

UltraMicroscope Blaze[™] Light sheet microscopy made fast and easy



Seeing nature's complexity in a new dimension

The UltraMicroscope Blaze, the market's most automated light sheet microscope, is ideal for highresolution 3D imaging of large and multiple cleared samples. With the revolutionary LightSpeed Mode and the new image processing software, MACS[®] iQ View – 3D Large Volume, it sets new benchmarks for high-quality and fast 3D imaging.

Explore the full range of your sample

Offering both high resolution and an extended imaging range, the UltraMicroscope Blaze empowers you to explore the full potential of your samples, from overview down to the subcellular level. Sample sizes range from as small as organoids to as large as entire mouse models and even human organs.

Faster than ever, precise as always

The LightSpeed Mode unlocks unprecedented imaging speed while preserving the high resolution that the UltraMicroscope is renowned for. Capture an entire mouse brain in less than 3 minutes, a process that would take hours with other light sheet microscopes. Combined with batch imaging, this translates to rapid, high-throughput analyses with minimal hands-on time.

3D imaging for everyone

The UltraMicroscope Blaze eliminates the need for specialized expertise, empowering anyone to leverage the power of light sheet microscopy. Its intuitive software, automated features, and comprehensive workflow solutions make 3D imaging accessible to users of all backgrounds.



High-resolution image of a whole mouse brain labeled with 3D-immunofluorescence (3D-IF) antibodies, cleared using the iDISCO+ method, and acquired with the UltraMicroscope Blaze. The two zoomed-in regions depict dopaminergic neurons in the *substantia nigra* (top) and *locus coeruleus* (bottom) (bottom).

- MBP (Myelin Basic Protein) Antibody, anti-human/mouse, Vio[®] R667, REAfinity™
 Tyrosine Hydroxylase Antibody, anti-human/mouse/rat, Vio G570, REAfinity

All you need for light sheet microscopy – from sample preparation to data optimization

Embark on your light sheet microscopy journey with the UltraMicroscope Blaze. Minimize the effort and maximize the potential of this remarkable 3D imaging technique with our comprehensive workflow solution. This includes validated 3D-IF antibodies for staining large tissue samples, the MACS Clearing Kit for efficient tissue clearing, the UltraMicroscope Blaze light sheet microscope for fast 3D imaging, and the MACS iQ View – 3D Large Volume image processing software for data optimization. Our unwavering support spans the entire workflow, addressing both technical and biological aspects. Leveraging the UltraMicroscope Blaze in our own research, we deeply understand your needs.

Validated 3D-IF antibodies

Skip the time-consuming process of screening and testing antibodies. Use our validated 3D-IF antibodies, optimized for whole-mount staining of large cleared samples.

UltraMicroscope Blaze Light Sheet Microscope

Enjoy the ease of fast 3D imaging with the fully automated UltraMicroscope Blaze Light Sheet Microscope, capable of visualizing samples ranging from organoids to whole organs and organisms.

UltraMi Blaze[™] Pla

MACS® Clearing Kit

Say goodbye to laborious reagent preparation. Our ready-to-use, nontoxic MACS Clearing Kit effectively renders your samples transparent. Dedicated tissue protocols ensure optimal results for diverse samples.

MACS iQ View – 3D Large Volume

Unleash the power of your light sheet imaging data with MACS iQ View – 3D Large Volume, a comprehensive software package specifically designed for processing the massive datasets generated by the UltraMicroscope Blaze. A

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Setting the benchmark with cutting-edge technology

The UltraMicroscope pioneered commercial light sheet microscopy, contributing to more scientific publications than any other system in its category.

This legacy continues with the UltraMicroscope Blaze, born from decades of customer feedback and setting the benchmark with cutting-edge technology. Stay at the forefront of discovery with this powerful tool.

Autofocus, motorized turret, and automatic post-magnifier

Reduce hands-on time via several automated functions. Switch automatically between objective lenses and keep your samples sharp – from overview scans to single cell imaging.



LightSpeed Mode

Experience unparalleled image quality at speeds that surpass all other systems in the market. LightSpeed Mode and batch imaging take high-throughput 3D imaging to a whole new level.



Light sheet and detection optics

Illuminate all areas of your sample and minimize shadows with bilateral, triple illumination. Collect the most out of your sample with dedicated long WD, high NA objective lenses.



Large sample chambers and automated sample release

Analyze samples as large as a human kidney or a whole adult mouse with ease. Choose between our standard and XXL chambers to fit your model needs. The automated sample release function ensures effortless sample loading and exchange between experiments.





Next-level light sheet microscopy

Unprecedented image quality with Multi-Immersion (MI) Plan objective lenses

The combination of Flat-field correction, high numerical aperture (NA) and long working distances makes the MI Plan objective lens series well-suited for high-resolution imaging of large samples. In addition, they are compatible with all imaging solutions from water to solvents with high refractive indices.

Light sheet technology tailored to your sample

The light sheet, thinnest within a specific horizontal range, is crucial for fluorescence detection. Tailored to match sample size and desired field of view (FOV), the light sheet parameters of the UltraMicroscope Blaze can be adjusted for optimal illumination (figure 3). A low NA provides a broad FOV but low z-resolution for large samples (A). A high NA offers high z-resolution and a narrow FOV for small samples (B), with gradations in between.

For both high z-resolution and a broad FOV, a sequential series of high-NA images can be acquired and automatically merged into a single high-quality image (Dynamic Focus).



Figure 1: By adjusting the shape of the light sheets, illumination is tailored to sample size and imaging goals. A lower NA results in a broad field of view (A), and a higher NA results in a narrow field of view (B). While there is a tradeoff between the field of view, the thickness of the light sheet, and the z-resolution, the UltraMicroscope Blaze allows balancing these parameters to meet your specific requirements.

Acquisition in record time

Microscopy often involves trade-offs, with one parameter affecting another, like sacrificing image quality for speed. However, the UltraMicroscope Blaze's LightSpeed Mode throws out the rulebook, delivering high-quality images at remarkable speeds.

Instead of moving the imaging optics and detector, LightSpeed Mode minimizes downtime by synchronizing the camera with the stage motion for continuous image acquisition. This innovative approach makes the UltraMicroscope Blaze up to 60× faster than Dynamic Focus, the standard highresolution acquisition mode. Combined with batch imaging and application-oriented sample holders, the LightSpeed Mode sets new standards for highthroughput 3D imaging.





Figure 2: A detailed view of blood vessels of a lectin-stained whole mouse brain imaged with Dynamic Focus (standard high-resolution acquisition) and LightSpeed Mode. LightSpeed Mode exhibits no vibration artifacts or resolution reduction in the acquired data. Imaging parameters: Z step-size 3 μ m, 4× MI Plan objective lens, and 6 μ m thick light sheet.



Antibodies validated for 3D imaging of cleared tissues





Figure 3: 3D-IF antibodies are compatible with other clearing methods. Mouse brain cleared with iDISCO+ and stained with Neurofilament Antibody, human/mouse, Vio R667, REAfinity. Data courtesy of Gubra, a CRO and Biotech company, Denmark.





One of the biggest bottlenecks in analyzing large, cleared samples is finding the right antibodies for your target structures. Extensive validation is essential to ensure meaningful results. Miltenyi Biotec takes the guesswork out: our REAfinity Antibodies are specifically engineered and validated for 3D immunofluorescence (3D-IF) on tissues cleared with the MACS Clearing Kit.

- Validated for whole-mount staining of large samples cleared with the MACS Clearing Kit
- · Compatible with other methods like iDISCO+
- 50% faster staining with pre-conjugated primary antibodies
- Superior tissue penetration
- Optimal signal-to-background ratios with bright and photostable Vio Dyes
- Recombinantly engineered for reproducible results and minimal background signals





Check out our portfolio of 3D-IF antibodies. miltenyibiotec.com/3D-IFantibodies

Streamlined tissue clearing to get started immediately



Current tissue clearing protocols are often timeconsuming, complex, or rely on harmful chemicals. The MACS Clearing Kit is a safe, fast, and budgetfriendly way to clear large tissue samples.

- Non-toxic and user-friendly clearing method
- Fast and efficient clearing in just one step wile preserving tissue morphology
- Easy-to-follow protocols for pigmented and nonpigmented tissues like mouse brain, embryo, tumors (including blood-rich varieties), organoids, liver, kidney, spleen, lung, and more
- Dedicated protocol for optimal preservation of endogenous protein signals
- Non-toxic MACS Imaging Solution, perfectly matching the refractive index of cleared tissue for stunningly sharp images



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Find the perfect tissue clearing protocol for your sample and quickstart your research.

miltenyibiotec.com/tissue-clearingprotocols



Figure 4: The MACS Clearing Kit enables effective clearing of tissues.



Figure 5: The MACS Clearing Kit preserves the endogenous GFP signal. GAD67-EGFP mouse brain cleared with the MACS Clearing Kit using the dedicated protocol. Preserved endogenous GFP signal (A) and staining with GFP Antibody, Vio R667 (B).

MACS iQ View – 3D Large Volume: Unlock the full potential of your data



MACS iQ View - 3D Large Volume offers a comprehensive and user-friendly solution for processing images captured with the UltraMicroscope Blaze. A unique feature of the software is the integration of various processing algorithms (3D Crop, Destripe, Denoise, Deconvolution, Stitching, and Contrast Compression) into a unified workflow. This allows users to process their images in a straightforward and efficient manner.

The stitching algorithm is a one-click solution. The 3D mosaic stacks are seamlessly stitched together without the need for any manual intervention! Deconvolution is tailored to the specific optical characteristics of your UltraMicroscope Blaze and enhances image quality and reveals hidden details. By viewing the unprocessed and processed data side by side, users can experiment with different settings and combinations of algorithms to find the best fit for their data.

Additionally, the software supports batch processing, allowing users to queue and initiate various workflows across multiple datasets. This feature proves especially valuable when dealing with extensive datasets and imaging multiple samples using the UltraMicroscope Blaze, particularly in the LightSpeed Mode, ensuring a smooth processing workflow.

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3D Large Volume.

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Revolutionizing research in neuroscience, immuno-oncology, and beyond

Used across diverse fields, the UltraMicroscope has contributed to over 1000 publications, attesting to its excellence in generating valuable research data. Dive into intricate neuron connections, map Alzheimer's pathology in stunning detail, spot individual cancer cells, or unlock the mysteries of embryology – all just a glimpse of the UltraMicroscope Blaze's potential. Explore a universe of possibilities. Start your journey here:



A 3D atlas of the developing human head

Unlock the secrets of developmental biology with the UltraMicroscope Blaze. This study delves deep into the wonders of embryology, showcasing the fascinating development of the human head.

Read the full article in Cell.

cell.com/cell/fulltext/S0092-8674(23)01230-8





A multimodal imaging workflow for monitoring CAR T cell therapy against solid tumors

Use 3D imaging in combination with spatial high-plex protein analysis to assess intratumoral therapeutic cell distribution.

Read the full article in Theranostics. ► thno.org/v12p4834.pdf





Spatial proteomics in 3D intact specimens

Identify diagnostic and therapeutic opportunities for complex diseases. This study focuses on unbiased proteome analysis of preclinical and clinical tissues following unbiased imaging of entire specimens in 3D.

Read the full article in Cell.

cell.com/cell/fulltext/S0092-8674(22)01465-9



VISIT



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Specifications

The UltraMicroscope Blaze can host three MI Plan objective lenses that can be exchanged automatically.

Total magnification ranges from $0.66 \times to 30 \times thanks$ to the automated magnification changer. The instrument can be equipped with a 4.2 MP sCMOS camera.



Figure 4: Overview of the UltraMicroscope Blaze configurations.

UltraMicroscope Blaze Instrument specifications				
Sheet optics				
Illumination	Uni- and bidirectional			
Number of light sheets	1–6			
Thickness	4–24 μm			
Width	1–20 mm			
Numerical aperture	0.0135–0.135			
Focus positioning	Dynamic			
Refractive index (RI) compensation	Software-controlled automated RI compensation over the range of 1.33–1.56, covering all clearing media			

UltraMicroscope Blaze Instrument specifications (cont.)

Light sources					
Laser BC	Max. 5 laser lines (405, 488, 561, 639, 785 nm)*, 50–100 mW per diode				
Supercontinuum WLL	405–850 nm spectral range, 1–4 mW/nm				
Detection optics					
Objective lenses	1.1×	4×		12×	
Total magnification	0.66–2.75×	2.4–10×		7.2–30×	
Numerical aperture	0.1	0.35		0.53	
Max. theoretical resolution at detector	4.8 μm	1.3 µm		0.5 μm	
Working distance	≤17 mm	≤16 mm		≤10.9 mm	
FOV diagonal (5.5 MP camera)	7.9–33 mm	2.2–9.1 mm		0.73–3 mm	
Emission filters	Seven filters Ø 43 mm				
Chromatic correction	Software-controlled automatic chromatic correction in the range of 400–850 nm				
Focusing	Software-controlled autofocus				
Objective change	Motorized turret allows automated change of objective lenses.				
Magnification change	Software-controlled automat	ed magnificatio	on changer for a	Il objective lenses	
Camera specifications					
Detector	4.2 Megapixel sCMOS camera				
Active pixels (w×h)	2048×2048				
Pixel size	$6.5 \mu\text{m} imes 6.5 \mu\text{m}$				
Sensor size	13.3 mm × 13.3 mm; 18.8 mm diagonal				
Readout noise	0.8 med e⁻				
Maximal frame rates	100 fps				
Maximum quantum efficiency	82%				
Sample chamber					
Chamber name	Cuvette for UltraMicroscope E (standard sample chamber)	Blaze	XXL chamber for UltraMicroscope Blaze		
Capacity	497 mL		715 mL		
Inner dimensions (w \times d \times h)	5.0 cm \times 18.3 cm \times 6.4 cm		7.1 cm \times 20.0 cm \times 6.4 cm		
Max. imaging range (x, y, z)	3.5 cm, 5.8 cm, 1.7 cm		4.4 cm, 7.0 cm, 1.7 cm		
Max. imaging volume	35 cm ³		53 cm³ (+51%)		
Imaging solution	Aqueous buffers and organic solvents				
Batch imaging mode	Multiple samples can be imaged in one session				
Refractive index compatibility	1.33–1.56				
General information					
Dimensions (w×h×d)	67 cm × 91 cm × 52.5 cm				
Weight	98 kg (w/o controller and laser)				

*Five out of eleven available laser lines can be chosen for the Beam Combiner.

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