

7. Specifications

7.1. SPECTRAMAX M2 AND M2^e PERFORMANCE SPECIFICATIONS

Thermal specifications for microplates used in the SpectraMax M2 and SpectraMax M2^e 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 μ L and 300 μ L.

Technical specifications are subject to change without notice.

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

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

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

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

Plate mixing modes	Selectable: off, once prior to any reading, and once prior to and between kinetic readings
Plate mixing duration	Selectable: 0 to 999 seconds (three-second default)
COMPATIBILITY	
Microplates	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.
Cuvettes	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 ^e " in the Appendix for more information.
Test tubes	12 x 75 mm test tubes can be used in the cuvette chamber with the test tube cover.
GENERAL INSTRUMENT	
Display	2x20-character backlit LCD
Operating panel	11-key membrane keypad
Self-diagnosis	Continuous on-board diagnostics
Spill control	Drawer mechanism and reading chamber assembly protected from accidental spillage by drainage ports
Computer interface	8-pin DIN RS-232 serial (double shielding required)
Printer interface	Parallel 25-pin to Centronics (double shielding required)
Microplates supported	All 6- to 384-well and strip-well microplates, including lids

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ROBOTICS AND AUTOMATION	
Robot compatible drawer	Positioning and plate gripping as drawer closes
Integrated automation interface	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 http://www.moleculardevices.com/pages/instruments/automation.html#spectramax .
ENVIRONMENTAL	
Operating temperature	15°C to 40°C
Operating humidity	0 to 70%, non-condensing
Storage temperature	-20°C to 65°C
PHYSICAL	
Size (h x w x d)	8.6" (220 mm) x 22.8" (580 mm) x 15" (380 mm)
Weight	35 lbs. (15.75 kg)
Power consumption	< 250 W
Line voltage and frequency	90–250 VAC autoranging, 50/60 Hz