



Automation and robotics for flow cytometry

Everyday high-throughput for your
flow cytometry workflow

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Robotic integration

What is an integrated workcell?

A workcell in flow cytometry is a multicomponent, automated work station (Figure 1) containing the instruments needed to complete a particular plate assay. Robotic integration for flow cytometry is a solution for high-volume labs and standardized operational parameters. The features and capabilities of each instrument in the work station contribute to the overall performance. In this guide, you will learn how each of these instruments from the Thermo Scientific™ and Invitrogen™ flow cytometry portfolio collectively deliver the walk-away reliability that automation is meant to provide.

Reliable performance for efficient flow cytometry

Our flow cytometry robotics workcell comprises five high-performance instruments that unite to provide a seamless, automated workflow for flow cytometry assays. Move your research forward with the help of our integrated, comprehensive, and automated flow cytometry station (Figure 1). Explore the suite of instruments designed to maximize operating capacity, mitigate human operator error, and enable rich, reproducible data:

- **Invitrogen™ Attune™ NxT Flow Cytometer**—superior speed and mechanical integrity
- **Invitrogen™ NxT CytKick Autosampler**—consistent plate sampling
- **Thermo Scientific™ Orbitor™ RS2 Microplate Mover**—unmatched speed and accuracy
- **Thermo Scientific™ Cytomat™ 2 C-LiN Automated Incubator Series**—dependable, environmentally controlled sample storage
- **Invitrogen™ Attune™ NxT External Fluid Supply (EFS)**—expanded fluidics and 24-hour continuous run time

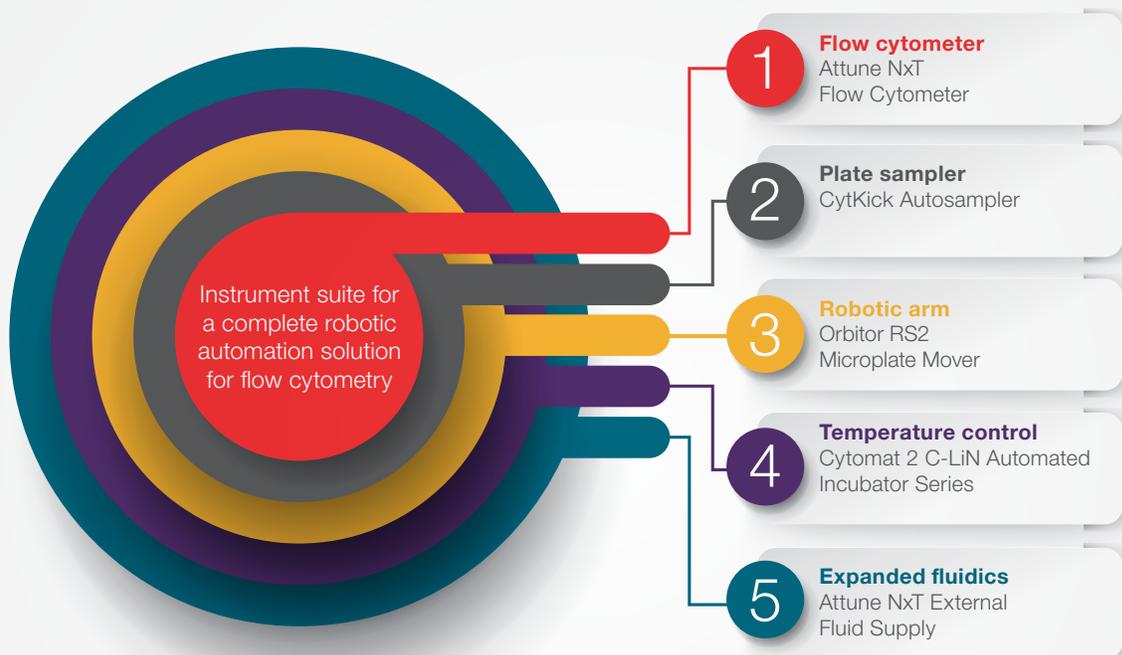


Figure 1. Components of a fully integrated robotic automation workcell for cell-based flow cytometry assays.

Flow cytometer: Attune NxT Flow Cytometer

1 Flow cytometer Attune NxT Flow Cytometer

Traditional flow cytometers face the following challenges when coupled with high throughput and automation:

- **Potential for clogging**—large, sticky, or heterogeneous cell populations can block tubing and the flow cell
- **Time-intensive assays**—certain types of samples are slow to acquire and analyze
- **Data inaccuracies**—imprecise concentration measurements, well-to-well carryover, inadequate mixing, and >10% coincidence rate of diminishing data quality

Performance overview

Reliability is central to automated operations and high-throughput experiments. The Attune NxT Flow Cytometer within a robotics workstation (Figure 2) is a high-performance instrument, engineered to meet the rigid demands of a high-throughput environment.

Fluidics designed for speed

The instrument operates with a non-peristaltic, continuous flow pump. Advantages include:

- **Precise counts**—uncompromised volumetric cell counts for all samples in a known volume (gated or total events)
- **Stable flow**—low fluid pulsation offers less variation in a particle's velocity within the flow stream and increased certainty of where the particle will be after traversing a distance within the flow cell
- **Engineering to actively resist clogging**—a syringe-driven system pushes the sample with a force of up to 75 psi and is significantly less susceptible to clogs caused by backpressure; robotic capability is inconsequential if paired with an instrument prone to clogging and other malfunctions

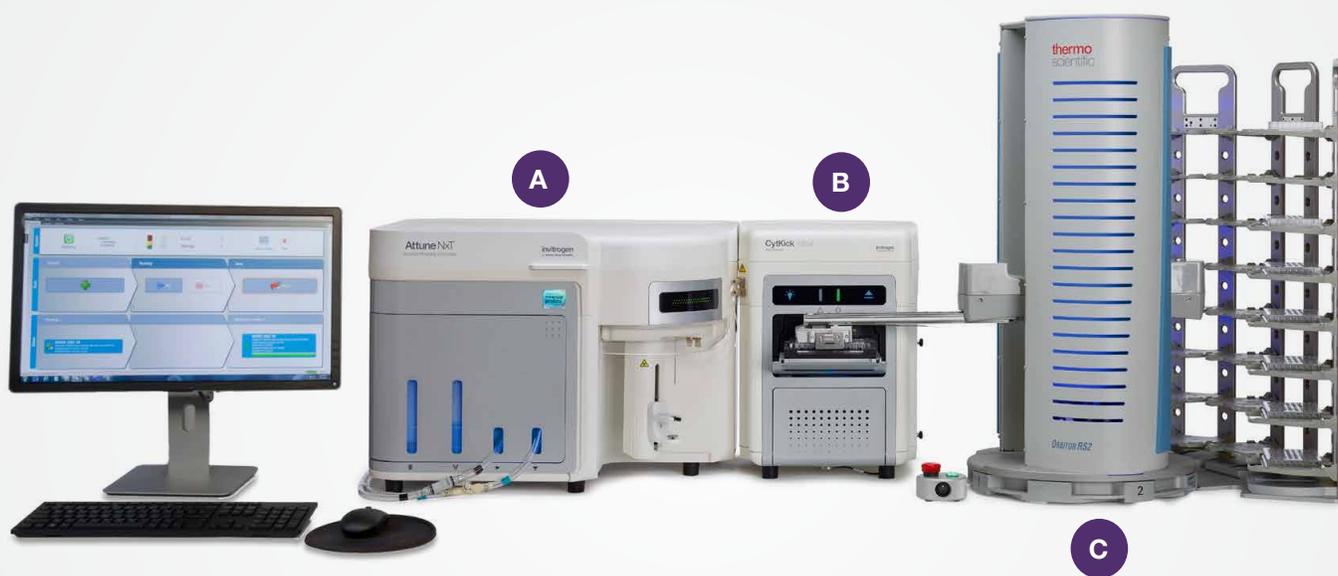


Figure 2. The Attune NxT Flow Cytometer configured for robotic automation with the Orbitor RS2 Microplate Mover. The components include the (A) Attune NxT Flow Cytometer, (B) CytKick Autosampler, and (C) Orbitor RS2 Microplate Mover.

Optimized optics

Optical design with defined, fixed alignment of up to 4 spatially separated lasers (Figure 3) offers consistency in data over time, superior performance, and measurable reliability.

- **Interchangeable filters**—minimized reagent crosstalk and maximized signal
- **Laser simmer mode**—ready at all times, but only changes to “on” when actively lasing; no warm-up requirement between acquisitions
- **Stable alignment**—prealigned and welded fiber to laser beam–shaping optics (BSO) interface

Technology

The instrument uses traditional hydrodynamic focusing for low sample rates (12.5–25 $\mu\text{L}/\text{min}$) and acoustic-assisted hydrodynamic focusing for high sample rates (up to 1,000 $\mu\text{L}/\text{min}$). Advantages include:

- **Uniform laser illumination**—a precisely aligned particle stream is maintained regardless of the sample input rate
- **High speed with low coincidence rate**—acquire data at up to 35,000 events/sec with 34 parameters, based on a 10% coincidence rate per Poisson statistics

Lasers	Laser configuration (Cat. No.)		Violet 405 nm	Blue 488 nm	Yellow 561 nm	Green 532 nm	Red 637 nm	Total detection channels Fluorescence + FSC + SSC
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	NA	4	Available as upgrade	9
	Blue/yellow (A24861)		Available as upgrade	3	4	NA	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	NA	Available as upgrade	11
3	Blue/green/red (A28997)		Available as upgrade	3	NA	4	3	12
	Blue/green/violet (A28999)		4	3	NA	4	Available as upgrade	13
	Blue/red/yellow (A28993)		Available as upgrade	3	4	NA	3	12
	Blue/violet/yellow (A24859)		4	3	4	NA	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	NA	3	14
4	Blue/red/violet/green (A29001)		4	3	NA	4	3	16
	Blue/red/yellow/violet (A24858)		4	3	4	NA	3	16
	Blue/red/yellow/violet 6 (A29004)		6	2	3	NA	3	16

Figure 3. Optimized optics with up to 4 lasers, 14 colors, and 16 parameters. Choose from 5 laser options with 12 possible configurations.

Technical specifications: Attune NxT Flow Cytometer

Instrument specifications

Optics

- **Laser power:**

Laser	Wavelength (nm)	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
- **Fluorescent 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

Comprehensive specifications available at [thermofisher.com/attune](https://www.thermofisher.com/attune)

Plate sampler: CytKick Autosampler

2

Plate sampler
CytKick
Autosampler

The CytKick Autosampler, an accessory instrument for the Attune NxT Flow Cytometer, is a high-throughput plate sampler that interfaces with the robotic Orbitor RS2 Microplate Mover.

Performance overview

This instrument enables 96-well, 384-well, and deep-well microplate capacity to the Attune NxT Flow Cytometer, increases walk-away autonomy, helps improve experimental workflow, and systematizes the data-gathering process.

- **Consistent data**—designed to provide minimal variation (Figure 4)
- **Intelligent probe**—minimizes clogging and carryover (0.5%) and helps prevent damage to the instrument (Table 1)
- **Mixing by aspiration**—mixes sample by aspiration instead of shaking, which helps to ensure homogeneity of the sample and cell viability (Table 2)
- **Supports systematic operation**—serves as the transaction interface with the Orbitor RS2 Microplate Mover

Engineering

Maximized sample integrity is achieved with the CytKick Autosampler by minimizing carryover or contamination (Table 1).

The CytKick Autosampler has a sample-mixing feature to maintain homogenous samples between wells (Table 2).

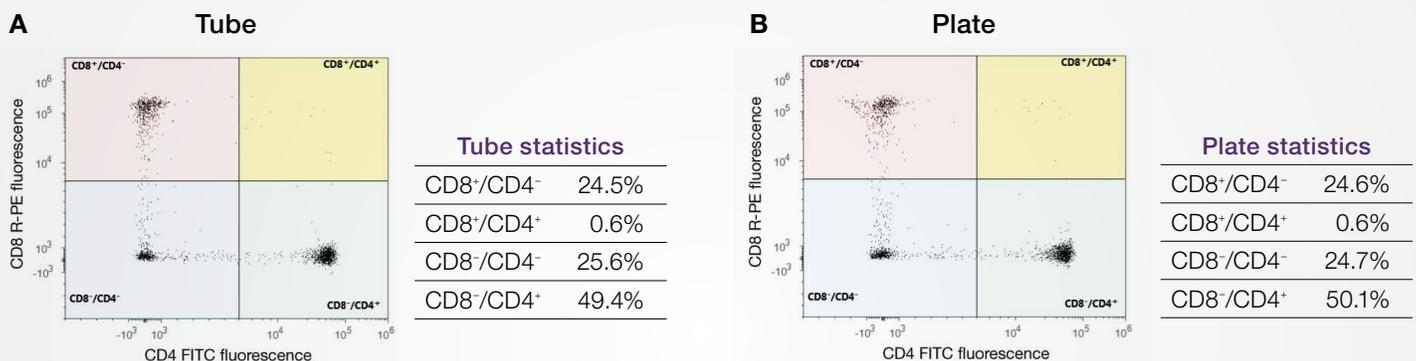
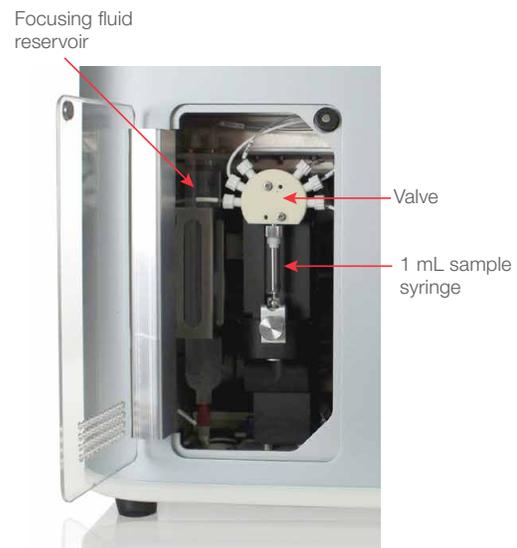


Figure 4. Consistent results are achievable regardless of sampling method. Whole blood lysed with ammonium chloride was labeled with Invitrogen™ mouse anti-human CD45 Pacific Orange™ (Cat. No. MHCD4530), mouse anti-human CD4 FITC (Cat. No. MHCD0401), and mouse anti-human CD8 R-PE (Cat. No. MHCD0804) antibody conjugates. Labeled samples were analyzed on a blue/violet-configured Attune NxT Flow Cytometer equipped with a 488 nm laser for fluorescence excitation of the FITC (530 BP) and R-PE (574/24 BP) dyes and a 405 nm laser for the Pacific Orange dye (603/48 LP). Identical samples, including compensation controls, were analyzed using either (A) tube mode or (B) plate mode with a standard collection rate of 200 μ L/min. Lymphocytes were gated using a CD45 vs. side scatter plot, and analyzed for expression of CD4 and CD8 antigens. Minimal variation was observed between analysis in a tube alone and on a plate running on the CytKick Autosampler.

Table 1. Minimal carryover using the CytKick Autosampler. Jurkat cells at a concentration of 1×10^6 cells/mL were dispensed into a 96-well V-bottom plate and sampled using the CytKick Autosampler. Samples were analyzed on the Attune NxT Flow Cytometer using collection rates in standard mode (200 μ L/min) and high-throughput mode (500 μ L/min). Each sample was mixed once, and the CytKick Autosampler was washed 1–3 times prior to sampling the next well. Percent sample carryover was calculated.

Mode	Number of washes and percent carryover		
	1	2	3
Standard	0.01	0.01	0.01
High-throughput	0.02	0.02	0.02

Table 2. Gentle sample mixing using the CytKick Autosampler.

Increasing the number of mixing cycles does not adversely affect cell viability. Ammonium chloride-lysed whole blood (LWB) and NIH 3T3 (live and heat-treated) cells were stained with 2 μ g/mL propidium iodide and loaded in triplicate into a 96-well V-bottom plate. Prior to acquisition, samples were mixed 0–5 times by the CytKick Autosampler, and then samples were analyzed using standard-mode collection rates (100 μ L/min for NIH 3T3 cells, 200 μ L/min for LWB) on the Attune NxT Flow Cytometer. Propidium iodide was excited using a 488 nm laser, and fluorescence emission was collected using a 640 nm longpass filter. Minimal variation was observed within each cell type, regardless of the number of mixing cycles used prior to acquisition.

Number of mix cycles	Percentage of dead cells	
	LWB	NIH 3T3
0	0.75	34.10
1	0.78	32.83
2	0.74	33.52
3	0.74	32.75
4	0.74	33.26
5	0.75	31.58

Technical specifications: CytKick Autosampler

Instrument specifications	
Performance	<ul style="list-style-type: none"> • Acquisition time for high-throughput mode: <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: Optimized mixing 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: Window with protective coating allows visibility to well progress while preventing exposure to ambient light during acquisition • Auto-calibration: Regular, 30-day interval, system-initiated function
Fluidics	<ul style="list-style-type: none"> • 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: Total of 800 mL fluid tanks onboard, capable of running four 96-well plates • Extended fluidics option: Optional external fluid tank with 10 L fluid capacity
Installation requirements	<ul style="list-style-type: none"> • Size (W x D x H): ~40 x 29 x 29 cm (16 x 11 x 11 in.) • Space requirements: <ul style="list-style-type: none"> - 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

Comprehensive specifications available at [thermofisher.com/attune](https://www.thermofisher.com/attune)

Robotic arm: Orbitor RS2 Microplate Mover

3

Robotic arm
Orbitor RS2
Microplate Mover

With superior speed and accuracy, the Orbitor RS2 Microplate Mover (Figure 5) is the perfect solution to automate a variety of workflows. When paired with the Attune NxT Flow Cytometer, scientists can benefit from the performance, software design, and safety features of the Orbitor RS2 mover.

Performance overview

Incorporating the Orbitor RS2 mover into the Attune NxT Flow Cytometer automation workflow helps increase efficiency and flexibility.

- **Rapid nest-to-instrument speed**—keeps pace with the Attune NxT Flow Cytometer, an instrument already 10x faster than conventional flow cytometers, with a high-speed transfer from storage to instrument

- **Extended continuous runtime**—the mover can run unattended and without fluid resupply for up to 19 hours when configured with the Attune NxT Flow Cytometer; external fluids can be refilled without interrupting operation for extended runtime
- **Collision detection and recovery**—the overhead gripper design is inherently safe and built-in control stops all movement at the slightest unexpected contact
- **Onboard barcode reader**—integrated, in-grip scanner enables sample tracking, inventory management, and reduces the risk of lost samples



Figure 5. The Orbitor RS2 Microplate Mover.

Plates

The Orbitor RS2 mover is compatible with a wide variety of plate types, enabling automated plate moving for a broad range of applications. The mover can de-lid plates, re-lid plates, and move lidded plates to and from storage.

Plate storage

Plate storage is managed by combinations of random access (hotels) and sequential access (stacks) storage options (Figure 6). Both hotels and stacks support landscape or portrait plate orientation.

The random access option enables the mover to retrieve and return a plate to and from the same nest. The sequential access option enables “run-until-empty mode,” processing all of the plates from the top down.

The robot comes standard with a baseplate for mounting storage configurations of up to 3 hotels or stacks. Expandable options are available with a capacity of up to 9 hotels or stacks.



Figure 6. Storage options. (A) Hotel plate storage for random access. (B) Stack plate storage for sequential access.

Find out more at thermofisher.com/orbitors2

Straightforward, feature-rich software

Invitrogen™ Attune™ NxT Software (Figure 7A) is designed for compatibility with Thermo Scientific™ Momentum™ Workflow Scheduling Software. The buttons on the ribbon in Attune NxT Software control the automation settings within the software (Figure 7B). When automation is enabled, the Momentum software connects the Orbitor RS2 Microplate Mover to the Attune NxT Flow Cytometer and manages the operations between the instruments.

The Momentum software utilizes event-driven scheduling for optimal performance. With unrivaled logic for on-the-fly decisions and adaptability to current situations, you can have confidence in your system's performance. The Momentum scheduling software uses a straightforward and intuitive dashboard from which you can add plates, choose prevalidated automated workflows, and monitor the progress of ongoing work units (Figure 8).

- **Worklist import**—matches barcode value to specific templates
- **Progress visualization**—records plate traceability and project status relative to others in priority on the Momentum software dashboard
- **Multuser, multiprocess scheduling**—actively prioritizes and reprioritizes runs in high-volume labs with dynamic scheduling
- **Customizable settings**—establishes user-determined variables to align with lab operations (for example, monitoring a specific fluid, modifying a default setting, or creating a batch scope that is most relevant)
- **Admin settings**—assigns tiered user roles: “Admin”, “Operator”, and “Expert”

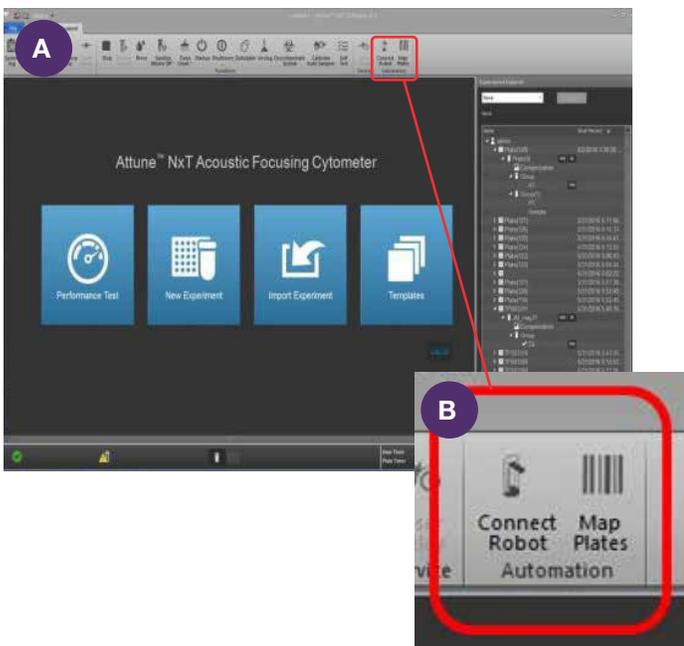


Figure 7. Attune NxT Software features. (A) The home screen and user interface of the Attune NxT Software. (B) Automation icons on the ribbon of the Attune NxT Software.



Figure 8. The dashboard screen and user interface of the Momentum Workflow Scheduling Software.

Technical specifications: Orbitor RS2 Microplate Mover

Instrument specifications	
Axis	<ul style="list-style-type: none"> • Z (height): 575 mm (range); 750 mm/sec (velocity); 2,250 mm/sec² (acceleration) • Radius (reach): ±406 mm (range); 200 mm/sec (velocity); 3,600 mm/sec² (acceleration) • Theta (rotation): Infinite (range); 225 deg/sec (velocity); 675 deg/sec² (acceleration)
Storage options	<ul style="list-style-type: none"> • Random access: 8 plates per hotel • Sequential access: 40 plates per stack • Maximum standard hotel capacity: 72 plates • Maximum standard stack capacity: 360 plates • Temperature control: Storage device available
Physical characteristics	<ul style="list-style-type: none"> • Power requirements: 110–230 V auto switching • Operating environment: 4–40°C, noncondensing • Safety compliances: CE, CSA • Weight: 25 kg (55 lb) • Motion control: Closed-loop servo, brushless AC motor • Operator control: Directly from PC, requires Microsoft™ Windows™ 7 or 10 operating system
Grip	<ul style="list-style-type: none"> • Plate type: Handles most SBS-conforming plates • Orientation: Landscape or portrait mode • Lids: Lids and un-lids • Plate detection: Enabled • Force and speed: User adjustable • Fingers: Variable plate and container designs
Safety	<ul style="list-style-type: none"> • Collision detection and recovery: Self-homing mover • Manual override: Hardwired emergency stop button
Software	<ul style="list-style-type: none"> • Interface format: Dashboard • Runtime views: Detailed • Mid-run sample loading and unloading: Available • Worklist: Automatic execution enabled • Process flow: User-set time and logical constraints • Shared lab: Multiuser login management • Process validation and version control: Built-in • Compliance: 21 CFR Part 11 and CLIA compliant; full audit logs in XML format • Distributed motion: Multimover systems supported • Workflow designer: Drag and drop • Sample tracking: By barcodes and sample ID • Container definition: Built-in library • Simulation mode: Real time, accelerated

Comprehensive specifications available at [thermofisher.com/flowautomation](https://www.thermofisher.com/flowautomation)

Temperature control: Cytomat 2 C-LiN Automated Incubator Series

4

Temperature control
Cytomat 2 C-LiN Automated Incubator Series

The Cytomat 2 C-LiN Automated Incubator Series bring the latest incubation technology to a compact solution with a wide temperature range and CO₂ control—the perfect temperature storage option for a robotic automation system. (Figure 9)

- **Superior speed**—with an average access time of 12 sec and a dedicated plate shuttle system, your automation system won't have to wait around

Performance overview

- **Complete control**—achieve ideal conditions for your cells with precise temperature, humidity, and CO₂ control, plus a variety of other options
- **Proven protection**—keep your cells safe from contamination using the ContraCon decontamination routine, which simplifies cleaning and eliminates variability in disinfection



Figure 9. The Cytomat 2 C-LiN Automated Incubator.

Technical specifications: Cytomat 2 C-LiN Automated Incubator Series

Instrument specifications	
Temperature range	<ul style="list-style-type: none"> • Wide temperature ranges available, from 4°C to 70°C
Inventory	<ul style="list-style-type: none"> • 56 x 1,536-well plates, 42 x 96-well plates, 30 x transwell or insert plates, 20 x deep-well plates
Physical Characteristics	<ul style="list-style-type: none"> • (W x D x H): 57.2 x 51.1 x 90.4 cm (22.5 x 20.1 x 35.6 in.) • Weight: 80 kg (~176 lb)
Features	<ul style="list-style-type: none"> • 12 sec access time • Precise temperature and CO₂ • Controlled humidity up to 90% relative humidity • Fully automated decontamination routine—ContraCon tool • Easy-to-use glove-friendly display with intuitive operation
Certifications	<ul style="list-style-type: none"> • CE marked
Available options	<ul style="list-style-type: none"> • Integrated barcode reader (1D/2D) enables sample tracking, barcode transmission, and inventory management • Plate park positioning sensor in stacker helps to eliminate labware handling errors • HydraSmart technology for controlled precise humidity without heat extraction and external water tank to avoid contamination • Adjustable speed settings for the right plate and right application • 6 possible gate positions available for maximum flexibility • Solid copper inner chamber for natural contamination prevention • Tower shaker for true orbital shaking available for applications requiring sample agitation and cells that need to be kept in suspension

Comprehensive specifications available at [thermofisher.com/cytomat](https://www.thermofisher.com/cytomat)

Expanded fluidics: Attune NxT External Fluid Supply

One significant advantage of robotic automation is the reduction of operator contact points. Configuring a workflow that includes the Attune NxT External Fluid Supply (EFS) reduces the frequency of replenishing and emptying fluids, and increases continuous runtime.

Performance overview

When the Attune NxT Flow Cytometer is equipped with the Attune NxT EFS, the instrument becomes capable of running for up to 19 hours continuously, which is supported effortlessly by the continuous plate handling of the Orbitor RS2 Microplate Mover. The Attune NxT EFS uses a cubetainer of Invitrogen™ Attune™ Focusing Fluid and a Thermo Scientific™ Nalgene™ waste bottle (Figure 10).

The Attune NxT EFS is ideal for use with the CytKick Autosampler and enables the collection of approximately twenty-eight 96-well or seven 384-well plates without changing the fluid tanks.

This device was designed to facilitate the use of a larger buffer and waste container. The Attune NxT EFS connects to the Attune NxT Flow Cytometer via umbilical cords (Figure 11). The system works by monitoring and supplying the internal fluid tanks on the Attune NxT Flow Cytometer so that the instrument can run without the need to change fluid or empty waste.



Figure 10. The Attune NxT External Fluid Supply device, an optional accessory to the Attune NxT Flow Cytometer, is equipped with a 10 L cubetainer of focusing fluid and a Nalgene waste bottle.



Figure 11. Umbilical cords connect the Attune NxT Flow Cytometer and the Attune NxT External Fluid Supply.

Technical specifications: Attune NxT EFS

Instrument specifications	
Focusing fluid	<ul style="list-style-type: none"> • Focusing fluid container: 10 L cubetainer, single use • Focusing fluid connection: Cap with sensor and fluid intake • Umbilical 1: For focusing fluid cubetainer
Waste	<ul style="list-style-type: none"> • Umbilical 2: 6 ft connection • Maximum waste volume: Up to 18 L (including 2 L of bleach for biosafety requirements) • Containment: 20 L reusable Nalgene standard container (non-autoclavable) with modified lid containing vent and sensor • Full notification: Yes, alarm
Physical characteristics	<ul style="list-style-type: none"> • Counter footprint (H x D x W): 25.4 x 41.9 x 63.5 cm (10 x 16.5 x 25 in.) • Footprint with containers (H x D x W): 55.9 x 41.9 x 63.5 cm (22 x 16.5 x 25 in.) • Dry weight: Approximately 13.6 kg (30 lb) • Weight with 10 L fluid: Approximately 28.1 kg (62 lb) • Electrical input: From Attune NxT Flow Cytometer
Operating range	<ul style="list-style-type: none"> • Operating range: 15–32°C • Humidity range: 10–90% noncondensing



Figure 12. Multicomponent workcell including the Attune NxT Flow Cytometer and the Orion RS2 Microplate Mover configured with 2 hotels and 1 stack.

Integrated workcell—summary

Anchor your automation with proven reliability in operation and innovative mechanical integrity.

Leverage the integrated workstation with robotic automation and a suite of instruments offered by the Thermo Scientific™ and Invitrogen™ portfolios for outstanding performance, walkaway reliability, accurate monitoring, and productive uptime (Figure 12). Optimize for particular specifications, workload, and objectives of multi-instrument, high-volume labs with custom upgrades.

Rich data

This degree of automation enables measurably more consistency in data than traditional methods by eliminating manual steps that can lead to variable results, increased processing costs, and impoverished data integrity.

Coordinated operations

Whether you handle tens of hundreds of samples for complicated multiparametric analysis or hundreds of thousands of samples in drug discovery, a high-performance multicomponent flow cytometry workcell will mean the difference between a reliable, fine-tuned operation and a process rife with downtime and sample waste.

Sustained reliability

The integrated workcell with the Attune NXT Flow Cytometer is mechanically engineered to achieve long-lasting high performance. True walkaway automation is not achieved solely with the integration of robotics and defined points of user intervention, but in combination with the sustained reliability that each component of this system provides. The fastest systems in the world will do no one any good if they are frequently breaking down.



Customer support

Our Thermo Scientific™ and Invitrogen™ portfolios are supported by an extensive global team of experienced scientists and engineers, who all adhere to a tenet of unrelenting reliability.

Engineering

Field service engineers dispatch to service calls and manage all instrument installs. An extended service option is also available.

Technical support

A technical support line is available for your convenience. Speak with an engineer or technician on the phone to get answers to your questions or troubleshoot a problem.

Application specialists

Globally, PhD-level and experienced scientists build the ranks of our teams to support, develop, and partner with you to expand the complexity of your cell-based assays, determine the best instrumentation configuration for your applications, and help you just get to the science.

Training workshops

After installation, labs receive a familiarization workshop to learn how to operate the Attune NxT Flow Cytometer in tandem with the Orbitor RS2 Microplate Mover, the Cytomat 2 C-LiN Automated Incubator Series, and the Attune NxT External Fluid Supply. Supplementary sessions are available to expand operations and optimize applications.



Resources

Reference guides

The Molecular Probes™ Handbook, 11th Edition

The most complete reference on fluorescence 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* at thermofisher.com/handbook

Immune cell guide

An extensive portfolio of human and mouse cell markers for immunological phenotyping of cells using flow cytometry, this 84-page guide includes a comprehensive overview of immune cell type markers, their distributions, and functions. Download at thermofisher.com/flowantibodies

Online tools

Flow cytometry antibody selection tool

Explore our extensive portfolio of high-quality primary and secondary antibody conjugates with an easy-to-use selection tool at thermofisher.com/flowantibodies

Fluorescence SpectraViewer

Plot up to 14 fluorophores on a single graph, then print or save for later. To learn more, go to thermofisher.com/spectraviewer

Flow Cytometry Panel Design Tool

Choose fluorescent antibody conjugates: pick an 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

Interactive instrument 3D explorer demo

Explore instrument capabilities with this virtual demo. Spin the unit around and interact with the key features. To learn more, go to thermofisher.com/attune3ddemo

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Flow cytometry learning center

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