VANTAstar™

Flexible plate reader with simplified workflows

VANTAstar

BMG LABTECH

BMG LABTECH

The Microplate Reader Company

Monochromator-based multi-mode microplate reader

Your benefits at a glance:

· Wavelength flexibility with filter-like performance
· No gain or focus adjustment required
· UV/vis absorbance spectra in <1 sec/well
· Luminescence cross-talk reduction
· One-click top/bottom detection switch
· CO_2 and O_2 control for happy cells
· Flexible injectors with heater and stirrer
· Made-in-Germany dependability

VANTAstar

BMG LABTECH

Your vantage point in the lab

The VANTAstar™ is a compact multi-mode microplate reader compatible with all plate formats up to 384 wells. Conceived for ease-of-use and flexibility, this instrument provides the perfect detection platform for a wide range of applications in basic research and life sciences. Equipped with our patented dual LVF Monochromator™ system for wavelength flexibility in fluorescence intensity and luminescence, and Enhanced Dynamic Range technology for effortless detection setup, it is the ideal instrument for obtaining great data with ease. Backed by German engineering, this upgradable plate reader can be equipped with the following detection modes:

·   UV/vis absorbance
·   Fluorescence intensity, including FRET
·   Luminescence (flash and glow), including BRET
·   Time-resolved fluorescence (TRF)
·   Time-resolved FRET (TR-FRET)
·   Fluorescence polarization/anisotropy (FP)

Triple technology

Although only 35 cm in width, the VANTAstar is equipped with three different detection technologies for the best performance with every detection mode and application:

· **Dual LVF Monochromator system** for wavelength flexibility and spectral scanning in fluorescence intensity including FRET, and flash/glow luminescence including BRET
· **Filters** for the best sensitivity in all fluorescence- and luminescence-based detection modes
· **Spectrometer** for the fastest absorbance spectra.

LVF Monochromators for wavelength flexibility

Why use filters if you can get comparable sensitivity and additional flexibility from a monochromator? Our patented monochromators are based on Linear Variable Filters (LVF), special filters that vary spectral properties over their length, transmitting or blocking specific wavelengths at different positions. LVF Monochromators ensure filter-like performance combined with wavelength flexibility. The VANTAstar is equipped with two LVF Monochromators, one for excitation and one for emission. Benefits from LVF Monochromators include:

· **Filter-like performance:** Linear Variable Filters have light transmitting properties comparable to optical filters. They provide LVF Monochromators with a higher sensitivity over conventional grating-based systems.
· **Adjustable bandwidths from 8 to 100 nm** ensure highest flexibility and performance. Larger bandwidths yield more light for excitation and emission, increasing sensitivity.
· **Linear Variable Dichroic Mirror:** positioned between excitation and emission monochromator, this unique feature significantly reduces background noise and allows a fiber optic-free, full air light path for efficient transmission. Automatically tuned, it provides the best settings to efficiently separate the excitation from the emission light.

Snap in your filters

For the highest sensitivity, the VANTAstar can accommodate up to 5 filter sets (excitation - dichroic - emission filter each). All filters are magnetic and can be snapped in position very

easily. Filter slots are easily accessible from the reader front and no additional tools are required for filter exchange. Thanks to the VANTAstar's optic design, you can combine filters and LVF Monochromators in one measurement, exciting with a filter and scanning the emission spectrum, or vice versa.

For users running a defined number of routine assays, the VANTAstar F is equipped with filter-based detection only.

Easy assay setup

VANTAstar users do not have to worry about selecting the optimal sensitivity or gain settings. The Enhanced Dynamic Range (EDR) technology grants a dynamic range spanning over 8 concentration decades in a single measurement, significantly simplifying detection setup. The benefits of the EDR technology include:

· Every plate is automatically read with a setting that provides the best sensitivity and signal-to-blank ratios
· An assay window of 8 concentration decades in one single measurement ensures almost any sample is always within range without user intervention
· Kinetic assays with signal intensities increasing over time do not saturate the detector
· Assays with very low signals and very bright signals on the same plate can be measured without optimisation or without further sample dilution
· New users do not need to be trained to understand or adjust gain settings
· Data acquired at different times are comparable as count scales are uniform from day to day and plate to plate

EDR can be applied in top or bottom fluorescence intensity and luminescence detection, both with LVF Monochromators and filters.

Focus on your samples

Focussing excitation light directly onto the sample significantly improves fluorescent yield, sensitivity and dynamic range. The VANTAstar incorporates a rapid, full-plate auto-focus for both top and bottom reading in all plate formats.

Combined with EDR, this feature makes detection easier, improving assay window, decreasing standard deviations among replicates and reducing blank measurements.

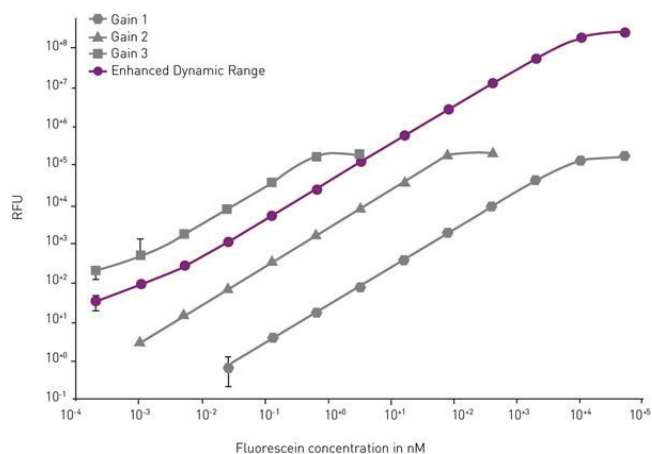### LVF Monochromator principle
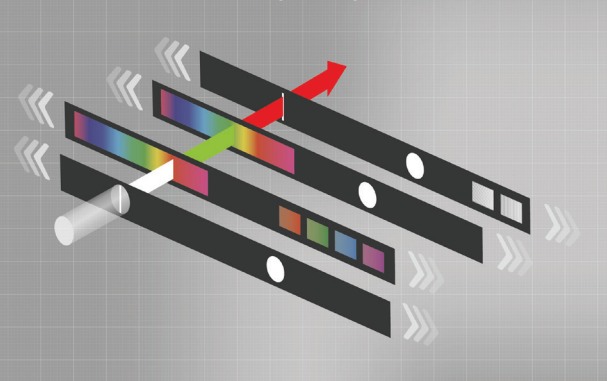
LVF Monochromator schematic: by sliding against each other the LVF slides separate light into distinct wavelengths and bandwidths.
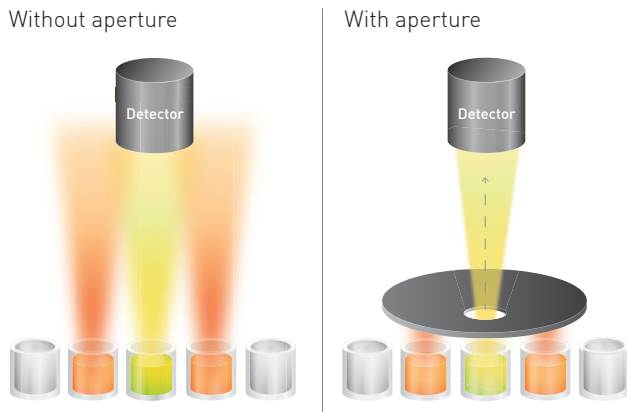

Linear Variable Dichroic Mirror
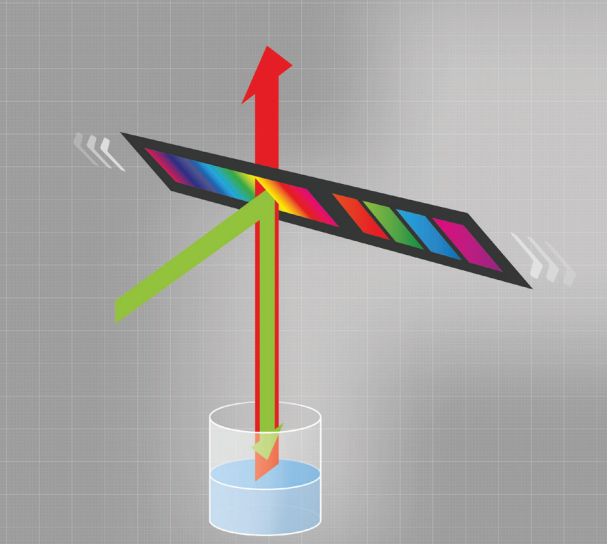
The tunable Linear Variable Dichroic Mirror positioned between excitation and emission monochromators blocks or transmits different wavelengths.

EDR enables the detection of samples spanning over 8 concentration decades in one single measurement with no manual intervention.
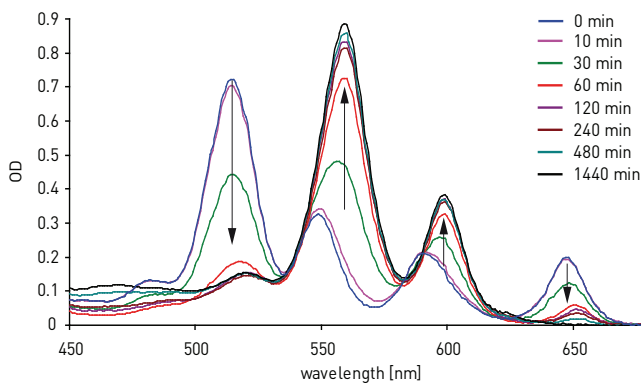
Improved luminescence detection

Flash, glow, Dual Luciferase® Reporter and BRET are some of the most commonly measured luminescence assays. The LVF Monochromators on the VANTAstar are sensitive enough that users often do not need filters for luminescence assays that require wavelength discrimination (e.g., BRET). The LVF Monochromator can even be used to acquire luminescence spectral scans.

Glow luminescence assays are often negatively affected by stray light and cross-talk from neighbouring wells. If cross-talk is not reduced, low-signal wells might see more counts from nearby bright wells than from their actual signal. BMG LABTECH's cross-talk reduction package automatically applies an aperture to reduce non-specific signal and mathematically corrects for light transmitted through the walls of a well.
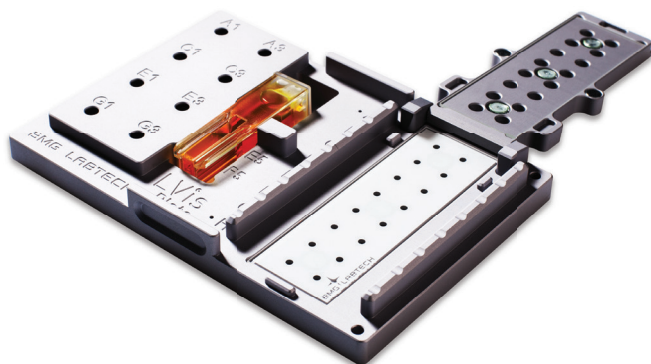

The cross-talk reduction package reduces unspecific luminescence signals that are cause of higher background noise and variability.

Full absorbance spectra in the blink of an eye

Why would you detect only a single wavelength if you could acquire a full UV/vis spectrum in the same amount of time? Spectral detection improves many absorbance assays. It can highlight the presence of contaminants or shifting peaks in enzymatic reactions.

The spectrometer on the VANTAstar captures a full UV/vis absorbance spectrum (220 - 1000 nm) at resolutions selectable from 1 to 10 nm in less than 1 second/well, significantly faster than any absorbance monochromator. Alternatively, users can measure up to 8 discrete wavelengths instantaneously with simultaneous data acquisition. For DNA quantitation, for example, 260-, 280- and 340-nm measurements are all captured with a single flash.

For low-volume quantitation, the LVis Plate enables detection of 2 µL samples in sixteen microdrop well sites.

In enzymatic reactions, a spectrometer-based spectral acquisition can highlight the evolution of absorbance peaks over time (arrows).

TRF, TR-FRET and FP

For time-resolved fluorescence (TRF and TR-FRET) and fluorescence polarization the reader uses specialised components that guarantee performance without compromise.

· **TRF and TR-FRET:** a high intensity xenon flash lamp combined with assay-optimised filters and adjustable gain ensure great sensitivity for your DELFIA®, HTRF®, LANCE®, LanthaScreen® and THUNDER™ assays.

The LVis Plate enables detection of sixteen 2 µL samples and includes filters for performance control.

- **Fluorescence polarization:** our unique optical design and instant polarizer switching provide the best possible mP standard deviation in any assay.

Effortless cell-based assays

Real-time cell-based assays are increasing in popularity because they better reflect the complexity of biological systems. When running live cell-based assays, several factors can improve the quality of your results:

- **Gas regulation** is required when running live cell-based experiments and kinetics. The Atmospheric Control Unit (ACU) module independently regulates the O_2 and CO_2 concentration (1 - 20%) in the reader, allowing for optimal cell culture conditions.

- **Temperature incubation and minimum condensation concept:** the incubation chamber in the VANTAstar consists of two independent heating plates, positioned above and below the microplate, with the upper plate operating at + 0.5°C than the lower. This provides a uniform incubation and prevents condensation.

- Three different **well scan modes** enable robust data acquisition even from non-homogeneous samples such as adherent cells, bacteria or precipitates. Orbital and spiral averaging automatically normalise for heterogeneous or non-confluent cell distribution. For higher resolution, matrix scan acquires up to 900 data points/well, displays each scan point graphically and creates a map for each well. Single scan points or entire sections can be easily removed upon detection.

- **Bottom reading** significantly improves data quality when detecting adherent cells. On this plate reader you can easily switch from top to bottom detection with a simple mouse click - no manual hardware adjustments are required. Bottom reading can be applied to any detection mode, both with LVF Monochromator or filter detection.

Flexible reagent injection

Reagent dispensers can be used to add a stimulus or inhibitor to initiate or stop a kinetic or enzymatic reaction. For the VANTAstar, injectors have been re-designed to provide improved capabilities, while maintaining the highest flexibility.
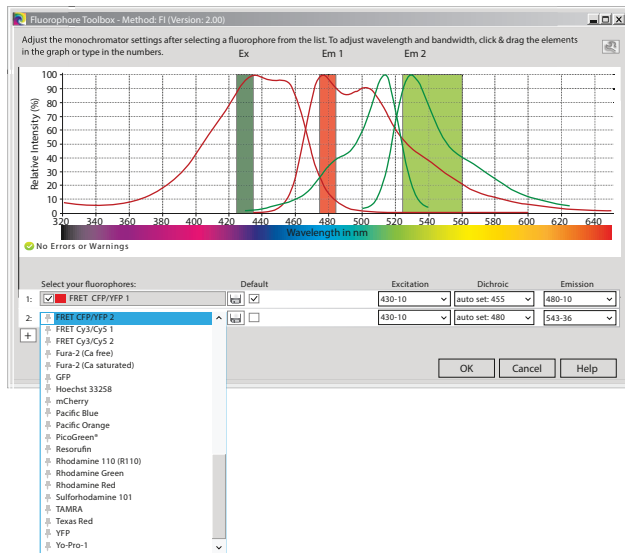

The Atmospheric Control Unit (ACU) perfectly regulates both O_2 and CO_2 for all cell-based assays.
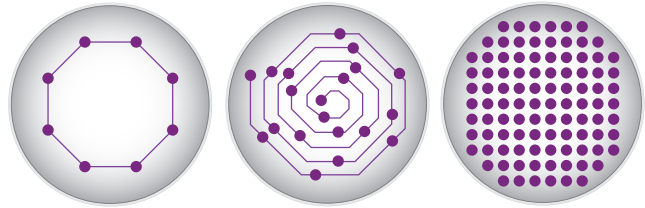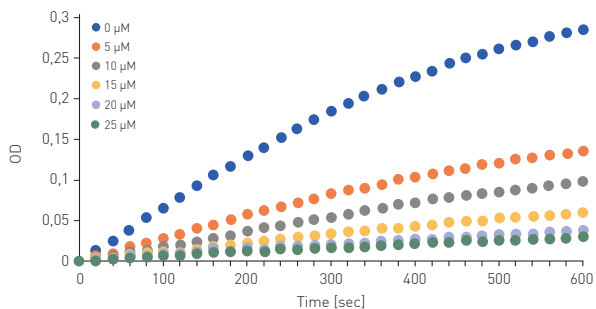

Orbital averaging, spiral averaging and matrix scanning simplify the detection of non-homogeneous samples such as adherent cells or bacteria.
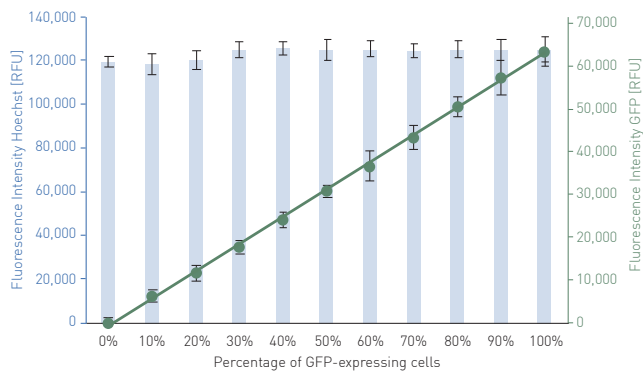

Injectors enable reagent delivery to any plate format from 6 - 384 wells.

A spectral library with popular fluorophores and luminophores is integrated into the fluorophore toolbox to simplify assay setup by "drag & drop".

Absorbance-based measurement of pyruvate kinase activity in the presence of increasing inhibitor concentrations.

Transfection efficiency: proof of principle using different ratios of HeLa-WT and HeLa-GFP cells. Hoechst staining was used for total cell counts.

Injection timing, speed, and volume are independently adjustable for each sample in up to 384-well plates. An extremely low dead volume and back flush capability ensure precious reagents are used sparingly and can be recovered. Injectors can be combined with a software-controlled heater and magnetic stirrer, enabling reagent mix and dispensing from a bottle or beaker at a specific temperature.

Data analysis made easy

The VANTAstar software package includes the Smart Control and MARS data analysis interfaces. This multi-user software can be installed on as many computers as you require, without the need to purchase additional licenses.
The Smart Control software allows to define measurement protocols and acquire data. It is an extremely versatile interface for the straightforward execution of routine tasks, as well as the optimisation of complex operations.
MARS is designed to make data analysis simple and effective, and offers multiple data reduction possibilities such as:

- Standard Curve Wizard for a step-by-step standard curve calculation
- Automatic DNA/RNA concentration determination
- Data display as bar charts, box plots, violin plots etc.
- Spectral view and analysis
- Background and baseline correction
- Signal interpolation: linear or cubic spline
- Various curve fit models including linear, 4- / 5-parameter, polynomial and user-defined fit models
- Enzyme kinetic analysis using various models
- EC_{50} calculation with confidence intervals
- Binding rates and constants determination
- ANOVA, Student's t-test or multiple comparisons
- Performance evaluation: signal-to-blank, signal-to-noise, %CV, Z-prime, etc.
- Automatic data processing using predefined templates

The software package comes with flexible data export (Excel, ASCII) and integration capabilities, and is compliant with FDA regulation 21 CFR Part 11.

Applications hub

A perfectly engineered instrument is only part of the solution, it needs to effectively perform all of the leading applications. We continuously work with all major reagent companies to develop protocols and improve instrument settings for their existing assays and their newest kits.

The VANTAstar is a user-friendly and flexible instrument that supports all your existing and future applications, including:

· DNA, RNA, and protein quantification
· ELISA and DELFIA immuno-assays
· Bacterial growth (OD_{600})
· Cell viability/toxicity
· Real-time cell-based assays
· Enzymatic activity
· Reporter gene assays
· And much more ...

Our comprehensive online application database reflects more than 30 years of expertise and innovations. Over 6,000 published entries of peer-reviewed articles and application notes demonstrate the flexibility and versatility of our readers, and their use in chemical and biological sciences.

Luminescence cell viability assay measured on a HeLa standard curve with CellTiter-Glo® (Promega) in 384-well format.

Automation friendly

Small footprint, multiple robotic software interfaces and an automation-friendly plate carrier guarantee an easy integration into all leading robotic platforms.
For GxP requirements, the multi-user software includes digital signature and FDA 21 CFR part 11 compliance.

Support and training

BMG LABTECH operates globally through an extensive network of subsidiaries and trained distributors. Customers can rely on qualified support and assistance with regard to software, assay development, or general enquiries related to the VANTAstar and all our other microplate readers.

LANCE and DELFIA are registered trademarks of PerkinElmer, Inc.
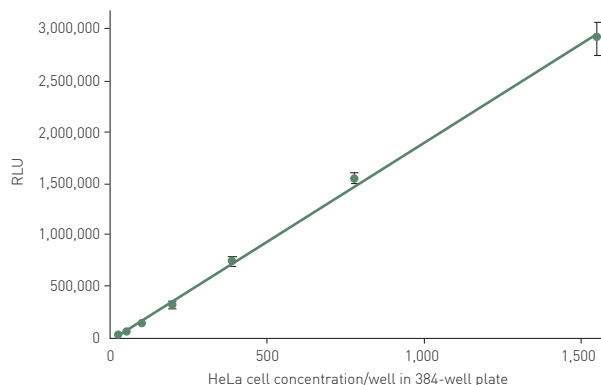HTRF is a registered trademark of Cisbio Bioassays.
LanthaScreen is a registered trademarks of Thermo Fisher Scientific.
Transcreener is a registered trademark of Bellbrook Labs.
Dual Luciferase Reporter is a trademark of Promega Corp.
Mycoalert is a trademark of Lonza.
THUNDER is a trademark of Bioauxilium.

BMG LABTECH
The Microplate Reader Company

The VANTAstar can include all or any combination of features listed below at purchase. Upgrading with additional features is possible at any time. Please contact your local representative for more details or a quote.

Detection modes	UV/vis absorbance Fluorescence intensity (incl. FRET) Luminescence (flash and glow) - incl. BRET Time-resolved fluorescence TR-FRET Fluorescence polarization
Measurement modes	Top and bottom reading Endpoint and kinetic Sequential multi-excitation Sequential multi-emission Spectral scanning (absorbance, fluorescence, luminescence) Ratiometric measurements Well scanning
Microplate formats	6- to 384-well plates, user-definable LVis Plate with 16 low volume microspots (2 µL)
Microplate carrier	Robot compatible
Light source	High energy xenon flash lamp
Detectors	Low-noise photomultiplier tube CCD spectrometer
Wavelength selection	Dual Linear Variable Filter (LVF) Monochromators™ Linear Variable Dichroic Mirror: separates excitation and emission LVF Monochromators Optical filters: excitation and emission slides hold up to 5 filters each LVF Monochromators + optical filters: use one for excitation and the other for emission UV/vis absorbance spectrometer: full spectra or 8 discrete wavelengths in <1 sec/well
Optical filters	Excitation and emission slides for up to 4 filters each for monochoromator units (VANTAstar), and for up to 5 filters each for filter-only units (VANTAstar F)
Optical path	Top and bottom: free-air optical light path guided by motor-driven mirrors and dichroics
Z-adjustment	Automatic focal height adjustment (0.1 mm resolution)

Spectral range		
	Filters	FI, LUM, TRF, FP, TR-FRET: 240 - 740 nm
	LVF Monochromators™	FI, LUM: 320 - 740 nm
	Linear Variable Dichroic	340 - 740 nm
	Spectrometer	ABS: 220 - 1000 nm; wavelength precision: ≤ 0.5 nm

Sensitivity		
	FI filters (top)	< 0.5 pM (< 10 amol/well FITC, 384sv, 20 µL)
	FI filters (bottom)	< 2.5 pM (< 125 amol/well FITC, 384g, 50 µL)
	FI monochromator (top)	< 0.8 pM (< 16 amol/well FITC, 384sv, 20 µL)
	FI monochromator (bottom)	< 3.5 pM (< 175 amol/well FITC, 384g, 50 µL)
	FI dynamic range	8 decades in a single measurement
	LUM	< 0.8 pM (< 15 amol/well ATP, 384sv white, 20 µL)
	LUM dynamic range	8 decades in a single measurement
	TRF	< 30 fM europium (< 2.4 amol/well, 384, 80 µL)
	HTRF®	Reader Control Kit (Eu) after 18h (384sv, 20 µL) Delta F > 700% (High Calibrator) Delta F > 25% (Low Calibrator)
	FP	< 1.2 mP SD at 1 nM FITC (384sv, 20 µL)
	ABS with spectrometer	Selectable spectral resolution: 1, 2, 5, and 10 nm OD range: 0 to 4 OD; photometric resolution: 0.001 OD Accuracy: < 1% at 2 OD Precision: < 0.5% at 1 OD and < 0.8% at 2 OD Linearity: ≤ 0.8% at 2.0 OD

Read times	**Flying mode** (1 flash)	9 sec (96), 16 sec (384)
Shaking		Linear, circular, and double-circular with user-definable time and speed
Incubation		+4°C above ambient up to 45°C or 60°C Minimum condensation concept: the upper heating plate of the incubation chamber operates at +0.5°C than the lower plate, heated optic system.
Software		Multi-user Smart Control and MARS data analysis software included FDA 21 CFR Part 11 compliant Integrated fluorophore library
Dimensions		Width: 35 cm, depth: 52 cm, height: 36 cm; weight: 27 kg

Optional accessories

Atmospheric Control Unit (ACU)	Actively regulates O_2 and CO_2: 1-20%
Reagent dispenser module	Up to 2 reagent injectors Individual injection volumes for each well: 3 to 500 µL (optionally up to 1 mL) Variable injection speed up to 420 µL/s Reagent back flushing Heater and stirrer plate Dimensions: width: 13 cm, depth: 31 cm, height: 26 cm; weight: 6 kg
LVis Plate	Microplate designed to measure 16 low volume (2 µL) samples and standard cuvettes. Incorporating NIST-traceable filters and holmium oxide standards for instrument performance test. Sensitivity: < 2 ng/µL dsDNA
THERMOstar	Microplate incubator and shaker
Filters	Optimised for dyes, fluorophores and specific assays Filters for all applications from UV to NIR Customised 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.

US Patent Number 9,733,124
Limit of detection (sensitivity) was calculated according to the IUPAC standard: $3 \times [SD_{blank}] / slope$
Specifications are subject to change without notice.

Made in Germany

Use the above details to contact us if this literature doesn't answer all your questions.

Pricing on any accessories shown can be found by keying the part number into the search box on our website.

The specifications listed in this brochure are subject to change by the manufacturer and therefore cannot be guaranteed to be correct. If there are aspects of the specification that must be guaranteed, please provide these to our sales team so that details can be confirmed.