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DATASHEET

Prisma E SEM

The most complete SEM for multi-user laboratories requiring all-round performance and ease-of-use

The Prisma E SEM is the first tungsten-based SEM supporting integrated ColorSEM Technology for combined elemental and topographic information in real time. Prisma includes an environmental mode (ESEM) and can be configured to meet specific needs with a full range of accessories.

Academic and industrial laboratories expect a modern scanning electron microscope to get the most data out of the widest variety of samples with excellent image quality. Since most laboratories are multi-user facilities, ease of use is of utmost importance so that all data is accessible for operators of all experience levels. The Thermo Scientific™ Prisma™ E SEM delivers on all these requirements.

The Prisma E SEM is the successor to the successful Quanta SEM series, formerly produced by FEI, and takes its ease of use, performance and flexibility to the next level. The Prisma E SEM comes with a new chamber that accommodates large, heavy samples and provides ample room for the many detector options. A new stage and new sample holder allow loading 18 samples at a time, while intuitive camera-based navigation* directly points you to the region of interest, enabling automated imaging.

The user interface provides new innovative functions, such as Undo/Redo, that speed up your work and make it easier for novice users to get started. The user interface is configurable for novice and expert user levels as required. You will only see the functions that you feel comfortable with. On the Prisma E SEM, the *in situ* and environmental capabilities of ESEM provide excellent image quality at any vacuum level and on any sample, while a range of software-integrated in situ stages enables materials testing in real-world conditions.

Thermo Scientific™ ColorSEM™ Technology is an optional tool for intuitive sample characterization. This option combines conventional SE or BSE imaging with live elemental analysis. Novel algorithms instantly map different hues onto the SEM image, which is no longer limited to greyscale. This allows

Key benefits

Live composition-based image coloring for the most intuitive elemental analysis with optional ColorSEM Technology and integrated EDS. Speed up your work and obtain the most complete sample information with always-on analysis.

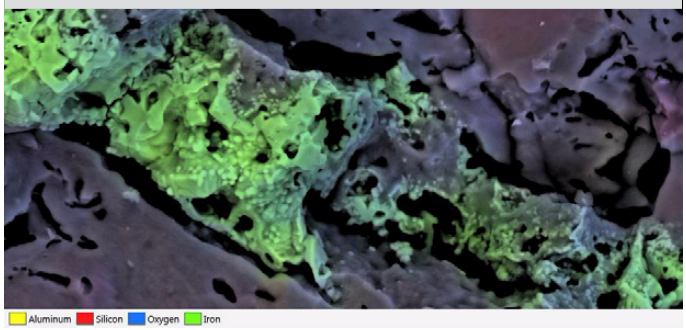
Minimize sample preparation time: low vacuum and ESEM capability enable charge-free imaging and analysis of non-conductive and/or hydrated specimens..

Excellent image quality at low kV and low vacuum thanks to flexible vacuum modes including through-the-lens differential pumping. Simultaneous SE and BSE imaging in every mode of operation.

***In-situ* study of materials in their natural state:** With Prisma E's ESEM mode, samples can be imaged even if they are hot, dirty, outgassing or wet.

Excellent analytical capabilities with a chamber that allows 3 simultaneous EDS detectors, EDS ports that are 180° opposite, WDS, coplanar EDS/EBSD and high quality charge free EDS and EBSD in low vacuum.

Easy to use, intuitive software with User Guidance and Undo functionality makes highly effective operation possible for novice users, while enabling experts to do their work faster and with fewer mouse clicks.



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anyone operating the SEM to tell materials apart not only by their shape but by automatic colorization representing chemical composition. This way, ColorSEM Technology provides direct access to crucial sample information and, as a consequence, a more complete characterization in the shortest time.

The unique combination of accessible all-round performance, a large set of accessories, and the most intuitive elemental analysis with ColorSEM Technology make the Prisma E SEM the go-to SEM for research, process control and failure analysis in any industry or field.

Electron optics

- High performance thermal emission SEM column with tetrode dual-anode source emission geometry
- Stable electronically aligned column with fixed objective aperture for ease of operation
- 45° objective lens geometry
- Through-the-lens differential pumping reduces beam skirting for the most accurate analysis and highest resolution at low beam energies in low vacuum

Electron beam resolution

- High-vacuum imaging
  - 3.0 nm @ 30 kV (SE)
  - 4.0 nm @ 30 kV (BSE)*
  - 8.0 nm @ 3 kV (SE)
- High-vacuum imaging with beam deceleration
  - 7.0 nm @ 3 kV (BD mode* + DBS*)
- Low-vacuum imaging
  - 3.0 nm @ 30 kV (SE)
  - 4.0 nm @ 30 kV (BSE)
  - 10 nm @ 3 kV (SE)
- ESEM
  - 3.0 nm @ 30 kV (SE)

Electron beam parameter space

- Beam current range: up to 2 µA, continuously adjustable
- Accelerating voltage range: 200 V – 30 kV
- Magnification: 5 to 1,000,000× (Polaroid)

Chamber

- Inside width: 340 mm
- Analytical working distance: 10 mm
- Ports: 12
- EDS take-off angle: 35°
- Three simultaneous EDS detectors possible, two at 180°
- Coplanar EDS/EBSD orthogonal to the tilt axis of the stage
- General purpose 7- or 52-pin electrical feedthrough

Detectors

Prisma E SEM detects up to four signals simultaneously from any combination of the available detectors or detector segments:

- ETD – Everhart-Thornley SE detector
- Low-vacuum SE detector (LVD)
- Gaseous SED (GSED) (used in ESEM mode)
- IR camera for viewing sample in chamber
- Thermo Scientific™ Nav-Cam™ Camera – color optical camera for sample navigation*
- DBS – Directional Backscatter Detector; retractable or lens-mounted segmented under-the-lens BSED*
- DBS-GAD – Lens-mounted gaseous analytical BSED*

Optimized detection for every vacuum mode

Vacuum range	SE	BSE	Other
High vacuum: **<6·10^{-4} Pa**	ETD	DBS*, GAD*	
Low vacuum: up to **130 Pa**	LVD	GAD*, DBS*	IR camera, Nav-Cam, STEM3+, CL, Current measurement, External
ESEM: up to **2,600 Pa**	GSED, ESEM-GAD*	ESEM-GAD*, GAD*	

- ESEM-GAD for simultaneous SE and BSE detection in ESEM at high chamber pressure*
- STEM 3+ – Retractable segmented detector (BF, DF, HADF, HAADF)*
- Thermo Scientific™ WetSTEM™ Detector – Cooling stage integrated STEM for observation of thin wet samples*
- RGB-CLD – real color cathodoluminescence (CL) detector*

ColorSEM Technology*

Live SEM image coloring is available based on energy-dispersive X-ray spectroscopy (EDS). Point & ID, linescan, region, element maps and accurate Noran quantification are included.

- EDS detector size: 10, 30, 60 or 100 mm^2
- Light element sensitivity down to beryllium
- 127 eV or 129 eV spectral resolution
- Optional motorized slide available
- Advanced mode with Pathfinder*

Vacuum system

- Electron beam current measurement*Vacuum system
- 1 × 250 liter/s TMP, 1 × PVP
- Patented through-the-lens differential pumping
- Beam gas path length: 10 mm or 2 mm
- Evacuation time: ≤ 3.5 minute to high vacuum and ≤ 4.5 minute to ESEM
- ESEM pressure up to 2,600 Pa (H_2O, default) or 4,000 Pa (N_2, auxiliary gas kit required)

Sample holders

- Standard multi-sample SEM holder uniquely mounts directly onto the stage, hosts up to 18 standard stubs (⌀ 12 mm), does not require tools to mount a sample
- Multi-purpose holder* for 18 stubs, three pre-tilted stubs, cross-section samples and STEM samples
- Wafer and custom holders*

Stage and sample	
Type	Eucentric goniometer stage, 5-axes motorized
XY	110 × 110 mm
Repeatability	< 3.0 µm (@ 0° tilt)
Motorized Z	65 mm
Rotation	n × 360°
Tilt	-15° / +90°
Max. sample height	Clearance 85 mm to eucentric point (10 mm). Taller samples (>200 mm) can be supported with the stage at 90° tilt
Max. sample weight	• 500 g in any stage position • Up to 5 kg at 0° tilt (some restrictions apply)
Max. sample size	122 mm diameter with full X,Y, rotation (larger samples possible with limited stage travel or rotation)

System control

- 64-bit GUI with Windows 10, keyboard, optical mouse
- 24-inch LCD display, WUXGA 1920 × 1200 (second monitor optional)
- Customizable graphical user interface, with up to four simultaneously active views
- Image registration
- Navigation montage
- Image analysis software
- Undo / Redo functionality
- User Guidance for basic operations / applications

Image processor

- Dwell time range from 50 ns – 25 ms/pixel
- Up to 6144 × 4096 pixels
- File type: TIFF (8-, 16-, 24-bit), JPEG or BMP
- Single-frame or 4-view image display
- SmartSCAN (256-frame average or integration, line integration and averaging, interlaced scanning)
- DCFI (Drift Compensated Frame Integration)

In-situ accessories (optional)

- Software controlled -20°C to +60°C Peltier cold stage
- Software controlled 1,000°C ESEM heating stage
- Software controlled 1,100°C High Vacuum Heating Stage
- Software controlled 1,200°C µHeater
- Software controlled 1,400°C ESEM heating stage
- Manipulators
- Cryo-stage
- Electrical probing / multi-probing stations

System options

- Beam deceleration with stage bias from -4,000 V to +50 V
- Fast beam blanker
- Sample / chamber cleaning: CryoCleaner, Integrated Plasma Cleaner
- Thermo Scientific™ QuickLoader™ Vacuum Technology – load lock for fast sample transfer
- Support PC
- Manual user interface
- Joystick
- Analysis: EDS, EBSD, parallel beam WDS, CL, Raman
- Integrated 16-bit patterning engine, electron beam lithography modules
- Specimen current meter
- Specimen holder kit
- Acoustic enclosure for vacuum pump
- 7- or 52-pin electrical feedthrough
- Oil-free pre-vacuum option pumping
- SEM start-up kit

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Software options

- Thermo Scientific™ Maps™ Software for automatic large area acquisition using tiling and stitching; correlative work
- Thermo Scientific™ AutoScript™ 4 Software – a Python-based application programming interface
- TopoMaps for image colorization, image analysis and 3D surface reconstruction
- Advanced image analysis software
- Remote control software

Documentation

- Online User Guidance
- Operating instructions handbook
- Online help
- Prepared for Thermo Scientific™ RAPID™ Service (remote diagnostic support)

Warranty and Training

- One-year warranty
- Choice of service maintenance contracts
- Choice of operation / application training contracts

Installation requirements

(Refer to preinstall guide for detailed data)

- Power:
  - Voltage 100 – 240 V AC (-6%, +10%)
  - Frequency 50 or 60 Hz (±1%)
  - Consumption: <3.0 kVA for basic microscope
- Environment:
  - Temperature (20 ± 3)°
  - Relative humidity below 40%
  - Stray AC magnetic fields <100 nT asynchronous, <300 nT synchronous for line times, 20 ms (50 Hz mains) or 17 ms (60 Hz mains)
- Minimum door size: 0.9 m wide × 1.9 m high
- Weight: column console 550 kg
- Dry nitrogen recommended for venting
- Acoustics: <68 dBC (site survey required as acoustics spectrum relevant)
- Floor vibrations: site survey required, as floor spectrum relevant
- Optional active vibration isolation table

Consumables (partial list)

- Tungsten filaments
- Apertures
- Rotary pump oil

* Optional

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

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