SHIMADZU
Excellence in Science

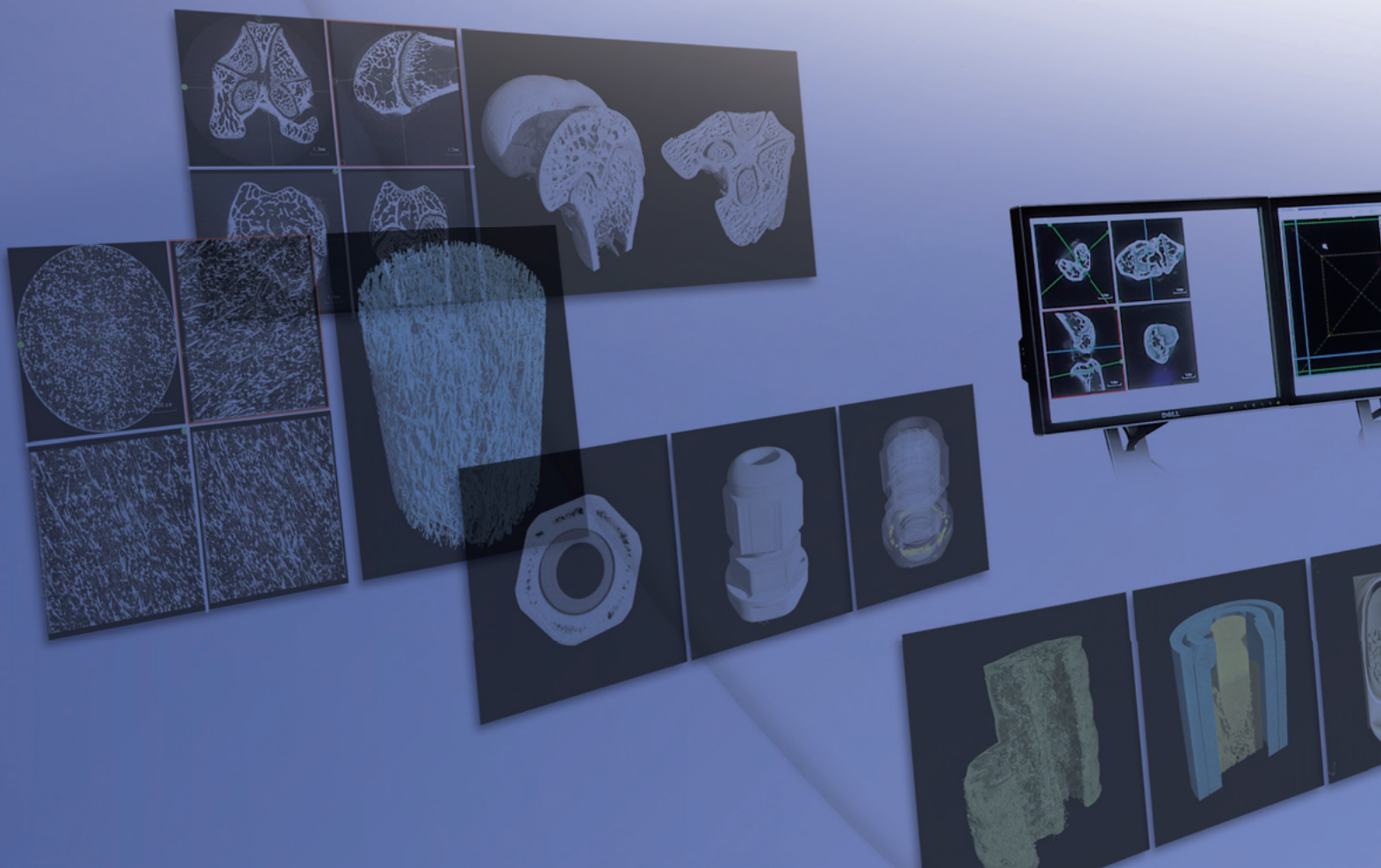
C251-E021

Micro Focus X-Ray CT System

inspeXio SMX-100CT

New Possibilities, Pioneered by inspeXio
A Solution That Gives Rise to User Friendliness and

The inspeXio SMX-100CT is a CT system capable of performing high-magnification 3D observations of resins, medicines, bones, and other soft materials. It is equipped with a sealed tube type microfocus X-ray generator with a maximum output of 100 kV, and a high-sensitivity image intensifier.
The interface provided is capable of easily observing the internal 3D structure of samples. Furthermore, clear, high-magnification CT images are obtained faster and more clearly thanks to the high-performance computing system HPC inspeXio.



Beauty

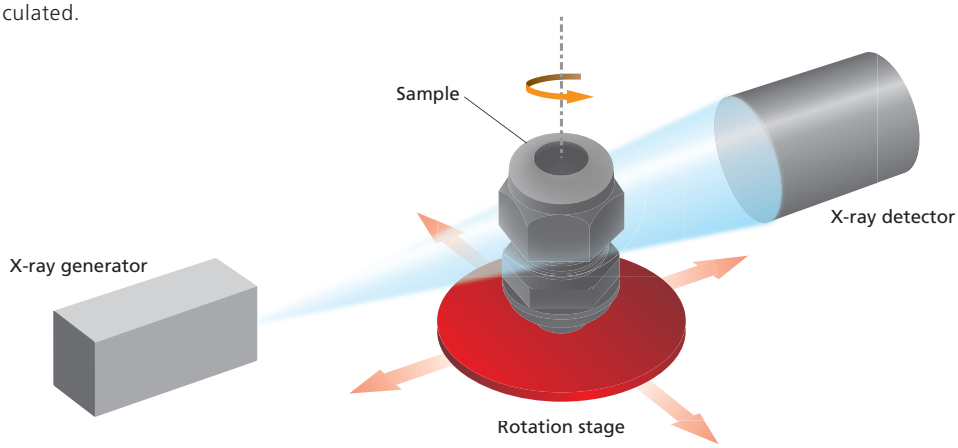
Micro Focus X-Ray CT System

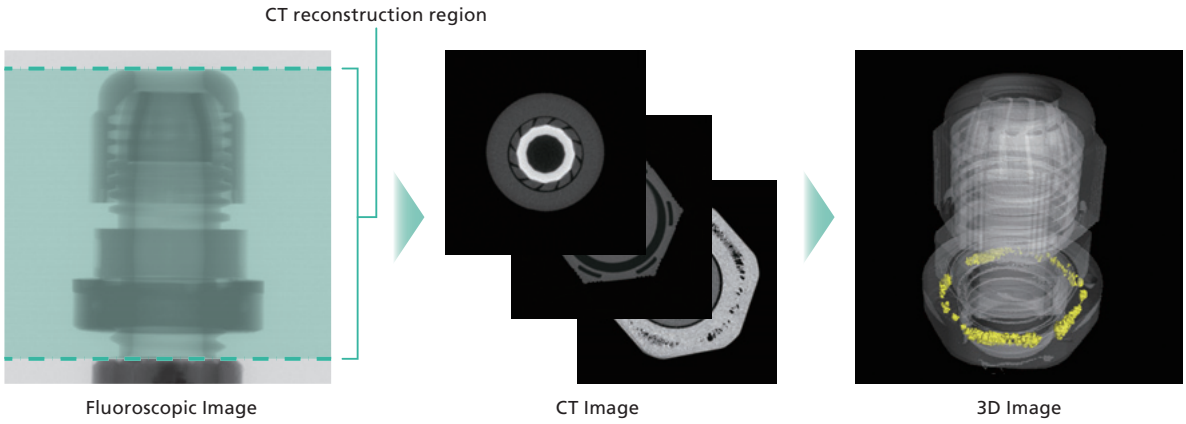
inspeXio SMX-100CT

Basic System to Achieve High Performance

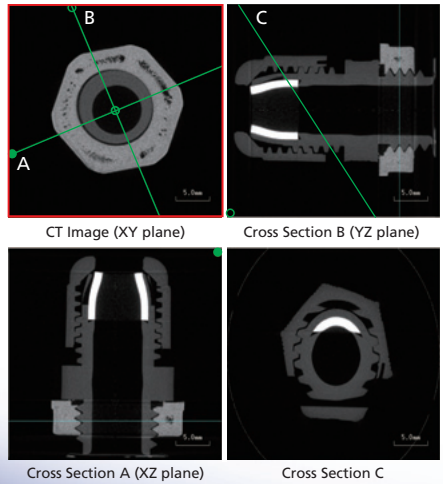
System Structure and Basic Principles

The measurement target (sample) is positioned between the X-ray generator and the X-ray detector, as shown in the figure below. X-ray fluoroscopic data is collected from every angle by rotating the sample 360 degrees, and computed tomographic images (CT images) are calculated.

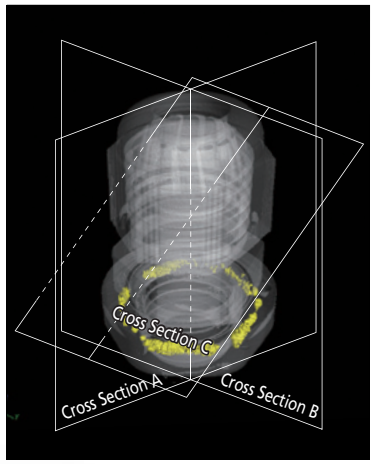




MPR Display



VR Display



MPR Display (Arbitrary cross sectional display)

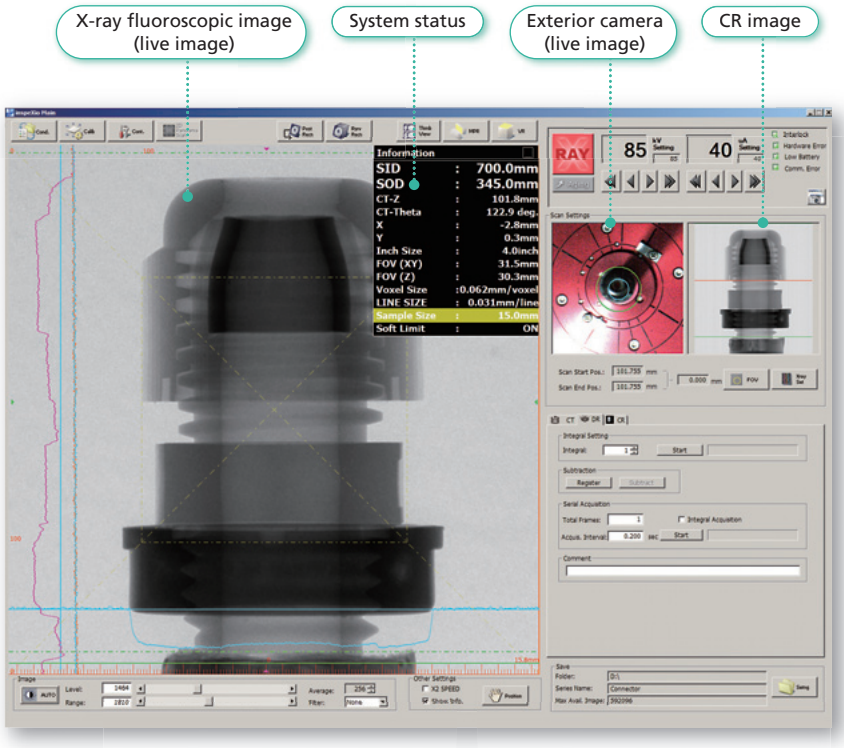
Stands for Multi Planar Reconstruction.
Multiple CT images are stacked in a virtual space, and four images — a CT image, mutually orthogonal longitudinal section images, and an arbitrary section image orthogonal to the longitudinal section images — are arranged for display.

VR Display

Stands for Volume Rendering.
Multiple CT images are stacked in a virtual space, and rendered in three dimensions.

User Interface

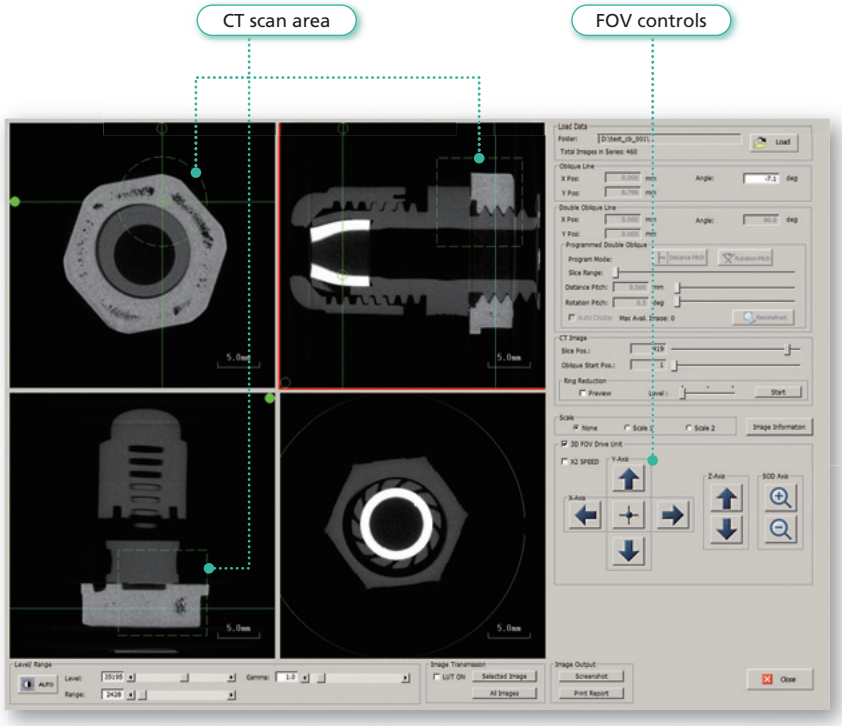
Main unit, operation box, and software design has been integrated to enable intuitive operation.



Main window

Performs X-ray control and CT stage control.

The X-ray fluoroscopic image and the exterior camera image are updated in real time.



Sub-window

Displays the CT scan results.

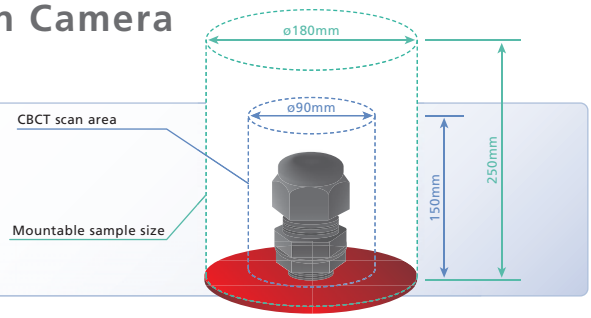
The CT scan area is displayed in real time in accordance with the system status.

Easy Sample Positioning Through Intuitive Operations

Intuitive Operations via Observation Camera

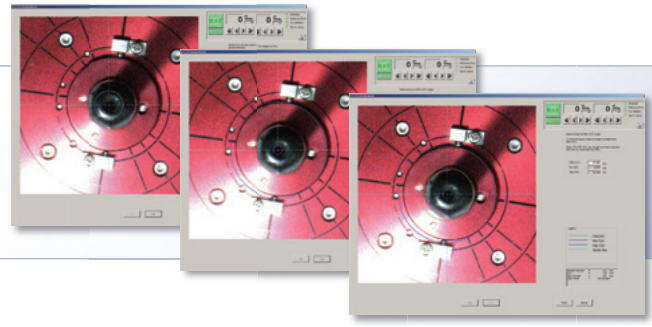
1. Load the sample

Samples up to 180 mm in diameter × 250 mm in height can be mounted.
CT scan area : CBCT: 90 mm dia. × H150 mm
2DCT: 115 mm dia.



2. Check the Positioning

Intuitive sample positioning via observation camera.

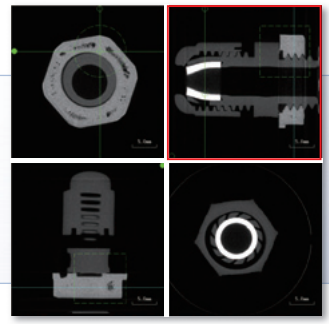


3. Start the CT Scan

Starts instantly, with no calibration required.

Imaging Complete

High-speed CT scan, thanks to the high-performance computing system HPC inspeXio.
MPR images are displayed 5 to 10 seconds after data collection is complete.

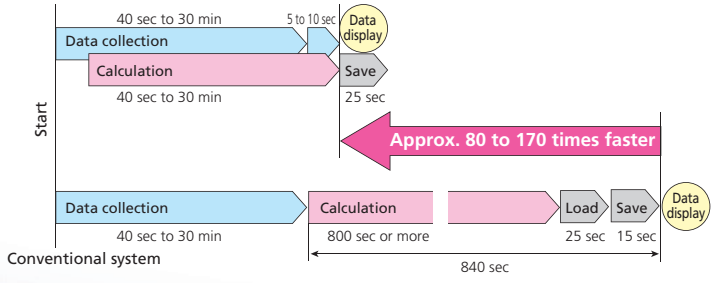


High-Performance Computing System HPC inspeXio

A system employing the latest High-Performance Computing (HPC) technology has been incorporated.
As a result, computational processing is approximately 80 to 170 times faster than before.

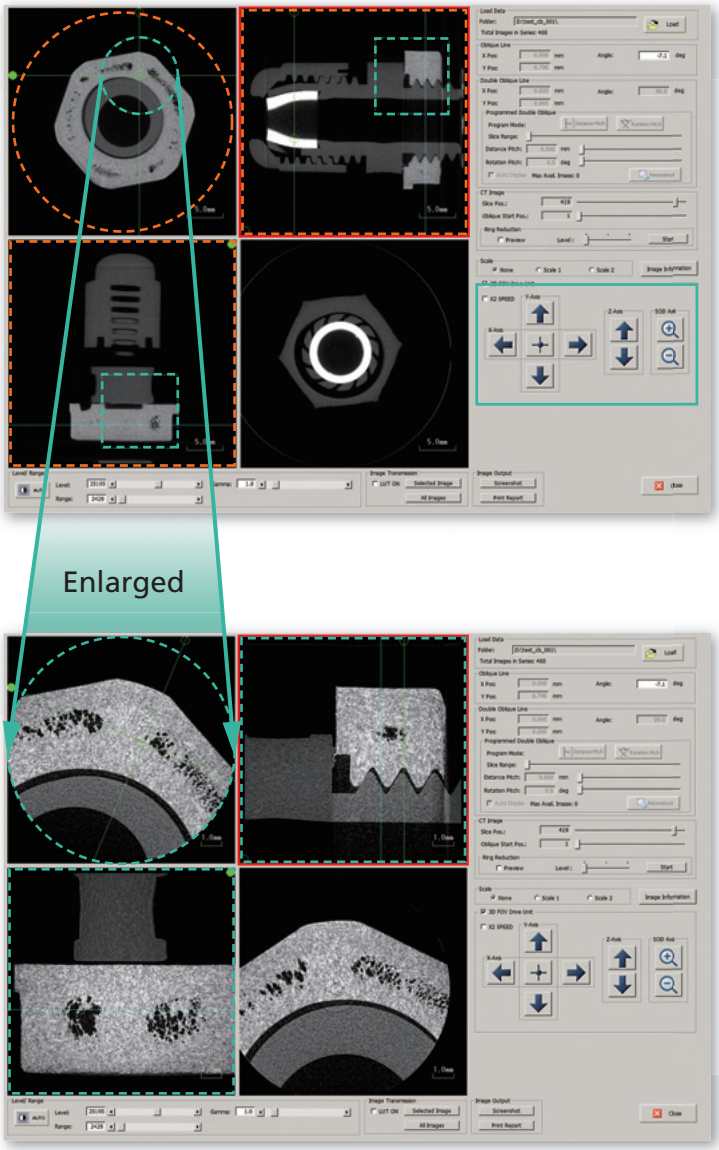
HPC inspeXio High Performance Computing inspeXio SHIMADZU

High-Performance Computing System HPC inspeXio
For 1,200 views → 512 × 512 × 480 slices

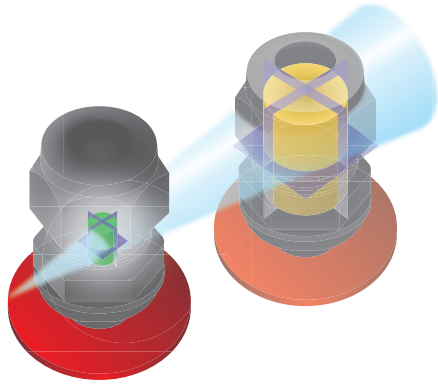


CT Scan Area 3D Display Function

The CT scan area is overlaid on the MPR image in real time to match the movement of the CT stage.



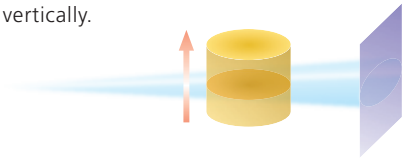
Based on the CT scan results, a CT scan of the region of interest can be performed at even higher magnification.



A Variety of Original Functions to Support the User

CR Scan

To obtain fluoroscopic images with no distortion in the vertical axis direction, data is only collected from the centerline of the X-ray detector while the sample is moved vertically.

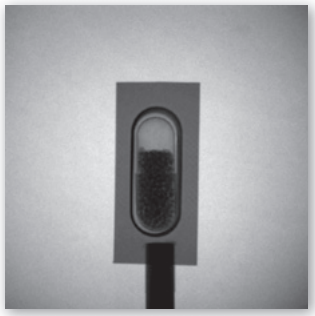


X-Ray Fluoroscopic Image

CR Scan Image

Real-Time Sensitivity Correction

This enables obtaining sharp X-ray fluoroscopic images free of shading (uneven brightness).



Not corrected

Corrected

DICOM Conversion Function

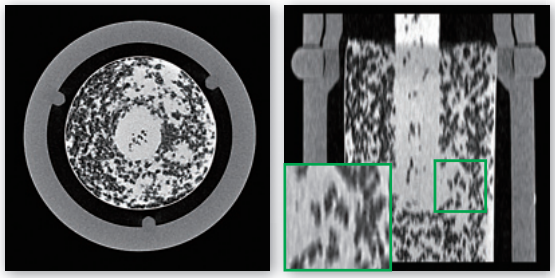
This enables converting obtained CT image data to the DICOM format, the world standard for medical imaging. This function is essential for analyses with medical imaging analysis software.

*Operation with all DICOM compatible software is not guaranteed.

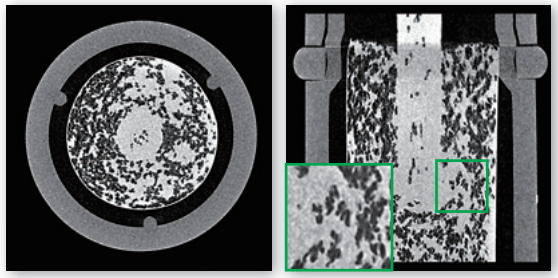
*CT image brightness is displayed in 16-bit grayscale, and does not conform to Hounsfield units. A conversion function is provided for CT image brightness values via manual input.

Enhanced Noise Reduction Function

In comparison with conventional processing, noise is reduced while keeping the shape of longitudinal sections intact.



Conventional Processing



Noise Reduction Function

Software Limit Function

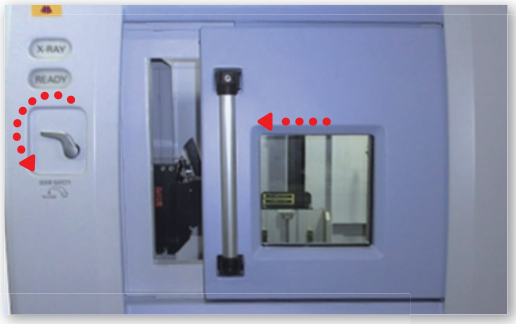
The software limit function, which can be configured to suit the sample size, helps prevent collisions between the X-ray generator and sample.

Routine Inspection Function

The minimum necessary routine inspections are performed when the system starts up. A software wizard has been adopted for the routine inspections, so that the system can always be used safely.

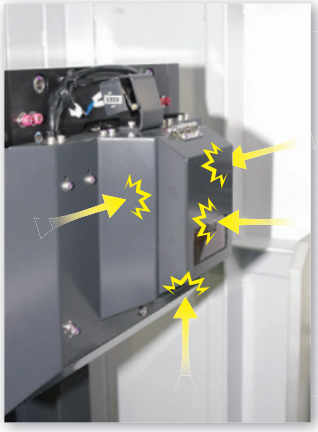
Sliding Door Finger-Pinch Preventive Mechanism

A finger-pinch preventive mechanism has been provided to prevent pinched fingers when the sliding door is closed.



Collision Sensor

Installed near the X-ray generator, this collision sensor stops the CT stage in an emergency (sample collision).



Door Interlock Mechanism (for X-rays)

Double interlock circuits are provided on the sliding door.
X-ray exposure is impossible when the sliding door is open.

Door Interlock Mechanism (for CT stage)

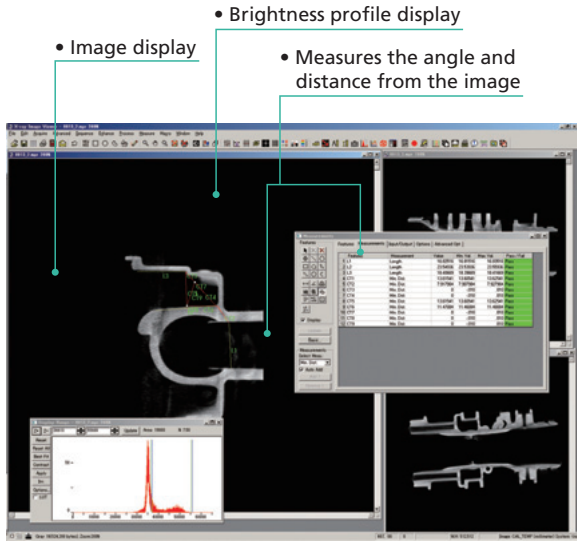
This stops internal CT stage movement when the sliding door is open.

A Wealth of Analysis Software to Accommodate a Variety of Situations

Standard Software

Image-Pro Analyzer

This 2D image processing software is capable of high-level image processing.



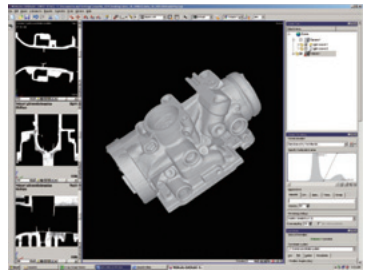
Optional Software

VGStudio
3D Image Processing Software

Volume Graphics GmbH

P/N: 362-99203-01 (32bit)

This software displays the tomographic images obtained by X-ray CT in 3D via volume rendering (VR). Basic animation creation and simple measurement functions are provided.

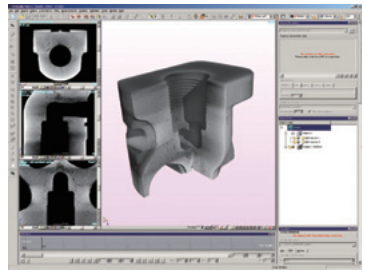


VGStudio MAX
3D Image Processing Software

Volume Graphics GmbH

P/N: 362-99203-03 (32bit)

This is the functionally extended version of the standard VGStudio software. The extended functionality includes animation creation (rotation, cross section, viewpoint motion); length, angle, minimum distance, histogram, volume, surface area, porosity, and other measurements; ROI area extraction; image filtering; and 3D image data alignment.

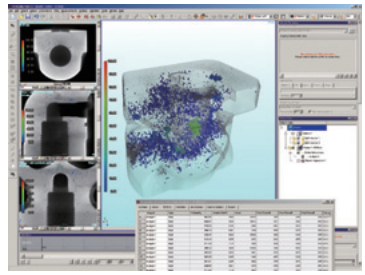


Defect Analysis
Defect Detection Module (VGStudio MAX optional tool)

Volume Graphics GmbH

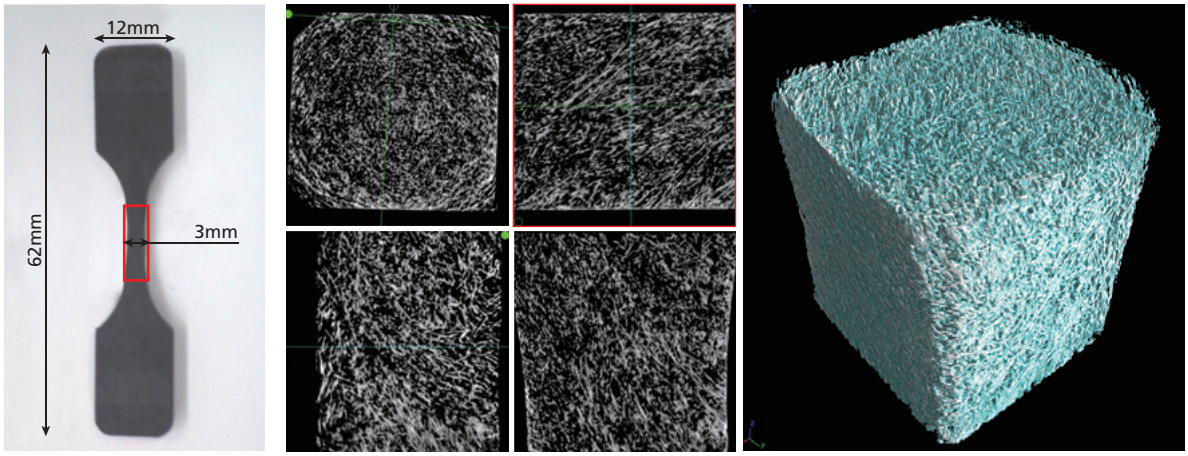
P/N: 362-99203-13 (32bit)

This can extract internal defects from X-ray CT images of foundry pieces and resins, allowing measurement of void quantity, volume, XYZ dimensions, projected area, and other properties. Reports can also be generated.

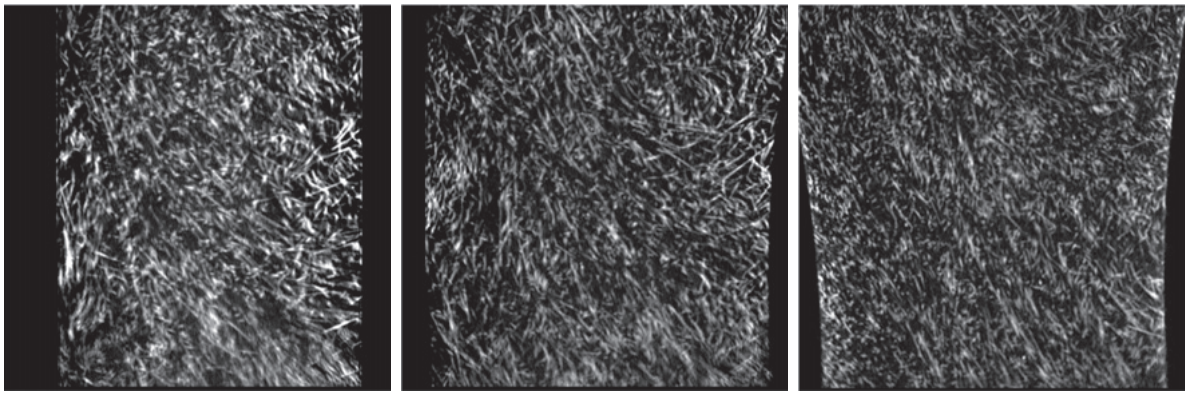


Applications

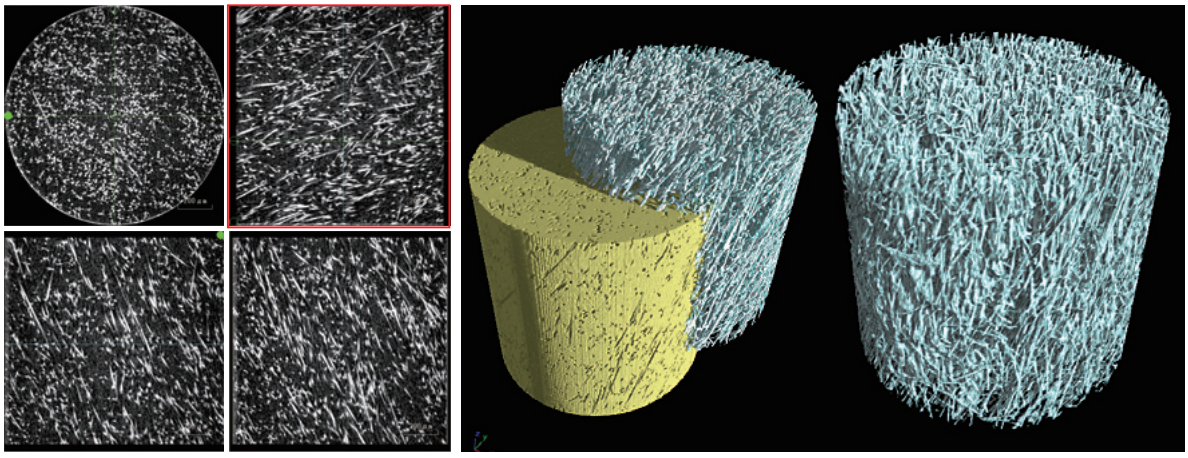
GFRP (Glass Fiber Reinforced Plastics)



Consecutive Cross Sectional Observations

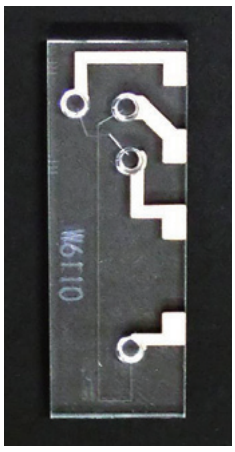


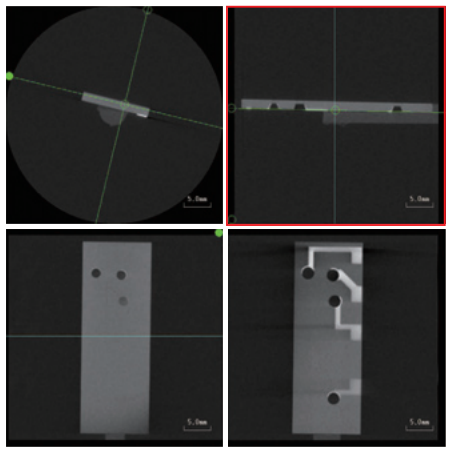
Magnified Image

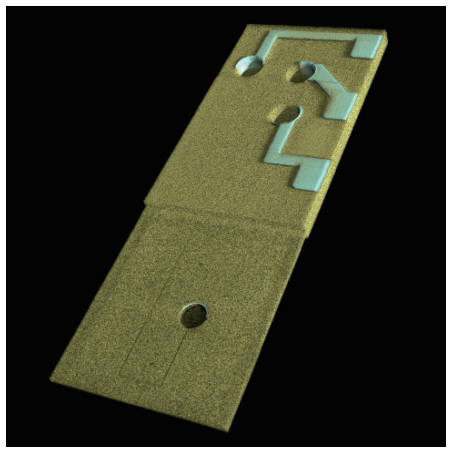


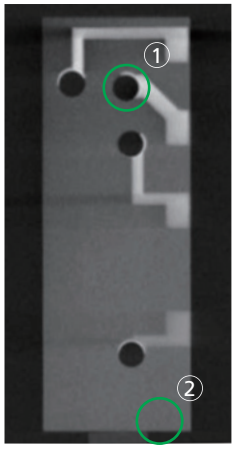
Base Resin + Glass Fibers Glass Fibers

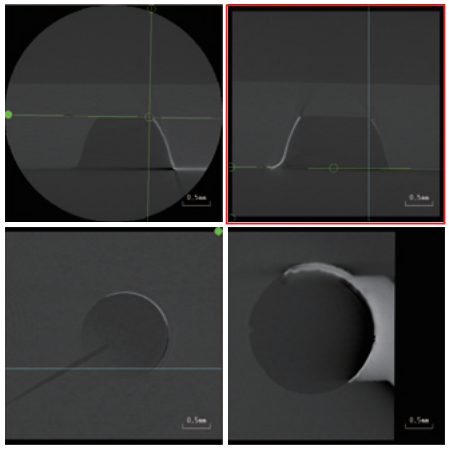
MEMS (Analytical Instrument MEMS Chip)

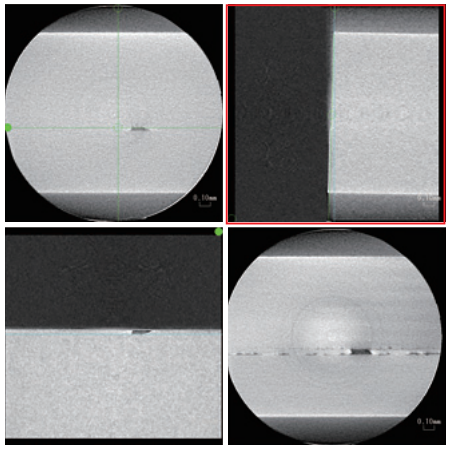








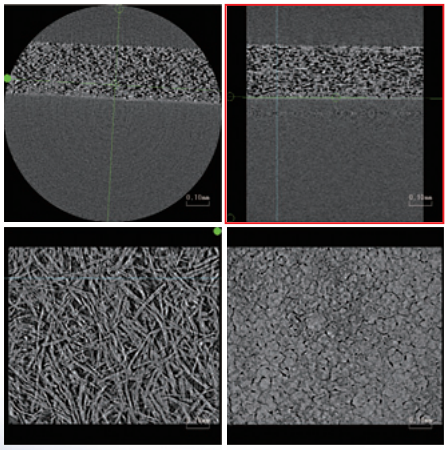


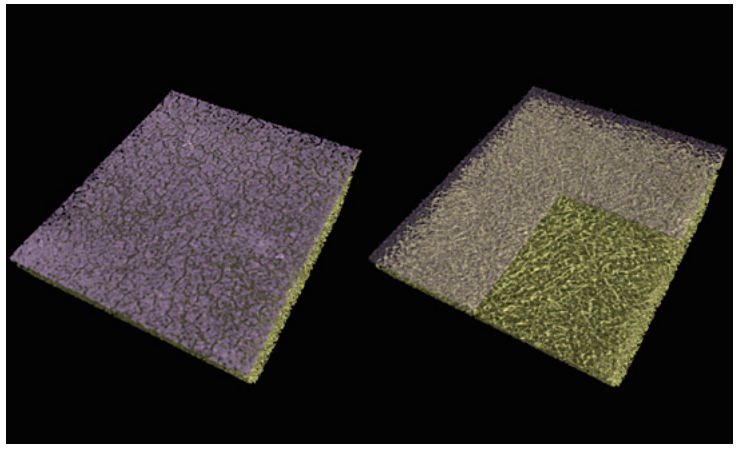


Magnified Image of Part ①　　Magnified Image of Part ②

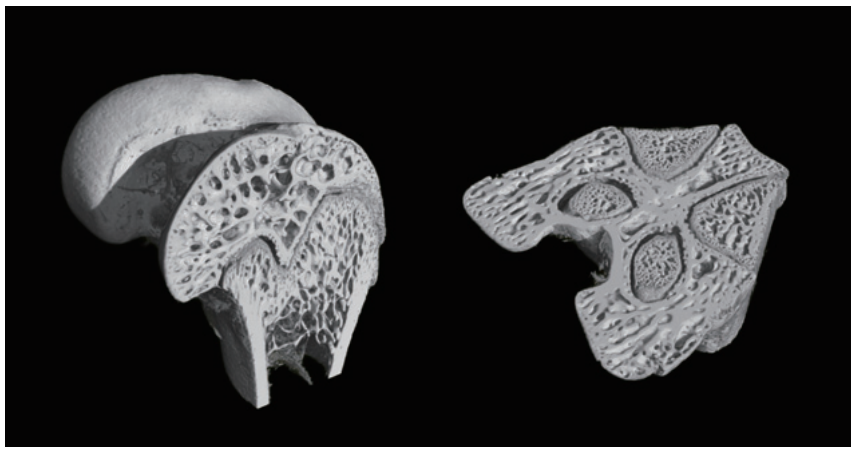
*Pseudo defects have been added to a normal product.

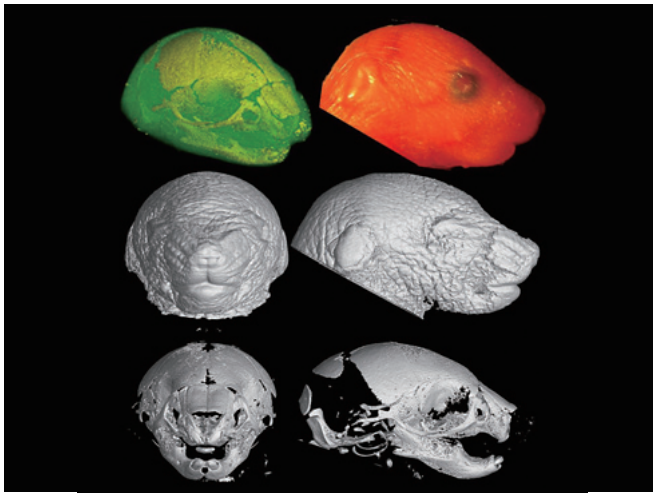
Glossy Photo paper





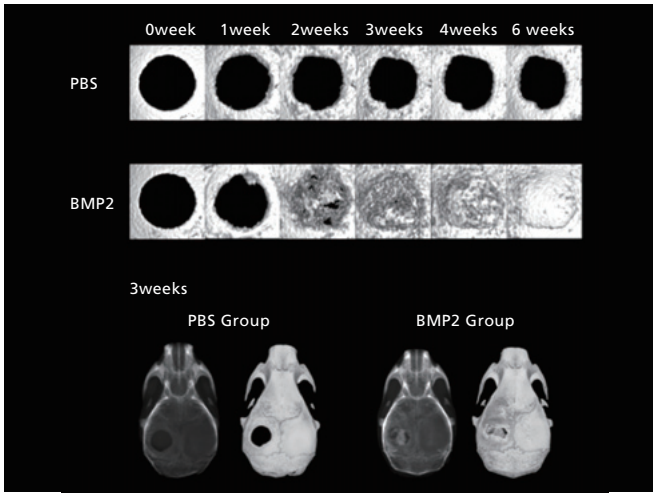
Biological Samples





Sample Observations of Skin Surface Quality,
Sinus Hair Arrangement, Subcutaneous Eyeballs, and Ear Cartilage

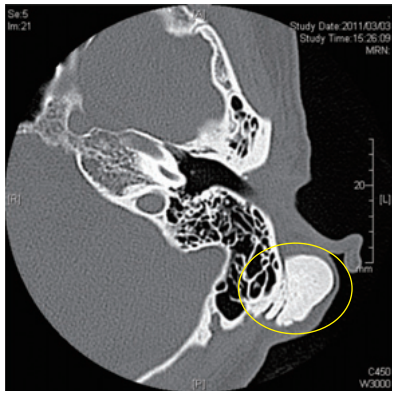
Presented by Dr. Okuhara, Section of Molecular Craniofacial Embryology,
Graduate School of Medical and Dental Sciences,
Tokyo Medical and Dental University



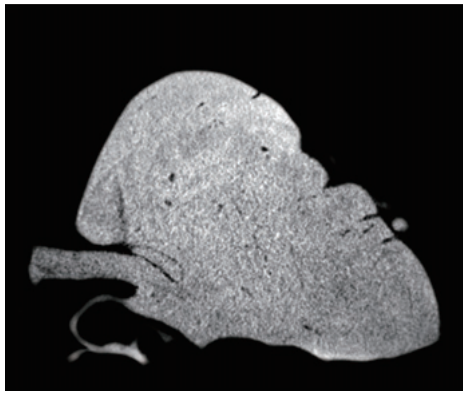
Sample Observations of Changes in Bone Defects
with Time, Created in a Mouse Calvarium

- Control Group: PBS
- Experimental Group: BMP2

Presented by Dr. Fujioka, Section of Molecular Craniofacial Embryology,
Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University



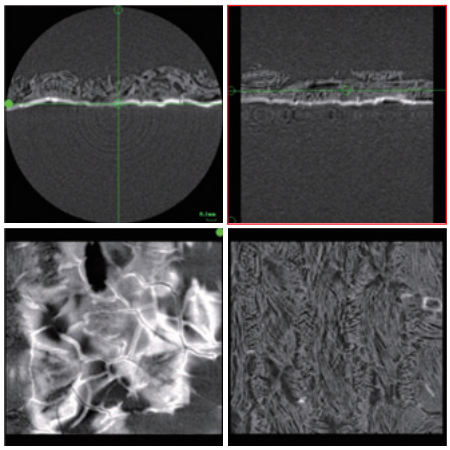
Medical CT Image of Osteoma in
48-Year Old Female (Presurgical Image)

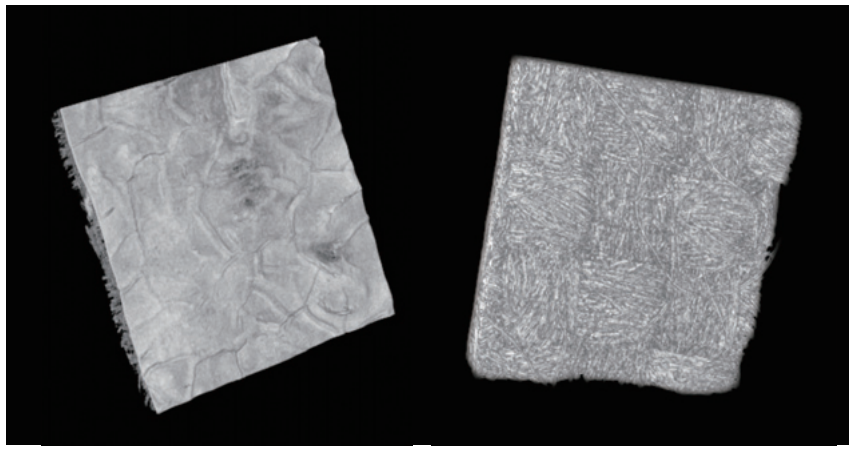


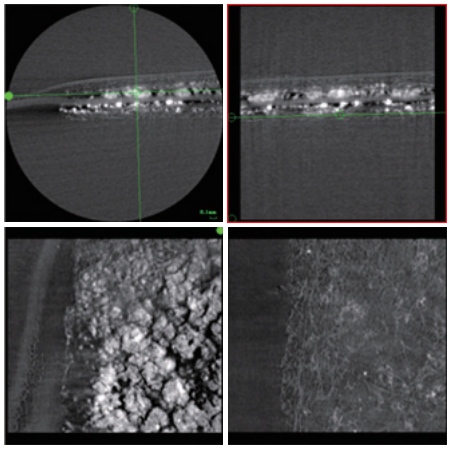
Sample Image of Osteoma
Removed This Patient

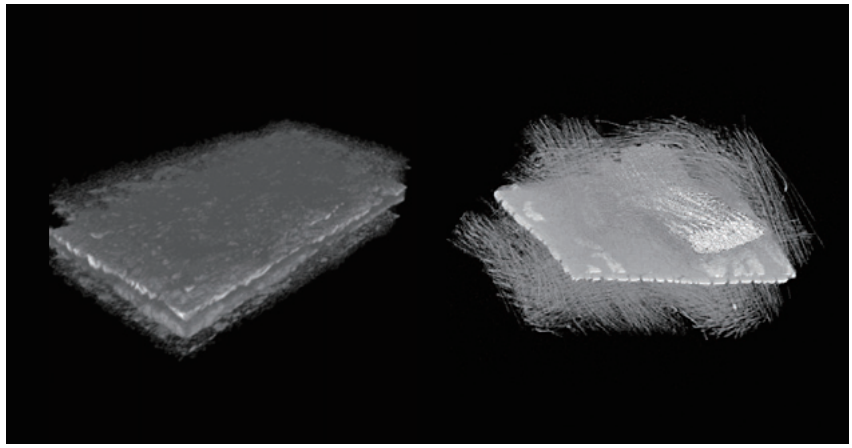
Presented by Dr. Tsunoda, Department of otolaryngology, Tokyo Medical and Dental University

Fuel Cell (MEA)



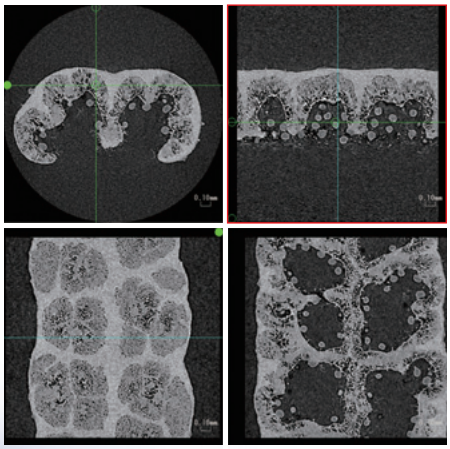


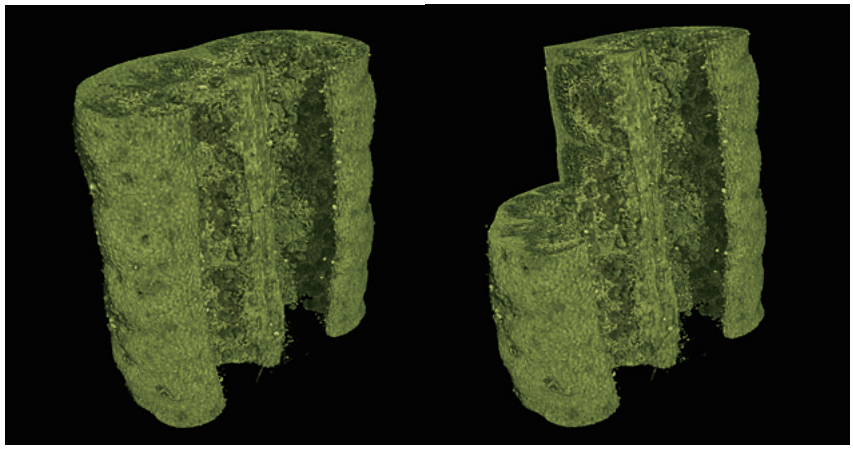




Rosemary Leaf

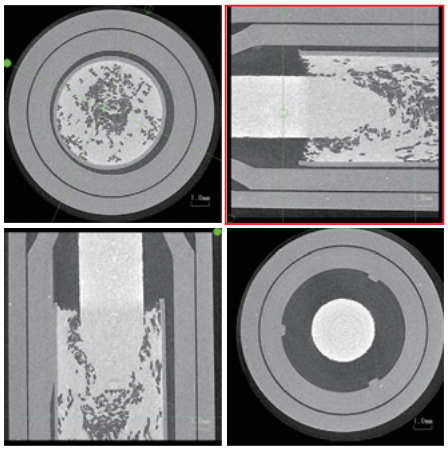
Sample Observation of Scutiform Glandular Hairs on the Inside and Outside of a Leaf

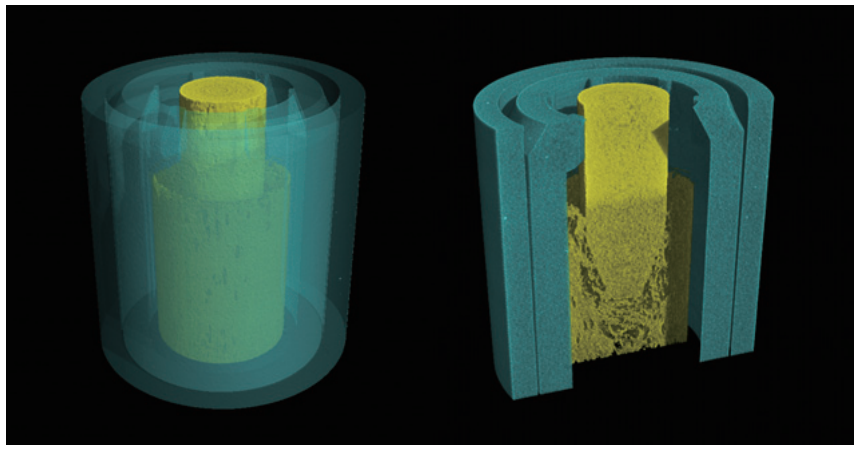




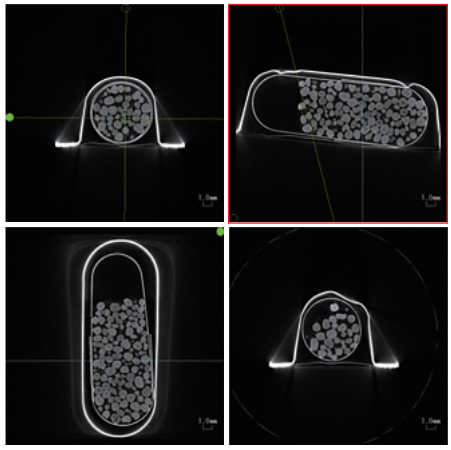
Presented by Mr. Sagawa, S & B Foods, Inc.

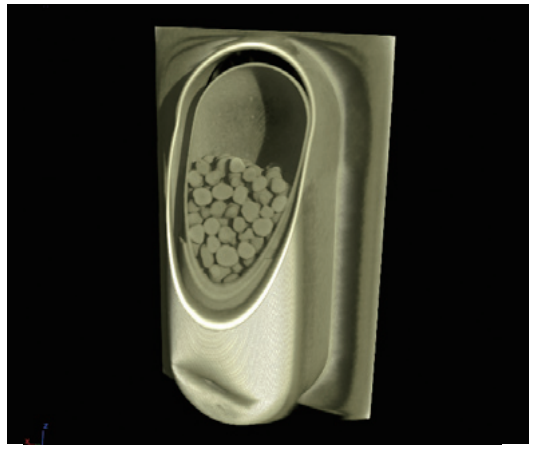
Highlighter Pen



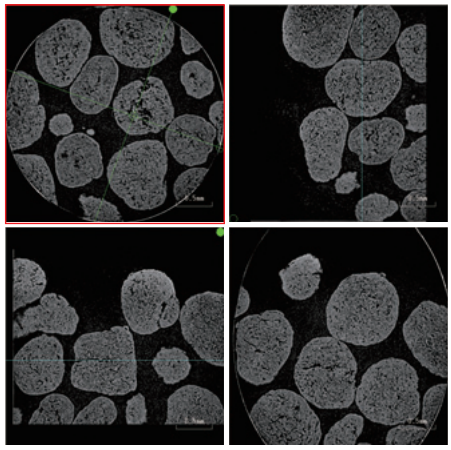


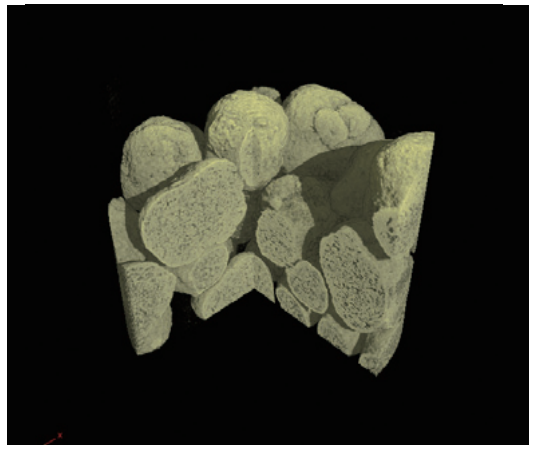
Pharmaceutial Products





Magnified Image

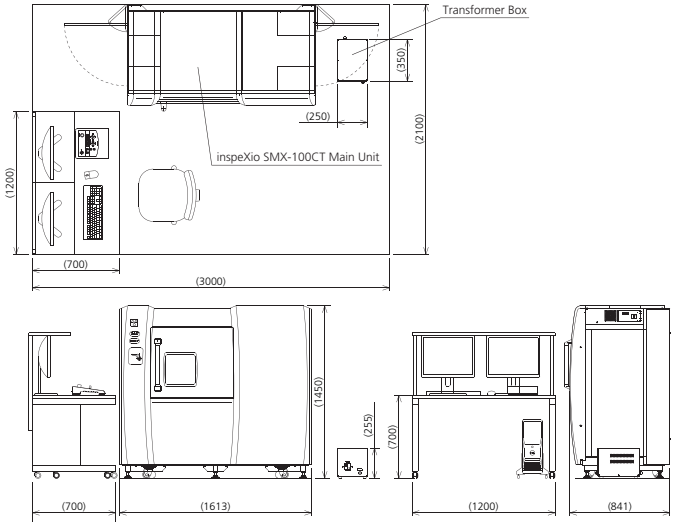




Standard Specifications

			
Model	inspeXio SMX-100CT	inspeXio SMX-225CT	inspeXio SMX-90CT
P/N	S362-79800-92	S362-69100-22	S362-65000-52
X-Ray Generator	Sealed tube type, Rated power: 20 W Max. tube voltage: 100 kV Max. tube current: 200 µA	Non-enclosure tube type, Rated power: 135 W Max. tube voltage: 225 kV Max. tube current: 100 µA	Sealed tube type, Rated power: 10 W Max. tube voltage: 90 kV Max. tube current: 250 µA
X-Ray Detector	Image intensifier	Image intensifier	Digital flat panel detector
Max. Stroke of CT Stage	SOD axis (*1) : 540 mm SID axis (*2) : Can be switched between 4 levels 200, 300, 500, and 700 mm Z axis: 150 mm	SOD axis (*1) : 670 mm SID axis (*2) : Can be switched between 4 levels 400, 600, 800, and 1,000 mm Z axis: 300 mm	SOD axis (*1) : 200 mm Z axis: 50 mm
Max. Sample Size	180 mm dia. × H250 mm, 4 kg max.	300 mm dia. × H300 mm, 9 kg max.	160 mm dia. × H100 mm, 4 kg max.
Max. CT Scan Area (FOV)	90 mm dia. (for 2DCT: 115 mm dia.)	200 mm dia.	50 mm dia.
Scanning Methods	Normal scan, half scan, offset scan, FS scan (*3) ,2DCT (*4) /CBCT (*5)	Normal scan, half scan, offset scan, FS scan (*3) , 2DCT (*4) /CBCT (*5)	Offset scan, CBCT (*5)
CT Data Acquisition Time	Any value from 10 sec to 30 min	Any value from 10 sec to 30 min	Any value from 40 sec to 30 min
CT Image Sizes	512 × 512, 1024 × 1024, 2048 × 2048, 4096 × 4096	512 × 512, 1024 × 1024, 2048 × 2048, 4096 × 4096	512 × 512, 1024 × 1024
Dimensions and Weight of Shield Box	W1,613 × D841 × H1,450 mm, approx. 1,200 kg	W2,170 × D1,350 × H1,857 mm, approx. 3,100 kg	W830 × D601 × H587 mm, approx. 250 kg
Dimensions and Weight of Dedicated Desk	W1,200 × D700 × H1,270 mm, approx. 50 kg	W1,200 × D700 × H1,270 mm, approx. 50 kg	W1,500 × D750 × H740 mm, approx. 60 kg
Power Requirements	Main unit: 100 V AC ±10 %, 50/60 Hz, 1 kVA Control computer: 100 V AC ±10 %, 50/60 Hz, 1 kVA Class D grounding (max. ground resistance of 100 Ω)	Main unit: 200 V AC ±10 %, 50/60 Hz, 3 kVA Control computer: 100 V AC ±10 %, 50/60 Hz, 1 kVA Class D grounding (max. ground resistance of 100 Ω)	100 V AC ±10 %, 50/60 Hz, 1 kVA Class D grounding (max. ground resistance of 100 Ω)
X-Ray Leakage Rate	1 µSv/h max.	1 µSv/h max.	1 µSv/h max.

(*1) SOD axis: Source to Object Distance, the distance from the X-ray focal point to the sample.
(*2) SID axis: Source to Image Distance, the distance from the X-ray focal point to the X-ray detector.
(*3) FS scan: Fan-Shaped Image Distance, a scanning method that obtains CT images at rotation angles of 60, 90, and 120 degrees.
(*4) 2DCT: 2-Dimensional Computed Tomography, a scanning method that obtains one or three CT images with a single scan.
(*5) CBCT: Cone Beam Computed Tomography, a scanning method that obtains hundreds of CT images with a single scan.



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