



Industrial X-ray
and CT



ADVANCED INDUSTRIAL X-RAY AND CT XT H Series

Core Features

Dual.Material CT for production

An innovative reconstruction technique enabling automatic inspection of dual material samples in a production environment. Its market-leading reduction of artefacts caused by high-density materials results in high-quality images.

Production Integration with OPC UA

Nikon's commitment to shop floor CT and integration of Nikon's X-ray systems with MES (Manufacturing Execution Systems) is achieved through the industry-standard protocol: OPC UA.

Auto.Filament Control to Double the Filament Lifetime

Auto Filament Control intelligently controls the X-ray source to double the lifetime of the filament, without having to defocus the X-ray beam or use thicker filaments, which would compromise resolution. Less frequent filament changes result in increased system availability.

Half.Turn CT Cuts Acquisition Time

Thanks to in-house developed, optimised reconstruction algorithms, artefact-free data without loss of quality or accuracy is generated from about half of the data usually acquired with conventional CT, cutting acquisition times significantly.

X.Tend Helical CT for Artifact-free High-resolution Scans

X.Tend helical CT allows to tall objects to be scanned in one continuous operation, eliminating the need to take multiple scans and the resulting stitching and cone beam artefacts. Additionally, resolution can be increased by bringing the sample closer to the source.

Offset.CT for Wider and Higher-resolution Scans

With Offset.CT, large components even wider than the detector itself can be scanned. It also allows the component to be placed much closer to the X-ray source, resulting in higher resolution scans.

Traceable Measurement Accuracy

The metrology grade MCT225 system is designed for high accuracy measurement applications with MPE verification in accordance with VDI/VDE 2630. With Local Calibration, measurements on any system can be made with a high level of confidence.

Industry-Leading Image Quality

Our industry-leading, large area, flat panel detectors with small pixel sizes and fast exposures, combined with our microfocus X-ray sources having a small focal spot size, result in high quality, high resolution datasets.

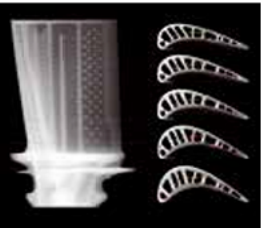
A wide range of applications



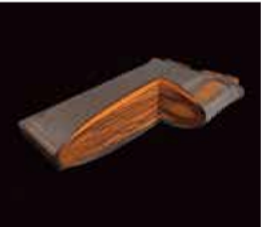
Connector wiring



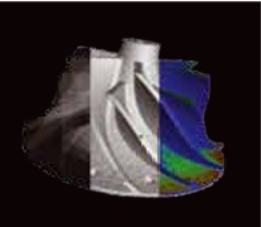
Turbocharger cast housing



Turbine blade



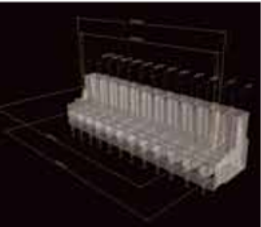
Battery



3D printed impeller



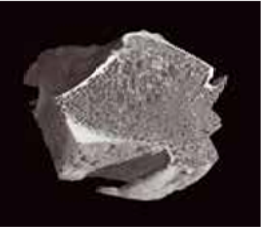
Sectioned light bulb



Plastic connector



Medical injector



Femur bone

Anywhere the internal structure matters, X-ray and CT technology serves as an efficient tool to provide valuable information. Detailed capture and measurement of internal features is often vital for quality control, failure analysis and material research across various industries.

- Fault detection and failure analysis
- Assembly inspection of complex mechanisms
- Dimensional measurement of internal components
- Part-to-CAD comparison
- Advanced material research
- Analysis of the biological structures
- Digital archiving of models

AUTOMOTIVE

- Electrical connectors
- Injection nozzles
- Sensors (e.g. Lambda sensor)
- LED light pipes
- Small high-pressure die cast parts
- DPF (Diesel Particulate Filters)

AEROSPACE

- Wax turbine blades
- Titanium turbine blades
- Crack analysis in components
- Weld analysis

PLASTIC INJECTION MOLDING

- Complex plastic components (e.g. fan)
- Soft, translucent materials where tactile or optical is no option
- Ultrasonic welding of plastic parts

PHARMACEUTICAL/MEDICAL

- Medicine dispensers
- Small medical devices (instruments, stents, pacemaker, etc)
- Small plastic or composite parts
- Bone structures
- Implants (dental, hip, knee, skull)

RESEARCH

- Material verification and analysis (e.g. structure, porosity, defects)
- Paleontology (e.g. bones, skulls, fossils)
- Geology and soil science
- Archeology
- Renewable energy (batteries, solar cells, etc.)

X-ray sources

IN-HOUSE DESIGN AND BUILD

Nikon Metrology X-ray sources are at the heart of our technology and have been designed and manufactured in-house from 1987 to this day; offering decades of knowledge. Control over the X-ray source technology allows Nikon Metrology to quickly move with the market and develop complete and innovative solutions to the application demand. All sources are open-tube giving a low cost of ownership and range from low (180) to medium (225) kV, all with micron-level resolution.

One X-ray tube, four target modules, limitless applications



180 kV TRANSMISSION TARGET

- Liquid-cooled Transmission Target
- Sub-micron feature recognition
- High resolution up to 180 kV
- Perfect for high resolution CT of small samples



225 kV REFLECTION TARGET

- Liquid-cooled Reflection Target
- Spot size down to 3 micron
- High resolution up to 225 kV
- Outstanding image quality and high resolution across a broad sample range



225 kV ROTATING TARGET 2.0

- Liquid-cooled Rotating Reflection Target
- 3x higher resolution for the same power as static target
- 3x higher power for the same resolution as static target
- Resulting in significantly faster scan times
- No cool-down periods; continuous operation up to a stunning 450 Watts power



225 kV MULTI-METAL REFLECTION TARGET

- Industry unique multi-metal target
- Optimize the X-ray profile generated
- Change metals without breaking vacuum
- Unrivalled flexibility for complex applications
- Versatility to enhance image contrast, perfect for materials research and more

XT H 225



Detailed capture and measurement of internal component and assembly features is often vital for quality control, failure analysis and material research. The entry-level versatile XT H 225 system offers a microfocus X-ray source, an inspection volume to accommodate small to medium sized parts and high image resolution. Ready for ultrafast CT reconstruction, the XT H 225 covers a wide range of applications, including the inspection of plastic parts, small castings and complex mechanisms as well as researching materials and natural specimens.

EASY OPERATION

Users are operational with the system within a few days of training. A CT wizard guides operators through the data acquisition process. Customizable macros automate the measurement workflow, and tight integration with industry-standard Volume Graphics software, streamline the decision making process.

FLEXIBILITY IN CT

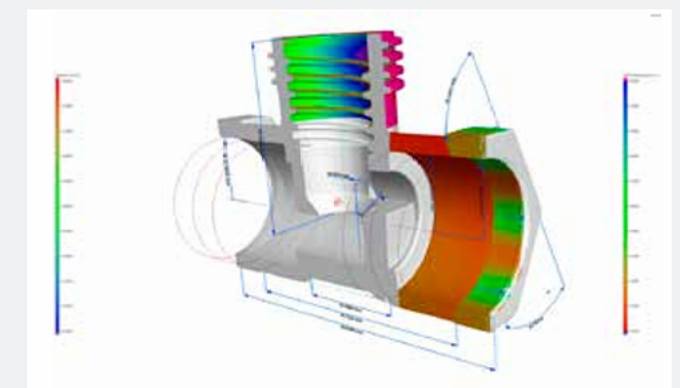
Specific applications require more detailed images or higher accuracy. The XT H 225 can be configured with different flat panels or source configuration (reflection/ transmission target) to adapt resolution to the specimen's needs: full part in coarse resolution and high resolution in a desired region of interest. A small spot size and a high-resolution flat panel create sharp images.

LOW COST OF OWNERSHIP

Regardless of the target of choice, the XT H 225 system uses an open-tube X-ray source that guarantees a lower cost-of-ownership. The open X-ray tube allows for local maintenance of internal tube components rather than whole tube replacements. The XT H 225 system is self-contained and quick to install. No special floor treatments are required.

WITH ALL NIKON METROLOGY CT SYSTEMS YOU CAN

- Verify complex internal structures
- Isolate and inspect included components
- Measure internal dimensions without sectioning the sample
- Automatically detect and measure internal voids/volumes
- Reveal internal and external surfaces with ease
- Reduce total inspection time
- Reduce number of iterations to fine-tune (pre-) production parameters



X-TEND

X.Tend – Higher resolution and faster: X.Tend your CT scanning capability
In comparison to conventional circular CT scanning, X.Tend is a CT acquisition method that allows customers to extend the height of their CT scan by moving the tall sample up through the X-ray cone-beam as the sample rotates. X.Tend eliminates the need to have partial scans of a sample that are stitched back together afterwards.

A better insight with improved image quality

X.Tend improves the image quality of CT scans by removing cone beam artefacts, ring artefacts and stitching artefacts, all of which would be present during a circular scan. X.Tend also enables the user to scan a part close to the X-ray source, resulting in higher resolution voxel size. The new X.Tend technique results in clearer, easy-to-interpret images and leaves no doubt in defect recognition, ultimately leading to faster decision making or corrective actions.

Benefits:

- Faster acquisition & processing
- Faster than several circular scans at same magnification
- Easier to mount the sample
- Improved image quality
- No cone beam artefact (better results on horizontal surfaces)
- No ring artefact
- No stitching artefact
- Increased resolution
- Sample doesn't have to fit in single image
- Scanning tall samples at high magnification

AVAILABILITY AND PRODUCTIVITY

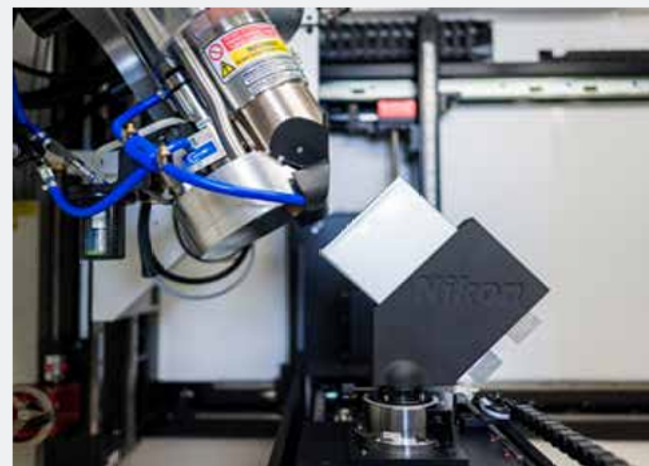
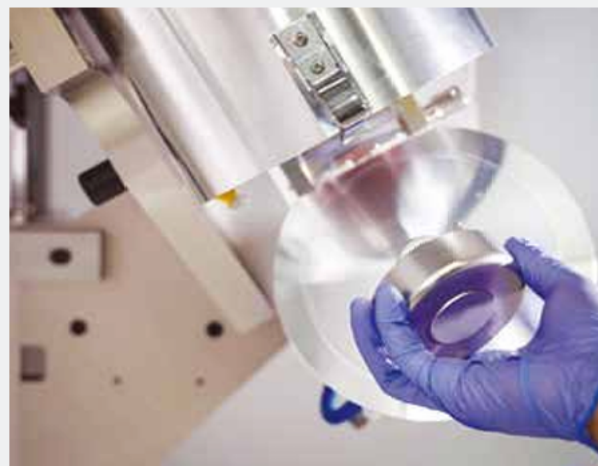
Auto.Filament Control intelligently manages the X-ray source to double the lifetime of the filament without relying on long-life filaments that would reduce the high-resolution micro-focus nature of the source. Less frequent changing of the filament means the system is available more often.

MOTORIZED FID

The XT H 225 ST 2x has motorized FID (Focus to Imager Distance) adjustment, so the user can effortlessly change the distance between the X-ray source and detector. A shorter FID provides faster scan times for a given resolution or, alternatively, a higher signal-to-noise ratio for enhanced image quality.

UNRIVALLED FLEXIBILITY

With four X-ray target heads, unique flexibility is achieved from a single 225 kV microfocus source. To optimize system performance, all targets are interchangeable by the user, quickly and effortlessly. The additional cost of buying and maintaining a second source tube and accessories is therefore avoided.



ABSOLUTE ACCURACY

MCT225 is pre-calibrated using accuracy standards recognized by the National Physical Laboratory (NPL), the UK's National Metrology Institute (NMI), and verified using VDI/VDE 2630 guidelines for Computed Tomography in Dimensional Measurement. Absolute Accuracy guarantees measurement accuracy without reference measurements. Samples are placed on a rotary table inside the enclosure and measured. Several key metrology features provide long-term hardware stability and enable the MCT225 to achieve MPE(SD) of 9+L/50µm.

FEATURES

- Temperature-controlled enclosure
- Liquid-cooled X-ray source
- Finite element Analysis (FeA) optimized manipulator
- High-precision linear guideways
- High-resolution optical encoders
- High-resolution 4-megapixel detector

ALL ANALYSIS IN ONE GO



Intelligent software

Intuitive and user-friendly software is essential to simplify the process of CT scanning complex samples for accurate inspection. Developed in-house, Inspect-X is designed to streamline the process of acquiring and reconstructing CT data, for both advanced and beginner users. The focus of Inspect-X is on intelligence, offering users only the information they need at any moment, therefore simplifying the task at hand.

FAST RECONSTRUCTION

Industry leading reconstruction, developed and controlled in-house.

FLEXIBLE SOLUTIONS

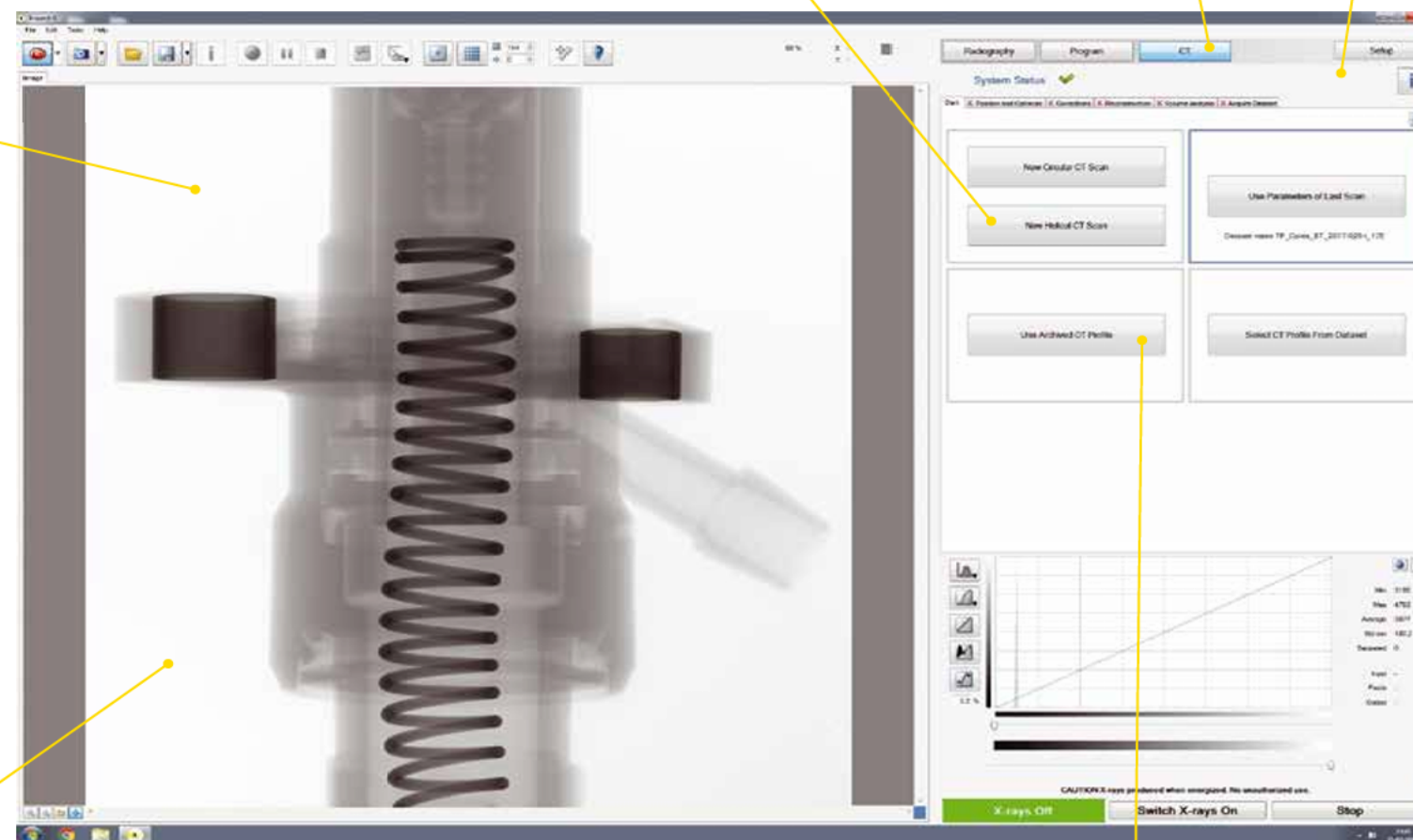
Inspect-X has multiple scanning techniques to meet the most demanding of applications from conventional circular CT scanning to X.Tend, which extends the vertical scan height of the X-ray system and Limited Angle, a method for improving the resolution of smaller regions of interest on a sample.

FULLY PROGRAMMABLE SOFTWARE

Inspect-X is unique in the X-ray CT market, offering unparalleled control through the use of its programmable interface. The possibilities are infinite, allowing custom experimentation, for example time-lapse CT or complete integration of the system within your production line.

CT WIZARD

Intuitive guide through the steps to acquiring CT data.



SIMPLE INTERFACE

With a large radiograph image and clear icons, the simple user interface reduces the operators learning curve.

ONE TOUCH

After selecting the part type from the scan library, only one button has to be pressed to start the scan, reconstruct the data, perform the analysis and output a results file.

Nikon CT Automation A major step closer to zero-defect production

BATCH INSPECTION IS STANDARD WITH INSPECT-X SOFTWARE

Batch inspection allows automation of multiple scans with manual part handling.



SERIES INSPECTION WITH AUTOLOADER

Semi-automated inspection allows automation of all tasks with multiple part loading.



FULL AUTOMATION WITH NIKON AUTOMATION OPC UA INTERFACE

In-line automation allows full integration to your production line.



Advanced scanning technologies improve resolution, scan volume, and speed

Enabling automated inspection, calibration, and evaluation



X.Tend Helical CT

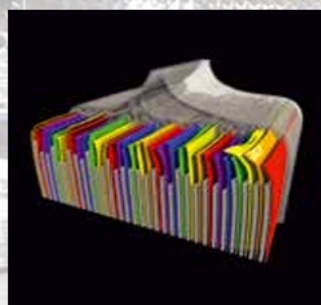
Tall objects can be scanned in a single acquisition process, eliminating artefacts introduced by the cone beam and multi-scan stitching. This also provides the benefit of scanning objects at higher magnification, resulting in significantly higher resolution.

► 400 mm tall Rocket Firework [scanned with X.Tend Helical CT]

Offset.CT

Objects wider than the detector itself can be captured in a single scan. This also allows smaller wide objects to be scanned at considerably higher magnification, providing enhanced detail.

► Heated Car Steering Wheel [scanned with Offset.CT]



Half.Turn CT

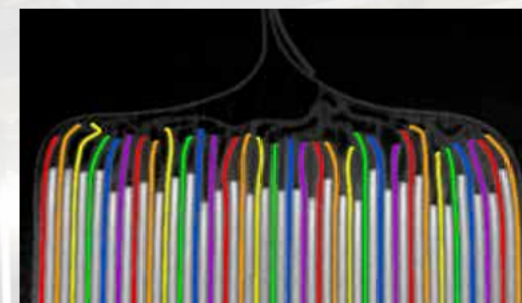
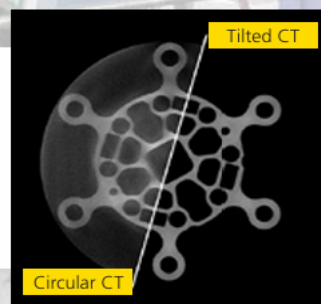
This is designed for high throughput environments where fast cycle times are most important. This productivity gain is achieved by acquiring and reconstructing approximately half the data of conventional circular CT without loss of resolution or image quality.

► Lithium-Ion Battery Pouch Cell [scanned with Half.Turn CT]

Tilted CT

Maximizes the geometric magnification and, therefore, the resolution of planar or high aspect ratio objects with a small region of interest. This is made possible by tilting the component's axis of rotation, which also yields superior image quality in areas previously masked by more dense material.

► Cylindrical Aluminium Extrusion [scanned with Tilted CT]



LiB.Overhang Analysis

Automatic high-speed analysis of anode overhang in Lithium-ion batteries. Cutting-edge Deep Learning AI precisely and reliably analyses the fastest CT scans, exporting repeatable results in a machine-readable format. LiB.Overhang Analysis enables closed-loop process control resulting in improved product quality and significantly reduced scrap.

Dual.Material CT

An innovative reconstruction technique for high throughput production environments that reduces streak and beam hardening artefacts caused by metal and other dense parts in dual-material samples. Discrimination between materials is greatly improved, resulting in clearer visualisation and facilitating automatic inspection. Dual. Material CT eliminates the need for long scan times and manual postprocessing routines.



Traditional reconstruction



With Dual.Material CT



ASTM E2737 Detector Evaluation Kit

The condition of flat panel detectors has a considerable influence on the efficiency and accuracy with which features are detected and measured, so evaluating and tracking their performance over time is crucial. Nikon's unique hardware and software evaluation kit enables detailed trend analysis and performance tracking in accordance with ASTM E2737 and produces clear graphical visualisation of results, all within a fully automated process.

Local.Calibration

Allows fast, automated calibration of voxel size at any CT scan position, rather than the user having to perform the function manually. This leads to a radical improvement in measurement accuracy for metrology applications. As the CT scan position is calibrated with reference to a known artefact, measurements can be made with high confidence.





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