A modular, easy to use, and cost-effective multimode reader for Luminescence, Fluorescence, and Absorbance Life Science applications.

### Modulus™ Microplate Multimode Reader

**Instrument Specifications (9300-010)**

<table>
<thead>
<tr>
<th>Detection Modes:</th>
<th>Luminescence, Fluorescence, Absorbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Type:</td>
<td>Glow, Flash, Kinetic, Repeat</td>
</tr>
<tr>
<td>Sample Format:</td>
<td>96-well plates</td>
</tr>
<tr>
<td>User Interface:</td>
<td>Built-in PC, touch screen navigation and operation</td>
</tr>
<tr>
<td>Data Output:</td>
<td>PC or Mac compatible .csv file format exported to USB flash drive, or connect to PC (not included) through optional PC connect kit</td>
</tr>
<tr>
<td>External PC Requirements (optional):</td>
<td>Windows XP or higher</td>
</tr>
<tr>
<td>Computer Interface:</td>
<td>RS-232 port</td>
</tr>
<tr>
<td>Auto Shutdown:</td>
<td>Touch screen hibernates after 15 min of inactivity</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>21” D x 17.3” W x 12.2” H (53 cm D x 44 cm W x 31 cm H)</td>
</tr>
<tr>
<td>Weight:</td>
<td>~35 lbs (~16 kg)</td>
</tr>
<tr>
<td>Operating Temperature:</td>
<td>60 - 85 ºF (15 - 30 ºC)</td>
</tr>
<tr>
<td>Warranty:</td>
<td>One year parts and labor</td>
</tr>
<tr>
<td>Approvals:</td>
<td>CE</td>
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</tbody>
</table>

**Luminescence Module Specifications (9300-020 Factory Installed)**

- **Detector:** Head-on photomultiplier tube (PMT) for photon counting
- **Spectral Range:** 350 - 650 nm
- **Peak Wavelength:** 420 nm
- **Detection Limit:** $3 \times 10^{-21}$ moles of luciferase or $1 \times 10^{-18}$ moles of ATP
- **Linear Dynamic Range:** >8 logs
- **Cross talk:** $5 \times 10^{-5}$

**Fluorescence Module Specifications (9300-040 User Installable)**

- **Light Source:** Wavelength-matched LED
- **Detector:** PIN-photodiode
- **Read Position:** Top reading
- **Wavelength Selection:** Snap-in Fluorescence Optical Kits
- **Wavelengths:** UV (Ex 365 nm, Em 410 - 460 nm), Blue (Ex 490 nm, Em 510 - 570 nm), Green (Ex 525 nm, Em 580 - 640 nm), Red (Ex 625 nm, Em 660 - 720 nm)
- **Detection Limit:** 0.5 fmol/200 μl or 1 ppt of fluorescein in 96-well plate, 30 pg/well dsDNA with PicoGreen®
- **Linear Dynamic Range:** 6 logs, assay dependent
- **Read Out:** Relative Fluorescence units
- **Absorbance Module - Vis Specifications (9300-050 User Installable)**

- **Light Source:** LED
- **Detector:** Large-area photodiode
- **Spectral Range:** 400 - 800 nm
- **Wavelengths for Installed Filters:** 450, 560, 600, 750 nm
- **Photometric Measuring Range:** 0 - 5.0 OD
- **Linear Dynamic Range:** 0 - 4.0 OD, assay dependent
- **OD Accuracy:** 0.01 OD ± 3% ≤ 2.5 OD
- **OD Precision:** 0.01 OD ± 1%
- **Stray Light:** 0.002% at 560 nm in clear bottom, black wall plates

### Single Injector System Specifications (9300-061 Optional)

- **Number of Injectors:** One injector
- **Dispense Volume Range:** Selectable between 25 - 200 μl in 5 μl increments
- **Waste Tray Volume:** ~50 ml

### Dual Injector System Specifications (9300-062 Optional)

- **Number of Injectors:** Two injectors
- **Dispense Volume Range:** Selectable between 25 - 200 μl in 5 μl increments
- **Waste Tray Volume:** ~50 ml

**For the most up-to-date specifications, visit:**

[www.turnerbiosystems.com](http://www.turnerbiosystems.com)
Overview
The Modulus™ Microplate Multimode Reader is skilfully designed for today’s life science laboratory. In addition to having performance on par with single-mode instruments, the Modulus™ Microplate blends user-friendly operation with easy data handling and flexible purchasing options. The result of this design is an instrument with superior performance that is easy to use, is affordable, and can be customized to your laboratory’s needs.

Performance
The Modulus™ Microplate Multimode Reader combines the superior performance expected from single-mode instruments with the functionality of multiple modes. To achieve industry-leading performance, the Modulus™ Microplate is designed with optical channels dedicated to each individual technology. Unlike other multimode systems, readings taken with the Modulus™ Microplate are not degraded by indirect fiber-optic transmission or crowded multimode systems, readings taken with the Modulus™ Microplate channels dedicated to each individual technology. Unlike other multimode systems, readings taken with the Modulus™ Microplate are not degraded by indirect fiber-optic transmission or crowded optical channels. Dedicated optical channeling ensures that the Modulus™ Microplate provides sensitivity and dynamic range on par with the highest performing single-mode instruments.

Ease of Use
The Modulus™ Microplate Multimode Reader is designed to be put into use straight from the box, without the need to read a manual or obtain special training. To achieve this plug-and-play usability, the Modulus™ Microplate combines a color LCD touch screen with a Windows-based onboard computer. The built-in computer eliminates the connectivity hassles, cost, and space requirements of running an external computer. Assay set-up on the Modulus™ Microplate is effortless with several flexible set-up options to choose from. Once an assay is run, data can be transferred in Excel-compatible .csv format from the Modulus™ Microplate using the built-in USB drive and the USB stick that comes with the instrument.

Affordable Modularity
The Modulus™ Microplate is a modular instrument that easily fits into most budgets. Purchase the technology or modes that you need now and add onto the system later as your needs expand. For example, the Modulus™ Microplate can be purchased as a luminometer, then fluorescence and/or absorbance modules can be purchased and added later.

There is no need for a service call or downtime. Installations take less than ten minutes and can be done right in your lab using just an Allen wrench which is provided with the module. In addition, after installing a new module, you will not need to download and install new software. The Modulus™ Microplate instantly detects the newly installed module(s) and will automatically adjust screens, protocols, and options.

Injectors
Both single and dual injectors are available for the Modulus™ Microplate Luminometer. Each injector has a volume range of 25 – 200 μl in 5-μl increments. Installed injector systems are automatically recognized by the instrument and controlled using the touch screen and fluids wizard. Prime and Flush commands provide easy maintenance and a Reverse Purge command saves valuable reagents. Injectors are recommended for labs running experiments with flash-based luminescence applications or dual-reporter assays.

Luminescence Light Plate
The optional Luminescence Light Plate provides an external control to confirm that the luminometer functions properly. Some labs require this additional verification procedure. Reading the light plate before taking measurements is a quick and easy way to ensure quality control over linearity and consistency of readings.

Data Analysis
Because data is provided in .csv format, any necessary data manipulations can be done within Excel. For optimum ease of analysis, Turner BioSystems has additionally developed optional, specialized software. This Curve-Fitting Data Analysis Software program provides calculation, graphing, and printing of eight different curve-fitting methods: linear fit, quadratic fit, cubic fit, two-parameter fit, four-parameter with linear x-axis fit, four-parameter with log two-axis fit, linear spline, and cubic spline. This software option is compatible with the Windows® XP operating system for PC computers.

Computer Interface
An optional software program is available for those labs that would prefer to operate the Modulus™ Microplate Multimode Reader through an external PC. The PC Connect Kit contains all of the same ease-of-use features which are available via the instrument’s built-in touch screen.

Microplate Format
The Modulus™ Microplate Multimode Reader accepts 96-well plates conforming to the SBS plate standard.

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Typical Applications

Flash Glow Luciferase Assays
Cell Viability/ATP Assays
Kinetics Assays
Steady-Glo® Luciferase Assays
ELISA, QuantiCleave™

*Recommended
• Crosstalk
Optional Single or Dual Auto Injectors
Dual-masking system reduces crosstalk

In addition to high sensitivity, the Modulus™ Microplate boasts greater than 8 logs of dynamic range, enabling the need to dilute samples or manage detector-driven gain changes. To achieve this extra large reading range, the Modulus™ Microplate is capable of simultaneously measuring samples of varying brightness. The photomultiplier tube automatically adjusts for the optimum reading of bright or dim samples. This means that the Modulus™ Microplate is capable of achieving a reading range of 2 – 3 logs more than competing multimode luminometers.

For further functionality, a Modulus™ Microplate with the Luminescence Module is designed to reduce crosstalk. The luminescent light path is isolated through a dual-masking system at both the detector and the well being read. Dual masking eliminates stray light by creating a column in which the light from the sample passes directly to the detector. When using 96-well white plates, this dual-masking system effectively results in a crosstalk rejection of 5 x 10⁻⁵.

Luminescence Module
(Factories Installed)
The Modulus™ Microplate Multimode Reader with the Luminescence Module is designed to deliver performance equivalent to dedicated microplate luminometers while also offering the flexibility of a multimode reader.

To achieve sensitivity on par with that of a dedicated luminometer, the luminescence channel is separated from other measurement technologies and positioned directly above the sample well. These conditions maximize light capture for the best possible sensitivity. In conjunction, a low-noise photomultiplier tube ensures that collected light is not compromised in any way. This design makes the Modulus™ Microplate between 10 to 1000 times more sensitive than competing multimode luminometers.

Fluorescence Features
• Epifluorescent detection
• Easy optical kit switching
• Wavelength-matched LEDs ensure high sensitivity

Fluorescence Module
(User Installable)
The Modulus™ Microplate Multimode Reader with the Fluorescence Module installed is designed to deliver both high performance and user flexibility.

To achieve high performance, the Fluorescence Module utilizes powerful light-emitting diodes (LEDs) as excitation sources. LEDs have very specific light-output profiles which closely match the excitation profiles of commonly used fluorescent molecules. LED usage increases sensitivity by fully exciting the fluorophore and reducing non-specific light leakage, a problem often found when using broad-spectrum light sources. Additionally, the Modulus™ Microplate Fluorescence Module uses an epifluorescent design to ensure a consistent measurement position. This pinpointed approach reduces the impact of volume fluctuation within small samples by reliably measuring at the same position from well to well.

The Modulus™ Microplate Fluorescence Module accepts different Fluorescence Optical Kits for measuring a variety of fluorophores. Four standard optical kits are available to measure the most popular fluorophores including Hoechst dye, fluorescein, rhodamine, Cy3, and Cy5. In addition, custom optical kits can be readily made for non-standard applications. Optical kits can be easily exchanged in seconds and built-in software ensures that the installed optical kit matches the selected application protocol. Protocols for nucleic acids and proteins such as PicoGreen®, RiboGreen®, and Quanti-IT™ assays are preprogrammed into the Modulus™ Microplate for your convenience.

The Modulus™ Microplate Fluorescence Module is designed as a user-installable module. This means that you can either buy the Fluorescence Module now or add it to your system later when your lab is ready to run fluorescence experiments. The ability to add modules as you need them gives you great purchasing flexibility. Installation is easy and takes less than ten minutes with the provided tool. There is no downtime or need for a service call.

Absorbance Module
(400 - 800 nm)

By purchasing the Modulus™ Microplate Multimode Reader with the Absorbance Module installed, the instrument stands alone as a high-performance photometer. As an alternative, purchase the Absorbance Module later and install it yourself. Installation is easy and takes less than ten minutes with the provided tool. There is no downtime or need for a service call.

The Modulus™ Microplate Multimode Reader with Absorbance Module provides measurements that are highly sensitive and cover a wide dynamic range. The absorbance channel has a reading range of 0 - 5.0 Optical Density (OD) with an accuracy that deviates less than 2%. The channel consists of a white LED with a spectral range of 400 to 800 nm positioned at the bottom of the instrument. As it shines through the bottom of the plate, your sample absorbs the light in a wavelength range that is dictated by your individual application. The final stage for measuring absorbance involves the light passing into a large-area photodiode where it is measured and processed.

The Absorbance Module comes with two open filter slots and four factory-installed filters. The preinstalled filters are for 450, 560, 650, and 750 nm as these cover the most common ELISAs and protein assays. With two open filter slots; you can also customize the absorbance module by adding the filter paddle of your choice. In addition, it is easy to run ratiometric absorbance-based assays to adjust for optical imperfections. Simply use the color touch screen to select the two desired wavelengths. OD values for each wavelength or a ratio of the two wavelengths will appear on the easy-to-read display screen.

Modulus™ Microplate Multimode Reader
Enabling People. Enabling Science.
Use the NEW PROTOCOL wizard to create a customized protocol within the instrument software. The wizard guides you step-by-step through choosing read parameters, injection methods, plate wells to read, and in saving your newly created, unique protocol for future use.

From the INSTRUMENT CONTROL screen, simply touch any parameter to access and change the setting. This method allows you to customize all settings necessary to obtain the perfect read for your application. Once your parameters are set, you have the option to save these settings for future use.

By choosing SELECT PROTOCOL, you have access to the most popular assays from common reagent suppliers preprogrammed into the instrument by Turner BioSystems. You can also instantly access previously saved user-customized protocols. Simply choose the protocol of choice and touch START.

The Modulus™ Microplate provides a simple and unique method for data handling. A USB stick is included and a USB drive is built into the instrument. To transfer data to either PC or Mac, simply copy the data from the Modulus™ Microplate to your computer. This method allows you to analyze your data when and where you find it most convenient.

Preprogrammed protocols for common applications are factory-installed on the instrument and can be selected for easy sample analysis.

The Modulus™ Microplate combines a 6.6” VGA color touch screen with an onboard Windows-based computer. In addition, the intuitive user interface makes setting up a run and retrieving data fast and simple while maintaining the flexibility needed for advanced or custom protocols.

Protocol Selection

Select a Preloaded Protocol

Data Transfer