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

Unique features

• Temperature stabilized digital DXR detector with active cooling for high dynamic live imaging
• 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
The high performance X-ray inspection solution

The phoenix microme|x and nanome|x 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 GE’s 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.

Brilliant DXR-HD live imaging

With GE’s 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

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

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-rays 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 microme|x and nanome|x including the unique x|act software package for fast and easy offline CAD programming. 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.

Efficient CAD programming – minimized setup time

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.

- Import of CAD-data
- Easy pad-based offline programming
- Specific inspection strategies for different pad types
- Fully automated generation of the inspection program even in oblique view and multiple angular positions per component
- Full program portability for all x|act compatible phoenix|x-ray systems

Repeatably high defect coverage

- Extremely high positioning accuracy even at oblique viewing and rotation
- Easy pad identification in manual X-ray inspection
- High reproducibility on large PCBs

phoenix microme|x / nanome|x – Your Advantages

- Brilliant live inspection images due to high dynamic GE DXR digital detector array
- Unique high power 180 kV / 20 W submicron 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
- Outstanding ease-of-use
- Detail detectability down to 0.5 µm or even 0.2 µm
- Optional Flash! Filters™ image optimization technology
- Optional advanced failure analysis with high resolution 3D micro- or nanoCT®
- Optional 3D CT scans up to 10 seconds

* Nanofocus 20 W only with diamond window, otherwise 15 W
Technical Specifications & Configurations

**System magnification and resolution**

- **Geometric magnification:** DMR max. 1.970 x max. 2.130 x with image intensifier
- **Total magnification:** DMR max. 2.660 x max. 22.150 x with image intensifier
- **Detail detectability:** up to 0.5 µm nanome|x to up to 2.0 µm

**180 kV microfocus or nanofocus X-ray tube**

- **Type:** Low maintenance open microfocus tube with unlimited lifetime, transmission type, 170° cone angle, collimated
- **Maximal tube voltage:** 180 kV
- **Maximal tube output:** 20W (15W nanofocus tube without diamond window)
- **Target:** Optional non-toxic diamond window (tungsten on CVD support) for up to 2 times faster data acquisition at the same high image quality level
- **Filament:** Tungsten hairpin, pre-adjusted in plug-in cartridges for fast and easy exchange

**X-ray detector**

- **Type:** High dynamic GE DXR250RT, temperature stabilized with active cooling for brilliant live imaging and extremely fast CT data acquisition. (Image intensifier and for nanome|x dual detector configuration also available.)
- **Pixels:** 1000 x 1000 pixels
- **Resolution (pixel size):** 200 x 200 micrometer
- **Frame grabbing rate:** Up to 50 fps at full frame

**Precise manipulation**

- **General construction:** High-precision vibration-free synchronised 5-axes manipulation
- **Max. inspection area:** 460mm x 360mm (18” x 14”)
- **Max. sample size/weight:** 610mm x 510mm (24” x 20”) without rotation table
- **Ovhm – oblique view at highest magnification:** 680mm x 635mm (27” x 25”) / 10 kg (22 lbs.)
- **Control:** Joystick or mouse control (manual mode) and CNC (automatic mode)
- **Manipulation aids:** Sample X-ray mapping, click’n-move-to function, click’n-zoom-to function, automatic isocentric manipulator movement, laser crosshair
- **Anti-Collision System:** May be deactivated for maximum magnification (tube touching the sample)

**System dimensions**

- **Dimensions (W x H x D):** 2,020 mm x 1,920 mm x 1,860 mm (79.5” x 75.6” x 73.2”)
- **Min. transportation width:** 1,560 mm (61.4”)
- **Weight:** approx. 2,600 kg / 5,732 lbs.

**Radiation Protection**

The radiation safety cabinet is a full protective installation without type approval according to the German RöV and the US Performance Standard 21 CFR 1020.40. For operation, other official licenses may be necessary.

www.ge-mcs.com/phoenix

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**Advanced image processing (16 bit)**

- **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
- **bgajmodule (standard):** Intuitive automatic view based BGA solder-joint evaluation incl. automatic wetting analysis
- **vcjmodule (standard):** Intuitive automatic view based voiding calculation software package incl. capability of multiple die attach voiding evaluation

**Software Configuration (Option)**

- **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
- **phj|module:** Automated inspection of QFN / MLF solder joints
- **c4|module:** Automated pin-through-hole solder joint evaluation
- **ml|module:** View based evaluation of multilayer printed circuit boards
- **quality review:** Visual interface for rework and failure indication
- **Flash Filters:** GE’s exclusive image optimization technology

**Hardware Configuration (Option)**

- **Tilt/rotate unit:** Tilt x 45° and rotation n x 360° for samples up to 2 kg for product identification

**Computed Tomography (Option)**

- **Upgrade package for combined 2D / 3D (computed tomography) operation:**
  - Volume acquisition / reconstruction software:
  - phoenix datos|x
  - Max. geom. magnification:
  - Max. voxel resolution:

**Software Configuration (Option)**

- **x|act PTH check strategy:** Automated CAD based analysis of PTH solder joints
- **qfp|module:** Automated QFP solder joint evaluation
- **phj|module:** Automated inspection of QFN / MLF solder joints
- **c4|module:** Automated pin-through-hole solder joint evaluation
- **ml|module:** View based evaluation of multilayer printed circuit boards
- **quality review:** Visual interface for rework and failure indication

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