Spark™ 10M instrument specifications and typical performance values

General specifications

Parameters	Characteristics
Width	494 mm/19.5 in
Height	395 mm/15.5 in
Height (with injector carrier)	455 mm/17.9 in
Depth	557 mm/21.9 in
Depth (plate carrier moved out)	699 mm/27.5 in
Weight – instrument	40 kg/88 lb
Weight – injector box (2 channel)	4.0 kg/8.8 lb
Weight – heater/stirrer	2.7 kg/6 lb
Operating temperature	+15 to +35 °C/59 to 95 °
Transportation temperature	-30 to +60 °C/-22 to +140 °F
Operating humidity	20-90 % (non-condensing)
Transportation humidity	20-95 % (non-condensing)
Operating pressure	700-1050 hPa
Transportation pressure	500-1100 hPa
Overvoltage category	II
Pollution degree	2
Noise level	<60 dBA
Method of disposal	Electronic waste (infectious waste)
Measurement	Software controlled
Interface	USB 2.0 or higher
Sample formats	SBS standard microplates from 1- to 384-wells, cuvettes, NanoQuant™ low-volume plate, Cell Chips™ and Cell Chip Adapter
Microplate shaking	Linear, orbital and double orbital shaking; variable amplitudes and frequencies
Lid lifting system – maximum height of microplate and lid	24.5 mm
Power supply	100-120 V and 220-240 V, auto-sensing
Power consumption	170 VA

Environmental control

Parameters	Characteristics
Temperature control – heating range	+4 °C above ambient up to +42 °C
Temperature control – uniformity	<0.5 °C at 30 °C and 37 °C at incubation position
Temperature control – environmental operating conditions	15-35 °C
Gas control – CO_2 range	0.04-10 % vol.
Gas control – O_2 range	0.1-21 % vol.
Gas control – CO_2 accuracy	<1 % vol.
Gas control – O_2 accuracy	<0.5 % vol.
Humidity cassette – 96-well plate with lid, 4 days incubation at +37 °C with 5 % CO_2	Evaporation <10 % (excluding the outside wells; first and last column, first and last row)
Humidity cassette – environmental operating conditions	+18 to 42 °C
Humidity cassette – plate formats	6- to 384-well
Humidity cassette small – maximum plate height	16 mm; 96- and 384-well plates without plate lid
Humidity cassette large – maximum plate height	23 mm; 6- to 384-well plates with or without plate lid

Injectors: hardware specifications

Parameters	Characteristics
Plate types	1- to 384-well plates
Injector syringe volumes	500 µl, 1000 µl
Accuracy @ 10 µl	≤5 %
Accuracy @ 100 µl	≤1 %
Accuracy @ 450 µl	≤0.5 %
Precision @ 10 µl	≤5 %
Precision @ 100 µl	≤1 %
Precision @ 450 µl	≤0.5 %
Heater/stirrer power supply	24 V, max. 60 W, external plug-in
Heater temperature regulation	20-42 °C
Stirring speed regulation	50-1,000 rpm

Injectors: reagent compatibility

Please refer to the following list for reagent compatibility.
Rating 'A' indicates good compatibility with the injector system.
Chemicals with the rating 'D' must not be used with the injector
system as they will cause severe damage.

'A'-rated chemicals	'D'-rated chemicals
Acetic acid <60 %	Acetonitrile
Dimethyl formamide	Butyl amine
Ethanol	Chloroform
Methanol (methyl alcohol)	Carbon tetrachloride (dry)
Water, deionized	Diethyl ether
Water, distilled	Ethanolamine
Water, fresh	Ethylene diamine
Potassium hydroxide (caustic potash)	Furfural
Potassium hypochlorite (aqueous)	Hexane
Sodium hydroxide (<60 %, aqueous)	Hydrofluoric acid
Sodium hypochlorite	Monoethanolamine
	Sulfuric acid (diluted or concentrated)
	Tetrahydrofuran

Cell counting module

Parameters	Characteristics
Illumination	LED
Image	Bright-field
Objective	4x
Optical resolution	>3 µm
Area/image	2.2 mm^2
Multiple images per sample	1, 4, 8
Cell Chips (Tecan)	Disposable; 2 sample chambers per Cell Chip; 10 µl sample volume
Cell Chip Adapter	4 Cell Chips per adapter; autoclaveable, stackable, SBS format
Number of samples/run	up to 8 samples
Cell size	4-90 µm
Cell concentration	1x10^4-1x10^7 cells/ml
Counting accuracy	± 10 %, HeLa and CHO at 1x106 cells
Counting precision	<10 % (1 sigma), HeLa and CHO at 1x10^6 cells
Measurement time*	<30 seconds/sample (1 image per sample)

* Plate-in and plate-out movements, and initialization steps are not included
in the measurement time.

Absorbance: hardware specifications and measurement times

Parameters	Characteristics	
Light source	High energy xenon flash lamp	
Detector	Silicon photodiode	
Wavelength selection	Single High-Speed Monochromator	
Wavelength range	200-1,000 nm, selectable in 1 nm steps	
Wavelength accuracy	≤0.8 nm	
Wavelength reproducibility	≤0.5 nm	
Bandwidth	Fixed, 3.5 nm	
Measurement range (OD)	0-4 OD	
Measurement time* 96-well plate, 1 flash		<14 seconds
Measurement time* 384-well plate, 1 flash		<30 seconds
Fast Scan (200-1,000 nm, 1 nm steps)		<5 seconds

* Fast reading times are determined by using one flash only, plate-in and plate-out
movements are not included in the measurement time.

Absorbance: performance specifications and typical performance values

Parameters	Characteristics
OD accuracy 0-0.8 OD, 96-well plate	±0.008 OD
OD accuracy 0.8-2.5 OD, 96-well plate	<±1.0 %
OD accuracy 2.5-3.0 OD, 96-well plate	<±1.5 %
*OD accuracy @ 260 nm	≤0.5 %
OD precision 0-1.2 OD, 96-well plate	<±0.006 OD
OD precision 1.2-3 OD, 96-well plate	±0.5 %
*OD precision @ 260 nm	≤0.2 %
OD linearity, 0-3 OD, 96-well plate, @ 260nm	R^2 > 0.999
OD uniformity, 96-well plate, @ 1OD	<3 %

* Typical performance value

Absorbance: performance specifications and typical performance values for the NanoQuant plate

Parameters	Characteristics
*Detection limit (DNA)	<1 ng/µl dsDNA
260/280 nm OD ratio accuracy	<0.07
260/230 nm OD ratio accuracy	<0.08
Measurement time for DNA quantification (consisting of a full wavelength scan plus fixed wavelength measurements at 230, 260, 280 and 310 nm)	<8 seconds/sample

* Typical performance value

Absorbance: performance specifications for the cuvette option

Parameters	Characteristics
Absolute height (including lid)	35-55 mm
Footprint (outer dimension)	12.5 x 12.5 mm
Optical path	10 mm*
Measurement window	>2 x 2 mm
Detection limit (DNA)	<0.2 ng/µl dsDNA
Detection limit (protein: BSA, IgG, lysozyme)	<0.1 mg/ml
Fast Scan (200-1000 nm, 1 nm steps)	<5 seconds

* If using a cuvette with different optical path measurement results
have to be corrected accordingly.

Fluorescence: hardware specifications and measurement times

Parameters	Characteristics
Light source	High energy xenon flash lamp
Detector	Low dark current photomultiplier tube
Detector gain	Manual: 1-255, optimal: automatic, calculated from well: automatic
Wavelength selection	Fusion Optics: Quad4 monochromators and/or optical filter
Wavelength range (Fluorescence top and bottom with UV-enhanced bottom fiber)	Monochromators: Excitation: 230-900 nm Emission: 280-900 nm selectable in 1 nm steps Filters: Excitation: 230-900 nm Emission: 230-900 nm
Wavelength accuracy	Monochromators: Excitation: <1 nm Emission: <2 nm Filters: Filter dependent
Wavelength precision	Monochromators: Excitation: <1 nm Emission: <1 nm Filters: Filter dependent
Bandwidth	Monochromators: Excitation: 20 nm (fixed) Emission: 20 nm (fixed) Filters: Filter dependent; available between 10 and 80 nm
High density well scanning	Up to 100 x 100 data points
Z-focusing (top and bottom)	Automatic adjustment with max. S/B ratio
Measurement time*, top, filter, 1 flash	96-well plate: <13 seconds 384-well plate: <30 seconds
Measurement time*, top, mono, 1 flash	96-well plate: <14 seconds 384-well plate: <32 seconds
Measurement time*, bottom, mono, 1 flash	96-well plate: <21 seconds 384-well plate: <35 seconds

* Fast reading times are determined by using one flash only, plate-in and plate-out
movements are not included in the measurement time.

Fluorescence intensity (FI): typical performance values

Parameters	Characteristics
*Limit of detection F/F – top	≤0.25 pM (≤25 amol/well; 100 μl)
*Limit of detection M/F – top	≤0.35 pM (≤35 amol/well; 100 μl)
*Limit of detection F/M – top	≤0.35 pM (≤35 amol/well; 100 μl)
*Limit of detection M/M – top	≤0.5 pM (≤50 amol/well; 100 μl)
*Limit of detection F/F – bottom	≤2.5 pM (≤0.5 fmol/well; 200 μl)
*Limit of detection M/F – bottom	≤3.5 pM (≤0.7 fmol/well; 200 μl)
*Limit of detection F/M – bottom	≤3.5 pM (≤0.7 fmol/well; 200 μl)
*Limit of detection M/M – bottom	≤4 pM (≤0.8 fmol/well; 200 μl)
Uniformity FF – 96-well – top and bottom	<3 CV %
Uniformity FF – 384-well – top and bottom	<5 CV %
Uniformity MM – 96-well – top and bottom	<3 CV %
Uniformity MM – 384-well – top and bottom	<5 CV %

* Typical performance value; Limit of detection for Fluorescein

Time-resolved fluorescence (TRF): hardware specifications

Parameters	Characteristics
Light source	High energy xenon flash lamp
Detector	Low dark current photomultiplier tube
Detector gain	Manual: 1-255
	Optimal: automatic
	Calculated from well: automatic
Wavelength selection	Fusion Optics: Quad4 monochromators and/or optical filter
Wavelength range (Fluorescence top and bottom with UV-enhanced bottom fiber)	Monochromators:
	Excitation: 230-900 nm
	Emission: 280-900 nm
	selectable in 1 nm steps
	Filters:
	Excitation: 230-900 nm
	Emission: 230-900 nm
Wavelength accuracy	Monochromators:
	Excitation: <1 nm
	Emission: <2 nm
	Filters:
	Filter dependent
Wavelength precision	Monochromators:
	Excitation: <1 nm
	Emission: <1 nm
	Filters:
	Filter dependent
Bandwidth	Monochromators:
	Excitation: 20 nm (fixed)
	Emission: 20 nm (fixed)
	Filters:
	Filter dependent
Z-focusing (top and bottom)	Automatic adjustment with max. S/B ratio
Integration time	20-2,000 μs
Lag time	0 μs-2 ms

Time-resolved fluorescence (TRF): typical performance values

Parameters	Characteristics
*Limit of detection F/F	≤40 fM (≤4 amol/well; 100 μl)
*Limit of detection M/F	≤65 fM (≤6.5 amol/well; 100 μl)
*Limit of detection F/M	≤65 fM (≤6.5 amol/well; 100 μl)
*Limit of detection M/M	≤100 fM (≤10 amol/well; 100 μl)

* Limit of detection for Europium

Fluorescence polarization (FP): hardware specifications

Parameters	Characteristics
Light source	High energy xenon flash lamp
Detector	Low dark current photomultiplier tube
Detector gain	Manual: 1-255
	Optimal: automatic
	Calculated from well: automatic
Wavelength selection	Fusion Optics: Quad4 monochromators and/or optical filter
Wavelength range (Fluorescence top and bottom with UV-enhanced bottom fiber)	Monochromators:
	Excitation: 300-850 nm
	Emission: 300-850 nm
	selectable in 1 nm steps
	Filters:
	Excitation: 300-850 nm
	Emission: 300-850 nm
Wavelength accuracy	Monochromators:
	Excitation: <1 nm
	Emission: <2 nm
	Filters:
	Filter dependent
Wavelength precision	Monochromators:
	Excitation: <1 nm
	Emission: <1 nm
	Filters:
	Filter dependent
Bandwidth	Monochromators:
	Excitation: 20 nm (fixed)
	Emission: 20 nm (fixed)
	Filters:
	Filter dependent

Fluorescence polarization (FP): typical performance values

Parameters	Characteristics
*Limit of detection F/F	≤1.5 mP
*Limit of detection M/F	≤2.5 mP
*Limit of detection F/M	≤2.5 mP
*Limit of detection M/M	≤3.0 mP

* FP precision at 1 nM Fluorescein

Luminescence: hardware specifications

Parameters	Characteristics – standard module	Characteristics – enhanced module
Detector	Low dark current photo-multiplier tube operated in counting mode	Low dark current photo-multiplier tube operated in counting mode
Wavelength range, glow and flash	370-700 nm	370-700 nm
Wavelength range, scanning	n.a.	390-660 nm
Wavelength selection, multicolor	n.a.	via filter sets (38 spectral filters)
Integration time/well	0.1-60 seconds	0.1-60 seconds
Attenuation	1 OD, 2 OD	1 OD, 2 OD, 3 OD
Dynamic range	10^7-10^9	10^7-10^{10}

Luminescence: typical performance values

Parameters	Characteristics
*Limit of detection (glow)	≤9 pM (≤225 amol/well; 25 μl)
**Limit of detection (flash)	≤218 fM (≤12 amol/well; 55 μl)

* Limit of detection for ATP (144-041 ATP detection kit SL, Biothema)

** Limit of detection for ATP (ENLITEN®, Promega)

Alpha Technology: hardware specifications

Parameters	Characteristics	
AlphaScreen®	Filter choice: Long-pass filter: 520 nm Short-pass filter: 620 nm	Central wavelength: 570 (100) nm
AlphaLISA®	Filter choice: Long-pass filter: 610 nm Short-pass filter: 635 nm	Central wavelength: 622.5 (25) nm
AlphaPlex™	Filter choice: Lable 1: Long-pass filter: 610 nm Short-pass filter: 635 nm Lable 2: Long-pass filter: 535 nm Short-pass filter: 560 nm	Central wavelength: Lable 1: 622.5 (25) nm Lable 2: 547.5 (25) nm
Excitation source	High power laser (680 nm/750 mW)	

Detector	Low dark current photomultiplier tube
Temperature correction	Contactless temperature sensor – automatic normalization of the signal to a temperature of 22.5 °C
Excitation time/well	10-1,000 ms
Integration time/well	10-60,000 ms

Alpha Technology: typical performance values

Parameters	Characteristics
*Limit of detection	≤100 amol/well bio-LCK-P
*Z´ value	≥0.9
**Limit of detection	≤2.5 ng/ml
**Uniformity	≤3.0 %
Fastest read times (incl. temp. corr.)	≤2 min (384-well plate) ≤1 min (96-well plate)

* P-Tyr-100 assay kit, Perkin Elmer
** Omnibeads™, Perkin Elmer

SparkControl™ highlights

Parameters	Characteristics
Dashboard control	Touch-optimized dashboard for instrument communication, measurement control and progress monitoring
Direct Excel® export	Automatic export of all data and measurement settings into Microsoft Excel
Touch-optimized, 1-click applications	Continuously enlarged set of 1-click applications with integrated data reduction, eg. for cell counting, cell viability, low-volume DNA quantification, absorbance-based cuvette measurements, etc.
Multiplexing capability in endpoint and kinetic modes	Up to ten different measurements in various measurement modes within a single endpoint or kinetic run
Well-wise kinetic measurement	A kinetic measurement performed well per well – eg. for Ca^{2+} release assays
Kinetics well-wise	A well-wise measurement performed in a kinetic run – eg. for FRET and TR-FRET kinetics
Gain regulation in fluorescence top and bottom kinetics	Automatic gain adjustment within a kinetic measurement prevents 'OVER' signals
Conditional measurements in kinetics	Time- and signal-triggered actions and measurements within a kinetic measurement run
Integrated fluorophore spectra viewer	>60 commercially available fluorophores
Extended dynamic range for fluorescence	Automatic gain adjustment during a fluorescence endpoint measurement for a higher dynamic signal range
Automatic mirror selection for fluorescence	Automatic selection of optimal mirror settings
3D scan for fluorescence	Simultaneous excitation and emission scans for convenient fluorophore characterization
Optimal Read for fluorescence bottom	Optimized illumination and signal detection for cell-based assays measured in fluorescence bottom mode, no matter which plate format is used
Multiple reads per well for absorbance, and fluorescence top and bottom modes	Multiple measurement spots per well
Area scan in fluorescence bottom and absorbance modes	High density (up to 100 x 100) option of multiple reads per well enabling enhanced signal resolution within a measured well
Screencasts	Continuously enlarged set of screencasts, showing exemplified workflow setups
Help Center	Fully integrated wizard for convenient set-up of the measurement script
Data reduction software: SparkControl Magellan™ Tracker	Offers all the functionality required for compliance with FDA regulation 21 CFR part 11 for electronic records and signatures in addition to the functionality of SparkControl Magellan Standard.

Specifications are subject to change. Typical performance values represent the average observed factory tested values.
For more product specifications refer to operators manual.