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## Luminex Prima

## **Theory of Operation**

Luminex 200 technology is based on flow cell fluorometry with Luminex-developed innovations. The fluidics, optics, robotics, temperature control, software, and xMAP® microspheres work together to enable simultaneous analysis of up to 100 analytes in a single test sample. Assay analysis requiring temperature control is provided through the Luminex XYP instrument heater block.

There are two fluidics paths in the Luminex 200 analyzer. The first path involves a syringe-driven mechanism that controls the sample uptake. This mechanism permits small sample uptake volumes from small reaction volumes. The syringe-driven system transports a specified volume of sample from a sample container to the cuvette. The sample is injected into the cuvette at a steady rate for analysis. Following analysis, the sample path is automatically purged with Luminex xMAP Sheath Fluid by the second fluidics path. This process removes residual sample within the tubing, valves, and probe. The second fluidics path is driven by positive air pressure and supplies sheath fluid to the cuvette and sample path.

Luminex xMAP Sheath Fluid is the delivery medium of the sample to the optics component. The analysis sample is acquired using a sample probe from a 96-well microtiter plate via the Luminex XYP instrument and injected into the base of the cuvette. The sample then passes through with sheath fluid at a reduced rate resulting in a narrow sample core to ensure that each microsphere is illuminated individually. The sample injection rate is such that the xMAP microspheres are introduced to the optics path as a series of single events. The Luminex SD system lets you run samples continuously without refilling sheath bottles. It automatically draws sheath from a non pressurized bulk sheath container to constantly maintain a reservoir of pressurized sheath fluid. A single 20 liter sheath container provides enough fluid for 48 hours or more of normal operation.

The optics assembly consists of two lasers. One laser excites the dye mixture inside the xMAP microspheres and the second laser excites the fluorophore bound to the surface of the xMAP microspheres. Avalanche photo diode detectors measure the excitation

emission intensities of the color coding classification dye mixtures inside the xMAP microspheres and a photomultiplier tube detects the excitation emission intensity of the reporter molecule bound to the surface of the xMAP microspheres. High speed digital signal processors and advanced computer algorithms provide analysis of the xMAP microspheres as they are processed through the Luminex 200 analyzer. Results of the analyses are processed and provided in a report format.

## Luminex Hardware:

- Luminex 200 analyzer
- Computer (PC), monitor, and accessories
- Luminex XYP instrument
- Luminex Sheath Delivery System (Luminex SDTM)
- Power cables
- Alignment guide
- Two long sample probes
- Reservoir
- Shield
- Heater block
- Sheath fluid container
- Waste container
- Sheath fluid line
- Air line
- Sheath fluid intake line
- Communications: 1 serial communication cable
- Communications: 1 USB communication cable
- Communications: 1 CANBUS cable (short cable)
- Barcode reader
- Sample probe height alignment kit
- 3/32 Hexdrive, Balldriver wrench

xMAP Technology Reagents

- Classification calibration microspheres (CAL1)
- Reporter calibration microspheres (CAL2)
- Classification control microspheres (CON1)
- Reporter control microspheres (CON2)
- Luminex xMAP Sheath Fluid

Required Laboratory Reagents

- Household bleach
- 70% isopropanol or 70% ethanol
- Mild detergent
- Distilled water

Luminex IS 2.3 Software

Luminex IS 2.3 software provides complete control of the system and performs data analysis. Your Luminex 200 system is preloaded with the Luminex software. However, we supply a software CD should you need to reinstall the software.

This software requires a dedicated system. Unauthorized additional software is prohibited and may result in improper operation of the system.

Speed	• Speed: greater than or equal to1.7 GHz Intel® Pentium® IV
	processor with 256 MB RAM
	• USB communications link for fast data transfer
	• Automatic transfer of assay templates and new reagent
	information into the system via a 31/2" diskette or large
	capacity read/write CD
	• Installation: < 4 hours
	• System calibration: < 10 minutes
	• System controls: < 10 minutes
	• Barcode reader entry of sample IDs
	Automatic post-analysis
	• Analyze one 96-well plate/hour depending on manufacturer's
	kit
	• Up to 100 xMAP microsphere sets per sample
	• Sheath flowrate: 90 $\mu$ L/sec ± 5 $\mu$ L
	• Sample injection rate into detector area: $1 \ \mu L/sec \pm 0.05 \ \mu L$
	• System warmup: 30 minutes. Systems that remain inactive for
	at least four hours will require a warm-up to restart the lasers.
	After acquiring sample, running system calibrators, running
	system controls, and warming up the instrument, the system
	resets the four-hour internal clock.
Accuracy and	• Sample uptake volume: ± 5%
Precision	• Classification of xMAP microspheres: > 80%
	• Misclassification of xMAP microspheres: $\leq 2$ - may vary by
	xMAP microsphere product lines. Refer to the specific product
	information sheet for further details.
	• Temperature control: $0^{\circ}$ C to + $2^{\circ}$ C of target
	• Internal sample carry over: < 0.9%
	Soluble background fluorescence emission at 575 nm
	automatically subtracted from fluorescence intensity values
Sensitivity	• Detect 1000 fluorochromes phycoerythrin (PE) per xMAP
	microsphere
	Reporter channel dynamic range: 3.5 decades of detection
Capacity	The specifications below reflect minimum capacity values:
	• 10 GB hard drive

	• Store data for up to 240,000 test results
	• 1.4 MB 31/2" diskette
	• 100 MB read/write CD ROM
	• Analyze multiple 96-well plates per batch
	• Analyze multiple assay templates per plate
	• Distinguish a minimum of 1 to a maximum of 100 unique
	xMAP microsphere sets in a single sample
	• Detect and distinguish surface reporter fluorescence emissions
	at 575 nm on the surface of 1-100 unique xMAP microspheres
	sets in a single sample
	• Sample core: 15-20 um core at 1 uI /sec. sample inject rate
	• Maintain samples at a constant temperature from 35°C to
	$55^{\circ}$ C ( $05^{\circ}$ F to $131^{\circ}$ F)
	• Automatic sampling from a 96-well plate
	Start campling from any well nosition
	• Sheath container and waste container hold enough volume to
	run un to two 06-well plates between refills
	• Microtiter plates with 96 wells must be compatible with the
	Luminev XVP instrument plate holder. The following microtiter
	plate types are compatible with the Luminey XVP instrument
	plate types are compatible with the Lummer ATT instrument
	plate folder. flatootion, concat, round, mer obtion, nam
	Migratizer plates with 06 wells must be compatible with
	• Microliter plates with 90 wens must be companyie with
	Luminex A Y P instrument neater block temperature from 55 C
	to 55°C (95°F to 151°F) when performing neared assays and
Laurineau 200 Analyzar	USINg the nearer block.
Conorol	• Indoor use only • Operating temperature: 15°C to 20°C (50°E to 86°E)
General	• Operating temperature. 15 C to 50 C (59 F to 60 F)
	• Humilarly. 20% to 80%, nonconnectioning
	• Altitude. Operation up to 2400 m ( $7074$ n.) above mean sea lovel
	• Physical dimensions: 43 cm (17 inches) W x 50 5 cm (20
	inches) D x $2/15$ cm (0.5 inches) H
	• Waight: maximum of 25 kg (60 lbs)
	• Weight, maximum of 25 Kg (00 105.)
	• OL Instantation category. OL instantation category in, as defined in Anney Lof III $61010\Delta_{-1}$
	• Pollution degree: UL Pollution Degree 2 as defined in Section
	• Follution degree. OF Follution Degree 2, as defined in Section $2.7.2.2 \text{ of III}$ $61010 \text{ A}_{-}1$
	• Shipping and storage: The allowable shipping and storage
	• Simpling and storage. The anowable simpling and storage tomograture and humidity ranges are $0^{\circ}$ C to $\pm 50^{\circ}$ C and $20_{-}80^{\circ}$
	temperature and number panges are 0 C to + 50 C and 20-0070
	Indicolluctions, respectively • Input voltage range: $100 - 120 V_{\odot} + 10\% - 1.4 \text{ Amp}$ and $200_{\odot}$
	• Input voltage lange. 100 - 120 $\sqrt{2} \pm 1070$ , 1.4 Amp, and 200- 240 M $\pm 10070$ 0 0 Mmp 47 62 Hz
	240 V~ $\pm$ 10%, 0.8 AIIIP, 47-05 HZ.
Ontios	• AC fillet fuse. 5 Allip, 250 v~, fast acting
Optics	• Reporter laser. 552 nm, nonlinal output 10-10.5 mw,
	maximum 500 mw, nequency-doubled diode, mode of

	operation, continuous wave (CW)
	• Classification laser: 635 nm, 9.1 mW $\pm$ 6%, maximum output
	25 mW, diode: mode of operation, continuous wave (CW)
	• Reporter detector: Photomultiplier tube, detection bandwidth
	of 565-585 nm
	• Classification detector: Avalanche photo diodes with
	temperature compensation
	• Doublet discrimination detector: Avalanche photo diodes with
	temperature compensation
Fluidics	• Sheath flow rate 90 $\mu$ L $\pm$ 5 $\mu$ L/second
1 Turures	• Cuvette: 200 micron square flow channel
	• Sample injection rate: 1 uI /second
	• Sample untake volume: 20-200 µL
Electronics	• Reporter channel detection: A/D resolution 14 bits
Lieutomes	Communications interface: USB
	• Luminey XVP instrument communications interface: RS 232
Luminov VVP	• Ambient temperature: 15°C to 30°C (50°E to 86°E)
Instrument Conerel	• Humidity: 200/ to 200/ noncondensing
Instrument General	• Humany. 20% to 80%, noncondensing
	• Altitude. operation up to 2400 m (7874 ft) above mean sea
	$\begin{bmatrix} 10001 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$
	• Physical dimensions: 44 cm $(1/.25 \text{ inches})$ W x 60 cm $(23.5)$
	inches) D x 8 cm (3 inches) H
	• Weight: 15 kg (33 lbs.)
	• UL installation category: UL Installation Category II, as
	defined in Annex J of UL 61010A-1
	• Pollution degree: UL Pollution Degree 2. as defined in Section
	3.7.3.2 of UL 61010A-1
	• Heater operating range: 35°C to 55°C (95°F to 131°F) with
	tolerance $0^{\circ}$ C to $+2^{\circ}$ C
	• Input voltage range: $100-240 \text{ V} \sim \pm 10\%$ , 1.8 Amps, 47-63 Hz
	• AC inlet fuse: 3 A, 250 V~, fast acting
Luminex SD System	• Ambient temperature: 15°C to 30°C (59° to 86°F)
General	• Humidity: 20% to 80%, noncondensing
	• Altitude: designed to operate at up to 2400m (7874 feet) above
	mean sea level
	• Physical dimensions: 20 cm (8 inches) W x 30 cm (11.75
	inches) D x 24.75 cm (9.75 inches) H
	• Weight: 9 kg (20 lbs)
	• UL installation category: UL Installation Category IL as
	defined in Annex J of UL 61010A-1
	• Pollution degree: UL Pollution Degree 2 as defined in Section
	3.7.3.2 of UL 61010A-1
	• Input voltage range: $100-240 \text{ V} \sim \pm 10\%$ 0.4 Amps 47-63 Hz
	• AC inlet fuse: 2 Amp. 250 V~ time lag
PC Specifications	For systems using a PC. A Dell OptiPlex GX280 or Dell

Optiplex GX520 (or newer PC) is shipped with the Luminex 200 system. For systems using a laptop, a Dell D610 Notebook is shipped with the system. Microsoft® Windows® XP is pre-installed on the computers. The power requirements are 115-230 V~, 6 Amps, 50-60 Hz
For updated information regarding the PC, notebook, or operating system, go to http://www.luminexcorp.com, then click on the Support link to open the FAQ list.



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