TESCAN
PERFORMANCE IN NANOSPACE

TESCAN S8000

New generation of SEM microscope


Field-Free UHR

Resolution


Variable pressure

S8000
series

TESCAN S8000

Highest 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 profit from all the benefits of the field-free ultra-high resolution achieved by the new TESCAN BrightBeam™ SEM column technology that 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 effortlessly and quickly obtained by any user thus guarantees high productivity in your lab and minimal time-to-data.

Benefits

- ✓ **Universality in sample analysis:**
  The BrightBeam™ SEM column delivers field-free ultra-high resolution imaging (0.9 nm at 15 keV, 1.4 nm at 1 keV) which guarantees maximum universality in sample analysis and allows high resolution imaging of magnetic samples.

- ✓ **Maximum insight from your sample:**
  Profit from the outstanding ultra-high resolution and excellent contrast which are essential for morphological characterisation and analysis of nanoparticles and other nanomaterials as well as for inspection and fault-finding in semiconductor manufacture 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 damaging to sample. 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 EDS, WDS, EBSD, and CL.

- ✓ **Enhanced surface sensitivity and maximum contrast:**
  Detection system with angle-selective and energy-filtering capabilities gives you complete control on 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 assure constant thermal power dissipation for excellent stability in time-consuming applications such as X-ray or EBSD microanalysis.

- ✓ **Imaging easier than ever**
  Easy-to-learn, customisable and workflow-oriented software for maximum control in all your applications and minimum time-to-result maximises productivity and throughput in your lab.

- ✓ **Easy navigation across sample and variety of imaging modes**
  Unique Wide Field Optics™ includes the proprietary Intermediate Lens that enables 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 beam guiding tube in the whole column reduces beam broadening while preserving brightness. When the beam guiding tube is enabled electrons from the sample are driven into the column by the electrostatic lens thus the signal collection is improved.

In addition, thanks to such electron optics design, aberrations are significantly reduced especially at low beam energies and the beam is shielded and less susceptible to environmental astray magnetic fields. These features result in excellent quality imaging at low and ultra-low beam energy down to 50 eV without relying on sample bias beam deceleration.

The Wide Field Optics™ enables a variety of imaging and displaying modes including undistorted large field of view with a maximum field of view of > 2.3 mm in the UH-Resolution mode, and 7 mm at analytical WD6 mm thus making operation and navigation across the sample easy, fast and comfortable.

The TESCAN S8000G is fitted with a robust multi-detector system that allows selectively collecting electrons according to their take-off angle and energy which results in maximum topographic and compositional information from the sample.

Furthermore, both the E-T detector which provides topographical contrast without edge effects and the Multidetector with energy-filtering capabilities can be used for supressing charging artefacts. The detection system is optimised to maximise signal collection in the entire beam energy range.

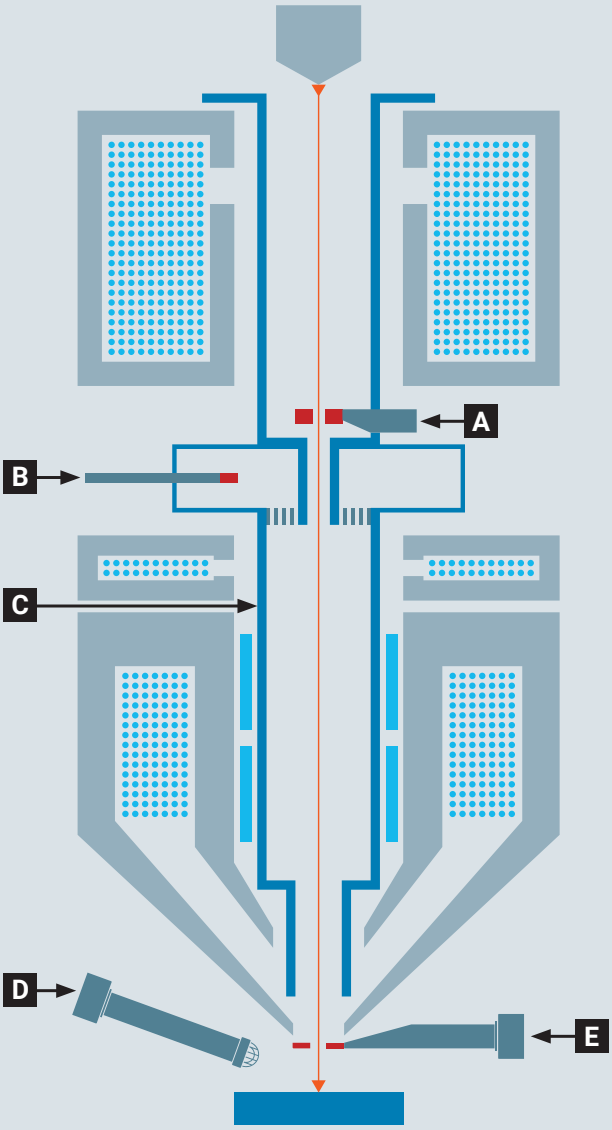


Fig: (A) Axial detector **(B)** Multidetector **(C)** Potential tube **(D)** E-T detector **(E)** Retractable BSE detector

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 your 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 variable pressure operations.

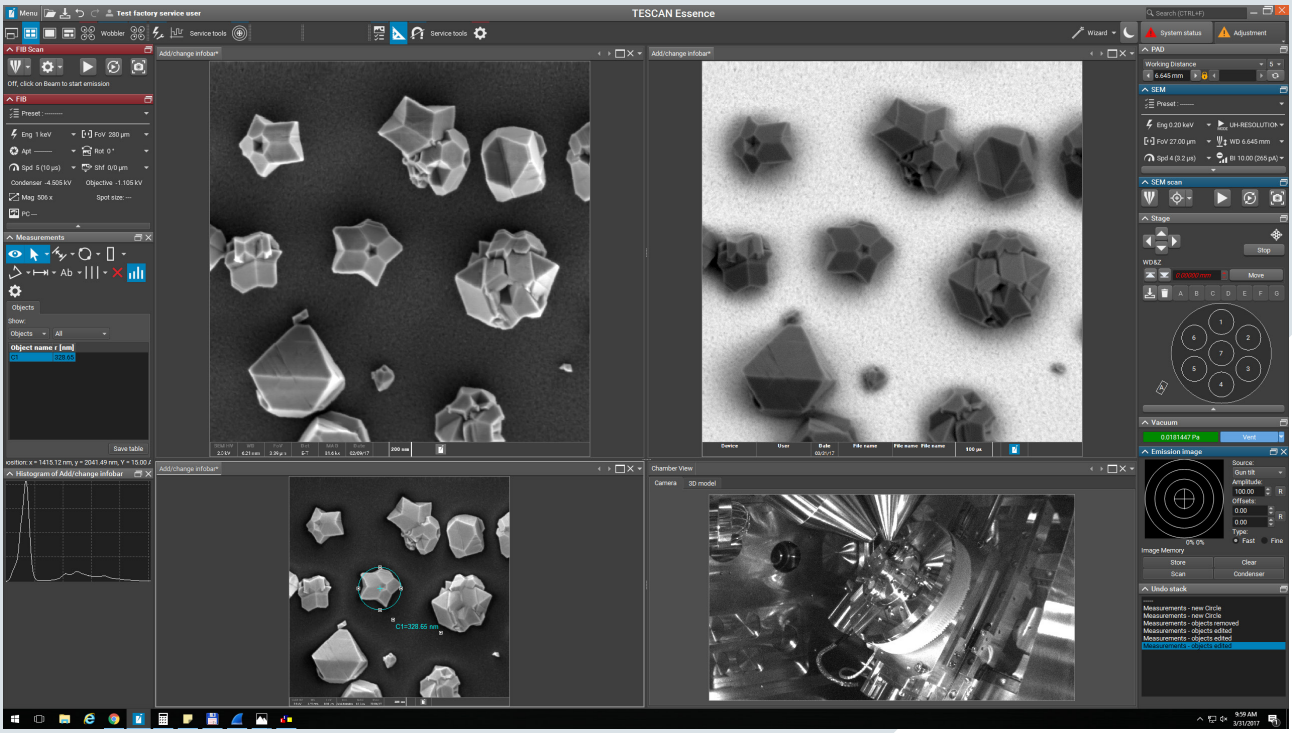


Fig: TESCAN Essence™ -- simplified GUI and customisable.

New TESCAN Essence SW platform makes imaging easier than ever

- ✓ Simplified UI with fast access to main functions
- ✓ Workflow-oriented wizards
- ✓ Easy-to-learn and customisable SW making new user productive within a short time
- ✓ Compatible with multi-user environment
- ✓ Maximum control in applications
- ✓ topographic and compositional information from the 3D collision model for unique chamber view

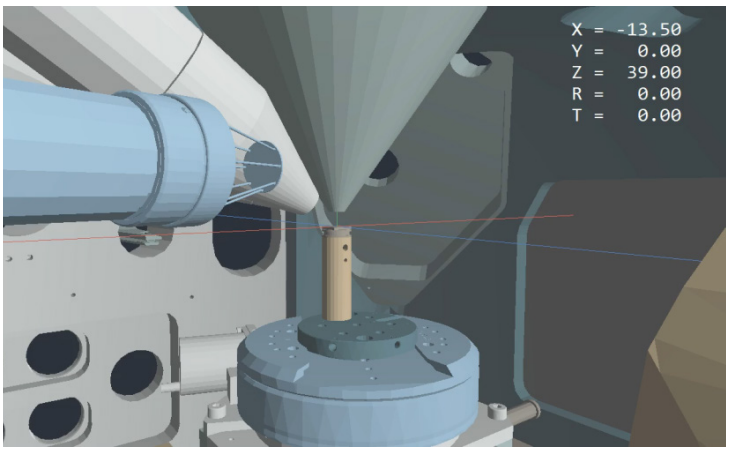


Fig: 3D collision mode.

Applications

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

Failure Inspection in the Semiconductor Industry

The TESCAN S8000 is an ideal instrument for SEM investigations and failure analysis of modern semiconductor devices which in many cases integrate components made of low-k dielectric materials or other beam-sensitive materials that are prone to shrink or get damaged during SEM investigation and for this reason require to be imaged at low beam energies (< 2 keV).
In addition, the TESCAN S8000 is fitted with a large chamber that makes possible the inspection of 8” wafer inspection at any location.

Characterisation of Nanomaterials

The TESCAN S8000 delivers a set of superior imaging capabilities that help researchers unveil hidden properties of materials that become only accessible at nanoscales, understanding their emerging mechanisms and developing far-reaching technological applications.

- ✓ Field-free UHR for high resolution imaging of any type of samples including investigation of magnetic samples.
- ✓ Energy-filtering capability can also be used for reducing charging artefacts during imaging.
- ✓ Very narrow energy window BSE imaging for fully controllable and 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 also 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.

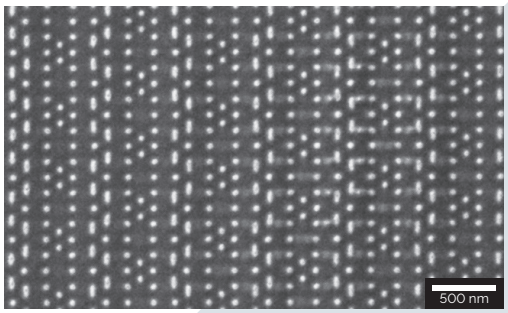


Fig.: SEM image at 700 eV of an IC delayered to the transistor contact layer. Topography contrast provided by the E-T detector reveals that M1 layer is not fully removed and delayering is not completed.

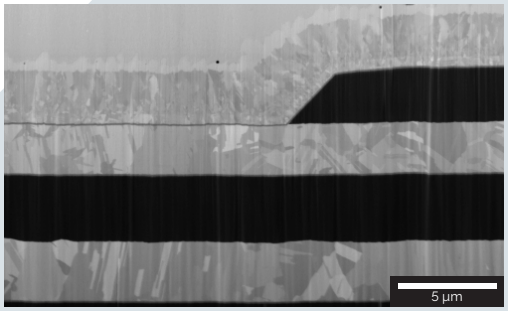


Fig.: High material contrast of under-bump metal layers observed at 1 keV with the E-T detector

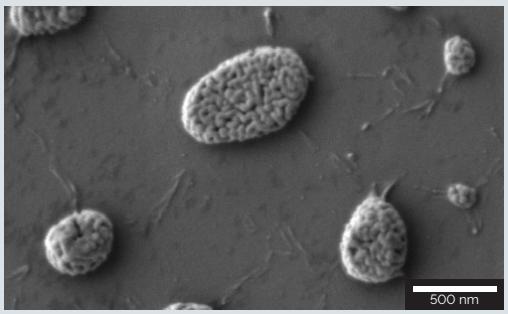
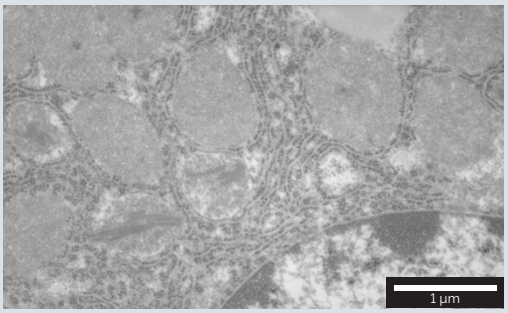


Fig.: Characterisation of Au nanoparticle on Si/SiO_2 substrate. The nanoporous structure, size and surface morphology of these nanoparticles can be investigated. Sample imaged at 500 eV with the E-T detector.



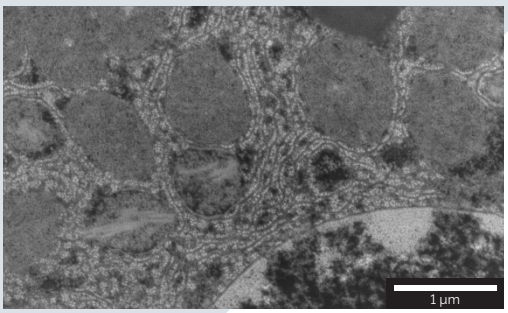


Fig.: Thin sections of liver tissue imaged with the HADF R-STEM detector: BF (top) HADF (bottom) images clearly show the internal structures with excellent contrast.

Technical Specifications

Electron Optics:

Electron Gun:	High brightness Schottky emitter
Electron optics:	BrightBeam™ column with combined electrostatic-magnetic objective lens and Wide Field Optics™
Resolution:	**Standard mode:** 0.9 nm at 15 keV 1.7 nm at 1 keV / 1.4 nm at 1 keV* 2.0 nm at 500 eV / 1.6 nm at 200 eV*
STEM (option)	0.9 nm at 30 keV
Low Vacuum Mode	**BSE:** 2.0 nm at 30 keV **LVSTD:** 1.5 nm at 30 keV
Maximum Field of View:	7.0 mm at $WD_{Analytical}$ 6 mm 21 mm at WD 30 mm
Electron beam energy:	50 eV to 30 keV
Probe Current:	< 1 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)
Optional detectors include:	HADF R-STEM, EDS, WDS, EBSD, CL, EBIC
Chamber:	Internal dimensions: 340 mm (width) × 315 mm (depth) × 320 mm (height) Number of ports: 20+ Chamber and Column Suspension: active vibration isolation (integrated)
Specimen Stage:	compucentric, fully motorised X/Y = 130 mm, Z = 90 mm Rotation = 360° continuous, Tilt = -60° to +90°
Maximum Specimen Height:	96 mm (with rotation stage) 137 mm (without rotation stage)
Accessories:	Peltier Cooling Stage Optical Stage Navigation Nanomanipulators Beam Blanker Load Lock Decontaminator / plasma cleaner Control Panel

*With the optional Beam Deceleration Technology option (BDT)