



TESCAN CLARA

UHR SEM for fast, accurate and comprehensive nanoscale surface analysis of any material

TESCAN CLARA satisfies the demand for high-quality images from any sample while providing a user experience that supports fast time-to-data and ease of use through workflow-driven automation. With an unrivaled choice of ultra-high-resolution imaging and contrast methods, TESCANA CLARA is the go-to solution for materials science labs that need versatility, plus maximum detail and contrast information from any sample, even magnetic and beam-sensitive materials.

TESCAN CLARA features TESCANA's own BrightBeam™ SEM column which employs a combined electrostatic – magnetic objective. This provides field-free, ultra-high-resolution capabilities at low accelerating voltages, which is essential for uncompromised imaging over the widest variety of samples. Our unique in-column multi-detector system allows collection of electrons according to their take-off angle and energy, resulting in the greatest amount of topographic and compositional information from the sample. TESCANA's Multidetector and filtering grid permit selective filtering of SE and BSE energies, enhance materials contrast, and can live-switch between SE and BSE signals. A second in-column detector, the Axial detector, is designed to collect SE signal with maximum efficiency and at any landing voltage, without discernable loss of SE signal.

TESCAN CLARA is equipped with two in-column detectors and an E-T detector as a standard to deliver detailed topography and phase contrast images from the sample. One of the optional retractable backscattered electron detectors – a low-energy BSE detector – collects wide-angle BSEs, and provides high material contrast, even at low accelerating voltages. Additionally, the widest selection of BSE or CL detectors is available to power your materials research at the nanoscale. In-Flight Beam Tracing™ enables analytical

conditions in a blink of an eye without any manual adjustment to the BrightBeam™ column. Furthermore, TESCANA CLARA can maintain high resolution even at high beam currents (up to 400 nA), which is beneficial for daily analytical EDS and EBSD work.

In-Flight™ Automated Control combined with the Essence™ software interface helps less experienced users confidently generate high-quality data, while seasoned users maintain the freedom to customize and configure experiments. In-Flight™ Automated Control takes over the common column and beam alignment routines, while our Essence™ modular software provides an unimimidating, user-centric interface.

Versatile and feature-rich TESCANA CLARA is ideal for the characterization of nanomaterials, for rigorous quality control in high-end manufacturing industry and for research and development.



BrightBeam™
electron
column



Field-Free
UHR SEM



Ultra-High
Resolution



Selective signal
collection



Variable Pressure
(MultiVac)



Key benefits:

- ✓ **Capture surface details at the nanoscale from any material without sample preparation** even below 1 keV landing energies and high-efficiency In-column SE detection
- ✓ **Reveal new contrast information and hidden features** with CLARA's unique method for selective BSE imaging — differentiated by take-off angle and energy — using two in-column BSE detectors and energy filtering
- ✓ **Achieve field-free, ultra-high-resolution imaging** with maximum topographic information, even from large or magnetic specimens, using BrightBeam™ technology
- ✓ **Perform the ultimate topographic nano-characterization at the lowest landing energies** by combining CLARA's BrightBeam™ technology and optional Beam Deceleration technology
- ✓ **Set up beam parameters for optimal imaging and analytical conditions quickly** using TESCAN's In-Flight Beam Tracing™
- ✓ **Arrive at areas of interest quickly and precisely** with Wide Field Optics™ and In-Flight™ Automated Controls
- ✓ **Move samples confidently and avoid collisions** using TESCAN's unique live 3D collision model which replicates the size and geometry of samples and detectors inside the chamber
- ✓ **Reveal the finest topographic details from insulating, beam sensitive and outgassing samples in low vacuum** by taking advantage of optional MultiVac, which provides the gaseous secondary electron detector (GSD) and additional water vapor atmosphere
- ✓ **Expand your research** by utilizing optional advanced characterization accessories such as integrated RAMAN, tensile stage, heating stages or Serial Block Face Imaging (SBFI)
- ✓ **Gain new insights into your materials** by leveraging TESCAN integrated BSE and CL detectors
- ✓ **Empower all users, whether novice, advanced or expert, to achieve the best imaging and analysis results** with Essence™ software, which features guided and customizable workflows, and task-focused automation
- ✓ **Design your own experiments and analytical routines** by utilizing advantages of TESCAN's open access hardware and software



Essential Specifications

BrightBeam™ Field-Free UHR FE-SEM Column

- Schottky field electron emitter, expected lifetime min. 2 years
- BrightBeam™ in-column potential tube
- Combined magnetic and electrostatic objective lens
- Dual in-column SE and BSE detection
- Electron beam landing energy range: 50eV – 30 keV (<50eV with BDT*)
- Spot optimization by electromagnetic beam aperture control
- Probe current: 2 pA–400 nA, continuously adjustable
- Maximum field of view:
 - 4.5 mm @ WD=10 mm (distortion-free imaging)
 - up to 17 mm @ WD=10 mm (live navigation)
 - > 50 mm @ max. WD
- Magnification: 2× to 2,000,000×

Electron Beam Resolution

High Vacuum Mode:

- 1.3 nm @ 1 keV
- 1.2 nm @ 1 keV with sample bias (BDT*)
- 1.5 nm @ 0.5 keV
- 0.9 nm @ 15 keV
- 0.8 nm @ 30 keV 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: pneumatic
- Chamber view (IR) camera standard
- 2nd chamber view (IR) camera*
- Integrated plasma cleaner (Decontaminator)

LM Stage

Motorized, 5-axis Compucentric 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*¹: 39 mm (65 mm without stage rotation)

- Max. specimen size: 100 mm diameter with full XY moves, rotation, no tilt (larger samples possible with limited stage travel and rotation)
- Max. specimen weight: 1000 g
 - Full XYZRT moves: 500 g
 - Full XYZ moves: 1000 g

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
- 2nd chamber view (IR) camera*
- Integrated plasma cleaner (Decontaminator)

GM Stage

Motorized, 5-axis Compucentric Stage

- X & Y axis travel range: 130 mm
- Z axis travel range: 100 mm
- Tilt range: compucentric, -70° to +90°
- Rotation: compucentric, 360 degrees (continuous)
 - Max. specimen height*¹: 92 mm (133 mm without stage rotation)
- Max. specimen size: 180 mm diameter with full XY moves, rotation, no tilt (larger samples possible with limited stage travel and rotation)
- Max. specimen weight: 8000g
 - Full XYZRT moves: 1000 g
 - Full XYZ moves: 8000 g
- Cradle stage*

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

Vacuum System

- High vacuum: <1×10⁻³ Pa
- MultiVac (N₂, H₂O)*: 7-500 Pa
- Pump types: all oil-free
- Load lock (manual or fully motorized)*

*Optional equipment

*¹Clearance to analytical WD.



Detectors and Analyzers

- pA meter incl. touch alarm function
- Everhart-Thornley chamber detector (E-T)
- In-column Energy-Filtered Multidetector (MD)
- In-column Axial detector (Axial)
- Gaseous SE detector (GSD)* - component of optional 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 (4Q LE-BSE)*
- Water-cooled, scintillator type, retractable (motorized) BSE, heat resistant <800 °C*
- Aluminum-coated, scintillator type, retractable (motorized) BSE for concurrent CL detection (Al-coated 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 (HADF R-STEM)*
- Optical Navigation and Correlation Camera (ONCam)*²
- EDS* (3rd party)
- EBSD* (3rd party)
- WDS* (3rd party)

Accessories

- Electron Beam Lithography*
 - Electrostatic beam blanker for SEM column*
 - TESCAN Essence™ EBL kit*
 - TESCAN Flow™ EBL offline*

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
- Dynamic focus
- Line and frame accumulation
- Drift-corrected frame accumulation (DCFA)
- Accessories
 - Electron Beam Lithography*
 - Electrostatic beam blanker for SEM column*
 - ESCAN Essence™ EBL kit*
 - TESCAN Flow™ EBL offline

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

Automated and Semi-automated SEM column adjustment routines

- SEM Emission control
- Automated electron source alignment
- Automated electron beam spot optimization
- Automated SEM column and Objective alignment

In-Flight Automated Controls

- In-Flight™ Beam Tracing™
- In-Flight™ Brightness and Contrast Adjustment
- In-Flight™ Auto Focus
- In-Flight™ Auto Stigmators
- In-Flight™ Auto Objective Centering
- In-Flight™ Auto Stigmators Centering

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 GTX1660 or equivalent
- Windows 11 Pro 64-bit
- 32" QHD monitor
- (Details available upon request)

TESCAN Essence™ software features

- Compact modular GUI
- Customizable GUI layouts
- Customizable shortcuts (F-keys)
- Multi-user account management
- Quick search bar
- Undo/Redo commands
- Live 3D collision model including IR camera view

*Optional equipment

²Navigation image can be acquired for samples with maximum height 40 mm.



- Sample stage navigation
- Single, dual, quad or hexa live image(s) display
- Multi-channel colored live image
- Histogram and LUT manipulation
- Image Processing
- Image measurement, tolerance measurement
- Object Area
- Instrument presets
- Positioner
- Switch-off Timer
- SharkSEM
- Remote support via TeamViewer

- Coral*
- Defect navigation*
- Synopsys Client*
- System Examiner*
- SharkSEM Advanced*
- TESCAN Flow (offline processing)*

Optional TESCAN Essence™ modules

- Image Snapper*
- Sample Observer*

Microscope Installation

Installation Requirements¹:

- Power supply: 230 V $\pm$ 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)

¹Request site-survey by TESCAN authorized technician.

Environmental Requirements²:

- 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 μ m/s below 30 Hz, <20 μ m/s for 30 Hz and above
- Acoustic noise: Less than 60 dBC
- Altitude: max. 3000 m above sea level

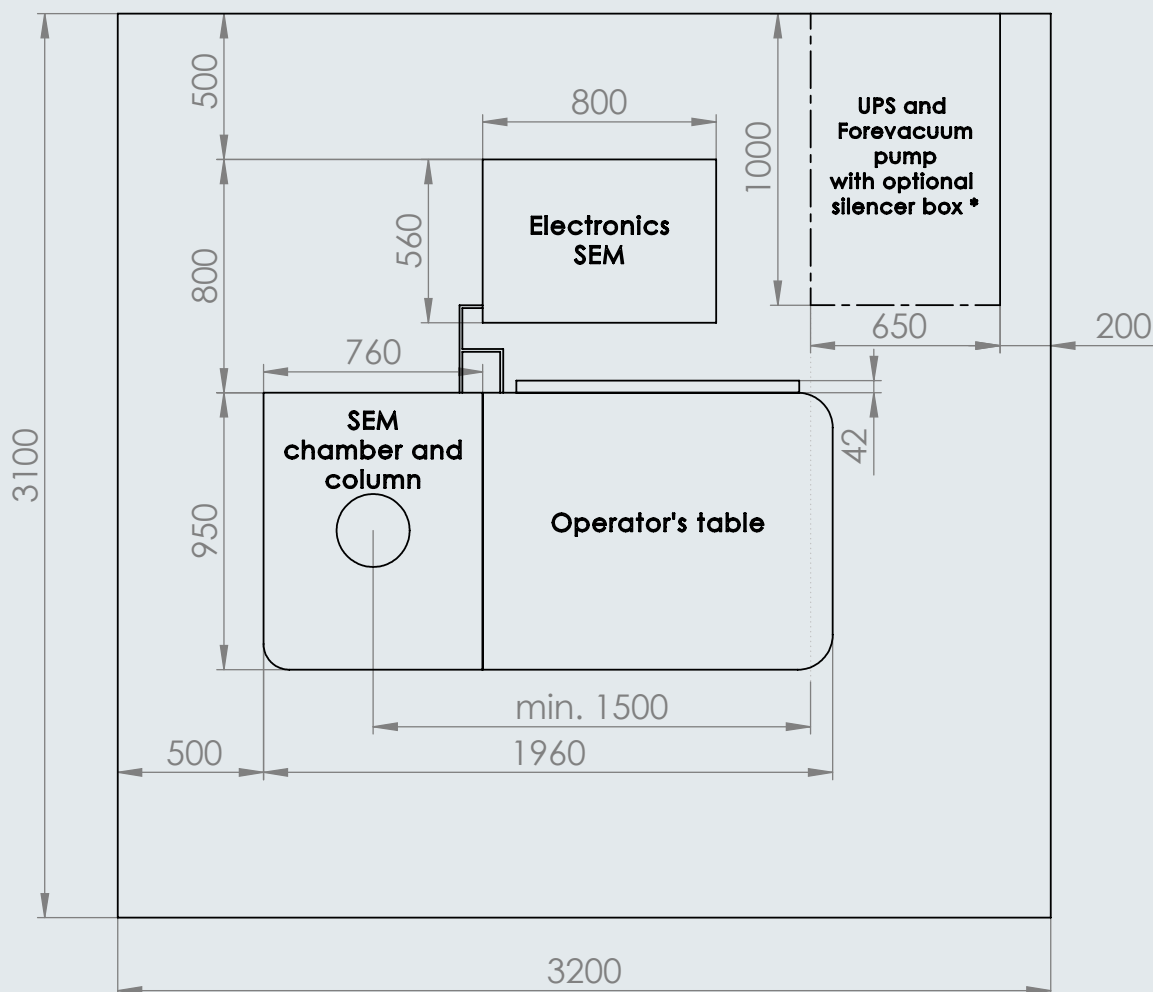
²Specification of background magnetic field is subject to actual acceleration voltage. Specified values are for 20 kV acceleration voltage.

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).



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TESCAN CLARA is based on the TESCO S8000 platform

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TESCAN GROUP, a.s.

Libušina tř. 21, 623 00 Brno - Kohoutovice / Czech Republic
(phone) +420 530 353 411 / (email) sales@tescan.com / marketing@tescan.com