

Right, First, Fast

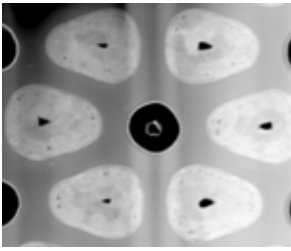
Helios NanoLab™ 400S Advanced DualBeam™ for Integrated S/TEM Sample Preparation, Imaging and Analysis

The Helios NanoLab series is the world's most advanced DualBeam platform for sample preparation, imaging and analysis in semiconductor failure analysis, process development and process control laboratories. All Helios NanoLab systems combine the innovative Elstar electron column for high-resolution, high-contrast imaging with the high-performance Sidewinder ion column for fast, precise cross sectioning. The advanced system design optimizes the column configuration to provide the best combined performance available in any dual beam (FIB/SEM) system. The Helios NanoLab 400S is optimized for high throughput, high-resolution S/TEM sample preparation, imaging and analysis. Its exclusive FlipStage and in-situ STEM detector can flip from sample preparation to STEM imaging in seconds without breaking vacuum or exposing the sample to the environment. The FlipStage mounts on a five-axis motorized stage that accommodates samples up to 80 mm in diameter with full coverage (larger with limited coverage) and industry-leading repeatability. Samples up to 100 mm can be introduced through the load lock for optimal throughput. Larger samples may be introduced through the chamber door.

- *Exclusive FlipStage™ for integrated sample preparation and STEM imaging*
- *New high-performance Elstar™ electron column for sub-nanometer SEM and STEM image resolution*
- *Sidewinder™ ion column for high-speed, high-resolution milling and cross sectioning*
- *Low kV ion beam clean-up minimizes sample preparation damage*
- *Five-axis piezo-driven stage with load-lock provides full coverage of 80 mm sample*
- *Advanced design provides unprecedented stability and immunity to environmental interference*
- *Automated setup and operation for ease-of-use and reduced training*
- *Comprehensive preparation, imaging and analysis capabilities maximize utilization and reduce cost-of-ownership*

Elstar Electron Column

The innovative Elstar electron column, newly introduced in the Helios NanoLab series, provides the foundation of the systems' unprecedented high-resolution imaging capability. Helios NanoLab systems are capable of 0.8 nm STEM resolution. SEM resolution is equally impressive with 0.9 nm at optimal working distance and 1.0 nm at the DualBeam coincident point. Imaging performance is further enhanced by advanced scanning and through-the-lens signal detection systems that provide dramatic improvements in contrast and signal-to-noise ratio. Double magnetic shielding increases the systems' immunity to environmental fields. Constant power lens technology eliminates thermal instabilities caused by routine changes in lens power.



Plan view STEM imaging is a powerful technique to investigate the interfaces around many contacts. This thin section is viewed with annular dark field mode.

Sidewinder Ion Column

The Sidewinder ion column combines high-resolution with exceptional low voltage performance. Not only does it enable excellent ion image resolution (5 nm @ 30 kV, coincident WD), it also provides the most precise ion milling, helping to insure that valuable defect information is not destroyed by the cross sectioning operation. A full range of beam chemistry options supports accelerated milling, selective milling, deposition and enhanced imaging with both ion and electron beams.

Integrated Preparation, Imaging and Analysis

The Helios NanoLab 400S is the ideal platform for S/TEM

sample preparation and imaging. The in-situ STEM detector permits real time monitoring of the STEM image while thinning, for ultimate control of the preparation process and localization. The Sidewinder ion column's ability to maintain small beam diameter at less than 1 kV enables low-energy, grazing-incidence final clean-up to remove surface damage induced by higher-energy milling. The 400S provides STEM capability at accelerating voltages up to 30 kV, or the sample may be transferred to a high voltage S/TEM for ultra high resolution imaging and analysis. Extensive automation permits unattended preparation of multiple site-specific S/TEM samples in a single session at a cost-per-sample competitive with conventional SEM bulk sample preparations. Optional X-ray (EDS or WDS) spectrometers offer compositional analysis in thin samples with resolution down to 30 nm. Automated slice and view capability can acquire a sequence of cross sectional images and reconstruct a three-dimensional model of the cross-sectioned volume that can be viewed and virtually resectioned in any direction.

Specifications

Electron source	Schottky thermal field emitter, over 1 year lifetime	
Ion source	Gallium liquid metal, 1000 hours	
Beam voltage	350 V - 30 kV SEM, 500 V - 30 kV FIB	
STEM resolution	0.8 nm	
SEM resolution	Optimal WD -	0.9 nm @ 15 kV
		1.4 nm @ 1 kV
	Coincident WD	1.0 nm @ 15 kV
		1.6 nm @ 5 kV 2.5 nm @ 1 kV
FIB resolution	Coincident WD	5 nm @ 30 kV
EDS resolution	< 30 nm on thinned samples	
Stage	FlipStage with in-situ STEM detector and Omniprobe sample extractor 5 axis all piezo motorized 100 mm XY motion Loadlock (80 mm max. diameter)	
Sample types	Wafer pieces, packaged parts, TEM grids, whole wafers up to 100 mm	
Max. sample size	80 mm diameter with full travel	
User interface	Windows® GUI with integrated SEM, FIB, GIS, simultaneous patterning and imaging mode	

Key Options

Gas chemistry	Range of deposition and etch chemistries
Software	AutoFIB™, AutoTEM™, AutoSlice&View™, Knights Camelot™ CAD Navigation, FEI Navigator™
Hardware	EDS, WDS, EBSP analysis STEM detector, Omniprobe™ sample extraction

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