Specification Sheet | **Microscopes**

Phenom XL

Desktop SEM for large samples and automation

Phenom XL
Desktop SEM for large samples and automation

Throughput and speed
Fastest loading cycle in the world

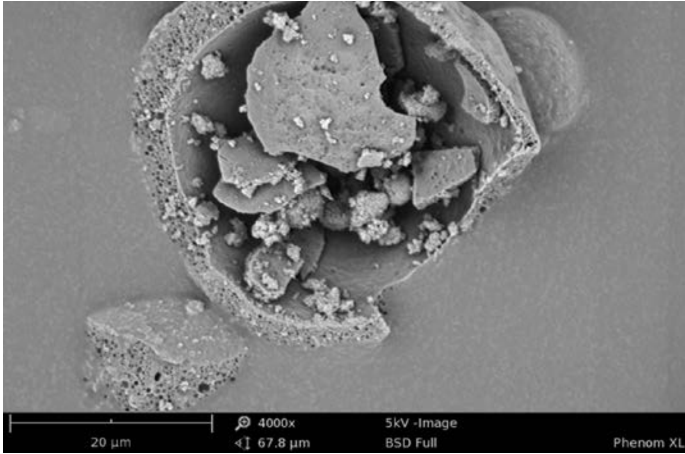
Largest sample size in its class
Motorized scan of samples up to 100 mm x 100 mm

Secondary electron detector
Detection of low energy electrons for topographical and surface information

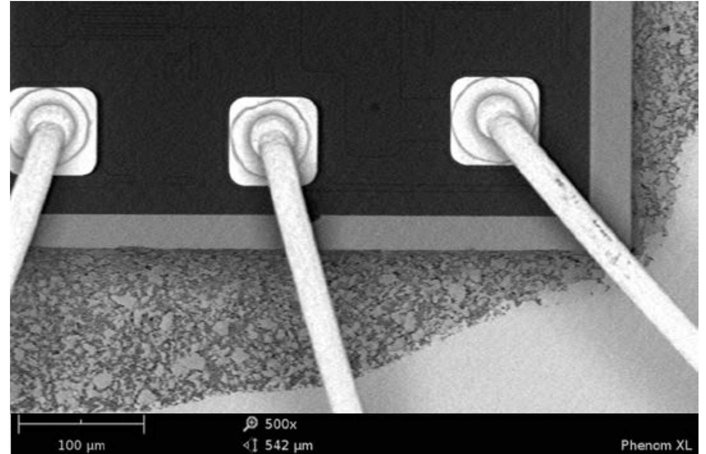
Fully integrated EDS
Elemental analysis is as easy as imaging, with fully integrated EDS

Never lost navigation
Swift navigation to any region of interest

PHENOMWORLD
part of Thermo Fisher Scientific



Pharmaceutical powder



Semiconductor device

The Phenom XL scanning electron microscope (SEM) pushes the boundaries of desktop SEM performance. It features the proven ease of use and fast time to image of any Phenom system. It is also equipped with a chamber that allows analysis of large samples up to 100 mm x 100 mm. A proprietary venting/loading mechanism ensures the fastest vent/load cycle in the world, providing the highest throughput. A newly developed compact motorized stage enables the user to scan the full sample area, and yet the Phenom XL is a desktop SEM that needs little space and no extra facilities. Ease of use is given an extra boost in the Phenom XL with a single shot optical navigation camera that allows the user to move to any spot on the sample with just a single click – within seconds.

Phenom XL

The Phenom XL features a newly designed chamber including a compact motorized stage that allows analysis of samples of up to 100 mm x 100 mm. In spite of this much larger sample size, a proprietary loading shuttle keeps the vent/load cycle to a minimum, which in practice enables a throughput that is a few factors higher than any comparable SEM system. The user interface is based on the proven ease of use technology already applied in the successful Phenom Pro and ProX desktop SEM. The interface enables both existing and new users to quickly become familiar with the system without much training. The standard detector in the Phenom XL is a four-segment backscattered electron detector (BSED) that yields sharp images and provides chemical contrast information. The Phenom XL can be equipped with two optional detector systems. The first one is a fully integrated Energy Dispersive Spectroscopy (EDS) system for elemental analysis. The second option is a Secondary Electron Detector (SED) that enables surface sensitive imaging. The ProSuite application platform is also available for the Phenom XL. With the ProSuite software, and applications such as ParticleMetric, PoroMetric, FiberMetric and 3D Roughness Reconstruction the user can further analyze samples.

Imaging Specifications

Imaging modes

• Light optical	Magnification range: 3 - 16x
• Electron optical	• Magnification range: 80 - 100,000x • Digital zoom max. 12x

Illumination

• Light optical	Bright field / dark field modes
• Electron optical	• Long lifetime thermionic source (CeB_6) • Multiple beam currents
• Acceleration voltages	• Default: 5 kV, 10 kV and 15 kV • Advanced mode: adjustable range between 4.8 kV and 20.5 kV imaging and analysis mode
• Vacuum levels	Low - medium - high
• Resolution	< 14nm

Detector

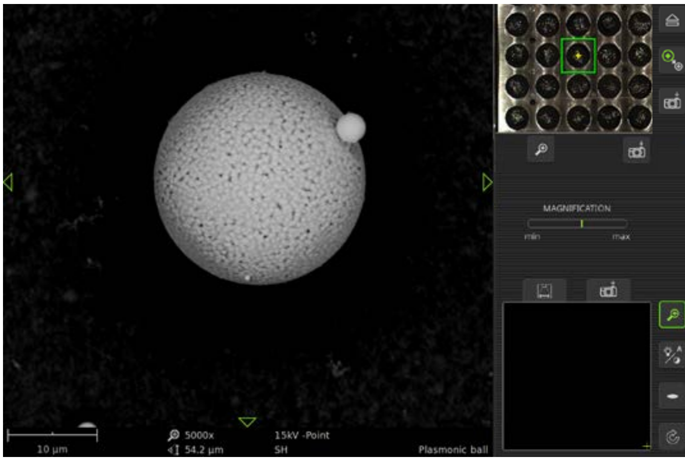
• Standard	Backscattered electron detector
• Optional	Secondary electron detector

Digital image detection

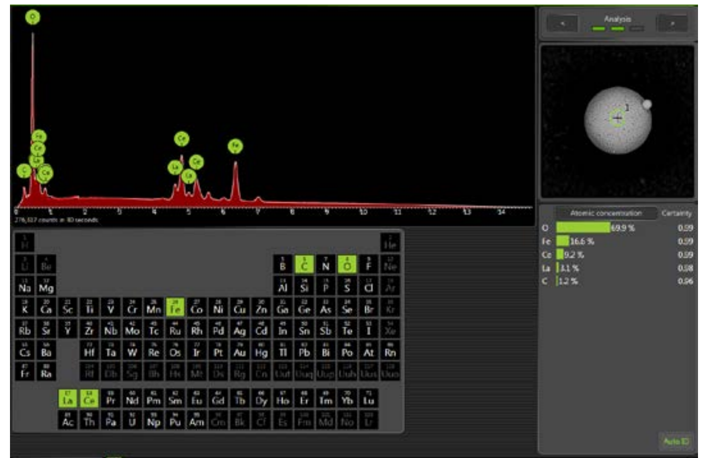
• Light optical	Proprietary high resolution color navigation camera, single shot
• Electron optical	High sensitivity backscattered electron detector (compositional and topographical modes)
Image formats	JPEG, TIFF, BMP
Image resolution options	456 x 456, 684 x 684, 1024 x 1024 and 2048 x 2048 pixels
Data storage	• USB flash drive • Network • ProSuite PC
Sample stage	Computer-controlled motorized X and Y
Sample size	• Max. 100 mm x 100 mm (up to 36 x 12 mm pin stubs) • Max. 65 mm (h)
Scan area	• 50 mm x 50 mm • 100 mm x 100 mm (optional)

Sample loading time

• Light optical	< 5 s
• Electron optical	< 60 s



Stainless steel nanoparticle



Stainless steel nanoparticle with EDS

Elemental analysis can be added by EDS technology already proven on the Phenom ProX. EDS allows users to analyze the chemical composition of their samples. Detailed chemical composition can be obtained from a micro volume via a spot analysis. Elemental distribution can be visualized with the elemental mapping option. An optional secondary electron detector is available for applications that require surface and topography sensitive imaging.

Step-by-step data collection

The dedicated software package Element Identification (EID) is used to control the fully integrated EDS detector. Analysis has become as easy as imaging, since there is no need to switch between external software packages or computers. The CeB_6 electron source in the Phenom is used to generate the highest X-ray count rate in its market segment, allowing fast results.
The EID software package allows the user to identify nearly all materials in the periodic table, starting from Boron (5) and ranging up to Americium (95). It is a perfect analysis tool for a wide range of samples and applications.

Projects can be stored locally or on the network, where they can be analyzed at a later stage or offline.
The EID software package runs smart algorithms with advanced peak analysis to optimize the auto-identification functionality, while still allowing for manual adjustments by the user at any time in the analysis process.
The intuitive step-by-step process within the software helps the user to collect all X-ray results in an organized and structured way.

EDS Specifications

Detector type	• Silicon Drift Detector (SDD) • Thermoelectrically cooled (LN_2 free)
• Detector active area	25 mm^2
• X-ray window	Ultra thin Silicon Nitride (Si_3N_4) window allowing detection of elements B to Am
• Energy resolution	Mn Kα ≤ 132 eV
• Processing capabilities	Multi-channel analyzer with 2048 channels at 10 eV/ch
• Max. input count rate	300,000 cps
• Hardware integration	Fully embedded
Software	• Integrated in Phenom ProSuite • Integrated column and stage control • Auto-peak ID • Iterative strip peak deconvolution • Confidence of analysis indicator • Export functions: CSV, JPG, TIFF, ELID, EMSA
Report	Docx format

System Specifications

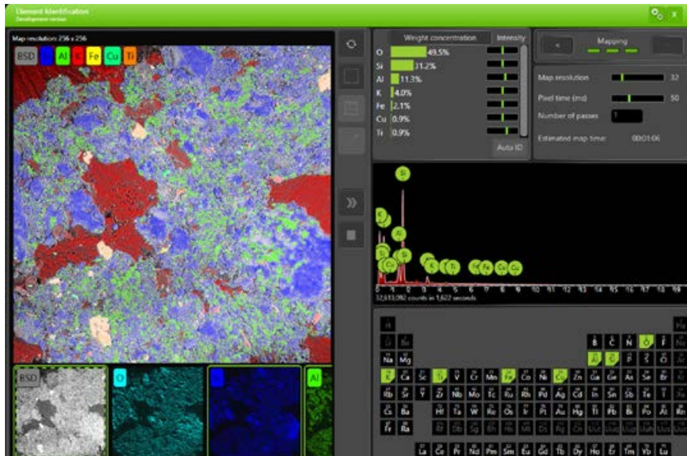
Dimensions & weight

• Imaging module	316(w) x 587(d) x 625(h) mm, 75 kg
• Diaphragm vacuum pump	145(w) x 220(d) x 213(h) mm, 4.5 kg
• Power supply	156(w) x 300(d) x 74(h) mm, 3 kg
• Monitor	375(w) x 203(d) x 395(h) mm, 7.9 kg
• ProSuite	• Standard ProSuite System including: 19" monitor with PC and network router mounted • 375(w) x 250(d) x 395(h) mm, 9 kg

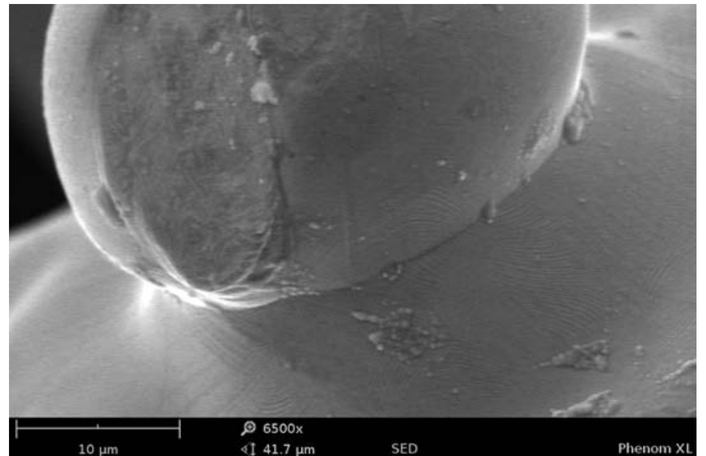
Requirements

Ambient conditions

• Temperature	15°C ~ 30°C (59°F ~ 86°F)
• Humidity	< 80% RH
• Power	Single phase AC 110 - 240 Volt, 50/60 Hz, 300 W (max.)
Recommended table size	150 x 75 cm, load rating of 150 kg



Mapping of a geological sample



Ceramic sample / poreous surface

Elemental Mapping and Line Scan

The Elemental Mapping functionality visualizes the distribution of elements throughout the sample. The selected elements can be mapped at a user specified pixel resolution and acquisition time. The real time mapping algorithm shows live build up of the selected elements. For a user, it is simply click and go to work with the Elemental Mapping and Line Scan functionality of the Phenom XL desktop SEM.

The Line Scan functionality shows the quantified element distribution in a line plot. This is especially useful for coatings, paints and other applications with multiple layers. All results of both the Elemental Mapping and Line Scan functionality can be easily exported by using an automated report template.

Secondary Electron Detector

A secondary electron detector (SED) is optionally available on the Phenom XL. The SED collects low energy electrons from the top surface layer of the sample. It is therefore the perfect choice to reveal detailed sample surface information. The SED can be of great use for applications where topography and morphology are important. This is often the case when studying microstructures, nanostructures or particles.

Eucentric sample holder

In many SEM applications, a user can gain more insight into sample properties if the sample can be tilted and rotated. The Eucentric Sample Holder has been specifically developed with that in mind. The holder contains a sub-stage that allows users to easily and safely look at a sample from all sides.

Optional

Elemental Mapping & Line Scan Specifications

Elemental Mapping	
• Element selection	10 individual user specified maps, plus backscatter image and mix-image
Backscatter image and mix-image	
• Selected area	Any size, rectangular
• Mapping resolution range	16 x 16 - 512 x 512 pixels
• Pixel dwell time range	10 - 250 ms
Line Scan	
• Line Scan resolution range	16 – 512 pixels
• Points dwell time range	50 – 250 ms
• Total number of lines	12
Report	Docx format

SED Specifications

Detector type	Everhart Thornley

Eucentric Sample Holder Specifications

Automated movements	In 4 directions: Z (height), R (rotation), T (tilt) and x' (x-prime).
Maximum sample size	90° tilt Ø ≤ 30 mm; height ≤ 32 mm < 45° tilt Ø ≤ 70 mm; height ≤ 32 mm
Tilt angle	Between -15° and +90°
Rotation	360° continuous

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