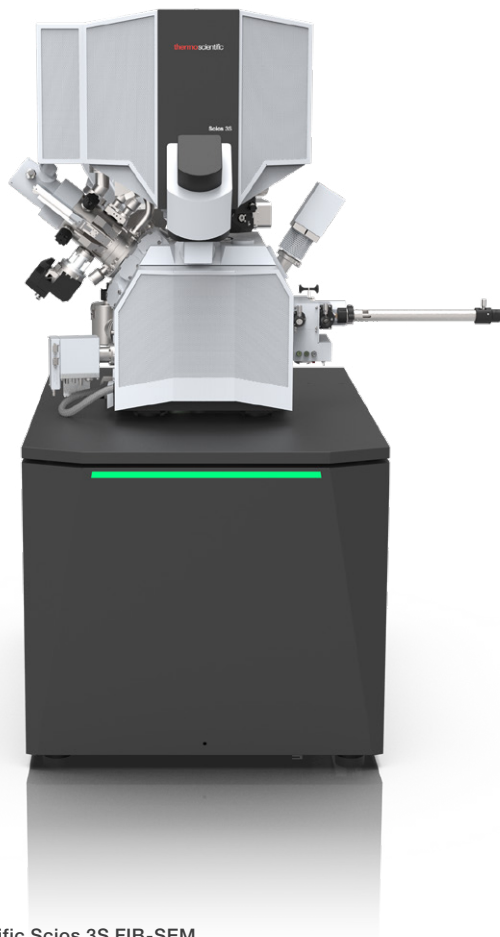


Scios 3S FIB-SEM for Semiconductors

Versatile, high-performance DualBeam instrument

The Thermo Scientific™ Scios™ 3S FIB-SEM delivers outstanding performance in sample preparation as well as subsurface and 3D characterization for a wide variety of samples, including magnetic and nonconductive materials. With innovative features designed to increase throughput, precision, and ease of use, the Scios 3S FIB-SEM meets the needs of scientists and engineers in advanced research and analysis across academic, government, and industrial research environments.



Thermo Scientific Scios 3S FIB-SEM.

Key features

Effortless sample preparation

Achieve fast and easy preparation of high-quality, site-specific TEM samples with the advanced Tomahawk HT ion column.

Ultra-high-resolution imaging

The Scios 3S FIB-SEM's DualBeam™ technology combines focused ion beam (FIB) and innovative electron beam NICol (SEM) capabilities, enabling precise sample preparation and detailed imaging in a single workflow.

Fast and efficient data acquisition

Capture complete sample information with the Scios 3S FIB-SEM's integrated in-column and below-the-lens detectors. Designed with the user in mind, this tool offers an easy-to-navigate user interface, 32" 4K monitor and selection of software applications for automated workflows like AutoTEM 5 Software, Auto Cross Section (AXS), and others.

Advanced subsurface and 3D insights

Unlock comprehensive subsurface and 3D imaging with precise targeting of regions of interest using Auto Slice & View 5 Software.

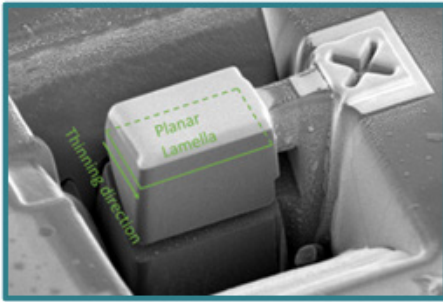
Artifact-free imaging and patterning

With specialized modes like DCFI, Drift Suppression, and Thermo Scientific SmartScan, the Scios 3S FIB-SEM delivers artifact-free imaging and patterning, ensuring reliable, high-quality data with consistent results.

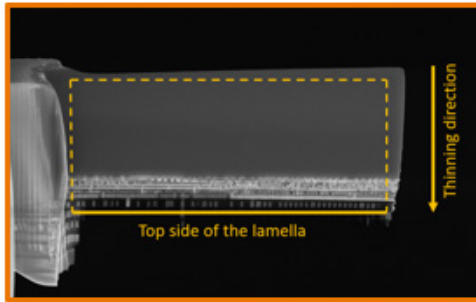
Flexible sample navigation

The highly flexible 110 mm stage and in-chamber Thermo Scientific Nav-Cam™ Camera provide precise sample navigation tailored to individual application needs.

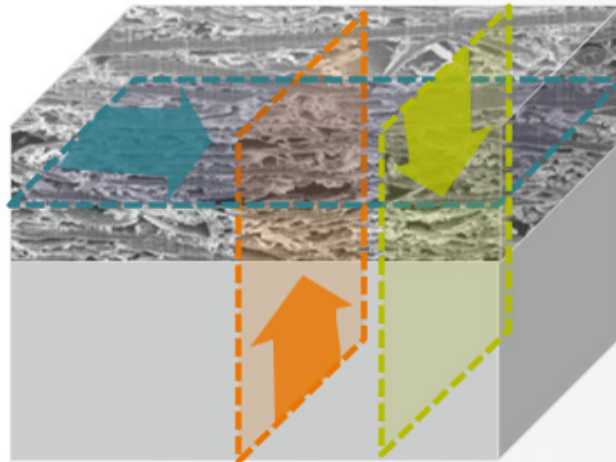
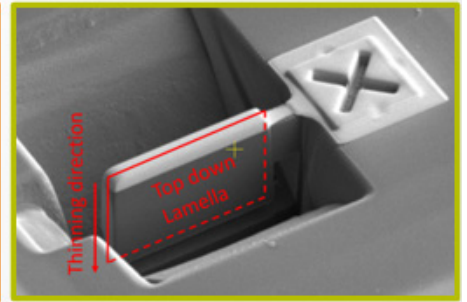
Planar



Inverted



Top down



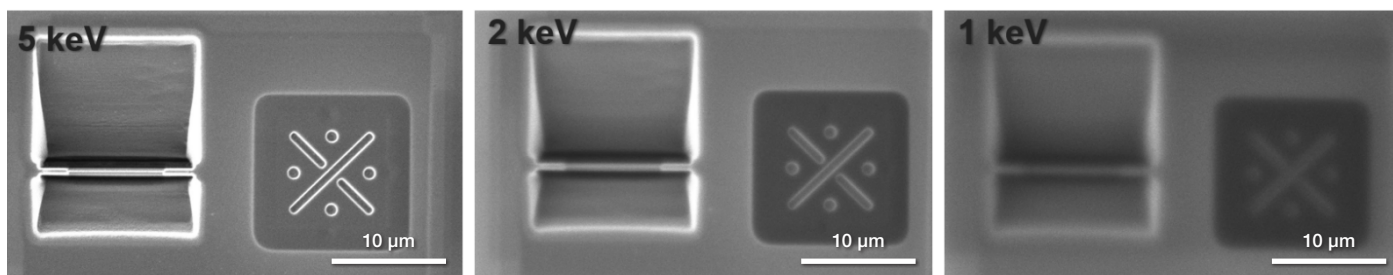
The Scios 3S FIB-SEM, combined with AutoTEM 5 Software, enables fully automated preparation of top-down, planar, and inverted lamellae. The automated lift-out feature, known as ALX, demonstrates high robustness within AutoTEM 5 Software.

High-quality TEM sample preparation

Scientists and engineers constantly face new challenges that require highly localized characterization of increasingly complex samples with ever smaller features. The latest technological innovations of the Scios 3S FIB-SEM, in combination with comprehensive, easy-to-use Thermo Scientific AutoTEM™ 5 Software and our application expertise, allow for fast and reliable preparation of site-specific HR-(S)TEM samples for a wide range of materials. To achieve high-quality results, it is essential to minimize surface damage on the sample. That's why final polishing with low-energy ions is a critical step in the sample preparation workflow. The Tomahawk HT focused ion beam (FIB) column delivers both high-resolution imaging and milling at high voltages, as well as excellent low-voltage performance, to help you create high-quality TEM lamella.

Ultra-high resolution with complete sample information

The innovative NiCol electron column provides the foundation for the system's high-resolution imaging and detection capabilities for a variety of samples. It offers excellent nanoscale details across the wide range of working conditions, whether operating at 30 keV in STEM mode to access structural information or at lower energies to obtain charge-free, detailed information from the surface. With its innovative in-lens Thermo Scientific Trinity™ Detection Technology, the system is designed for the simultaneous acquisition of angular and energy-selective SE and BSE imaging. Fast access to the most detailed nanoscale information is ensured, not only top-down but also on tilted specimens or cross-sections. Optional below-the-lens detectors and electron beam-deceleration mode ensure fast and easy simultaneous collection of signals to reveal even the smallest features in material surfaces or cross-sections. Fast, accurate, and reproducible results are obtained thanks to the innovative NiCol column design with full auto alignments.



The Tomahawk HT ion column offers a broad range of acceleration voltages from 30 keV to 500 eV. AutoTEM 5 Software executes a top-down TEM preparation workflow and captures low-keV images. As the standard ion column in the Thermo Scientific Helios™ series, the Tomahawk HT can obtain sharper, higher-resolution images from 5 keV to 1 keV, showcasing its outstanding capabilities.

High-quality subsurface and 3D information

Cross-sectioning, which makes it possible to image and analyze subsurface features in a material, is the core functionality of a FIB-SEM instrument. Thermo Scientific Auto Cross Section (AXS) Software automates both FIB preparation of cross sections and SEM imaging of the prepared sites. With a focus on ease of use and reliability, this software allows novice users to obtain high-quality results easily and helps experienced users increase throughput and optimize tool use by automating data acquisition. Three-dimensional characterization is often required to better understand the structure and properties of a sample. The Scios 3S FIB-SEM with optional Thermo Scientific Auto Slice & View™ 5 Software allows for high-quality, fully automated acquisition of multi-modal 3D datasets, including, among others, simultaneous multi-detector SEM imaging for maximum material and topography contrast, energy dispersive spectroscopy (EDS) for compositional information, and electron backscatter diffraction (EBSD) for microstructural and crystallographic information. Combined with Thermo Scientific Avizo™ Software, it delivers an innovative workflow for high-resolution, advanced 3D characterization and analysis at the nanometer scale.

Enabling real-world experiments

The Scios 3S FIB-SEM is a universal platform, supporting versatile applications and analyses of challenging materials. It has an optional low-vacuum mode and easily accommodates a wide range of sample types and data collection. The optional Thermo Scientific CleanConnect™ Sample Transfer System is used to load air-sensitive samples into the microscope chamber under a protective Ar gas environment without exposing them to air. The optional Thermo Scientific MultiChem™ Gas Delivery System supports advanced chemistry. It features a compact design with integrated process control, gas mixing, and a wide selection of deposition and etching chemistries.

Enhanced productivity and flexibility for most users

No matter your experience level, the Scios 3S FIB-SEM's streamlined performance can help you obtain high-quality, reproducible results faster and easier. Automated SEM and FIB alignments help ensure that the tool is always ready to acquire data. Plus, the built in User Guidance makes it easy for novice users to be productive quickly.

Specifications

Electron optics

The NiCol column is an ultra-high-resolution, non-immersion field emission SEM column with:

- High-stability Schottky field emission gun to provide stable, high-resolution analytical currents
- 60° dual objective lens, allowing for tilting of larger samples
- Automated heated apertures to ensure cleanliness and touch-free aperture exchange
- Continuous beam current control and optimized aperture angle
- Easy gun installation and maintenance-auto bakeout, auto start, no mechanical alignments
- Double stage scanning deflection
- Dual objective lens, combining electromagnetic and electrostatic lenses
- User guidance and column presets
- Minimum source lifetime: 24 months

Electron beam resolution

Optimum WDs

- 0.7 nm at 30 keV STEM
- 1.4 nm at 1 keV
- 1.2 nm at 1 keV with beam deceleration*

Electron beam parameter space

- Beam current range: 1 pA to 400 nA
- Landing energy range: 20* eV to 30 keV
- Accelerating voltage range: 200 V to 30 kV
- Maximum horizontal field width: 3.0 mm at 7 mm WD and 7.0 mm at 60 mm WD
- Extra wide field of view (1×) available through standard navigation montage

Ion optics

Tomahawk HT Ion Column with remarkable high-current performance

- Ion beam current range: 1 pA to 100 nA
- Accelerating voltage range: 500 V to 30 kV
- Two-stage differential pumping
- Time-of-flight (TOF) correction
- 23-position aperture strip
- Max. horizontal field width: 0.9 mm at beam coincidence point
- Minimum source lifetime: 1,500 hours
- Ion beam resolution: 2.5 nm at 30 kV using selective edge method
- Ion beam resolution: 4.0 nm at 30 kV using preferred statistical method

Detectors

- Trinity Detection System (in-lens and in-column)
 - T1 segmented lower in-lens BSE detector
 - T2 upper in-lens SE detector
 - T3 retractable in-column SE detector*
 - Up to four simultaneously detected signals
- Everhart-Thornley SE Detector (ETD)
- High-performance ion conversion and electron (ICE) detector for secondary ions (SI) and secondary electrons (SE)*
- Retractable low-voltage, high-contrast, segmented, solid-state backscatter electron detector (DBS)*
- Retractable STEM 3+ detector with BF/ DF/ HAADF segments*
- IR camera for viewing samples and chamber
- In-chamber Nav-Cam Sample Navigation Camera*
- Integrated beam current measurement
- Retractable cathodoluminescence detector (CLD), EDS, EBSD

Stage and sample

Flexible 5-axis motorized stage:

- XY range: 110 mm
- Z range: 65 mm
- Rotation: 360° (endless)
- Tilt range: -38° to +90°
- XY repeatability: 3 µm
- Max sample height: Clearance 85 mm to eucentric point
- Max sample weight at 0° tilt: 5 kg (including sample holder)
- Max sample size: 110 mm with full rotation (larger samples possible with limited rotation)
- Compucentric rotation and tilt

Vacuum system

- Complete oil-free vacuum system
- Chamber vacuum: <6.3 × 10⁻⁶ mbar (after 72 hours pumping)
- Evacuation time: <3.5 minutes
- Optional low-vacuum mode: up to 500 Pa chamber pressure

Chamber

- E- and I-beam coincidence point at analytical WD (7 mm SEM)
- Ports: 21
- Inside width: 379 mm

Sample holders

- Standard multi-purpose holder mounts 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° and 90°) and does not require tools to mount a sample
- Each optional row-bar accommodates 6 STEM grids
- Various wafers and custom holder(s) available by request*

System control

- 64-bit GUI with Windows® 11, keyboard, optical mouse
- Up to four live images showing independent beams and/or signals. Live color signal mixing
- Local language support: Check with your local Thermo Fisher Scientific sales representatives for available language packs
- 32-inch widescreen monitor 3840×2160 pixels (second monitor optional)
- Joystick*
- Multifunctional control panel*
- Remote control and imaging*

Image processor

- Dwell time range from 25 ns to 25 ms/pixel
- Up to 64k × 64k pixels
- File type: TIFF (8-, 16-, 24-bit), BMP or JPEG standard
- SmartSCAN System (256 frame average or integration, line integration and averaging, interlaced scanning)
- DCFI (Drift-Compensated Frame Integration)

Supporting software

- “Beam per view” graphical user interface concept, with up to four simultaneously active quads
- Simultaneous FIB patterning and SEM imaging, intermittent SEM imaging and FIB patterning, integrated real-time monitor, and FIB immersion modes for advanced, real-time SEM and FIB process monitoring and endpointing
- Patterns supported: rectangles, lines, circles, cleaning cross-section, regular cross-section, polygons, bitmap, stream file, exclusion zones, arrays and extended patterning capabilities
- Directly imported BMP file or stream file for 3D milling and deposition
- Material file support for “minimum loop time”, beam tuning and independent overlaps
- Image registration enabling sample navigation in an imported image
- Sample navigation on an optical image
- Undo and Redo functionality
- User Guidance for most common DualBeam System operations and applications
- Drift suppression mode for FIB milling

Accessories (optional)

- GIS (Gas Injection System)
 - Single GIS: up to four independent units for enhanced etching or deposition
 - MultiChem Gas Delivery System: up to six chemistries on the same unit for advanced etching and deposition controls

- GIS – Beam chemistry options (optional)
 - Platinum deposition
 - Tungsten deposition
 - Carbon deposition
 - Insulator deposition II
 - Gold deposition
 - Thermo Scientific Enhanced Etch™ Gas Chemistry Solution (iodine, patented)
 - Insulator enhanced etch (XeF₂): Thermo Scientific Delineation Etch™ Gas Chemistry Solution (patented)
 - Selective carbon mill (patented)
 - Empty crucibles for Thermo Fisher Scientific-approved user-supplied materials
 - More beam chemistries available upon request
- Thermo Scientific EasyLift NanoManipulator for precise in situ sample manipulation
- FIB Charge Neutralizer
- μ Heater: High-vacuum compatible, ultra-fast heating stage up to 1,200°C
 - μ Polisher: Low-energy ion polishing solution for localized surface cleaning
- Analysis: EDS, EBSD, WDS, CL
- Thermo Scientific QuickLoader™ Vacuum Technology: Loadlock for fast sample exchange without breaking system vacuum
- CleanConnect System for safe sample exchange in an inert atmosphere
- Exclusive Thermo Scientific CryoMAT Kit for cryo applications
- Cryo solutions from external vendors
- Thermo Scientific Acoustic Enclosure
- Thermo Scientific CryoCleaner Decontamination Device
- Integrated plasma cleaner

Software options

- AutoTEM 5 Software for fast and easy highly automated STEM sample preparation
- Auto Slice & View 5 Software: Automated sequential mill and view to collect series of slice images, EDS or EBSD maps for 3D reconstruction
- Auto Cross Section Software (AXS): Automated milling and imaging of cross sections
- Avizo Software for 3D reconstruction and analysis
- Thermo Scientific Maps Software for automatic acquisition of large images and optional correlative work
- Web-enabled data archive software
- Advanced image analysis software

Warranty and training

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

Documentation and support

- Online user guidance
- User operation manual
- Prepared for Thermo Scientific RAPID™ remote diagnostic support
- Free access to online resources

*Optional

 Learn more at thermofisher.com/scios3s

thermo scientific

For research use only. Not for use in diagnostic procedures. For current certifications, visit thermofisher.com/certifications

© 2025 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific and its subsidiaries unless otherwise specified. DS0524-EN-11-2025