

Micro Tool and Tilt-Rotation Sample Holder

For imaging axial-shaped objects

The micro-manufacturing sector contains companies that produce micro tools such as drills, end mills, routers, boring bars engraving tools, etc. These precision tools can have submicron diameters and tight tolerances. They are used in a large variety of applications, including the electronics, medical/dental, automotive, semiconductor and optical industries. High precision, reproducibility and state of the art quality control are the key factors for producing reliable products.

Scanning electron microscopy is an accepted technique for achieving and maintaining these standards. The combination of the micro tool sample holder and the Phenom™ desktop electron microscope make imaging at high magnifications with a large depth of focus possible.

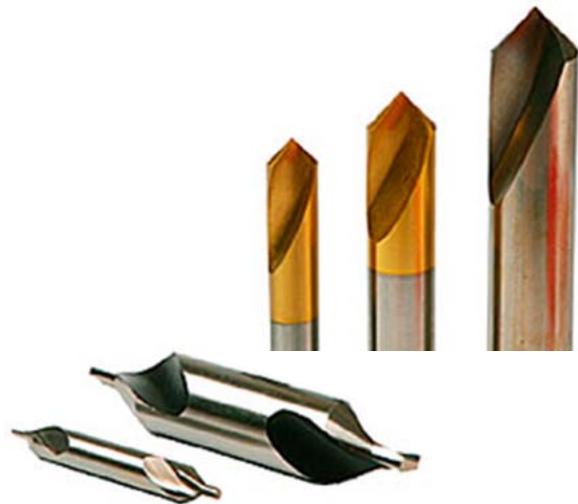
The Phenom is the only electron microscope that is able to load and image these axial-shaped samples in their original state, enabling inline inspections without time-consuming sample preparation.

Key benefits

- Easy and fast clamping
- Tilt and rotation allow for easy sample positioning
- No extra tooling required for sample loading
- No sample modification needed



Micro tool sample holder.



Drill bits.

Micro Tools

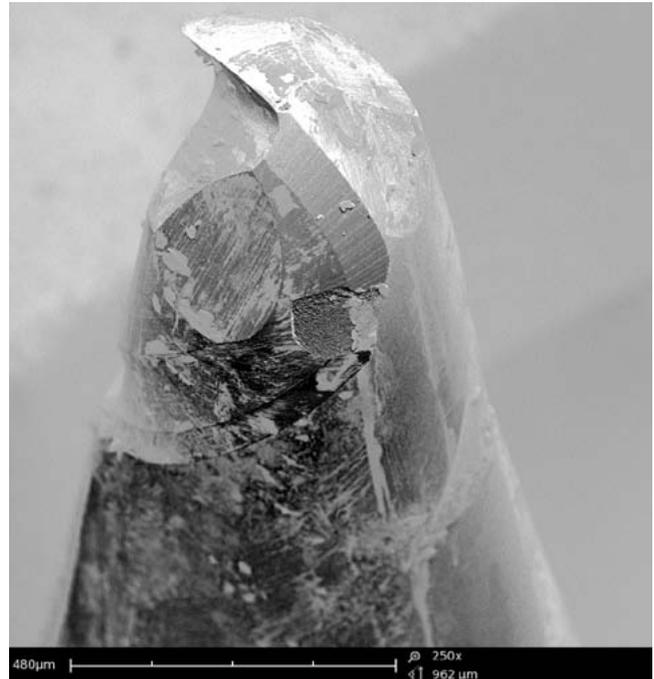
Measuring critical dimensions on axial-shaped tools such as drill bits and milling tools requires magnifications in the submicron range (Figure 1).

The Phenom offers a total quality management solution. It supplies the data needed to control the whole manufacturing process:

- Incoming inspection of micro tools
- Monitoring of micro tool condition and wear during manufacturing
- Inspection of the finished product.

The low magnification image (Figure 2) provides an overview of the top of a drill bit. The large depth of focus is what gives SEM images a striking three-dimensional perspective. For this reason, Phenom images of three-dimensional objects are superior to those from a light microscope, even at low resolution and low magnification.

Wear, the condition of the cutting edges, coatings, defects and surface roughness can be monitored.



Top of drill bit at 45° tilt angle and 250x magnification (Figure 1).

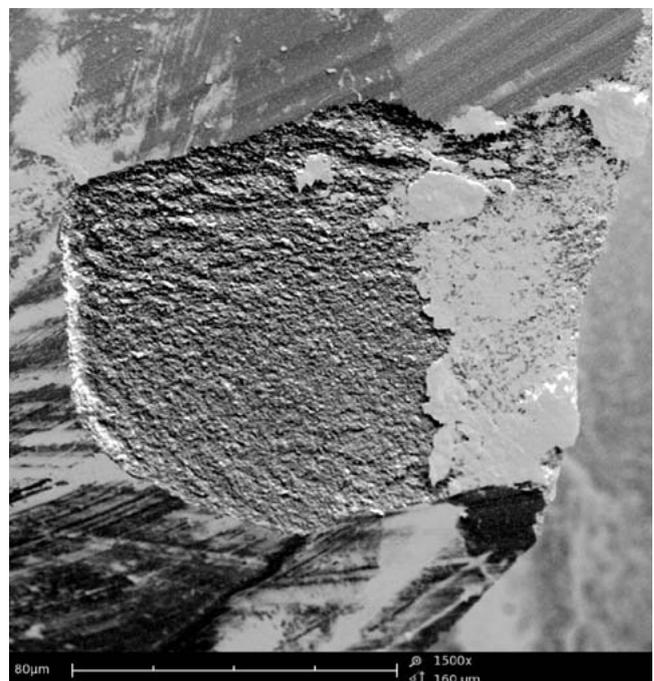


Image of same drill bit as above but focused on defect at 1500x magnification (Figure 2).

Figure 2 is a high magnification version of Figure 1, showing a defect in great detail.

Axial-shaped objects

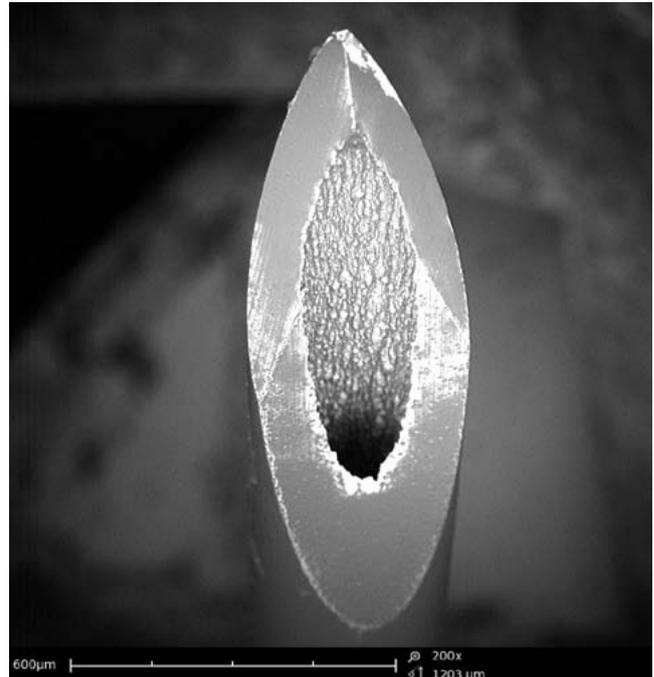
The micro tool sample holder can accommodate any axial-shaped micro-manufactured parts such as needles (Figure 3), fibers, (fuel) injectors and pencils.

The sample is clamped inside the holder and can instantly be loaded into the Phenom. It can be aligned, rotated and tilted to optimize the position of the sample.

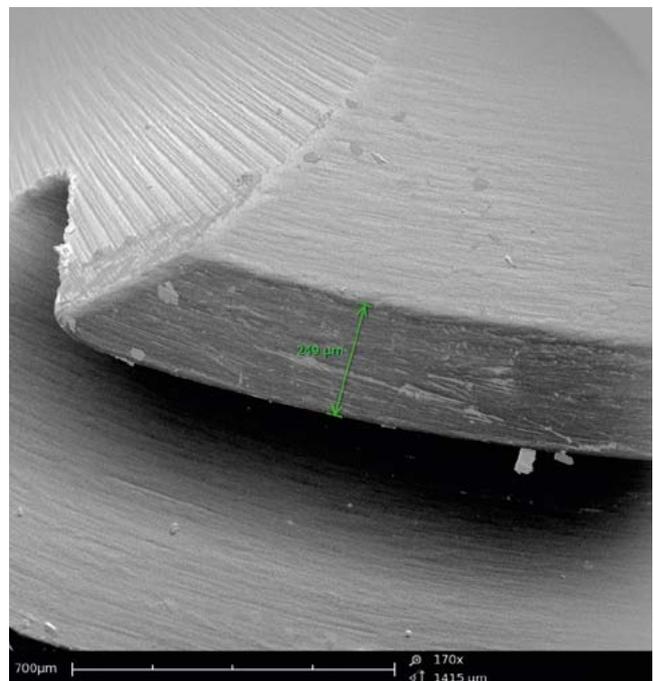
The ability to switch from topographical to compositional mode make it fast and easy to collect different types of data. The topographical mode generates images that can be used to investigate surface structure and to measure height differences in the sample. The compositional mode generates images that can be used to identify coating wear and material contrast.

With the Phenom, it is possible to perform a point-to-point measurement (see Figure 4).

The Phenom can store images in various image formats. TIFF and JPEG images contain so-called "header" information. The header enables calibrated measuring by a large variety of measurement software packages.



Dental needle at 200x magnification (Figure 3).



Topographic image containing point-to-point measurement (Figure 4).

Specifications

- Sample diameter: 0.5 - 10 mm
- Sample length: 10 - 100 mm
- Tilt angle: -5° to $+40^{\circ}$
- Rotation angle: -35° and $+35^{\circ}$



Clamping needle in holder.



Micro tool sample holder (top view).