

# Phoenix Nanotom M

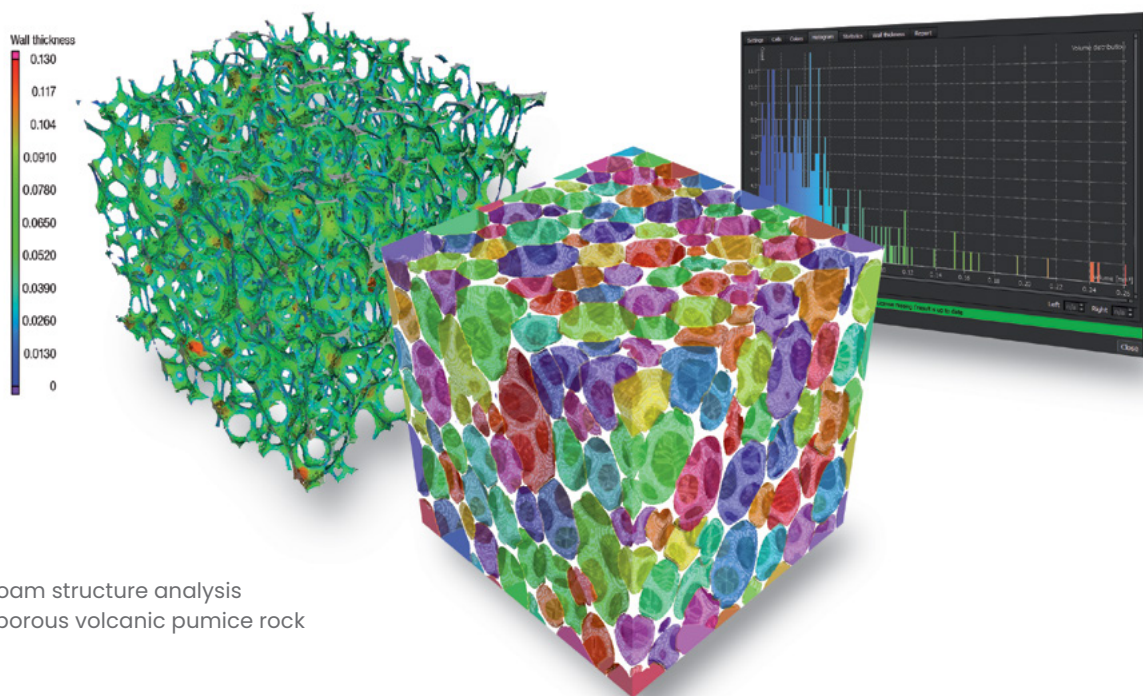
180 kV / 20 W X-ray nanoCT<sup>®</sup> system  
for high-resolution analysis and 3D metrology



# Phoenix Nanotom M - versatile 3D CT system

High-resolution computed tomography (CT) has become a powerful inspection tool for a wide range of industrial and scientific inspection and metrology applications such as non-destructive structure and failure analysis as well as for quality assurance or production control.

With its 180 kV/20 W ultra high performance nanofocus X-ray tube, precision mechanics and advanced software modules, the Phoenix Nanotom M is the inspection solution for a wide range of 3D CT applications. Once scanned, the fully three dimensional CT information allows many possibilities for analysis, e.g. non-destructive visualization of slices, arbitrary sectional views, or automatic pore analysis. Since the whole geometry of the object is scanned, precise and reproducible 3D measurements of complex objects and even the automatic generation of first article inspection reports within an hour are possible.



NanoCT foam structure analysis  
of highly porous volcanic pumice rock

# nanoCT<sup>®</sup>

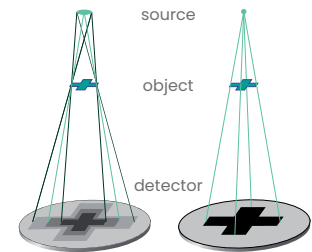
## – close to synchrotron CT

With its special design, the Nanotom M provides focal spot sizes in the submicron range. Smaller focal spots ensure very little geometric unsharpness and therefore improved image resolution. And due to its high dynamic range detector the system offers long-term stability and optimized image quality.

In pursuit of potential high-resolution images with ease of use in an economy environment, nanoCT can compete in many application fields with limited available synchrotron facilities, e.g.:

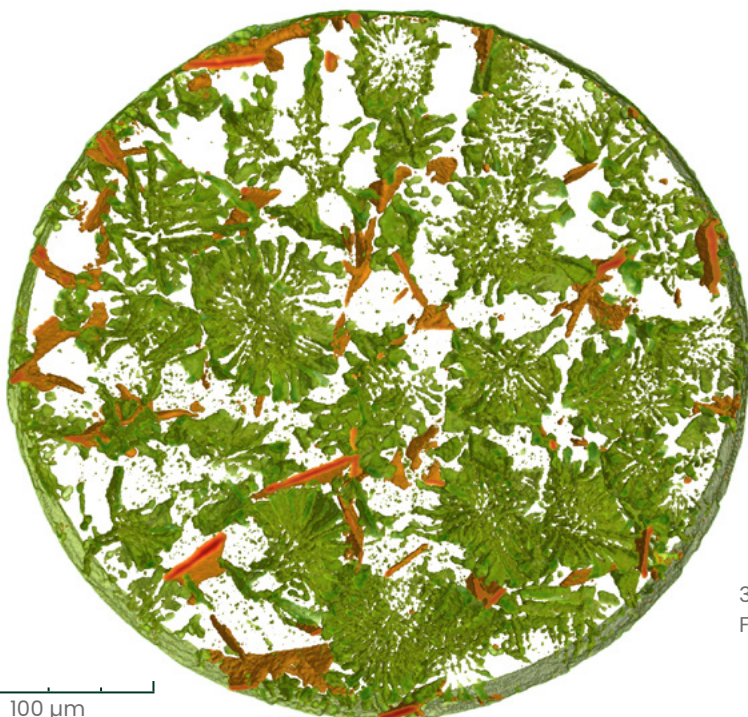
- Materials science
- Micro-engineering
- Electronics
- Life sciences
- Geosciences and much more

### What makes the difference between micro- and nanofocus tubes?



microfocus system    nanofocus system

Although the focal spot of microfocus tubes is as small as a few microns, it is still large enough to cause a half shadow, known as the penumbra effect. This results in a residual unsharpness and can be avoided by using nanofocus technology. Nanofocus provides focal spots well below one micron while maintaining the highest intensity needed.



3D volume slice of an AlMg5Si7 alloy ( $\varnothing$  350  $\mu$ m): Fe-aluminides and Mg<sub>2</sub>Si phases.

# 3D metrology with high-resolution CT

Especially if complex parts with hidden or difficult accessible surfaces have to be measured, CT offers big advantages in comparison with conventional tactile or optical coordinate measuring machines (CMMs).

With its optimized 3D measurement package, the Phoenix Nanotom M includes all essential features for CT with extremely high accuracy and reproducibility:

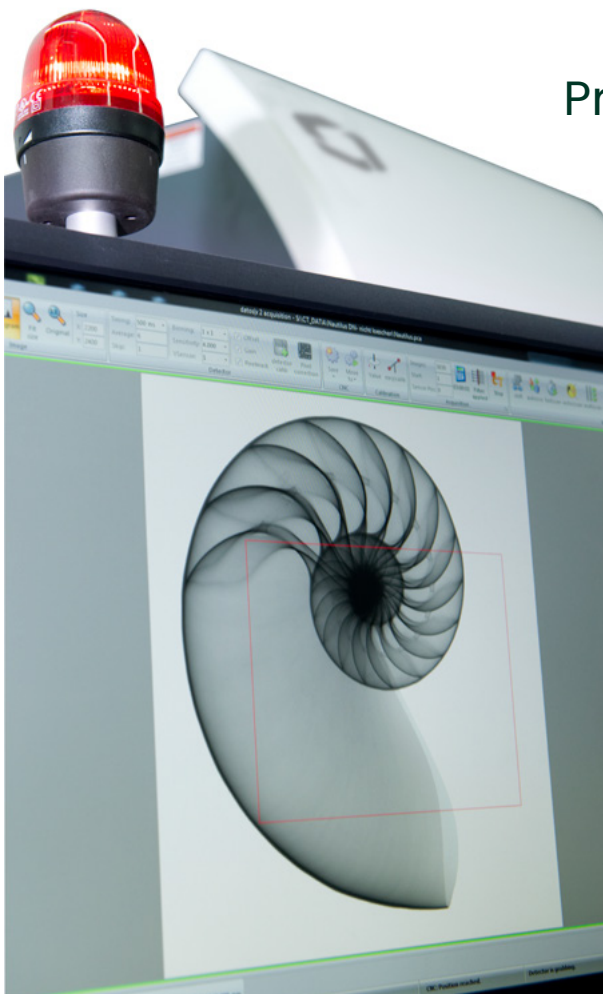
- Temperature stabilized cabinet
- High accuracy direct measuring system
- Vibration insulation of the manipulator
- Temperature stabilized DXR detector for brilliant image quality
- 2 calibration objects
- Phoenix Datas|x software "Click & measure|CT"

# Phoenix Datos|x advanced CT software

## Fully automated data acquisition and volume processing

With Datos|x, the entire CT process chain can be fully automated. This minimizes operator time and influence, while highly increasing the repeatability and reproducibility of CT results.

Once the appropriate setup is programmed, the whole scan and reconstruction process incl. volume optimization features (e.g. automatic beam hardening correction) or surface extraction can be fully automated. Furthermore, 3D failure analysis or metrology tasks like generation of first article inspection reports can be executed automatically.

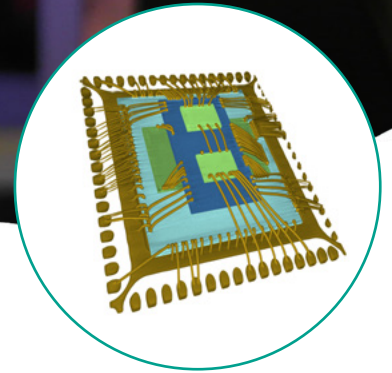


## Precise, reliable and fast CT results

By using Phoenix Datos|x CT software, 3D metrology and failure analysis with Phoenix CT systems becomes as fast and easy as never before:

- Click & measure|CT: Fully automated data acquisition and volume processing – insert sample, start CT scan, check results
- Reproducible high precision 3D metrology and failure analysis tasks performed with a minimum of operator training
- Significant reduction of required operator time by factor of up to 5
- Wide spectrum of modules for ease of use and accurate CT results
- Accelerated sample throughput due to batch CT scans and up to 9 times faster volume reconstruction

# Phoenix Nanotom M - Your Advantages



- Extremely high image quality due to unique temperature stabilized DXR detector (3,072 x 2,400 pixels) with a high dynamic range > 10,000 :1
- New open 180 kV / 20 W high-power nanofocus X-ray tube with down to 200 nm detail detectability, optimized for long-term stability
- High spatial and contrast resolution on a wide sample range - from small material to medium sized plastic samples covering 3 orders of magnitude (0.25 mm to 250 mm sample size)
- Optimized 3D measurement package for stable acquisition conditions, fast reconstruction within minutes and reproducible measurement results
- Max. sample size 240 mm  $\varnothing$  x 250 mm in height and 3 kg (6.6 lbs.) in weight
- Down to 300 nm minimum voxel size
- Diamond window for extremely high focal spot stability and up to 2 times faster data acquisition at the same high image quality level
- Optimized ease of use due to system design and advanced Phoenix Datos|x CT software

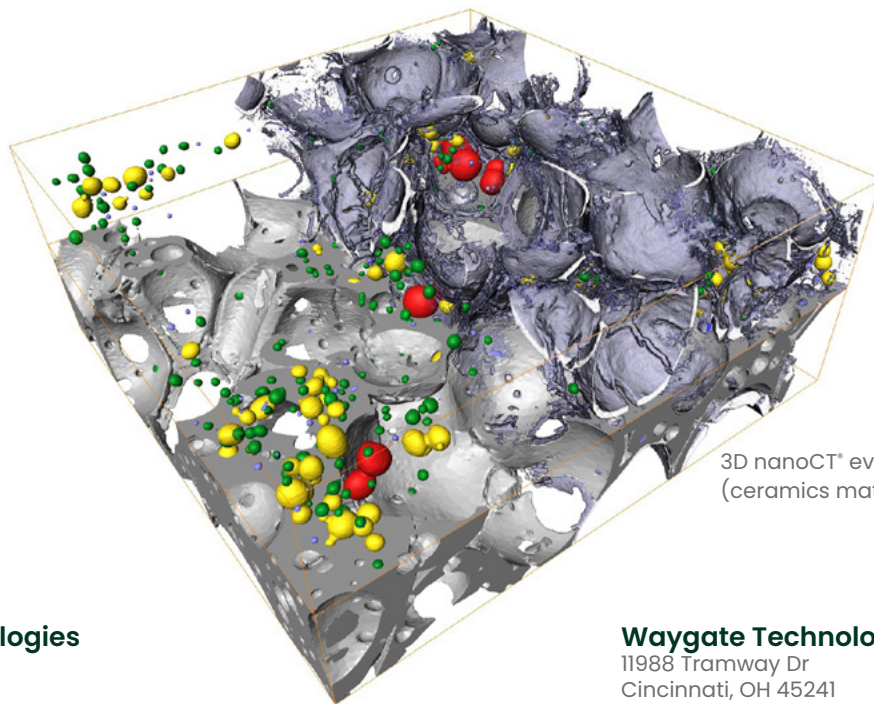
**New tube design optimized for long-term stability**

# General specifications

	Phoenix Nanotom M
<b>X-ray tube type</b>	Proprietary open high-power nanofocus X-ray tube, optimized for long-term stability Internal X-ray tube cooling
<b>Max. voltage / power</b>	180 kV / 20 W
<b>Target</b>	Tungsten on CVD diamond for up to 2 times faster data acquisition at the same high image quality level Transmission target type, rotatable for multiple use (other target materials, e.g. molybdenum on request)
<b>Filament</b>	Tungsten hairpin, pre-adjusted plug-in cartridges for fast and easy exchange
<b>Geom. magnification (3D)</b>	1.4x - 300x
<b>Detail detectability</b>	Down to 200 nm (0.2 microns)
<b>Min. voxel size</b>	Down to 300 nm (0.3 microns)
<b>Detector type</b>	Temperature-stabilized high dynamic DXR, 14 bit, 1.5x detector enlargement (max. 4,600 pixel detector width)
<b>Pixels</b>	3,072 x 2,400
<b>Pixel size</b>	100 µm
<b>Manipulation</b>	Granite based 5-axes manipulator with vibration insulation, precision rotation table on air bearings
<b>Variable focus detector distance</b>	from 200 mm to 600 mm
<b>Max. sample diameter</b>	< 1 mm to 240 mm
<b>Max. sample height / weight</b>	250 mm / 3 kg (6.6 lbs.)
<b>Sample travel length Y / Z</b>	250 mm / 400 mm
<b>Rotation</b>	0° - 360° x n
<b>System dimensions</b>	1,980 mm x 1,600 mm x 925 mm (78" x 63" x 36.4")
<b>System weight</b>	Appr. 1,900 kg / 4,190 lbs.
<b>Optional 3D measurement package</b>	Temperature stabilized cabinet, high accuracy direct measuring system, Calibration object, Datas x module packages "metrology" and "Click & measure CT"
<b>Software</b>	Phoenix Datas x 3D computed tomography acquisition and reconstruction software. Different 3D evaluation software packages for 3D metrology, failure or structure analysis on request.
<b>CT reconstruction</b>	Phoenix Datas Velo CT high-speed
<b>Basic Datas x modules</b>	Auto ROI, Sector scan, Fast scan, Multi scan, Multi volume reconstruction, AGC module - automatic geometry calibration, BHC+ module - automatic beam hardening correction, RAR module - ring artefact reduction,
<b>Optional modules</b>	Datas x module package 3D "measurement", Datas x module package "Click & measure CT"
<b>Optional advanced sample manipulation</b>	Manual XY highly accurate positioning table, tensile & compression testing stage system, coolstage specimen cooling unit Motorized XY-table with two linear axes
<b>Radiation protection</b>	Radiation safety cabinet for full protective installation without type approval according to German StrSchG/StrSchV. It complies with French NFC 74 100 and the US Performance Standard 21 CFR Subchapter J. For system operation, other official licenses may be necessary

# By making the invisible visible, we ensure safety, quality and productivity.

Our innovative Phoenix CT solutions are designed to increase throughputs without compromising quality. From producing higher resolution scans at higher speeds with our precision line, to bringing inspection to the production floor with our production line, we are committed to helping your research and operation become more efficient than ever before.



3D nanoCT® evaluation of artificial bone  
(ceramics matrix with aluminium coating)

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**Baker Hughes** 