

SpectraMax® Multi-Mode Microplate Reader Performance Specifications

Thermal specifications for microplates used in the SpectraMax® Multimode Microplate Reader apply to flat-bottom microplates with isolated wells. All other microplate specifications apply to standard 96-well polystyrene flat-bottom microplates.



Note: In this user guide, all references to SpectraMax Multi-Mode Microplate Readers include the M3, M4, M5, and M5^e models. When a feature or capability applies to only certain readers, this exception is noted.

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.

Table A-1 Technical Specifications

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

Table A-1 Technical Specifications (cont'd)

Stray light	≤ 0.05% at 230 nm
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 INTENSITY PERFORMANCE	
Sensitivity	Top Read < 5 pM FITC, 1 fmol/200 μL(96), < 20 pM, 2 fmol/100 μL(384) Bottom Read < 20 pM FITC(96)
Sensitivity (cuvette)	< 15 pM fluorescein
Wavelength range	250–850 nm
Wavelength selection	Monochromators, tunable in 1-nm increments
Bandwidth (excitation, emission)	9 nm, 15 nm
Number of excitation/emission pairs per plate	4
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)

Table A-1 Technical Specifications (cont'd)

FLUORESCENCE POLARIZATION PERFORMANCE	
Wavelength range (M5 and M5 ^e models only)	400–750 nm
Wavelength selection	Monochromators, tunable in 1-nm increments
Bandwidth (excitation, emission)	9 nm, 15 nm
Precision	< 5 mP standard deviation at 1 nM fluorescein in 96 and 384 wells
TIME-RESOLVED FLUORESCENCE PERFORMANCE	
Sensitivity (M4, M5, M5 ^e models only)	100 fM europium in 96 or 384 wells (top read)
Wavelength range	250–850 nm
Bandwidth (excitation, emission)	9 nm, 15 nm
Precision data collection	1–100 flashes; delay of 0–600 μ s before read; integration time selectable 50–1500 μ s
LUMINESCENCE PHOTOMETRIC PERFORMANCE	
Sensitivity	< 2 fg/well for firefly luciferase in 96- and 384-well top read
Wavelength range	250–850 nm
Crosstalk	< 0.5% in 96- and 384-well microplates
PHOTOMETRIC ANALYSIS MODES	
Front Panel Operation	Single wavelength Absorbance, %Transmittance, Fluorescence reading of the cuvette (or test tube)
Using SoftMax Pro	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

Table A-1 Technical Specifications (cont'd)

MEASUREMENT TIME (CALIBRATION OFF)	
Microplate read time (endpoint), Standard read	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 Pathlength Measurement Technology	96 wells in 2:07 minutes (single wavelength, absorbance) 384 wells in 7:19 minutes (single wavelength, absorbance)
Microplate read time (endpoint), Speed read	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 60°C when temperature regulation enabled. The ambient temperature must be > 20°C to achieve temperature regulation at 60°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)

Table A-1 Technical Specifications (cont'd)

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 Software)
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 Cuvettes on page 78 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	2-x-20-character backlit LCD
Operating panel	11-key membrane keypad
Self-diagnosis	Continuous on-board diagnostics

Table A-1 Technical Specifications (cont'd)

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
ROBOTICS AND AUTOMATION	
Robot compatible drawer	Positioning and plate gripping as drawer closes
Integrated automation interface	SoftMax® Pro Software automation interface integrated with robot partners. SpectraMax® Multi-Mode Microplate Readers and SoftMax Pro Software are the #1 choice of robotic partners and robots. Please visit the Molecular Devices web site for more information: www.moleculardevices.com .
ENVIRONMENTAL	
Operating temperature	15°C to 60°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 15.3" (390 mm)
Weight	36 lb (16.4 kg)
Power consumption	< 420 W
Line voltage and frequency	100–240 VAC autoranging, 3.5 A, 50/60 Hz