X-ray technology for electronics inspection

NIKON METROLOGY | VISION BEYOND PRECISION

X-ray and CT inspection of electronic components

Get the inside picture of printed circuit boards, by literally looking into the internal structure. Or even use CT capability to analyze any inner or outer detail, all in a smooth, non-destructive process.

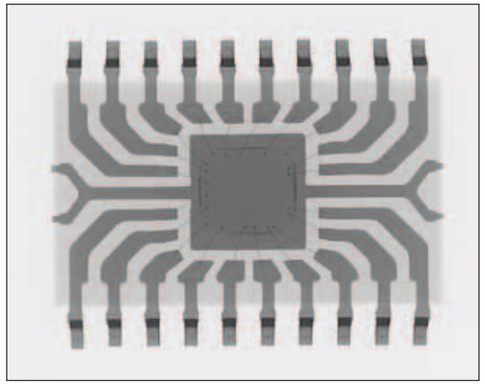
The Nikon Metrology X-ray inspection system is a highly accurate, flexible solution that facilitates the detection of defects in loaded PCB boards. Designed for inspection of multi-layer boards, PCB solder joints, Ball Grid Arrays (BGA) and µBGAs, it is a simple-to-use, high-resolution and cost-effective system that is an indispensable workhorse for any inspection lab.

In addition, it is ready for CT inspection to reconstruct the test sample in full 3D volume.

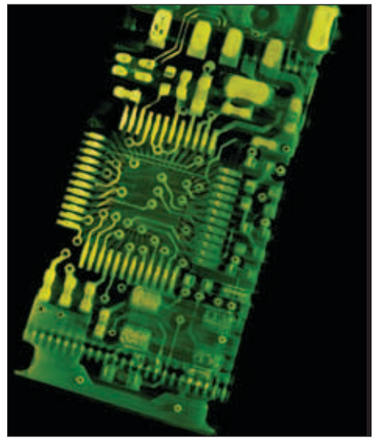
Overall, Metris has a worldwide install base of approximately 1,500 X-ray and CT systems.

At a glance

- Flexibility combined in one system
  - Interactive visualization
  - Fully automatic X-ray inspection
  - CT for in-depth analysis
- Maximum magnification at unrivalled angles
- Fast operation with interactive joystick navigation
- Low-cost maintenance with open-tube technology
- Safe system requiring no special precautions or badges
- Small footprint and low weight for easy installation



X-ray inspection of micro-chip

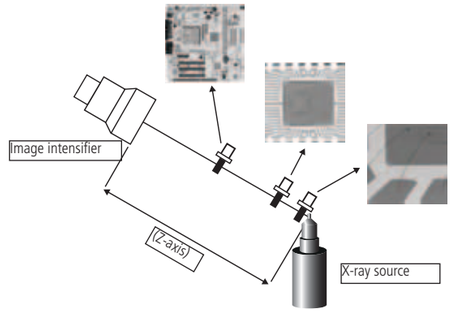


USB stick - CT provides detailed insight into the internal structure. Post-processing opens up new horizons for visualization and analysis

Insight into the inside

X-ray concept

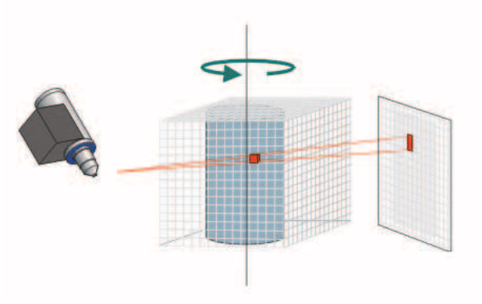
X-ray technology provides a detailed view of the inner structure of parts. The radiation is generated by a micro-focus source and transmitted through the sample. A digital flatbed detector is used to capture patterns of X-rays that pass through the specimen, showing different shades of gray depending on material and geometry. Thicker or denser material – such as iron, copper and lead – represent darker areas than areas highlighting thin or light materials – such as plastic, paper or air.



Moving the sample closer to the X-ray source increase the magnification of the resulting image

Computer Tomography (CT)

CT offers that extra dimension to X-ray technology. Based on a large number of X-ray images captured around a single axis of rotation, CT reconstructs an accurate 3D volume dataset that represents the internal structure of your sample. Viewed as slices in any orientation or as a 3D scene, the inner part is visualized and enables you to explore all the details of the object.

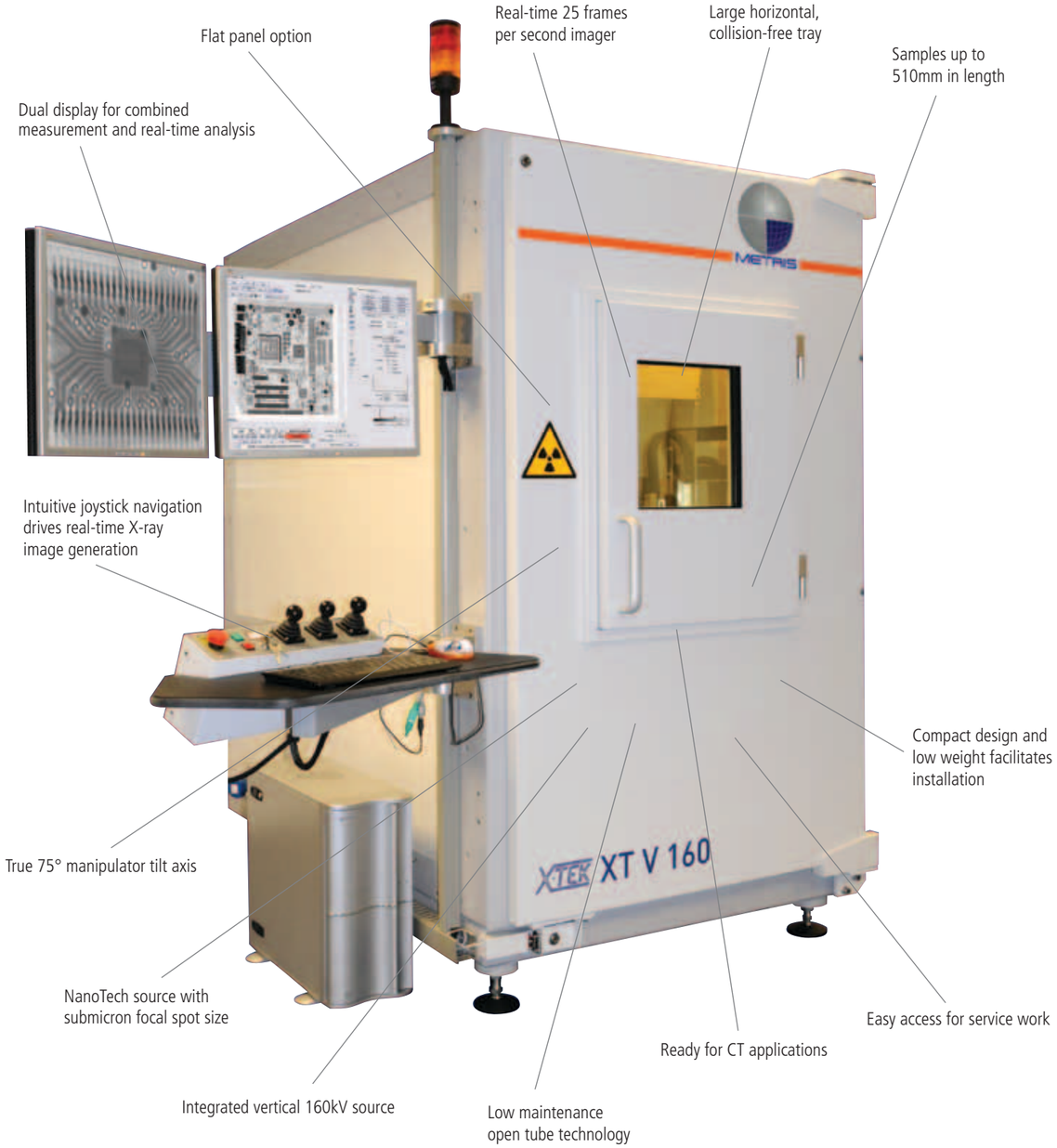


The component is rotated around its axis to take X-ray images from all around, resulting in a 3D volume dataset

XT V 160: Fast, accurate inspection for today's miniaturized and increasingly intricate arrays

The XT V 160 is an easy-to-use, cost-effective, high quality PCB inspection system. It is specifically designed for use in production lines and failure analysis laboratories. Intuitive software allows operators to visualize the most demanding defects.

In manual mode, all 5 axes of the sample manipulator are controlled by a precision joy stick with proportional speed. In automated inspection mode, samples can be inspected at highest troughput.



High quality images

- In-house NanoTech™ source with submicron focal spot size
- Maximum magnification (6000) at unrivalled angles
- Large set of image enhancement tools
- True 75° tilting angle for easy optimal inspection of internal features
- Flat panel use

Intuitive to use

- Short learning curve – operational within 3 days
- Interactive joystick navigation
- True concentric imaging
- Dual screen for detailed and overview views
- Bar code reader to read board serial number
- Local language support facilitate use by local operators

Focus at productivity

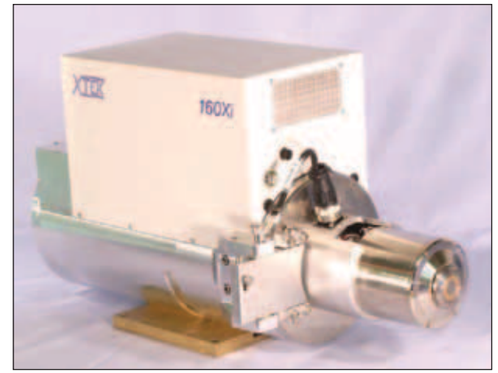
- Large tray to load multiple boards
- Fast automated component inspection

Safety as a design criterion

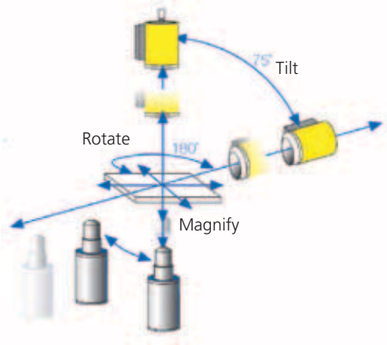
- Electrostatic shielding for component safety
- Full protective enclosure requires no need for special badges or protective clothing
- Continuous fail-to-safe monitoring
- Lead-lined cabinet fully complies to DIN 54113 radiation safety standards and CE regulation

Low cost of ownership

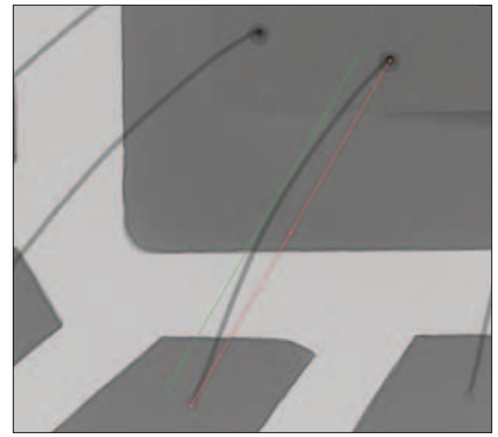
- Open X-ray tube allows for easy local maintenance of internal tube components and quick replacement of low-cost filaments
- Integrated integrator obsoletes high-voltage cable
- Low system weight avoids special floor treatment
- Compact design easily fits double-door facility entries
- Easily maneuverable through 3-wheel transportation



In-house X-ray source technology guarantees optimum image quality



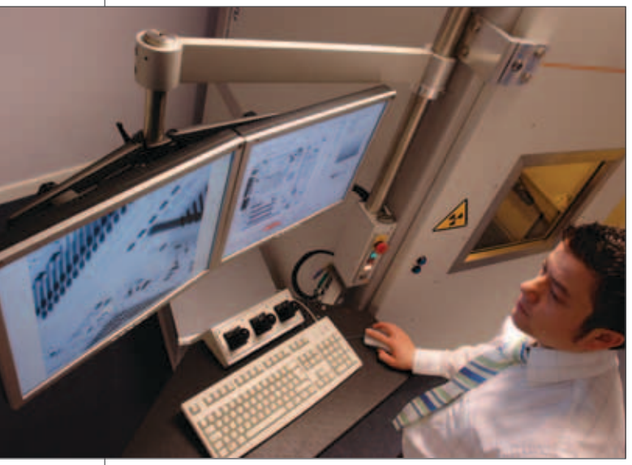
True concentric imaging - The operator chooses a region of interest (ROI) and positions this region in the center of the screen. Under any combination of rotate, tilt and magnification, true concentric imaging ensures that the ROI remains completely locked into the center of the field of view



Maximum magnification - An ultra thin output window enables samples to be safely placed within 250µm distance of the focal spot providing magnification up to 6000x

The versatile tool for your inspection lab

Interactive and user-friendly software is essential in evaluating the complex internal structure of samples and performing accurate inspection. The software tools perfectly guide you in retrieving the required information, using the most advanced visualization and analysis capabilities. Developed to streamline inspection and measurement, the process is fully automatable.



Real time X-ray inspection

- Interactive joystick control for intuitive part positioning
- Lock in on BGA or region of interest (ROI)
- Ultra-fast acquisition of X-ray scans
- Integrated display and analysis tools
- Measure on screen and annotate data

Image analysis / enhancement

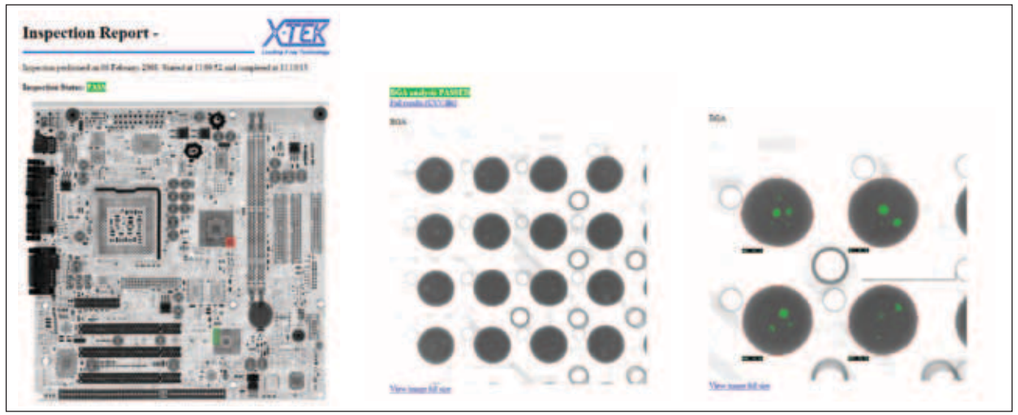
- User-configurable multi-point tone adjustment
- Image processing filters (sharpen, smooth, edge detect, emboss, background subtract, etc.)
- Inspection tools (e.g. BGA void recognition)
- Image histogram

Maximum productivity

- Macro-based automation requires no programming skills
- Parameter locking organizes operator and supervisor rights
- Component-specific automated pass/fail analysis
- Redo analysis on off-line visualization station
- Automatic HTML report generation
- VBA (Visual Basic for Applications) ready to automate complex tasks

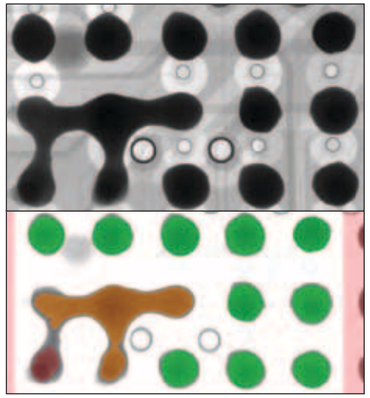
Integrated CT acquisition

- Easy-to-use data collection
- 3D volume reconstruction function
- CT data ready for industry standard post-processing applications



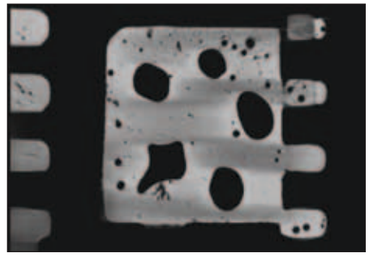
Automatic report generation

Beyond what the eye can detect



Bridging/Shorts due to surplus solder

Damaged wirebond in IC



Voiding at board level

A wide range of applications

Any OEM and supplier of electronic subsystems in consumer electronics, automotive, aerospace can enrich its inspection process by adopting X-ray and CT.

Electronic and electrical components
Inspection/Detection of:
- Broken wedge bonds
- Lifted ball bonds
- Wire sweep
- Die attach

Populated and unpopulated PCBs
- View surface mount defects (i.e. misaligned devices, solder joint porosity and bridging)
- Detailed inspection of vias, through-hole plating and multi-layer alignment
- BGA and CSP inspection
- Non-lead solder inspection

Application case: a focus on BGA inspection

With the advent of many newer type components such as BGA and flip-chip devices, optical inspection is no longer an option as the majority of solder connections to the PCB remain hidden for the eye. This means that the ability to generate premium-quality real-time X-ray images is more important than ever before.

Soldering imperfections:
- Dry joints due to insufficient solder
- Bridging/Shorts due to surplus solder
- Voiding due to gas bubbles within the solder
- Misplacement/Misalignment due to inaccurate placement of components

The ability to trace these defects depends on the resolution of the image. Defects such as bridging and gross misalignment can be detected with the human eye. Others, such as voiding issues related to micro-BGAs, require X-ray with a resolution down to one micron and power in excess of 100W.

To detect dry joints, high resolution (1 micron), high magnification (100X to 5,000X), complex sample manipulation (tilt and rotate), and sophisticated image processing software is required. XT V 160 combines all these features in a single, highly-intuitive inspection system.

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