



## QEMSCAN<sup>®</sup> 650F

### Automated, Quantitative Petrographic Analyzer

QEMSCAN<sup>®</sup> 650F is a laboratory-based, automated petrography analyzer, initially developed for the Mining Industry by CSIRO, Australia (Intellection). It serves Mineralogy, Petrology and Metallurgy use cases in a range of Natural Resources industries, such as Mining, Oil & Gas and Geoscience Institutes.

A key attribute of the QEMSCAN 650F system is ultra-fast mineral identification for each point on a finely spaced measurement grid. Advanced software automation enables unattended data acquisition. Basic system output such as modal mineralogy, grain sizes, mineral associations, mineral liberation and 2D porosity, or calculated data such as elemental chemistry, rock matrix density or grade-recovery curves, are based on hundreds of thousands of underlying individual measurements and mineral classifications.

QEMSCAN 650F excels at consistent and robust data acquisition from a wide variety of sample types, combined with a versatile mineral identification process (Species Identification Protocol or SIP) and powerful, versatile data analysis and reporting functionality (iDiscover). Many of the acquisition and analysis routines have been inspired by standard optical petrography methods such as point counting and linear intercepts. The results are high spatial resolution petrographic images that are intuitive and readily accessible to a wide range of professions outside the laboratory. The images form the basis of subsequent image or particle-by-particle textural, mineralogical, chemical or associated data analysis.

Common applications in the Mining Industry are ore characterization for populating block models or plant optimization and yield excursion troubleshooting. Oil & Gas companies or service providers use QEMSCAN for high resolution petrographic analysis of core or cuttings samples, such as automated lithotyping, clay typing and 2D porosity measurements.

Field electron emission (FEG) provides a premium user experience, enhancing ease of use, beam current stability, image and X-ray acquisition throughput and backscattered electron image quality.

#### Key Benefits

- Petrographic analyzer, i.e. combined Mineralogy and Texture
- High resolution, versatile environmental SEM platform
- Petrographic data; modal mineralogy, clay typing, grain size, mineral association, mineral liberation, 2D porosity
- Calculated data; lithology, particle or rock matrix density, assay, grade – recovery, elemental distribution
- Statistically meaningful data
- 24/7 system productivity
- Retrospective data interrogation (off-line)
- Dedicated support resources (geologists, mineralogists)

## Essential specifications

### Key features

- Petrographic analyzer, i.e. combined Mineralogy and Texture
- FEG-ESEM™ platform
- Mineral classification by elemental analysis (SIP) algorithms
- Ultra-fast – at up to 200 measurements per second
- Automated for unattended analysis
- Quantitative, consistent data acquisition and analysis
- Particle-by-particle (mineral-by-mineral) analysis
- Report templates for a range of industries, e.g. mining, oil & gas
- Smallest practical particle size: 1 µm
- Comprehensive support through annual subscriptions including software upgrade licenses

### System

- Environmental, Field Emission Scanning Electron Microscope (FEG-ESEM)
- Dual silicon-drift Energy Dispersive X-ray spectrometers (EDS)
- QEMSCAN scanning and pulse processing (eSCAN and eXRAY)
- QEMSCAN software suite (iMeasure and iDiscover)

### ESEM™

- Intrinsic SEM imaging resolution: 1.2 nm
- Up to 30 kV electron beam excitation energy
- Sample stage stroke: 150 mm (X) x 150 mm (Y)
- Model: FEI Quanta™ 650 FEG
- Electron emission: field (FEG source)
- Includes environmental imaging mode for oil & gas wettability studies
- Solid-state backscattered electron detector, two segments
- Keithley picoammeter
- 14 resin block (30 mm diameter) holder standard, thin section and rough rock holder optional
- Refer to Quanta 650 FEG product data sheet for additional product data

### FEG benefits (compared to thermal emission)

- 1 year guaranteed emitter life
- No filament changes required
- Fewer column adjustments required
- Improved system setup time
- Significantly faster image acquisition
- Improved small, submicron bright phase detection (e.g. Pt, Au, U)

### EDS

- Liquid-nitrogen free, silicon drift-type detectors
- 2 x 30 mm<sup>2</sup> active X-ray detection area
- Energy resolution: ≤ 133 eV
- Typical input countrate: 800 kcps

### QEMSCAN software suite

- iMeasure
- iDiscover
  - Datastore Explorer
  - iExplorer
  - SIP editor (Species Identification Protocol)
  - SBH editor (Sample Block Holder)
  - Measurement designer
  - Datastore

### Measurement modes

- BMA – Bulk Mineralogical Analysis, equivalent to one-dimensional point counting. Fast modal mineralogy, grain sizes and mineral association data is obtained from this measurement mode
- PMA – Particle Mineralogical Analysis, equivalent to two-dimensional point counting along a grid of measurement points
- SMS/TMS – Specific Mineral Search and Trace Mineral Search. Refinement of PMA scan but only measures a sub-population of the particles based on a backscattered electron intensity threshold value
- Field Scan – captures a full petrographic image of each field on a sample. Ideal for bulk rock or core samples

### iMeasure

- Handles data acquisition
- Raw data include BSE and spectra data for each measurement – to be used to reclassify measurements
- Appending data – new measurements can be appended to older measurements from the same sample
- SMS messaging when a run is completed or aborted
- Instrument utilization logs

### SIP editor

- Two standard SIPs provided – ore and oil & gas reservoir mineralogy
- Spectra import – imports spectra data files .ems or .msa to create mineral definitions with the spectral analysis engine (SAE)
- Spectra library – holds all imported spectra data files for the SIP used as needed to create new SIP entries
- Synthetic spectrum builder – creates synthetic spectra from a formula or based on elemental weight percentages
- Simustat tests – provides a simulated spectral response for the supplied spectral data, used to test the SIP against simulated scans
- Measurement debugger

**Processing**

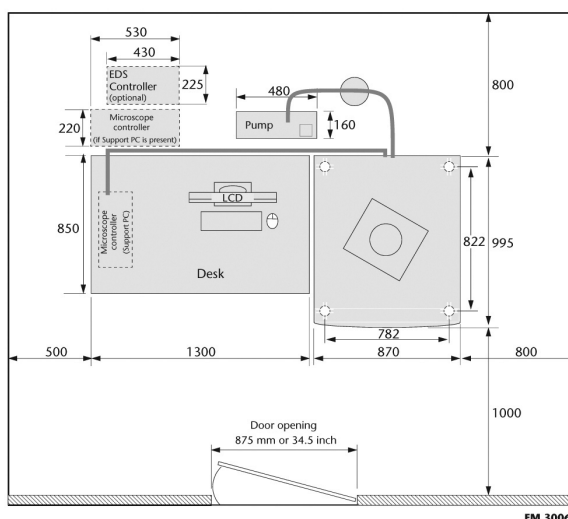
- Filter – allows exclusion of particles based on an expression
- Boundary phase processor – adjustments to eliminate boundary-phase artifacts in the measurements
- Touching particles – filters out or splits particles that are touching
- Segment Line – used to split line-scans into individual particles
- Binary Erode / Dilate – erodes / dilates the surface of particles
- Binary Open / Close – removes stray pixels and fills indentations in the perimeter of the particle
- Linear intercepts processor – splits particles into individual lines with 1 pixel spacing
- Field stitch processor – stitches fields or particles
- Particulate processor – identifies and separates particles which are not touching
- Granulator processor – extracts grains of minerals from particles, and converts them into individual particles
- Gangue buster processor – converts gangue material into background
- Retrogressor – reverts particles to their original state
- Particle manager – allows a series of processors to be applied to a set of measurements.
- Marking bad particles – allows particles to be selected and marked as “bad” and exclude them from calculations
- Editing particles – particles can be manually edited to correct errors in the measurements

**Reports**

- 3D chart
- 2D chart
- XY chart
- Modal analysis
- Particle view
- Liberation report
- Ternary diagram
- Data validation
- Generic tabular – presents data in tabular format
- Image grid – divides measurements into X and Y axes to display a grid of particle populations
- Intercept length distribution
- Mineral associations
- Recovery analysis
- Theoretical grade recovery
- Customizable reports
- Drill down reports – further investigation of a subsection of a report
- Exporting data and image – windows clipboard
- Interactive charts

- Categorizers – represent a set of rules that will take measured particles and assign them to categories, based on calculations built into the categorizer
  - Mineral categorizers
  - Element categorizers
  - Particle categorizers, simple, complex
  - Calculated values

**Floorplan**



**Installation requirements and floor plan**

Refer to the Quanta 650 pre-installation guide available upon request

**Cost of ownership**

- Warranty: 1 year standard
- Choice of hardware service contracts after warranty
- Comprehensive software support subscription after warranty
  - Software update / upgrade licenses
  - 1 annual site visit
  - Software issue reporting and ticketing
  - UGM’s – user group meetings, annual
  - FEI Australia-based training events
  - Telephone application support

## Notes

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TÜV Certification for design, manufacture, installation and support of focused ion- and electron-beam microscopes for the Electronics, Life Sciences, Research and Natural Resources markets.

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