JSAN JR

Swift

Bay bioscience

◇ JSAN JR Swift features

The JSAN JR Swift was developed as the most compact high-speed, high performance cell sorter.
It established a new standard for compactness, flexibility, and ease of use.

Features

- Laser configuration: from 1 laser, 2-color ~ to 2-laser, 6-color
- Second laser options: UV, Violet, Yellow, Red — your choice
- "Sense in quartz, sort in air" design results in excellent fluorescence sensitivity
- Hybrid flow cell design integrates flow and nozzle for easier cleaning and maintenance
- System dead volume is very low, maximizing amount of sample sorted
- Our patented OptiDrop*1, OptiDelay*2 enable rapid sort setup and stable operation
- High speed (20,000 events/sec) sorting, at lower pressure (30psi) improves viability
- Sorting options such include sorting into microtiter plates, temperature control for sample tube and collection tubes
- Compact size minimizes lab space requirements
- Compact size also enables easier installation in a bio-safety cabinet

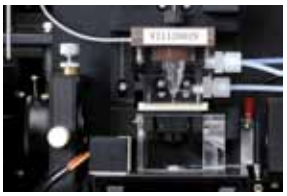
Printer, Compressor, Waste fluid, Workstation, High-resolution display, Software are included in the specifications

*1 JSAN Jr Swift Advanced sort control functions incorporate the patented OptiDrop software to monitor and optimally regulate droplet parameters.
*2 OptiDelay (Patented) provides the JSAN Jr Swift's automated drop delay control to maintain high sorting stability and accuracy. It does so by the automatic and constant computation and feedback loop based on the parameters these algorithms monitor.

◇ Features

Easy to Use

- Separate tabs are available in a single window for instrument settings, sort settings and CloneMate control, allowing quick and easy selection of the tab related to the instrument function you wish to adjust or monitor.
- The flow cell unit may be easily removed and replaced (a matter of a few seconds). If the laser needs to be re-centered on the flow cell, there is a single knob adjustment, which requires only a few seconds.



Flowcell Unit

Efficient sample handling

- The sample station is located near the top of the system, close to the flow cell, which helps to reduce sample loss and reduces carry-over.

sample station

Compact design

- Main body 705 W x 695 D x 640 H (mm)
- The JSAN JR swift is a high speed droplet cell sorter, introduced as the world's smallest in its class

Bio-safety enhancement

- The sort chamber is sealed tightly
- There is also a cover for the stream, prior to its reaching the sort chamber
- HEPA aerosol containment is available as an option

sort chamber

Advanced Sorting Accuracy and reliability

- Simpler and faster operation for sort set-up reduces overall time to prepare for sorting
- Automated re-setting of the drop delay to its previous setting also reduces sort set-up time
- Automated correction of the drop delay time improves sorting stability and reliability

◇ Many available options

Second laser

- UV, Violet, Yellow, Red — your choice

Option；2nd Laser

CloneMate

- By choosing the CloneMate, you can sort single cells – or as many cells as you wish –into each well of up to 96-well microtiter plates.

CoolMate

- Choosing JSAN JR Swift's optional CoolMate can be used to help control the temperature of the sample tube and the sort collection tubes (and plates), to help increase viability or control other experimental factors that may affect the cells.

Clonemate

Coolmate

Aerosol Unit

- Aerosol containment is available as an option, with which any aerosols are evacuated from the sort chamber through a HEPA filter

Bio-safety Unit

- If a bio-safety cabinet is desired the compact design allows the use of a smaller, more affordable BSC (cabinets requiring half the space and half the cost of those used with other sorters).

Bio-safety unit

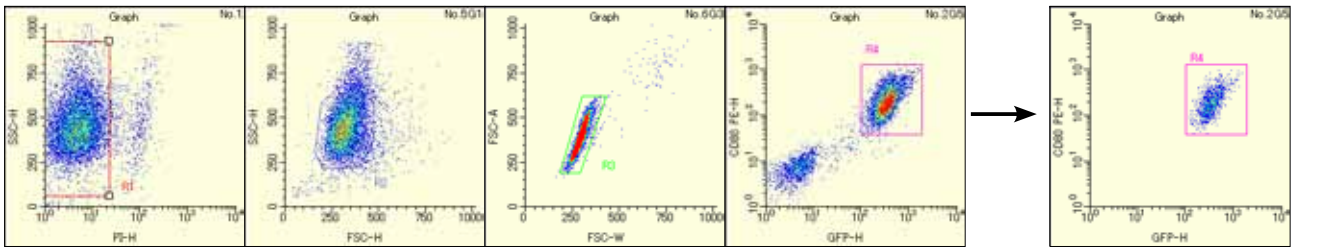
◇ Applications

Sorting of Hela cells expressing GFP

In order to monitor expressions of gene insertion, fluorescent proteins are widely used as reporter molecules. Although green fluorescent protein (GFP) is the most commonly used of them, laser choices are available for any of the other fluorescent proteins that investigators may wish to use.

FL-1 : GFP
FL-2 : PE-CD80
FL-3 : PI

In Fig.1, HeLa cells expressing the marmoset CD80-GFP fusion protein are used to gate on the PI negative population, HeLa population. After that, doublets are excluded, then, GFP positive/ CD80positive cell population are sorted with the JSAN JR Swift.



Gating on PI negative population | Gating on HeLa population | Exclude the doublet | Gating on GFP positive/ CD80 positive cells | GFP positive/CD80 positive cells after sorting

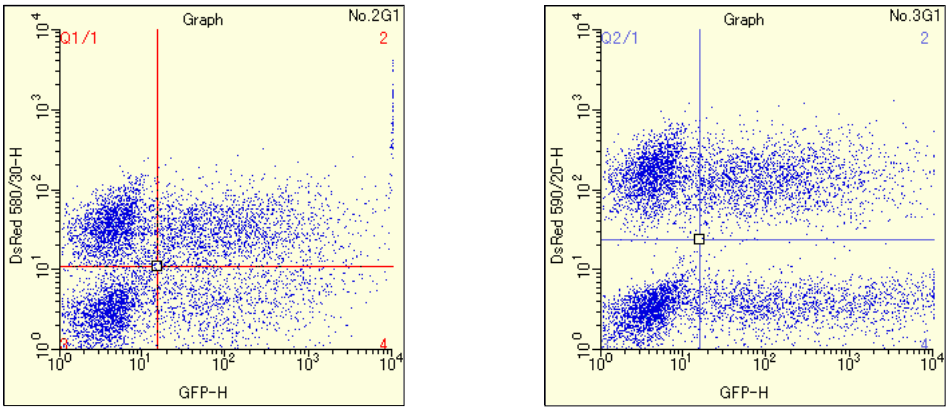
Fig. 1

Two-color Analysis : Reporter Genes

To monitor expressions of gene insertion, fluorescent proteins are widely used as reporter molecules.
Initially, green fluorescent protein (GFP) was the only such molecule available. Today, however, multiple fluorescent proteins are available, e.g., yellow (YEP), orange-red (mCherry, mdTomato) and red (RFP, sometimes referred to as DsRed) and are widely used. This variety enables the use of several reporter molecules in the same experiment, for more complex studies of gene expression and the like.

FL-1 : GFP
FL-2 : DsRed (excited by Blue laser)
FL-5 : DsRed (excited by Blue and Yellow laser)

Fig.2 below shows comparison data of DsRed expressing cells excited by 488nm (blue) and 561nm (yellow) lasers, indicating cells excited by the 561 nm laser are more sensitively detected and require less compensation than when they are excited by the 488 nm laser.



Pattern of DsRed excited with Blue Laser (FL-2 detection)

Pattern of DsRedexcited with Yellow Laser ((FL-5 detection)

Fig. 2

Side Population (SP) Cell Sorting

Side population (SP) cells are typically considered to be stem cells or cells which at least share some of the properties of stem cells. When labeled with the DNA binding dye Hoechst 33342, the efflux pump in SP cells pumps out some of the dye, so that their DNA associated fluorescence is less intense than non-stem cells. This can be confirmed using drugs like Verapamil or Reserpine which inhibit the efflux pump and cause the fluorescence of stem cells to be equivalent to other cells. (i.e. the side population dots "disappear" on the plot). SP cell groups are thought to include cancer stem cells, suggesting great potential for using them in cancer research.

SP cell analysis using mouse bone marrow cells

Mouse bone -marrow cells were stained with Hoechest33342, sorted and analyzed with the JSAN JR Swift, then reanalyzed for SP cells.

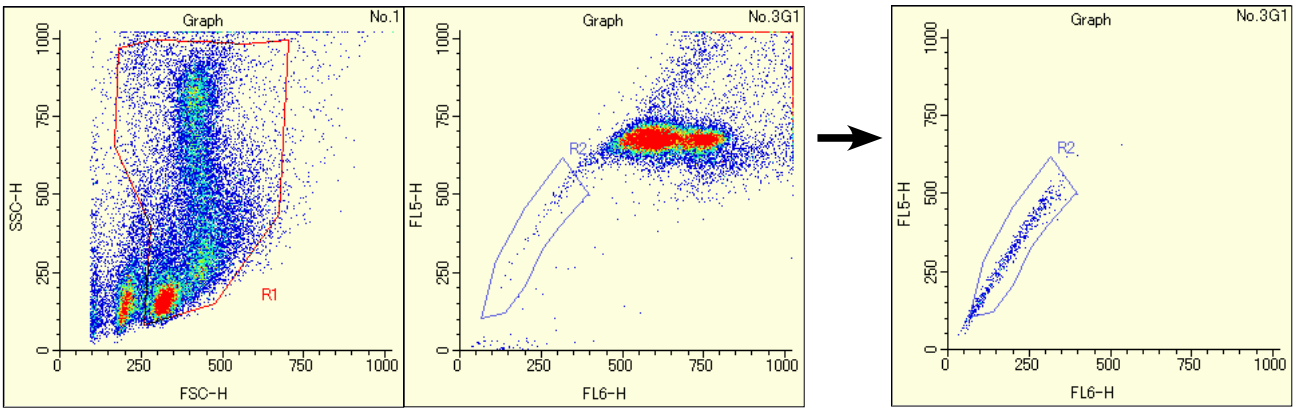


Fig.3

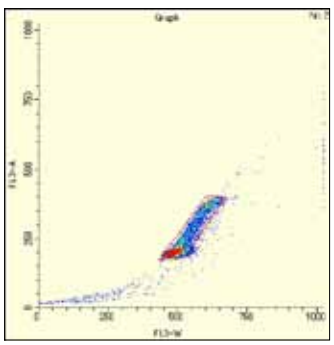
Gating on SP cell population

SP cells after sorting are analyzed with JSAN JR Swift
Cell population within the gate is SP cells

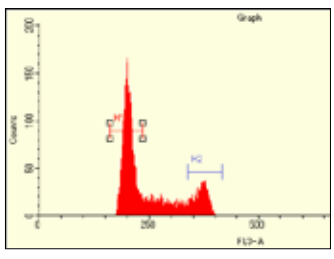
Cell Cycle Assay

Cell cycle may vary as a result of cell-intrinsic factors. Other factors may also affect cell cycle distributions, examples being such things as treatment with drugs, exposure to radiation or congenital or acquired mutation of specific genes, resulting in deviations from the normal cell cycle distribution.
Flow cytometry can be used to resolve cells in the different phases of the cell cycle (G0/G1, S-phase and G2M) with high precision.

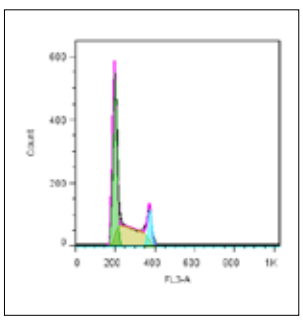
Fig 4 shows cultured HL-60 cells stained with BD Cycletest Plus and analyzed with the JSAN JR Swift.



Exclude the doublet



Cell cycle data of HL-60



Dean-Jett-Fox
RMS = 2.81
Freq. G1 = 51.67
Freq. S = 36.54
Freq. G2 = 11.82
G1 Mean = 199.27
G2 Mean = 374.89
G1 cv = 7.11
G2 cv = 4.18
Freq. sub-G1 = -1.27
Freq. super-G2 = -0.87

Analyze the data from JSAN JR Swift with FlowJo software

Fig.4

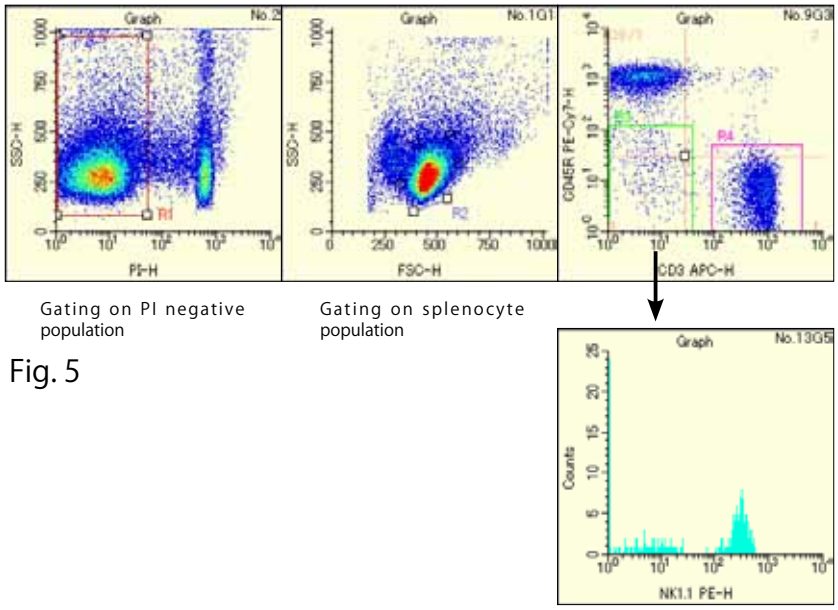
◇ Applications

Multicolor Analysis ／ Sorting

Cell sorting is a technique that allows separation of specific cells from peripheral blood, which contains a variety of cell populations. Cell sorting has continued to become even more important as time has passed.
Mouse spleen cells and human peripheral blood were analyzed with five distinct antibodies and PI on the JSAN JR Swift.

FL-1 : FITC-CD4
FL-2 : PE-NK-1.1
FL-3 : PI
FL-4 : PE-Cy7-CD45R(B220)
FL-5 : APC-CD3
FL-6 : APC-eFluor780-CD8a

Fig. 5 shows mouse spleen cells (C57BL/6) stained with five distinct antibodies and PI, gated on the PI negative fraction and splenocyte population, after which CD 3 positive and negative cells were respectively sorted to expand.



Gating on PI negative population

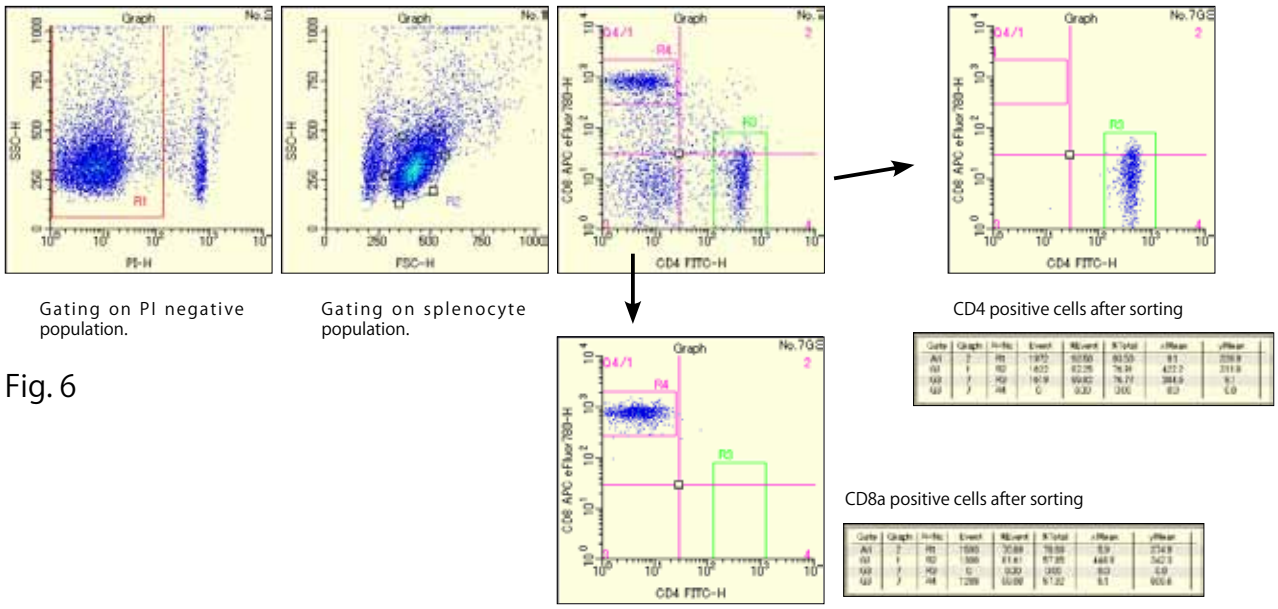
Gating on splenocyte population

CD 3 positive cells were expanded, after which CD4/CD8 expression was analyzed.

CD 3 negative cells were expanded, after which NK-1.1 expression was analyzed

Fig. 5

In Fig. 6, using the same cells in Fig.1, gated on the PI negative population and splenocyte population, CD 4 positive helper T cells and CD 8a positive Cytotoxic T cells were sorted on the JSAN JR Swift.
The results show that they both were able to be sorted at a nearly 100 percent purity level.



Gating on PI negative population.

Gating on splenocyte population.

CD4 positive cells after sorting

CD8a positive cells after sorting

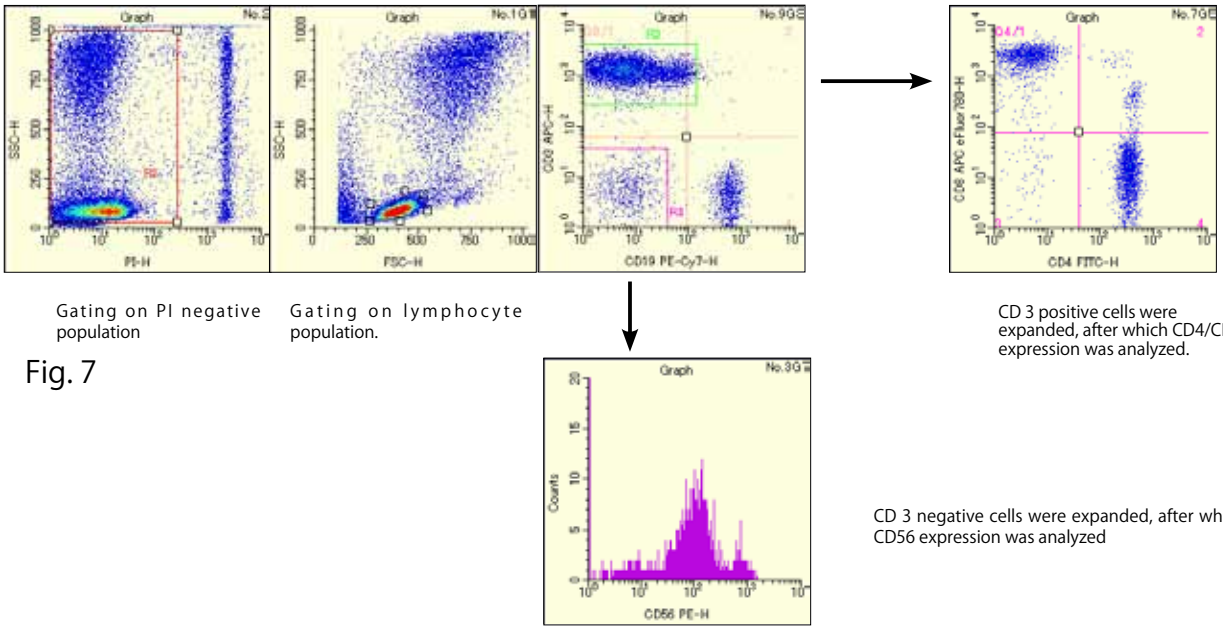
Fig. 6

Human peripheral blood Multicolor Analysis ／ Sorting

Human peripheral blood was analyzed with five distinct antibodies and PI on the JSAN JR Swift.

FL-1 : FITC-CD4
FL-2 : PE-CD56
FL-3 : PI
FL-4 : PE-Cy7-CD19
FL-5 : APC-CD3
FL-6 : APC-eFluor780-CD8a

Fig. 7 shows human peripheral blood stained with five distinct antibodies and PI, gated on the PI negative lymphocyte population, after which CD 3 positive and negative cells were respectively sorted to expand.



Gating on PI negative population

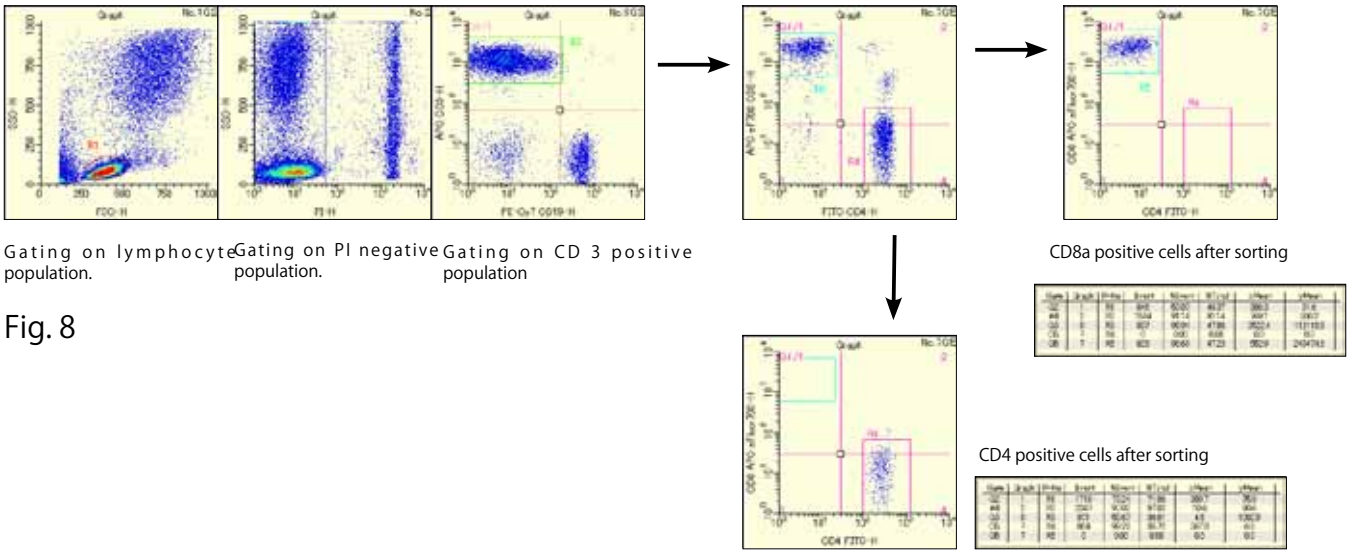
Gating on lymphocyte population.

CD 3 positive cells were expanded, after which CD4/CD8 expression was analyzed.

CD 3 negative cells were expanded, after which CD56 expression was analyzed

Fig. 7

In Fig. 8, using the same cells in Fig.3, gated on the lymphocyte population, the PI negative population and the CD 3 positive population, CD 4 positive helper T cells and CD 8a positive cytotoxic T cells were sorted on the JSAN JR Swift. The results show that they both were able to be sorted at a nearly 100 percent purity level.



Gating on lymphocyte population.

Gating on PI negative population.

Gating on CD 3 positive population

CD8a positive cells after sorting

CD4 positive cells after sorting

Fig. 8

◇ Specifications

Model	JSAN JR Swift
Optics	
Lasers	Blue: 488 nm, ≧ 20 mW DPSS laser: Primary laser
	Red: 638 nm, ≧ 20 mW semiconductor laser: Typically the second laser option
	UV: 375 nm, ≧ 16 mW semiconductor laser: One choice for the second laser option
	Violet: 405 nm, ≧ 100mW semiconductor laser: One choice for the second laser option
	Yellow: 561 nm, ≧ 50mW DPSS laser: One choice for the second laser option
Detection Optics	Fiber optics coupled with a hybrid flow cell
	Detectors detect the emitted fluorescence collected by a separate fiber specific to each laser
Optical Adjustment	Easy optical adjustment by laser adjustment (positions for detector optical fiber and laser emission are fixed)
Detection Parameters	Forward scatter (FSC), and side scatter (SSC)
	Up to four fluorescent signals (1st laser), up to two fluorescent signals (one choice for second laser option)
Detectors	Two fixed-fiber for the 488 and 638/375/405nm lasers (axes of the 1st laser and 2nd laser are different)
	Forward scatter (FSC) detector: one photodiode
	Side scatter (SSC) detector: one PMT
	Fluorescence detectors: up to six PMTs (The most common JSAN JR configuration has four fluorescence PMTs.)
	Two to four PMTs detect fluorescence excited by the blue laser
	Up to two PMTs detect fluorescence excited by the second laser (optional)
Sample Acquision Rate	Maximum acquisition rate: 60,000 events per second
Fluorescence Sensitivity	200MESF using SPHERO™ Rainbow Calibrite Particles
Fluorescence Resolution	Coefficient of variation (CV): <3.0%, PI-stained chicken erythrocyte nuclei (CEN)
Signal Processing	
Signal Processing System	Digital processing system
Signal Processing Parameters	Maximum parameters: eight (4 to 8 parameters)
Signal Resolution	1024/4096 channels per each parameter
Signal Dynamic Range	20-bit linear signal, four/six-decade digital-log signal for any parameter
Pulse Processing	Height, Area, and Width measurements available
Fluorescence Compensation	No limit to inter- and intra-beam compensation
	Maximum 6 x 6 compensation matrices available. (Depends on laser configuration)
Sorting	
Sorting System	Droplet-sorting System
Sorting Mode	Three modes: normal, high purity, and high recovery. Each allows 1-3 droplet envelopes
Sorting Speed	Drop drive frequency: ≧ 60,000 droplets per second; Max. speed: 20,000 cells per second
Sorting Resolution	256 x 256, 65,536 points
Sort Collection	Two-way sorting
Sort Performance	Purity: >98% (using CaliBRITE™ Beads)
Utilities	
Workstation	Operation System: DOS/V , Windows®XP or Windows® 7
Monitor	One LCD: 23-inch monitor
Printer	Color inkjet printer
Software	JSAN software AppSan (FCS 2.0, 3.0)
Options	CloneMate (Automated cell deposition unit), CoolMate (Sample cooling device), Desk, aerosol unit,
	compact size Bio Safety Unit
Others	
Power	JSAN JR main body: operation at 100-240VAC and 50 or 60 Hz, 400W
	Tank Cart: operation at 100-240VAC 50 or 60 Hz, 200W
Dimensions and Weight	JSAN JR main body: 69.5 cm depth, 70.5 cm width, and 64 cm height; approx. 120 kg
	Tank cart: 41 cm depth, 60 cm width, 60 cm height, approx. 15kg
Ambient temperature and humidity	within a range of 19 to 25℃ , 5 to 70% humidity; no condensation
Storage temperature and humidity	within a range of 0 to 40℃ , 5 to 70 % humidity; no condensation
CB report Number	2029081 001 (TÜV Rheinland)

※ The specifications are subject to change without notice.
※ The JSAN JR flow cytometer is For Research Use Only. Not for use in diagnostic or therapeutic procedures.
※ The JSAN workbench is an option. The image in this brochure might differ from the actual one.
※ Windows is a registered trademark of Microsoft Corporation.
※ SPHERO is a trademark of Spherotech, Inc.
※ CaliBRITE Beads is a trademark of BD Biosciences

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