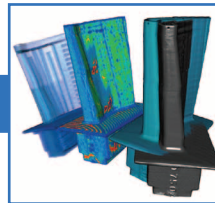


# phoenix v|tome|x m

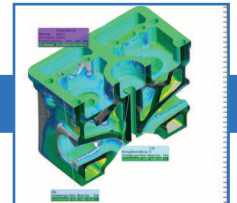
Powerful versatile X-ray microfocus CT system for 3D metrology and analysis with up to 300 kV / 500 W



3D analyses of a scanned turbine blade.



Automatic pore volume analysis in an aluminum casting.



3D measurements and nominal-actual CAD comparison on an aluminum cylinder head.

## Key features & benefits

- scatter|correct: highly improved CT quality level compared to conventional mikrofocus cone beam CT
- Industry leading magnification and power at 300 kV for high absorbing samples on a wide application range
- Unique dual|tube configuration for high power  $\mu$ CT as well as high resolution nanoCT®
- First compact 300 kV microfocus CT system with  $< 1 \mu\text{m}$  detail detectability
- metrology|edition for precision measurements with up to  $4+L/100 \mu\text{m}$  referring to VDI 2630 guideline\*
- Max. sample size up to 500 mm  $\varnothing$  x 600 mm in height; 3D scanning area max. 290 mm  $\varnothing$  x 400 mm; up to 50 kg (110 lbs.)

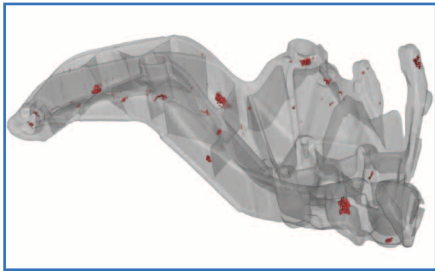


# phoenix v|tome|x m

High-end tool for 3D industrial and scientific analysis tasks

Within the phoenix v|tome|x m, GE's unique 300 kV microfocus X-ray tube is for the first time available in a compact CT system for industrial process control as well as for scientific research applications. Beyond down to  $< 1 \mu\text{m}$  detail detectability, the system offers industry leading magnification and power at 300 kV. GE's high dynamic DXR digital detector array and the click & measure|CT automatization functionality make it an efficient 3D tool for industrial inspection and scientific research. Due to its dual|tube configuration, detailed 3D information for an extremely wide sample range is provided: from high resolution nanoCT® of low absorbing samples up to high power  $\mu\text{CT}$  applications such as turbine blade inspection.

## Industrial non-destructive 3D testing

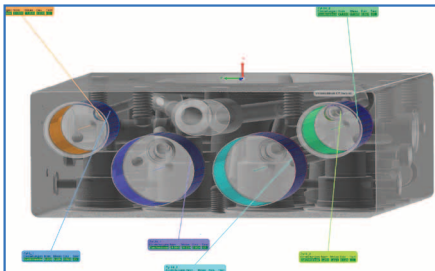


Automated 3D porosity analysis in an automotive control arm

Beyond high-resolution 3D analysis in R&D and failure analysis labs, the phoenix v|tome|x m allows even 3D production control due to its powerful 300 kV tube and high dynamic detector technology for fast CT acquisition, fast velo|CT volume reconstruction and its high automation grade. Applications are, e.g., in light metal casting, electronics assembly, plastics molding as well as in turbine blade inspection:

- Internal defect analysis / 3D quantitative porosity analysis
- Assembly control
- Materials structure analysis

## Reproducible precision 3D metrology with CT

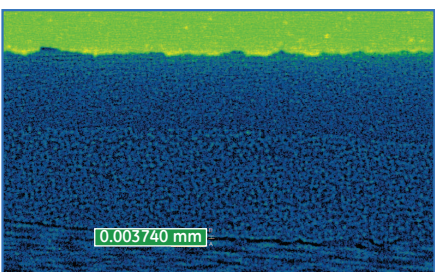


3D metrology of internal features of a valve block made of high grade aircraft aluminum

Especially if complex parts with hidden or difficult accessible surfaces have to be measured, 3D CT offers big advantages in comparison with conventional tactile or optical coordinate measuring machines (CMMs) e.g. for work piece qualification and fast first article inspection. Optimized for long term stability and equipped with its specific 3D metrology package and advanced scatter|correct technology, the phoenix v|tome|x m includes all essential features for CT with extremely high accuracy and reproducibility:

- Accuracy specification of  $4+L/100 \mu\text{m}$  referring to VDI 2630 guideline\*
- Nominal-actual CAD comparison
- Dimensional measurements / wall thickness analysis
- Reverse engineering / tool compensation

## Explore the 3rd dimension of science



nanoCT® of an aluminium plate (green) welded with carbon fibers in polyamide matrix

With its high resolution 180 kV nanoCT® option, the new phoenix v|tome|x m opens a non destructive third dimension for scientific research down to the submicron scale - with no required preparation, slicing, coating or vacuum treatment. Analyze biomedical, materials science, composite, electronics or geological samples with down to  $< 1$  micron voxel size.

Compact CT system with unique dual|tube combination

# phoenix datos|x CT software

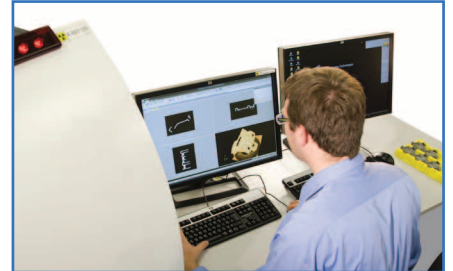
## Fully automated data acquisition and volume processing

With datos|x, the entire CT process chain can be fully automated. Once the appropriate setup is programmed, the whole scan and reconstruction process as well as 3D failure analysis or metrology evaluations 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|x-ray CT systems becomes as fast and easy as never before.

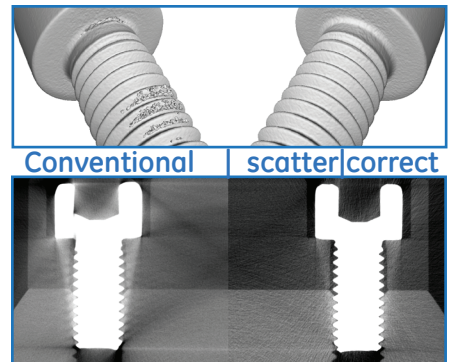
- click & measure|CT: Fully automated data acquisition and volume processing – insert sample, start CT scan, check results
- Reproducible high precision 3D metrology and failure analysis tasks performed with a minimum of operator training
- Significant reduction of required operator time by factor of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



Easy and user friendly CT operation and evaluation.

## Unique scatter|correct technology

GE's breakthrough scatter|correct technology innovation is exclusively available in industrial microCT for the v|tome|x m system. This technological advancement automatically removes scatter artifacts from the CT volume, allowing users to gain significant improved CT results compared to conventional cone beam microCT.



Compared with conventional cone beam CT, scatter|correct significantly improves the result quality of CT

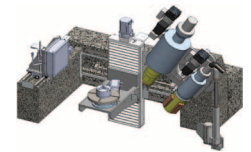
## phoenix v|tome|x m - Your Advantages

- Reduced CT artifacts by up to 300 kV X-ray radiation and advanced, high quality scatter|correct option
- High precision 3D metrology referring to VDI standard 2630 and non destructive testing tasks performed with minimal operator training
- Increased 3D inspection throughput due to high power X-ray tube, efficient, fast detector technology and a high grade of automation
- Very high image quality due to unique GE DXR detector array with an extremely high dynamic range
- All major hardware and CT software components of the system are proprietary GE technology optimally compatible with one another
- Significant reduction of required operator time by using the click & measure|CT functionality
- Stability optimized CT acquisition conditions due to temperature stabilized X-ray tube, digital detector array and cabinet



The unique 300 kV microfocus X-ray tube allows 3D scans even of large or high absorbing work pieces.

# Technical Specifications & Configurations



	phoenix v tome x s	phoenix v tome x m**
X-ray tube type	Open directional high-power microfocus X-ray tube, closed cooling water circuit. Optional additional (open) transmission high power nanofocus X-ray tube	
Max. voltage / power	240 kV / 320 W	300 kV / 500 W. Alternatively available with 240 kV / 320 W microfocus X-ray tube
	Optional additional 180 kV / 15 W in dual tube configuration. Easy tube exchange just by a push of a button	
Geometrical magnification (3D)	1.46 x to 100 x; up to 200 x with nanofocus tube	1.3 x to 100 x at 800 mm FDD (min. sample Ø 2 mm), up to 200 x with nanofocus tube
Detail detectability	Down to < 1 micron (microfocus tube); optional down to < 0.5 micron (nanofocus tube)	
Min. voxel size	Down to 2 microns (microfocus tube)	Down to 1 micron (microfocus tube)
	Optional down to < 1 micron (nanofocus tube)	
Measurement accuracy		4+L/100 µm referring to VDI 2630-1.3 guideline* /**
Detector type (all according US ASTM E2597-07 standard)	Temperature stabilized digital GE DXR detector array, 200 µm pixel size, 1,000 x 1,000 pixels, 200 x 200 mm, extremely high dynamic range > 10000:1, 2x detector enlargement	Temperature stabilized digital GE DXR detector array, 200 µm pixel size, 2000 x 2000 pixels, 400 x 400 mm, extremely high dynamic range > 10000:1
	Optional 400 x 400 mm large 4 MPixel DXR detector (without detector enlargement)	
Manipulation	6-axes metal precision manipulator	Granite based precision 5-axes manipulator (6-axes with detector shift)
Focus-detector-distance	800 mm	800 mm fixed
Max. sample diameter x height	max. 3D scanning size up to 260 mm x 420 mm	360 mm x 600 mm; up to 500 x 600 mm with limited travel range, max. 3D scanning size up to 290 mm x 400 mm
Max. sample weight	max. up to 10 kg (220 lbs.)	High accuracy CT up to 20 kg (44 lbs.); max. up to 50 kg (110 lbs.)
Focus object distance (micro-focus tube)	7 mm to 545 mm	8 mm to 600 mm at FDD 800 (min. sample Ø 2 mm)
System dimensions W x H x D	2,170 mm x 1,690 mm x 1,500 mm (85.4" x 66.5" x 59" )	2,620 mm x 2,060 mm x 2,980 mm (103" x 81" x 117.3) D 1,570 mm (62") without user panel and generators
System weight (without ext. components)	Appr. 2,900 kg / 6,400 lbs.	Appr. 7,960 kg / 17,550 lbs. (300 kV configuration) Appr. 6,410 kg / 14,150 lbs. (240 kV configuration)
Temperature stabilization	Active X-ray tube cooling   temperature stabilized detector	Active X-ray tube cooling   temperature controlled cabinet   temperature stabilized detector
Optional scatter correct hard-/software bundle (also upgrade option)		CT quality like 2D fan beam CT with minimized scatter radiation artifacts. Max. scan diameter: 260 mm, geom. magnification 1,51x - 100x
Opt. 2D inspection bundle	Tilt and rotation axes for tilted 2D inspection of samples up to 10 kg (22 lbs.)   2D inspection software	
Opt. 3D metrology bundle** (also upgrade option)	High accuracy direct measuring system   2 calibration objects   phoenix datos x CT software package "metrology"	
Opt. nanoCT® bundle	180 kV / 15 W high power nanofocus tube   Precision rotation unit with air bearings   diamond window	
Opt. click&measure CT	Optional fully automated CT process chain	included
Software	phoenix datos x 3D computed tomography acquisition and reconstruction software. Different 3D evaluation software packages for 3D metrology, failure or structure analysis on request	
Radiation protection	The radiation safety cabinet is a full protective installation without type approval according to the German RöV. It complies with French NFC 74 100 and the US Performance Standard 21 CFR Subchapter J. For operation, other official licenses may be necessary.	

\* Measured as deviation of sphere distance in tomographic static mode SD(TS), method details referring to VDI 2630-1.3 guideline on request, valid only for phoenix v|tome|x m metrology edition

\*\* phoenix v|tome|x m metrology|edition only available in specific countries at present, more information on request



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