

2. General Information

AquaPen is a portable, battery-powered device that measures photosynthetic parameters in algal or cyanobacterial suspensions. Due to its **ultra-high sensitivity - up to 10 ng Chl/l**, the AquaPen can be effectively used for measurements in natural water samples containing low concentrations of phytoplankton.

AquaPen-P AP-P 100 measures samples via an optical probe. It is equipped with a **blue** measuring light that suits investigations in algal suspensions.

AquaPen-C AP-C 100 measures samples that are placed in a cuvette. It is equipped with **red** and **blue** measuring lights and can thus perform measurements both in algal and cyanobacterial suspensions.

The AquaPen device measures the following chlorophyll fluorescence parameters:

Ft - Instantaneous Chlorophyll Fluorescence

Ft is equivalent to Fo if the sample is dark-adapted.

QY - Quantum Yield

QY is a measure of the Photosystem II efficiency. In a dark-adapted sample this is equivalent to Fv/Fm. In a light-adapted sample it is equivalent to Fv'/Fm'.

OD - Optical Density*

Optical density at 680 nm represents light scattering and chlorophyll absorption. Optical density at 720 nm represents light scattering.

NPQ - Non-Photochemical Quenching

The NPQ protocol is the most typically used measuring approach to quantify photochemical and non-photochemical quenching. The measurement should be performed with a dark-adapted sample (see more in Chapter 8.D. of this Manual).

OJIP - Chlorophyll Fluorescence Induction Kinetics

The OJIP curves enable observing major changes that occur during exposure of a sample to high irradiance (see more in Chapter 8.C. of this Manual).

Light Curve

The LC 1 and LC 2 protocols serve to describe adaptation of Quantum Yield to six different light levels (see more in Chapter 8.E. of this Manual).

** Optical density is defined as*

$$OD = -\text{Log}(I/I_0),$$

where "I₀" is the irradiance that is transmitted through the cuvette filled with medium without algae or cyanobacteria. This quantity must be measured as the reference. "I" is the irradiance transmitted through the cuvette with algal or cyanobacterial suspension in which the OD is measured. "Log" is the decadic logarithm of the I/I₀ ratio.

Thus, the optical density OD=1 means that the light at the respective wavelength is attenuated by the algae or cyanobacteria 10 times relative to the reference. With OD=2, the attenuation relative to the reference is 100 times.

Optical density is measured only in the cuvette version – in AquaPen-C AP-C 100.