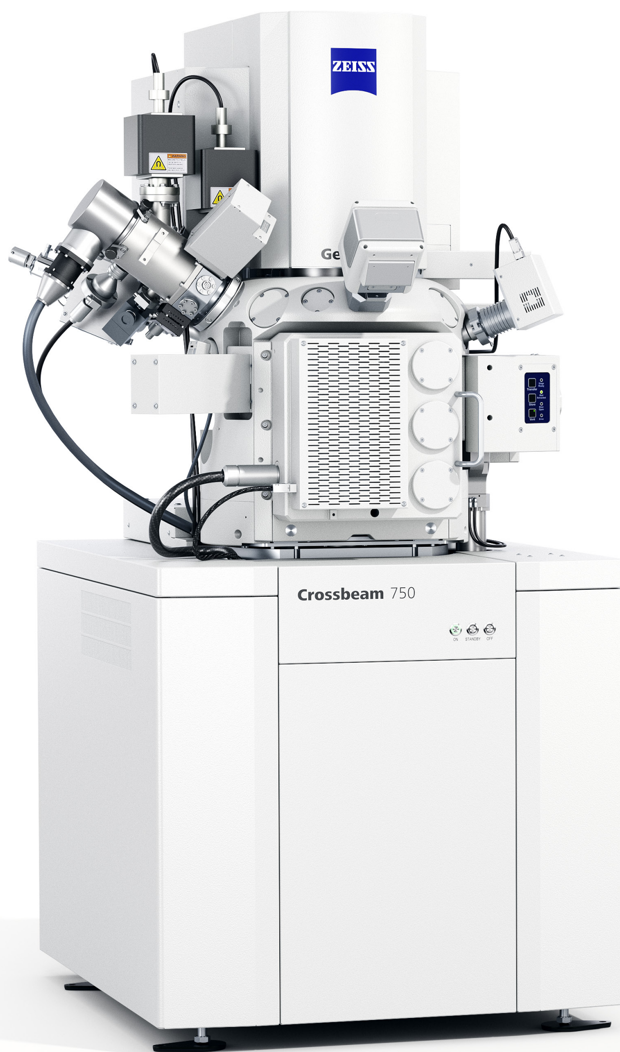
See while you mill.

Leading-edge endpoint control for superb lamella quality.



ZEISS Crossbeam 750

Deliver first-time-right sample preparation for even the most challenging targets

zeiss.com/crossbeam-750

Seeing beyond

ZEISS Crossbeam 750 – your FIB-SEM for consistently precise TEM lamella preparation.

There is pressure in the semiconductor lab to improve at every margin. As features shrink, complexity rises. Targeting becomes more critical. Samples become more valuable. Quality and throughput requirements also increase. In sample preparation with a FIB-SEM, the decision is made at the cut. It is essential to observe the FIB/sample interaction, promptly adjust it, and hit the endpoint the first time to make the best samples and achieve the most efficient, predictable time-to-TEM.

The new ZEISS Crossbeam 750 FIB-SEM provides superb SEM resolution, driving highly reproducible results. New optics deliver a clear, high-resolution SEM view at any imaging or milling condition, so you get immediate feedback, reduce stops and checks, achieve consistent first-pass TEM lamellae, and produce precise FIB cross-sections.

Demand precision with no surprises

To reveal nanometer features, the traditional stop-and-check routine drifts, over-thins, forces remakes, and extends turnaround time. See while you mill replaces intermittent peeking with real-time clarity. Engineers can fine-tune during polishing and hit nanometer endpoints on the first attempt.

What's new in Crossbeam 750: higher precision, greater control

- New Gemini 4 SEM optics significantly increase low-kV resolution and signal-to-noise ratio (SNR). This applies even to cross-sections in tilted samples. The new optics also reduce the lens field influence on low-energy FIB probes used simultaneously under high-resolution SEM conditions.
- The new scan generator introduces an interwoven SEM/FIB mode called High Dynamic Range (HDR) Mill + SEM. This mode maintains a clear SEM view during milling with any FIB probe by completely suppressing the FIB-generated secondary electron (SE) background (see Figure 1). This allows users to observe fine details throughout the process.
- High-resolution in-column SEM detectors monitor milling processes at any FIB voltage, including the lowest settings, ensuring precise control during the critical final thinning steps (see Figure 2).

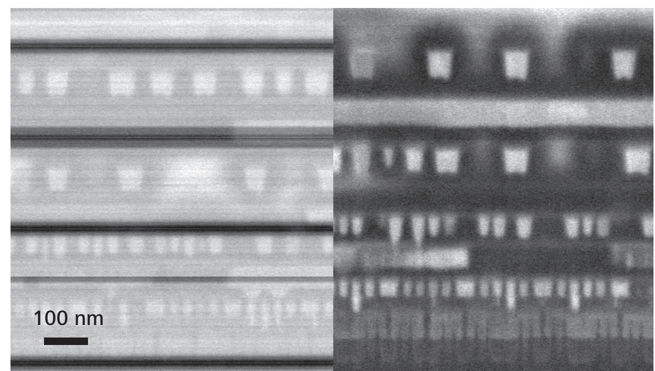


Figure 1 *SEM while milling with standard Mill + SEM (left) and with HDR Mill + SEM (right). Crossbeam 750 HDR Mill + SEM provides immediate, background-free visual feedback.*

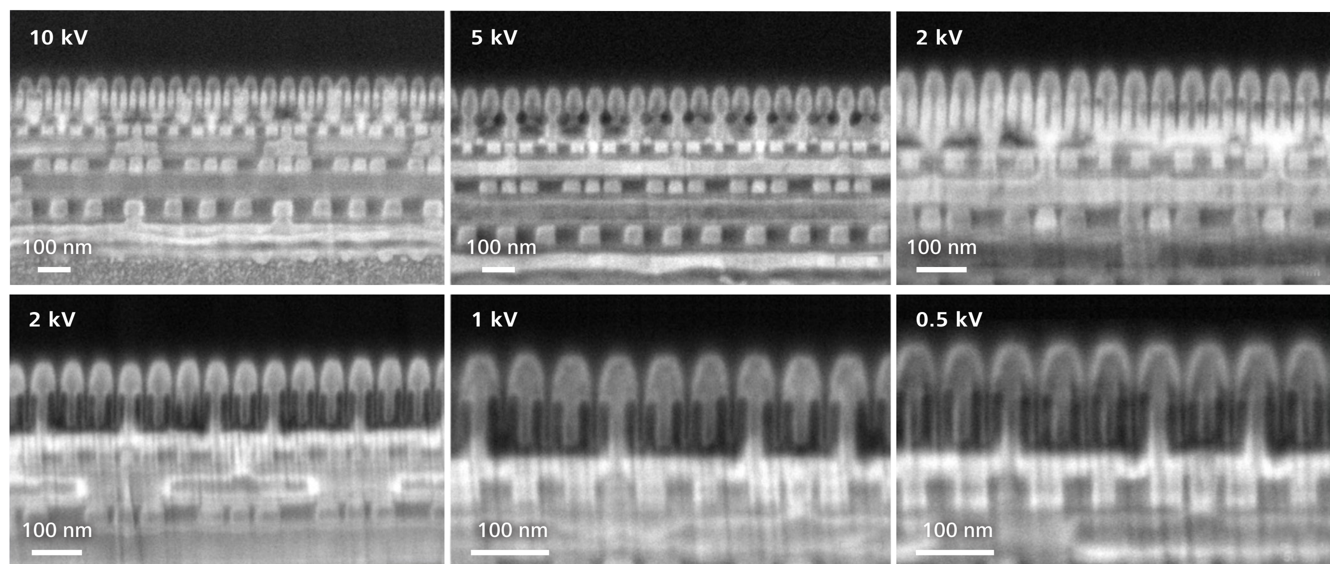
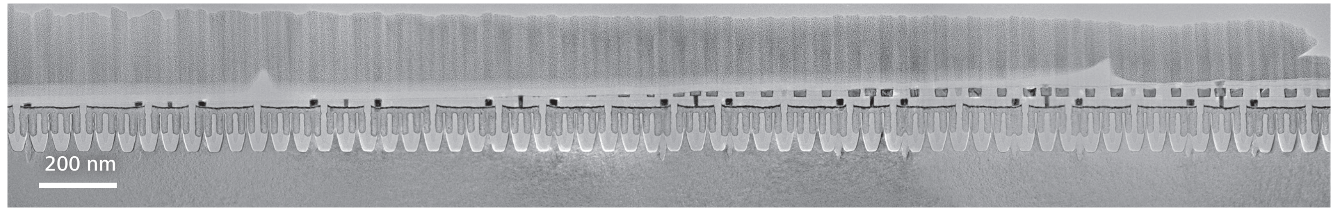


Figure 2 *Thinning and endpointing of a 3 nm FinFET device lamella at FIB energies from 10 down to 0.5 kV using HDR Mill + SEM. The two 2 kV images demonstrate the use of on-the-fly milling angle correction to mill exactly parallel to the FinFET gates. Note that these are snapshots from the real-time SEM monitoring of the process, not still images taken at different times.*



Achieve clarity with exceptional SEM image quality

ZEISS Crossbeam 750 lets engineers see smaller features while milling, allowing them to make earlier decisions about stopping or continuing. As a result, excessive stops and over-thinning are reduced. This leads to shortened cycle times and higher yields right from the first pass of the lamella preparation. Validation and method transfer become both faster and lower risk because performance is measured at the actual operating points used for endpoint control.

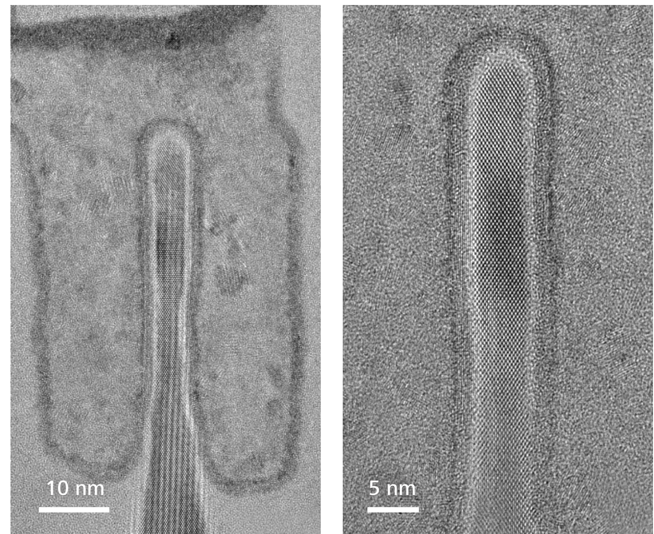
Rely on predictable endpointing and preserve critical features

Engineers can simultaneously judge lamella thickness, surface quality, and milling endpoint using different detectors. This ability helps ensure high-quality results by allowing detection and correction of issues as they arise. They can use ultra-precise translational and rotational milling nudging for fast-nanometer control with the highest resolution, ensuring the lamella meets exact specifications. Immediate feedback enables engineers to confidently lock the endpoint, resulting in reproducibly perfect lamellae. Figures 3 and 4 illustrate the precision of the Crossbeam 750 at leading-edge commercial nodes: a 3 nm FinFET (Figure 3) and a 3 nm gate-all-around (GAA) FET device lamella (Figure 4).

Make expertise scalable

Because the FIB cut is visible and controllable in real-time, first-pass lamella quality no longer depends on highly skilled FIB experts. Software adds guardrails with prompts, recipe templates, and auto-logging tied to the acceptance checklist. The centralized nudge tool, intuitive mouse-drag controls, shape properties, and live progress bars shorten the learning curve. Operators at all levels of experience can work confidently and achieve deterministic endpoints.

Figure 3 *TEM micrographs of a 3 nm FinFET device lamella prepared using 1 kV FIB for endpointing with HDR Mill + SEM. (Above) Overview. Thickness at fin tips 6–13 nm, gates perfectly centered across several micrometers. (Below) Single FinFET at high resolution, showing preserved crystallinity (lattice contrast) with minimal amorphization and redeposition. All layers clearly distinguishable.*



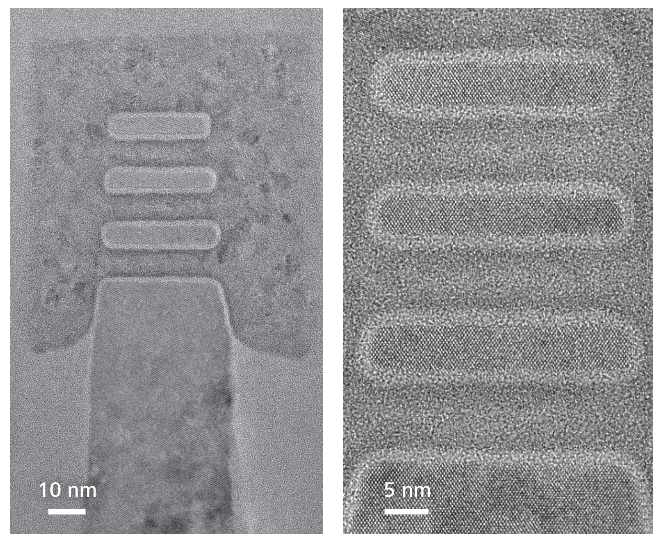
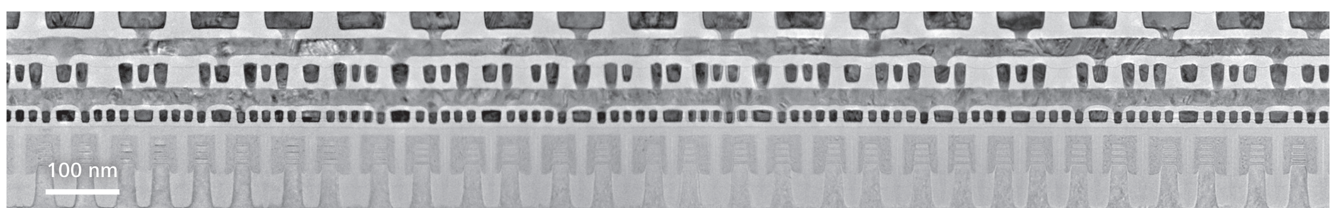


Figure 4 *TEM micrographs of a 3 nm GAA-FET device finished with 1 kV FIB with HDR Mill + SEM. (Above) increased magnification of a single GAA transistor—overall a superb result. (Below) Gates perfectly centered across several micrometers; crystallinity preserved with minimal amorphization; layers clearly distinguishable.*



ZEISS Crossbeam 750 at a glance

Other FIB-SEMs	ZEISS Crossbeam 750
Stop and check breaks context, adds drift, and without expert focus can lead to rework	See while you mill provides clarity with the highest SEM resolution at the cross-section, immediate feedback, fewer stops, and shorter turnaround time to TEM
Fixed instrument conditions during FIB milling reduces operator flexibility to react	Live adjustments of any SEM and FIB parameters with immediate feedback for real-time milling plane corrections are enabled giving the user more flexibility and fine control
Risk of over thinning or damaged targets at fine features	Increased low-kV SEM resolution and SNR during low-energy FIB finishing protects your ROI during endpointing and ensures consistent first time results

Key features

- Gemini 4 field-free SEM objective
- HDR Mill + SEM
- Split-mode imaging and fine-plane nudging
- Ion-sculptor Ga FIB for low-energy finishing

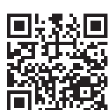
Key benefits

- Immediate high-resolution feedback at the target plane
- Background-free FIB process control for precise fine-polish
- Sub-nanometer endpoint accuracy with uniform thickness
- Cleaner finishes and preserved interfaces/crystallinity

Technical specifications

	ZEISS Crossbeam 750 with Gemini 4	ZEISS Crossbeam 550 with Gemini 2	ZEISS Crossbeam 350 with Gemini 1
SEM working distance at coincidence point	4 mm	5 mm	5 mm
Resolution at coincidence point	0.9 nm @ 15 kV 1.5 nm @ 1 kV 1.2 nm @ 1 kV (DCV)* 1.3 nm @ 1 kV TD**	0.9 nm @ 15 kV 1.8 nm @ 1 kV — 1.3 nm @ 1 kV TD	1.1 nm @ 15 kV 2.3 nm @ 1 kV — 1.6 nm @ 1 kV TD
Resolution at cross-section (at coincidence & tilt)* **	0.9 nm @ 15 kV 1.5 nm @ 1 kV	—	—
High Dynamic Range Mill + SEM	Available at any SEM and FIB parameters		

* Digital resolution (deconvoluted) ** Tandem deceleration (TD) – stage biasing *** 36° tilt to SEM



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