Industrial X-ray
and CT

XT H SERIES

Advanced Industrial X -ray and CT

Insight into the inside

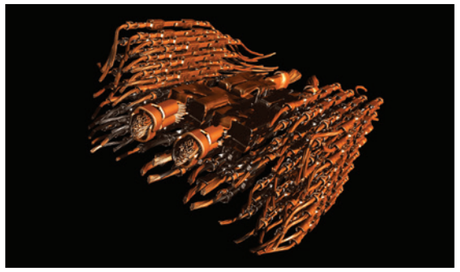
Get the inside picture of complex industrial parts, by looking into the internal structure. Use CT capability to qualify and quantify any inner or outer dimension in a smooth, fast, non-destructive process.

Industrial X-ray and CT systems bring high accuracy and the ability to measure internal and external dimensions simultaneously without destroying the part. Furthermore, they provide additional insight through the fourth dimension of material density and structure, rapidly making X-ray technology a must-have tool in the production toolbox.

A LEGACY OF MORE THAN 30 YEARS IN X-RAY AND CT

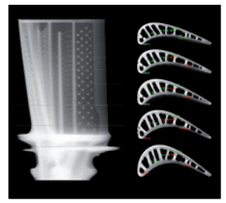
With an experience of more than 30 years, Nikon Metrology has an extensive installation base of thousands of X-ray and CT inspection systems worldwide. CT specialists in Tring, UK, design, develop and manufacture complete systems, incorporating proprietary microfocus X-ray sources, high-precision 5-axis fully programmable manipulators and fast acquisition and reconstruction software.

A wide range of applications

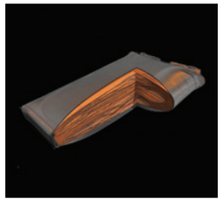


Connector wiring

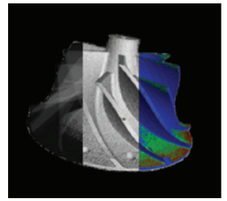
Turbocharger cast housing



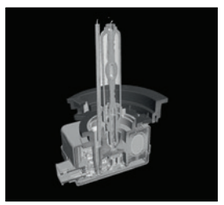
Jet engine turbine blade



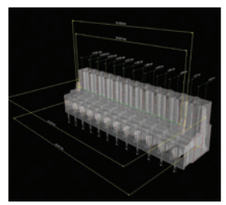
Battery



3D printed impeller

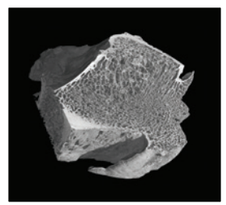


Sectioned light bulb



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
- Cast 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

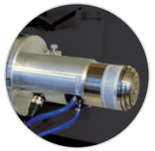
Nikon Metrology X-ray sources are at the heart of our technology and have been designed and manufactured in-house from 1987 to this day; offering over 30 years of knowledge. Being at the heart of the image, control over the X-ray source technology allows Nikon Metrology to quickly move with the market 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) to high (450) kV, all with micron resolution.

The World's only 450 kV microfocus source

450 kV REFLECTION TARGET

- Unique 450kV microfocus source with 25 micron accuracy and repeatability
- Rotating Target source option for 5x faster scanning
- Liquid-cooled advanced technology for 450 Watt continuous power
- Orders of magnitude higher resolution than minifocus sources at same energy
- Industry leading performance with faster scan times and higher accuracy

One X-ray tube, five 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

320 kV SOURCE

- Liquid-cooled Reflection Target
- Unique 320 kV high-power microfocus source
- Penetrates dense samples while maintaining high resolution
- Ideal for rock cores, castings and dense objects

MULTI-METAL TARGET

- Industry unique multi-metal target
- Optimise 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 offer a microfocus X-ray source, an inspection volume to accomodate 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 post-processing applications streamline the decision making process.

FLEXIBILITY IN CT

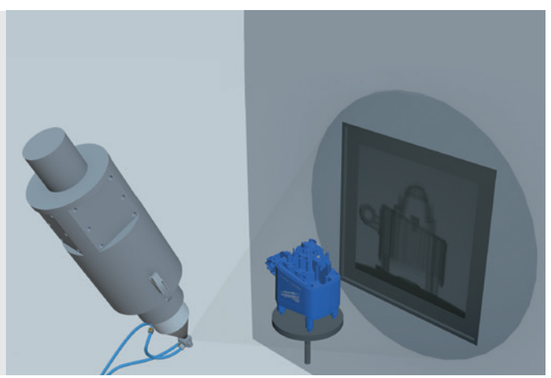
Specific applications require more detailed images or higher accuracy. The XT H 225 can be configured with different flat panels or source configuration (reflection/ transmission target) to adapt resolution to the specimen's needs: full part in coarse resolution and high resolution in a desired region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



XT H 225 ST 2x

The XT H 225 ST 2x system is ideally suited to a wide range of materials and sample sizes. The system can be configured with a range of industry-leading flat panel detectors, up to 2,880 x 2,880, 150 µm pixels, to best suit the user application.

Tools for increasing scan speed, prolonging system uptime and maintaining measurement accuracy, when combined with the interchangeable X-ray targets and motorized FID, provide a flexible tool for Quality Control laboratories, Production facilities, Research and Development departments and academia.

AVAILABILITY AND PRODUCTIVITY

Auto.Filament Control intelligently controls the X-ray source to double the lifetime of the filament, without 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 of the time.

When a short turnaround is required, **Half.Turn CT** allows faster CT scans by only rotating the sample just over 180 degrees. Novel centre of rotation and new reconstruction algorithms allow automated scans which retain the quality of a longer 360 degree CT scan.

TRACEABLE ACCURACY

Automated calibration of any CT scan position is possible with **Local.Calibration**; leading to improved measurement accuracy for metrology applications.

As the CT scan position is calibrated with reference to a known artefact, measurements can be made with a high level of confidence with traceable procedures.

UNRIVALLED FLEXIBILITY

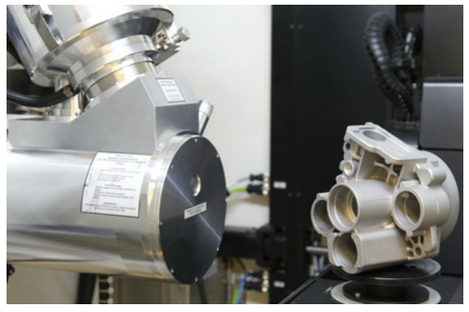
With four X-ray target heads, unique flexibility is achieved from a single source. Targets are easily user exchanged, to allow optimisation of the source for the sample being scanned.

With a motorised FID (Focal spot to Imager Distance) adjustment, the user does not have to increase either X-ray power or detector exposure to compensate for the fall in X-ray intensity between the source and flat panel detector. A faster scan time or a higher signal to noise ratio is possible when a shorter FID is selected.

XT H 320

The XT H 320 is a large cabinet system for the X-ray CT scanning and metrology of large components. The system consists of a 320 kV microfocus source delivering up to 320 W of power.

A high resolution flat panel is used to collect high quality images of the sample. The system is controlled by Inspect-X software which makes the collection of CT data and setting up of measurements simple and easy. The system can output volume data to industry standard volume viewing software.



POWERFUL 320 kV MICROFOCUS

Most system suppliers only offer microfocus sources up to 225 kV, while more powerful sources in their offerings are minifocus. With larger samples, one often needs more penetration power and therefore Nikon Metrology offers a unique 320 kV microfocus X-ray source. As the X-ray spot size of these sources is orders of magnitude smaller compared to minifocus sources, end users benefit from superior resolution, accuracy and a wider array of measurable parts.

MCT225: ABSOLUTE ACCURACY FOR METROLOGY CT

Dimensional inspection using industrial CT has many advantages as all internal dimensions are measured without destroying the part. Metrology CT is possible by - either calibrating scans by performing time consuming reference measurements - or by using a metrology grade system.

The MCT225 is pre-calibrated using accuracy standards by VDI/VDE 2630 guidelines for Computed Tomography in dimensional measurement. Several key metrology features provide enable an impressive absolute accuracy specification of 9+L/50 µm combined with a long term stability.

FEATURES

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

Extended information and specifications can be found in the MCT225 brochure or datasheet.

ALL ANALYSIS IN ONE GO

Dimensioning / GD&T

CAD comparison

Void analysis

XT H 450

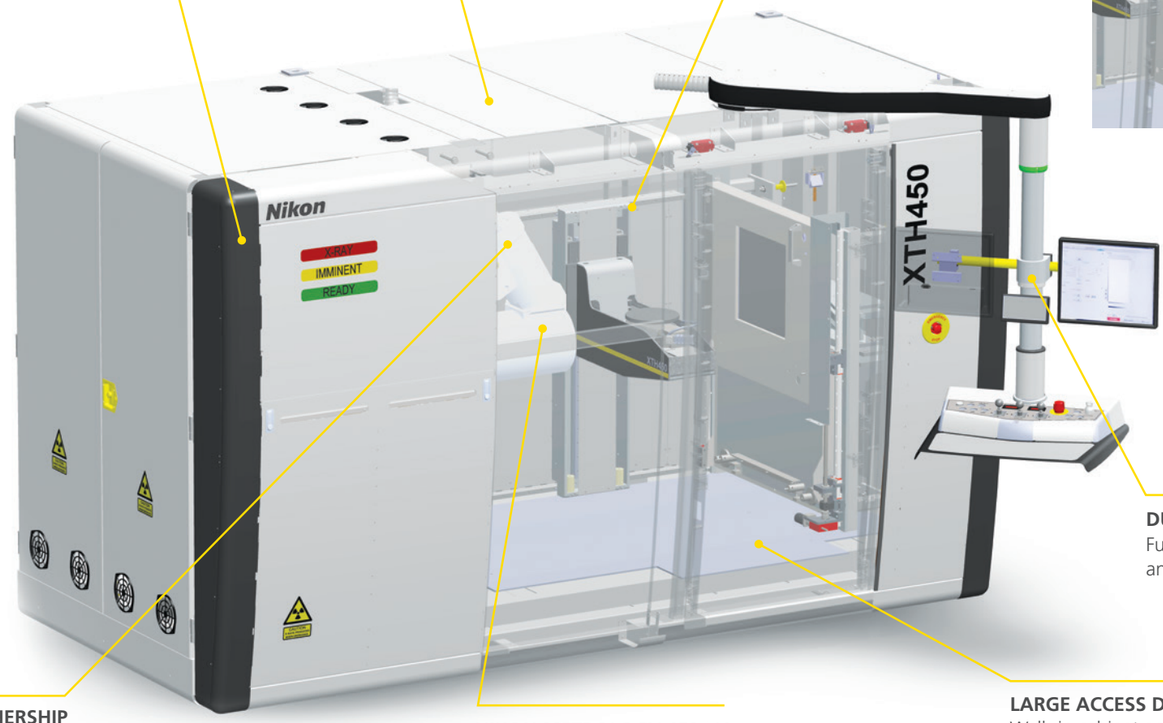
High voltage microfocus CT

The XT H 450 system offers the necessary source power to penetrate through high density parts and generate a scatter-free CT volume with micron accuracy. At the core of this powerful equipment is a 450 kV microfocus source, providing superior resolution and accuracy up to 450 W power whilst offering sufficient X-ray power to penetrate dense specimens. The system is available with a flat panel (for 3D cone-beam CT) or a proprietary Curved Linear Diode Array (CLDA) (for 2D fan-beam CT) that optimizes the collection of the X-rays without capturing the undesired scattered X-rays.

LARGE CAPACITY MANIPULATOR
Samples weights up to 100 kg

PROTECTIVE ENCLOSURE
No risk of radiation exposure

FLAT PANEL & CLDA
Choice of flat panel or CLDA, or both, to suit the application



DUAL MONITORS
Full screen image and software controls

LOW COST OF OWNERSHIP
Serviceable open-tube source

NIKON METROLOGY 450 kV
World's only 450 kV microfocus X-ray source, available in static or rotating target

LARGE ACCESS DOOR
Walk-in cabinet accessible via large pneumatic controlled door

450 kV MICROFOCUS

The proprietary 450 kV source is the world's only microfocus X-ray source at this energy, enabling the XT H 450 system to deliver 25 micron repeatability and accuracy. As this microfocus spot size is considerably smaller than existing mini-focus sources, the level of detail that it captures is beyond comparison. With the rotating target the level of detail possible with 450 kV can now be collected up to 5x faster, or with higher accuracy in a similar scan duration, compared to the default 450 kV source.

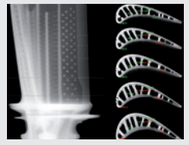
UNIQUE CLDA TECHNOLOGY

When X-rays hit an object, they are absorbed but also scattered, an undesired phenomenon that increases as the density of the object increases. Scatter coming from all points of the part reduces image contrast sensitivity, as is visible on flat panel images. Nikon Metrology has developed a proprietary CLDA that optimizes the collection of the X-rays travelling through the part, without capturing the undesired scattered X-rays. By avoiding image pollution and associated contrast reduction, the CLDA realizes stunning image sharpness and contrast. The linear array of diodes is curved to further enhance image quality by keeping the X-ray path length to diode receptors constant compared to straight arrays. This allows longer crystals to be used to enhance the X-ray sensitivity and hence boost the signal-to-noise ratio and reduce the scan time.

CASTING INSPECTION

Microfocus sources at this energy are needed to run highly accurate inspection of dense industrial objects, such as large castings. The XT H 450 3D is a system designed to give industry leading performance in the scanning of large objects where scattering is not a limiting factor, e.g. large low density castings. For higher density castings which exhibit scatter, the XT H 450 can build a 3D volume by combining CLDA 2D CT slices.

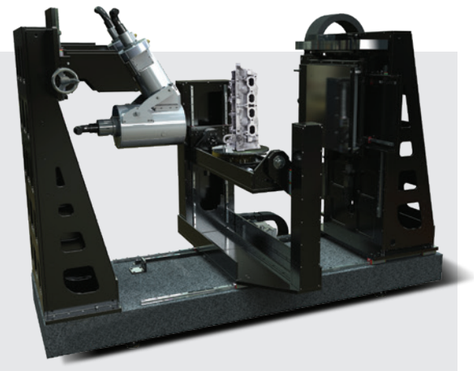
TURBINE BLADE INSPECTION



A 450 kV source in combination with a CLDA is ideal for radiographic and CT inspection as well as metrology of small to medium metal alloy turbine blades. Such an X-ray system offers sufficient source power to penetrate through the part and generate a scatter-free CT volume. In a production environment, the system runs automatic data acquisition, high-speed CT reconstruction and inspection, generating pass/fail status for each inspected part. Blade manufacturers can run detailed CT metrology inspection of turbine blades (e.g. wall thickness) to optimize the fuel economy of jet engines.

CT VERSATILITY WITH CONFIGURABLE SYSTEMS

When there is no standard X-ray and CT system available that suits your organization's specific requirements, Nikon Metrology can provide a configurable CT system that can be built into (existing) cabinets or walk-in rooms. These modular systems support multiple sources, multiple detectors, specific manipulators and can be custom-configured to fit a variety of applications.



Intelligent software

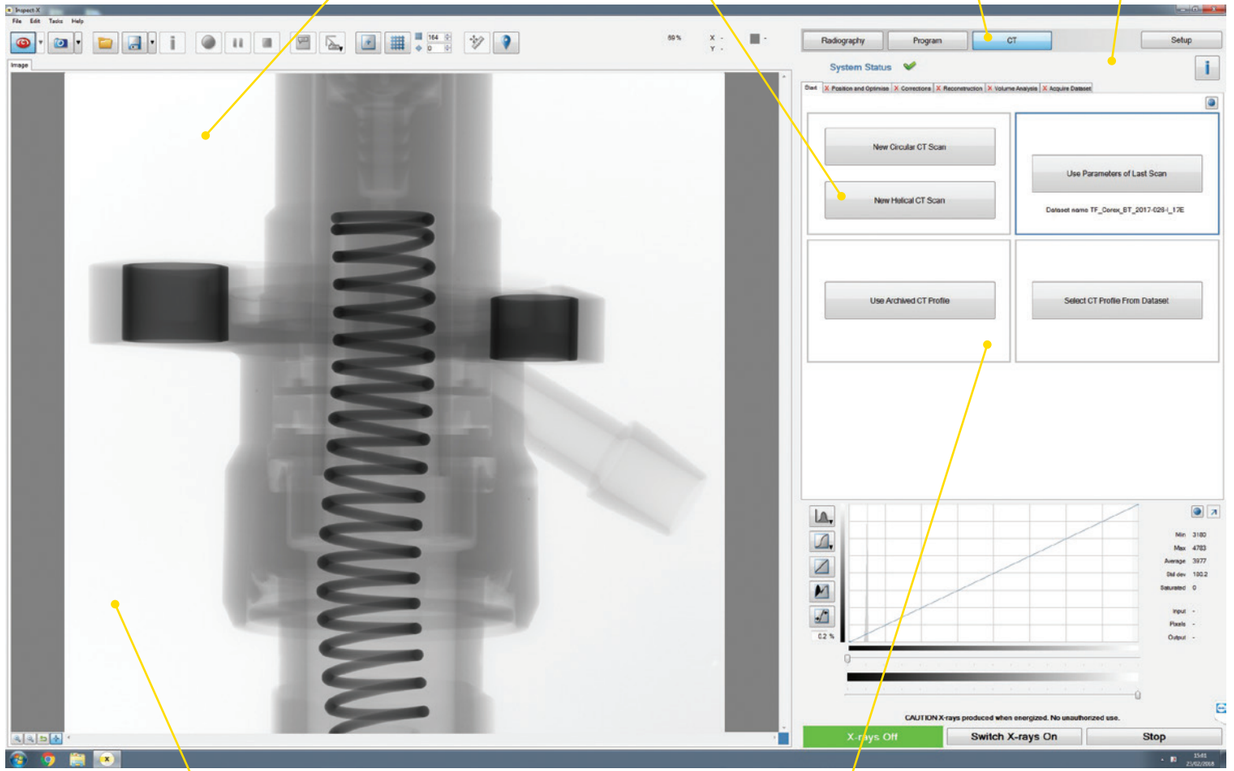
Intuitive and user-friendly software is essential to simplify the process of CT scanning complex samples for accurate inspection. Developed in-house, Inspect-X is designed to streamline the process of acquiring and reconstructing CT data, for both advanced and beginner users. The focus of Inspect-X is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

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.

FAST RECONSTRUCTION
Industry leading reconstruction, developed and controlled in-house.



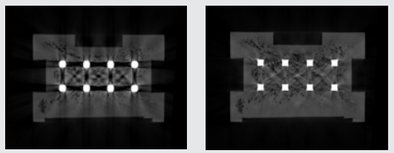
SIMPLE INTERFACE
With a large radiograph image and clear icons, the simple user interface reduces the operators learning curve.

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.

ASTM E2737

Evaluate and track the performance of the detector with ASTM E2737. Dedicated software performs all necessary functions, including artefact manipulation, image collection and data analysis, creating a detailed report automatically and rapidly with a unique performance tracking and trend analysis.

DUAL.MATERIAL CT
Aiding the automatic inspection of dual material samples in a production environment, Dual.Material CT's reduction of artefacts delivers high-quality images – eliminating the need for long scan times and manual post-processing.



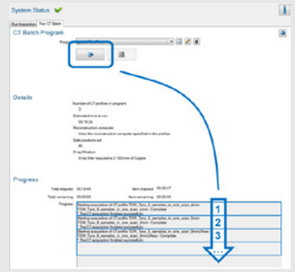
Traditional reconstruction

With Dual.Material CT

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 OPC UA

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

Specifications

X-ray Source	XT H 225	XT H 225 ST 2x	MCT 225	XT H 320	XT H 450
Type	Open Tube Microfocus				
Target Options	Reflection Target Transmission Target Multimetal Target	Reflection Target Transmission Target Multimetal Target Rotating Target 2.0	Reflection Target	Reflection Target Rotating Target 2.0 Multimetal Target	Reflection Target Rotating Target
Max. Energy	225 kV			320 kV	450 kV
Max. Power	225 W	450 W	225 W	450 W	450 W
Min. Focal Spot	1 µm		3 µm		80 µm

System					
Max. CT Swept Diameter	280 mm	265 mm	250 mm	300 mm	468 mm
Max. FID	970 mm nominal	1,110 mm nominal	1,175 mm	1,025 mm	1,200 mm
FID Type	Moveable	Motorised moveable	Fixed		
Max. Sample Weight	15 kg	50 kg		100 kg	100 kg

Detector				
Max. Pixel Matrix	2,880 x 2,880			
Min. Pixel Size	150 µm			
Max. Frame Rate	30 fps	7.5 fps	30 fps	30 fps
Type	ASTM E2597 Flat Panel			
				CLDA

Cabinet				
Length	1,830 mm	2,414 mm	2,695 mm	3,613 mm
Width	875 mm	1,275 mm	1,828 mm	1,828 mm
Height	1,987 mm	2,202 mm	2,249 mm	2,249 mm
Weight	2,250 kg	4,200 kg	9,250 kg	14,260 kg

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