



Miltenyi Biotec

# The MACSQuant<sup>®</sup> X

Reliable high-throughput flow cytometry



**JOIN THE  
FLOW  
REVOLUTION**

# Innovative benchtop screening

The MACSQuant® Analyzer X is designed to offer maximum speed and reliability for complex high-throughput screening: perfect for labs looking to optimize challenging large-scale applications. Enjoy the certainty of reliable results in every run, in less time, and with less effort.

## High-throughput

Process and analyze up to 10 parameters in 384- and 96-well formats.

## Speed

Run an entire 96-well plate in only 15 minutes and a whole 384-well plate in under 60 minutes.

## Reliability

Get consistent results every experiment regardless of sample type and volume.

## Flexibility

Easily and quickly switch between tubes and plates at the click of a button. Apply unique settings to each and every well.

## Automation

Take advantage of a truly hands-free instrument, which can be easily integrated into liquid handlers.



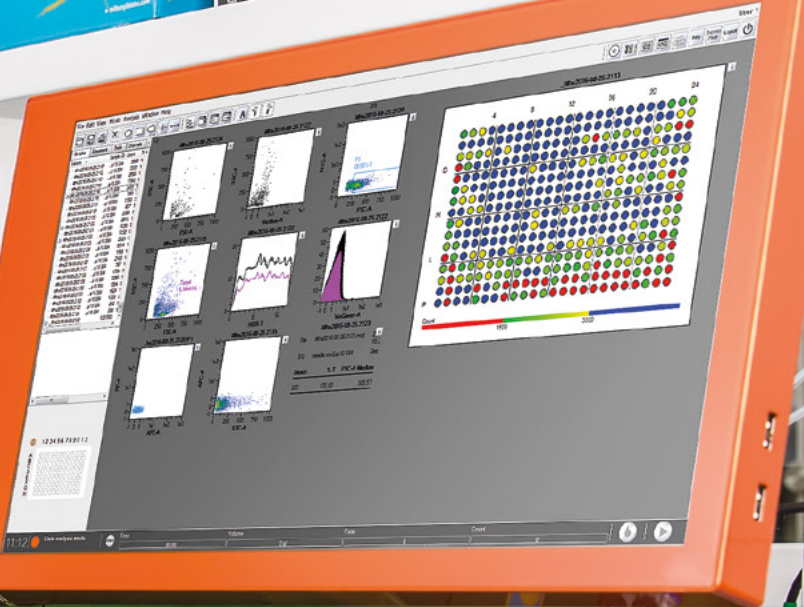


MACS  
Quant X

MACS Media  
StemMACS™  
PBS Brew XF

KIMTECH  
KIMTECH  
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MACS Media  
StemMACS™  
PBS Brew XF



MACS Media  
StemMACS™  
PBS Brew XF

MACS  
Universal Reagent



High-throughput



Speed



Reliability



# Speed meets reliability

## Compact and consistent high-throughput flow cytometry

### Get more out of every plate

The MACSQuant® X gives you access to affordable and easy-to-use, 10-parameter high-throughput flow cytometry. Building on the core of our successful line of MACSQuant Instruments, we have developed a flow cytometer capable of processing various types of tubes and plates.

- 384-well plates in less than 60 minutes
- 96-well plates in 15 minutes

The MACSQuant X fluidics system utilizes less running buffer during each run, enabling the processing of multiple plates without the need to exchange buffer bottles. This miniaturization makes it possible to use 384-well plates for any type of cell- or bead-based assay, allowing you to use less sample volume while getting consistent results.

### From start to analyzed data in 15 minutes

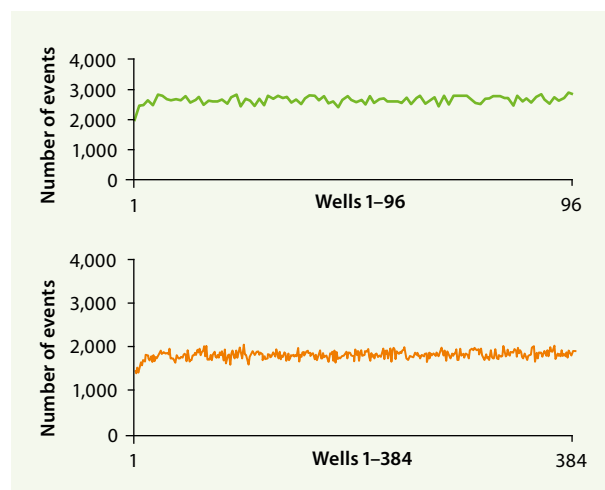
Built with speed in mind, the MACSQuant X allows you to screen record amounts of data in a short period of time. Each sample is saved as an individual file, allowing you to either analyze every sample on the fly or access ready-to-analyze samples immediately after the plate processing has finished.

When used in conjunction with our MACSQuantify™ Software, a heat map view allows for rapid visual depiction of the information measured for every sample, even while the instrument is continuously acquiring samples.

### Biology's variability measured with consistency

At Miltenyi Biotec we believe that instruments should adapt to your experimental set-up, and not vice versa. That is why the MACSQuant X provides reliable data regardless of the chosen flow rate, sample type, or uptake volume. Expect consistently low sample variability even with an uptake volume as low as 5  $\mu$ L per sample (fig. 1). Fulfilling the industry's gold standard of less than 0.1% carryover between samples, the MACSQuant X gives you certainty of data you can trust, even when screening hundreds of samples at a time.

Consistent results with as little as 5  $\mu$ L uptake volume per sample.



**Figure 1:** Fast and reliable high-throughput 96- and 384-well plate processing.

# Automate your workflow and speed up your analyses



## Place your samples and walk away

Enjoy hands-free maintenance and sample processing with the built-in automation capabilities of the MACSQuant® X. From start-up and cleaning routines, to compensation and shut-down, everything is completely automated, leaving you more time to focus on your science.

The MACSQuant X's integrated robotic pipetting arm can also stain your samples for you, allowing you to enjoy hands-free labeling of up to 384 samples at a time. Just load the plate with your sample and let the MACSQuant X do the work for you.

## Automated analysis, reproducible results

Setting up and analyzing an experiment using our integrated MACSQuantify™ Software has never been easier. Simply plan and schedule all automated housekeeping functions, sample layouts, and labeling options directly from within the software itself.

## Express Modes – reliable data at the push of a button

Express Modes are unique add-on features for MACSQuantify Software. They are standardized data analysis tools that are optimized to automate flow cytometric measurements and analyses via predefined experiment settings, acquisition, and automated gating. Derived from mathematical algorithms based on real-life test cases, they reduce human error and therefore increase experimental reproducibility.

Express Modes contain application-dependent templates that are based on a significant amount of real data, including up to 1,100 datasets for a given application. They contain verified gating ranges that are derived from distinct algorithms for the application-specific distributions. Automated adjustments for each individual datafile allow for optimal analysis without the variability introduced by manual intervention. This data analysis provides consistent results and robust analyses that are easily integrated into standardized operating procedures (SOPs).

## Custom Express Modes

If your research application is not included in our Express Modes packages, we also offer a Custom Express Mode service.

Custom Express Modes are developed specifically for your workflow and are optimized to fulfill your individual needs. They can cover automated acquisition and analysis with custom statistic tables and export of reports in various file formats.

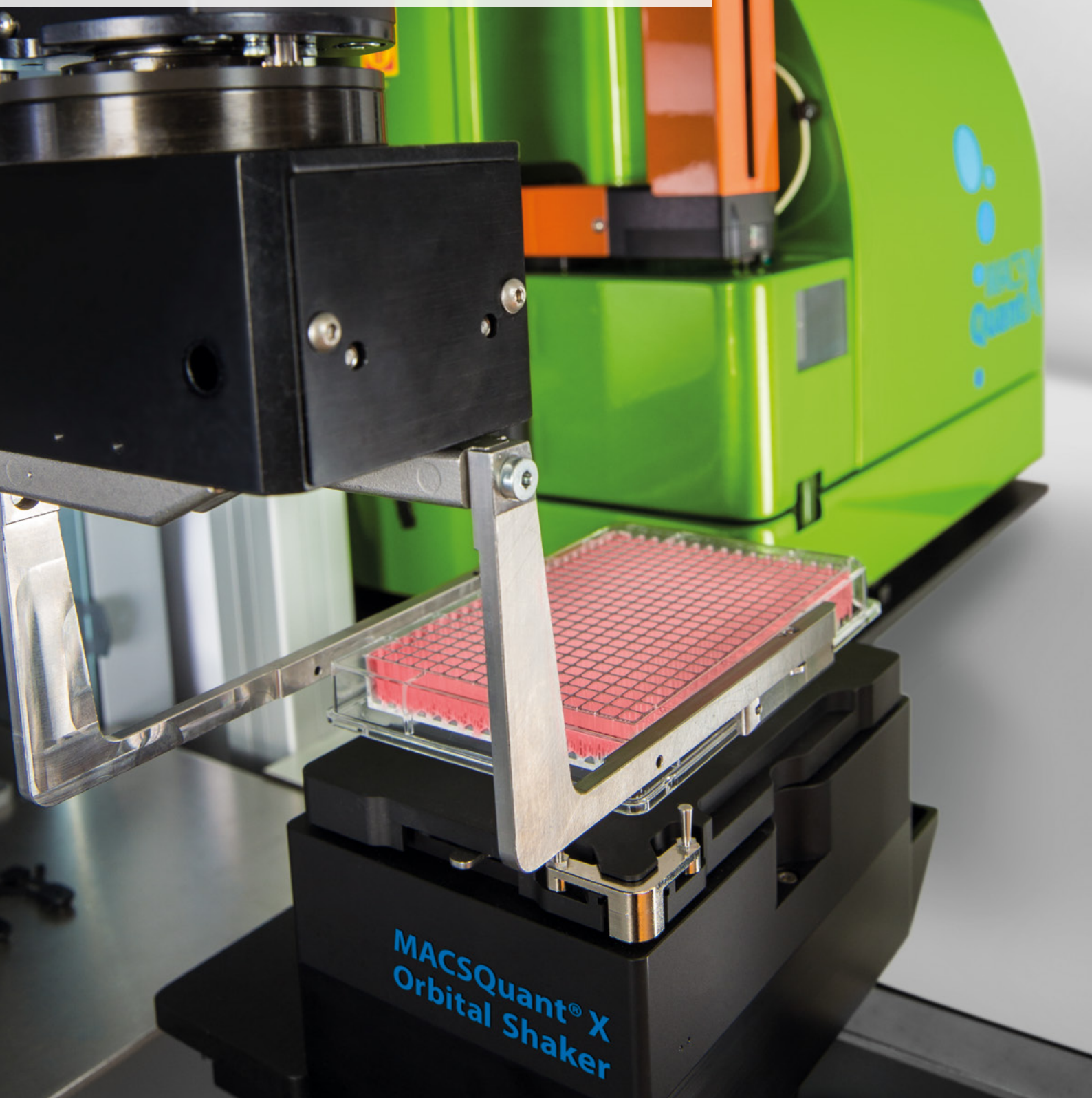
For more information please contact:

**[Application\\_Development@miltenyibiotec.de](mailto:Application_Development@miltenyibiotec.de)**

## Truly hands-free operation

### Integration with liquid handling systems

The MACSQuant® X was built on the premise of delivering a cytometer robust enough to process thousands of samples in a day. For that reason, it can be seamlessly integrated into a variety of robotic liquid handling systems, giving you access to unprecedented levels of automation.





## Autolabeling

Why risk the variability when you can automate your applications?

Reduce the risk of pipetting variability with the reliability of robotics. The MACSQuant® X has an orbital shaker which, in combination with the Universal Reagent Rack, enables autolabeling of your samples. Simply add the titer of your reagent, the incubation time, and the dilution of your sample.





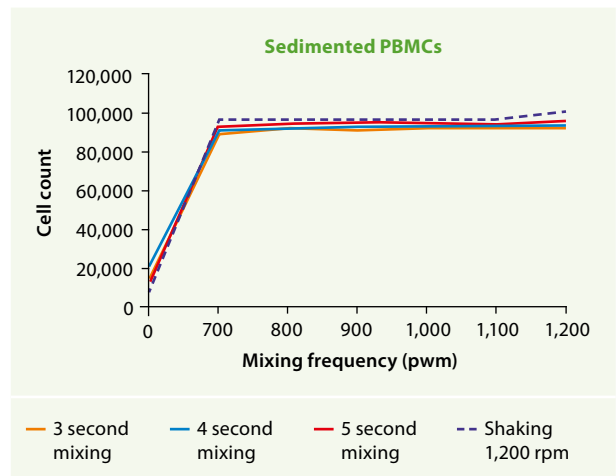
### One cytometer for all your needs

The integrated MACSQuant® X Orbital Shaker allows you to easily set up your experiment and choose between a 384-well plate, 96-well plate, multi-tube rack, or single tube set-up at the click of a button. The MACSQuant X gives you the speed of a screener together with the robustness of a day-to-day cytometer, all within one compact instrument.

Choose between different sample re-suspension options, giving you control over how and when to re-suspend your samples, ensuring consistent results regardless of your assay (fig. 2).

Sample mixing options:

- **Orbital shaker** – gentle, 2-dimensional mixing of all samples within the plate at once
- **Needle vibration** – effective, individual mixing even for hard to re-suspend samples



**Figure 2:** Needle vibration or plate shaking both easily resuspend sedimented PBMC and ensure reliable cell count: with either method, at a mixing frequency of 700 pwm the cells are reproducibly re-suspended.



## Harmonizing the world is just an instrument setting away

### Smart Gain with MACSQuantify™ Software

Experience consistently reproducible results from day to day, instrument to instrument, and operator to operator. With MACSQuantify Software's Smart Gain technology, you can transfer your assay from one instrument to another while passing on all necessary information to ensure identical setup.

As a result, the MACSQuant® Operating System produces comparable, standardized results, every time, everywhere.

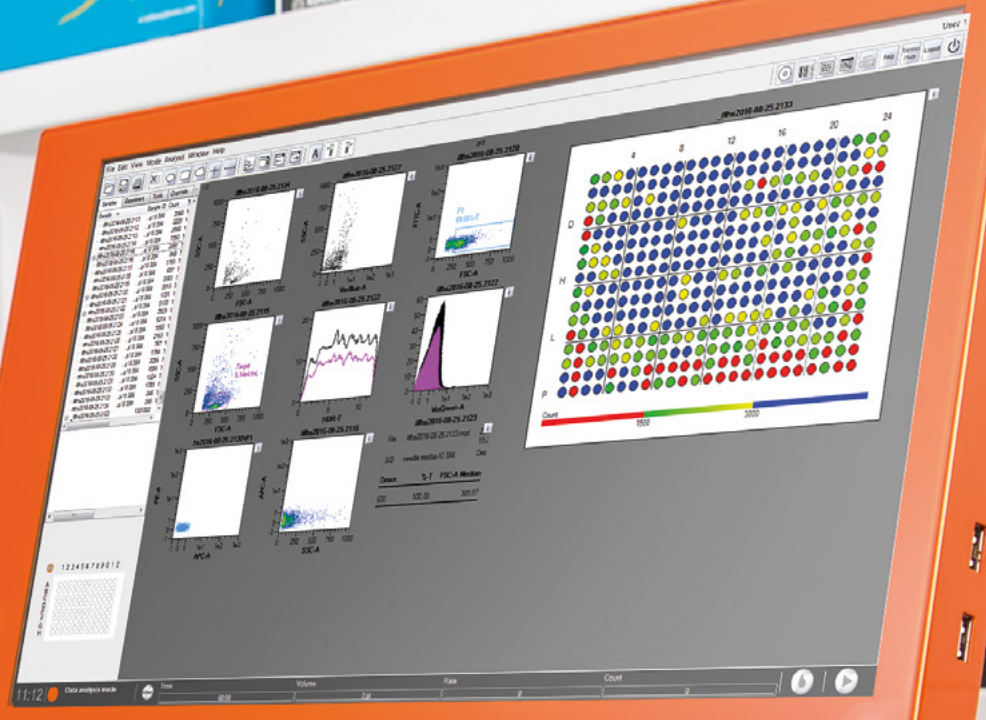
### Compliance with 21 CFR Part 11

You can be sure that your data is suitable for submission to regulatory agencies with the optional 21 CFR Part 11 feature, which includes:

- **Audit trail**
- **Analysis reports with e-signature**
- **User management system compliant with 21 CFR Part 11**



MACS  
Quant X



# The complete package for reproducible results in flow cytometry

Achieving maximum reproducibility between experiments cannot depend on the flow cytometer alone. In order to achieve consistent results, Miltenyi Biotec offers a complete flow cytometry solution including a broad range of reagents. We help you make sure that variations in your experiment are due to your sample and not due to unreliable antibodies or instruments.

## REAffinity™ Recombinant Antibodies – flow cytometry is in their genes

Miltenyi Biotec has introduced a portfolio of REAffinity Antibodies, which are recombinantly generated antibodies that provide superior lot-to-lot consistency and purity compared to mouse or rat monoclonal and polyclonal antibodies. They have been engineered to lack any background binding. Additionally, they all have the same human IgG1 isotype, eliminating any need to include multiple isotype controls during flow analysis.

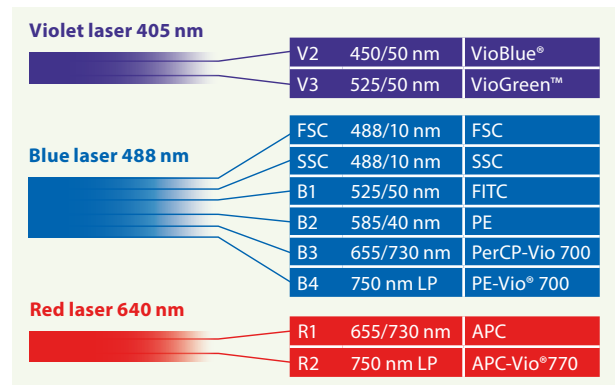
### Advantages of REAffinity Recombinant Antibodies:

- High lot-to-lot consistency
- One universal isotype
- No more background signal

## Vio® Dyes – brighter dyes for flow cytometry

Vio® and VioBright™ Dyes are a Miltenyi Biotec proprietary family of fluorochromes for flow cytometry and fluorescence microscopy. When used in combination with the MACSQuant® Analyzer X, you can take advantage of superior mean fluorescence intensity and high stain indices. As the brightest dyes on the market, and with low spillover, setting up complex multicolor experiments has never been so simple. Used together with traditional fluorochromes, such as FITC, PE, PerCP, and APC, they allow researchers a greater selection of antibodies for multiparameter cell analysis. Fluorochrome-conjugated MACS® Antibodies are perfectly suited for identification and enumeration of human, mouse, rat, or non-human primate cells.

## The MACSQuant Analyzer X optical bench



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For more bright ideas, visit:

► [miltenyibiotec.com/vio](http://miltenyibiotec.com/vio)



## Ready-to-use kits

As a leading supplier of flow cytometry products, offering one of the broadest portfolios of antibodies, kits, and support reagents available, Miltenyi Biotec's range of ready-to-use, pretitrated kits save valuable experiment set-up time and assay costs. MACS® Flow Cytometry kits allow flow cytometry users to perform sophisticated analyses right from the start. Optimized to achieve reproducible results and validated for use with the automatic labeling capacities of the MACSQuant® X, their use in combination with our MACSQuant Express Modes gives you true walkaway capabilities.

Support reagents include instrument support reagents, sample preparation reagents, fluorescence amplification reagents, and a broad range of kits to check cell viability and cell labeling, as well as antibody conjugation and cell staining kits. For many of the most common laboratory assays, all you have to do is set up the experiment and come back later to look at completely analyzed data.

Work with Miltenyi Biotec to take advantage of:

- Simplified flow cytometry with intuitive kits and support reagents
- Unique assays that enable the staining of viable cytokine-secreting cells
- Ready-to-use cocktails for the phenotypic characterization of cells



## Customized solutions

Miltenyi Biotec's custom antibody design service enables researchers to benefit from personalized flow cytometry solutions. This service includes purified, functional-grade antibodies, single- and multicolor antibody conjugates, as well as multicolor antibody cocktails.

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To find out more, visit:

► [miltenyibiotec.com/customab](https://miltenyibiotec.com/customab)

## MACSQuant® X specifications

### Optics

Laser excitation	405 nm, 40 mW diode 488 nm, 30 mW DPSS (diode pumped solid state) 640 nm, 20 mW diode			
Emission detectors	FSC: 488 / 10 nm SSC: 488 / 10 nm	B1: 525 / 50 nm B2: 585 / 40 nm B3: 655–730 nm B4: 750 nm LP	V1: 450 / 50 nm V2: 525 / 50 nm	R1: 655–730 nm R2: 750 nm LP
Fluorescence sensitivity and resolution	MESFs (CV < 5%): FITC < 200 PE < 100 APC < 150			
Flow cell dimensions	200×250 µm			
Fluorescence detectors	Optimized with spectrally matched PMTs for all channels			
Laser spot size	15×45 µm			

### Fluidics

Minimal uptake volume*	1 µL (20 µL recommended for volumetric counting applications)
Sample flow rate	25, 50, or 100 µL/minute plus automated flow rate to maintain 500, 1,000, or 2,000 events/second
Measurement speed <sup>1,4</sup>	15 minutes per 96-well plate (5 µL measurement volume; screen mode)
Sample uptake	1–5,000 µL uptake port (for y/z axis movements) with an automated washing station
Maximal event rate	15,000 events/second
System maintenance	Automated startup, PMT calibration, cleaning cycles, and shutdown
Sample mixing	2-dimensional orbital shaking (200 rpm–3,000 rpm) Vibrating needle (300 pwm–1,200 pwm)

### Performance

Absolute cell count performance (reproducibility) <sup>1,2</sup>	CV < 5%
Sample carryover <sup>1,3</sup>	< 0.1%
Fluorescence performance	5 decade logarithmic scales (10 <sup>-2</sup> to 10 <sup>-3</sup> ), display in lin, log, or hlog scales
Sample tube/plate	384-well plate (U, V, flat well) 96-well plate (U, V, flat well, deep well) FACS tubes (5 mL) Eppendorf tubes

### Data management

Measurement parameters	Area, width, height for all parameters, with time and volume
Signal processing	>18-bit dynamic range in area with 32-bit floating point signal processing
Compensation	Automated or manual with 8×8 matrix, during or post acquisition
Threshold	Threshold can be set for any channel by selecting the trigger value
Data files	.mqd (proprietary file type) .fcs (2.0, 3.0, 3.1 compatible)

### Operational details

Width×depth (with MACS® Mini Sampler)	605×500 mm (23.8"×19.6")
Height (adjustable touchscreen)	393–520 mm (15.4"–20.4")
Weight	50 kg / 110 lbs
Monitor	15.6" touchscreen (internal)
Power requirements	100–240 VAC, 50/60 Hz
Power consumption	450 W
Ports	4×USB 2.0, 2×DisplayPort, VGA, LAN

\*At every uptake, additional excess volume is aspirated by the instrument. The excess volumes are calibration- and process-dependent and do not exceed 10 µL for Fast, Standard, and Extended modes, and 20 µL for Screen mode.

<sup>1</sup>Referred value indicates the average of multiple experiments and can differ for individual sample materials.

<sup>2</sup>For counting performance, full 96-well plates were loaded with 200 µL/well of peripheral blood mononuclear cell (PBMC) suspension at a nominal concentration of 5,000 cells/µL. The uptake volume was set to 50 µL at medium flowrate.

<sup>3</sup>For carry-over, full 96-well plates were loaded with 200 µL/well of PBMC suspension at a nominal concentration of 5,000 cells/µL in every other well ("SRC-wells"). Alternating wells are loaded with an equal volume of MACSQuant® Running Buffer ("CO-wells"). The uptake volume was set to 50 µL at medium flowrate. The carry-over is defined by  $\text{sum}(\text{CO-singlet count})/\text{sum}(\text{SRC-singlet count}) \times 100\%$ .

<sup>4</sup>The measurement speed is determined by measuring the time between the first movement of the robotic arm into the first measured well and the first movement out of the last well. The measurements themselves were carried out at the highest possible flow rate in fast mode measuring 5 µL per well.

#### MACSQuant® Live Support

- Live support at your fingertips via MACSQuant Support Portal
- Have your questions answered in real-time by one of our experts



## Support at your fingertips

#### Application and instrument support

- Technical and field application support for assay design and product advice
- Custom automation and Express Mode development



#### Instrument training

- Training at regional MACS® Academy Miltenyi Biotec facilities
- Onsite training and assay development
- Online application resources



#### Service

- Comprehensive service options
- Globally distributed field service teams



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