven excitation wavebands for PEP-based spectral correction

Applications

- Deployable on a range of MAS, including surface AUVs, gliders and floats
- Continuous interrogation of phytoplankton photosynthesis and assessment of primary productivity
- Ground-truthing of satellite-based models of phytoplankton photosynthesis
- Monitoring phytoplankton bloom development and changes in community structure
- Real-time assessment of the impact of environmental change on photosynthesis

Specifications

MicroSTAF Instrument	
Limit of detection	Can resolve variable fluorescence (F_v) with an amplitude equivalent to the fluorescence signal generated under 452 nm excitation by 0.001 mg m^{-3} of chlorophyll-a
Excitation wavebands	Seven excitation wavebands, centred at: 416, 442, 468, 495, 520, 598 & 630 nm
Actinic light source	Collimated output from 10 to 2000 µmol photons m^{-2} s^{-1}
Dimensions	Ø 88 mm x 290 mm (excluding connector and sample chamber)
Mass	3.4 kg
Volume	1.8 L
Housing material	Grade 5 titanium
Depth rating	2000 m
Input voltage	9 - 12 VDV
Current requirement	180 - 350 mA at 12 V (typical)
Autonomous data output	RS232 or RS422 (115 kBd)

SPAR Sensor	
Spectral range	When attached to MicroSTAF, the SPAR sensor is used to assess PAR photon irradiance (400 – 700 nm) and PEP photon irradiance (380 – 660 nm). The PEP spectral output is also used to apply real time spectral correction at 10 nm resolution. The PAR and PEP photon irradiances are accurate to below 1 µmol photons m^{-2} s^{-1}. The full spectral range of the SPAR sensor is from 340 – 850 nm. Complete specifications for the SPAR sensor are provided in a separate document.
Dimensions	Ø 46 mm x 100 mm (excluding connectors)
Mass	0.4 kg
Housing material	Grade 5 titanium
Depth rating	2000 m
Input voltage	4-6 VDC
Power consumption	100 mA (typical) at 5 V
Data output	RS232 (115 kBd)

*In view of our continual improvements, the designs and specifications of our products may vary from those described

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