Sort What You See
With The Gentle VERLO™
Image-Guided Cell Sorter

nanocellect
Biomedical, Inc.

VERLO
nanocellect

Visualize and Sort High Integrity Cells ●●●

A classic challenge in biological research: how to visualize and sort cells effectively, easily, and of high quality. As science continues to move forward into increasingly complex realms, the VERLO Image-Guided Cell Sorter is now providing conventional flow cytometry and cell sorting along with the ability to perform imaging analysis to identify and sort cells based on morphology, subcellular localization and more.

The VERLO instrument significantly expands the capabilities of gentle benchtop microfluidic cell sorting. With two lasers and nine colors, plus 3 label-free parameters, it maintains simple workflows for either bulk sorting or single-cell dispensing into 96- or 384-well plates with an integrated cell dispenser. This flexibility in performance, along with the additional abilities of dual-laser cytometry and imaging makes it ideal for use in many different research fields and application areas like stem cells, single-cell genomics, cell line development, gene editing, antibody discovery, immunology, infectious disease, and more.

VERLO Image-Guide Cell Sorter

Flow and Imaging Detectors

Extend conventional flow cytometry with rich image and morphology data enabled by our unique detection architecture with dual lasers and 9 fluorescent colors.

Label-Free Imaging

Combine imaging and flow cytometry transmission, forward and back scatter measurements for label-free image analysis and sort of cells based on morphology.

Seeing Is Believing

Images provide immediacy for data and allow generation of novel hypotheses and insights.

Image Feature Extraction

Quantitatively characterize cells with automated feature extraction for physical dimensions and textures.

High Sensitivity and Resolution

With an optical resolution of 1 micron and < 250 MESF sensitivity, along with transmission, forward and back scatter, the VERLO can detect particles as small as 1 μm.

Healthy Cells

At < 2 psi, the VERLO is gentler than any conventional cell sorter, enabling healthier cells post-sort, especially for sensitive engineered lines, primary cells, and stem cells.

Compact, Simple and at Your Bench

Intuitive software, fixed optics, no fluidics cart and less than one minute clean-up time. With a small footprint, NanoCellect's is redefining the benchmark for Imaging Cytometry at the bench.

Contaminant- and Biohazard-Free

Disposable, aerosol-free microfluidic cartridge allows for sterile sorting that protects the sample from the environment and scientist from the sample.

VERLO Image Sorting Technology ●●●

12-Parameter Image-Guided Sorting

With 488 nm and 561 nm lasers to detect up to 9 fluorescent markers and 3 channels of label-free information, the VERLO™ Image-Guided Cell Sorter can identify key structures, such as golgi and nuclei, internalization, overall morphology, and nuanced texture features that can discriminate live-dead—as well as the physiology of the cells. This includes the pluripotency/differentiation status of stem cells, the proliferation and protein expression status of CHO and HEK293 cells—and can perform 5-part differentials on PBMCs. By combining the power of the single-pixel parameters of conventional flow cytometry with up to 1,600-pixel parameters of VERLO, what biology will you discover?
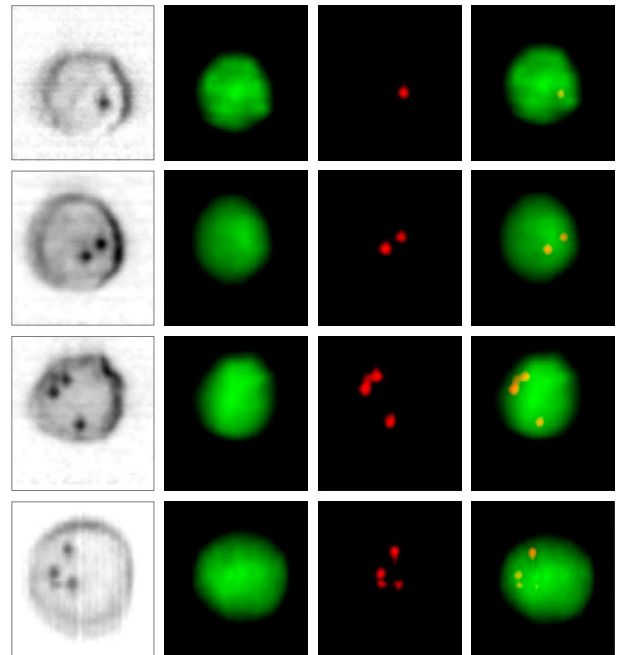
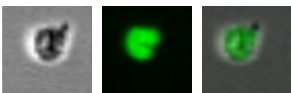# Key VERLO Applications ●●●
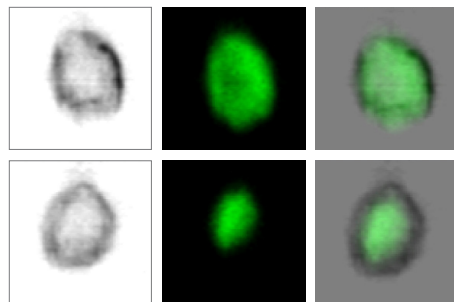
Label-Free Morphology
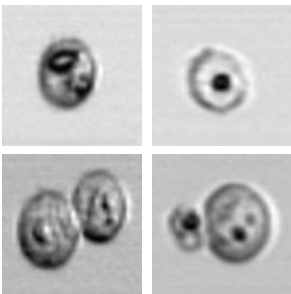
Cell-Cell Interactions
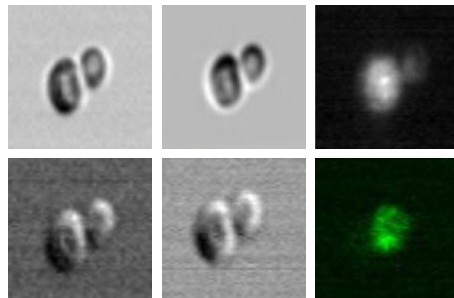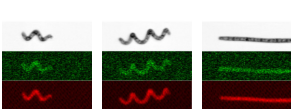

Phagocytosis

Organelle Identification

Nuclear Translocation

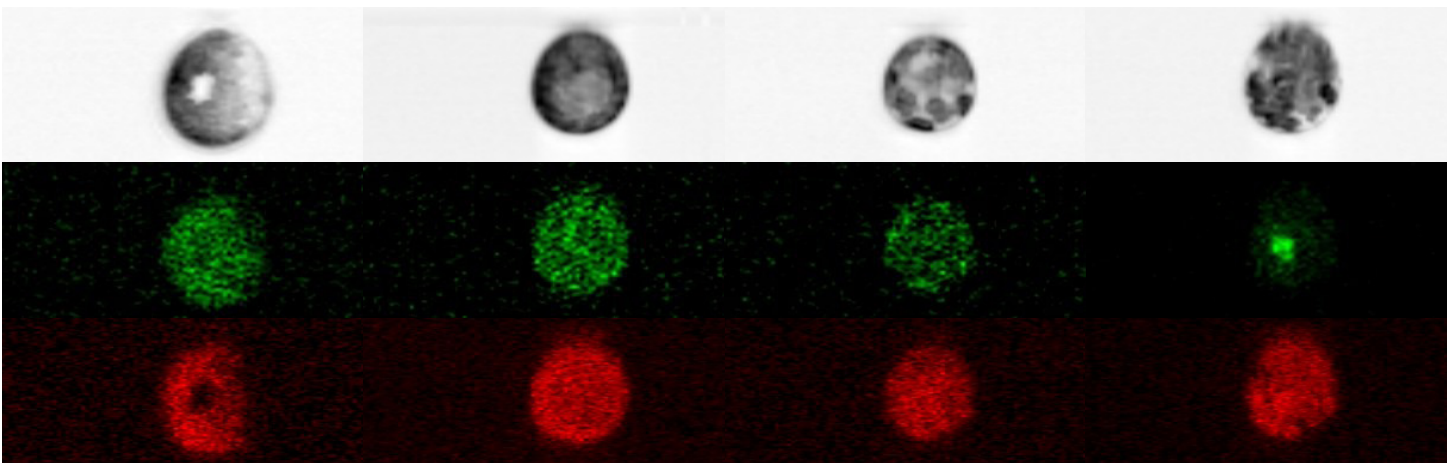**Marine Biology**

Label-Free Plant Protoplast Identification
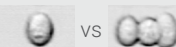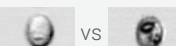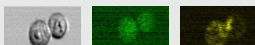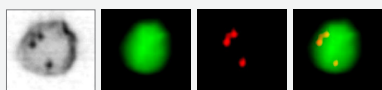
Image Enabled Cell Sorting ●●●
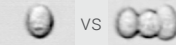
Image Feature			
Area	Cell size	Calculate the radius, diameter, and volume of the cell	
Perimeter	Cell circumference	Identify cells with irregular surfaces or dendrites	
Major Axis	Cell shape	Identify differently sized cells	
Minor Axis			
Aspect Ratio		Identify single vs doublet cells or recently divided cells in mitosis	
Eccentricity		Identify cell clusters, nuclear translocation, cells in mitosis	
Integrated Intensity	Fluorescence intensity	Quantify relative levels of fluorescence between cells and within different regions of the same cell	
Average Intensity		Quantify average fluorescence within and between cells. Identify bright punctate spots. Track internalization of particles.	
St Dev Intensity		Estimate pixel variation level. Distinguish apoptotic and necrotic cells.	
Max Intensity		Estimate peak fluorescence activity. Identify punctate vs uniform staining.	
Contrast	Cell texture	Determine peak focus quality of images. Characterize cell texture.	
Gradient RMS		Determine overall focus quality of images.	
Correlation	Cross-channel	Quantify translocation. Identify co-localization.	
Delta Center of Mass		Measure shifts in X or Y direction between two images. Identify capped vs non-capped cells.	
Spot Counting	Spot counting	Count parasites, phagocytosed particles, punctate spots, FISH spots.	

Once you have decided on which morphological features of the cells you want to sort, you can gate on image features such as Area vs Max Intensity, just like you would when sorting using FSC vs BSC. The image features are calculated in real-time, enabling you to begin sorting your samples without having to first analyze the whole sample and then run it through the instrument again.

Pre-sort

Set gates on image features

Post-sort
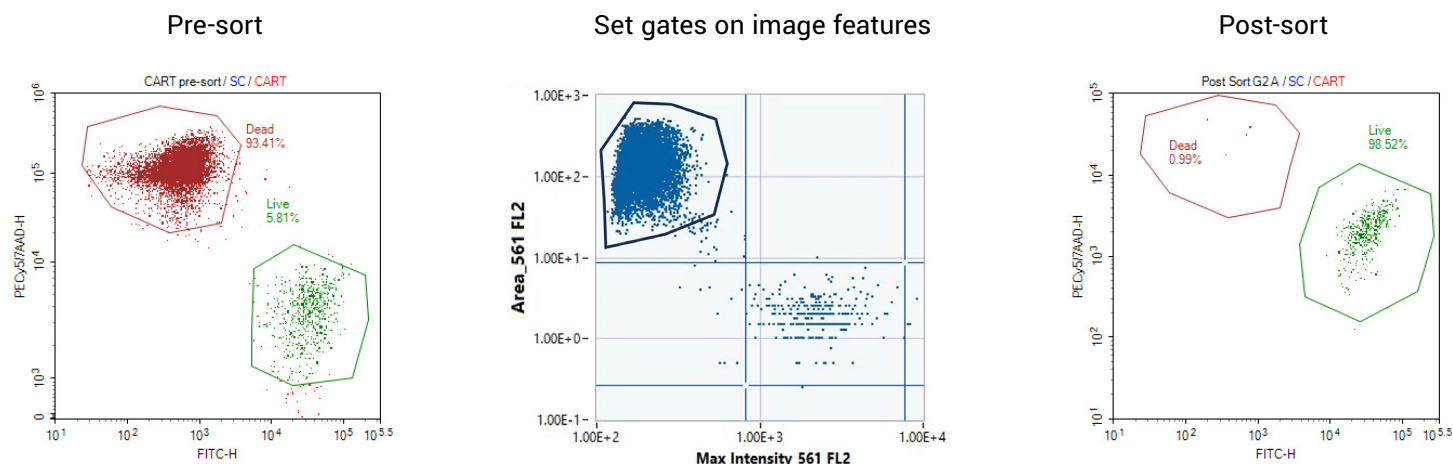
Microfluidic Cartridge Technology ●●●

The VERLO™ Image-Guided Cell Sorter uses patented, microfluidic-based sorting with robust laser-excitation and sensitive PMT detectors to isolate mammalian cells, microbes, plant cells and more. A gentle and precise piezoelectric actuator directs cells into collection channels and allows analysis and sorting in a disposable format. This eliminates sample-to-sample contamination and biohazard exposure or cleanup.

- Unique to NanoCellect are our disposable cartridges that allow for bulk sorting or single-cell sorting.

- The sorting cartridges use a piezoacoustic actuator that gently directs cells into collection channels; an embedded cell sorting verification system gives instant feedback of sorting accuracy.

- This technology allows the VERLO to sort up to 200 cells per second with high accuracy and effective recovery.

- Sort two selected cell populations with bulk sorting while the remainder of cells collects in a third channel.

- Deposit 1 to 100 cells per well in a 96- or 384 well plate using a single-cell sorting cartridge and integrated Single-Cell Dispenser.

Magnified Sorting Junction

Actuator
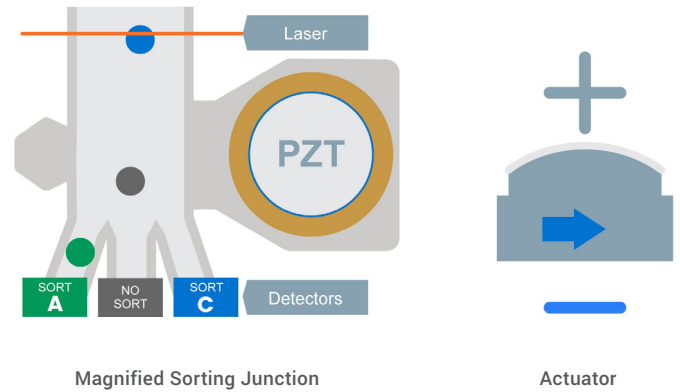
VERLO Integrated Platform ●●●

CellVantage™ Software

The CellVantage software combines the classic flow cytometry features familiar to flow cytometry scientists with an interactive image gallery to visualize all analyzed and sorted cells. The software has an intuitive workflow interface that walks the user through the experimental process and is designed for both novice and expert users.

Single-Cell Dispenser

Designed to sort and dispense into 96- and 384-well plates, the integrated dispenser provides higher rates of singlet detection compared to cell printers or limiting dilution. Users can perform simple, label-free dispensing or advanced multicolor panel single-cell dispensing.

Plate sorting specifications
Time to Plate (96-well): 6 min
Time to Plate (384-well): 20 min
Dispensed Volume: 4 µL
Plating options: 96- or 384-well plates (flat/U/V bottom or PCR)

Sample Cooling and Mixing

The VERLO has integrated sample cooling designed to keep your temperature-sensitive samples cooled and agitated to maintain them in uniform suspension while running bulk and single-cell sorting. Both your sample and sheath fluid are kept at the desired temperature. In addition, sorted cells are also kept cooled whether you sort in tube or multi-well plates.
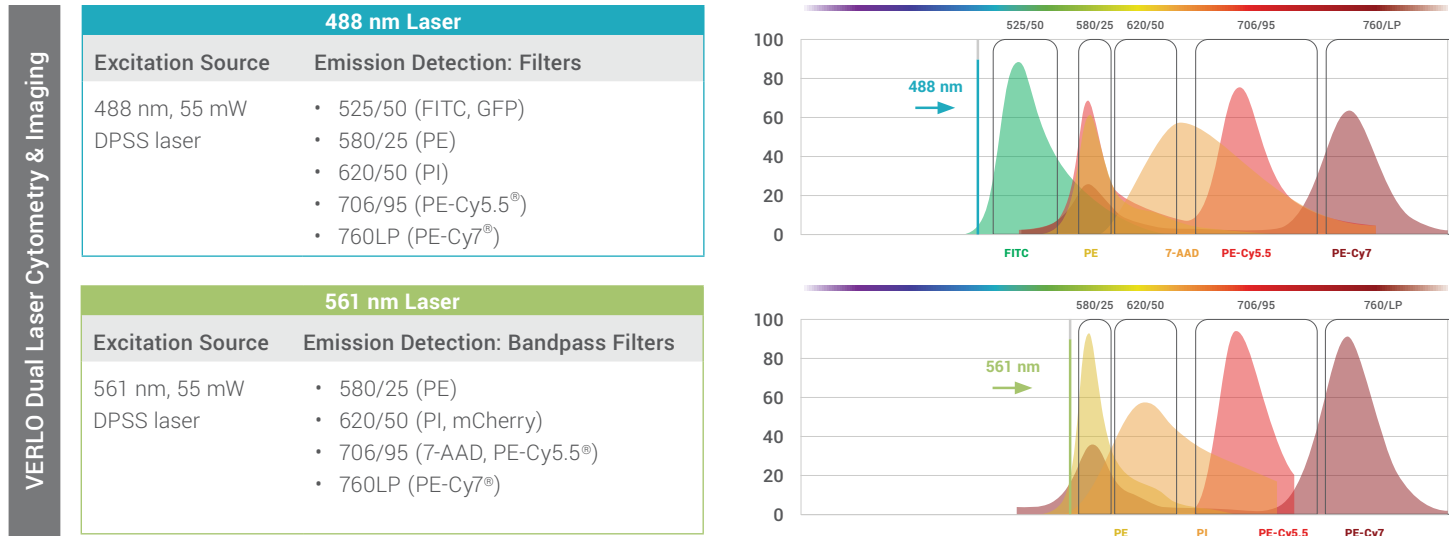
Sample cooling and mixing specifications
Chilling Temperature: 4-24°C (39.2-75.2°F)
**Sample Rotation Speed:** 5-100 rpm

VERLO Configuration ●●●

The VERLO's dual laser configuration allows 9 fluorescent and 3 label-free flow cytometry and imaging channels to be collected.

VERLO Dual Laser Cytometry & Imaging

488 nm Laser	
Excitation Source	**Emission Detection: Filters**
488 nm, 55 mW DPSS laser	• 525/50 (FITC, GFP) • 580/25 (PE) • 620/50 (PI) • 706/95 (PE-Cy5.5®) • 760LP (PE-Cy7®)

561 nm Laser	
Excitation Source	**Emission Detection: Bandpass Filters**
561 nm, 55 mW DPSS laser	• 580/25 (PE) • 620/50 (PI, mCherry) • 706/95 (7-AAD, PE-Cy5.5®) • 760LP (PE-Cy7®)

The VERLO has 12 channels of conventional flow cytometry, each with a corresponding image.

1: 0-10° FSC Transmission / Brightfield
2: 10-20° FSC Darkfield
3: 180° BSC Darkfield
4-12: Epifluorescence

1: 0°-10° FSC Transmission/Brightfield
4-12: Epifluorescence
2: 10°-20° FSC Darkfield
3: 180° BSC Darkfield
Cell or Particle
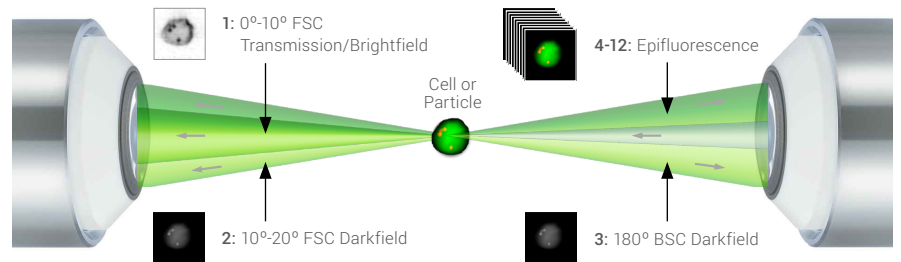
Instrument	Excitation Laser	Emission Filter	Fluorescent Dyes	Fluorescent Proteins
VERLO Image-Guided Cell Sorter	**488 nm**	525/50	Alexa Fluor® 488, FITC, Brilliant Violet™ 515	eGFP, eYFP, mCitrine
		580/25	PE	mKate, mBeRFP
		620/50	PI, Texas Red®, PE-Texas Red®, PE-Alexa Fluor® 594, ECD	DsRED
		706/95	PerCP, PE-Cy5.5®, PE-Cy5®, PerCP-Cy5®	
		760LP	PE-Cy7®, PE-Vio®770	
	561 nm	580/25	PE	DsRED, tdTomato
		620/50	Texas Red®, PE-Texas Red®, Alexa Fluor® 594, PE-Alexa Fluor® 594, ECD	mCherry, mStrawberry
		706/95	PE-Cy5.5®, PerCP, 7-AAD, DRAQ5	
		760LP	PE-Cy7®, DRAQ5™, DRAQ7™	

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Alexa Flour®, Texas Red®, SYTOX®, and Qdot® are registered trademarks of Life Technologies Corporation.

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Brilliant Violet™ is a trademark of Sirigen Group Ltd.

BD Horizon™ is a trademark of Becton, Dickinson and Company.

Vio® is a registered trademark of Miltenyi Biotec GmbH.

Dazzle™ is a trademark of BioLegend.

For more information on compatible fluorophores, visit nanocellect.com or email info@nanocellect.com

VERLO Specifications ●●●

Fluidics	
Sample input	1.5, 2.0, and 5.0 mL tubes
Sheath input	50 mL conical tubes
Sheath fluid	Buffer of choice
Sheath fluid usage	9.6 mL/hour
Sample flow rate	12 μL/minute
Sheath flow rate	120 μL/minute
Sample line volume	50 μL
Minimum sample volume	100 μL
Tubing diameter (inner)	200 to 500 μm
Flow cell	200 x 700 μm
Smaller channel diameter	70 μm
Sample pressure	< 2 psi
Sample output (bulk sorting)	1.5 mL or 5 mL tubes
Sample output (single cell)	96- or 384-well plates (flat/U/V bottom or PCR)

Performance	
Scatter sensitivity	< 1.5 μm by FSC or BSC
Scatter resolution	Resolves lymphocytes, monocytes and granulocytes
Fluorescence sensitivity	< 200 MESF FITC (488 nm laser) < 250 MESF PE (561 nm laser)
Fluorescence resolution	9-peak separation with SPHERO™ Rainbow Calibration Particles
Analysis speed	2,000 events/second
Sorting	1- and 2-ways
Back-to-back sorting speed	200 events/second
Absolute counts	Yes
Volumetric counts	Yes
Warm-up time	Less than 1 minute
Sorting purity	Up to 99% purity

N1 Plate sorting specifications	
Time to plate (96 wells)	6 minutes
Time to plate (384 wells)	20 minutes
Droplet volume	4 μL
Sample plate options	96 or 384 well (flat bottom, V-bottom, U-bottom, PCR)

Optics	
Laser Profile	1.5 x 1.5 μm
Scatter detection	Forward (0 degrees, +/- 15) Back (180 degrees, +/- 15)
Excitation & emission detection	488 nm 50 mW: 525/50, 580/25, 620/50, 706/95, 760LP
	561 nm 50 mW: 580/25, 620/50, 706/95, 760LP
Optical alignment	Fixed alignment

Instrument specifications	
VERLO Dimensions	18 in H x 40 in W x 18 in D (45.7 cm H x 101.6 cm W x 45.7 cm D)
VERLO Weight	150 lbs / 68 kg
VERLO Electrical	AC Input: 100-240V, 50-60Hz, 2A

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NanoCellect Technical Support ●●●

Onboarding

NanoCellect is committed to provide you with the highest level of support and expertise for your cell sorting workflow. We are dedicated to delivering the very best solutions and assistance to help you improve the quality of your research.

Training

Our Sales and FAS teams will assist you during initial instrument installation and for additional training options. Online training videos and other material are always available and being updated on our website's dedicated Knowledge Base.

Technical Support

Our expert technical support, including dedicated Field Application Scientists and Customer Success teams respond quickly and are available for you when you need them. Additional support options include remote TeamViewer sessions, in-person training and repairs, and online educational resources.

Service Contract

Our service offerings have expanded to include two options, allowing you to pick the level that best fits the needs for your budget and lab. In addition to standard customer support, one-on-one TeamViewer sessions, enhanced software updates for greater analysis capability, and preventative instrument maintenance (once per year) and repairs are covered under both plans.