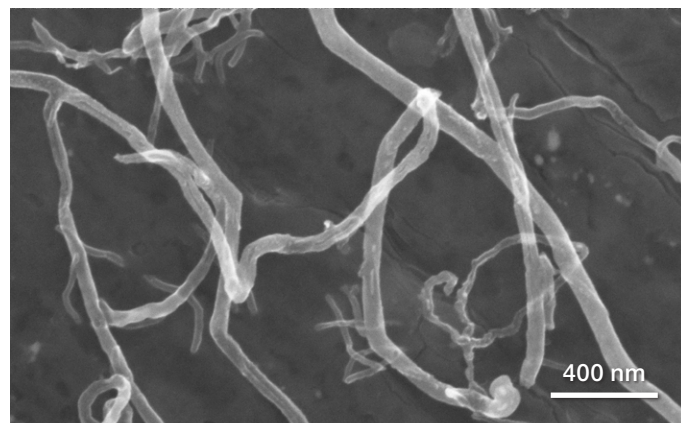
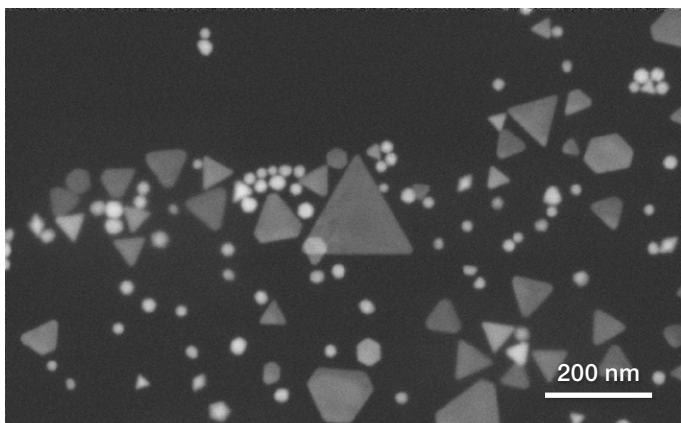


Phenom Pharos G2 Desktop FEG-SEM

Intuitive evidence for your research





Nanomaterial characterization becomes truly accessible with the Phenom Pharos G2 Desktop FEG-SEM. Left: gold nanoparticles, backscatter electron image. Right: carbon nanotubes, secondary electron image.

The Thermo Scientific™ Phenom Pharos™ G2 Desktop FEG-SEM brings field emission SEM to your tabletop. The Phenom Pharos G2 Desktop FEG-SEM will outperform many floor-standing SEMs in terms of image quality, while offering a vastly better user experience. For academic and industrial laboratories that so far have not considered SEM a realistic option, the Phenom Pharos G2 Desktop FEG-SEM makes FEG performance accessible thanks to its attractive form factor and short training required. Blazing fast sample loading means fast sample exchange, which means higher productivity. Unlike other SEMs, which often end up being fully booked, the Phenom Pharos G2 Desktop FEG-SEM performs imaging and analysis jobs so quickly that it serves well as a walk-up tool. With the new Phenom Pharos G2 Desktop FEG-SEM, the Phenom Pharos line expands its acceleration voltage range down to 1 kV, to better accommodate insulating and beam-sensitive samples, and up to 20 kV, with a resolution of 2.0 nm that reveals the finest details.

The need for field emission SEM

Scientists and researchers in academia and industry who want to create higher-quality products, improve specifications, discover new applications, and develop new materials will require access to the smallest length scales. While optical and conventional (tungsten) SEM provide high-resolution imaging, demanding applications need more.

The morphology of nanoparticles, small defects in thin films, insulating materials, or materials sensitive to high-kV electron beams can be adequately studied only by using a field emission SEM. A field emission electron source provides a stable, high-brightness beam, and field emission tips usually last longer than a year, meaning you will not have regular downtime for source exchange.

Field emission SEMs are also known to be large, often requiring a dedicated room while also requiring special infrastructure and connections. Additionally, they can be difficult to master. As a result, many institutions that own a field emission SEM will restrict its use to highly trained personnel. Many research groups, departments, or companies outsource their FEG SEM needs to service labs or central facilities to avoid these hassles.

Those hassles are gone with the Phenom Pharos G2 Desktop FEG-SEM. It provides FEG performance for everyone. It is so easy to install and operate that it will enable those research groups, departments, or companies to own their own FEG SEM and no longer rely on external services.

Increased productivity

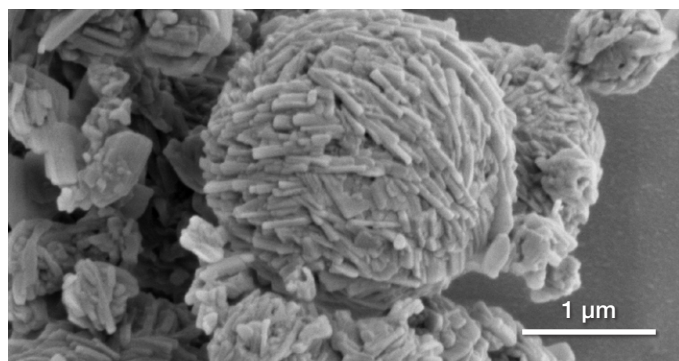
Sample loading is easy—just insert the holder. An optical image is available immediately. This image is for initial navigation and will be used throughout the SEM session. After switching to SEM mode, the image appears in 30 seconds. A new UI shows a 24-inch full-screen SEM image. Immediately, you will see an incredible amount of detail. It is easy to zoom in or navigate to other parts of the sample. Settings are very accessible, such that, within one hour of training, operation of the Phenom Pharos G2 Desktop FEG-SEM is explained. Master students, visitors, or other researchers typically not trained to work on high-end FEG SEMs can easily use the Phenom Pharos G2 Desktop FEG-SEM to create stunning images.

Excellent image quality

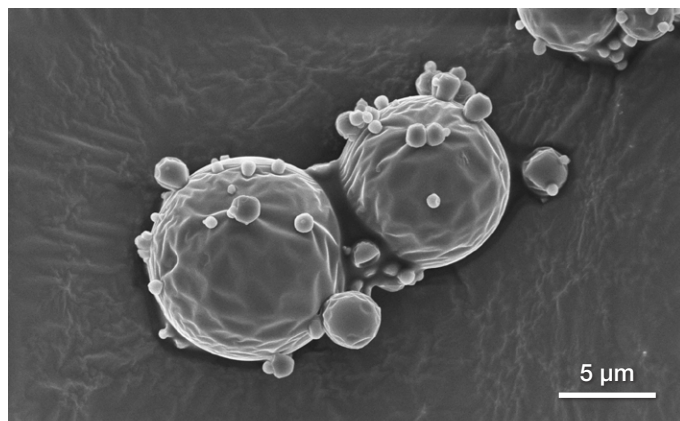
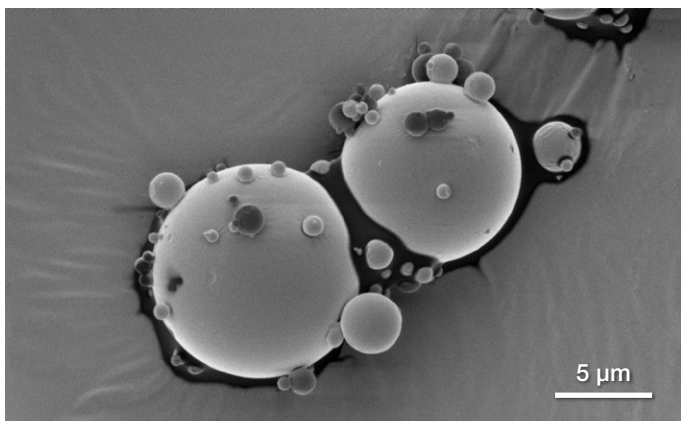
The Phenom Pharos G2 Desktop FEG-SEM delivers an image quality unexpected from a tabletop tool. At 20 kV, the resolution of 2.0 nm resolves details that other SEMs might miss. The Phenom Pharos G2 Desktop FEG-SEM also supports lower voltages, enabling imaging of beam-sensitive samples, such as polymers, as well as insulating samples, without the need to apply a coating. As a result, nanoscale surface features are not obscured.

Easy to own

The installation process of the Phenom Pharos G2 Desktop FEG-SEM is straightforward. A (solid) table and a regular power outlet are all that you need to install it. The Phenom Pharos G2 Desktop FEG-SEM kit also includes a pre-vacuum pump, a PC with monitor, and a power supply with built-in UPS (uninterruptable power supply), which is used to protect the source from unexpected power failures. Upon connecting the cables, the initialization process starts automatically once power is switched on.



Silver nanostructure.



Sensitive materials require gentle conditions. With an acceleration voltage down to 1 kV, the Phenom Pharos G2 Desktop FEG-SEM images beam-sensitive samples without sample coating or other sample preparation. Left: pharmaceutical powder, imaged without damage at 1 kV. Right: the same sample imaged at 5 kV, with damage, illustrating the need for low-kV imaging.

Imaging specifications

Electron source

Long lifetime Schottky Field Emission source (>10,000 hours)

Acceleration voltage range

1–20 kV

SEM resolution

- <2.0 nm (SE), 3 nm (BSE) at 20 kV
- 10 nm (SE) at 3 kV

Maximum SEM magnification

2,000,000x

Electron detection

Standard	High-sensitivity backscattered electron detector (multi-mode)
Optional	Everhart-Thornley secondary electron detector (SED)

Vacuum modes

Integrated low-/medium-/high-vacuum modes available

Navigation camera (NavCam)

- Magnification range (monitor) 27–160x
- Selectable axial and off-axis LED illumination

Sample handling

Sample size

- 25 mm (Ø)
- Option for 35 mm (Ø) and 100 mm (h) available

Stage

Computer controlled, motorized X and Y

Max stage travel

18x18 mm

Loading time

- Light Optical: <5s
- Electron Optical: <30s

Elemental analysis (EDS)*

Detector type	Silicon drift detector (SDD)
Detector active area	25 mm ²
X-ray window	Ultra thin silicon nitride (SiNx) window allowing detection of elements B to Cf
Energy resolution	Mn K α \leq 132 eV
Processing capabilities	Multi-channel analyzer with 2,048 channels at 10 eV/ch
Max. input count rate	300,000 cps
Hardware integration	Fully embedded, no external digital beam control needed

Software

- Integrated in Phenom user interface
- Integrated column and stage control
- Auto-peak ID
- Iterative strip peak deconvolution
- Export functions: CSV, JPG, TIFF, ELID, EMSA

Report

Docx format

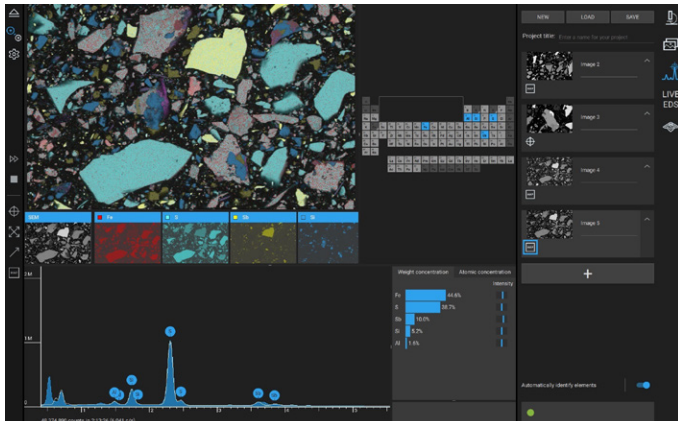
Optional accessories

Application software

- 3D roughness reconstruction
- Thermo Scientific ParticleMetric, PoroMetric, FiberMetric Software
- PPI–Phenom Programming Interface
- Remote UI

Sample holders and inserts

- Sample holders for resin mount, 1.0" core plug, micro tool and tilt-rotation, temperature control, motorized tilt and rotation and electrical feedthrough
- Inserts for micro-electronics, X-view



The optional EDS detection suite on the Phenom Pharos G2 Desktop FEG-SEM offers comprehensive elemental analysis with a few clicks and within a few seconds.

Elemental Mapping and Line Scan*

Elemental Mapping 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 fast mapping algorithm shows live buildup of the selected elements. One simple click starts you working with the Elemental Mapping and Line Scan functions of the Phenom Pharos G2 Desktop FEG-SEM. Line Scan 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 Elemental Mapping and Line Scan can be easily exported by using an automated report template.

Secondary electron detector*

A secondary electron detector (SED) is an available option on the Phenom Pharos G2 Desktop FEG-SEM. The SED collects low-energy electrons from the top surface layer of the sample. Therefore, it is 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.

High diversity in applications*

You can gain more insights with the Phenom Pharos G2 Desktop FEG-SEM within specific SEM applications by using a broad range of sample holders, such as metallurgical, temperature-controlled, electrical feed-through, and tilt and rotation. Simply exchange sample holders to fulfill specific requirements for your application.

* Optional

Find out more at thermofisher.com/pharos

Image data	
Image format	JPEG, BMP, 8-bit TIFF
Image resolution options	960x600, 1920x1200, 3840x2400, and 7680x4800 pixels
Data storage	USB 2.0 Flash drive, internal hard drive, or network
System	
System includes	Imaging module, 24" monitor, keyboard, mouse, diaphragm vacuum pump, uninterruptible power supply
Dimensions and weight	
Imaging module	360x580x590 mm / 14.2x22.8x23.2 inches, 75 kg / 165 lbs
Diaphragm vacuum pump	145x220x213 mm / 5.7x8.6x8.4 inches, 4.5 kg / 9.9 lbs
Power supply	230x255x75 mm / 9x10x3 inches, 4.3 kg / 9.5 lbs
Monitor	531.5x250x515.4 mm / 20.9x9.8x20.3 inches, 6.7 kg / 14.8 lbs
Site requirements	
Ambient conditions	
Temperature	15°C ~ 30°C (59°F ~ 86°F)
Humidity	20–80% RH
Power	Single phase AC 100–240 Volt, 50/60 Hz, 400 W (max.)
Recommended table size	
120x75 cm / 47x9.5 inches	
Recommended load rating	
150 kg / 330 lbs	
Maximum operation altitude	
2,000 m	