PRODUCT HIGHLIGHTS

NEW:
MULTI-COLOR-PAM

High Quality Instrumentation for Plant Sciences

WALZ
Mess- und Regeltechnik

MULTI-COLOR-PAM

Multiple Excitation Wavelength Chl Fluorometer

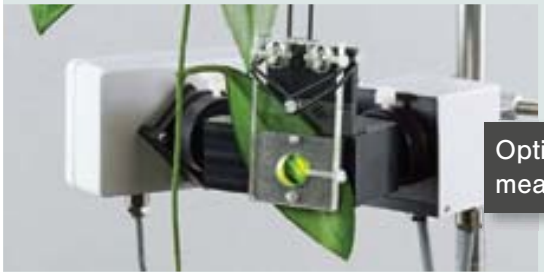
- Unprecedented range of colors of measuring and actinic light including white and far-red
- Highly sensitive analysis of dilute chloroplasts or cell suspensions
- Accessory for leaf studies including evaluation of epidermal UV-A screening
- Saturation Pulse analysis and Fast Kinetics recordings with 10 µs time resolution
- Highly accurate determination of effective PS II quantum yield even under severe light-stress
- Determination of functional PS II absorption cross-section and PS II turnover rates

Optical unit for suspensions

The **MULTI-COLOR-PAM** provides 6 colors of pulse-modulated measuring light (400, 440, 480, 540, 590 and 625 nm) and 5 colors of actinic light (440, 480, 540, 590, 625) plus white (420-640 nm) and far-red light (730 nm).

The various colors enable adaptation of excitation light to the spectral properties of the sample and to study various wavelength-dependent aspects of photosynthesis.

Spherical and flat cosine-corrected sensors are available for accurate PAR-measurements in suspension or at leaf surface, respectively. A special routine is provided for measuring PAR-lists of all colors.



Optical unit for leaf measurements

GFS-3000

Portable Gas Exchange Fluorescence System

- Integrated H_2O control for drying and humidifying (0 to nearly 100% rh)
- Integrated CO_2 control (0 to 2000 ppm)
- Powerful temperature control
- Special cuvettes and measuring heads
- Simultaneous chlorophyll fluorescence measurements
- New: color screen, well readable in sunlight
- New: broad range of input voltages allowed (12 - 24 V)

The **GFS-3000** is a high-precision gas exchange and chlorophyll fluorescence measuring system. The GFS-3000 includes full control of CO_2 and H_2O concentration, cuvette or leaf temperature, ventilation and light.

Integrated fluorometer available: **LED-Array/PAM** for up to 8 cm^2 sample area, or **Fiberoptics-PAM** for measurements in ambient light.

New: color screen

The system now comes with a color screen (10 cm x 13 cm) and accepts USB-memory sticks for data storage. It now can be powered with a wide range of DC input voltages (12 - 24 V). Upgrading of older instruments is possible.

The GFS-3000 can be combined with complete PAM systems for simultaneous measurements: **IMAGING-PAM** or **DUAL-PAM-100**.

Gas exchange with fluorescence imaging

IMAGING-PAM *M-Series*

Chlorophyll Fluorescence System

- From intact leaves to single cells using the same Multi Control Unit
- MAXI-, MINI- and MICRO-SCOPY-versions for fluorescence imaging of largely different sample areas ranging from 10 x 13 cm to 130 x 150 µm
- Images of Fo, Fm, Fm', ΔF/Fm', NPQ, absorbed PAR, rel. rate of photosynthesis, rel. inhibition, etc.
- Major applications in Phytopathology, Plant Molecular Biology, Limnology, Agriculture, Monitoring of Phytotoxicity

Mini-version

The ***M-Series*** family of **IMAGING-PAM** chlorophyll fluorescence imaging systems covers a wide range of applications. Large sample areas exceeding multiwell plate format can be imaged as well as microscopically small samples at the level of single cells. **MAXI-, MINI-** and various **MICROSCOPY**-versions are available, based on the same Multi Control Unit.

Measuring heads can be also equipped with special LEDs and filter sets, e.g. for excitation of cyanobacteria Chl and imaging of GFP fluorescence.

A special RGB-Head for microscopy applications is available that allows differentiating between cells of green algae, diatoms, cyanobacteria etc.

Mini-version combined with GFS-3000

PAM-2500

Portable Chlorophyll Fluorometer

- For basic/applied research and plant screening
- Powerful illumination system featuring red, blue, far-red light and single/multiple turn-over flashes
- Fully computer controlled; optional ultra-mobile PC for touch screen operation
- User-friendly and versatile PamWin-3 software for quenching analysis, slow/fast kinetic recordings, and light curves
- Optional accessories for algae and cyanobacteria

The **PAM-2500** Portable Chlorophyll Fluorometer is the successor of the renowned PAM-2000/2100 instruments which were introduced in the 1990s as the first portable PAM fluorometers. In the development of the PAM-2500, particular care was taken to maintain all properties appreciated by PAM-2000/2100 users and, at the same time, to integrate state-of-the-art technology.

Major innovations

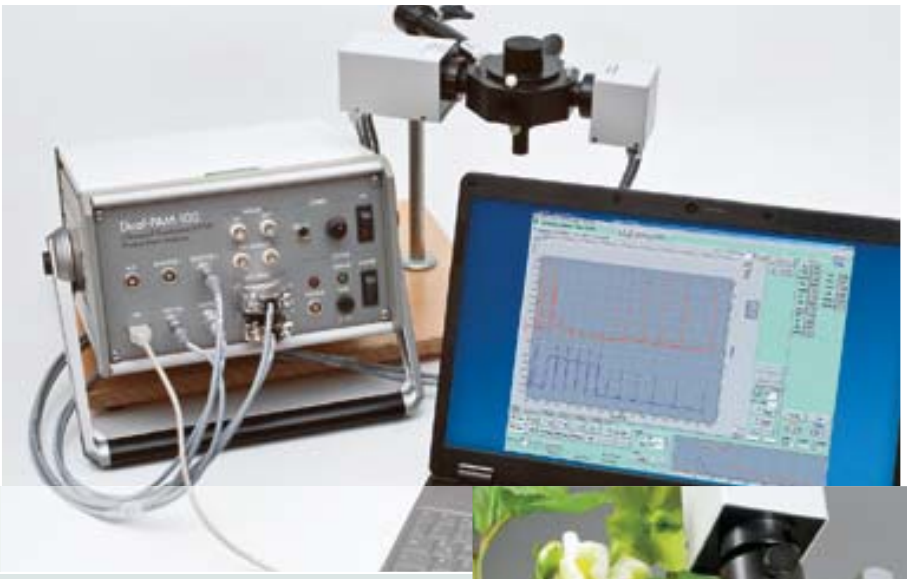
Consistent use of LED technology for saturation pulses, actinic light, single and multiple turnover flashes.

Time resolution down to 10 µs. Significantly improved sensitivity for high quality measurements even with critical samples (e.g. low Chl content).

DUAL-PAM-100

P700 & Chlorophyll Fluorescence System

- Simultaneous measurements of Chl fluorescence and P700 absorbance changes due to innovative dual-channel modulation technique
- Fiber version available
- Integrated red, blue, and far-red actinic illumination. Saturating single turnover and multiple turnover flashes
- Dedicated DualPAM software featuring numerous automated measuring routines
- Saturation pulse method for simultaneous assessment of PS I and PS II quantum yields
- Optional emitter-detector heads for measuring additional photosynthetic parameters (ΔpH, NADPH, P515 etc.)

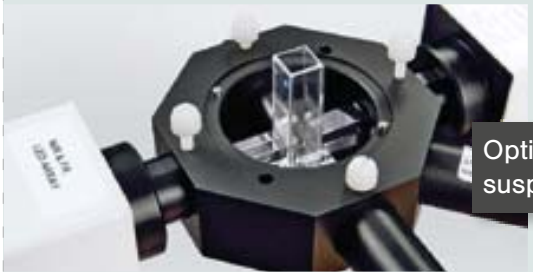


Leaf holder

The **DUAL-PAM-100** may serve for advanced analysis of photosynthesis parameters in intact leaves and suspensions of algae/cyanobacteria/isolated chloroplasts. PS I is assessed *via* dual-wavelength P700 measurements (830 vs. 870 nm absorbance) using essentially the same saturation pulse method as for assessment of PS II *via* Chl fluorescence.

All light sources are integrated in an extremely compact optical system and controlled *via* the dedicated DualPAM windows software with 2.5 µs resolution.

Preprogrammed measuring routines allow complex protocols to be carried out reproducibly even by non-experts.



Optical unit for suspensions

JUNIOR-PAM

Teaching Chlorophyll Fluorometer

- Best price-performance ratio of all PAM fluorometers
- Well suited for teaching classes and workshops
- Blue measuring/actinic light and saturation pulses. Far red illumination
- Controlled and powered by PC *via* USB cable
- Simplified Teaching Edition of the WinControl-3 research software to assist teaching in elementary courses

The **JUNIOR-PAM** Teaching Chlorophyll Fluorometer replaces the Walz Teaching-PAM (PAM-200/210) which, in the 1990s, carried PAM fluorometry into university classrooms.

Thanks to the latest progress in LED and PC technology, the JUNIOR-PAM is outstanding in terms of quality, versatility and compactness.

The JUNIOR-PAM detects with high selectivity the fluorescence excited by pulse-modulated measuring light: ambient continuous light does not disturb the signal.

The WinControl-3 software executes saturation pulse quenching analyses and automatically calculates various fluorescence ratio parameters. Routines for measuring standard dark-light induction curves and light curves are provided. Batch-file programming allows reproducible execution of sophisticated experimental protocols.

MONITORING-PAM

Multi-Channel Chlorophyll Fluorometer

- Specially developed for long-term monitoring of chlorophyll fluorescence
- Parallel operation of up to 7 measuring heads using the stand-alone Data Acquisition System MONI-DA
- Powered by battery and solar panels
- Robust and waterproof components for unattended operation in the field
- Submarine version available
- Optional data transfer via telephone modem or satellite phone

The ONLINE version of the **MONITORING-PAM** system simply requires an interface box for data acquisition by a Windows PC running the WinControl-3 software.

At remote places, when line current is unavailable, the MONITORING-PAM Data Acquisition System (**MONI-DA**) allows battery-operated fluorescence monitoring.

MONI-DA

Measurements over extended time periods can be achieved using solar panels connected to the MONI-DA.

A special leaf-holder with a white diffuser serves for detection of light intensity at leaf level. In this way, PAM fluorescence data can be transformed in relative electron transport rates to provide reliable information on the long-term photosynthetic performance of plants in their natural environment.

PHYTO-PAM

Phytoplankton Analyzer

- Providing four parallel signals with 470, 520, 645 and 665 nm excitation
- Extreme sensitivity down to 0.1 µg Chl a/l
- Differentiating between green, blue-green and brown algal groups
- Assessment of effective quantum yield
- Automated recordings of light response curves
- Different measuring heads for laboratory and field

PHYTO-ED

The **PHYTO-PAM** is a 4-wavelength chlorophyll fluorometer which can differentiate between the contributions of green algae, diatoms and cyanobacteria. It not only measures chlorophyll content, but also photosynthetic performance by assessment of quantum yields, relative electron transport rates and light response curves.

The standard version of the PHYTO-PAM features a modular Optical Unit, which is best suited for basic research in the laboratory.

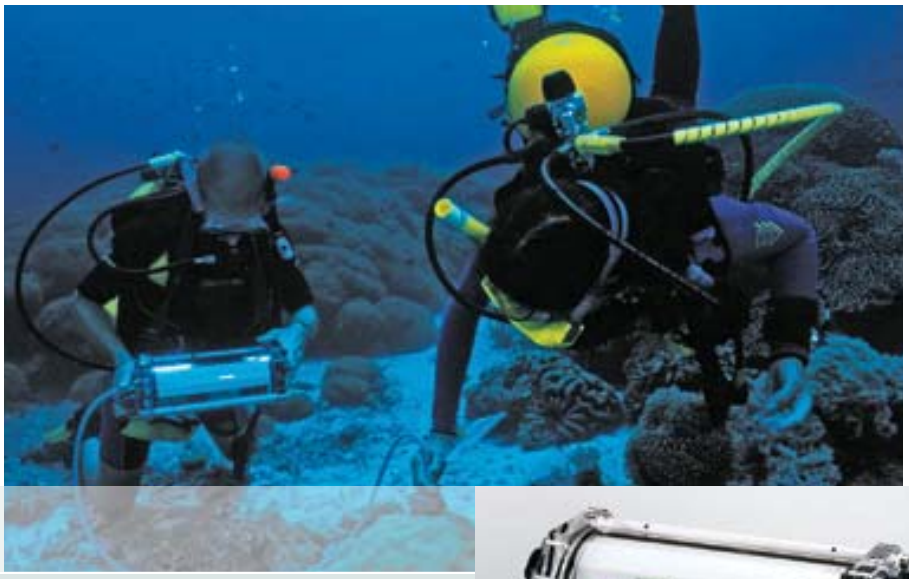
For phytoplankton field work the compact Emitter-Detector Unit **PHYTO-ED** is recommended. The Emitter-Detector Unit **PHYTO-EDF** features fiberoptics and is well-suited for studies of periphyton and microphytobenthos.

PHYTO-EDF

DIVING-PAM

Underwater Chlorophyll Fluorometer

- Safe operation down to 50 m depth
- Special Windows-software provided for data analysis
- Wide spectrum of chlorophyll fluorescence quenching analysis
- Automated recordings of light response curves
- Integrated water temperature and depth sensors
- External fiber quantum sensor
- Versions with 470 nm or 650 nm excitation available



The **DIVING-PAM** is a world-wide unique instrument for studying *in situ* photosynthesis in underwater plants, including macroalgae, sea grasses and corals. It opens the way for a profound analysis of these organisms under natural conditions.

Such analysis profits from considerable experience gained during the past 25 years from chlorophyll fluorescence studies of terrestrial plants with the standard PAM fluorometers.

Heinz Walz GmbH
Eichenring 6 · 91090 Effeltrich · Germany
Tel.: +49-(0)9133/7765-0 · Fax: +49-(0)9133/5395
E-mail: info@walz.com · Internet: www.walz.com

2.141/06.2012 · Subject to change without prior notice