

# GE Sensing & Inspection Technologies phoenix|x-ray

## v|tome|x L – versatile and flexible CT system

The phoenix v|tome|x L 300 and L 450 are versatile high resolution microfocus systems for 3D and 2D Computed Tomography and 2D non-destructive X-ray inspection. With their granite-based 8-axes manipulation they are handling even large samples with highest precision. Both systems are the optimal solution for void and flaw detection and 3D metrology (e.g. first article inspection) of castings. Furthermore, phoenix|x-rays high resolution X-ray technology with many extras like an optionally second X-ray tube allows to adapt the v|tome|x L to any kind of industrial and scientific CT application. A variety of effective software tools minimises physical effects like ring-artefacts or beam-hardening for highest CT quality.



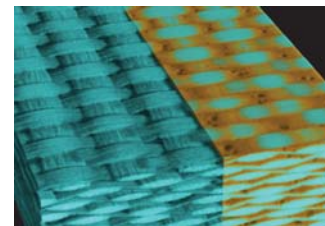
phoenix v|tome|x L 300



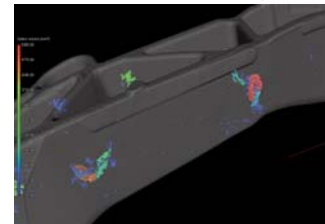
phoenix v|tome|x L 450

|                                  | phoenix v tome x L 300                                    | phoenix v tome x L 450                 |
|----------------------------------|---|--|
| Optional X-ray tube combinations | unipolar 300 kV microfocus<br>180 kV high-power nanofocus | 300 kV microfocus<br>450 kV macrofocus |
| Max. voxel resolution            | 1 µm  | < 2 µm                                 |
| Max. object size (3D-CT)         | Ø 500 mm, H 600 mm  | Ø 1000 mm, H 1250 mm                   |
| Max. object weight               | 50 kg   | 100 kg                                 |

- ▶ Longlife open micro- and nanofocus X-ray tubes
- ▶ Unique 300 kV / 500 W unipolar microfocus tube for high magnification
- ▶ Granite based precision manipulation up to 8 axes
- ▶ High precision CNC control
- ▶ High dynamic temperature stabilized detector technology
- ▶ High contrast array detector + multi-line detector or line detector for 2D CT
- ▶ Virtual detector enlargement
- ▶ Easy switching between 2D inspection and 3D computed tomography mode
- ▶ Excellent software modules for highest CT quality and ease of use
- ▶ velo|CT for extreme high speed reconstruction
- ▶ Advanced surface extraction for high precision 3D Metrology (CAD variance analysis, reverse engineering etc.)
- ▶ Automatic generation of first-article-inspection reports in < 1 hour possible



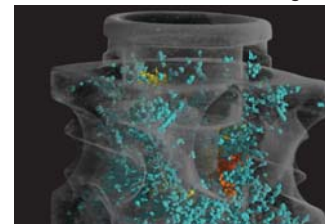
Fiberglass



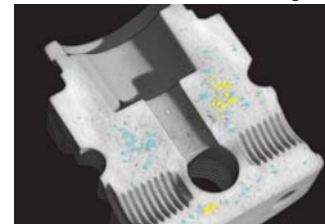
Cavities in an Aluminum casting



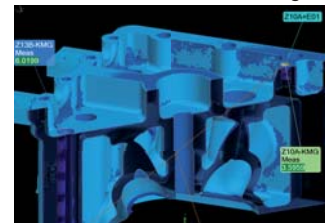
Aluminum casting



Cavities in an Aluminum casting



Aluminum casting



AL casting 3D measurements

## v|tome|x L – highest precision even for large samples

With its granite-based 8-axis manipulation unit, the phoenix v|tome|x L 450 handles even large samples (up to 100 kg (220 lbs) in weight, up to 1000 mm in diameter and up to 1250 mm in height) with highest precision. A supplemental detector axis enlarges the detector width up to 1200 mm. Additional to its 300 kV / 500 W microfocus X-ray tube, the v|tome|x L 450 may come optionally equipped with an extra, 450 kV closed minifocus tube for high absorbing samples. All v|tome|x systems can also be used for 2D inspection with fast and easy switching between 2D and 3D mode. The wide range of available configurations allows to adapt the v|tome|x L to almost any kind of application in science, production control and 3D metrology.

### Advanced CT software

All v|tome|x CT systems come standard with phoenix|x-rays proprietary CT acquisition and reconstruction software package datos|x for fast and accurate CT. Due to GPU based reconstruction techniques, CT results are available after just a few minutes. For ease of use and to optimise the quality of high resolution CT data, phoenix|x-ray offers a variety of effective software tools, e.g. for automatic geometry calibration, for <math>360^\circ</math> ROI-CT with maximised magnification, for ring artefact reduction, beam-hardening-correction, optimisation of scans with drift-effects as well as for advanced extraction of surface points for metrological applications. For 2D inspection, phoenix|x-rays 16 bit image processing software quality|assurance comprises image enhancement functions, measurement functions and CNC programming for automated X-ray inspection.

### Maximised flexibility

The v|tome|x L 300 comes with a new unipolar 300 kV / 500 W microfocus source. Due to this unique technique the system can be used for high magnification applications as well as scans of strongly absorbing samples. Major components of the system, like the X-ray tube and the temperature stabilized detector are proprietary technology of GE. For highest resolution scans, the v|tome|x L 300 can be outfitted with an additional open 180 kV high power nanofocus tube. There are many flat panel and line detector options for v|tome|x L systems. In multiline detector configuration, the reduction of scattered radiation for precise 2D scans for metrology application can be reached without installation of an additional expensive line detector.

### Highest accuracy for 3D metrology

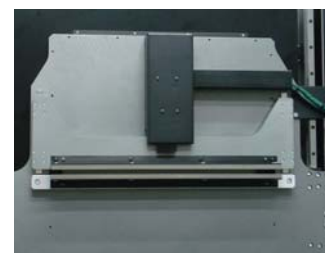
Especially if complex parts with hidden or difficult accessible surfaces have to be measured, CT offers big advantages comparing with conventional tactile or optical coordinate measuring machines (CMMs): high density of measurement points and fast capturing of the complete sample's geometry. v|tome|x L systems include all essential features for CT with highest accuracy: Minimised focal spot and voxel size, granite based setup in an air-conditioned walk in cabinet for high mechanical and thermal stability, high power X-ray tube to enable beam filtering as well as advanced software for optimised CT reconstruction quality and geometrically correct surface extraction. phoenix|x-ray specifications are in accordance with the upcoming standard VDI 2630. E.g. for a 30 mm object (position tolerance  $\pm 1.5 \mu\text{m}$ ) and at a voxel size of  $40 \mu\text{m}$ , the v|tome|x L shows a sphere distance error SD of  $< \pm 0,5 \mu\text{m}$  at a diameter measurement error PS of  $< 2 \mu\text{m}$ . Both parameters were determined by using a special sphere plate designed and calibrated by the German Metrology Institute PTB.



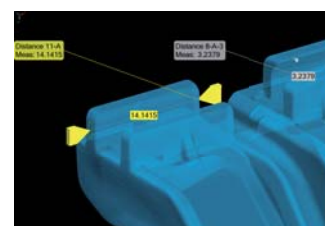
Movement of all axes: v|tome|x L 450 at German aerospace centre DLR



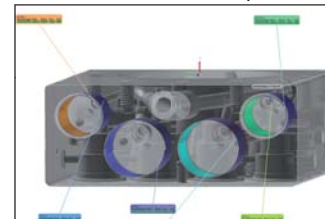
Wall-thickness measurement



16 bit multi-line detector in position



Measurements in moulded plastic



Measurement of internal geometry