

## MLA 600F

### The automated mineralogy analyzer with unparalleled time to data capabilities

MLA 600F is a high-speed automated mineralogy analyzer used in the mining Industry to optimize the performance of mineral processing operations. Compared to traditional automated mineralogy analyzers, the system reduces sample analysis turnaround time from days to hours, allowing operators to increase metal recovery by responding faster and more frequently to changes in feed and waste stream mineralogy.

The MLA 600F system was developed together with FEI's partner, JKTech, based in Australia. The time to data characteristics of the MLA 600F significantly reduce the analysis component of the total mineralogy analysis turnaround time and represent a significant step towards the implementation of automated mineralogy systems at the operational mining sites.

The MLA 600F uses a scanning electron microscope equipped with a field emission source (FEG) and multiple high speed energy dispersive X-ray spectrometers (EDS) to automatically acquire image and composition information from a large number of samples – typically polished sections of particulates from mineral processing operations and drill cores, or lump materials, from exploration. Specialized software from FEI's partner and mineral analysis leader, JKTech, uses the data to acquire and measure characteristics such as mineral type and proportions, elemental distributions, grain size, liberation and association – essential properties of the ore that must be accommodated in mineral processing to achieve maximum metal recovery. The ability of the MLA 600F system to reduce sample analysis turnaround times from days to hours derives from both hardware and software enhancements. Principal among them are faster, higher quality imaging provided by the high brightness electron source, and high speed data acquisition and analysis enabled by efficient sampling, fast automation and streamlined analytical design.

#### Key benefits

- Automated mineralogy analyzer using the latest SEM, EDS and mineral liberation analysis technologies
- Best in class mineral classification with breakthrough time to data capabilities
- Concentrator process management applications
- Automated template reporting capabilities
- Dual high throughput EDS detectors
- Market leading analytical field emission SEM platform
- Global sales and support network in > 50 countries

## Features & specifications

### Application and use cases

#### Applications

- Ore characterization
  - Evaluate exploration targets
  - Characterize the geometallurgical properties of an ore
  - Detection of nanoscale precious particles
- Plant design & optimization
  - Analyze products from batch or pilot scale separation tests
  - Grind size determination
- Metal recovery
  - Analyze concentrator feeds and tailings
  - Facilitate effective ore blending
  - Avoid metallurgically poor ore stocks
- Mineralogy analytical services

#### Mineral resources

- Base metals
  - Copper ore
  - Nickel ore
  - Iron ore
  - Others, such as lead, zinc, manganese
- Precious metals
  - PGM ores
  - Uranium ore
  - Gold ore
  - Others, such as silver, titanium
- Industrial minerals
- Heavy mineral sands

#### Other mineral industries

- Mineralogy characterization applications, such as:
  - Drill core mineralogy & tracer minerals (oil & gas)
  - Coal ash mineralogy (coal)
  - Polluted soils (waste management)
  - Fly ash mineralogy (cement)

#### Mineral analysis capabilities (all automated)

- Mineral classification
- Mineral abundances
- Elemental distributions
- Mineral texture
- Mineral association
- Mineral liberation

## System

### Automated mineralogy analyzer comprising

- Field emission (FEG) scanning electron microscope
- Silicon Drift (SDD) energy dispersive X-ray detectors
- Mineral Liberation Analysis (MLA) software including data acquisition, data analysis and data presentation modules
- Sample holder: 14 positions for 30 mm sample blocks

### Options

- microValidator™
  - Automated system validation
  - Certification solution for precious metals analysis routines
- Custom sample holders
  - Holders for any sample size and shape e.g. thin sections
- MLA qualification and training
  - Recommended for first time MLA users
- MLA software service contract
- Choice of SEM and EDS training arrangements

## SEM

### Electron optics

- High brightness, ultra-stable Schottky field emission source
- Typical beam stability: < 0.4 % / 10 hours
- Fast time to beam stability after pumpdown – typically < 15 minutes

### Resolution

- 1.2 nm @ 30 kV (SE)
- 2.5 nm @ 30 kV (BSE)
- Acceleration voltage: 200 V to 30 kV
- Probe current: up to 100 nA, continuously adjustable

### Detectors

- BSED, two segment solid state
- SED, Everhart Thornley & low vacuum SED (LFD)
- IR-CCD

### Vacuum

- High vacuum operating mode
- Low vacuum operating mode 10 to 130 Pa
- ESEM operating mode 1- to 4000 Pa
- 1 x 240 l/s TMP, 2 x PVP

### Chamber

- 379 mm size left to right
- 10 mm analytical working distance
- 35 ° EDS take-off angle
- Accommodates multiple EDS detectors, EBSD and WDS

### Stage

- X-Y = 150 mm
- Z = 65 mm
- T = - 5 ° to + 70 °
- R = 360° continuous

### System control

- 32 bit graphical user interface with Windows® XP SP 2, keyboard, optical mouse
- Image display: two 19 inch LCD, SVGA 1280 x 1024

### EDS

#### Detector type

- Silicon drift (SDD)
- 10 mm<sup>2</sup> active area - multiple
- Energy resolution: ≤ 133 eV
- Ultra-fast pulse processing
- No liquid nitrogen required
- Elemental mapping and spectrum quantification capabilities included

### Automated data acquisition, analysis and presentation

#### MLA software suite

- Measurement program
  - SEM and EDS control
  - Standards collection
- Processing program
  - Image processing and classification tools
  - Mineral database management
- Data presentation program (DataView)
  - View data in tabular or graphical form
  - Compare, combine and filter data sets
  - Group minerals
  - Mineral abundance (modal analysis) and sample elemental distributions (assay)
  - Particle and grain size distribution
  - Mineral associations, liberation and locking
  - Theoretical grade-recovery curves
  - Particle densities and shape factors

#### Measurement modes

- BSE – image
- X-BSE – image + X-ray
- GXMAP – image + X-ray map (Ford method)
- SPL – sparse phase liberation
- XMOD – X-ray modal composition
- RPS – rare phase search
- SX-BSE (Lätti method)
- STD – automated standards collection
- Dual Zoom (Schouwstra method)
- Dual Dwell (Moeller method)
- Line Scan

**Installation requirements**

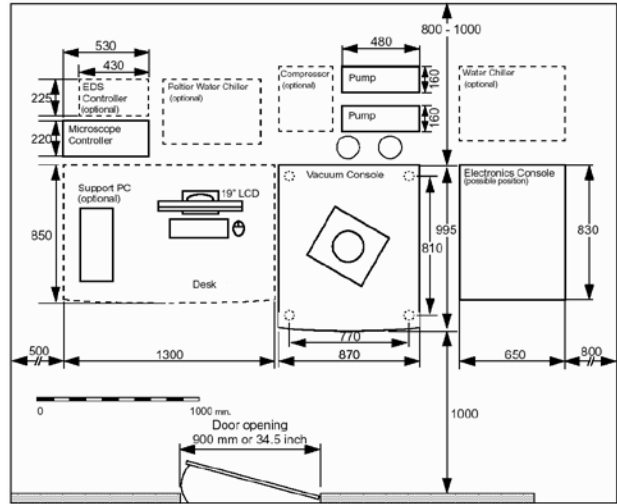
(refer to pre-install guide for additional data)

- Power: voltage 230 V (+ 6 %, -10 %), frequency 50 or 60 Hz (+/- 1 %)
- Power consumption: < 3.0 kVA for basic microscope
- Environment: temperature 20 °C +/- 3 °C, relative humidity below 80 % RH
- Stray AV magnetic fields
  - < 40 nT asynchronous
  - < 300 nT synchronous
- Acoustics: < 60 dBC
- Compressed air 4 to 6 bar – clean, dry and oil free
- Water cooling is only required if room is not meeting specification according pre-installation instructions
- Door width: 90 cm
- Weight: column console 570 kg
- Weight: electrical console 139 kg

**Service contracts**

- Comprehensive contracts (preventive and corrective maintenance included)
  - 5 x 8 hours, 72 hours on-site response time
  - 5 x 16 hours, 24 hours on-site response time
- Choice of preventive maintenance contracts only

**Floorplan**



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