PRODUCT DATA

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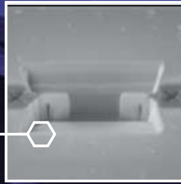
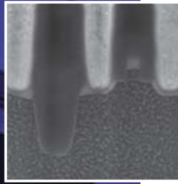




*Right, First, Fast*

# Helios NanoLab™ 600

## Advanced DualBeam™ for Sample Preparation, Imaging and Analysis

- *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*
- *Up to 200 mm wafers with 150 mm piezo-driven XY travel*
- *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*
- *Beam chemistries enhance imaging and milling performance*

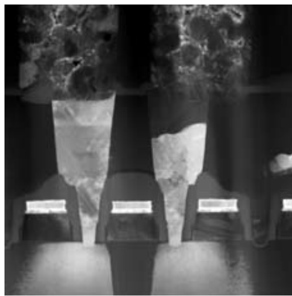
**The Helios NanoLab series is the world's most advanced DualBeam platform for sample preparation, imaging and analysis in semiconductor failure analysis, process development and process control laboratories. All Helios NanoLab systems combine the innovative Elstar electron column for high-resolution, 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 600 is intended for labs that need to accommodate a wide range of samples from small parts and wafer pieces up to full 200 mm wafers, with a primary emphasis on site-specific cross sectioning and imaging.**

### 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.

### 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 precise ion milling, helping to insure that valuable defect information is not destroyed by the cross sectioning operation. A full range of beam chem-



Tecnai F20 STEM image of DRAM prepared with Sidewinder ion column.

istry options supports accelerated milling, selective milling, deposition and enhanced imaging with both ion and electron beams.

**Sample Preparation**

The Helios NanoLab 600 is an ideal platform for preparing the ultra-thin samples required for high-resolution S/TEM imaging. An optional detector enables STEM imaging at accelerating voltages up to 30 kV, or the FIB prepared sample may be transferred to a high-voltage S/TEM for ultra-high resolution imaging and analysis. Optional X-ray (EDS or WDS) spectrometers can provide compositional analysis in thin samples with resolution down to 30 nm.

Localization is essential in the preparation of S/TEM samples. The Helios NanoLab's ability to simultaneously image with the electron beam while thinning with the ion beam permits close control of the sample creation process, insuring that the resulting thin section contains the targeted feature and is the right thickness for application. 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. 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. 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 | 5 axis motorized, 150 mm piezo driven XY motion | |
| Sample types | Wafer pieces, packaged parts, TEM grids, whole wafers up to 200 mm | |
| Max. sample size | 150 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 | STEM detector<br>EDS, WDS, and EBSP analysis,<br>Omniprobe™ sample extraction |

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