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DATASHEET

Themis S TEM

A perfect combination of the best image resolution and the highest analytical efficiency

The Themis S TEM is an 80-200 kV scanning/transmission electron microscope (S/TEM) designed for high-speed imaging and analysis of semiconductor devices.

The Thermo Scientific™ Themis™ S TEM is the latest member of the industry standard Themis TEM family. The Themis S TEM inherits a unique combination of the best spatial resolution and the most efficient chemical analysis. The Themis S TEM delivers sub-Å resolution, the fastest energy dispersive X-ray spectroscopy (EDS) collection and the flexibility to address other critical semiconductor use cases, such as strain measurement and low-dose, high-contrast imaging (iDPC). Themis S TEM addresses the needs of materials analysis labs that require high throughput, high quality and versatility, particularly semiconductor failure analysis labs working at the sub-20 nm technology nodes.

The Themis S TEM may be equipped with a probe Cs-corrector to achieve sub-Å spatial resolution in STEM mode. To simplify the operation of Cs-corrector, the industry-standard OptiSTEM™ Software is included to automatically optimize the corrector and provide uninterrupted daily operation.

For EDS analysis, the Themis S TEM employs the Dual-X™ System, which consists of two large side-entry silicon drifted detectors (SDD) with a geometric solid angle between 1.8 sr and 2.2 sr (after removing the effects of shadowing). This ensures the most robust, accurate and fastest chemical analysis.

To optimize productivity, the Themis S TEM uses double-coil constant power lenses to minimize thermal drift and maximize system throughput. This design eliminates heating variations in the lens when switching between modes, such as when changing from low magnification for feature searching to high magnification for imaging.

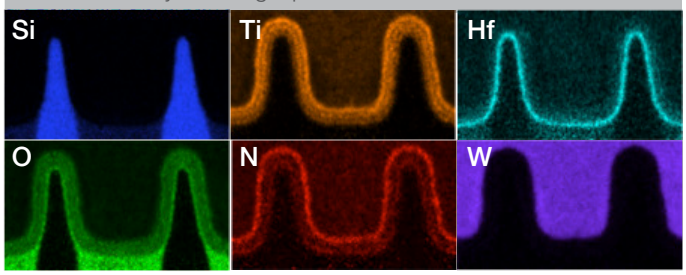
The Themis S TEM achieves the fastest time to data by using a combination of the Piezo stage and drift-corrected frame integration (DCFI) to compensate for possible specimen drift. This makes it possible to acquire high-quality, high-resolution images in both TEM and STEM modes only minutes after sample loading.

Key benefits

Best combination of high-resolution and high-throughput analytics, uniquely provides the best image resolution together with the highest EDS efficiency

The most trusted measurement accuracy, with ≤2% measurement uncertainty, making the critical dimension measurement reliable, repeatable and consistent

The highest versatility, due to the combination of optics, chemical detection, the wide gap pole-piece and unique application software, ensuring a wide range of applications are covered by this single platform



The Themis S TEM provides excellent results, even when working in sub-optimal environments. It includes an environmental enclosure, full remote operation capability and an optional integrated vibration isolation system (iVIS), all of which create a suitable mini-environment around the TEM column for higher quality results.

To meet the needs of the semiconductor foundry supply chain and to provide traceability between lab facilities, the Themis S TEM includes a ≤2% total measurement uncertainty specification, based on the combination of magnification calibration and linear image distortion. This specification ensures consistent results across fleets of tools, even if they are located in different facilities.

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Many new features have been added to the software suite application to meet the needs of semiconductor applications. These features include DCFI, iDPC, live TEM image rotation with coordinated stage control and fast EDS map quantification. Imaging success rate is further enhanced by allowing users to collect data with multiple frames and then allowing them to later remove any unwanted frames.

Themis S TEM provides the fastest time to data, flexibility and ease of use required to meet the challenges of today's semiconductor processes.

Specifications		
High tension range	80-200 keV	
Electron source	X-FEG	
TEM information limit	0.11 nm	
Probe corrector option	No	Yes
STEM resolution at 200kV (nm)	0.164	0.083
STEM resolution at 80kV (nm)	0.31	0.136
EDS collection angle (shadowing removed)	1.8 srd	
OptiSTEM	Included	
iDPC	Optional	
STEM detectors	HAADF/BF/DF2/DF4	
Camera	Ceta 4k × 4k CMOS	

Additional features

- Ultra-stable, high-brightness Schottky field emission gun (X-FEG) to ensure both high brightness and high emission current
- Environmental enclosure to relax the acoustic and room temperature variation requirements
- Thermo Scientific™ ConstantPower™ Lens, designed for ultimate thermal stability in mode switch
- Symmetric objective lens with 5.6 mm wide pole-piece gap to have a "space to do more"
- Fully digital system with SmartCam for easy navigation and operation in a normally-lit room
- Automatic apertures for reproducible recall of aperture positions after aperture exchange
- Computerized 5-axis specimen Piezo stage for accurate recall of stored positions, tracking of the areas visited during search, fine focusing and low specimen drift
- The Piezo stage allows for movements as fine as 20 pm for centering of feature of interest in the field of view
- Tilting range ±40° in alpha and ±30° in beta for standard Themis S double tilt holder enables correct orientation of samples
- Fully compliant with SEMI S2 industry requirements
- Velox application user-interface
- Dual-X for EDS analysis with a collection solid angle of 1.8 sr after correcting the shadowing
- Thermo Scientific™ Ceta™ 16M 4k × 4k CMOS camera
- Gatan energy filter series can be attached (optional)
- Tomography including EDS tomography (optional)
- Strain analysis by using nanobeam diffraction (optional)

Installation requirements

Please contact your sales representative for a complete preinstallation document.

Find out more at **thermofisher.com/EM-Sales**

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