

# 7. Specifications

## 7.1. SPECTRAMAX M2 AND M2<sup>e</sup> PERFORMANCE SPECIFICATIONS

Thermal specifications for microplates used in the SpectraMax M2 and SpectraMax M2<sup>e</sup> apply to flat-bottom microplates with isolated wells.

All other microplate specifications apply to standard 96-well polystyrene flat-bottom microplates.

Performance specifications for cuvette readings apply only to aqueous solutions having solute molal concentrations less than 0.4 M.

When pathlength compensation is applied to microplate absorbance measurements, agreement with cuvette absorbance measurements for the same solution requires that the solution volume in the microplate well is between 100  $\mu$ L and 300  $\mu$ L.

Technical specifications are subject to change without notice.

ABSORBANCE PHOTOMETRIC PERFORMANCE	
<b>Wavelength range</b>	200–1000 nm
<b>Wavelength selection</b>	Monochromator tunable in 1-nm increments
<b>Wavelength bandwidth</b>	$\leq 4.0$ nm full width half maximum
<b>Wavelength accuracy</b>	$\pm 2.0$ nm across wavelength range
<b>Wavelength repeatability</b>	$\pm 0.2$ nm
<b>Photometric range</b>	0.0 to 4.0 OD
<b>Photometric resolution</b>	0.001 OD
<b>Photometric accuracy/linearity, 0–2.0 OD</b>	$< \pm 1.0\%$ and $\pm 0.006$ OD
<b>Photometric precision (repeatability), 0–2.0 OD</b>	$< \pm 1.0\%$ and $\pm 0.003$ OD
<b>Stray light</b>	$\leq 0.05\%$ at 230 nm

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<b>Photometric stabilization</b>	Instantaneous
<b>Photometric drift</b>	None—continuous referencing of monochromatic input
<b>Calibration</b>	Automatic before first kinetic read and before every endpoint reading
<b>Optical alignment</b>	None required
<b>Light source</b>	Xenon flash lamp (50 Watts)
<b>Average lamp lifetime</b>	1 billion flashes
<b>Photodetectors</b>	Silicon photodiode
<b>Endpoint baseline noise (cuvette)</b>	±0.003 OD @190, 405, 850 nm
<b>Endpoint kinetic noise (cuvette)</b>	±0.003 OD @190, 405, 850 nm ≥ 0.2 mOD/min and ≤ 0.2 mOD/min
<b>FLUORESCENCE PHOTOMETRIC PERFORMANCE</b>	
<b>Detection limit (top read, microplate, SpectraMax M2 and SpectraMax M2e)</b>	3.0 fmol/well in 200 µL FITC 96 wells (15 pM) 3.0 fmol/well in 75 µL FITC 384 wells (40 pM)
<b>Detection limit (bottom read, microplate, SpectraMax M2e only)</b>	5.0 fmol/well FITC 200 µL in 96 wells (25 pM) 5.0 fmol/well FITC 75 µL in 384 wells (67 pM)
<b>Detection limit (cuvette)</b>	15 pM fluorescein
<b>Excitation wavelength range</b>	250–850 nm
<b>Emission wavelength range</b>	360–850 nm (SpectraMax M2) 250–850 nm (SpectraMax M2e)
<b>Scanning provided over full range</b>	in 1-nm increments
<b>Number of excitation/emission pairs per plate</b>	4
<b>Bandwidth (excitation emission)</b>	9/9 nm
<b>Dynamic range</b>	10 <sup>6</sup> in 96-well black plates: auto gain circuitry
<b>System validation</b>	Self-calibrating with built-in fluorescence calibrators
<b>Light source</b>	Xenon flash lamp (1 joule/flash)
<b>Average lamp lifetime</b>	2 years normal operation
<b>Detector</b>	Photomultiplier (R3896)

LUMINESCENCE PHOTOMETRIC PERFORMANCE	
<b>Detection limit (384-well microplate)</b>	10 amol/well alkaline phosphatase, 200 $\mu$ L
<b>Wavelength range</b>	250–850 nm
TIME-RESOLVED FLUORESCENCE PERFORMANCE	
<b>Detection limit (384-well microplate)</b>	0.5 fmol/well Eu-Ch
<b>Wavelength range</b>	250–850 nm
PHOTOMETRIC ANALYSIS MODES	
<b>Front Panel Operation</b>	<ul style="list-style-type: none"> <li>• Single wavelength Absorbance, %Transmittance, Fluorescence reading of the cuvette (or test tube)</li> </ul>
<b>Using SoftMax Pro</b>	<ul style="list-style-type: none"> <li>• Express data as Absorbance, %Transmittance, Fluorescence, Luminescence</li> <li>• Single wavelength reading of microplate and/or cuvette</li> <li>• Multiple wavelength (up to four) reading of microplate or cuvette</li> <li>• Kinetic and kinetic graphics of microplate and/or cuvette</li> <li>• Spectral scan (190–1000 nm) of microplate and/or cuvette</li> <li>• Well scan of microplate using absorbance or fluorescence intensity</li> </ul>
MEASUREMENT TIME (CALIBRATION OFF)	
<b>Microplate read time (endpoint), Standard read</b>	<ul style="list-style-type: none"> <li>• 96 wells in 24 seconds (single wavelength, absorbance)</li> <li>• 96 wells in 15 seconds (single wavelength, fluorescence intensity)</li> <li>• 384 wells in 1:57 minutes (single wavelength, absorbance)</li> <li>• 384 wells in 45 seconds (single wavelength, fluorescence intensity)</li> </ul>
<b>Microplate read time (endpoint), Standard read with PathCheck</b>	<ul style="list-style-type: none"> <li>• 96 wells in 2:07 minutes (single wavelength, absorbance)</li> <li>• 384 wells in 7:19 minutes (single wavelength, absorbance)</li> </ul>

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<b>Microplate read time (endpoint, Speed read)</b>	<ul style="list-style-type: none"> <li>• 96 wells in 18 seconds (single wavelength, absorbance)</li> <li>• 384 wells in 49 seconds (single wavelength, absorbance)</li> </ul>
<b>SCAN SPEED</b>	
<b>Cuvette: Normal scan</b>	45*K nm/min (K = wavelength interval)
<b>Cuvette: Speed scan</b>	130*K nm/min
<b>Wavelength repeatability</b>	±0.2 nm
<b>TEMPERATURE REGULATION</b>	
<b>Reading chamber</b>	Isothermal when temperature regulation is not enabled
<b>Range</b>	4°C above ambient to 45°C when temperature regulation enabled. The ambient temperature must be > 20°C to achieve temperature regulation at 45°C.
<b>Resolution</b>	±0.1°C
<b>Accuracy</b>	±1.0°C for microplate and cuvette chamber
<b>Temperature uniformity at equilibrium</b>	±0.5°C at 37°C
<b>Chamber warm-up time</b>	15–30 minutes (measured on air) after initiation of temperature regulation
<b>Temperature regulation</b>	4 sensors
<b>Drift</b>	±0.2°C (regulated)
<b>Temperature regulation diagnostics</b>	Temperature regulation system is continuously monitored and updated
<b>Evaporation</b>	Plate lid required to minimize evaporative cooling
<b>Recommended microplate</b>	Flat-bottom microplates with isolated wells and lid
<b>Control</b>	Front panel reports cuvette chamber temperature only (temperature for microplate chamber reported in SoftMax Pro)
<b>AUTOMIX WITH SOFTMAX PRO</b>	

<b>Plate mixing modes</b>	Selectable: off, once prior to any reading, and once prior to and between kinetic readings
<b>Plate mixing duration</b>	Selectable: 0 to 999 seconds (three-second default)
<b>COMPATIBILITY</b>	
<b>Microplates</b>	Standard 6- to 384-well flat-bottomed microplates. Polystyrene plates for absorbance wavelengths above 340 nm; UV-transparent plates for absorbance readings above 220 nm; quartz plates for absorbance readings above 200 nm; low-volume 384-well plates. Use purple adapter plate only with 96- and 384-well plates.
<b>Cuvettes</b>	Standard height (45 mm) cells with 10 mm pathlength (12.5 mm x 12.5 mm outside) with minimum inside width of 4 mm (typical for 3 mL volume cells). See the section "Cuvettes in SpectraMax M2 and SpectraMax M2 <sup>e</sup> " in the Appendix for more information.
<b>Test tubes</b>	12 x 75 mm test tubes can be used in the cuvette chamber with the test tube cover.
<b>GENERAL INSTRUMENT</b>	
<b>Display</b>	2x20-character backlit LCD
<b>Operating panel</b>	11-key membrane keypad
<b>Self-diagnosis</b>	Continuous on-board diagnostics
<b>Spill control</b>	Drawer mechanism and reading chamber assembly protected from accidental spillage by drainage ports
<b>Computer interface</b>	8-pin DIN RS-232 serial (double shielding required)
<b>Printer interface</b>	Parallel 25-pin to Centronics (double shielding required)
<b>Microplates supported</b>	All 6- to 384-well and strip-well microplates, including lids

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ROBOTICS AND AUTOMATION	
<b>Robot compatible drawer</b>	Positioning and plate gripping as drawer closes
<b>Integrated automation interface</b>	SoftMax Pro automation interface integrated with robot partners. SpectraMax and SoftMax Pro are the #1 choice of robotic partners and robots. Visit the Molecular Devices web site for more information at <a href="http://www.moleculardevices.com/pages/instruments/automation.html#spectramax">http://www.moleculardevices.com/pages/instruments/automation.html#spectramax</a> .
ENVIRONMENTAL	
<b>Operating temperature</b>	15°C to 40°C
<b>Operating humidity</b>	0 to 70%, non-condensing
<b>Storage temperature</b>	-20°C to 65°C
PHYSICAL	
<b>Size (h x w x d)</b>	8.6" (220 mm) x 22.8" (580 mm) x 15" (380 mm)
<b>Weight</b>	35 lbs. (15.75 kg)
<b>Power consumption</b>	< 250 W
<b>Line voltage and frequency</b>	90–250 VAC autoranging, 50/60 Hz