PRODUCT DATA

FEI COMPANY™

Expida™ Series Advanced DualBeam™ Tool

Defect Analysis and Process Development of 300mm Wafers

FEI's Expida™ Series offers the ultimate tools for defect characterization, failure analysis, and Transmission Electron Microscope (TEM) sample preparation on patterned and unpatterned wafers, as well as piece parts. Advanced software automation enables automated TEM sample preparation and high throughput ion milling, all designed to increase productivity and provide rapid feedback to the manufacturing process.

- *Accurate defect characterization for reduced yield excursion times*
- *Rapid diagnosis of process related impact on yield from most process steps: via etch, metal etch and deposition, or resist CMP*
- *Integrated high speed, accurate navigation from files generated by defect detection and dedicated review tools*
- *Superior low magnification imaging for defect navigation on unpatterned wafers*
- *Exposes the source of migrated defects in non-reviewed layers using FIB milling*
- *Turnkey defect navigation with files received from bright field, dark field and SEM detection and review tools*
- *High throughput TEM sample preparation*
- *Optional Nanolift™ system for removal of prepared TEM samples*

As device geometries continue to shrink, the need for high resolution analytical capabilities increases. FEI's Expida line meets this demand by delivering fast and accurate three-dimensional defect characterization—providing the most accurate picture of your process for increased control and improved yield. Introduced in 2004, the Expida Series employs FEI's most advanced electron and ion columns for unmatched defect analysis, high throughput TEM sample preparation, and optional energy dispersive x-ray microanalysis (EDS).

FEI's new Sirion™ scanning electron microscope (SEM) column has been optimized for low voltage operation—below 1 kV, without sacrificing performance at higher voltages (up to 30kV). With higher angular intensity and a more finely-controlled spot size, the column offers superior low magnification capabilities on bare wafers for defect navigation, as well as better performance imaging on charging materials such as low-K dielectrics and copper.

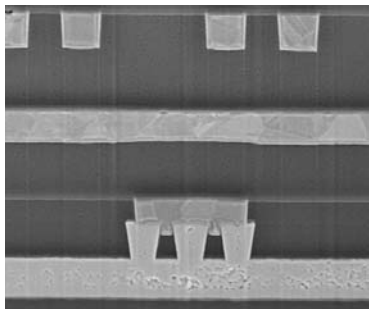
The Expida Series also utilizes FEI's new Sidewinder™ focused ion beam (FIB) column with improved beam profile and higher angular intensity - delivering almost 80% more current into the same spot size than other columns. The result is faster milling and TEM sample preparation plus consistent performance throughout the entire voltage range. This high resolution SEM imaging, complemented by FIB milling, lets you investigate below the surface to reveal buried defects, process anomalies, and device failures—all of which are invisible to conventional wafer SEMs.

On-Target Navigation

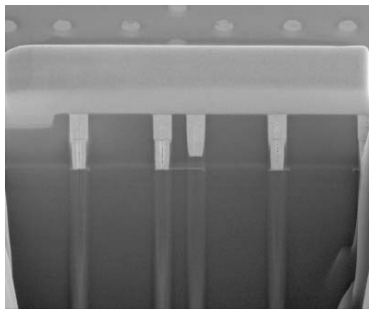
The Expida Series uses the highest accuracy 5-axis, 300 mm stage available. With guaranteed accuracy of <1.5 µm across a 300 mm wafer, and actual performance often as much as four times better, you can confidently navigate directly to the defect location at speeds of up to 100 mm/sec.

Optimized Beam Chemistries

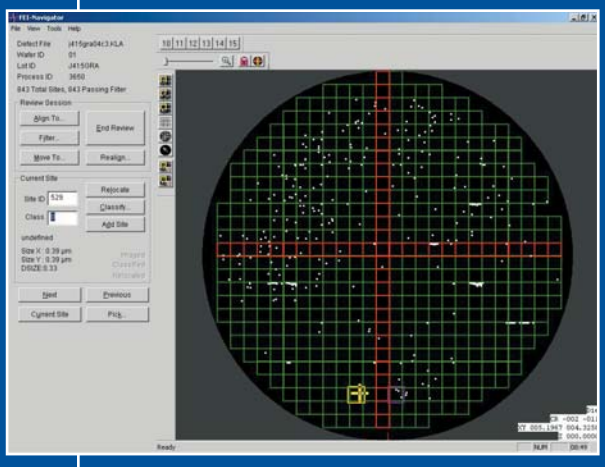
The Expida's high-speed beam chemistry implementation utilizes multiple retractable needles for safety and ease of application. Available beam chemistries are conductor and insulator deposition materials, as well as a range of enhanced etch gases. These gases significantly extend the capabilities of the system, allowing localized deprocessing and *in situ* delineation of cross-section faces. In particular, Delineation Etch™ reveals oxide and other layers within a cross section, eliminating the need to use wet chemical etches outside the system before acquiring the final SEM image.



***In situ* Delineation Etch™** provides the equivalent of "wet bench" etching performance. Only the DualBeam offers this process-safe technology in combination with SEM imaging on a single tool.



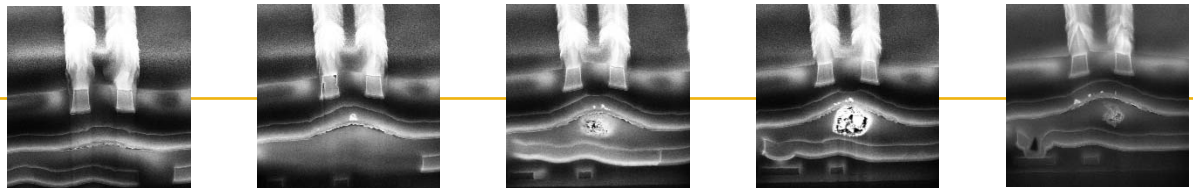
Beam Chemistries
Fully integrated beam gas delivery system features a wide range of gases for the highest reliability and performance.



FEI-Navigator™

- *Simple, software-guided wafer alignment*
- *Automatic wafer map generation*
- *Optimized alignment routine for patterned and bare wafers*

FEI-Navigator software translates data obtained from bright field, dark field and SEM detection and review tools, then directs Expida's high accuracy stage to the precise defect locations identified for 3D characterization.



Auto(Slice and View)™
automatically mills high-precision consecutive slices through a three-dimensional feature, collecting images of the slices. When the operation is complete, you can view images individually, in an animated sequence or offline, using any bitmap editor. For most jobs, once you set up the system, you can leave it unattended.

3D Analytical Capabilities

The high resolution SEM imaging capabilities of the Expida Series are complemented by Focused Ion Beam (FIB) milling, which takes you below the surface to reveal buried defects, process anomalies, and device failures, all of which are invisible to a conventional SEM. Visualizing this third dimension enables a comprehensive view of a process problem, including an enhanced view from the examination of serial slices through a feature.

Full-Featured Defect Characterization

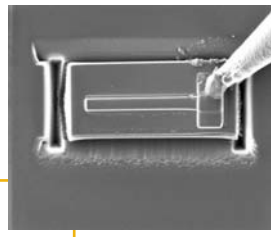
From defect navigation to imaging, cross-sectioning, and materials analysis, the Expida Series has an array of features designed to make defect characterization more accurate and productive. Integrated backscattered electron (BSE) detection allows you to relate image contrast to average atomic number, making it easy to differentiate metallic contamination from oxide or organic contamination. An EDS (energy dispersive x-ray microanalysis) package is an option for providing more detailed compositional analysis.

Automation Adds Efficiency

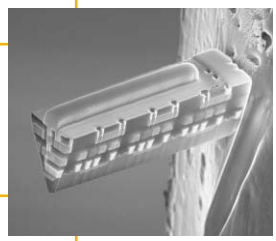
Expida systems take advantage of numerous automated routines developed for FEI's xP software interface. Scripts automate routine processes and procedures to increase the accuracy of the information collected and enhance productivity. Our AutoTEM™ Wizard software permits unattended preparation of multiple TEM specimens easily and reliably. It can be configured to prepare samples on either standard TEM grids or for *in situ* extraction. The *in situ* extraction process does not require dicing the wafer or mechanical polishing. Automated TEM sample preparation is faster, more precise, and more accurate than mechanical methods.

Integration with FEI UltraView™

Proper sample management is critical in defect analysis. The Expida line is compatible with UltraView™, a complete sample transfer and analysis suite that rapidly extracts samples from in-process wafers and transfers the samples to near-fab labs for ultra-high resolution STEM and atomic-level TEM imaging and analysis. The NanoLift™ option for Expida systems is an *in-situ* sample lift-out, load-lock, and transport mechanism used for transferring cartridges containing multiple TEM samples. As many as six samples can be transferred to a grid and placed in a single capsule for auto-loading from the Expida.



Top-down view of prism prepared by AutoTEM Wizard software with OmniProbe™ needle attached.



The prism has been attached to TEM grid and is ready for removal.

The NanoLift™ provides the capability to lift out small chunks of a wafer in a controlled process. After lift-out the chunks can be automatically exported to another tool in a sealed container.

UltraView™ Nanolift™
An *in-situ* semiconductor sample lift-out, loadlock and transfer process for samples between systems

Front End Wafer Loading Choices

The Expida line includes two models, the 1255 and the 1285. The 1255 includes a single wafer loadlock for wafer and piece part loading, offering the flexibility to load a wide range of samples. The 1285 comes equipped with a Brooks Automation robotic front-end for fully-automated FOUP or open cassette loading.

Complete Life Cycle Support

Our customers are our number one focus at FEI. Your investment in the Expida Series is fully supported by the industry leader in Tools for Nanotech. Our global network of applications experts and service personnel is ready to assist, and we are continually working to add value to your purchase through an aggressive program of product enhancements, software upgrades, and training—all to assure that your Expida systems will support your nanotechnology needs for years to come.

Specifications

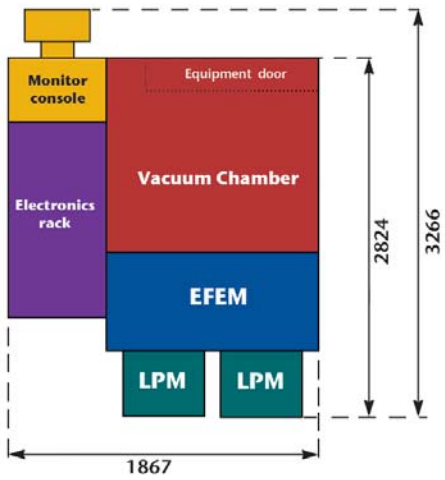
Electron source	FEI Sirion™ Column Schottky emitter, 12-month lifetime
Ion source	FEI Sidewinder™ Column Gallium liquid metal source, 1500 hours guaranteed
Beam voltage	SEM: 200 V - 30 kV; FIB: 5 kV - 30 kV
FIB current range	1pA - 20 nA
Image resolution	SEM: 3 nm from1 kV - 30 kV (site dependent); FIB: 7 nm (5 nm achievable)
Stage	5-axis motorized (tilt eucentric); XY: 305 x 305 mm 100 mm/second travel
Operating Software	FEI xP
Optional Software	AutoFIB AutoTEM Auto(Slice and View) FEI Navigator CoppeRx CAD-based Navigation Defect Analyzer Software

Our Nanotechnology Solution Centers in Oregon, Massachusetts, The Netherlands, Singapore and Japan, welcome you for demonstrations, training and application support.

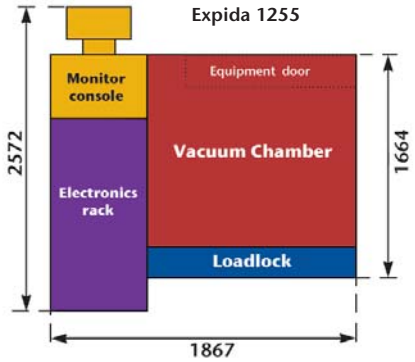
Visit FEI's Website

To learn more about FEI, its products, and advanced Tools for Nanotech for semiconductor processing visit FEI's website at www.feicompany.com.

Expida 1285



Expida 1255



scale in mm

FEI Company
World Headquarters and
North American Sales
5350 NE Dawson Creek Drive
Hillsboro, OR 97124-5793
Tel: +1 503 726 7500
Fax: +1 503 726 7509

e-mail: sales@feico.com
www.feicompany.com

Asia-Pacific Sales
Tel: +65 351 7671
Fax: +65 354 0644

European Sales
Tel: +31 40 27 66 768
Fax: +31 40 27 66 786

Japan Sales
Tel: +81 3 3740 5942
Fax: +81 3 3740 5944

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DB021-DS0911 04/2005