FLUOstar® Omega

The Microplate Reader
for life science research

BMG LABTECH

The Microplate Reader Company

The multi-mode microplate reader for life science research

The FLUOstar® Omega represents the best combination of performance and flexibility for all of your life science and R&D applications. Using BMG LABTECH's unique Tandem Technology, it provides the perfect platform for a wide range of applications in basic research, life science studies, and assay development.

Flexibility

Backed by German engineering and technology, the FLUOstar Omega is a versatile, automated microplate reader offering the following detection modes:

- Ultra-fast UV/vis absorbance spectra or filter-based absorbance
- Fluorescence intensity, including FRET
- Time-Resolved Fluorescence (TRF)
- Time-Resolved FRET (TR-FRET)
- Luminescence (flash & glow), including BRET
- AlphaScreen®/AlphaLISA®

With its ability to capture fast, full UV/vis absorbance spectra; to monitor rapid and slow kinetic reactions; and to perform FRET, BRET, TR-FRET and AlphaScreen®/AlphaLISA® detection, the FLUOstar Omega fulfills all research needs.
Top and bottom plate reading, multi-color detection, well scanning, precise temperature control, multi-mode shaking, and a gas vent all enhance the flexibility of the FLUOstar Omega. The addition of onboard "smart" injectors provides the ability to dispense reagents and initiate kinetic reactions. The FLUOstar Omega reads all plate formats from 6- to 1536-well in absorbance and up to 384-well in all other detection modes.

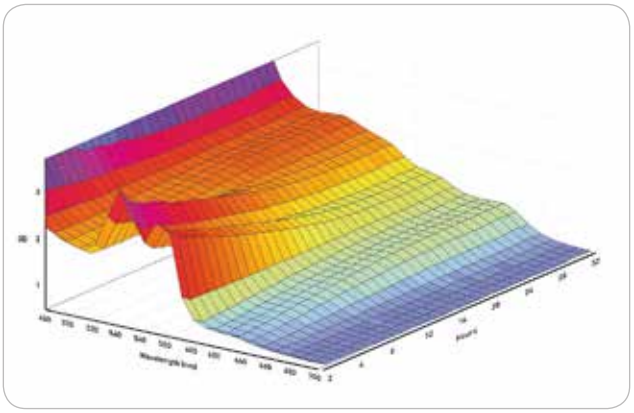
Tandem Technology

The FLUOstar Omega multi-detection microplate reader is built upon BMG LABTECH's unique Tandem Technology. This is a combination of two technological concepts – an ultra-fast, full spectrum absorbance spectrometer, and extremely sensitive filter-based detection, with advanced optics and a photomultiplier tube to provide superior sensitivity for all detection modes. For the first time, spectrometer-based absorbance measurements with a resolution of 1 nm can now be performed in a multimode

microplate reader. Alternatively to the spectrometer, filter-based absorbance detection is available as well.

Spectrometer-based detection

The FLUOstar Omega is the first multimode plate reader to use a CCD spectrometer for absorbance measurements. This new technology can capture a full UV/vis absorbance spectrum from 220 to 1000 nm at resolutions from 1 to 10 nm. A full absorbance spectrum can be measured as quickly as one second per well, which is significantly faster than other current microplate reader methods. Alternatively, up to eight wavelengths can be measured simultaneously in a single pass with no wavelength switching.



Time-dependent change in haemoglobin absorbance spectrum in the presence of N.nigricollis venom.

Filter-based detection

For fluorescence and luminescence assays, filters provide precise and superior performance for both sensitivity and selectivity. In fluorescence and luminescence modes, the fast filter switching capability of the FLUOstar Omega allows the use of multi-excitation and multi-emission applications, such as FRET, BRET, FURA-2 and other ratiometric methods. Filters offer more light transmission and excellent blocking of undesired wavelengths, higher sensitivity, precise control over transmitted peak shape, and fast switching between wavelengths when more than one filter pair is employed. Filters are the most technically preferred and most cost-efficient technology in fluorescence- and luminescence-based detection. BMG LABTECH offers a wide range of assay-specific filters from UV to NIR with various bandwidths.

Advanced Time-Resolved Fluorescence

For superior TRF and TR-FRET detection, the FLUOstar Omega can also be equipped with an advanced TRF optic head. Assays such as HTRF®, LANCE®, Delfia®, and LanthaScreen® can now be performed with outstanding sensitivity. Combined with the high intensity xenon flash lamp, assay-optimized filters and adjustable gain, the advanced TRF optic head allows the FLUOstar Omega to outperform any microplate reader in its class.

AlphaScreen®/AlphaLISA®

BMG LABTECH's engineers have developed a specialized optical system for the FLUOstar Omega to read AlphaScreen®/AlphaLISA® assays without having to use an expensive laser as a light source. For the first time, users can experience fantastic AlphaScreen®/AlphaLISA® performance normally only available on more costly microplate readers.

High-performance luminescence

The FLUOstar Omega has been designed with a dedicated luminescence detection system for both flash and glow based assays. It offers exceptional luminescence performance that exceeds Promega's stringent Dual Luciferase® Reporter validation criteria for the DLReady™ certification in both 96- and 384-well plate formats.

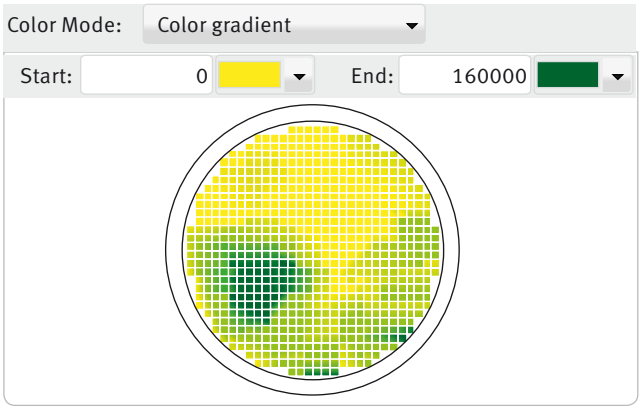
Advanced reagent injection and detection

Two precise onboard injectors with an exceptional low dead volume allow simultaneous reagent injection and detection. Users can adjust all parameters, such as injection speed, timing, shaking and the number of injections per well. Delivery volumes are adjustable for each well, so dilution schemes and concentration gradients can be automatically produced across the microplate. The injectors are readily accessible and are housed within the instrument to safeguard any light sensitive reagents.

Endpoint, slow and fast kinetics

Kinetic data can be collected as fast as 50 reading points per second or as slow as one measurement every 2.5 hours. Users can capture, for example, a fast calcium signal that

happens in seconds, or measure bacterial growth over a period of days. Data can also be collected at different rates within the same experiment, allowing users to collect more data when it is needed and less when it is not. Kinetic events can be conveniently initiated using the onboard reagent injectors.



Well Scanning of GFP-expressing protoplasts. The well scan shows not evenly distributed protoplasts (green colour) in the well.

Well scanning and orbital averaging

The FLUOstar Omega can easily handle nonhomogeneous samples such as adherent cells by taking multiple measurements in each well with up to 900 data points/well. The software displays each scan point graphically.
Another way to measure nonhomogeneous well content is BMG LABTECH's unique orbital averaging feature. This allows several measurements over a defined orbit, to collect data and to calculate an average for each well.

Control and MARS data analysis software

The FLUOstar Omega multi-user software package provides an extensive range of possibilities for both test protocol definitions and data analysis, and is fully compliant with FDA regulation 21 CFR part 11.
The user-friendly interface of the control software has definable assay buttons for favorite applications. Just one click and the measurement begins.
Well organized, versatile, easy to use and powerful are just a few of the ways the MARS data analysis software package is described by users. Data can be processed with powerful predefined templates or by using an extensive range of data calculation features. There are automatic calculation for enzymatic parameters (Michaelis-Menten or Lineweaver-Burk equations), as well as many standard curve fitting algorithms to calculate for example EC_{50}, IC_{50}, and r^2 values:

- Linear regression
- 4- and 5-parameter
- Hyperbola
- Segmental regression
- Cubic spline
- 2^{nd} and 3^{rd} polynomial
- User-defined fit

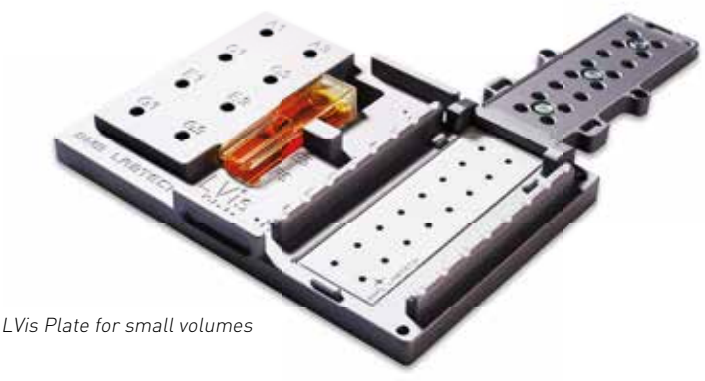
Stacker and robot compatibility

BMG LABTECH's standardized reader footprint and robotic software interface allow for easy integration into all robotic platforms. For medium level throughput, the 50-plate Stacker with an integrated barcode reader is also available.

LVis Plate accessory

BMG LABTECH's LVis Plate is perfect for low-volume DNA/RNA/protein quantitation, cuvette-based measurements, and quality control checks.
The LVis Plate has the following outstanding features:

- Sixteen microdrop well sites for 2 µL samples
- Horizontal position for a standard cuvette
- Left and right handed 8-channel pipette tip rest
- Quick-clean surface for repeat measurements
- Optional NIST-traceable O.D. filters and holmium oxide filter to assess instrument reproducibility and wavelength accuracy



LVis Plate for small volumes

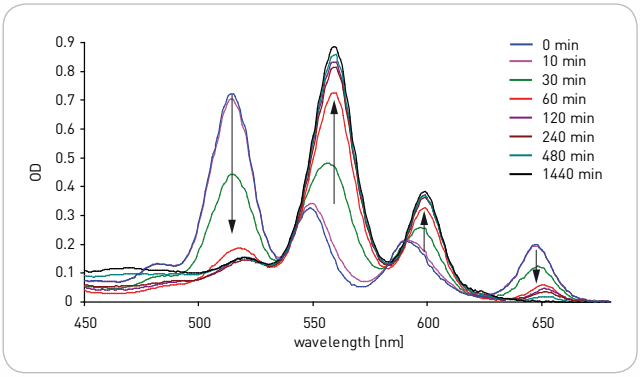
Applications center

The FLUOstar Omega has been cited in numerous publications, all of which clearly illustrate it's versatility. A wide range of applications are possible, including:

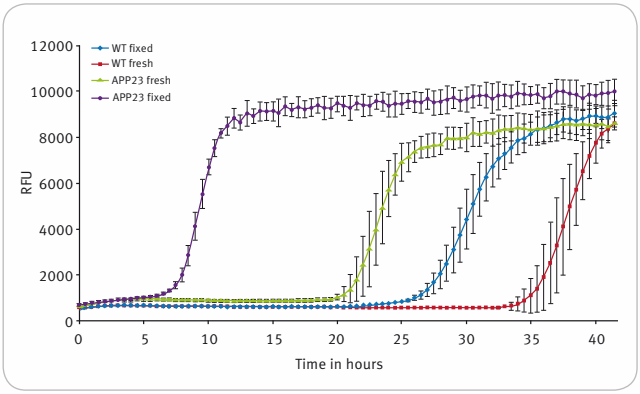
- Biomolecular interaction assays
- Cell-based assays
- Binding assays
- Enzyme activity assays
- Quantification assays

The FLUOstar Omega's versatility and flexibility are illustrated by the following examples:

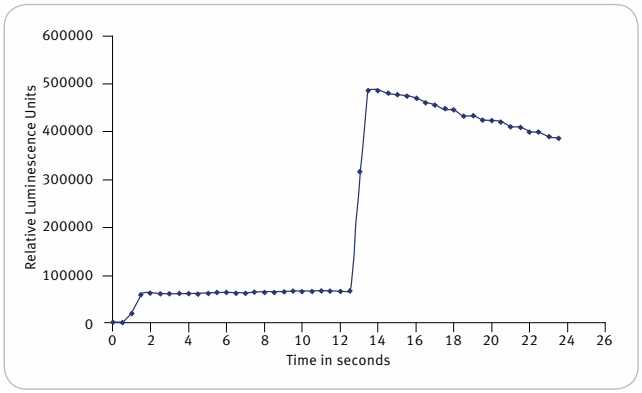
- Kinetic studies on the metallation of porphyrin
- Fluorescence-based detection of Aβ amyloid fibril formation
- DLR™ assay to monitor early stage replication events of Hepatitis C virus (luminescence)



Changes in visible spectrum accompanying zinc metallation of TPP. Arrows indicate the evolution of the absorption bands with time.[1]



Signal curves for samples containing either fixed or fresh-frozen wild type or APP23 brain homogenates. Error bars represent deviation of replicate wells within one plate from mean.[2]



Signal curve for the DLR™ assay. The substrate for the Firefly luciferase was injected after 1 second, whereas the substrate for the Renilla enzyme was injected after 13 seconds.[3]

BMG LABTECH continuously works with all major reagent companies to develop protocols and to optimize instrument settings for their existing assays and their newest kits. The FLUOstar Omega is certified for the following assays:

Visit BMG LABTECH's Applications Center online to download all the leading application notes and peer-reviewed papers.

BMG LABTECH's searchable applications database provides the expertise expected from a dedicated microplate reader company. With well over 4,000 published entries of scientific posters and peer-reviewed papers, there is extensive information on how to perform countless applications with our microplate readers.

Support and training

BMG LABTECH operates globally through an extensive network of subsidiaries and well trained distributors. Customers can rely on PhD level support and assistance with regard to software, assay development, or general enquiries related to the FLUOstar Omega and all other BMG LABTECH microplate reading solutions.

[1,2,3] The graphs were taken from BMG LABTECH's application notes AN 178, AN 250 and AN 172.

FLUOstar® Omega - 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 modes	Fluorescence intensity - including FRET AlphaScreen®/AlphaLISA® Luminescence (flash and glow) - including BRET Time-Resolved Fluorescence - including TR-FRET UV/vis absorbance	
Measurement modes	Top and bottom reading Endpoint and kinetic Sequential multi-excitation Sequential multi-emission Ratiometric measurements Well scanning	
Microplate formats	Up to 384-well plates, 1536-well plates in absorbance, user-definable	
Light source	High energy xenon flash lamp	
Detectors	Side window photomultiplier tube	
Optical filters	Excitation and emission filter wheels for 8 filters each	
Spectral range	240 - 740 nm or 240 - 900 nm Absorbance spectrometer: 220 - 1000 nm	
Sensitivity	FI	< 0.2 fmol/well fluorescein
	TRF	< 30 amol/well europium
	High-end TRF for Omega	< 3 amol/well europium
	LUM	20 amol/well ATP DLReady™ certified
	AlphaScreen®	< 100 amol* (384)
	Abs with spectrometer	Spectral range: 220 - 1000 nm Full spectrum captured in < 1 s/well Selectable spectral resolution: 1 - 10 nm OD range: 0 to 4 OD Accuracy: < 1% at 2 OD Precision: < 0.5% at 1 OD and < 0.8% at 2 OD
Read times	Flying mode: 9 s (96), 16 s (384)	
Reagent injection	Up to 2 built-in reagent injectors Injection at measurement position (6 to 384-well) Individual injection volumes for each well (3 to 500 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	+4°C above ambient up to 45°C or 65°C	
Software	Multi-user software package including Reader Control and MARS data analysis software	
Dimensions	Width: 44 cm, depth: 48 cm, height: 30 cm; weight: 28 kg	
Accessories		
Stacker	Plate handler for up to 50 microplates - continuous loading feature	
THERMOstar	Microplate incubator and shaker	
LVis Plate	Microplate designed to measure 16 low volume (2 µL) samples and standard cuvettes. Incorporating NIST filter and holmium oxide standards for instrument performance test. Sensitivity: 2 ng/µL dsDNA	
Filters	Optimized for dyes, fluorophores and specific assays Filters for all applications from UV to NIR Customized filters available upon request	
Upgrades	Upgrades to include options such as additional detection modes, reagent injectors, extended temperature control, etc. are available. Please contact your local representative for more information.	

* Limit of detection < 100 amol of biotinylated and phosphorylated polypeptide (P-Tyr-100 assay kit, PerkinElmer, #6760620C), measured in white 384 small volume microplates (17 µL/well)

Limit of detection was calculated according to the IUPAC standard: $3x(SD_{blank})/slope$

Headquarters Germany
BMG LABTECH GmbH
Allmendgrün 8
77799 Ortenberg
Tel. +49 781 96968 -0
germany@bmglabtech.com

Australia
BMG LABTECH Pty. Ltd.
2/24 Carbine Way
Mornington, Victoria, 3931
Tel. +61 3 5973 4744
australia@bmglabtech.com

France
BMG LABTECH SARL
7, Rue Roland Martin
94500 Champigny s/Marne
Tel. +33 1 48 86 20 20
france@bmglabtech.com

Japan
BMG LABTECH JAPAN Ltd.
1-6-2, Shimo-cho
Omiya-ku
330-0844 Saitama City
Tel. +81 48 647 7217
japan@bmglabtech.com

UK
BMG LABTECH Ltd.
5 Alton House Office Park
Gatehouse Way
Aylesbury
HP19 8XU
Tel. +44 1296 336650
uksales@bmglabtech.com

USA
BMG LABTECH Inc.
13000 Weston Parkway
Suite 109
Cary, NC 27513
Tel. +1 877 264 5227
usa@bmglabtech.com

www.bmglabtech.com

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