



# BD FACSVers<sup>TM</sup> Flow Cytometer

## Technical Specifications

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The BD FACSVers<sup>TM</sup> flow cytometer has been uniquely designed to offer remarkable performance, flexibility, and ease of operation for research applications. Innovation in the design of both the hardware features and in new BD FACSuite<sup>TM</sup> software provides intuitive tools that enable a seamless workflow all the way through system setup, data acquisition, analysis, and export of experimental results.

The BD FACSVers system features a new compact optical bench, miniaturized detection optics, plus optical filter/mirror assemblies with integrated electronic ID chips to monitor the instrument configuration. By incorporating vacuum-driven fluidics, a unique sample injection tube (SIT) was created which can accommodate a wide variety of sample input formats. In addition, a new flow cell was designed which improves system reliability and signal resolution.

The instrument is designed to be compact with no external fluidics cart and fits easily on a benchtop. It is available in three standard configurations: one-laser (488 nm) supporting 6 parameters, two-laser (488 nm and 640 nm) supporting 8 parameters, and three-laser (488 nm, 640 nm, and 405 nm) supporting 10 parameters.

The BD FACSVers flow cytometer is fully field upgradeable. In addition to laser and optical detector upgrades, other options include the BD FACS<sup>TM</sup> Universal Loader which accommodates racks of 30 or 40 tubes (12 x 75-mm), as well as 96- and 384-well microtiter plates, the BD<sup>TM</sup> Flow Sensor option which allows for bead-free absolute count determination, and a handheld barcode scanner for data entry.

Together, the BD FACSVers system and BD FACSuite software allow users to improve laboratory efficiency and advance their flow cytometry applications.

## Optics

### Excitation Optics

The BD FACSVerser system optical deck is designed for up to three lasers.

The system has fixed alignment. The built-in capability to automatically check laser alignment at startup and correct when needed allows for optimal alignment at all times.

#### Possible system configurations

- 1-Laser (blue), 4-color (4)
- 2-Laser (blue, red), 6-color (4-2)
- 3-Laser (blue, red, violet), 8-color (4-2-2)

#### Laser specifications

##### Blue laser

Wavelength: 488 nm  
Optical power: 20 mW  
Beam spot size: 9 μm x 63 μm

##### Red laser

Wavelength: 640 nm  
Optical power: 40 mW  
Beam spot size: 9 μm x 63 μm

##### Violet laser

Wavelength: 405 nm  
Optical power: 40 mW  
Beam spot size: 9 μm x 63 μm

### Emission Optics

#### Forward scatter detection

Si-photodiode with built-in 488/10 bandpass filter

#### Fluorescence and side scatter detection

Reflective optics with single transmission bandpass filter in front of each PMT

High-performance customized PMT modules for all fluorescence and SSC channels

Unique electronic identification of the filter/mirror units allows for automatic detection of the configuration and avoidance of errors due to configuration mismatches.

Light collected by the objective lens is delivered by fiber optics to specially designed heptagon detector arrays.

The cuvette flow cell is gel-coupled by refractive index-matching optical gel to the fluorescence objective lens (1.2 NA) for optimal collection efficiency.

#### Forward and side scatter sensitivity

Enables separation of fixed platelets from noise.

#### Forward and side scatter resolution

Scatter performance is optimized for resolving lymphocytes, monocytes, and granulocytes.

#### Side scatter resolution

Enables separation of 0.2-μm beads from noise.

## Performance

#### Nominal acquisition rate

35,000 events per second

#### Carryover

Less than or equal to 0.5%

#### Sensitivity

Nominal fluorescence sensitivity in Normal mode

FITC: 100 molecules of equivalent soluble fluorochrome (MESF-FITC)

PE: 25 molecules of equivalent soluble fluorochrome (MESF-PE)

APC: 50 molecules of equivalent soluble fluorochrome (MESF-APC)

FITC and PE measurements performed using SPHERO™ Rainbow Calibration Particles (RCP-30-5A)

APC measurements performed using SPHERO Ultra Rainbow Calibration Particles (URCP-38-2K)

Channel	Qr* (x 1000)
FITC	20
PE	133
PerCP-Cy™5.5	13
PE-Cy™7	17
APC	10
APC-Cy7	7
BD Horizon™ V450	47
BD Horizon™ V500	17

\*Qr is the relative fluorescence detection efficiency, used for describing the light collection efficiency of a detector, measured in assigned BD units (ABD units). One ABD unit, for a given fluorochrome, is defined as the fluorescence of one antibody bound to a CD4<sup>+</sup> cell.

#### Fluorescence resolution

Coefficient of variation for PI: Area of <3%, full G<sub>0</sub>/G<sub>1</sub> peak for propidium iodide (PI)-stained chicken erythrocyte nuclei (CEN)

#### Fluorescence linearity

Doublet/singlet ratio of 1.95–2.05 for CEN stained with PI and excited with the 488-nm (blue) laser

## Fluidics

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### Flow cell

Stainless steel with low coefficient of thermal expansion for predictable, stable performance

### Cuvette internal cross-section

430  $\mu\text{m}$  x 180  $\mu\text{m}$

### Sample flow rates

Low: 12  $\mu\text{L}/\text{min}$

Medium: 60  $\mu\text{L}/\text{min}$

High: 120  $\mu\text{L}/\text{min}$

High sensitivity: 40–55  $\mu\text{L}/\text{min}$

### Fluid capacity

Standard 5-L tanks, optional 10-L tanks, 20-L sheath cubitainer adapter available

### Sheath core stream fluid velocity

Normal: 5.4 m/s

High sensitivity: 2.7 m/s

### Sheath fluid consumption

Normal: 13.6 mL/min

High sensitivity: 6.6 mL/min

### Integrated cleaning cycles

Daily Clean, Monthly Clean, SIT flush

### BD Flow Sensor (optional)

Used for volumetric measurement

### Sample input formats

For use on the manual tube port

Tubes

BD Falcon™ 5 mL (12 x 75-mm) polystyrene

BD Falcon 5 mL (12 x 75-mm) polypropylene

BD Trucount™ 5 mL (12 x 75-mm)

BD Falcon 15 mL

BD Falcon 50 mL

Microcentrifuge 2 mL

### For use with the BD FACS Universal Loader (optional)

Tube racks

30-tube rack (12 x 75-mm tubes)

40-tube rack (12 x 75-mm tubes)

96, matrix tube

Plates

96 standard height, round, polystyrene

96 standard height, flat, polystyrene

96 standard height, round, polypropylene

96 standard height, conical, polypropylene

384 standard height, flat, polystyrene

96, half deep, conical, polypropylene

96, deep, conical, polypropylene

96, filter bottom, polypropylene

## Data Management

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### Software

BD FACSuite software version 1.0 or later

### BD Assurity Linc™ software

For remote diagnostics capability on the system

### Operating system

Windows® 7 Professional

### Data resolution

Uncompensated data has a range of 0 to 262,143, which is 18 bits

### FCS format

FCS 3.0 for export

FCS 2.0 and 3.0 for import

## Installation Requirements

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### Operating temperature

The cytometer has an operating range between 15°C (59°F) and 30°C (86°F). We recommend that the lab temperature fluctuate less than 5°C within a day for best operation.

### Humidity

The operating humidity tolerance is between 5% and 95% relative humidity (noncondensing).

### Dimensions (W x D x H)

Cytometer

63.2 x 57.9 x 57.9 cm

(24.9 x 22.8 x 22.8 in.)

Cytometer with standard tanks

85.2 x 57.9 x 57.9 cm

(33.5 x 22.8 x 22.8 in.)

Cytometer with standard tanks and Loader

107.2 x 57.9 x 57.9 cm

(42.2 x 22.8 x 22.8 in.)

### Weight

Cytometer: 55.0 kg (121 lb)

Loader: 13.2 kg (29 lb)

### Power specifications

Voltage: 100–240  $\pm$ 10% VAC

Frequency: 50–60  $\pm$ 10% Hz

Current: 2 A

Power: 150 W

### Heat dissipation

Less than 430 BTU/hour at ambient temperature with the cytometer and Loader running.

### Noise

Less than 65 dBA over 8 hours under normal operating conditions with the cytometer and Loader running.

## System Options

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### **BD FACS Universal Loader**

Single optional device for multi-sample handling, compatible with 30 (barcoded) or 40 (non-barcoded) tubes (12 x 75 mm)

Equipped with an orbital shaker for in-place mixing and resuspension of cells, optimized for all supported formats

Positive sample identification:

Capability to decode barcode labels on tubes and plates with the following symbologies: Codabar, Code 128, Code 3 of 9, Interleaved 2 of 5

### **BD Flow Sensor**

Inline sensor that directly measures the flow rate of particles to provide accurate absolute counts

### **Handheld barcode scanner**

Handheld barcode scanner with stand to input information

### **Extended-use fluidics**

Optional tanks and connectors to allow for use with 10-L waste tanks and BD FACSFlo<sup>TM</sup> cubitainers

### **Research Assay Module for BD FACSuite software**

Predefined assays with setup, acquisition, and analysis built in for common applications which are complementary to popular research assay kits available from BD

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