

# Phenom Desktop SEMs

A fresh perspective on industrial and academic material analysis

# A phenomenal package

Desktop scanning electron microscopes (SEMs) have come a long way in recent years, and Thermo Scientific™ Phenom™ Desktop SEMs are excellent proof of that progression. These intuitive systems combine the ease of use of a traditional optical microscope with advanced analytical performance that delivers an outstanding blend of precision, speed, and low cost of ownership for a desktop SEM.

Phenom Desktop SEMs feature advanced cerium hexaboride and field emission gun electron sources complemented by multiple detectors, including an integrated energy-dispersive X-ray spectroscopy (EDS) detector for advanced compositional analysis. Their innovative column design produces electron micrographs quickly across large samples.

Best of all, you don't need extensive technical training and knowledge to get started. Whether you're conducting research in any of a range of disciplines or performing quality control and failure analysis in manufacturing, a Phenom Desktop SEM can help you advance your analyses and work more productively.





# Phenom Desktop SEM overview



## A significant step up from optical microscopy

**Recommended for:** Quality managers, lab managers, and SEM novices

### Phenom Pure Desktop SEM

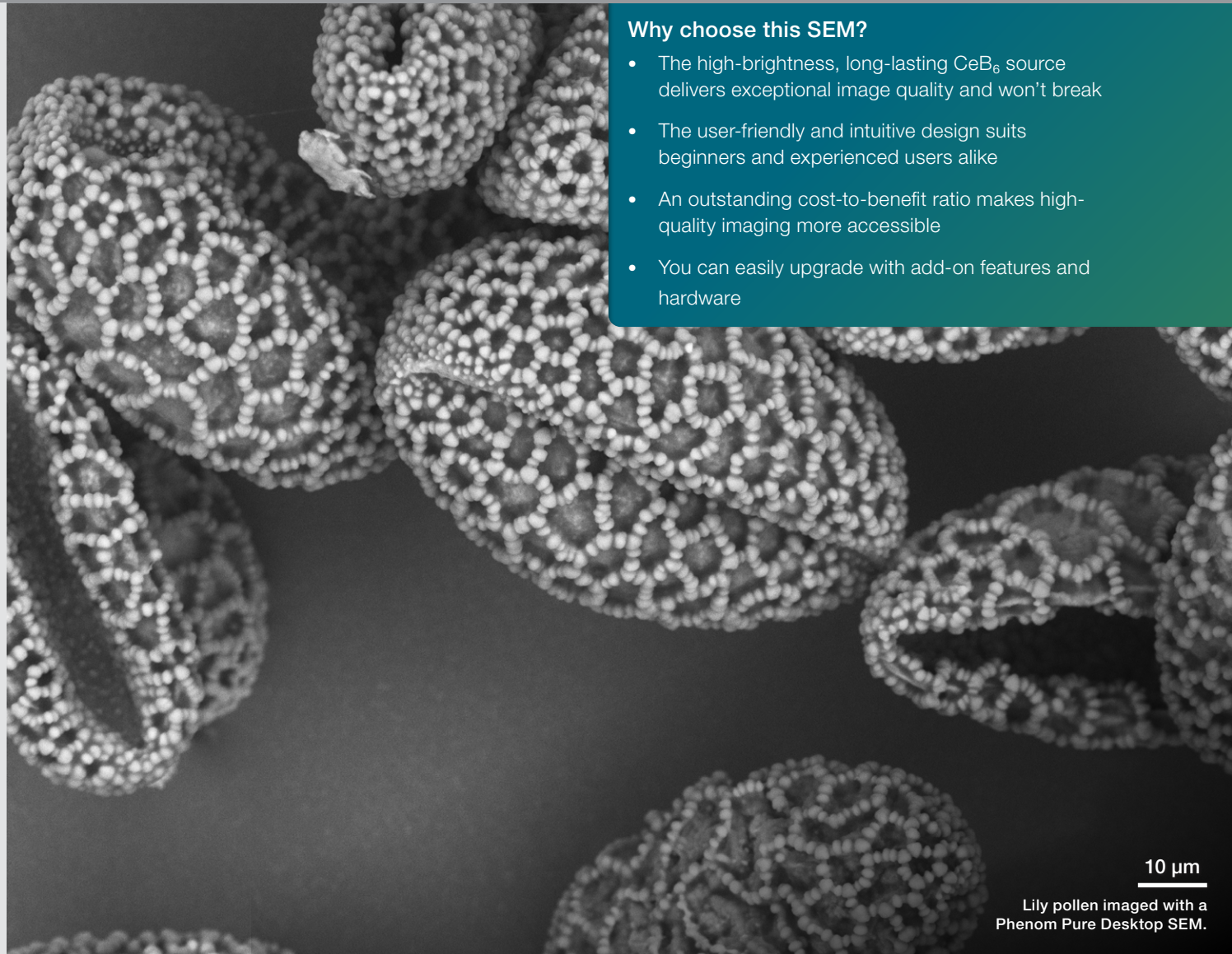
Pure and simple, if you need an entry-level system that delivers a first step up from traditional microscopy, the Phenom Pure Desktop SEM is an excellent choice.

Thanks to its reliable  $\text{CeB}_6$  electron source, the Phenom Pure Desktop SEM provides high-quality images with better signal-to-noise ratio than other systems in its class. You will rarely need to change the source, and just 10 minutes of training is all that's required to begin using this microscope. Many key functions are automated to save time and effort.

[Learn more](#)

### Why choose this SEM?

- The high-brightness, long-lasting  $\text{CeB}_6$  source delivers exceptional image quality and won't break
- The user-friendly and intuitive design suits beginners and experienced users alike
- An outstanding cost-to-benefit ratio makes high-quality imaging more accessible
- You can easily upgrade with add-on features and hardware



10  $\mu\text{m}$

Lily pollen imaged with a Phenom Pure Desktop SEM.

# Phenom Desktop SEM overview



## Phenom Pro Desktop SEM

This high-resolution yet compact and practical desktop SEM is a great choice for conducting more advanced materials science research.

It combines high-quality imaging with a magnification range up to 350,000x, along with multiple acceleration voltages and fast operation. This low-maintenance system also has an intuitive design, including an efficient sample loading mechanism that enables faster and more productive routine analysis with minimal time spent tuning between experiments.

You can use the Phenom Pro Desktop SEM in any lab environment, and it doesn't require specialized infrastructure or expert oversight. It also comes with an optical sensor and the option of adding an EDS detector later for in-depth elemental analysis.

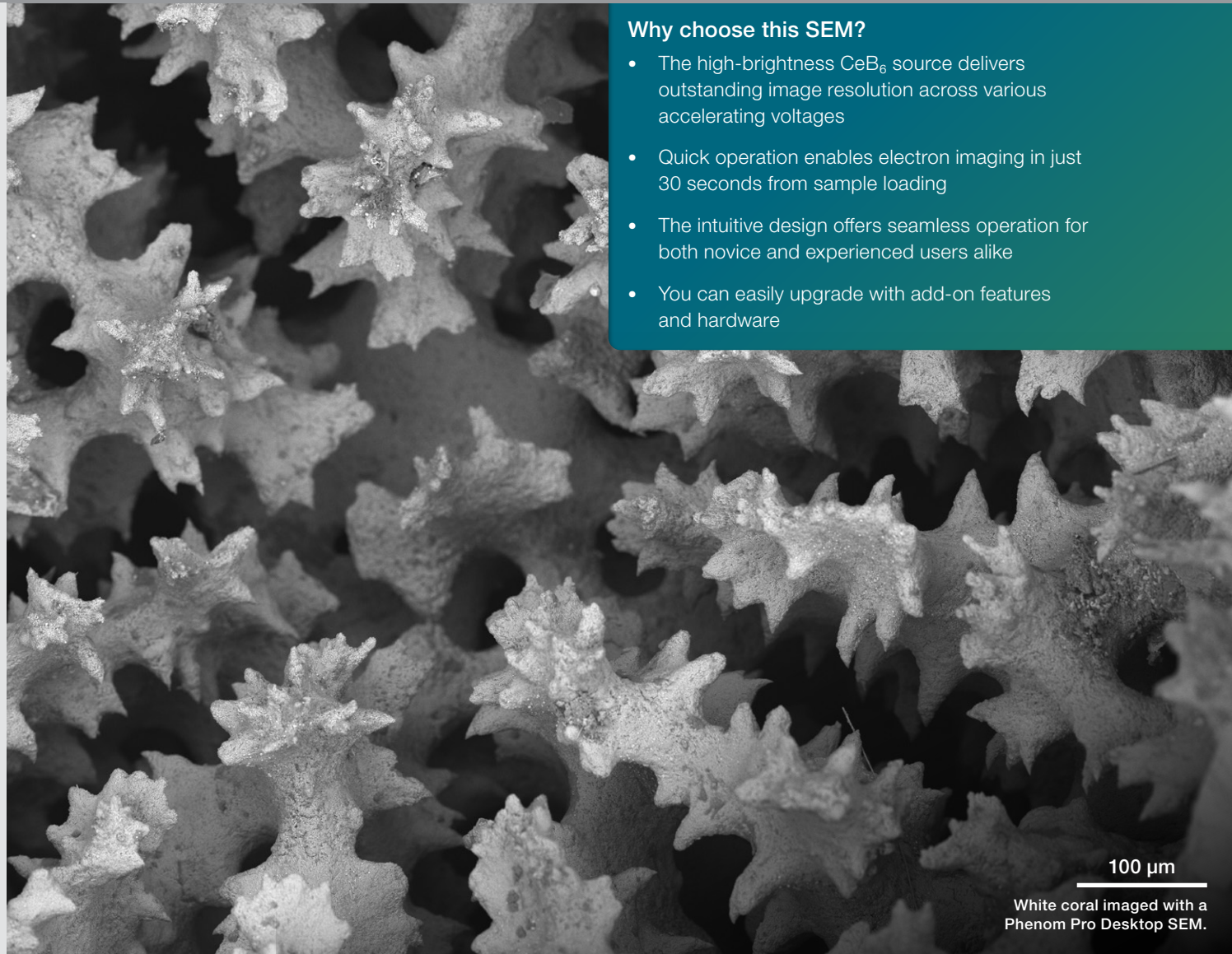
[Learn more](#)

## Comprehensive imaging for your advanced applications

**Recommended for:** Quality managers, lab managers, and staff with some SEM experience

### Why choose this SEM?

- The high-brightness  $\text{CeB}_6$  source delivers outstanding image resolution across various accelerating voltages
- Quick operation enables electron imaging in just 30 seconds from sample loading
- The intuitive design offers seamless operation for both novice and experienced users alike
- You can easily upgrade with add-on features and hardware



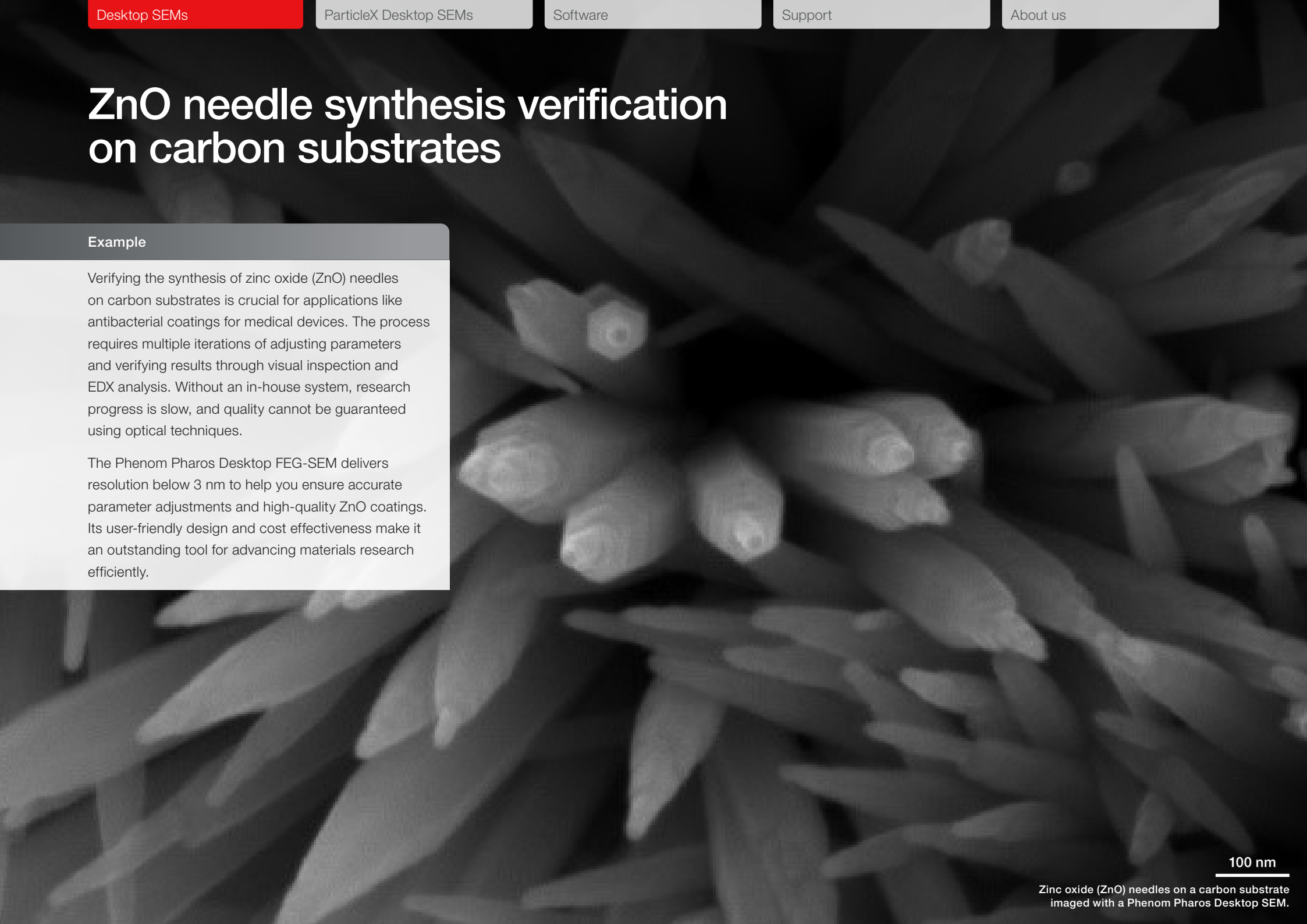


# ZnO needle synthesis verification on carbon substrates

## Example

Verifying the synthesis of zinc oxide (ZnO) needles on carbon substrates is crucial for applications like antibacterial coatings for medical devices. The process requires multiple iterations of adjusting parameters and verifying results through visual inspection and EDX analysis. Without an in-house system, research progress is slow, and quality cannot be guaranteed using optical techniques.

The Phenom Pharos Desktop FEG-SEM delivers resolution below 3 nm to help you ensure accurate parameter adjustments and high-quality ZnO coatings. Its user-friendly design and cost effectiveness make it an outstanding tool for advancing materials research efficiently.

A scanning electron micrograph (SEM) showing a dense field of zinc oxide (ZnO) needles. The needles are elongated, tapered structures with sharp points, oriented in various directions. They appear to be grown on a carbon substrate. The image is in grayscale, highlighting the texture and morphology of the nanomaterials.

100 nm

Zinc oxide (ZnO) needles on a carbon substrate  
imaged with a Phenom Pharos Desktop SEM.

# Phenom Desktop SEM overview



**Recommended for:** Industrial users who need deeper elemental analysis

Conduct advanced compositional analysis right from your desk

## Phenom ProX Desktop SEM

If you're looking for a desktop SEM system with the X factor, you've found one. With its integrated EDS detector, the Phenom ProX Desktop SEM is a total research solution that fits on your desk.

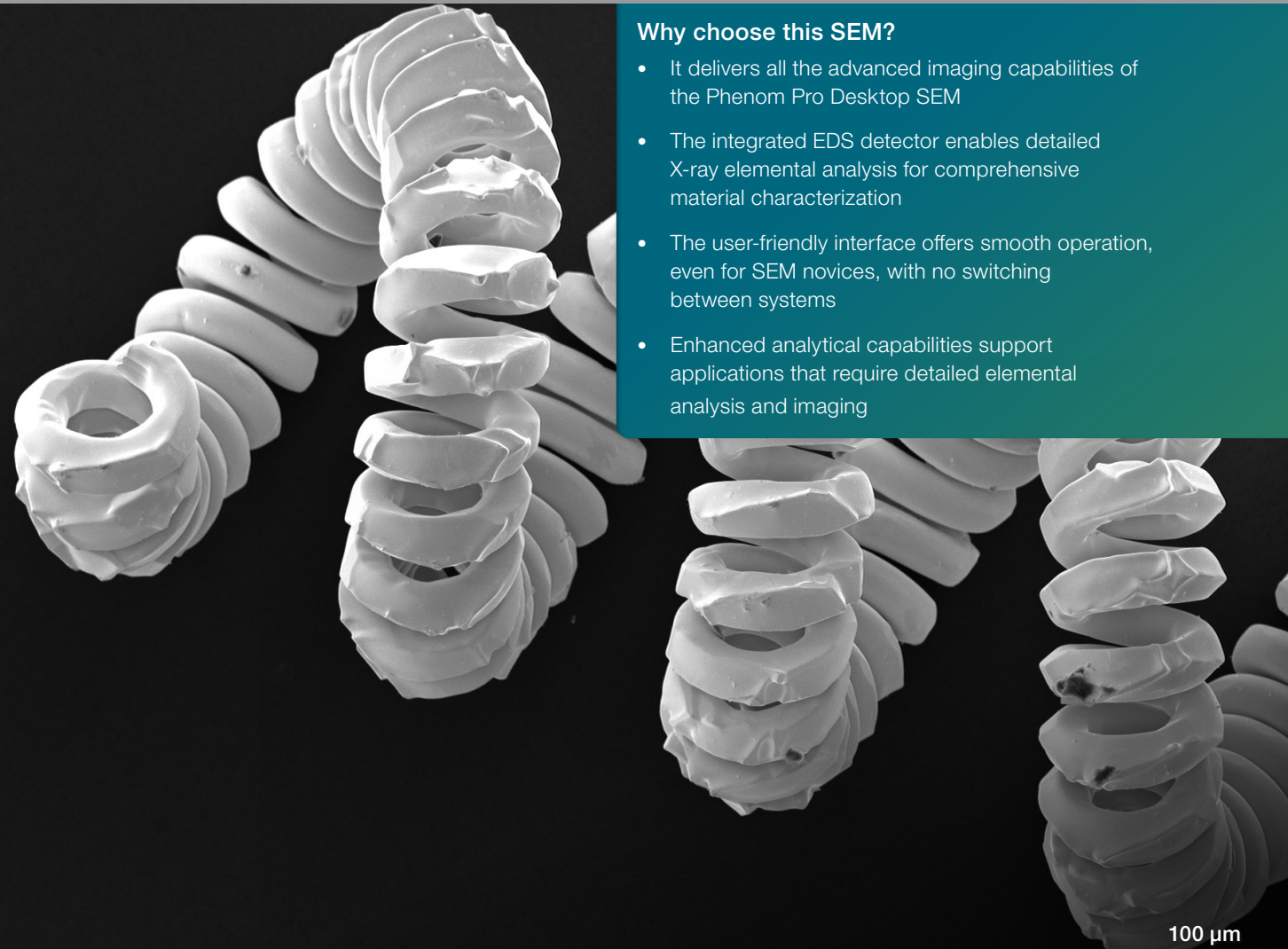
In addition to high-performance imaging, this instrument can help you and your team conduct detailed elemental analysis without switching between systems, which in turn unlocks huge benefits to productivity and efficiency.

Like all models in the portfolio, the Phenom ProX Desktop SEM is compact, fast, easy to use, and delivers high-resolution images with outstanding brightness.

[Learn more](#)

## Why choose this SEM?

- It delivers all the advanced imaging capabilities of the Phenom Pro Desktop SEM
- The integrated EDS detector enables detailed X-ray elemental analysis for comprehensive material characterization
- The user-friendly interface offers smooth operation, even for SEM novices, with no switching between systems
- Enhanced analytical capabilities support applications that require detailed elemental analysis and imaging



Light bulb wire imaged with a Phenom ProX Desktop SEM.



# Nanofiber technology research using the Phenom ProX Desktop SEM

## Example

At the Technical University of Liberec, the Department of Nonwovens and Nanofibrous Materials leads innovative research in nonwoven textiles and electrospinning. One of their major challenges was how long it took to characterize nanofibers using traditional electron microscopes.

The Phenom ProX Desktop SEM delivered three benefits: faster high-quality imaging, easy operation for students, and a magnification range that allows them to study samples in detail. They also added Thermo Scientific FiberMetric Software to automatically measure nanofiber and pore diameters.

[Learn more](#)

5  $\mu\text{m}$

Nanofiber structures captured on the Phenom ProX Desktop SEM.

# Phenom Desktop SEM overview



## Setting the stage for larger material samples

**Recommended for:** Industrial users who need fast and efficient analysis of larger samples up to 100 mm x 100 mm

### Phenom XL Desktop SEM

The Phenom XL Desktop SEM sets the stage for faster and more efficient quality control and failure analysis.

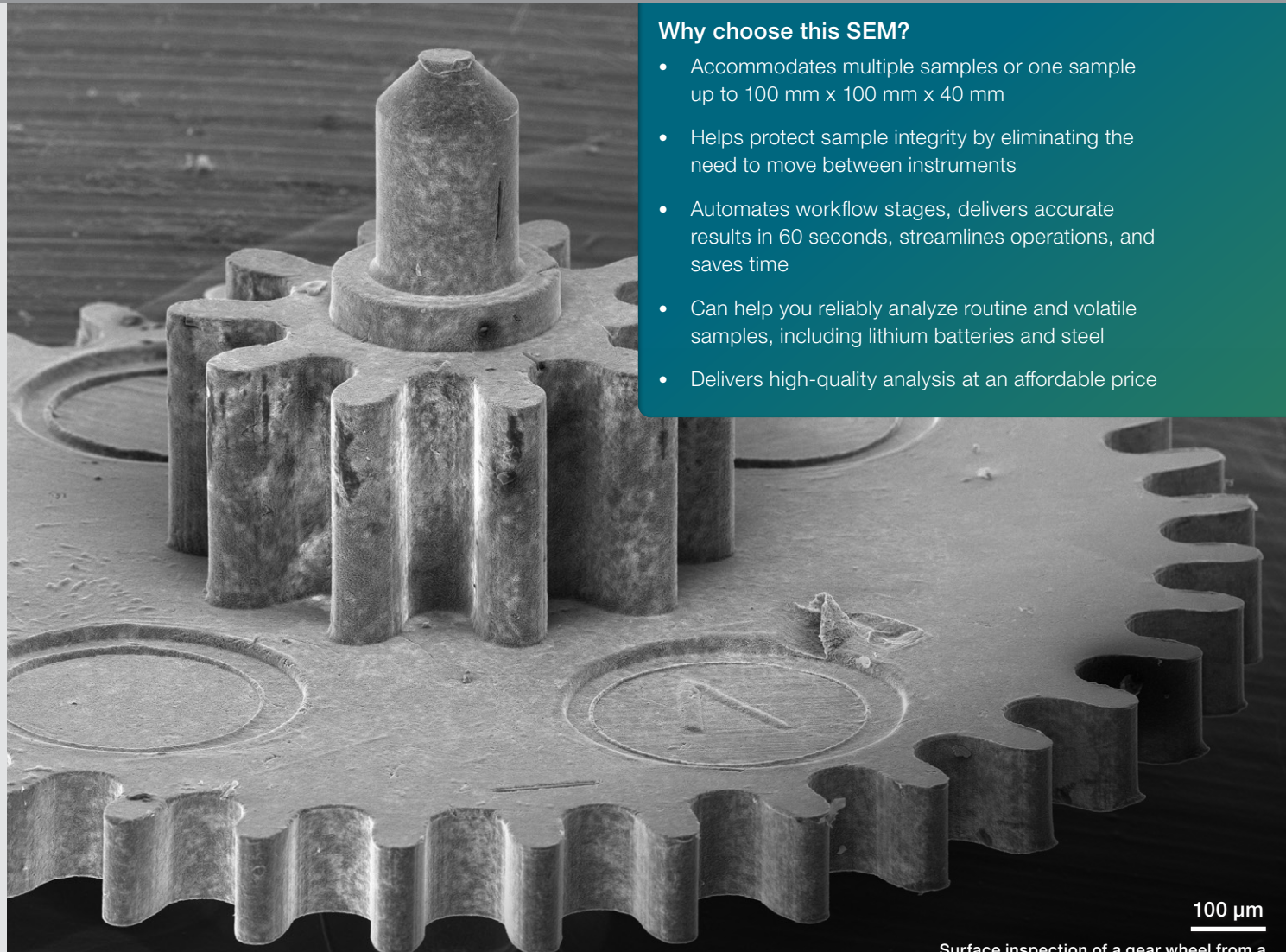
It automates routine analytical tasks and delivers accurate, reproducible results with an average time to image of just 60 seconds. As a result, you can analyze a greater quantity of samples with less margin for human error. And the spacious chamber allows for advanced features like motorized eucentric sample tilting, in situ tensile testing, and electrical feedthrough options. This proven and highly popular all-rounder helps you extend the physical scope of what can be analyzed with a desktop SEM.

All of which makes the Phenom XL Desktop SEM an outstanding choice for both routine failure analysis and bespoke research. It's even available in argon-compatible models that offer an inert environment for protecting delicate samples.

[Learn more](#)

### Why choose this SEM?

- Accommodates multiple samples or one sample up to 100 mm x 100 mm x 40 mm
- Helps protect sample integrity by eliminating the need to move between instruments
- Automates workflow stages, delivers accurate results in 60 seconds, streamlines operations, and saves time
- Can help you reliably analyze routine and volatile samples, including lithium batteries and steel
- Delivers high-quality analysis at an affordable price



100  $\mu$ m

Surface inspection of a gear wheel from a watch imaged with a Phenom XL Desktop SEM.



# Phenom Desktop SEM overview



Analyze beam-sensitive samples quickly and easily

**Recommended for:** Busy lab managers and research staff who need a true walk-up SEM

## Phenom Pharos Desktop FEG-SEM

If you need to analyze small particles at high resolution—and at blazing speed—this system is for you, thanks in large part to its electron source.

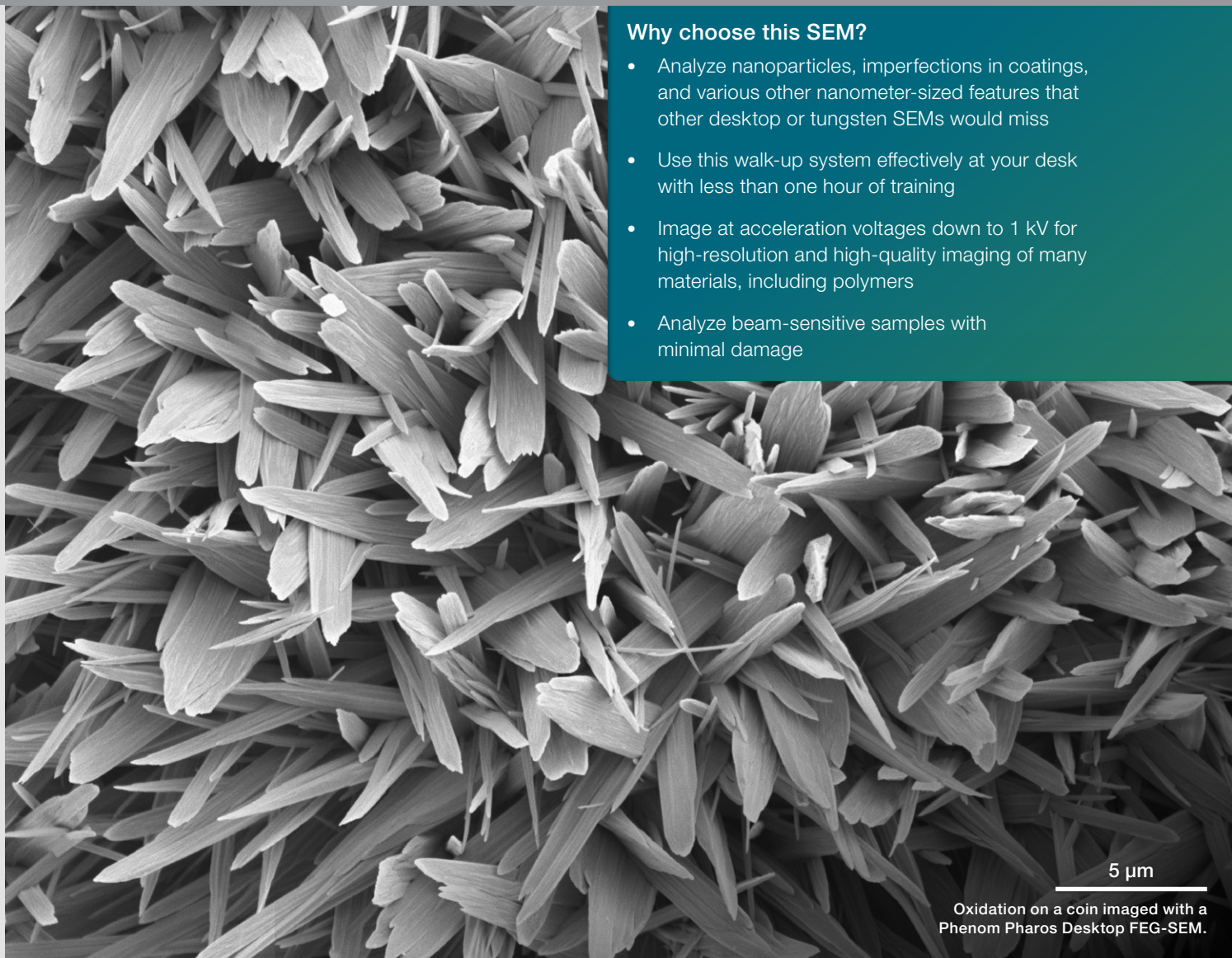
The Thermo Scientific™ Phenom Pharos™ Desktop FEG-SEM uses a field emission gun, which extracts electrons from the source via a small electromagnetic field. This in turn gives you higher resolution, while the low operating voltage makes it possible to analyze beam-sensitive samples with minimal damage.

Just as importantly, this SEM delivers all this with no extensive training required, so more lab staff can achieve more.

[Learn more](#)

## Why choose this SEM?

- Analyze nanoparticles, imperfections in coatings, and various other nanometer-sized features that other desktop or tungsten SEMs would miss
- Use this walk-up system effectively at your desk with less than one hour of training
- Image at acceleration voltages down to 1 kV for high-resolution and high-quality imaging of many materials, including polymers
- Analyze beam-sensitive samples with minimal damage



5  $\mu$ m

Oxidation on a coin imaged with a Phenom Pharos Desktop FEG-SEM.

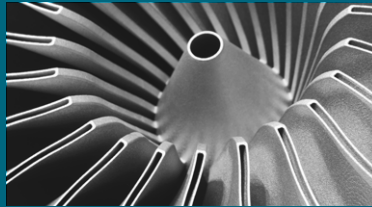
# Phenom ParticleX Desktop SEMs

Thermo Scientific Phenom™ ParticleX™ Desktop SEMs feature built-in Thermo Scientific™ Perception Software, which automates high-throughput particle analysis and integrates SEM imaging and EDS analysis to provide detailed insights into particle size, shape, and elemental composition.



## Technical Cleanliness (TC)

Analyzes particles on filters while adhering to ISO 16232 and VDA 19 standards, which are commonly used in automotive manufacturing.

[Learn more](#)

## Additive Manufacturing (AM)

Monitors critical characteristics of metal powders, such as particle size distribution, morphology, and composition, to support quality control.

[Learn more](#)

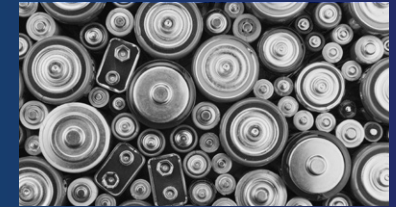
## Steel Manufacturing

Monitors non-metallic inclusions in steel, aiding in compliance with ASTM standards.

[Learn more](#)

## Gunshot Residue (GSR)

Analyzes gunshot residue particles in compliance with ASTM E1588.

[Learn more](#)

## Battery Manufacturing

Analyzes structural and chemical properties of battery materials to support quality control in production.

[Learn more](#)

## What does the software do?

Perception Software automatically detects, classifies, and analyzes particles, so you can process up to 10,000 particles per hour without the need for a skilled operator. The software offers several industry-specific modules:

Each module generates standardized, customizable reports—including histograms, ternary diagrams, summary tables, and pass/fail metrics—to provide actionable insights. Overall, the software can help you perform particle analysis in your own facility, reduce reliance on external laboratories, and accelerate decision-making. With seamless integration of hardware and software, you have a powerful, automated tool for comprehensive particle analysis that streamlines workflows and upholds high quality standards across various industries.

Visit our learning center to discover how particle analysis can support a range of industries.

[Start learning](#)



# Phenom ParticleX Desktop SEM overview



## Driving technical cleanliness analysis to industry standards

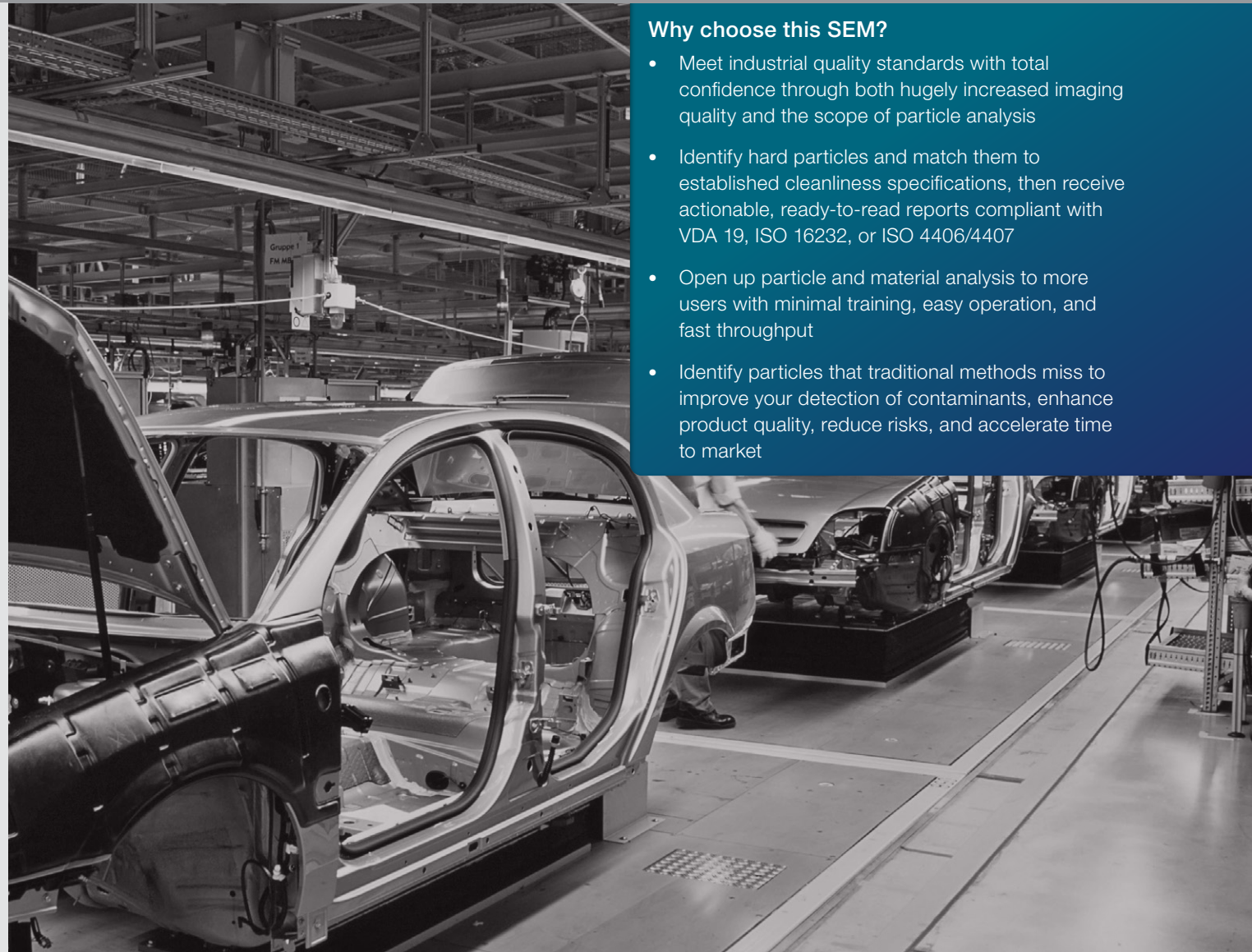
**Recommended for:** Delivering technical cleanliness to the highest standards

### Phenom ParticleX TC Desktop SEM

The Phenom ParticleX Technical Cleanliness Desktop SEM conducts detailed compositional analysis at the microscale using the integrated energy-dispersive EDS detector.

It also reliably detects and analyzes translucent particles like glass that are often missed by other systems.

Integrated Perception Software analyzes hard particles, like  $\text{SiO}_2$  or corundum, that can increase the wear rate of products like gearboxes. It also matches findings to cleanliness specifications, delivering concise industrial reports that help you comply with quality specifications, including German VDA standards.

[Learn more](#)

### Why choose this SEM?

- Meet industrial quality standards with total confidence through both hugely increased imaging quality and the scope of particle analysis
- Identify hard particles and match them to established cleanliness specifications, then receive actionable, ready-to-read reports compliant with VDA 19, ISO 16232, or ISO 4406/4407
- Open up particle and material analysis to more users with minimal training, easy operation, and fast throughput
- Identify particles that traditional methods miss to improve your detection of contaminants, enhance product quality, reduce risks, and accelerate time to market

# Phenom ParticleX Desktop SEM overview



## Phenom ParticleX AM Desktop SEM

The Phenom ParticleX Additive Manufacturing Desktop SEM analyzes critical characteristics of metal powders at the microscale, allowing simultaneous work with up to 49 samples.

The integrated software automatically finds and identifies debris, spherical or elongated particles, and other particles to provide concise industrial reports. It includes EDS for advanced compositional analysis and an optional secondary electron detector (SED) that collects low-energy electrons from the top surface layer of the sample to provide detailed surface information.

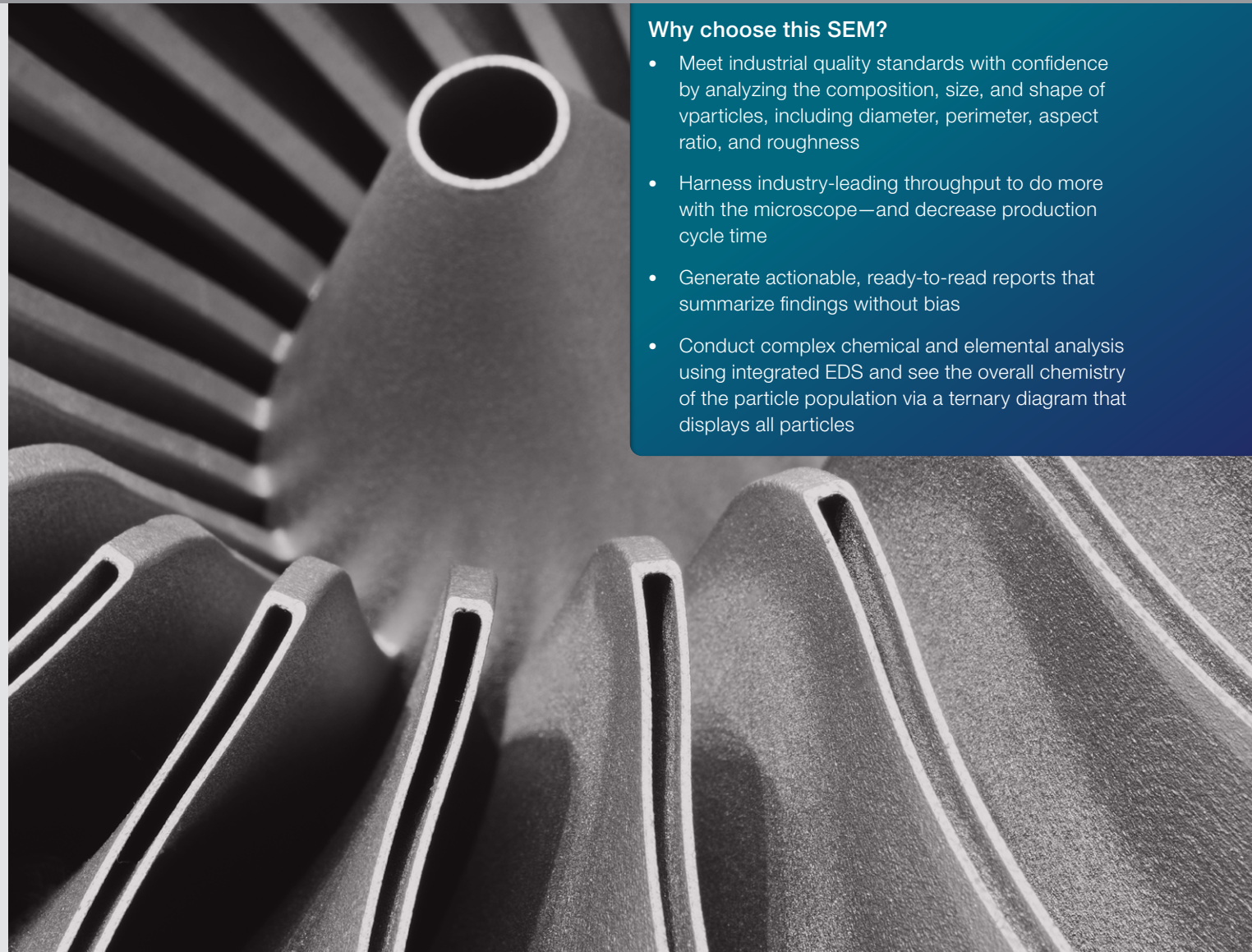
[Learn more](#)

Add greater speed and efficiency to your additive manufacturing analysis

**Recommended for:** Stepping up the quality and precision of your additive powder testing

### Why choose this SEM?

- Meet industrial quality standards with confidence by analyzing the composition, size, and shape of vparticles, including diameter, perimeter, aspect ratio, and roughness
- Harness industry-leading throughput to do more with the microscope—and decrease production cycle time
- Generate actionable, ready-to-read reports that summarize findings without bias
- Conduct complex chemical and elemental analysis using integrated EDS and see the overall chemistry of the particle population via a ternary diagram that displays all particles





# Phenom ParticleX Desktop SEM overview



## Phenom ParticleX Steel Desktop SEM

The Phenom ParticleX Steel Desktop SEM can help you conduct compositional failure analysis of steel at the nanoparticle level.

You can perform this analysis on steel during steel production, including aluminum-killed, silicon-killed, and calcium-treated processes, and in its finished form, such as gear wheels and bearings.

The SEM analyzes polished cross sections of steel samples to automatically find and classify inclusions that can affect the strength, ductility, and corrosion resistance of your steel. Then it delivers concise, unbiased industrial reports for you and your team. It also features an integrated EDS detector for elemental research, so you can conduct failure analysis and automated characterization of non-metallic inclusions via one simple process.

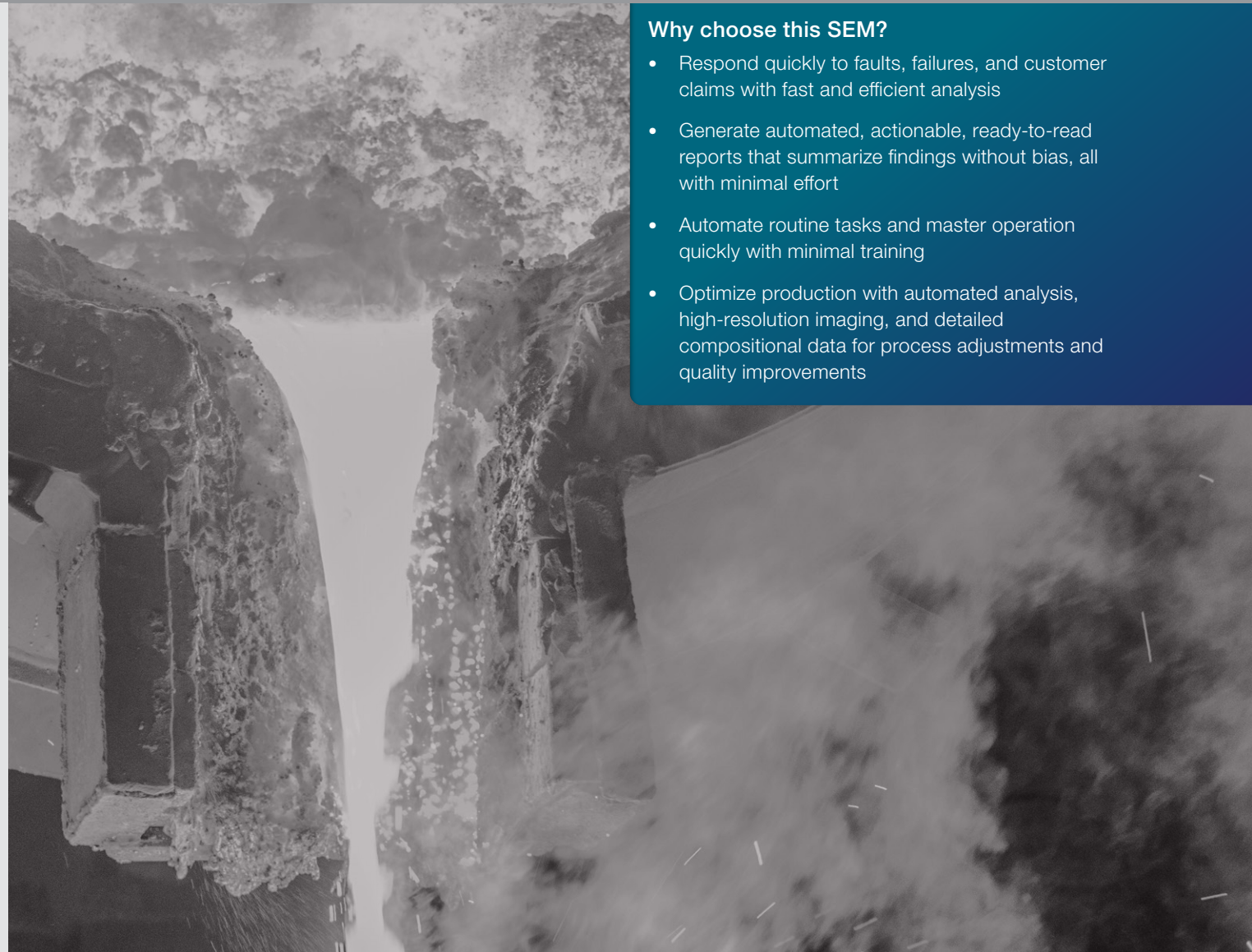
[Learn more](#)

A better way to meet industrial quality standards in steel particle analysis

**Recommended for:** Meeting stringent industrial quality requirements in steel analysis

### Why choose this SEM?

- Respond quickly to faults, failures, and customer claims with fast and efficient analysis
- Generate automated, actionable, ready-to-read reports that summarize findings without bias, all with minimal effort
- Automate routine tasks and master operation quickly with minimal training
- Optimize production with automated analysis, high-resolution imaging, and detailed compositional data for process adjustments and quality improvements



# Phenom ParticleX Desktop SEM overview



## Forensic gunpowder residue analysis you can trust

**Recommended for:** Custom compositional analysis at lightning speed

### Phenom ParticleX GSR Desktop SEM

The Phenom ParticleX Gunshot Residue Desktop SEM delivers compositional analysis of gunshot residue (GSR) at the micro level and helps you analyze samples that might take conventional SEMs four hours in as little as 15 minutes.

Custom designed for GSR analysis, it can help you find more particles and analyze a greater quantity of samples. It then delivers concise industrial reports that turn raw data into clear and unbiased answers for you and your team.

The integrated EDS detector enables accurate analysis of particle composition on a GSR sample to identify whether gunshot residue is present via one simple process.

[Learn more](#)



### Why choose this SEM?

- Identify GSR particles with round-the-clock, in-depth analysis
- Maintain high quality while drastically accelerating throughput
- Work smarter with multiple automation features
- Analyze the elemental composition of GSR powder with integrated EDS



# Phenom ParticleX Desktop SEM overview



Precision battery powder analysis at lightning speed

**Recommended for:** Identifying tiny impurities in NCM powder

## Phenom ParticleX Battery Desktop SEM

The Phenom ParticleX Battery Desktop SEM delivers up to 10 times faster throughput than other automated quality control SEMs, allowing you to analyze up to 49 samples simultaneously.

It can detect impurities smaller than  $5\text{ }\mu\text{m}$  to help ensure the safety and performance of your final product.

This system automatically analyzes tens of thousands of particles per sample and then matches the amount and type of particles found to a set of cleanliness specifications. It then delivers concise industrial reports that turn raw data into clear and unbiased insight for you and your team.

[Learn more](#)

## Why choose this SEM?

- Speed up and simplify your work with lightning-fast throughput and easy-to-use automation
- Detect and analyze metal impurity particles smaller than  $5\text{ }\mu\text{m}$  in NCM powder
- Generate unbiased, ready-to-read reports with minimal effort
- Conduct complex chemical and elemental analysis using integrated EDS, and see the overall chemistry of the particle population via a ternary diagram that displays all particles



# Software

Integrated analytical capabilities in scanning electron microscopes.

Our advanced software enhances SEMs with customized and expanded analytical capabilities for research and industrial applications.



## Elemental analysis

Thermo Scientific™ ChemiSEM™ Technology offers precise, comprehensive elemental characterization that's essential for quality assurance in various industries, including metals production, aerospace manufacturing, automotive manufacturing, and advanced materials development.

## Correlative microscopy

Thermo Scientific Maps Software automates large-area analysis and integrates data from various techniques, improving efficiency and consistency in materials research, engineering, biology, and quality control.

## Fiber and particle analysis

Thermo Scientific Phenom FiberMetric and ParticleMetric Software automate fiber and particle characterization respectively, delivering precise measurements quickly and consistently.

Whether you need elemental analysis, particle characterization, microstructural examination, or large-area analysis, our software delivers precision and efficiency that help drive your projects to new heights.

[Learn more](#)



# Quality control of cathode material in batteries using AutoScan Scripts and ParticleMetric Software

## Example

In the battery industry, ensuring the quality of cathode materials is crucial for battery performance and longevity. Traditional quality control methods are slow and labor-intensive, but automated SEM imaging and analysis deliver a significant improvement.

Thermo Scientific AutoScan Scripts and ParticleMetric Software deliver rapid and precise particle analysis that significantly speeds up quality control. The automation reduces human error and helps ensure uniformity in quality assessments.

[Learn more](#)

5  $\mu$ m

Polycrystalline NCM particles with inset graph showing a broad distribution of secondary particle sizes.

# How can we help?



## Distributors

Our worldwide distributor network sells and services Phenom Desktop SEMs, providing comprehensive support from installation services to on-site and remote maintenance. Our team of experts is here to support you at every step.

[Learn more](#)

## Global service logistics and field service assistance

We maintain an extensive network of central warehouses, regional hubs, and local stock locations to fulfill your needs more quickly. From installation services to on-site and remote maintenance agreements, our team of experts is here to support you at every step.

[Learn more](#)

## Application support

After your system is installed, our team of applications experts can help you quickly get up to speed. From training and documentation to troubleshooting and more, we're with you every step of the way to help your research succeed.

[Learn more](#)



# About Thermo Fisher Scientific

We are the world leader in serving science. Our Mission is to enable our customers to make the world healthier, cleaner and safer.



Learn about the mission of Thermo Fisher Scientific. Duration 1:23.

Our innovative solutions for electron microscopy, surface analysis, and microanalysis help materials science researchers advance their sample characterization to gain deeper insight into the physical and chemical properties of materials from the macroscale to the nanoscale. Our multiscale, multimodal solutions cover a broad range of applications across dozens of industries and research fields, serving customers in academia, government, and industry. Our TEMs, DualBeam™ FIB-SEMs, comprehensive portfolio of SEMs, XPS, and microanalysis solutions, combined with software suites, take customers from questions to usable data by combining high-resolution imaging with physical, chemical, elemental, mechanical, and electrical analysis across scales and modes.

## Financial and Leasing Services

At Thermo Fisher Scientific, we will not let budgetary constraints stand between you and your next great discovery.

We are your one-stop partner for the best laboratory products and analytical technologies available, plus the unique financing options you need to accelerate success in science or industry.

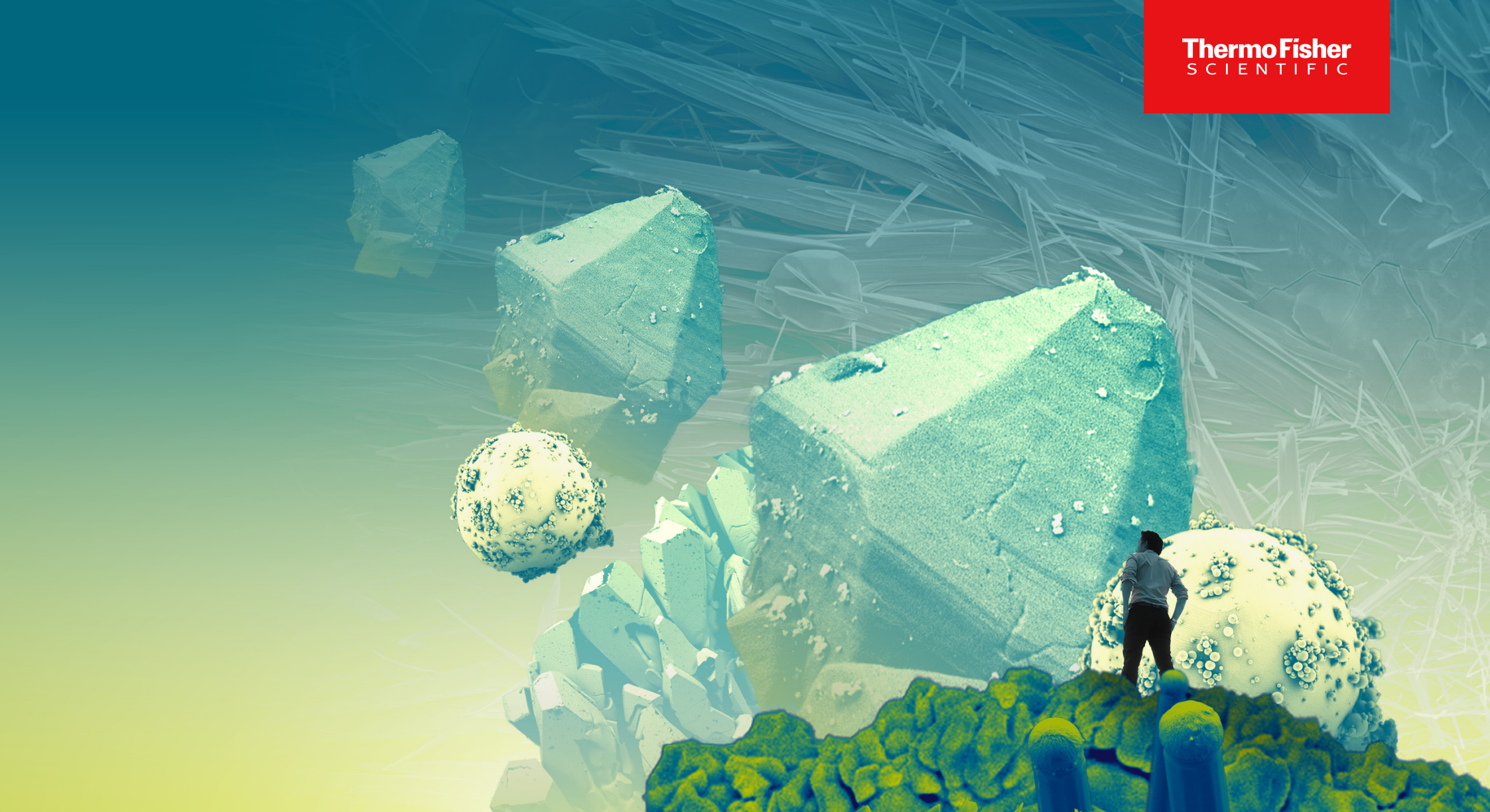
Cost-effective financing designed for each individual customer is key to any successful capital equipment solution.

We understand not just your advanced technology and application requirements, but the business challenges you face when financing your critical equipment assets. For decades, we have worked closely with businesses, hospitals, universities, and municipalities to provide flexible financing terms to support their successful operations.

If you are looking for off-balance sheet financing, accelerated ROI, technology protection, or cash flow management, our innovative financing options can help meet your company's budgetary needs and bottom-line goals.

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