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WATER-PAM-II

Chlorophyll Fluorometer for Phytoplankton

High Quality Instrumentation for Plant Sciences

WALZ

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Chlorophyll Fluorometer for Phytoplankton

The WATER-PAM-II is next to PHYTO-PAM-II, the instrument of choice for phytoplankton analysis. It can be used for laboratory cultures as well as natural water samples when very low chlorophyll contents of samples require ultra-sensitive fluorescence detection.

The WATER-PAM-II is a portable cuvette system for analyzing the photosynthetic activity of a wide variety of phytoplankton samples. The lightweight instrumentcan be used in plenty of applications thanks to its large sensitivity spectrum, the ability to easily switch between red and blue light mode (measuring light and actinic light) and a variety of accessories such as a flow-through cuvette.

Request a Quote

WATER-PAM-II Video

With the WATER-PAM-II a detailed analysis can be made of the photosynthetic activity of phytoplankton samples, including quenching parameters. It can be used as a stand-alone instrument or connected to an external computer running WinControl-3 software. In addition to simple single measurements, analysis protocols such as induction curves and light curves can be performed with easy-to-use program routines.

A new feature of WATER-PAM-II instruments is the differential analysis of algal content, providing a tool to determine the composition of algae populations with respect to three algae groups (green algae, cyanobacteria and brown algae), based on differences in the F-spectrum of these algal groups. A deconvoluted/differential analysis of photosynthetic activity of mixed algal samples is provided by PHYTO-PAM-II instruments.

Design features of this very compact instrument:

- Integrated sunlight readable touchscreen enabling easy operation and providing numerical and graphical display of the measurements
- Practical power supply option: common, easily replaceable, off-the-shelf (rechargable) batteries (type AA)
- Energy-efficient LED light sources and storage capacity of 27 000 data sets permit long-term experiments in the field
- Highly sensitive photomultiplier detector with automatic overexposure protection for safe use even in sunny environments

Extensive set of accessories included: several cuvettes, a cuvette stand and the US-SQS/L Light Sensor for precise light calibration.

Accessories for WATER-PAM-II:

- WATER-II/S Stirrer (device controlled) to prevent settling of sample
- WATER-II/FT Flow-Through Cuvette and WATER-II/FT/I Pump Control 0-10 V for automated sampling
- BCS-9590 Barcode Scanner for an easy-to-use administration of measurements of labelled samples
- WATER-II/H Tripod Holder for WATER-PAM-II

Accessories for WATER-PAM-II

Flow-Through Cuvette WATER-II/FT

Cuvette holder made from black polyoxymethylene polymer (POM) with in-/out water tubing connectors. This cuvette can be easily mounted into the optical pathway of WATER-PAM-II instruments.

Tripod Holder for WATER-PAM-II WATER-II/H

WATER-PAM-II holder with 3/8 inch thread for tripod applications. Including a 6-fold cuvette rack and resting option for the stirrer

Barcode Scanner BCS-9590

The Barcode Scanner is the ideal add-on when many different samples are separately probed. Simply mark your samples by barcodes. Then, the BCS-9590 scanner writes for each saturation pulse analysis the sample ID into the memory of WATER-PAM-II or the report data in WinControl-3. The barcode scanner is connected to the COMP port of the WATER-PAM-II.

Controllable Stirring Device WATER-II/S

Instrument operated stirring device. Equipped with disposable perspex stirring paddles. The part is shipped with a set (10 pieces) of Stirring Paddles WATER-R.

Stirring Paddles WATER-R

Spare stirring paddles (10 pieces) for the Controllable Stirring Device WATER-II/S. With the WATER-II/S one set stirring Paddles WATER-R is delivered.

Quartz Glass Cuvette WATER-K

Round Quartz Glass Cuvette with 15 mm diameter for highly sensitive measurements of very dilute samples.

K5SET

Set of 5 standard glass cuvettes with low background noise for measurements of samples with medium algae concentrations. Not compatible with Flow-Through Cuvette PHYTO-II/FT.

Accessories for WATER-PAM - FIBER Version

Mini Quantum Sensor US-MQS/WB

The cosine-corrected US-MQS/WB serves for PAR measurement at sample level and for calibration of the internal actinic light list. PAR data are collected by the PAM-CONTROL unit. For detailed information on sensor properties see MQS-B.

Specifications for WATER-PAM-II

Optoelectronic Unit WATER-PAM-II
Measuring light: Blue (450 nm) and red (630 nm) LED, standard modulation frequencies 5 to 25 Hz, adjustable in increments of 5 Hz, and 100 Hz, measuring light PAR at standard settings = 0.05 µmol m^{-2} s^{-1}. For differential algae analysis auxiliary LEDs 520 and 660 nm.
Actinic light: Blue (450 nm) and red (630) LED as for measuring light, maximum actinic PAR = 3000 µmol m^{-2} s^{-1}, maximum PAR of saturation pulses = 6000 µmol m^{-2} s^{-1} adjustable in increments of 500 µmol m^{-2} s^{-1} expandable on request to 12000 µmol m^{-2} s^{-1} adjustable in increments of 1000 µmol m^{-2} s^{-1}
Far red light: Peak emission at 730 nm
Signal detection: Hamamatsu photomultiplier protected by long-pass and a short-pass filters
Cuvette holder: for 15 mm Ø cuvette, Perspex inlet for overspill protection, POM cuvette cover 35 mm high x 40 mm Ø
Data memory: Flash memory, 8 MB, providing memory for more than 27,000 saturation pulse analyses
Display: Backlit 160x104 dots (78 x 61 mm) transflective B/W LCD display with resistive touchscreen
Ports: PAR sensor, Temp, AUX1, AUX2, SYNC, Stirrer, CTRL1, CTRL2, COMP, EXT DC and USB
Power supply: 8 AA (Mignon) rechargeable batteries (Eneloop 1.2 V/2 Ah), providing power for up to 1000 yield measurements; 8 spare batteries, automatic power/off, battery charger (100 to 240 V AC, 50-60 Hz, 0.35 A) for 1 to 8 AA NI-MH batteries, 12 V 5,5 A power supply MINI PAM-II/N

Operating temperature: -5 to +45 °C (non-condensing)
Dimensions: 17.2 cm x 13.5 cm x 7.6 cm (L x W x H)
Weight: 1.5 kg (incl. battery)

Power Supply MINI-PAM-II/N
Input: 100 to 240 V AC, 50 to 60 Hz
Output: 12 V DC, 5.5 A
Operating temperature: -5 to +45 °C (non-condensing)
Dimensions: 13 cm x 5.5 cm x 3 cm (L x W x H)
Weight: 350 g including cables

Battery Charger 000190101101
Input: 100 to 240 V AC, 50 to 60 Hz
Output: 12 V DC, 1.0 A
Operating temperature: -5 to +45 °C (non-condensing)
Dimensions: 17.5 cm x 10.5 cm x 3 cm (L x W x H)

Weight: 300 g including cable

Software WinControl-3

Program: WinControl-3 System Control and Data Acquisition Program (Microsoft Windows 10 and 11) for operation of measuring system via PC, data acquisition and analysis. Not compatible with Windows 10 on ARM

Saturation Pulse Analysis: Measured: Ft, F_0, F_M, F, F_0' (also calculated), F_M'. PAR, Calculated: F_0' (also measured), F_V/F_M and Y(II) (maximum and effective photochemical yield of PS II, respectively), q_L, q_P, q_N, NPQ, Y(NPQ), Y(NO) and ETR (electron transport rate)

Fitting Routines: Differential algae analysis; two routines for determination of the cardinal points α, I_k and ETR_{max} of light curves

Programmed Features: light curve protocols; induction curve protocols; Actinic+Yield protocols; clock and batch file operation; automatic determination of signal offset and background fluorescence (e.g., originating from yellow substance) for all light intensities and all gain levels; automatic calibration of internal PAR using light sensor US-SQS/L

Communication Protocol: USB

Transport Case WATER-PAM/T

Design: Aluminum case with custom foam packing

Dimensions: 50 cm x 34 cm x 20 cm (L x W x H)

Weight: 3.8 kg

Accessories

Stirrer WATER-II/S

Design: Instrument operated stirrer with disposable perspex stirring paddles. Delivery includes a set (10 pieces) of Stirring Paddles WATER-R.

Dimensions: 71 mm x 30 mm (l x Ø)

Weight: 95 g

Stirring Paddles WATER-R

Design: Set of 10 perspex stirring paddle for WATER-II/S

Flow-Through Cuvette WATER-II/FT

Design: Cuvette holder made from black polyoxymethylene polymer (POM) with in-/out water tubing connectors (4 mm inner diameter; 6 mm outer diameter). The cuvette is mounted to the optical unit of the instrument using an adapter ring and two knurled screws.

Dimensions: : Ø 49 mm, with connectors and cuvette 64 mm x 74 mm

Weight: 150 g

WATER-II/H WATER-PAM-II tripod holder

Design: Tripod holder with 3/8 inch thread (without tripod). WATER-PAM-II mounting is secured with knurled screws. Side resting option for the stirrer and 6 cuvettes.

Dimensions: 24.5 x 13 x 4.5 cm

Weight: 312 g

Barcode Scanner BCS-9590

Design: Single-line handheld laser scanner with trigger button and 1 m, partially coiled, cord; to be connected to the Photosynthesis Yield Analyzer MINI-PAM-II or WATER-PAM-II. Bar codes are stored together with fluorescence data

Dimensions: 9 cm (max.) x 6 cm (max.) x 16 cm (max.) (L x W x H)

Weight: 335 g

Specifications for WATER-PAM FIBER Version

Emitter-Detector-Fiberoptics Unit (red) WATER-EDF1.5R

Design: Metal housing with LED array, photomultiplier, pulse signal preamplifier and cables connecting to photomultiplier (PM) and AUX output sockets of PAM-CONTROL unit.

LED Array: Two red measuring light LEDs (620 nm) and two red actinic light LEDs (635 nm), all equipped with a filter blocking radiation > 700 nm. 1 blue LED (460 nm) for selective excitation of photosystem I in cyanobacteria. Note: the blue LED of the WATER-EDF1.5R is controlled by the Far-Red LED switch in the WinControl-3 software. Actinic intensity up to 2000 µmol quanta m^{-2} s^{-1} of photosynthetically active radiation (PAR). Saturation pulse intensity up to 4000 µmol quanta m^{-2} s^{-1}.
Dimensions: 11.5 cm x 9 cm x 5.5 cm (L x W x H)
Weight: 550 g (incl. cable 0.6 m long)

Signal detection: Photomultiplier detector based on Photosensor Module H-6779-01 (Hamamatsu) with high red sensitivity; featuring pulse preamplifier and automatic overload switch-off; fluorescence detection at wavelengths > 710 nm

Fiber Optics: Three 1.5 mm diameter plastic fiber optics (lengths 200 mm, 600 mm, and 1200 mm) for connection with the emitter-detector box are supplied.

Dimensions: 11 cm x 9 cm x 8 cm (L x W x H)

Weight: 600 g (incl. cable 0.6 m long)

Emitter-Detector-Fiberoptics Unit (blue) WATER-EDF1.5B

LED Array: Two blue measuring light LEDs (460 nm) and two blue actinic light LEDs (460 nm). One far red LED (730 nm) for selective excitation of photosystem I in non-cyanobacterial photosynthetic organisms. Actinic intensity up to 2000 µmol quanta m^{-2} s^{-1} of photosynthetically active radiation (PAR). Saturation pulse intensity up to 4000 µmol quanta m^{-2} s^{-1}.

Signal detection: As Emitter-Detector-Fiberoptics Unit (red) WATER-EDF1.5R but fluorescence detection at wavelengths > 680 nm.

Other specifications: See Emitter-Detector-Fiberoptics Unit (red) WATER-EDF1.5R.

Compact Tripod ST-2101A

Height: Adjustable between 24 cm and 87 cm

Weight: 400 g

Accessory

Cosine Corrected Mini Quantum Sensor US-MQS/WB

Design: Cosine-response mini quantum sensor for selective measurement of photosynthetically active radiation (PAR, 400 – 700 nm) with Perspex diffuser disk as light entrance and signal amplifier box

Signal detection: High stability silicone photovoltaic detector with filter set providing equal response to photon fluxes across the PAR spectral range. The typical signal output of the detector is 2 µA / (1000 µmol m^{-2} s^{-1})

Temperature coefficient of photodiode: 0.01 %/K

Absolute calibration: ± 5 %

Angular dependence: error < 4 % between angles from -80° to +80° from normal axis

Immersion coefficient: Typically 1.32

Cable length: 3 m

Size: Height: 16 mm; diameter: 14 mm; Diffuser diameter: 5.5 mm

Weight: 32 g

Amplifier box: Two amplification ranges (0 to 1000 and 0 to 20,000 µmol m^{-2} s^{-1}, each range corresponding to 0 to 2.5 V DC). To be connected to the Leaf Clip Holder 2030-B port of the PAM-CONTROL unit. Power provided by the PAM-CONTOL unit. Dimensions: 5 cm x 3 cm x 5 (W x H x D). Weight: 200 g.