Product Data

Quanta™ 250 FEG

Discover what a truly high resolution versatile SEM can do

Addressing the need to investigate a wide variety of materials and characterize structure and composition, the FEI Quanta™ FEG provides unmatched flexibility to increase both performance and versatility to handle the challenges of today's wide ranging research needs. View any sample and get all the data: surface images and compositional images can be combined with accessories for determining material properties and elemental composition.

Today's research extends beyond simple metals and coated samples and the Quanta series can comfortably handle challenges to produce top quality images and analysis. The Quanta 50 series from FEI is the advanced, flexible solution for current and future research applications. Featuring three imaging modes – high vacuum, low vacuum and ESEM™, it accommodates the widest range of samples of any SEM system. These instruments are engineered to provide maximum data – imaging and microanalysis – from all specimens, with or without preparation. Characterization of both traditional samples from metals, fractures and polished sections, to non-conductive soft materials.

The Quanta 50 series is the third generation Quanta system built on the success of previous generations of ESEM Schottky FEG. This series has an easy-to-use and flexible user interface with functions to maximize productivity and allow all the data to be collected. Designed by microscopists for microscopists, this instrument series is truly above and beyond 'easy to use'. Navigation features include auto navigation montage, double-click stage-movements, drag-to-zoom and other useful features incorporated as standard. SmartSCAN™ technology is smart scanning strategy to reduce noise and provide better data. Additional new options such as beam deceleration to improve low kV performance, Nav-Cam™ color image navigation, and new retractable detectors provide even greater flexibility to the Quanta FEG series.

Better data. More flexibility. Higher efficiency. General purpose FEG ESEM is now within your reach.

Key benefits

- Only high resolution FEG-SEM with ESEM technology
- Characterize conductive and non-conductive samples with SE and BSE imaging possible in every mode of operation
- Minimize the amount of sample preparation, low vacuum and ESEM capability enables charge-free imaging and analysis of non-conductive and/or hydrated specimens
- Increase analytical capabilities by enabling EDS and EBSD analysis on conductive and non-conductive samples in high and low vacuum thanks to Quanta's patented through-the-lens pumping. Stable high current FEG (up to 200 nA) enable fast, accurate analysis
- Perform dynamic *in situ* analysis of diverse samples in their natural state above or below ambient temperatures from - 165 °C to 1500 °C with specialized *in situ* stages
- Enable surface imaging with optional beam deceleration mode to get surface and compositional information from conductive samples
- Easy to use, intuitive software makes highly effective operation possible for novice users

Typical applications include:

NanoCharacterization
- Metals & alloys, oxidation/corrosion, fractures, welds, polished sections, magnetic and superconducting materials
- Ceramics, composites, plastics
- Films/coatings
- Geological sections, minerals
- Soft materials: polymers, pharmaceuticals, filters, gels, tissues, plant material
- Particles, porous materials, fibers

in situ NanoProcesses
- Hydration/dehydration
- Wetting behaviour/contact angle analysis
- Oxidation/corrosion
- Tensile (with heat or cooling)
- Crystallization/phase transformation

NanoPrototyping
- Electron beam lithography (EBL)
- Electron beam-induced deposition (EBID)

Essential specifications

Electron optics
- High resolution Schottky field emission
- SEM column optimized for high brightness/high current
- 45° objective lens geometry with through-the-lens differential pumping and heated objective apertures
- Maximum horizontal field width: 5 mm at analytical working distance (10 mm); 8.8 mm at 25 mm WD
- Accelerating voltage: 200 V to 30 kV
- Probe current: ≤ 200 nA, continuously adjustable
- Magnification: 14 to 1000000 x

Electron Beam resolution
- High vacuum
  - 0.8 nm at 30 kV (STEM)*
  - 1.0 nm* at 30 kV (SE)
  - 2.5 nm at 30 kV (BSE)*
  - 3.0 nm at 1 kV (SE)
- High vacuum with beam deceleration option
  - 3.0 nm at 1 kV (BD mode* + BSE*)
  - 2.3 nm at 1 kV (BD mode* + ICD*)
  - 3.1 nm at 200 V (BD mode* + ICD*)
- Low vacuum
  - 1.4 nm at 30 kV (SE)
  - 2.5 nm at 30 kV (BSE)*
  - 3.0 nm at 3 kV (SE)
- Extended vacuum mode (ESEM)
  - 1.4 nm at 30 kV (SE)

Detectors
- Everhardt Thornley SED (secondary electron detector)
- Large Field Low vacuum SED (LFD)
- Gaseous SED (GSED) (used in ESEM mode)
- High sensitivity low kV SS-BSED*
- IR camera for viewing sample in chamber
- Gaseous BSED (BSE detector for high pressures, used in ESEM mode)*
- 4 quadrant solid-state BSED*
- Scintillator BSED/CLD*
- vCD (low voltage high contrast detector)*
- In-column detector (ICD) for secondary electrons in BD mode*
- Electron beam current measurement*
- Gaseous analytical BSED (GAD)*
- STEM detector*
- Nav-Cam™ - color optical camera for sample navigation*
- Cathodoluminescence*
- EDS*
- WDS*
- EBSD*

Vacuum system
- 1 x 250 l/s TMP (turbomolecular pump), 2 x PVP
- Patented through-the-lens differential pumping
- Beam gas path length: 10 mm or 2 mm
- Optional upgrade to oil free scroll/dry PVPs
- 2 x IGP
- Chamber vacuum (high) < $6e^{-4}$ Pa
- Chamber vacuum (low) < 10 to 130 Pa
- ESEM vacuum < 10 to 4000 Pa
- Evacuation time: ≤ 150 s to high vacuum and ≤ 270 s to ESEM (FEI standard test procedures)
- Optional Cryo Cleaner cold trap

Chamber
- 284 mm size left to right
- 10 mm analytical WD
- 8 ports
- EDS take-off angle: 35°

* optional

Stage
- X-Y = 50 mm
- Z = 50 mm (25 motorized)
- T = - 15° to + 75° (manual)
- R = 360° continuous
- Repeatability: 2 µm (x and y)
- Tilt-eucentric at analytical height (10 mm)
- x and y movements are in the tilt plane
- Beam deceleration (cathode lens/sample bias)*

Sample holders
- Multi-stub holder
- Single stub mount, mounts directly onto stage
- Universal sample holder kit*
- Various wafer and custom holder(s) available by request*

System control
- 32-bit graphical user interface with *Windows® XP*, keyboard, optical mouse
- One/Two* 19-inch LCD displays, SVGA 1280 x 1024
- Software-controlled switchbox*
- Joystick*
- Manual user interface*

Image processor
- Up to 4096 x 3536 pixels (~14 MP)
- File type: TIFF (8 or 16 bit), BMP or JPEG
- Single frame or 4-quadrant image display
- 4 quadrants live
- Live or static signal mixing in color or grayscale
- 256 frame average or integration
- Digital video recording (.avi)
- Image histogram and measurement software

Supporting software features
- SmartSCAN™ scan strategy
- Navigation Montage automated routine
- SW temperature control
- Interval image acquisition in 1 to 4 quads
- Multiple image saving function
- FEI Movie Creator Utility (custom .avi file creation from automatically acquired TIFF image series)
- Large Image Window Functionality (displays image on a separate monitor allows dual full screen imaging from different detectors)

System options
- Beam deceleration
- Manual user interface
- Support PC (including 2nd 19-inch monitor)
- SW controlled Peltier cooled specimen stage
- SW controlled WetSTEM™ system
- SW controlled 1000 °C heating stage
- SW controlled 1500 °C heating stage
- Cryocleaner
- Cryocleaner spare vessel
- Joystick
- AAS (automatic aperture system)
- Specimen current meter
- Remote control SW
- Video printer
- Specimen holder kit
- Acoustic enclosure for vacuum pump
- 7 or 52 pin electrical feedthrough
- Electrostatic beam blanker
- WDS completion kit
- Scroll pre-vacuum pump kit

Common 3rd party accessories
- EDS
- WDS
- EBSD
- Cryo stage
- Cathodoluminescence
- Sample current detector
- Nanomanipulators
- Lithography systems
- CAD navigation
- Electrical probing

Documentation and support
- On-line help
- 'Quanta FEG Getting Started' training CD
- RAPID™ (remote diagnostic support)
- Free access to FEI for owners on-line resources
- Free membership in the FEI ESEM User Club

* optional

Software options

- Remote control/viewing software
- Image analysis software
- Web-enabled data archive software
- Height mapping/roughness measurement software

Warranty and training

- 1 year warranty
- Optional applications training class available
- Choice of service maintenance
- Choice of operation/application training contracts

Installation requirements

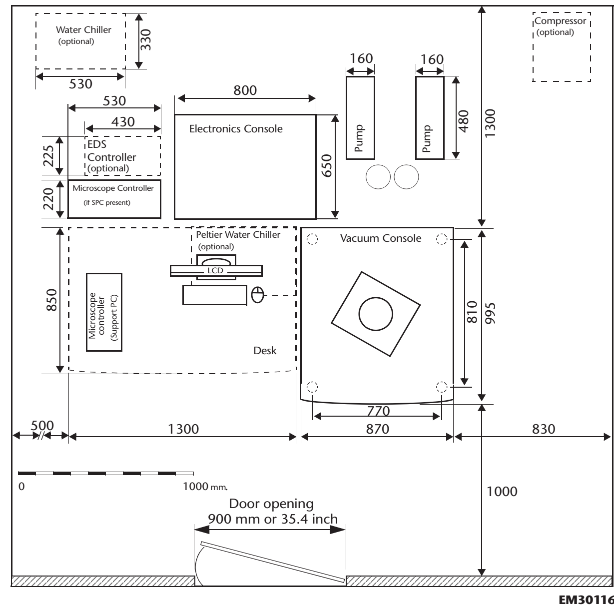
(refer to pre-install guide for additional data)

- Power: voltage 230 V (+ 6 %, - 10 %), frequency 50 or 60 Hz (+/- 1 %)
- Power consumption: < 3.0 kVA for basic microscope
- Earth resistance: < 0.1 Ω
- Environment: temperature 20 °C +/- 3 °C, relative humidity below 80 % RH, stray AV magnetic fields
  < 40 nT asynchronous
  < 300 nT synchronous
- Door width: 90 cm
- Weight: column console 530 kg
- Weight: electrical console 139 kg
- Dry nitrogen recommended: system (0.7 to 0.8 bar, max 10 l/min during vent)
- Compressed air 4 to 6 bar - clean, dry and oil-free
- System chiller is only required if room is not meeting specification according pre-install instructions
- Acoustics: < 68 dBC (site survey required as acoustics spectrum relevant)
- Floor vibrations (site survey required as floor spectrum relevant)
- Vibration isolation table available as option

Energy conservation

- Energy Star compliant monitors and PC systems
- System designed to operate without water chiller

Floor plan



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