

Unique spatial and contrast resolution on a wide sample range

GE
Measurement & Control Solutions
phoenix|x-ray

phoenix nanotom m

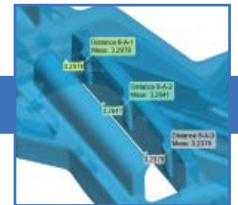
180 kV / 15 W X-ray nanoCT[®] system for high-resolution analysis and 3D metrology



nanoCT[®] of TSVs in an electronic package. The voids in the copper filling are clearly visible.



3D volume slice of an AlMg5Si7 alloy (\varnothing 350 μ m): Fe-aluminides and Mg₂Si-phases.



3D image of an injection molded part showing feature details.

Key features & benefits

- Unique temperature stabilized digital GE DXR detector (3,072 x 2,400 pixels) for a high dynamic range > 10,000 : 1
- New open 180 kV / 15 W high-power nanofocus X-ray tube with up to 200 nm detail detectability, optimized for long-term stability
- diamond|window for extremely high focal spot stability and up to 2 times faster data acquisition at the same high image quality level
- Granite-based manipulator for high stability
- Max. sample size 240 mm \varnothing x 250 mm in height
- Down to 0.3 μ m min. voxel size
- Optimized ease of use due to intelligent system design and advanced phoenix datos|x 2.0 CT software
- 3D metrology package with temperature stabilized cabinet and high accuracy direct measuring system



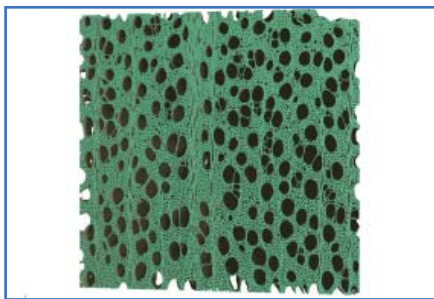
GE imagination at work

phoenix nanotom m

Versatile 3D computed tomography 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 / 15 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® – closest to synchrotron CT



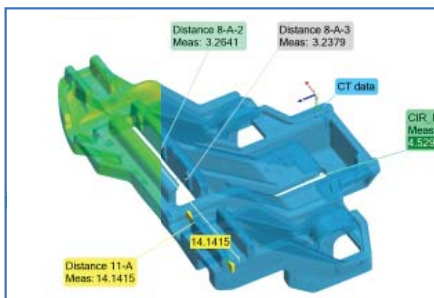
3D image of copper particles in a piece of wood

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 the new high dynamic range GE DXR detector the system offers long-term stable optimized image quality.

In pursuit of high-resolution images, the potential, convenience and economy of 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

3D metrology with high-resolution CT



CAD variance analysis and measurement of 5 features of an injection molded part

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 metrology 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 GE DXR detector for brilliant image quality
- Long-term stability optimized X-ray tube with diamond|window – reduction of artefacts
- 2 calibration objects
- phoenix datos|x 2.0 software “click & measure|CT” and “metrology”

First article inspection report in less than 1 hour possible

phoenix datos|x 2.0 – CT software

Fully automated data acquisition and volume processing

With datos|x 2.0, 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 2.0 CT software, 3D metrology and failure analysis with phoenix|x-ray CT systems becomes as fast and easy as never before

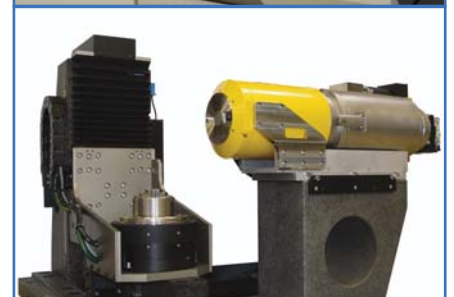
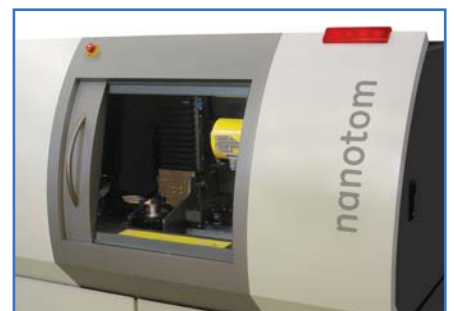
- click & measure|CT: Fully automated data acquisition and volume processing – insert sample, start CT scan, check results
- Reproducible high precision 3D metrology and failure analysis tasks performed with a minimum of operator training
- Significant reduction of required operator time by factor of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



Intuitive graphical user interface for easy usage and a fast learning curve due to clear display of CT results in 2D axis views and 3D render mode.

phoenix nanotom m - Your Advantages

- Unique 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 metrology package for stable acquisition conditions, fast reconstruction within minutes and reproducible measurement results
- Extremely high image quality due to unique temperature stabilized GE DXR detector (3,072 x 2,400 pixels) with a high dynamic range > 10,000 : 1
- Max. sample size 240 mm Ø x 250 mm in height and 3 kg (6.6 lbs.) in weight
- Automatic and continuous adjustment of the magnification
- Optimized ease of use due to system design and advanced phoenix datos|x 2.0 CT software



New tube design optimized for long-term stability

Technical Specifications & Configurations

	phoenix nanotom m
X-ray tube type	open high-power nanofocus X-ray tube, optimized for long-term stability
Max. voltage / power	180kV / 15W
Target	tungsten on CVD diamond, transmission type, rotatable for multiple use, up to 2 times faster data acquisition at the same high image quality level (other target materials, e.g. molybdenum on request)
Filament	tungsten hairpin, pre-adjusted plug-in cartridges for fast and easy exchange
Geom. magnification (3D)	1.5 times up to 300 times
Detail detectability	up to 200 nm (0.2 microns)
Min. voxel size	up to 300 nm (0.3 microns)
Detector type	GE DXR, 14 bit / 16 bit, 1.5x detector enlargement (max. 4,500 pixel detector width)
Pixels	3,072 x 2,400
Pixel size	100 µm
Manipulation	granite based 5-axes manipulator with vibration insulation, precision rotation unit with air bearings
Variable focus-detector-distance	150 mm to 600 mm
Max. sample diameter	< 1 mm to 240 mm
Max. sample height / weight	250 mm / 3 kg (6.6 lbs.)
Sample travel length Y / Z	0 – 250 mm / 0 – 400 mm
Rotation	0° - 360° x n
Detector travel length Z / X	150 – 600 mm / +/- 125 mm
System dimensions	1980 mm x 1600 mm x 900 mm (78" x 63" x 35.4")
System weight	appr. 1900 kg / 4189 lbs.
Optional 3D metrology bundle	temperature stabilized cabinet high accuracy direct measuring system 2 calibration objects phoenix datos x 2.0 CT software package "click & measure CT" and "metrology"
Software	phoenix datos x 2.0 - 3D computed tomography software
Basic modules	agc module - automatic geometry calibration, bhc+ module - automatic beam hardening correction, rar module - ring artefact reduction, velo CT - high speed CT reconstruction
Optional modules	datos x module package 3D "metrology", datos x module package "click & measure CT" as well as different individual modules on request
Optional XY - Table – motorized	This additional attachment on the rotary table which consists of two motorized linear axes (+/-5 mm travel range) which are orthogonally mounted, permits a comfortable and highly accurate adjustment of the sample to the center of rotation. This facilitates the positioning of very small samples in order to be able to test them at high magnifications.
Radiation protection	The radiation safety cabinet is a full protective installation without type approval according to the German RöV, French NFC 74 100 and the US Performance Standard 21 CFR 1020.40. For operation, other official licenses may be necessary.



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