



# Helios NanoLab™ 1200 Full Wafer DualBeam™

## The Latest DualBeam Technology for High Resolution Imaging, Analysis and TEM Sample Preparation for 300 mm Wafers

The Helios NanoLab™ 1200 DualBeam™ combines next-generation electron beam imaging and ion beam milling to deliver high-performance cross-sectional scanning electron microscope (SEM) imaging and analysis on 300 mm wafers. For transmission electron microscopy (TEM), it helps you quickly and accurately prepare ultra-thin samples. As device geometries continue to shrink and new materials are introduced, semiconductor manufacturers need increasingly higher resolution in the imaging and analysis techniques used for failure analysis, process development and process control. The H1200 addresses these needs with fast, precise focused ion beam (FIB) cross-sectioning and high-resolution SEM imaging. When imaging requirements exceed the capability of SEM technology, the Helios NanoLab 1200 continues to deliver with optional sample lift-out and integrated scanning transmission electron microscope (STEM) capability for higher resolution and stronger material contrast. Finally, for the most demanding applications, the H1200 enables you to quickly and reliably prepare the site-specific, ultra-thin samples required for imaging and analysis in dedicated STEM or TEM systems.

### Integrated TEM Lamella Preparation, Imaging and Analysis

When the analysis demands the ultra-high resolution of a dedicated S/TEM, the Helios NanoLab 1200 is the ideal platform for preparing the ultra-thin samples those techniques require. Extensive automation permits unattended preparation of multiple, site-specific samples in a single session at a cost-per-sample that is competitive with conventional SEM bulk sample preparations. *Slice&View™* software acquires a sequence of cross-sectional images and reconstructs a three-dimensional model of the sampled volume that can be viewed and virtually resectioned in any direction. Optional energy dispersive X-ray spectrometry (EDS) on thin samples offers compositional analysis with very good spatial resolution. The new MultiLoader option allows safe, secure transfer of TEM lamellae between other FEI MultiLoader enabled imaging systems, such as FEI's industry leading Titan™ and Tecnai™ family of TEMs.

### Elstar™ Electron Column

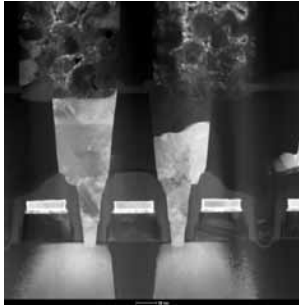
The innovative Elstar electron column, newly introduced in the Helios DualBeam series, provides the foundation for the H1200's exceptional imaging capability. The system is capable of 1.0 nm SEM resolution at optimal working distance. Imaging performance



### Key Benefits

- iFAST™ automation software offers improved quality and consistency of output for standardized tasks
- Easy to use operator interface reduces training and improves productivity
- High-performance Elstar field emission electron column delivers fast and simple high-resolution, high-contrast, subnanometer SEM and STEM imaging
- Sidewinder ion column provides high speed, high-resolution milling and cross sectioning
- Accommodates 300 mm or 200 mm semiconductor wafers, 100 to 200 mm data storage wafers or wafer pieces
- Small parts holder accommodates TEM samples and wafer pieces up to 50 mm<sup>2</sup>
- FEI MultiLoader™ compatible for safe, secure, hands-free TEM lamella transfer to FEI MultiLoader enabled imaging tools
- Optional X-ray analysis provides definitive elemental composition

is further enhanced by advanced scanning techniques and through-the-lens signal detection systems that provide dramatic improvements in contrast and signal-to-noise ratio. Double magnetic shielding increases the system's immunity to environmental fields. Constant Power™ lens technology eliminates thermal instabilities caused by routine changes in lens power.



Tecnai F20 STEM image of DRAM from TEM lamella prepared on Helios NanoLab with Sidewinder ion column

### Sidewinder™ Ion Column

The Sidewinder ion column provides outstanding performance across a broad range of operating voltages and beam currents. At higher voltages, it achieves an optimal balance between beam current for milling speed and beam diameter for milling precision, helping to insure that valuable defect information is not destroyed during the cross-sectioning operation. Its ability to maintain a small beam diameter at low voltages (1 kV) enables a final low-energy, grazing-incidence clean-up of milled surfaces to remove surface damage. A full range of beam chemistry options supports accelerated milling, protective depositions, and enhanced imaging.

### Specifications

#### Electron Source

- Schottky thermal field emitter, over one year lifetime

#### Ion Source

- Gallium liquid metal, 1000 hours

#### SEM Resolution

- Optimal WD
  - 1.0 nm @ 15 kV & 1.4 nm @ 1 kV

#### FIB Resolution

- Coincident WD (smallest aperture)
  - 5.0 nm @ 30 kV

#### Stage

- 5 axis motorized (X, Y, Z, R, Tilt), 300 mm piezo driven motion
- Global accuracy, up to 300 mm travel:  $\leq 2.5 \mu\text{m}$  (mean +  $3\sigma$ )
- Local accuracy, up to 2 mm travel:  $\leq 0.5 \mu\text{m}$ ,  $3\sigma$

#### User Interface

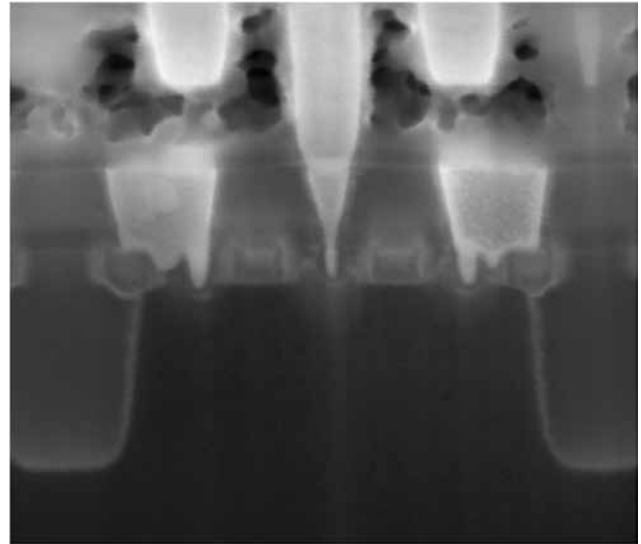
- Windows GUI with integrated controls for SEM, FIB, and GIS; simultaneous patterning and imaging modes
- iFast DualBeam Automation Software

#### Options

- Software
  - CAD Navigation with Knights Camelot™
  - FEI Navigator
  - RAPID™
- Hardware
  - STEM detector, Color Optical Microscope, and EDS analysis
  - Range of deposition and etch beam chemistries

### Helios 1200 Secondary Electron Image

Image displayed at 600 nm field of view (horizontal field width)



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