invitrogen

Attune NxT Flow Cytometer

Run samples faster and achieve greater resolution while minimizing sample loss due to clogging. The Invitrogen™ Attune™ NxT Flow Cytometer combines precision with performance in a true benchtop flow cytometer, with up to 4 lasers and 16 parameters of detection. The Attune NxT Flow Cytometer was developed with the goal of removing barriers associated with flow cytometry and enabling new research. This includes bringing the power of flow cytometry to the analysis of more sample types, including cancer cells. The addition of the Invitrogen™ Attune™ NxT Autosampler enables significantly faster high-throughput screening on a multiparametric platform.

- **Time savings**—up to 10x faster data acquisition speeds

- **Reduced clogging**—engineered for even large or sticky cell types

- **Efficient protocols**—rapid no-wash, no-lyse sample prep helps reduce protocol time and minimize cell loss

- **Robust software**—developed to offer user-focused functionality with many automated, user-definable, and administrative features

- **Reduced need for compensation**—spatially separated lasers

- **Elegant fluidics design**—readily accessible, easy to fill, and requires minimal maintenance

- **Rare-event detection**—technology for identifying very rare subpopulations of cells with high efficiency and certainty

- **Flexibility**—choice of lasers and parameters

- **Multiple configurations**—for a broad array of applications

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Instrument specifications

Optics

- **Laser power**

Laser	Wavelength (nm)	Beam-shaping optics (BSO)* (mW)	Diode power** (mW)
Violet	405	50	100
Blue	488	50	100
Green	532	100	140
Yellow	561	50	100
Red	637	100	140

  * Amount of measured usable laser power after light has gone through the beam optics and shaping filters.

  ** Vendor-specified theoretical maximum.

- **Laser excitation:** Optimized excitation for minimized stray laser-line noise and losses to reflection
- **Laser profile:** 10 x 50 µm flat-top laser providing robust alignment
- **Emission filters:** Up to 14 color channels with wavelength-tuned photomultiplier tubes (PMTs); user-changeable, keyed filters
- **Laser separation:** 150 µm
- **Optical alignment:** Fixed alignment with prealigned welded fiber; no user maintenance required
- **Onboard thermoelectric cooler:** No warm-up delay; fiber isn't affected by "on/off"
- **Simmer mode:** Instant "on/off" reduces usage and/or aging by 10x; only keep it "on" when acquiring samples; reports hours of usage
- **Flat top specified at the flow cell:** Coefficient of variation (CV) <3% over width of flat top
- **Upgradable:** Convenient field changes

Fluidics

- **Flow cell:** Quartz cuvette gel coupled to 1.2 numerical aperture (NA) collection lens, 200 x 200 µm
- **Sample analysis volume:** 20 µL to 4 mL
- **Custom sample flow rates:** 12.5–1,000 µL/min
- **Sample delivery:** Positive-displacement syringe pump for volumetric analysis
- **Sample tubes:** Accommodates tubes from 17 x 100 mm to 8.5 x 45 mm
- **Fluid-level sensing:** Active
- **Standard fluid reservoirs:** 1.8 L focusing fluid tank, 1.8 L waste tank, 175 mL shutdown solution tank, and 175 mL wash solution tank
- **Fluid storage:** All fluids stored within instrument
- **Extended fluidics option:** Configuration for 10 L fluid
- **Nominal fluid consumption:** 1.8 L/day
- **Automated maintenance cycles:** ≤15 min start-up and shutdown—deep clean, sanitize, and debubble modes

Performance

- **Fluorescence sensitivity:** ≤80 molecules of equivalent soluble fluorochrome (MESF) for FITC, ≤30 MESF for PE, ≤70 MESF for APC
- **Fluorescence resolution:** CV <3% for the singlet peak of propidium iodide–stained chicken erythrocyte nuclei (CEN)
- **Data acquisition rate:** Up to 35,000 events/sec, 34 parameters, based on a 10% coincidence rate per Poisson statistics
- **Maximum electronic speed:** 65,000 events/sec with all parameters
- **Carryover:** Single-tube format: <1%
- **Forward and side scatter sensitivity:** Able to discriminate platelets from noise
- **Forward and side scatter resolution:** Optimized to resolve lymphocytes, monocytes, and granulocytes in lysed whole blood
- **Forward scatter:** Photodiode detector with 488/10 nm bandpass filter
- **Side scatter:** PMT with default 488/10 nm bandpass filter; optional 405/10 nm bandpass filter
- **Fluorescence detectors:** 14 individual detectors
- **Electronic pulse:** Measured area, height and width pulse for all detectors
- **Violet side scatter resolution:** Can be configured for violet side scatter to better resolve particles from noise
- **Minimum particle size:** 0.2 µm on side scatter using submicron bead calibration kit from Bangs Laboratories

Instrument specifications (continued)	
Software	• **Compensation:** Full matrix—automated and manual modes, on-plot compensation tools for fine adjustment; use of tubes and wells
	• **Flow rate:** Precise flow rate control via software; no hardware adjustments
	• **Live streaming:** Live update of statistics during acquisition of events up to 35,000 events/sec
	• **Overlays:** Comparative analysis between samples; 3D view
	• **Sample recovery:** System able to return unused samples
	• **Concentration:** Direct concentration measurement without use of counting beads
	• **Software layout:** Fully customizable for each user account
	• **Bubble detection technology:** Stops automated run to preserve sample integrity
	• **Maximum single-event file:** 20 million with option to append
	• **Heat map:** Set up for definition of plate layout; screening view for analysis for tubes and plates
	• **Threshold:** Up to 4 individual thresholds with user option to apply Boolean logic
	• **Gating:** Hierarchal gating with the ability to derive gates
	• **SmartGate™ labeling:** Option to annotate quad gate names based on fluorophore and target names
	• **Voltage:** User adjustable
	• **Window extensions:** User adjustable
	• **Area scaling factor (ASF):** User adjustable
	• **Acquisition settings:** Documented in FCS files and maintained upon import
	• **Templates:** Create from existing experiments—instrument settings, workspaces, run protocols, heat map settings, and compensation settings optimized and defined previously
	• **Tube-to-plate conversion:** One-click transition from tubes to plates and vice versa; no disassembly, no additional QC, no reboot required for conversion between plates and tubes
	• **Graphics resolution:** Publication-quality images; support for TIF, PNG, BMP, JPG, GIF, and EMF; quickly copy and paste plots to any external application (e.g., Microsoft™ PowerPoint™ software)
	• **User account administration:** Administrative creation of individual user accounts with designated roles, advanced setting permissions, management of individual accounts, user time tracking, and sample count
Quality and regulatory	• **Instrument tracking:** Automated daily baseline and performance test with Levey-Jennings plots
	• **Warranty:** 1 year
	• **Production verification testing:** Each instrument is tested and verified for assembly integrity and performance to specifications
	• **Quality management system:** Manufacturing standards comply with the requirements of ISO 13485:2003
	• **Robust installation specifications:** Units installed by engineer; preplanning checklist, delivery, and installation; and performance validation compliance with standardized procedure
	• **For Research Use Only**
Data management	• **Software requirements:** Invitrogen™ Attune™ NxT Software
	• **Monitor:** 23-inch flat panel (1,920 x 1,080 resolution); dual-monitor capability
	• **Computer:** Minitower desktop
	• **Operating system:** Microsoft™ Windows™ 7 64-bit
	• **FCS format:** FCS 3.1, 3.0
	• **Processor:** Intel Core™ i7 processor
	• **RAM:** 32 GB
	• **Hard drives:** 2 x 2 TB SATA 6.0 Gb/s, 7,200 RPM, 64 MB data burst cache; controller RAID1, integrated

Installation requirements

- **Electrical requirements:** 100–240 VAC, 50/60 Hz, <150 W
  Thermo Fisher Scientific certifies that the Attune NxT Flow Cytometer conforms to relevant directives to bear the CE mark. The instrument also conforms to the UL and CAN/CSA general requirements (61010.1). The Attune NxT Flow Cytometer is a Class I laser product per Center for Devices and Radiological Health (CDRH) regulations and EN/IEC 60825.

- **Heat dissipation:** <150 W

- **Temperature operating ranges:** 15–30°C (59–86°F)

- **Operating humidity:** 10–90%, noncondensing

- **Audible noise:** <65 dBA at 1.0 m

- **Instrument size (H x W x D):** ~40 x 58 x 43 cm (16 x 23 x 17 in.), including fluid bottles

- **Weight:** ~29 kg (64 lb)

- **Available configurations** (as shown in table below)

Lasers	Laser configuration (Cat. No.)	Violet 405 nm	Blue 488 nm	Yellow 561 nm	Green 532 nm	Red 637 nm	Total detection channels*
1	Blue (A24864)	Available as upgrade	4	Available as upgrade	Available as upgrade	Available as upgrade	6
2	Blue/green (A28995)	Available as upgrade	3	–	4	Available as upgrade	9
	Blue/yellow (A24861)	Available as upgrade	3	4	–	Available as upgrade	9
	Blue/violet (A24862)	4	4	Available as upgrade	Available as upgrade	Available as upgrade	10
	Blue/red (A24863)	Available as upgrade	4	Available as upgrade	Available as upgrade	3	9
	Blue/violet 6 (A29002)	6	3	Available as upgrade	–	Available as upgrade	11
3	Blue/green/red (A28997)	Available as upgrade	3	–	4	3	12
	Blue/green/violet (A28999)	4	3	–	4	Available as upgrade	13
	Blue/red/yellow (A28993)	Available as upgrade	3	4	–	3	12
	Blue/violet/yellow (A24859)	4	3	4	–	Available as upgrade	13
	Blue/red/violet (A24860)	4	4	Available as upgrade	Available as upgrade	3	13
	Blue/red/violet 6 (A29003)	6	3	Available as upgrade	–	3	14
4	Blue/red/violet/green (A29001)	4	3	–	4	3	16
	Blue/red/yellow/violet (A24858)	4	3	4	–	3	16
	Blue/red/yellow/violet 6 (A29004)	6	2	3	–	3	16

* Includes forward scatter (FSC) and side scatter (SSC).

Attune NxT Autosampler

To improve experimental workflow, the Attune NxT Autosampler is a high-throughput sampler option for the Attune NxT Flow Cytometer. The system offers:

- **Broad compatibility**—compatible with many different plate formats, including 96-well, 384-well, and deep-well plates

- **Intelligent probe design**—minimizes clogging

- **Auto cleaning**—performs automated cleaning when the instrument is shutting down

- **Consistent data**—designed to provide minimal variation regardless of sampling method (tube vs. plate) and collection rate

- **Mixing by aspiration**—mixing sample by aspiration instead of shaking helps ensure homogeneity of the sample and maintains cell viability

- **One-click transition**—plate and tube compatibility: no disassembly, no additional QC, no reboot required for conversion between plates and tubes

Comparing flow cytometers among manufacturers

The purpose of this specification sheet is to help you identify design attributes of the Attune NxT Flow Cytometer, such as performance, size, environment, and software, to determine if the instrument is a good fit for your research. The specifications can be used as a basis for comparison, helping you assess the value of different instruments for the price. This specification sheet is also a guide to the expected performance. For this reason, you should have a good understanding of the stated values and how they pertain to your intended use of the instrument. When using this document as a comparison guide across platforms, be aware that there are many performance values that appear comparable across instruments but in reality are quite different. A specification is derived from a specific test or calculation, but these tests are not standardized across instrument developers and may be misleading in a side-by-side comparison.

Instrument specifications	
Performance	• **High-throughput mode acquisition time:** <42 min for 96-well plate, <180 min for 384-well plate (using one rinse and one mix, and full analysis of a 40 µL sample)
	• **Carryover:** <0.5% in plate loader format (standard mode, 2 wash cycles); multiple-rinse capability for ultralow carryover
	• **Sample mixing:** Mixing optimized to preserve cell viability; mixing cycles optimized to sample analysis volume
	• **Mixing method:** Each well mixed via full aspiration (no shaking)
	• **Wash cycle:** User-defined number of wash cycles, dependent on plate-processing protocol and time to acquire plates
	• **Minimum dead volume (single draw):** 30 µL for 12.5–200 µL/min, 50 µL for 50–1,000 µL/min
	• **Sample window:** Protectively coated window allows visibility to well progress while preventing exposure to ambient light during acquisition
	• **Auto-calibration:** Regular, 30-day interval, system-initiated function
Fluidics	• **Plate and tube compatibility:** One-click transition from tubes to plates and vice versa; no disassembly, no additional QC, no reboot required for conversion between plates and tubes
	• **Compatible plate types:** 96 deep-well (flat, round, and V-bottom), 96-well standard depth (flat, round, and V-bottom), 384-well standard depth (flat, round, and V-bottom), 384 deep-well (flat, round, and V-bottom)
	• **Cleaning cycles:** Automated daily and monthly cleaning protocols
	• **Fluidics requirements:** 800 mL total of onboard fluid tanks, capable of running four 96-well plates
	• **Extended fluidics option:** Optional external fluid tank with 10 L fluid capacity

Instrument specifications (continued)

Installation requirements	• **Size (W x D x H):** ~40 x 29 x 29 cm (16 x 11 x 11 in.)
	• **Space requirements:**
	  – Minimum width: 40 cm (15.8 in.); when attached to the Attune NxT Flow Cytometer, the total width is 167 cm (65.8 in.)
	  – Minimum depth: 58.5 cm (23.1 in.) provides 43.2 cm (17.1 in.) for the cytometer unit, a 10.2 cm (4 in.) ledge in front of the unit to place fluidics bottles, and 6.5 cm (2.5 in.) behind the unit for ventilation
	  – Minimum clear height: 74 cm (29 in.) above the mounting
	• **Mounting:** Side
	• **Weight:** ~16 kg (35 lb)
	• **Operating range (environmental conditions):** 15–30°C (50–95°F)
	• **Operating humidity:** <80% noncondensing
	• **Electrical requirements:** 100–240 VAC, 50/60 Hz, <300 W

Education, service, and support

Flow cytometry learning center: Find a range of targeted resources for flow cytometry, from webinars that cover the basics of this technology to application notes that demonstrate the utility of flow cytometry for high-content analysis applications. Go to **thermofisher.com/flowlearning**

Training: Hands-on, in-lab training is available. Customer training centers are also available in selected countries.

Service and support: Reliable global technical support, experienced field service engineers, and flow cytometry specialists are available for assistance.

Remote monitoring and diagnostics service: The Smart Monitor™ tool is a real-time, remote instrument performance monitoring service* that incorporates an instrument management dashboard, remote diagnostics, and aggregated performance data tracking.

Service packages at a glance	AB Complete Plan	AB Assurance Plan	AB Maintenance Plus Plan
On-site response time	Guaranteed next business day**	Guaranteed 2 business days**	Target 2 business days**
Scheduled planned maintenance	√	√	√
Application technical support	√	√	√
Instrument operating software updates	√	√	√
On-site service—labor, parts, travel	√	√	10% discount
Phone and email access to engineers in the remote service center	√	√	
Computer coverage	√	√	
Remote instrument monitoring diagnostics	√	√	
On-site application consulting	√		
Qualification service	√		

* Subject to Internet connectivity.
** Availability limited in some geographic areas.

Resources

Reference guides

***The Molecular Probes™ Handbook,* 11th Edition**
The most complete reference on fluorescent labeling and detection available, this resource features extensive references and technical notes and contains over 3,000 technology solutions representing a wide range of biomolecular labeling and detection reagents. See the online version of *The Molecular Probes Handbook* and request your free copy* at **thermofisher.com/handbook**

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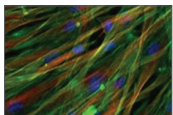
Flow cytometry antibody selection tool
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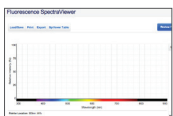
Fluorescence SpectraViewer
Plot up to 14 fluorophores on a single graph that you can print or save for later. Find out more at **thermofisher.com/spectraviewer**

Flow Cytometry Panel Design Tool
Choose fluorescent antibody conjugates: pick the antibody species reactivity, select up to 14 targets of interest (choices include viability dyes), and choose the lasers or fluorophores you want to view. Then print or email your list. Access the tool at **thermofisher.com/flowpanel**

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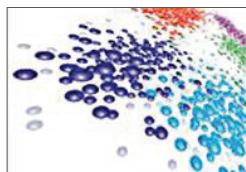
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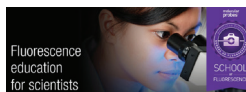
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Service and support

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