

**POLARstar Omega**

# The Ultimate Microplate Reader for Research and Life Science



**BMG LABTECH**

*The Microplate Reader Company*



# The **Ultimate** Microplate Reader for Research and Life Science

The optimal combination  
of performance and  
flexibility for all of your  
R&D applications

The POLARstar 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 instrument for a wide range of applications in basic research, life science studies, and assay development.

### Flexibility

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

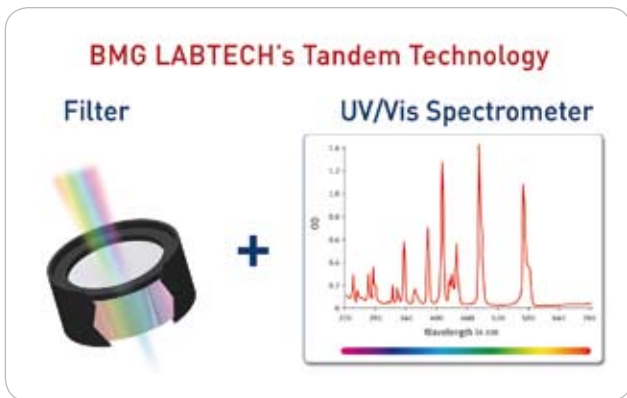
- Ultra fast UV/Vis absorbance spectra
- Fluorescence intensity, including FRET
- Fluorescence polarization / anisotropy
- Time-resolved fluorescence
- Time-resolved FRET
- Luminescence (flash & glow), including BRET
- AlphaScreen® / AlphaLISA®

With its ability to capture fast, full UV/Vis absorbance spectra; to monitor rapid and slow kinetic reactions; and to perform FP, FRET, BRET, TR-FRET and AlphaScreen® / AlphaLISA® detection, the POLARstar Omega will confidently fulfill all assay needs.

Top and bottom plate reading, multi-color detection, Simultaneous Dual Emission detection, well scanning, precise temperature control, multi-mode shaking, and a gas vent all enhance the flexibility of the POLARstar Omega. The addition of onboard "smart" injectors provides the ability to dispense reagents and initiate kinetic reactions. The POLARstar Omega reads all plate formats from 6- to 1536-well in absorbance and up to 384-well in all other detection modes.

### Tandem Technology

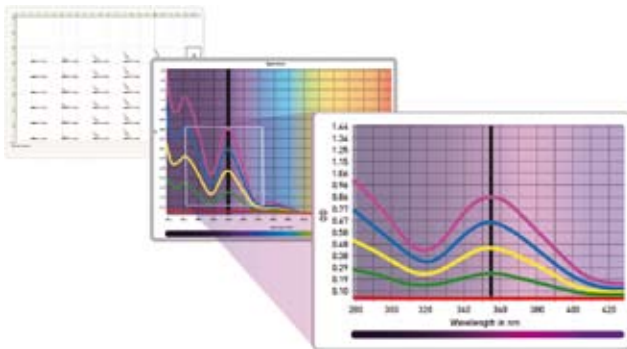
This is a combination of two technological concepts – an ultra-fast UV/Vis full spectrum absorbance spectrometer, and extremely sensitive filter based detection incorporating advanced optics and photomultiplier tubes to provide superior sensitivity. For the first time, full spectrum absorbance with high resolution at 1 nm can now be performed in a multidetection microplate reader.



*Tandem Technology enables researchers to use the POLARstar Omega for all assays utilising the most effective detection mode.*

### Spectrometer-Based Detection

The POLARstar Omega is the first multidetection plate reader to use a spectrometer for absorbance measurements. This new technology can capture a full UV/Vis absorbance spectrum (220 to 850 nm) at resolutions from 1 to 10 nm. Full absorbance spectrum can be measured as quickly as one second per well, significantly faster than any conventional method. Alternatively, up to eight wavelengths can be measured simultaneously in a single pass with no wavelength switching.



*...from a single spectrum per well to spectra overlay plots.*

### High-Performance Luminescence

The POLARstar 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.

### Filter-Based Detection

For fluorescence and luminescence assays filters provide precise and superior performance for both sensitivity and selectivity. Filters offer high sensitivity, greater light transmission, precise control over transmitted peak shape, excellent blockage of undesired wavelengths, and fast wavelength switching. This is ideal for multi-excitation and multi-emission applications. Filters are also the technically preferred and most cost efficient technology for non-absorbance based assays. BMG LABTECH offers a wide range of assay specific filters from UV to NIR with various bandwidths.

### Simultaneous Dual Emission

Simultaneous Dual Emission detection offers a significant advantage and halves read times. It corrects flash-to-flash variations, assay effects such as photobleaching, decaying kinetic signals, or fluctuating conditions like temperature, pH, and evaporation. Simultaneous Dual Emission in the POLARstar Omega is perfect for detecting applications that emit two wavelengths or polarization vectors at the same time without the need to switch filters. This includes FRET, BRET, FP, and anisotropy assays.

### Advanced Time-Resolved Fluorescence

New to the POLARstar Omega is Advanced TRF capability utilizing an advanced optic head for TRF and TR-FRET. Assays such as homogeneous TRF (e.g. HTRF®, LANCE®, 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 POLARstar Omega to outperform any microplate reader in its class.

### AlphaScreen® / AlphaLISA®

BMG LABTECH's engineers have developed a specialized measurement mode and optical system for the POLARstar Omega to read AlphaScreen® / AlphaLISA® assays without using an expensive laser as a light source. For the first time users can experience fantastic AlphaScreen® / AlphaLISA® performance normally only available on more costly instruments.

### Advanced Reagent Injection

Two precise onboard injectors 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 quickly as 50 reading points per second or as slowly as one measurement every 2.5 hours. Users can capture a fast calcium signal that happens in a few 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 and Orbital Averaging

In well scanning mode, the POLARstar Omega can easily deal with heterogeneous samples such as adherent cells by taking multiple measurements in each well with up to 30 x 30 data points. The software displays each scan point graphically and creates a map for each well. Another way to measure nonhomogeneous well contents is BMG LABTECH's unique orbital averaging feature. This allows several measurements over a defined orbit, to collect data and calculate an average for each well.



... automated microplate handling with Stacker.

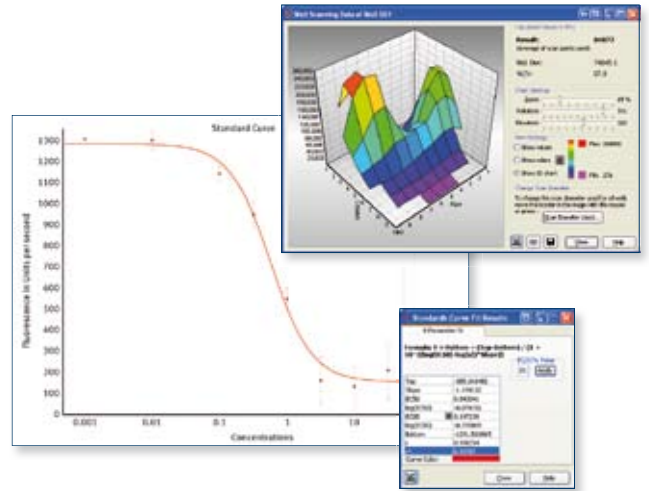
### Stacker and Robot Compatibility

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

### Control and MARS Data Analysis Software

The POLARstar Omega software package provides an extensive range of possibilities for both test protocol definitions and data analysis. It is fully compliant with FDA regulation 21 CFR Part 11. The control part of the software allows users to define instrument parameters and test protocols.

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. MARS provides several options to display data in a clear and concise format.



The MARS Data Analysis Software provides sophisticated tools for automated data reduction.

Data can be processed with powerful predefined templates or by using an extensive range of data calculation features. For example the automatic calculation of enzyme kinetic parameters ( $V_{max}$  and  $K_m$ ) with a variety of fits based on Michaelis-Menten or Lineweaver-Burk equations, or the generation of standard curves based on the following curve fitting algorithms to calculate e.g.  $EC_{50}$ ,  $IC_{50}$ , and  $r^2$  values:

- Linear regression fit
- 4 parameter fit
- Point to point fit
- Segmental regression fit
- Cubic spline fit
- 2<sup>nd</sup> and 3<sup>rd</sup> polynomial fit
- Enzyme kinetic fit (e.g. Michaelis-Menten, Lineweaver-Burk, Scatchard)

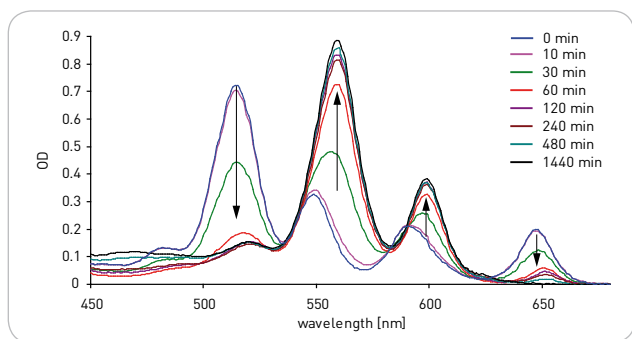
## Applications Center

The following categories are amongst a wide range of possible applications performed with the POLARstar Omega:

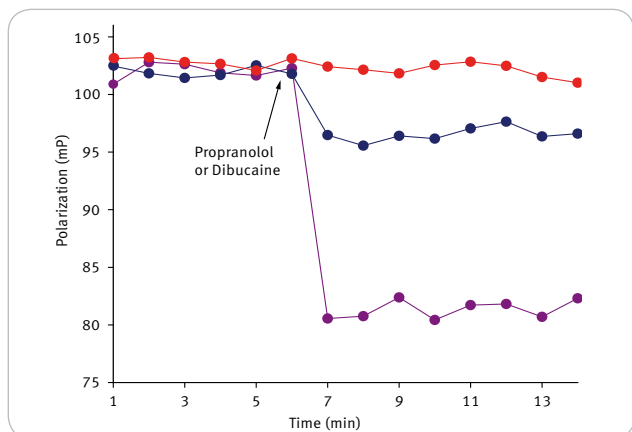
- Biomolecular interaction assays
- Cell-based assays
- Binding assays
- Enzyme activity assays
- Quantification assays

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

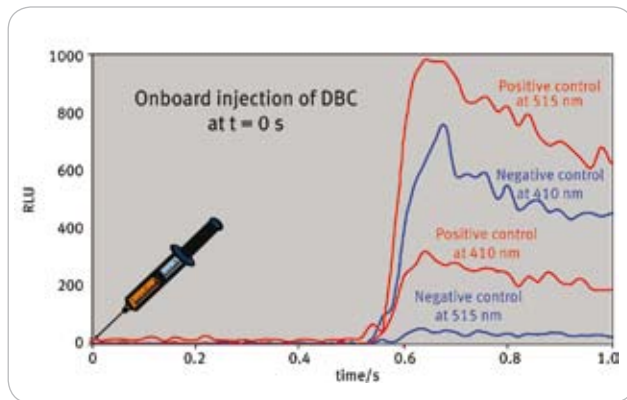
- Kinetic studies on the metallation of porphyrin (absorbance)
- Measurement of membrane fluidity in mitochondria (fluorescence polarization)
- Cell-based biomolecular interaction assay (bioluminescence resonance energy transfer)



Changes in visible spectrum accompanying zinc metallation of TPP. Arrows indicate the evolution of the absorption bands with time.<sup>1</sup>



Propranolol (purple) and dibucaine (blue) increases membrane fluidity measured in mitochondria. Red line is control.<sup>2</sup>



Injection of Deep Blue C™ (DBC) results in resonance energy transfer in the positive control. No BRET occurs for negative control.<sup>3</sup>

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 POLARstar Omega is certified for the following assays:



Visit BMG LABTECH's Online Applications Center to download all the leading applications, listed as:

- Application notes
- Scientific posters
- Peer-reviewed papers

BMG LABTECH's searchable applications database provides the expertise expected from a dedicated microplate reader company. With well over 1,700 published entries of peer-reviewed articles, application notes and scientific posters, there is ample 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 distributors. Customers can rely on PhD level support and assistance with regard to software, assay development, or general enquiries related to the POLARstar Omega and all other BMG LABTECH microplate reading solutions.

<sup>1,2,3</sup>The graphs were taken from BMG LABTECH's Application Notes AN 178, AN 205 and AN 120.

# POLARstar 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.

<b>Detection Modes</b>	Fluorescence Intensity - including FRET Fluorescence Polarization / Anisotropy AlphaScreen® / AlphaLISA® Luminescence (flash and glow) - including BRET Time-Resolved Fluorescence - including TR-FRET UV/Vis Absorbance Spectra	
<b>Measurement Modes</b>	Top and bottom reading Endpoint and Kinetic measurements Sequential Multi-Excitation measurements Sequential Multi-Emission measurements Simultaneous Dual Emission measurements Ratiometric measurements Well Scanning	
<b>Microplate Formats</b>	6 to 1536-well plates, user-definable	
<b>Light Source</b>	High energy xenon flashlamp	
<b>Detectors</b>	Two matched side window photomultiplier tubes	
<b>Optical Filters</b>	Excitation and emission filter wheels for 8 filters each	
<b>Spectral Range</b>	240 - 740 nm or 240 - 900 nm Absorbance Spectrometer: 220 - 850 nm	
<b>Sensitivity</b>	FI	< 0.2 fmol / well Fluorescein
	FP	< 5 mP SD at 1 nM 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 - 850 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
<b>Read Times</b>	Flying mode: 9 s (96), 16 s (384)	
<b>Reagent Injection</b>	Up to 2 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	
<b>Shaking</b>	Linear, orbital, and double-orbital with user-definable time and speed	
<b>Gas Vent</b>	System to inject an atmosphere or to pull a vacuum into the reader	
<b>Incubation</b>	+5°C above ambient up to 45°C or 60°C	
<b>Software</b>	License-free software package including Reader Control and MARS Data Analysis Software	
<b>Dimensions</b>	Width: 44 cm, depth: 48 cm, height: 30 cm, weight: 28 kg	
<b>Accessories</b>		
<b>Stacker</b>	Plate handler for up to 50 microplates - continuous loading feature	
<b>THERMOstar</b>	Microplate incubator and shaker	
<b>Filters</b>	Optimized for dyes, fluorophores and specific assays Filters for all applications from UV to NIR Customized filters available upon request	
<b>Upgrades</b>	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.	

## Headquarters

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HTRF is a registered trademark of Cisbio International.  
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\* 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:  $3 \times (SD_{blank}) / slope$