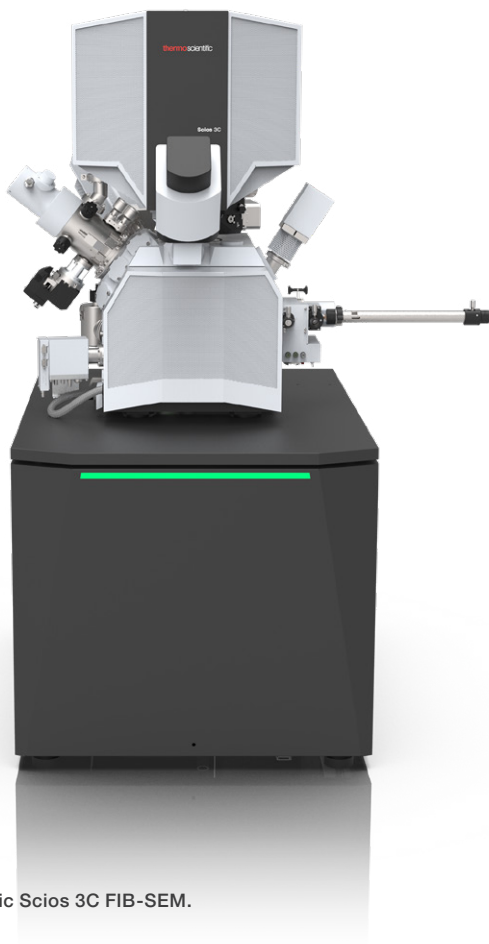


Scios 3C FIB-SEM for Semiconductors

Maximizing productivity through workflow automation

The Thermo Scientific™ Scios™ 3C FIB-SEM, with its reliable, automated workflows, removes operational complexity to help you streamline processes and focus on results. By delivering consistent, high-quality data, it helps ensure excellent performance in subsurface analysis, 3D characterization, and TEM lamella preparation. Built with flexibility in mind, the Scios 3C FIB-SEM enables complete analysis of a variety of materials, making it an ideal solution for diverse research and industrial environments.



Thermo Scientific Scios 3C FIB-SEM.

Key features

Effortless sample preparation

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

Ultra-high-resolution imaging

The Scios 3 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 3 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

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Artifact-free imaging and patterning

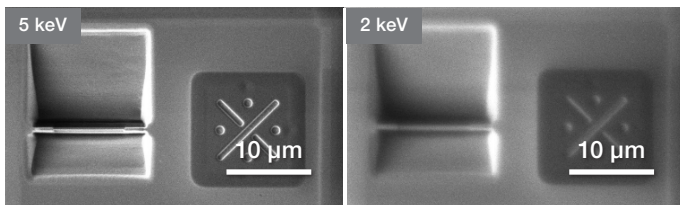
With specialized modes like DCFI, Drift Suppression, and Thermo Scientific SmartScan, the Scios 3 FIB-SEM delivers artifact-free imaging and patterning, ensuring reliable, high-quality data with consistent results.

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.

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 3C FIB-SEM, combined with the comprehensive, easy-to-use Thermo Scientific AutoTEM™ 5 Software and our application expertise, allow for fast and easy preparation of site-specific HR-TEM samples from a wide range of materials. To achieve high-quality results, final polishing with low-energy ions is required to minimize surface damage on the sample. The Thermo Scientific Sidewinder HT focused ion beam (FIB) column not only delivers high-resolution imaging and milling at high voltages but also has excellent low-voltage performance, enabling the creation of high-quality TEM lamellae.

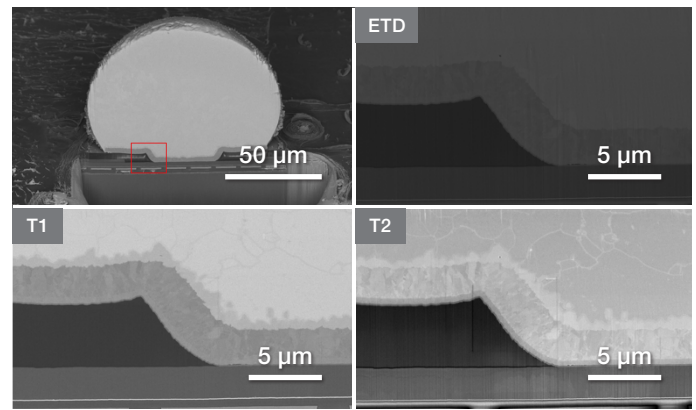


The Sidewinder HT ion column offers a broad range of acceleration voltages from 30 keV to 500 eV. AutoTEM 5 Software executed a top-down TEM preparation workflow and captured low-keV images. The sharp, high-resolution images obtained at 5 keV to 2 keV demonstrate the capabilities of the Sidewinder HT ion column.

Ultra-high resolution with complete sample 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.

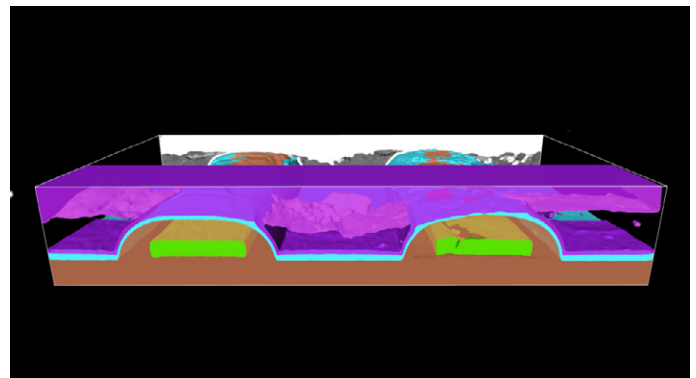
Three-dimensional characterization is often required to better understand the structure and properties of a sample. The Scios 3C FIB-SEM with optional Thermo Scientific Auto Slice & View™ 5 Software allows for high-quality, fully automated acquisition of multi-modal 3D datasets, including, among others, simultaneous multi-detector SEM imaging for maximum materials 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 advanced, high-resolution 3D characterization and analysis at the nanometer scale.



The Scios 3C FIB-SEM demonstrates the Auto Cross Section (AXS) process on a ball-grid array sample. The combination of the Trinity detection system and ETD detector delivers remarkable surface characterization (T1), Z-contrast features (T2), and detailed topographical information (ETD), showcasing exceptional precision.

Versatile productivity for most users

The Scios 3C FIB-SEM is specifically designed to meet user needs, from entry-level to advanced researchers focused on cross-section interface studies and materials characterization. With its streamlined performance, the system enables the rapid and easy acquisition of high-quality, reproducible results. Intuitive user guidance helps ensure that novice users can quickly become productive. This versatile system offers advanced features combined with user-friendly operation, making it an ideal choice, no matter your experience level.



The Scios 3C FIB-SEM performed slice and view on the MOSFET device, generating a 3D model using Avizo Software to assemble the sliced images. This MOSFET device can be further analyzed to display distinct segmentations.

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 WD

- 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

Sidewinder HT ion column with excellent high-current performance

- Acceleration voltage: 500 V to 30 kV
- Ion beam current range: 1.5 pA to 65 nA
- 15-position aperture strip
- Drift suppression mode as standard for non-conductive samples
- Minimum source lifetime: 1,500 hours
- Ion beam resolution: 3.0 nm at 30 kV using selective edge 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

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

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 row-bar holders, and two optional pre-tilted row-bar holders (38° and 90°), and it does not require tools to mount a sample
- Each optional row-bar accommodates six 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 4 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
- 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

Accessories (optional)

- GIS (Gas Injection System)
 - Single GIS: Up to four independent units for enhanced etching or deposition
- GIS – Beam chemistry options (optional)
 - Platinum deposition
 - Tungsten deposition
 - Carbon deposition
 - Insulator deposition II
 - 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
- EasyLift System for precise in situ sample manipulation
- FIB charge neutralizer
- Analysis: EDS, EBSD, WDS, CL
- Thermo Scientific QuickLoader™ Vacuum Technology: LoadLock for fast sample exchange without breaking system vacuum
- Thermo Scientific CleanConnect™ Sample Transfer System for safety sample exchange in an inert atmosphere
- Exclusive Thermo Scientific CryoMAT Kit for cryo applications
- Cryo solutions from external vendors
- Thermo Scientific Acoustic Enclosure
- CryoCleaner Decontamination Device
- Integrated plasma cleaner

Software options

- AutoTEM 5 Software for fast, easy, highly automated STEM sample preparation
- Auto Slice & View 5 Software: Automated sequential mill and view to collect a 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 and application training contracts

Documentation and support

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

*Optional

 Learn more at thermofisher.com/scios3c

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