Waygate Technologies
a Baker Hughes business

# High Performance X-ray Inspection Solution

## with non-destructive Planar|CT board inspection


Microme|x Neo 160
Microme|x Neo 180
Nanome|x Neo 180

# Phoenix Microme|x Neo and Nanome|x Neo

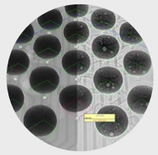
## High resolution 160/180 kV micro- / nanofocus X-ray inspection systems with 3D CT option

The Phoenix Microme|x Neo and Nanome|x 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.

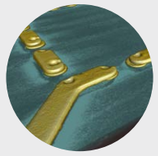
The Phoenix|x-ray X|act technology offers easy to program CAD based µAXI ensuring automated inspection in the micrometer range. Another unique benefit is Waygate Technologies' rich options of DXR-HD digital detector fleet. There's definitely a perfect match of image chain serving your particular application.

## Unique features

- Superior pixel resolution 85 µm, 100 µm and 139 µm new detectors are more competent to semiconductors and micro electronics components inspection
- Ease of use: inspection report to be automatically generated after inspection
- 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
- Dose|manager combined with Shadow|target to prevent sensitive devices from radiation damage by reducing unnecessary dose
- Optical and X-ray navigation map for fast positioning and easy programming
- Proprietary OVHM technology enables synchronised motion and ergonomic set up for easy view configuration
- Flash!Electronics™, Waygate Technolgies' best ever image processing technology specially optimized for Electronics inspection

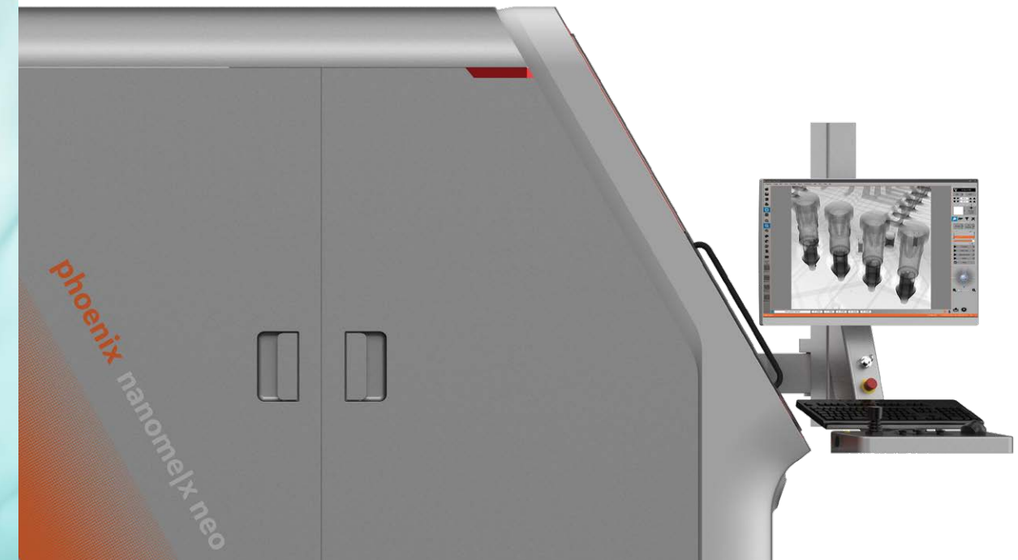


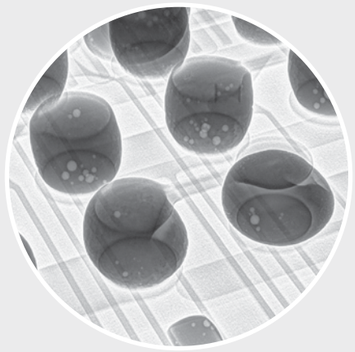
Open BGA ball withlive CAD data overlay and Flash!™ image optimization



3D computed tomography of a part of QFN package

Advanced Planar|CT evaluation (left) without overlaying features in the X-ray image





Flash!™ processed voids in an open µBGA ball: 2,300x geometric zoom for extreme high magnification

## Waygate Technologies brilliant DXR-HD detector fleet

**Large size DXR S100 Pro detector in combination with superior pixel resolution defines industry-leading imaging technology:**

Provides superior 100 µm pixel resolution and 30 cm x 25 cm large active area combining outstanding detectability with high inspection efficiency

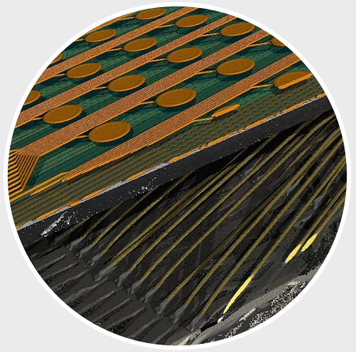
**High dynamic DXR S140 detector with enhanced scintillator technology for precise and fast LIVE inspection:**

Full frame rate of 25 frames per second at 1536 x 1536 pixels offers low noise coupled with brilliant image quality ensuring fast and detailed live inspection.

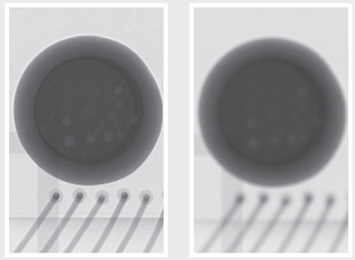
## High-resolution 3D computed tomography

**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 Neo allows even a higher image sharpness



nanoCT® of a part of BGA component



Diamond|window beryllium window

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

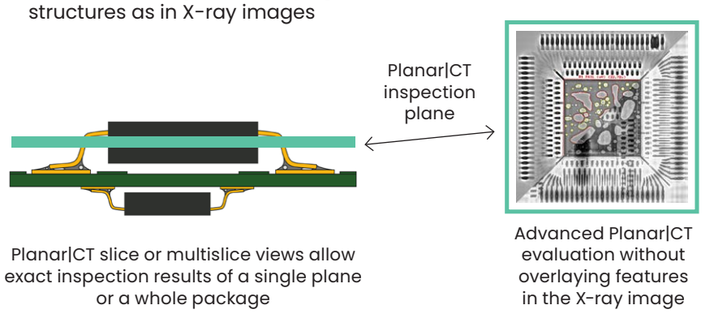
## High output with high-resolution: Diamond|window

**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.**

- 180 kV high energy and up to 20w target power
- 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

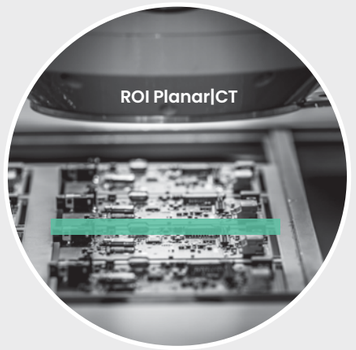
## Virtual board slicing with Planar|CT

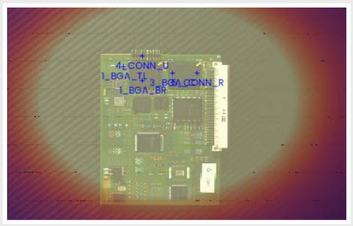
- Easy 2D slice or 3D volume evaluation of large complex boards
- No board cutting, no overlaying structures as in X-ray images




Planar|CT slice or multislice views allow exact inspection results of a single plane or a whole package

Advanced Planar|CT evaluation without overlaying features in the X-ray image



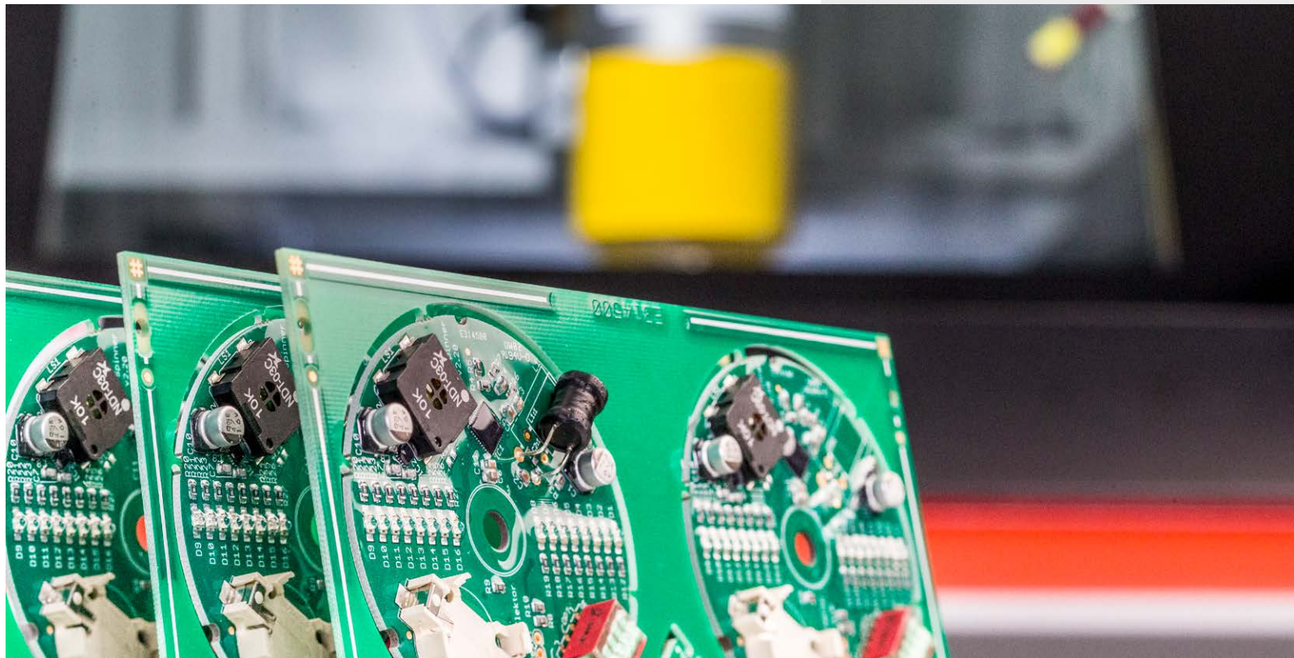
Dose map for 7 views manual inspection

Comparing with manual inspection, up to 99% radiation dose can be saved combining dose control technologies with automated inspection (programming)

## Smart dose management

**Waygate Technologies' proprietary Shadow|target inside the X-ray tube enables a reduction of unnecessary radiation dose compared to conventional X-ray tubes during a typical inspection. Combined in a low-dose bundle together with the brand new Dose|manager tool, it enables real-time dose monitoring and controlling. This solution protects radiation sensitive inspected components such as programmed flash memory, MOSFET and Quartz Oscillators from aging to worst case damage.**

- The Shadow|target is linked with the Dose|manager tool
- Shadow|target reduces unwanted radiation without frequent generator start & stop
- Fast and stable X-ray recovering. No delay of energy running up
- Dose measurement: real time visualization of projected dose through "dose map" overlaid with navigation map
- Cumulated dose calculation per inspection
- Multi-position dose measurement well integrated into inspection program



## 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 neo and Nanome|x neo including the unique X|act software package for fast and easy offline CAD programming.

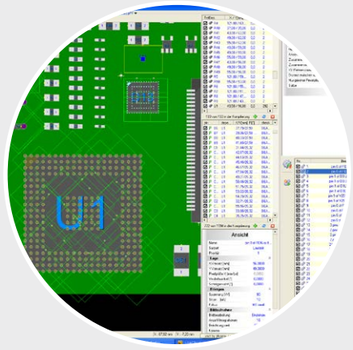
Its intuitive new GUI with improved outstanding precision and repeatability, small views with resolutions of only a few micrometers, 360° rotation and oblique viewing up to 70° ensures meeting highest quality standards – even for inspection of components with a pitch of just 100 microns.

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

## 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.**

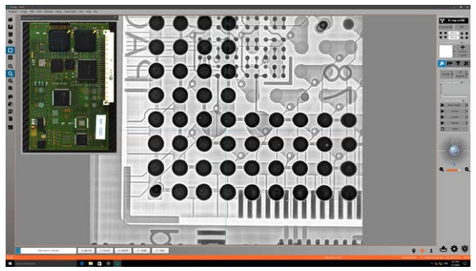
- Easy pad-based offline programming
- Specific inspection strategies for different pad types
- Fully automated inspection program generation
- Extremely high positioning accuracy even at oblique viewing and rotation
- Easy pad identification in manual X-ray inspection
- High reproducibility on large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



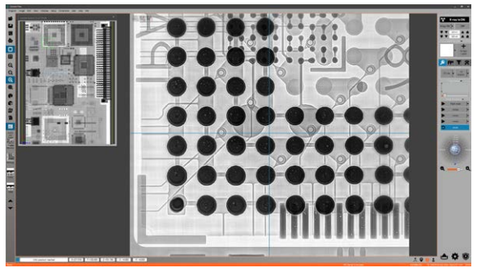
Fast and easy programming: just assign the inspection strategies and let X|act generate the automated inspection program

## Navigation map – Clear overview and fast positioning

- Optical camera image or X-ray overview image for whole sample as navigation map
- Fast manipulation by clicking on the map
- Inspection program can be set up based on the optical navigation map
- Sample map and view positions saved in test report



Easy sample map orientation

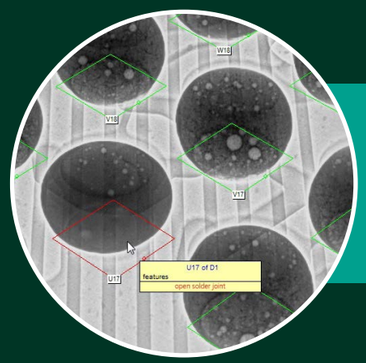




# Your advantages

## Phoenix Microme|x and Nanome|x Neo

- Brilliant live inspection images due to high dynamic Waygate Technologies DXR-HD digital detector fleet
- 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
- Xe² toolkit (Xray image Evaluation Environment), a graphical based development environment for fast measure setups for evaluating X-ray images
- Best detail detectability 0.5 µm or even 0.2 µm with nanofocus
- Optional Flash!ElectronicsTM image processing optimizes digital images quickly and constantly
- Optional advanced failure analysis with high resolution 3D micro- or nanoCT® or large board Planar|CT
- Optional 3D CT scans less than 10 seconds
- Comprehensive and industry leading dose control technology to protect radiation sensitive devices
- Optical or X-ray image based navigation map to make multi-position inspection easier and faster
- OPC-UA(Open Platform Communications Unified Architecture) interface to enable standard communication protocol for customized system integration




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

Waygate Technologies exclusive **Flash!**™ technology option enables **faster, more reliable** failure detection.

# Technical specifications and configurations

| | Nanome\|x Neo 180 | Microme\|x Neo 180 | Microme\|x Neo 160 |
|---|---|---|---|
| **X-ray detector** | • 100 µm Superior pixel resolution DXR S100 Pro, large size 30 cm x 25 cm<br>• 139 µm high pixel resolution DXR S140, 25 fps at 1536 x 1536 pixels<br>• 200 µm pixel resolution DXR250RT, high dynamic 30 fps with active cooling | | 85 µm pixel resolution DXR S85, 13 cm x 13 cm active area |
| **Magnification** | DXR250RT/DXR S140: max. 2,100x; DXR S100 Pro: max. 2,300x | | max. 2,100x |
| **Total magnification 27" 2K monitor** | DXR250RT: max. 38,600x; DXR S140: max. 39,200x; DXR S100 Pro: max. 43,200x | | DXR S85: max. 92,500 |
| **Detail detectability** | up to 0.2 µm | up to 0.5 µm | |
| **X-ray tube type** | Low maintenance open nanofocus tube with unlimited lifetime, transmission type, 170° cone angle, collimated | Low maintenance open microfocus tube with unlimited lifetime, transmission type, 170° cone angle, collimated | |
| **Max. tube voltage/power on target** | 180 kV / 20 W | 180 kV / 20 W | 160 kV / 20 W |
| | Diamond\|window for up to 3 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 | | |
| **Manipulator** | high-precision vibration-free synchronized 5-axes manipulation | | |
| **Max. inspection area** | 460 mm x 360 mm (18" x 14"), 610 mm x 510 mm (24" x 20") without rotation table | | |
| **Max. sample size / weight** | 680 mm x 635 mm (27" x 25") / 10 kg (22 lbs.) | | |
| **ovhm – oblique view rotation** | continuously adjustable view angle up to 70°, rotation 0° – 360° | | |
| **Control** | Joystick or mouse control (manual mode) and CNC (automatic mode) | | |
| **Manipulation aids** | Sample navigation map based on camera or X-ray overview image, click'n-move-to function, click'n-zoom-to function, automatic isocentric manipulator movement | | |
| **Positioning aid** | laser crosshair | | laser crosshair optional |
| **Anti-Collision System** | may be deactivated for maximum magnification (tube touching the sample) | | |
| **System dimensions (D x H x W)** | 2,160 mm x 1,958 mm x 1,590 mm (85" x 77" x 62.6"), (without control console)<br>2,772 mm x 1,958 mm x 1,770 mm (109" x 77" x 69.7"), (with control console) | | |
| **Min. transportation width:** | 1,770 mm (69.7") (with control console) | | |
| **Max. weight** | appr. 3,250 kg / 7165 lbs | | |
| **Radiation safety** | The radiation safety cabinet is a full protective installation without type approval according to the German StrSchG/ StrSchV and the US Performance Standard 21 CFR, Subchapter J. For operation, other official licenses may be necessary. Exposure rate < 1 µSv/h emission limit, measured at 10 cm distance from accessible surfaces. | | |
| **Dose Reduction (Option)** | Dose\|manager – combined with Shadow\|target inside the X-ray tube, the low-dose bundle enables real-time dose management protecting sensitive samples from radiation damage. Shadow\|target is available for Microme\|x Neo 180 only. | | |
| **Image processing software** | • 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<br>• BGA\|module (standard): Intuitive automatic view based BGA solder-joint evaluation incl. automatic wetting analysis<br>• VC\|module (standard): Intuitive automatic view based voiding calculation software package incl. capability of multiple die attach voiding evaluation<br>• C4\|module: view based evaluation of round solder joints with background structure, such as C4 bumps<br>• ML\|module: view based registration of multilayer printed circuit boards | | |
| **Software Configuration (Option)** | X\|act BGA check strategy: automated CAD based analysis of BGA solder joints<br>X\|act PTH check strategy: automated CAD based analysis of PTH solder joints<br>Xe² package – Automated solder joint evaluation package:<br>• QFP\|module: automated QFP solder joint evaluation<br>• QFN\|module: automated inspection of QFN / MLF solder joints<br>• PTH\|module: automated pin-through-hole solder joint evaluation<br>X\|act review: visual interface for rework and failure indication<br>Flash!™: Waygate Technologies' exclusive image optimization technology | | |
| **Hardware Configuration (Option)** | • Anti-vibration feet for high system stability<br>• Tilt / rotate unit: tilt ± 45° and rotation n x 360° for samples up to 2 kg<br>• Manual bar code reader: for product identification | | |
| **Planar\|CT (Option)** | Planar\|CT module: Non destructive 2D slice and 3D volume board evaluation incl. 3D\|viewer software | | |
| **Computed Tomography (Option)** | • Volume acquisition / reconstruction software: Phoenix Datos\|x<br>• Upgrade package for combined 2D / 3D (computed tomography) operation CT-unit: precision rotation axis<br>• Max. geom. magnification: 100 x (CT)<br>• Max. voxel resolution: down to 2 µm, resolution depending on the sample size.<br>• The nanoCT® function of the Nanome\|x Neo allows a higher image sharpness. | | |

**For more detailed information or to request a demo, please visit our website or contact us.**

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