Baker Hughes

Inspection Technologies

High performance X-ray inspection solution

with non-destructive planarCT board inspection

microme|x neo 160
microme|x neo 180
nanome|x neo 180

phoenix microme|x neo and nanome|x neo

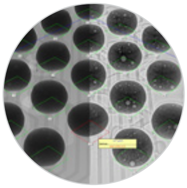
High resolution 160/180 kV micro- / nanofocus X-ray inspection systems with 3D CT option

The phoenix micromeIx neo and nanomeIx neo series combines high-resolution 2D X-ray technology and 3D CT in one system. Innovative and unique features and an extreme high positioning accuracy make both systems the effective and reliable solution for a wide spectrum of 2D and 3D offline inspection tasks: R&D, failure analysis, process and quality control.

The phoenix|x-ray x|act technology offers easy to program CAD based µAXI ensuring automated inspection in the micrometer range. Another unique benefit is Baker Hughes highly dynamic DXR flat panel detector with active cooling. Offering up to 30 frames per second, it provides outstanding brilliant live imaging and fast data acquisition for 3D CT.

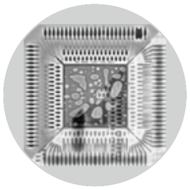
Unique features

- Temperature stabilized digital DXR detector with active cooling for high dynamic live imaging at 180 kV configurations
- 180 kV / 20 W high-power micro- /nanofocus tube with up to 0.5 µm or 0.2 µm detail detectability
- x|act package for CAD based µAXI programming and automatic inspection
- diamond|window for up to 2 times faster data acquisition at the same high image quality level
- Optionally 3D computed tomography scans within 10 seconds

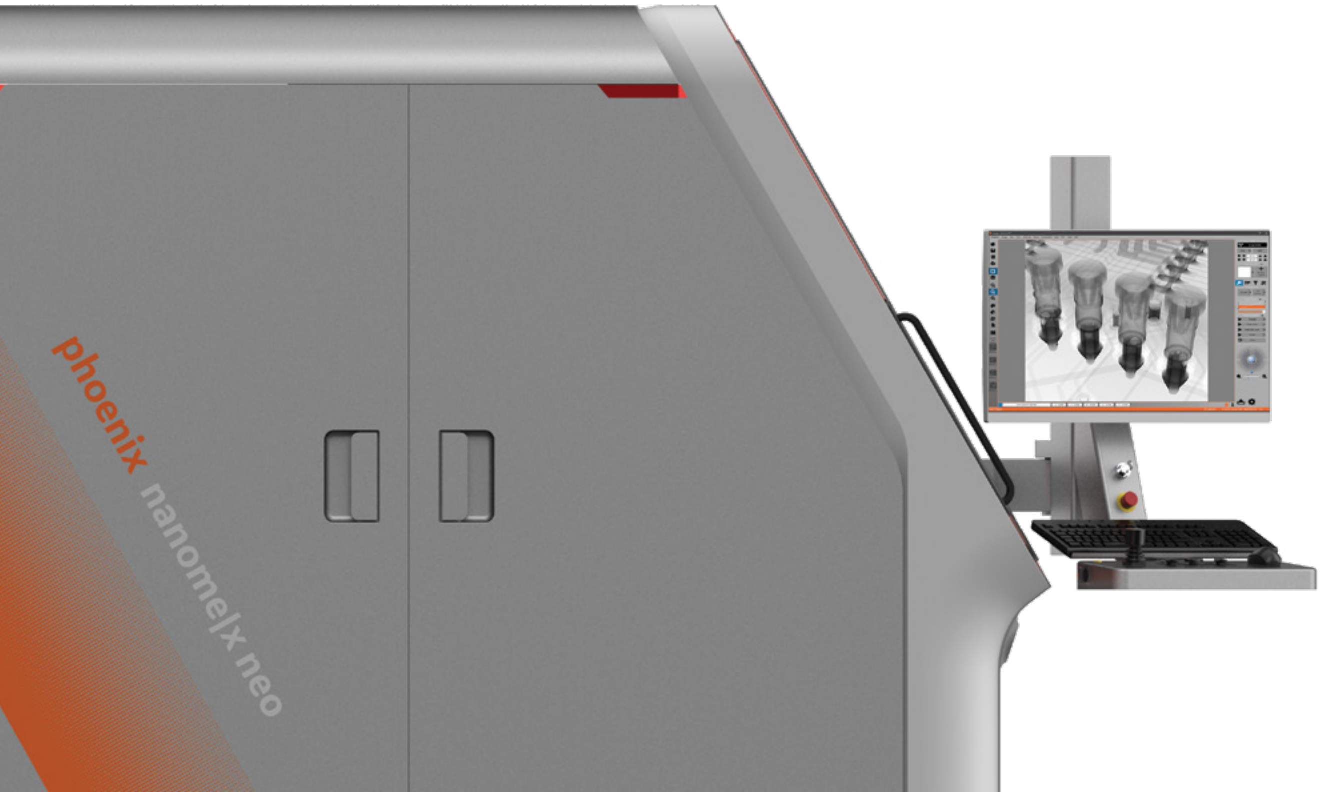


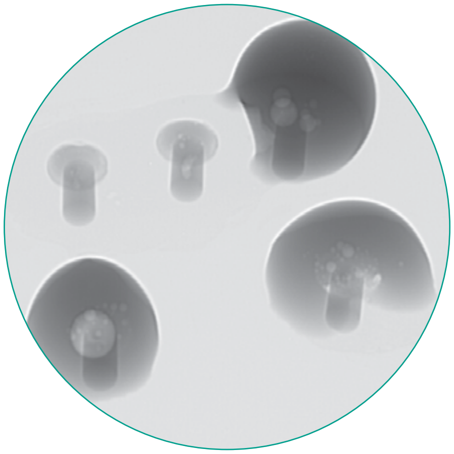
Open BGA ball
with live CAD data
overlay and
Flash! Filters™
image optimization

3D Computed
Tomography of
an USB flash drive



Advanced
planarCT evaluation
(left) without
overlaying features
in the X-ray image



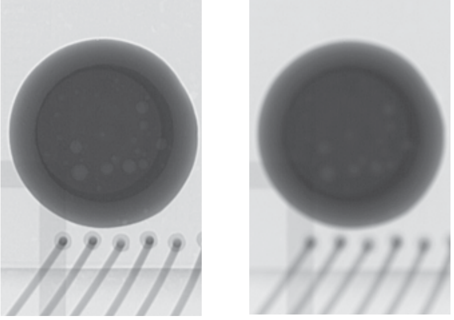


Flash! filtered voids in an open µBGA ball: 1,970x geometric zoom for extreme high magnification

Brilliant DXR-HD live imaging

Baker Hughes proprietary high dynamic DXR detector with enhanced scintillator technology phoenix|x-ray introduces a new industry standard for efficient live inspection:

- Full frame rate of 30 frames per second at 1000x1000 pixels offers low noise coupled with brilliant image quality ensuring fast and detailed live inspection
- Active temperature stabilization for precise and reliable inspection results
- Extremely fast data acquisition in 3D CT mode
- Detail detectability down to 0.5 µm / 0.2 µm for high performance failure analysis



diamond|window beryllium window

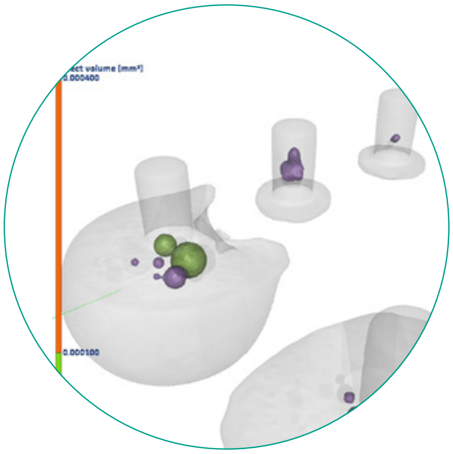
(same X-ray tube parameter: 130 kV, 11.4 W)

High output with high-resolution: diamond|window

Compared to conventional beryllium targets, the diamond|window* allows higher power at a smaller focal spot. This ensures high-resolution even at a high output.

- Up to 2 times faster CT data acquisition at the same high image quality level
- High output with high-resolution
- Non-toxic target
- Improved focal spot position stability within long term measurements
- Increased target lifetime due to less degradation with higher power density

* Option for the 180 kV tube

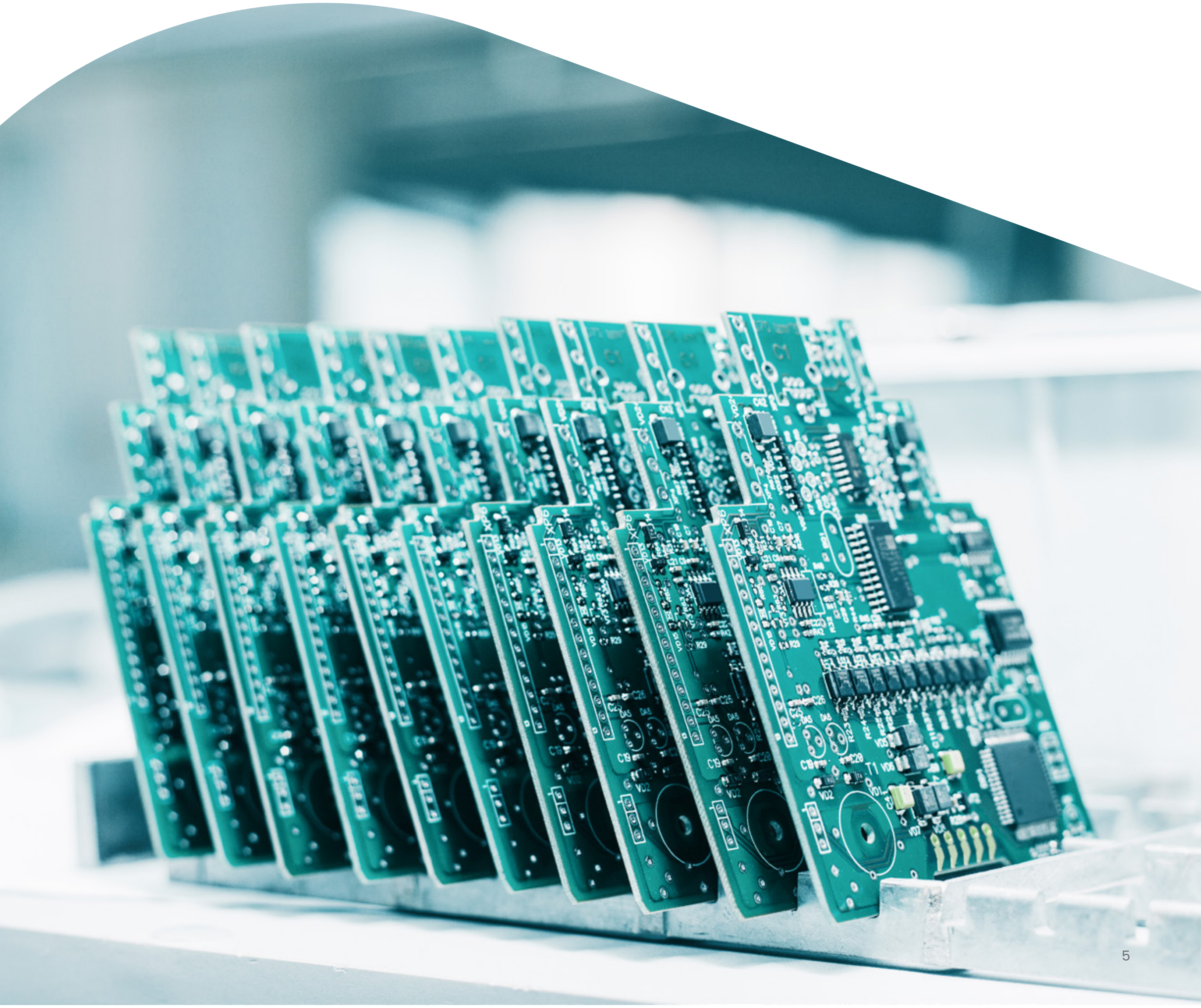


nanoCT® of TSVs in an electronic package. The voids in the copper filling are clearly visible.

High-resolution 3D computed tomography

For advanced inspection and 3D analysis of smaller samples, phoenix|x-ray’s proprietary 3D CT technology is optionally available.

- 180 kV high power X-ray technology, fast image acquisition with DXR detector and diamond window combined with phoenix|x-ray’s fast reconstruction software deliver high quality inspection results
- Maximum voxel resolution down to 2 microns; the nanoCT® capability of the nanome|x allows even a higher image sharpness



x|act – CAD based inspection:

high resolution µAXI for extremely high defect coverage

As a solution for µAXI with extremely high defect coverage, phoenix|x-ray provides its high precision systems micromelx neo and nanomelx neo including the unique x|act software package for fast and easy offline CAD programming.

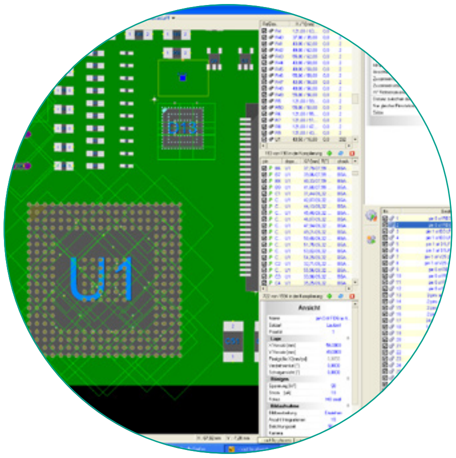
Its intuitive new GUI with improved* outstanding precision and repeatability, small views with resolutions of only a few micrometers, 360° rotation and oblique viewing up to 70° ensures meeting highest quality standards – even for inspection of components with a pitch of just 100 microns.

Besides automated inspection, x|act ensures an easy pad identification by its live CAD data overlay function even in manual inspection while Flash! Filters™ image optimization ensures high defect coverage.

*AXI capabilities provide the outstanding precision

Efficient CAD programming

x|act provides not only a minimal setup time compared with conventional view based AXI – once programmed, the inspection program is portable to all x|act compatible systems.



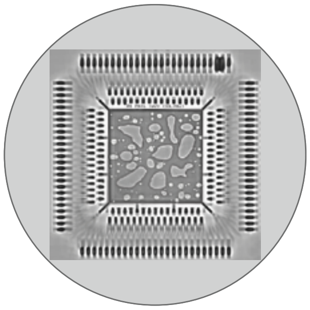
- Easy pad-based offline programming
- Specific inspection strategies for different pad types
- Fully automated inspection program generation
- Extremely high positioning accuracy even at oblique viewing and rotation
- Easy pad identification in manual X-ray inspection
- High reproducibility on large PCBs

Fast and easy programming: just assign the inspection strategies and let x|act generate the automated inspection program

Virtual board slicing with planarCT

- Easy 2D slice or 3D volume evaluation of large complex boards
- No board cutting, no overlaying structures as in X-ray images

planarCT slice or multislice views allow exact inspection results of a single plane or a whole package

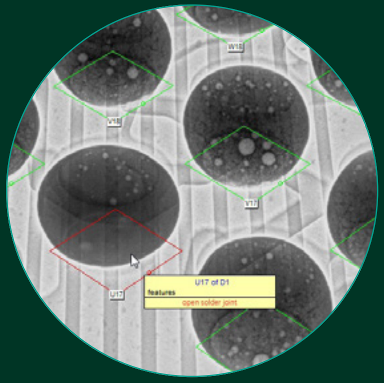


Advanced planarCT evaluation without overlaying features in the X-ray image

Your advantages

phoenix microme|x and nanome|x neo

- Brilliant live inspection images due to high dynamic GE DXR digital detector array
- Unique high power 180 kV / 20 W micro- or nanofocus tube for even high absorbing electronic samples
- Minimized setup time due to highly efficient automated CAD programming
- Live overlay of CAD and inspection results even in rotated oblique inspection views
- Extremely high defect coverage and repeatability
- Best detail detectability 0.5 µm or even 0.2 µm with nanofocus
- Optional Flash! Filters™ image optimization technology
- Large 27” monitor for better defect identification
- Optional advanced failure analysis with high resolution 3D micro- or nanoCT® or large board planarCT
- Optional 3D CT scans up to 10 seconds



x|act provides **live CAD overlay** and inspection results in the X-ray live image – at **any time**, at **any viewing angle**.

Baker Hughes exclusive **Flash! Filters** technology option enables **faster, more reliable** failure detection.

Technical specifications and configurations

<table>
<tr><th></th><th>nanome|x neo 180</th><th>microme|x neo 180</th><th>microme|x neo 160</th></tr>
<tr><td>X-ray detector</td><td colspan="2">High dynamic GE DXR250RT, 1,000 x 1,000 pixels, temperature stabilized with active cooling for brilliant live imaging and extremely fast CT data acquisition, 200 x 200 µm pixel size, up to 30 fps at full frame</td><td>High contrast 1,536 x 864 pixel flat panel CMOS detector, 75 µm pixel size</td></tr>
<tr><td>Geometric magnification</td><td colspan="3">max. 1,970x</td></tr>
<tr><td>Total magnification 27” Monitor</td><td colspan="2">max. 2,700x</td><td>max. 7,200 x</td></tr>
<tr><td>Total magnific. 27” 2K Monitor</td><td colspan="2">max. 2,300x</td><td>max. 6,000x</td></tr>
<tr><td>Detail detectability</td><td>up to 0.2 µm</td><td colspan="2">up to 0.5 µm</td></tr>
<tr><td>X-ray tube type</td><td>Low maintenance open nanofocus tube with unlimited lifetime, transmission type, 170° cone angle, collimated</td><td>Low maintenance open microfocus tube with unlimited lifetime, transmission type, 170° cone angle, collimated</td><td>open microfocus tube, transmission head, 170° cone angle, collimated, target rotatable for multiple use.</td></tr>
<tr><td rowspan="2">Max. tube voltage/power on target</td><td>180 kV / 15 W</td><td>180 kV / 20 W</td><td>160 kV / 20 W</td></tr>
<tr><td colspan="2">Optional diamond|window for up to 2 times faster data acquisition at the same high image quality level</td><td>-</td></tr>
<tr><td>Filament</td><td colspan="3">Tungsten hairpin, pre-adjusted in plug-in cartridges for fast and easy exchange</td></tr>
<tr><td>Manipulator</td><td colspan="3">high-precision vibration-free synchronized 5-axes manipulation</td></tr>
<tr><td>Max. inspection area</td><td colspan="3">460 mm x 360 mm (18” x 14”), 610 mm x 510 mm (24” x 20”) without rotation table</td></tr>
<tr><td>Max. sample size / weight</td><td colspan="3">680 mm x 635 mm (27” x 25”) / 10 kg (22 lbs.)</td></tr>
<tr><td>ovhm – oblique view rotation</td><td colspan="3">continuously adjustable view angle up to 70°, rotation 0° – 360°</td></tr>
<tr><td>Control</td><td colspan="3">Joystick or mouse control (manual mode) and CNC (automatic mode)</td></tr>
<tr><td>Manipulation aids</td><td colspan="3">sample X-ray mapping, click’n-move-to function, click’n-zoom-to function, automatic isocentric manipulator movement</td></tr>
<tr><td>Positioning aid</td><td colspan="3">laser crosshair</td></tr>
<tr><td>Anti-Collision System</td><td colspan="3">may be deactivated for maximum magnification (tube touching the sample)</td></tr>
<tr><td>System dimensions (W x H x D)</td><td colspan="3">2,160 mm x 1,920 mm x 1,590 mm (85” x 75.6” x 62.6”), (without control console)</td></tr>
<tr><td>Min. transportation width:</td><td colspan="3">1,590 mm (62.6”)</td></tr>
<tr><td>Max. weight</td><td colspan="3">appr. 3,100 kg / 6,835 lbs.</td></tr>
<tr><td>Radiation safety</td><td colspan="3">The radiation safety cabinet is a full protective installation without type approval according to the German RöV and the US Performance Standard 21 CFR, Subchapter J. For operation, other official licenses may be necessary</td></tr>
<tr><td>Image processing software</td><td colspan="3">phoenix x|act: comprehensive CAD based X-ray inspection software comprising image enhancement functions, measuring functions and fast and easy automated CAD based programming for automatic inspection
bga|module (standard): Intuitive automatic view based BGA solder-joint evaluation incl. automatic wetting analysis
vc|module (standard): Intuitive automatic view based voiding calculation software package incl. capability of multiple die attach voiding evaluation</td></tr>
<tr><td rowspan="2">Software Configuration (Option)</td><td colspan="3">x|act BGA check strategy: automated CAD based analysis of BGA solder joints
x|act PTH check strategy: automated CAD based analysis of PTH solder joints
qfp|module: automated QFP solder joint evaluation
qfn|module: automated inspection of QFN / MLF solder joints
pth|module: automated pin-through-hole solder joint evaluation
c4|module: view based evaluation of round solder joints with background structure, such as C4 bumps
ml|module: view based registration of multilayer printed circuit boards
quality|review: visual interface for rework and failure indication
Flash! FiltersTM: GE’s exclusive image optimization technology</td></tr>
<tr><td colspan="2">planarCT module: Non destructive 2D slice and 3D volume board evaluation incl. 3D|viewer software</td><td>-</td></tr>
<tr><td>Hardware Configuration (Option)</td><td colspan="3">Tilt / rotate unit: tilt ± 45° and rotation n x 360° for samples up to 2 kg
Manual bar code reader: for product identification</td></tr>
<tr><td>Computed Tomography (Option)</td><td colspan="3">Volume acquisition / reconstruction software: phoenix datos|x
Upgrade package for combined 2D / 3D (computed tomography) operation CT-unit: precision rotation axis
Max. geom. magnification: 100 x (CT)
Max. voxel resolution: down to 2 µm, resolution depending on the sample size. The nanoCT® function of the nanome|x allows a higher image sharpness.</td></tr>
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