FEI™

Scios

High Resolution and throughput for 2D and 3D analytical applications

Maximum insight. FEI Scios™ is an ultra-high-resolution analytical DualBeam™ system that delivers outstanding 2D and 3D performance for a broad range of samples, including magnetic material. With innovative features designed to increase throughput, precision, and ease of use, the FEI Scios is ideal for advanced research and analysis across academic, government, and industrial research environments.

Get faster time to data. Advanced detection technology is at the very core of the FEI Scios. In-lens FEI Trinity™ detection technology collects all signals simultaneously, saving time and offering distinctly different contrasts to capture the maximum amount of data. An innovative, under-the-lens concentric backscatter detector enhances efficiency, enabling you to select a signal based on its angular distribution to easily separate materials and topographic contrast—even at 20 eV landing energy.

Simplify high-precision sample prep. The proven FEI Sidewinder™ ion column accelerates sample preparation with high beam current density and a low-energy cleaning capability. Achieve highly precise transmission electron microscope (TEM) sample preparation with the ability to monitor focused ion beam (FIB) processing using the scanning electron microscope (SEM), which enables you to end-point on even the smallest features. An integrated 16-bit patterning engine provides superior control of the FIB and SEM during all patterning steps.

Provide flexibility and ease of use. Simplify use and maintenance with the FEI Scios' attention to detail. The FEI NICol™ electron column is specifically designed for ease of use and flexibility. Greatly reduce the need for operators to adjust settings with fully automated column alignment. Eliminate mechanical alignment concerns with an optimized field emission gun (FEG) design. The FEI Scios also offers user guidance, making it easy for novice users to be productive quickly. In addition, features such as "undo" and "redo" encourage greater experimentation with peace of mind.

A 110 mm stage tilts up to 90° and provides a long, eucentric working distance for great flexibility. FEI Scios easily accommodates a wide range of sample types and data collection techniques while simultaneously allowing maximum energy dispersive x-ray spectroscopy (EDS) signal detection at the FIB and SEM coincidence point.

KEY BENEFITS

Get more data from difficult materials: Best-in-class resolution and contrast deliver more data and better information, even on magnetic materials.

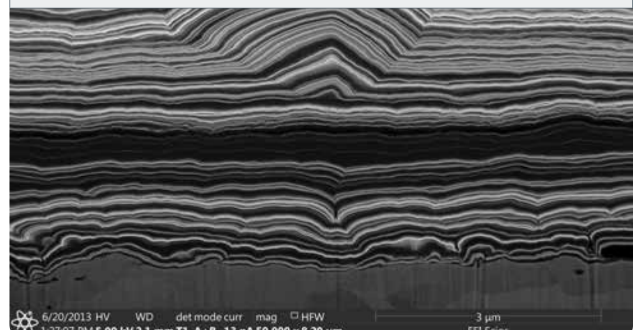
Get answers faster: A high-throughput FIB accelerates performance to shorten time to answers.

Capture detail more easily: Widest variety of signals available simultaneously with FEI Trinity In-lens detection technology.

Increase usability and confidence: A high degree of automation makes FEI Scios easy to use and encourages greater experimentation with more confidence.

Improve sample preparation precision: 16-bit digital patterning and imaging delivers best-in-class beam control and signal processing for greater precision.

Tailor your solution: A flexible DualBeam configuration is easily optimized to meet your specific requirements.



↑ **Coated wire.** Cross-section of a coated wire at a defect location.

NICol UHR Non-Immersion FESEM Column

High resolution field emission-SEM column, with:

- High stability Schottky field emission gun
- Source lifetime 12 months
- Easy gun installation and maintenance – auto bakeout, auto start, no mechanical alignments
- Automated heated apertures
- Continuous beam current control and optimized aperture
- Double stage scanning deflection
- Dual objective lens combining electromagnetic and electrostatic lenses
- 60 degree objective lens geometry
- Beam current range: 1 pA to 400 nA
- Landing energy range: 20 eV – 30 keV*
- Accelerating voltage range: 350 eV – 30 keV
- User guidance and column presets

Electron Beam Resolution at Optimum Working Distance

- High vacuum imaging

At optimum WD:

- 0.8 nm at 30 keV STEM
- 1.0 nm at 15 keV
- 1.6 nm at 1 keV

Stage and Sample

- Maximum horizontal field width: 4.0 mm at 7 mm WD (corresponds to 30× minimum magnification in quad view)
- Extra wide field of view (1×) available through standard navigation montage

Chamber

- Left to right: 379 mm
- Analytical working distance: 7 mm
- Ports: 21
- EDS take-off angle: 35°

Sidewinder Ion Column

- High-current gallium liquid metal ion source
- Source lifetime: 1,300 hours / 2600 µA hours guaranteed
- Acceleration voltage: 500 V – 30 kV
- Probe current: 0.6 pA – 65 nA in 15 steps
- Beam blanker standard
- 15-position aperture strip
- Magnification: 40× – 1.28M× based on Polaroid output
- Drift suppression mode as standard for non-conductive samples

Ion Beam Resolution

High vacuum imaging, optimum WD

- 3.0 nm (statistics over 50 edges)
- 5.0 nm (statistics over 1000's of edges)

Detectors

- Trinity Detection System (in-lens and in-column)
  - T1 segmented lower in-lens detector
  - T2 upper in-lens detector
  - T3 retractable in-column detector*
  - Up to four simultaneously detected signals
- Everhart-Thornley SED
- ICE detector (secondary electrons and ions)*
- DBS retractable segmented under lens BSED*
- STEM retractable segmented detector (BF, DF, HADF, HAADF)*
- IR-CCD
- Nav-Cam™ chamber mounted camera*

Vacuum System

- Complete oil free vacuum system
- 1 × 220 l/s TMP
- 1 × PVP-scroll
- 3 × IGP
- Chamber vacuum (high vacuum) < 6.3×10^{-6} mbar (after 72 hours pumping)
- Evacuation time: ≤ 3.5 minute

Sample Holders

- Standard multi-purpose holder, unique mounting directly onto the stage, hosts up to 18 standard stubs (Ø12 mm), three pre-tilted stubs, two vertical and two pre-tilted row-bar holders* (38 degrees and 90 degrees)
- Each optional row-bar accommodates 6 S/TEM grids
- Wafer and custom holders*

Supporting Software

- "Beam per view" graphical user interface concept, with up to 4 simultaneously active views
- FEI SPI™, iSPI™, iRTM™ for advanced real-time SEM and FIB process monitoring and end-pointing
- Patterns supported: lines, rectangles, polygons, circles, donuts, cross-sections, cleaning cross-sections, array generation, exclusion zones, dynamic threshold milling
- Image registration
- Directly import .bmp files or stream files for 3D milling and deposition
- Material file support for "minimum loop time", beam tuning and independent overlaps
- Navigation montage
- Image analysis software
- Undo / Redo functionality
- User guidance for basic DualBeam operations / applications

STAGE SPECIFICATIONS	
Type	Eucentric goniometer stage, 5-axes motorized
XY	110 × 110 mm
Repeatability	< 2.0 µm (@ 0° tilt)
Motorized Z	65 mm
Rotation	n × 360°
Tilt	-15° / +90°
Max. sample height	Clearance 85 mm to eucentric point
Max. sample weight	500 g in any stage position (up to 2 kg at 0° tilt)
Max. sample size	150 mm with full rotation (larger samples possible with limited rotation)

Image Processor

- Dwell time range from 0.025 – 25000 µs/pixel
- Up to 6144 × 4096 pixels
- File type: TIFF (8, 16, 24 bit), BMP or JPEG, standard
- Single-frame or 4-view image display
- SmartSCAN™ (256-frame average or integration, line integration and averaging, interlaced scanning)
- DCFI (Drift Compensated Frame Integration)
- Image registration

System Control

- 64-bit GUI with Windows 7, keyboard, optical mouse
- "Beam per view" graphical user interface concept, with up to 4 simultaneously active views
- 24-inch LCD display, WUXGA 1920 × 1200 (second monitor optional)
- Optional joystick
- Optional multifunctional control panel

Accessories (Optional)

- Sample / chamber cleaning: FEI CryoCleaner, FEI Integrated Plasma Cleaner
- Analysis: EDS, EBSD, WDS, CL
- QuickLoader™: loadlock for fast sample transfer
- Navigation: Nav-Cam, Correlative Navigation, MAPS Tiling and Stitching
- FEI Gas injection: up to 4 units (other accessories may limit number of GIS available) for beam-induced deposition and etching from a choice of > 10 precursors, e.g.
  - Platinum
  - Silicon oxide
  - Tungsten
  - Enhanced Etch (I_2)
  - Carbon
  - Insulator Enhanced Etch (XeF_2)
  - Gold
  - Selective Carbon Etch (water)
- Manipulators
- Electrical probing
- *In-situ* sample lift-out system FEI EasyLift™ (or other manipulators)

Software Options

- AutoFIB™ package for macro and script based DualBeam automation
- iFast for advanced DualBeam automation
- MAPS™ for automatic acquisition of large Images and correlative work
- AutoTEM™ wizard for automated S/TEM sample preparation and cross-sectioning
- AutoSlice and View™: automated sequential mill and view to collect a series of slice images for 3D reconstruction
- 3D reconstruction software
  - EBS3™: automated sequential mill and acquire EBSD maps to collect series of texture or orientation for 3D reconstruction
  - EDS3™: automated sequential mill and acquire EDS data to collect series of chemical maps for 3D reconstruction
- Web enabled data archive software
- Image analysis software

Documentation

- Online user guidance
- Operating instructions handbook
- Online help
- Prepared for RAPID™ (remote diagnostic support)
- Free access to 'FEI for Owners' online resources

Warranty and Training

- 1 year warranty
- Choice of service maintenance contracts
- Choice of operation / application training contracts

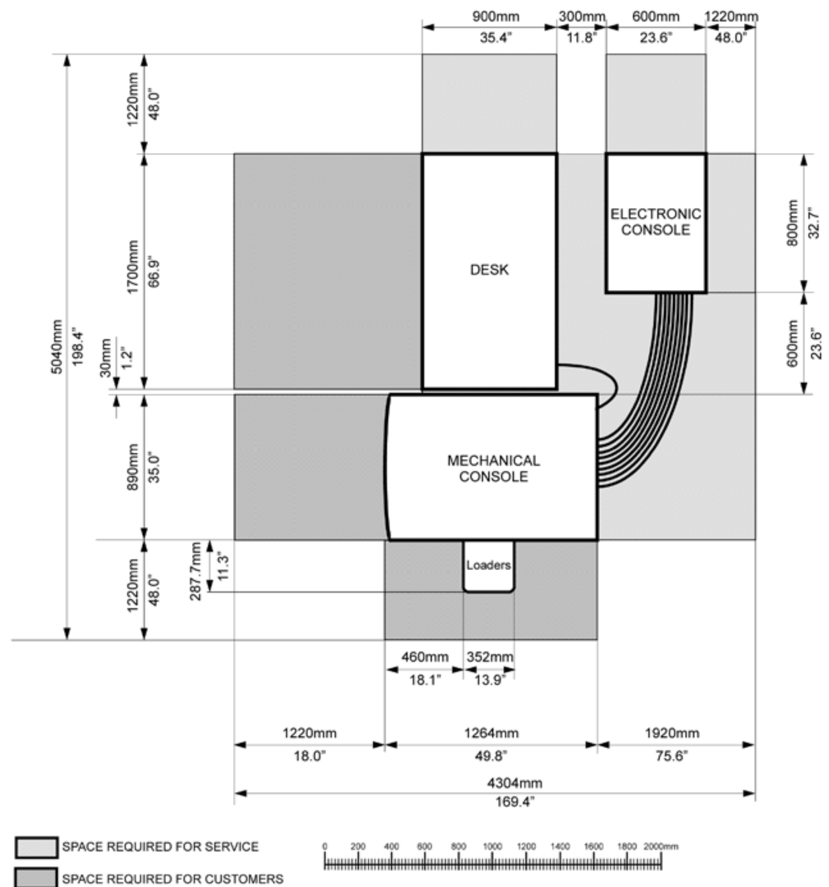
Consumables (Partial List)

- Replacement Ga-ion source
- Replacement Schottky electron source module
- Aperture strips for electron and ion columns
- GIS refill

Installation Requirements

(Refer to preinstall guide for detailed data)

- Power:
  - voltage 100 – 240 V AC (-6%, +10%)
  - frequency 50 or 60 Hz (±1%)
  - consumption: < 3.0 kVA for basic microscope
- Earth resistance < 0.1Ω
- Environment:
  - temperature 20°C ±3°C
  - relative humidity below 80% RH
  - stray AC magnetic fields < 40 nT a-synchronous, < 300 nT synchronous for line times, > 20 ms (50 Hz mains) or > 17 ms (60 Hz mains)
- Minimum door size: 0.9 m wide × 1.9 m high
- Weight: column console 980 kg
- Dry nitrogen
- Compressed air 4–6 bar — clean, dry and oil-free
- System chiller
- Acoustics: site survey required as acoustic spectrum relevant
- Floor vibrations: site survey required as floor spectrum relevant
- Optional vibration isolation table



*Optional

World Headquarters
Phone +1.503.726.7500

FEI Europe
Phone +31.40.23.56000

FEI Japan
Phone +81.3.3740.0970

FEI Asia
Phone +65.6272.0050

FEI Australia
Phone +61.7.3512.9100

Learn more at FEI.com

TÜV Certification for design, manufacture, installation, and support of focused ion- and electron-beam microscopes for the electronics, life sciences, materials science, and natural resources markets.

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