

## Quanta™ 450

### Discover what a truly versatile SEM can do

Addressing the need to investigate a wide variety of materials and characterize structure and composition, the FEI Quanta™ provides flexibility and versatility to handle the challenges of today's wide ranging research needs. View any sample and get all the data: surface 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 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. Characterization of both traditional samples from metals, fractures and polished sections, to non-conductive soft materials.

The Quanta 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 series.

Better data. More flexibility. Higher efficiency. The Quanta series delivers more value for your investment.

#### Key benefits

- 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 beam currents (up to 2  $\mu$ A) 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 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

- Lithography
- EBID

## Essential specifications

### Electron optics

- High performance thermal emission SEM column with dual-anode source emission geometry
- Fixed objective aperture for ease of operation
- 45° objective lens geometry with through-the-lens differential pumping
- Maximum horizontal field width: 6.5 mm at analytical working distance (10 mm); 24.3 mm at 65 mm
- Accelerating voltage: 200 V to 30 kV
- Probe current: up to 2 µA, continuously adjustable
- Magnification: 6 to 1000000 x

### Electron beam resolution

- High vacuum
  - 3.0 nm at 30 kV (SE)
  - 4.0 nm at 30 kV (BSE)\*
  - 8.0 nm at 3 kV (SE)
- High vacuum with beam deceleration option
  - 7.0 nm at 3 kV (BD mode\* + vCD\*)
- Low vacuum
  - 3.0 nm at 30 kV (SE)
  - 4.0 nm at 30 kV (BSE)\*
  - 10 nm at 3 kV (SE)
- Extended vacuum mode (ESEM)
  - 3.0 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)\*
- 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), 1 x PVP
- Patented through-the-lens differential pumping
- Beam gas path length: 10 mm or 2 mm
- Optional upgrade to oil free scroll/dry PVP
- Chamber vacuum (high) < 6e<sup>-4</sup> Pa
- Chamber vacuum (low) < 10 to 130 Pa
- ESEM vacuum < 10 to 2600 Pa
- Evacuation time: ≤ 150 s to high vacuum and ≤ 270 s to ESEM (FEI standard test procedures)

### Chamber

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

\* optional

### Stage

- X-Y = 100 mm
- Z = 60 mm
- Z clearance = 75 mm
- T = - 5° to + 70°
- R = 360° continuous
- Repeatability: 2 µm (x and y)
- Tilt-eucentric at 11.3 mm mounting height for all working distances
- 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
- Various wafer and custom holder(s) available by request\*
- Universal sample holder kit\*

### System control

- 32-bit graphical user interface with *Windows® XP*, keyboard, optical mouse
- One/Two\* 19-inch LCD displays, SVGA 1280 x 1024
- MagicSwitch™ (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 2<sup>nd</sup> 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
- 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
- Auxilliary gas kit (for gases instead of water)

### Common 3<sup>rd</sup> party accessories

- EDS
- WDS
- EBSD
- Cryo stage
- Cathodoluminescence
- Sample current detector
- Nanomanipulators
- Lithography system
- CAD navigation
- Electrical probing

### Documentation and support

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

### Software options

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

\* optional

**Warranty and training**

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

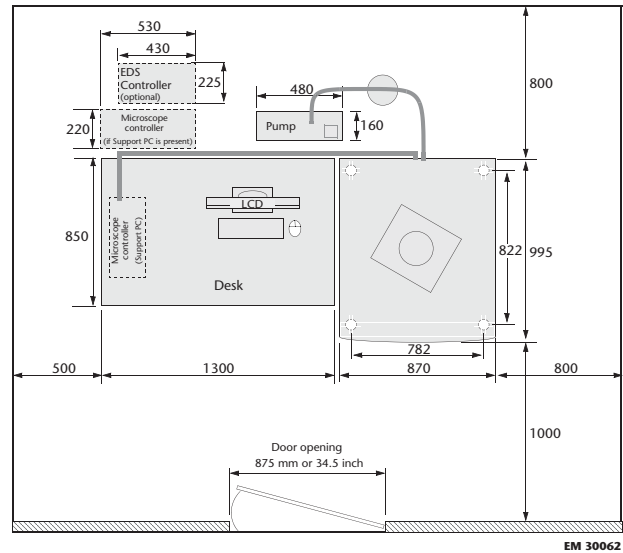
**Installation requirements**  
(refer to pre-install guide for additional data)

- 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: maximum temperature range for operation 15 °C to 25 °C, relative humidity below 80 % RH (non-condensing), stray AV magnetic fields  
< 100 nT asynchronous  
< 300 nT synchronous
- Door width: 90 cm
- Weight: column console 450 kg
- Dry nitrogen recommended: system (0.7 to 0.8 bar, max 10 l/min during vent)
- 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 or compressed air

**Floor plan**



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