TESCAN
PERFORMANCE IN NANOSPACE

TESCAN

S8000

New generation of SEM microscope

- BrightBeam™ Electron Column
- Field-free UHR
- 1.3 nm at 1 keV — Resolution
- 0.9 nm at 15 keV — Resolution
- Selective In-Beam signal
- UniVac

Ultra-high resolution and best conditions for microanalysis guaranteed in one single instrument

The TESCAN S8000 is a Scanning Electron Microscope (SEM) that comes to satisfy the most demanding needs for image quality and sample microanalysis that routinely arise in different fields of research and technology. Researchers can now benefit from all the advantages of field-free ultra-high resolution achieved by the new TESCAN BrightBeam™ SEM column technology. This new technology delivers excellent beam quality at all beam currents and first-class imaging performance with outstanding contrast at low beam energies. The new TESCAN Essence™ software platform is the key component, which makes the TESCAN S8000 an easy-to-use microscope; excellent images can be obtained effortlessly and quickly by any user guaranteeing high productivity in the lab and minimal time-to-data.

Universality in sample analysis

The BrightBeam™ SEM column delivers field-free ultra-high resolution imaging (0.9 nm at 15 keV, 1.3 nm at 1 keV) which guarantees maximum universality in sample analysis and allows high-resolution imaging of magnetic samples.

Maximum insight from your sample

Benefit from the outstanding ultra-high resolution and excellent contrast, which are essential for morphological characterization and analysis of nanoparticles and other nanomaterials. It is also essential for the inspection and failure analysis of semiconductor manufacturing and processing.

Maximum protection for beam-sensitive samples

The combination of the electron column design and the detection system results in excellent imaging performance at low-beam energies, which is ideal for imaging non-conducting samples and uncoated biological specimens without charging artefacts or sample damage. In addition, a variable pressure operation mode with dedicated detector is also available for charge compensation or imaging of hydrated specimens.

Best conditions for microanalysis

The BrightBeam™ SEM column is capable of operating at electron currents up to 400 nA, which guarantees an excellent signal for even the most demanding SEM analytical techniques including EDX, WDX, EBSD, and CL.

Enhanced surface sensitivity and maximum contrast

Detection system with angle-selective and energy-filtering capabilities gives complete control of surface sensitivity and the option to explore with different contrast. Images containing topographic or material contrast, or both, can be acquired simultaneously for maximum insight in minimum time.

Reliability and excellence performance in lengthy applications

EquiPower™ lens technology assures constant thermal power dissipation for excellent stability in time-consuming applications such as 3D X-ray or EBSD microanalysis.

Imaging easier than ever

User-friendly, customizable and workflow-oriented software provides maximum control for all your applications with minimum time-to-result, which increases productivity and throughput in the lab.

Easy navigation across samples and a variety of imaging modes

Unique Wide Field Optics™ includes the proprietary dual objective lens configuration that enables an undistorted large field-of-view and a variety of imaging modes. Switching between modes is fast and easy and high to low magnification images are only one click away.

TESCAN BrightBeam™ SEM column technology

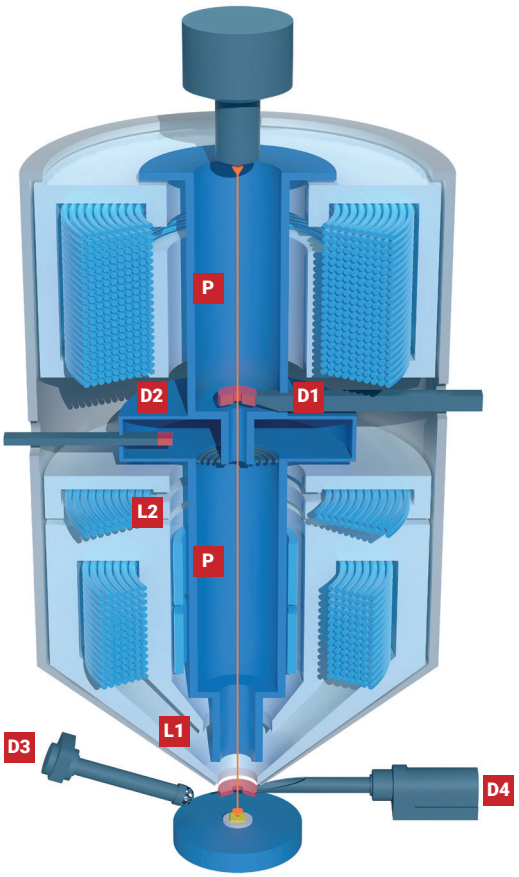
The electron optics in the new TESCAN BrightBeam™ SEM column technology is based on a combined electrostatic-magnetic objective. A potential tube through the whole column keeps electrons at an energy that is higher than the electron beam landing energy and as a result, electrostatic interactions within the beam are reduced. In turn, this significantly reduces optical aberrations specially at low beam energies.

In addition, the potential tube makes the electron beam less susceptible to environmental (stray) magnetic fields. These features result in excellent quality imaging at low electron-beam energies without relying on sample bias beam deceleration.

A dual objective lens configuration with two-stage scanner offers an extremely wide field-of-view making live navigation across the sample easy and comfortable and locating the region of interest is straightforward.

The TESCAN S8000 is fitted with a robust multi-detector system that allows selective electron collection according to their take-off angle and energy resulting in maximum topographic and compositional information from the sample.

Furthermore, both the E-T detector (Everhart-Thornley) which provides topographical contrast without edge effects, and the Multidetector with energy-filtering capabilities can be used for suppressing charging artefacts. The detection system is optimized to maximize signal collection in the entire beam energy range.



L1 Combined magnetic-electrostatic lens

L2 Second magnetic lens

P Potential tube

D1 In-Beam Axial detector

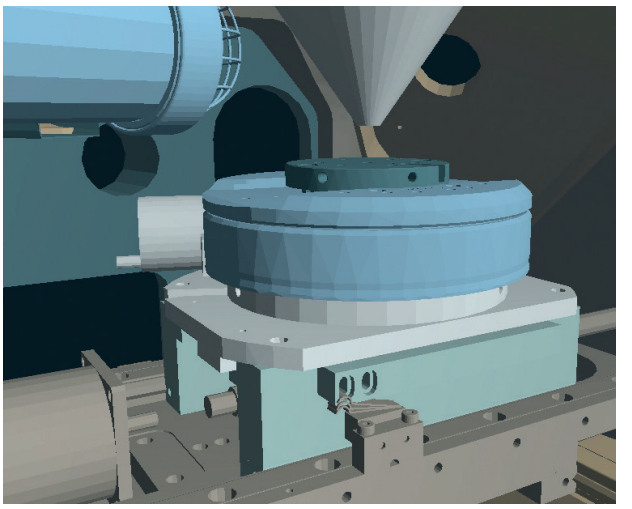
D2 In-Beam Multidetector

D3 E-T detector

D4 R-BSE detector

New TESCAN Essence™ software platform makes microscope control easier than ever

- Simplified UI with fast access to main functions
- Workflow-oriented wizards
- User-friendly and customizable SW making new users productive in a short time
- Optimized for multi-user environment
- Maximum control in applications
- 3D collision model for even better protection during sample manipulation



▲ **Fig.:** 3D collision mode.

When it comes to versatility, the TESCAN S8000 microscope delivers a truly flexible analytical platform that offers excellent quality in imaging with superb contrast. Whether samples are conductive or nonconductive, magnetic or nonmagnetic, organic or inorganic, the TESCAN S8000 offers the ideal imaging conditions thanks to its advanced detection system with electron-signal filtering capabilities and a low vacuum mode with UniVac.

▲ **Fig.:** TESCAN Essence™ - simplified GUI and customizable.

Applications

It is the excellent performance at low beam energies which makes the TESCAN S8000 ideal for characterization of nanomaterials and rigorous quality control in the high-end manufacturing industries, or routine inspection and fault isolation tasks, for the purposes of failure analysis of microelectronic devices in semiconductor foundries.

Failure Analysis in the Semiconductor Industry

The TESCAN S8000 is an ideal instrument for SEM investigations and failure analysis of modern semiconductor devices which commonly integrate components made of low-k dielectric materials or other beam-sensitive materials prone to shrinkage or damage during SEM investigation. For this reason, low beam energies (< 2 keV) are required.

In addition, the TESCAN S8000 is fitted with a large chamber that makes the inspection of 8” wafers possible at any location.

Characterization of Nanomaterials

The TESCAN S8000 delivers a set of superior imaging capabilities essential to unveil hidden properties of materials that only become accessible at nanoscales. This knowledge helps researchers understand emerging mechanisms of properties of materials that can in turn lead to innovative technological applications.

- Field-free UHR for high resolution imaging of any type of sample including investigation of magnetic samples.
- Energy-filtering capability can also be used to reduce charging artefacts during imaging as well as low-loss BSE contrast.
- Dedicated detectors for ultimate surface sensitivity.

High contrast imaging in Life Sciences

Life Sciences also greatly benefit from the excellent image quality and contrast delivered by the detection system. The TESCAN S8000 is compatible with high pressure operations up to 500 Pa, thus the integrity of hydrated specimens can be preserved during imaging. The TESCAN S8000 can be equipped with the HADF R-STEM detector for unique ultrastructural investigations of biological tissue. The versatility of the detection system can help suppress charging artefacts and images of highly charging, non-conductive uncoated samples without edge effects can be obtained at low beam energies.

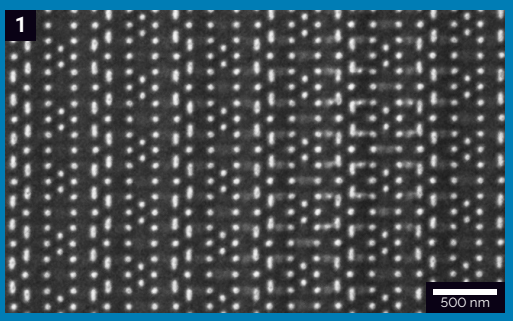


Fig. 1: SEM image at 700 eV of an IC delayered to the transistor contact layer. Topography contrast provided by the E-T detector reveals that M1 layer is not fully removed and delayering is not completed.

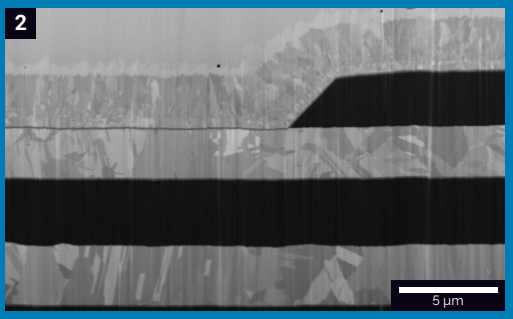


Fig. 2: High material contrast of under-bump metal layers observed at 1 keV with the E-T detector

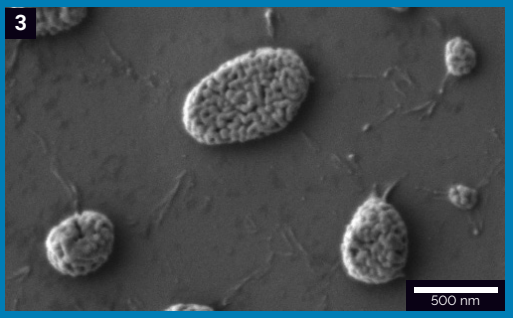
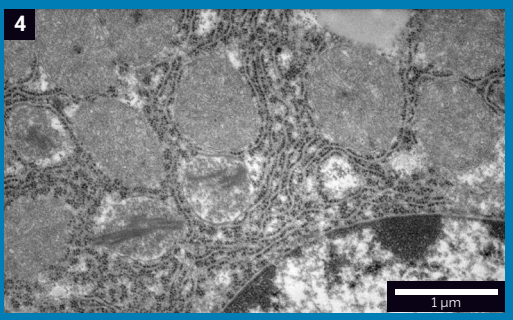


Fig. 3: Characterization of Au nanoparticle on Si/SiO_2 substrate. The nanoporous structure, size and surface morphology of these nanoparticles can be investigated. Sample imaged at 500 eV with the E-T detector.



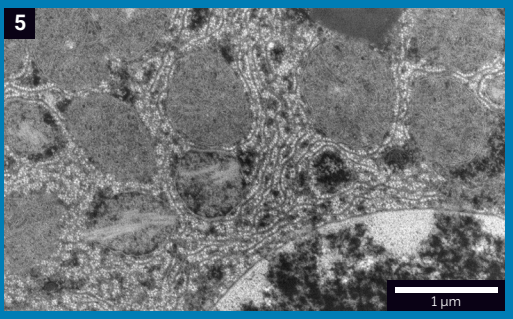


Fig.: Ultrathin section of liver tissue where mitochondria, rough endoplasmic reticulum, and nucleus are clearly visualized. Images were simultaneously acquired using bright field **(4)** and dark field **(5)** signal at accelerating voltage 30 kV.

Technical Specifications

Electron Optics:

Electron Gun:	High brightness Schottky emitter	
Electron Optics:	BrightBeam™ column with combined electrostatic-magnetic objective lens and Wide Field Optics™ technology	
Resolution:	**Standard mode:** 0.9 nm at 15 keV 1.6 nm at 1 keV 1.9 nm at 500 eV	**Beam Deceleration mode (option):** 1.3 nm at 1 keV 1.5 nm at 200 eV
	Low Vacuum Mode*: **BSE:** 2.0 nm at 30 keV **LVSTD:** 1.5 nm at 30 keV	**STEM (option):** 0.9 nm at 30 keV
Maximum Field of View:	7.0 mm at $WD_{Analytical}$ 10 mm 21.0 mm at WD 30 mm	
Electron Beam Energy:	200 eV to 30 keV / down to 50 eV with BDT option	
Probe Current:	2 pA to 400 nA	

Detectors, Chamber and Sample Stage

Detectors (standard):	Multidetector (In-Beam) Axial detector (In-Beam) E-T detector (In-Chamber) Retractable BSE (In-Chamber)** pA meter Chamber view camera
Optional Detectors*:**	Beam Deceleration Technology (BDT), 4Q BSE, Water-cooled BSE, Al-coated BSE, LE-BSE, LVSTD, HADF R-STEM, CL, EDX, WDX, EBSD, Raman Spectrometer (RISE)
Accessories*:**	**Standard:** Decontaminator/plasma cleaner. **Optional:** Nanomanipulators, Load Lock (Manual/Automatic), Optical Stage Navigation, Control Panel, Peltier Cooling Stage, Beam Blanker, Cradle Stage
LM Chamber:	Internal dimensions: Ø 230 mm Door width: 148 mm Number of ports: 11+ Integrated active vibration isolation
Stage:	Compucentric, fully motorized **Movements:** X = 80 mm (–40 mm to +40 mm) Y = 60 mm (–30 mm to +30 mm) Z = 49 mm Rotation: 360° continuous Tilt: –80° to +80°
GM Chamber:	Internal Dimensions: 340 mm (width) × 315 mm (depth) Door: 340 mm (width) × 320 mm (height) Number of ports: 20+ Integrated active vibration isolation
Stage:	Compucentric, fully motorized **Movements:** X = 130 mm (–65 mm to +65 mm) Y = 130 mm (–65 mm to +65 mm) Z = 95 mm Rotation: 360° continuous Tilt: –60° to +90°

*For systems with UniVac. **Standard for variable pressure (UniVac) systems, optional for high vacuum systems. ***Availability of some items may depend on chamber configuration.
+Configuration and number of ports can be modified according to customer's needs.