TESCAN CLARA

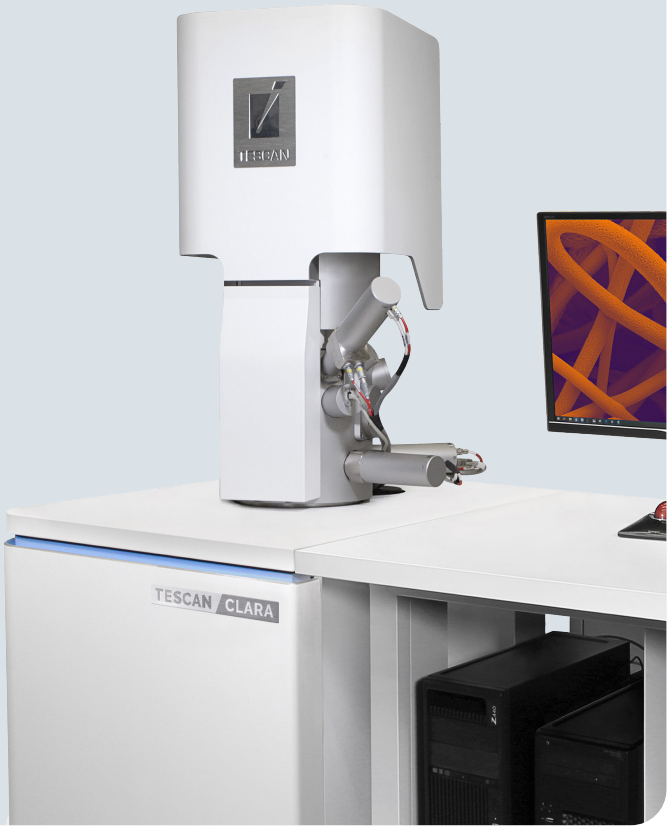
Field-free analytical UHR-SEM for materials characterization at the nanoscale

TESCAN CLARA is a Scanning Electron Microscope (SEM) that satisfies the demands for high quality images and microanalysis that routinely arise in different fields of research and technology. TESCAN CLARA features the TESCAN BrightBeam™ SEM column technology, which utilizes a combined electrostatic-magnetic objective. This provides ultra-high-resolution capabilities at low accelerating voltages in a field-free fashion – an essential feature for uncompromised imaging of all kinds of samples, including those which are magnetic.

TESCAN CLARA is fitted with unique in-column multi-detector system that allows selective collection of electrons according to their take-off angle and energy. This results in maximum topographic and compositional information from the sample. The Multidetector, which is equipped with a filtering grid, gives access to selectively filter SE and BSE energies and enhances materials contrast, as well as the ability to live-switch between SE and BSE signal. The second in-column detector, the Axial detector, is designed to collect SE signal at maximum efficiency and any

Key benefits:

- ✓ Unique In-Beam BSE system allows filtering of signal based on energy and take off angle
- ✓ Field-free characterization of materials at low beam energies for maximum topography
- ✓ Excellent for imaging beam-sensitive and non-conductive samples
- ✓ Fast setup of electron beam – optimal imaging and analytical conditions guaranteed by In-Flight Beam Tracing™
- ✓ Intuitive and precise live-SEM navigation on the sample at low magnification without the need for an optical navigation camera
- ✓ Intuitive Essence™ software, a modular platform designed for effortless operation regardless of a user's experience level



BrightBeam™ electron column

Field-Free UHR SEM

1.2 nm at 1 keV
Low-kV Resolution

0.9 nm at 15 keV
Resolution

Selective signal collection

MultiVac

landing voltages without palpable loss of SE signal. This makes UHR-SE observation very easy and routine, even at low landing voltages.

Additionally, TESCAN CLARA can be equipped with two In-chamber detectors and an E-T detector as standard, to provide excellent high signal and topographical contrast from the sample. The optional retractable low energy BSE detector collects wide-angle BSEs and provides high material contrast, even at low accelerating voltages. TESCAN CLARA is also designed for analytical purposes, thanks to In Flight Beam Tracing™ and Intermediate Lens™ utilities. TESCAN CLARA can maintain high resolution even at high beam currents (up to 400 nA), which is beneficial for daily analytical work. TESCAN CLARA is truly a versatile instrument, ideal for the characterization of nanomaterials, rigorous quality control in the high-end manufacturing industry, as well as for Research and Development.

Essential Specifications

BrightBeam™ Field-Free UHR FE-SEM Column

- Schottky field electron emitter, lifetime 12 months guaranteed
- Combined magnetic and electrostatic objective lens
- In-column potential tube (“beam booster”)
- Dual in-column SE and axial BSE detection
- Electron beam landing energy range: 50eV–30 keV (<50eV with BDM*)
- Spot optimization by electromagnetic beam aperture control
- Probe current: 2 pA–400 nA, continuously adjustable
- Maximum field of view: 7 mm at WD=10 mm, >50 mm at max. WD
- Magnification: 2× to 2,000,000×

Electron Beam Resolution

High Vacuum Mode:

- 1.4 nm @ 1 kV
- 1.2 nm @ 1 kV with sample bias (BDM*)
- 0.9 nm @ 15 kV
- 0.8 nm at 30 kV STEM*

Low Vacuum Mode:

- 2.0 nm @ 30 keV (BSE)
- 1.8 nm @ 30 keV with GSD*
- 3.0 nm @ 3 keV with GSD*

Vacuum Chamber

LM Chamber

- Internal diameter: 230 mm
- Ports: 12+
- Suspension type: active
- Chamber view (IR) camera standard
- 2nd chamber view (IR) camera*
- Essence™ integrated plasma cleaner (Decontaminator)

LM Stage

Motorized, 5-axis goniometer stage

- X & Y axis travel range: 80 (X) × 60 (Y) mm
- Z axis travel range: 49 mm
- Tilt range: compucentric, -80° to +80°
- Rotation: compucentric, 360 degrees (continuous)
- Max. specimen height: 49 mm (76 mm without stage rotation)

GM Chamber

- Width: 340 mm
- Depth: 315 mm
- Ports: 20+
- Suspension type: active
- Extension for 6” and 8” wafers*
- Extension for 6”, 8” and 12” wafers (with cradle stage)*
- Extension for parallel Raman microscope with spectrometer (RISE™)*
- Chamber view (IR) camera standard
- 2nd chamber view (IR) camera*
- Essence™ integrated plasma cleaner (Decontaminator)

GM Stage

Motorized, 5-axis goniometer stage

- X & Y axis travel range: 130 mm
- Z axis travel range: 95 mm
- Tilt range: compucentric, -60° to +90°
- Rotation: compucentric, 360 degrees (continuous)
- Max. specimen height: 95 mm (136 mm without stage rotation)
- Cradle stage*

Note: The range of movements is dependent on the configuration and WD/Z

Vacuum System

- High vacuum: <9x10^{-3} Pa
- MultiVac*: 7–500 Pa
- Pump types: all oil-free
- Load lock (manual or fully motorized)*

Detectors and Analyzers

- pA meter incl. touch alarm function
- Everhart-Thornley chamber detector (E-T)
- In-column Energy-Filtered Multidetector (MD)
- In-column axial BSE/SE detector (Axial)
- Gaseous SE detector (GSD), standard with MultiVac*
- Retractable (motorized) BSE, scintillator type (R-BSE)*
- Low energy, scintillator type, retractable (motorized) BSE (LE-BSE)*
- Low energy, solid state, retractable (motorized), 4 quadrant BSE (LE 4Q BSE)*
- Water-cooled, scintillator type, retractable (motorized) BSE, heat resistant <800 °C*

Optional equipment

[3] Navigation image can be acquired for samples with maximum height 40 mm

- Aluminum-coated, scintillator type, retractable (motorized) BSE for concurrent CL detection (Al-BSE)*
- Compact, retractable (manually) panchromatic CL detector, 350–650 nm*
- Compact, retractable (manually) panchromatic CL detector, 185–850 nm*
- Compact, retractable (manually), color Rainbow CL detector*
- CL retractable panchromatic detector, 350–650 nm*
- CL retractable panchromatic detector, 185–850 nm*
- CL retractable panchromatic rainbow detector*
- Retractable (motorized) STEM detector, BF, DF and HADF sectors, holders for up to 8 grids (R-STEM)*
- Optical Navigation and Correlation Camera (ONCam)*[3]
- EDS* (3rd party)
- EBSD* (3rd party)
- WDS* (3rd party)

SEM Scanning Systems

- Dwell time: 20 ns–10 ms, in steps or continuously adjustable
- Full frame, selected area, line or point
- Image shift, scan rotation, tilt correction
- Line and frame accumulation
- Dynamic focus
- Drift-corrected frame accumulation (DCFA)

Image Acquisition

- Max. frame size: 16k × 16k
- Aspect ratio: 1:1, 4:3 and 2:1
- Image stitching* (requires Essence™ Image Snapper)
- Up to 8 channels can be acquired simultaneously
- Color mapping and multi-channel signal mixing
- Multitude of image formats incl. TIFF, PNG, BMP, JPEG and GIF
- Dynamic range: 8 or 16 bits

User Interface:

- Keyboard and Mouse
- Trackball
- Control panel*
- TESCAN Essence™ graphical user interface

Microscope Control PC

- High performance PC: Intel Core i7 or equivalent, 16 GB RAM, 2 TB HDD, Nvidia GTX 1060 or equivalent, Windows 10 Pro 64-bit (details available upon request)
- 32” QHD monitor

TESCAN Essence™ Software:

- Customizable GUI layout
- Multi-user account management
- Quick search bar
- Undo/Redo commands
- Single, dual, quad or hexa live image(s) display
- Multi-channel colored live image

Automated and Semi-Automated Routines

- SEM emission control
- Electron gun and column alignment
- Contrast and brightness, autofocus
- In-Flight Beam Tracing™
- Electron beam spot optimization

Advanced Essence™ Modules

- Measurement, Tolerance Measurement
- Image Processing
- Presets
- Histogram and LUT
- SharkSEM™ Basic (Remote Control)
- 3D Collision Model
- Object Area
- Positioner
- Switch-off Timer
- CORAL™*
- Image Snapper*
- Sample Observer*
- SharkSEM™ Advanced (Python scripting)*
- System Examiner*
- Synopsys Client*
- TESCAN Flow™ (offline processing) *

*Optional equipment

Microscope Installation

Installation Requirements[1]:

- Power supply: 230 V ± 10% / 50 Hz (or 120 V / 60 Hz-optional), power 2300 VA, 2 kW UPS delivered with the system
- Compressed air: 6–7 bar (87–102 psi), clean, dry, oil free
- Compressed nitrogen for venting: 1–7 bar (15–102 psi), 99.99% purity (4.0 purity level)
- Room for installation: min. 3.2 × 3.1 m; minimum door width 0.9 m (1.0 m if equipped with R-STEM and/or Motorized Load-lock)

[1]Request site-survey by TESCAN authorized technician

Environmental Requirements[2]:

- Temperature of environment: 17–24 °C with stability better than 2 °C with a rate of change 1 °C/hour
- Relative humidity: <65 %
- Background magnetic field: Synchronous <300 nT, Asynchronous <100 nT
- Vibrations: <10 µm/s below 30 Hz, <20 µm/s for 30 Hz and above
- Acoustic noise: Less than 60 dBC
- Altitude: max. 3000 m above sea level

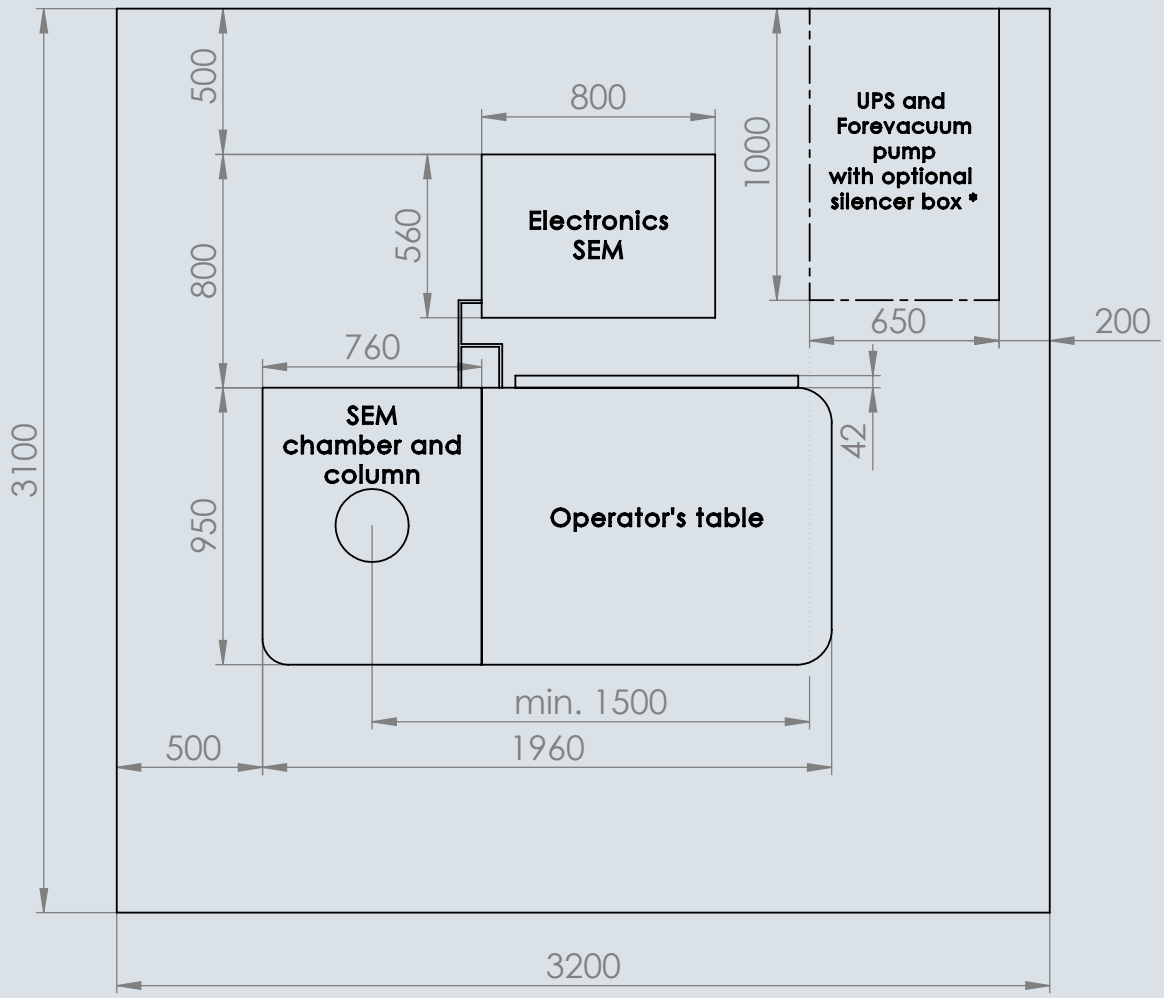
[2]Specification of background magnetic field is subject to actual acceleration voltage. Specified values are for 20 kV acceleration voltage.

Training:

- **Introductory:** by TESCAN engineer after installation
- **Advanced (optional):** at TESCAN facilities or on-site

Footprint of the microscope (all dimensions in mm):

If a forevacuum pump is to be placed in the same room as TESCAN CLARA microscope, then it is highly recommended to purchase the TESCAN silencer box together with the microscope *(to be ordered separately)*.



TESCAN CLARA is based on the TESCAN S8000 platform

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