



NEPHELOstar

Laser-based Microplate Nephelometer



NEPHELOstar - the unique laser-based microplate nephelometer

The NEPHELOstar is the world's first and only laser-based microplate nephelometer for measuring turbidity or solubility of a sample in native microplate based environments, even up to 384-well formats.

Flexibility

The NEPHELOstar microplate nephelometer detects particles in liquid samples by measuring forward scattered light when a laser beam is directed through the solution. This scattered light is detected at angles up to 80 degrees, making it approximately thirty times more sensitive than traditional transmission readers that measure the reduction in direct light passing through a sample well.

The key feature of the NEPHELOstar is the robust optical system employing a self-monitoring laser diode that offers adjustable intensity and beam diameter. These features permit the user to reduce meniscus effects and optimize sensitivity, even allowing for measurements to be performed in 384-well plate format.



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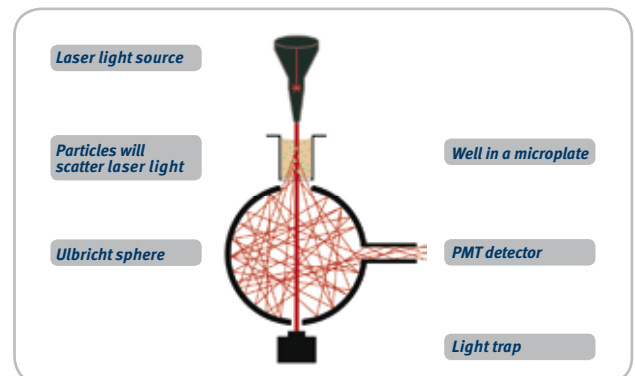
Furthermore, the NEPHELOstar samples are measured directly in the microplate well meaning there is no need to transfer samples to a measurement cell as in other systems. 96-well plates can be read in as little as 23 seconds, while 384-well plates can be read in approximately 66 seconds.

Up to three optional on-board reagent injectors, precise temperature control, multi-mode shaking capabilities, automatic gain adjustment, Stacker plate handler, and a robotic plate carrier further enhance instrument flexibility.



Optical Design

The high-intensity light source of the NEPHELOstar is a laser diode (at 635 nm) with a highly collimated beam. The laser beam passes through the sample well into an Ulbricht sphere scattered light detector. If the light is not deflected by particles, it passes straight through the sphere and no signal is generated. If particles are present in the sample, the light is scattered and reflected around the interior of the sphere and ultimately detected by the photomultiplier tube (PMT) and the signal measured.



In liquid solutions, the relationship between the concentration of scattering particles and scattered light intensity is linear over a wide range of concentrations. An exclusive feature of the NEPHELOstar is the ability to adjust the laser intensity and the beam width for best performance. With a narrow beam width, liquid surface effects such as a strong meniscus can be reduced.



Liquid Handling

All three precision syringe injectors have direct access to the measurement position, allowing injection of reagents and plate reading simultaneously. The software gives complete control over injection timing and pump speed.



...up to three reagent injectors, programmable with individual injection volumes for each well

The three injectors have a delivery volume of 3 to 350 μL (in 96-well plates), adjustable in 1 μL increments, and can be used for injecting up to three different reagents.

Stacker and Robot Compatibility

If you have medium level throughput needs for your NEPHELOstar, BMG LABTECH offers the 50 plate Stacker that can be equipped with a barcode reader. For even higher throughput, BMG LABTECH microplate readers can be integrated into many types of robotic systems.



...automated plate handling with Stacker

Control and Evaluation Software

Windows™ based PC software provides an extensive range of options for assay design and data evaluation. During plate measurement, the Current State feature can be used to observe kinetics in any well. The evaluation part of the software is based on powerful Excel™ macros with built-in solubility point determination. Worksheets are provided for raw data display, calculations, signal plots, and standard curves. In addition, you can create your own workbooks for specific assays and evaluation methods.

Applications

The flexibility and performance of the NEPHELOstar allows more applications to be adapted to microplate-based laser nephelometry than ever before:

- Drug solubility determinations**
- Bacterial and fungal growth kinetics**
- Determination of precipitation of particles in solution (e.g. immunoprecipitation, protein precipitation)**
- Quantification of macromolecules (e.g. polymerization)**
- Automated Drug Solubility Screening**

Determining aqueous compound solubility has become an essential early measurement in the drug discovery process to avoid time-consuming and costly ADME screens of low solubility compounds. Developed to meet high-throughput demands, the NEPHELOstar offers HTS/drug screening laboratories a fast and simple method for checking compound solubility, which can be fully automated. The nephelometric method has been shown to produce results equivalent to those produced by an HPLC method and to be largely unaffected by colored solutions.
- Microbial Growth Kinetics**

Continuous nephelometric monitoring of changes in the optical density can be used to test antimicrobial drugs and their effects on turbidimetric growth curves. Among various parameters of the growth curves, the duration of the lag phase is strongly affected by the presence of antimicrobial drugs. Using the NEPHELOstar instead of a traditional photometer this early part of the growth curve can be monitored much more exactly. Featuring additional precise temperature control and multi-mode shaking capabilities, the instrument is a perfect tool to study microbial growth.
- Quantification of Proteins**

In clinical chemistry immunonephelometric assays are used to determine the concentration of serum immunoglobulin (IgA, IgG, IgM), complement components (C3, C4), acute phase reactant proteins (CRP, transferrin), albumin, and α -1-antitrypsin. Protein precipitation of globular proteins refers to the formation of protein aggregates by adding e.g. salt or organic solvent in contrast, immunoprecipitation allows a given protein to be precipitated selectively via an antibody-antigen reaction.
- Monitoring of Polymerization**

In organic chemistry, nephelometry is used to quantify macromolecules, e.g. monitoring of a polymerization reaction.

The NEPHELOstar's unique combination of features is ideal for all four application areas.

NEPHELOstar - Technical Specifications

Due to the modularity of BMG LABTECH's instruments, all or combinations of the features below can be installed at purchase or upgraded at any time. Please contact your local representative for more details or a quote.

Detection Mode	Nephelometry
Measurement Modes	Endpoint and Kinetic measurements
Microplate Formats	Up to 384-well plates
Light Source	Self-monitoring laser diode Wavelength 635±10 nm Stability <0.2% deviation Lifetime 20,000 hours Output: 1 mW Selectable beam width: 1.5 to 3.5 mm Selectable Intensity 0-100% Scattering angle: Detects up to 80° full cone angle
Detectors	Side window photomultiplier tube
Sensitivity	Depends on particle size and liquid properties Silica detection (particle size 0.5 to 10 µm) 800 nM Dynamic Range: 5 decades Maximum measurement value (1s= 500,000 Relative Nephelometry Units)
Read Times	Depend on assay conditions and liquid surface stability 23 s (96), 66 s (384)
Reagent Injection	Up to 3 built-in reagent injectors Injection at measurement position (6 to 384-well) Individual injection volumes for each well (3 to 350 µL) Variable injection speed up to 420 µL / s Up to four injection events per well Reagent back flushing
Shaking	Linear, orbital, and double-orbital with user-definable time and speed
Gas Vent	System to inject an atmosphere or to pull a vacuum into the reader
Incubation	+5°C above ambient up to 38°C
Software	License-free software package including Reader Control and MARS Data Analysis Software
Dimensions	Width: 44 cm, depth: 48 cm, height: 33 cm; weight: 25 kg
Accessories	
Stacker	Magazines for up to 50 plates - continuous loading feature
THERMOstar	Microplate Incubator and Shaker



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