C251-E037

SHIMADZU
Excellence in Science

Micro Focus X-Ray CT System

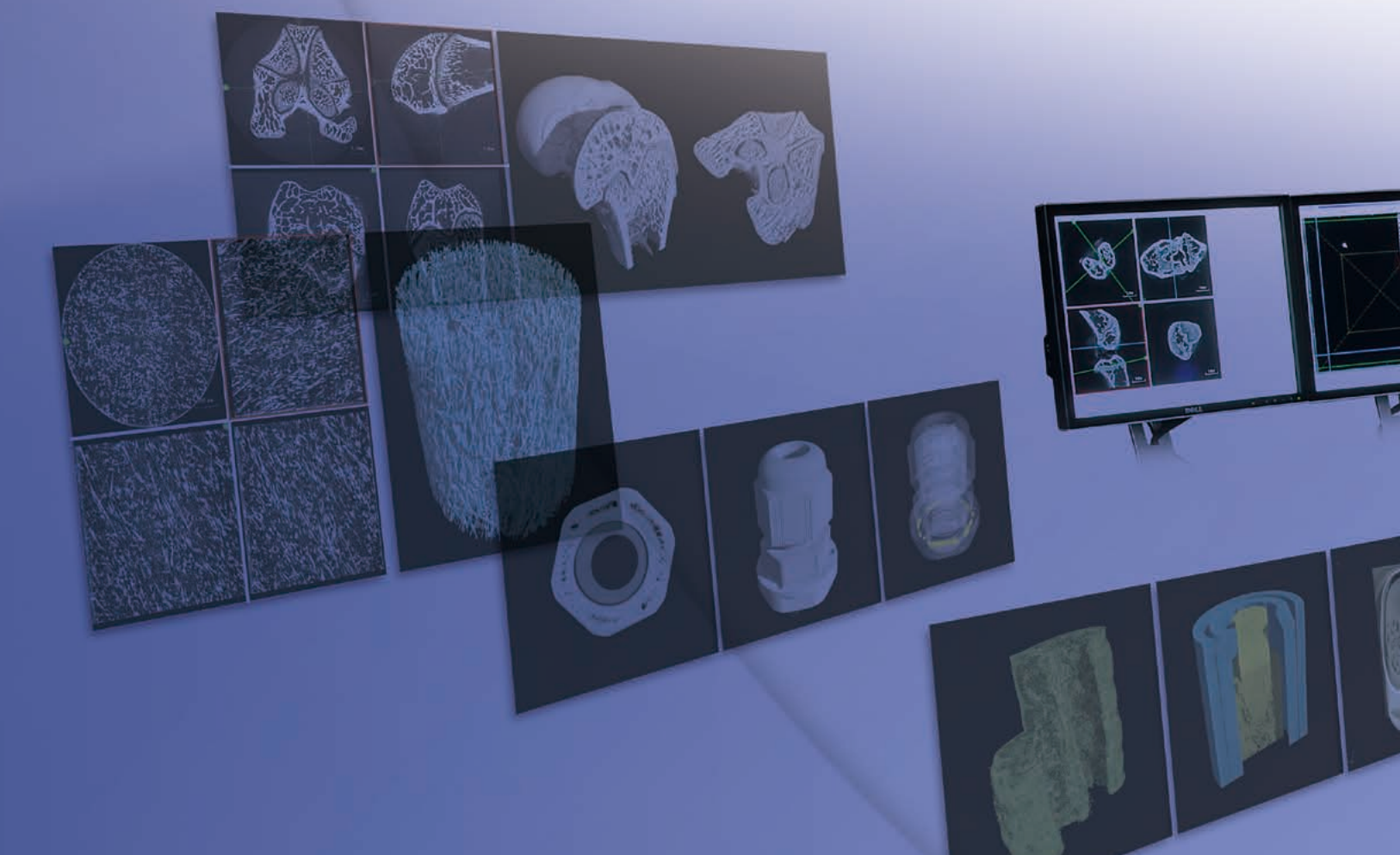
# inspeXio SMX-100CT Plus

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

The inspeXio SMX-100CT Plus 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 HPCinspeXio.





**Beauty**

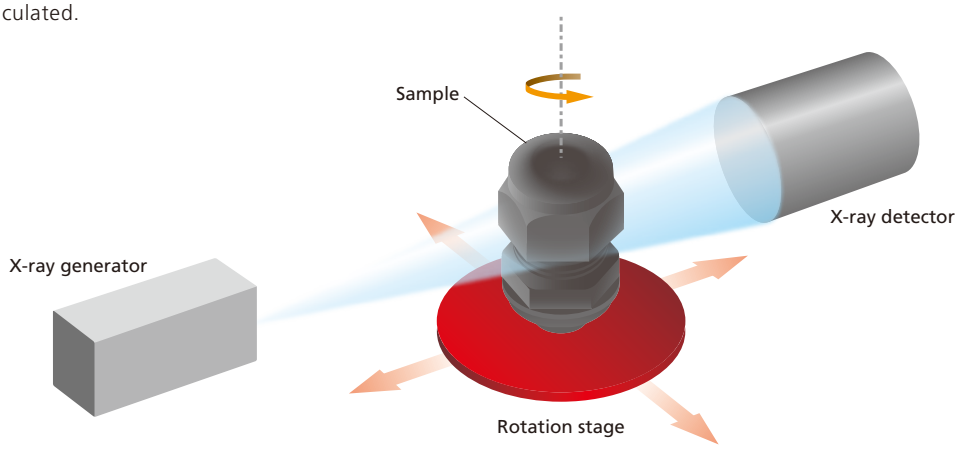
Micro Focus X-Ray CT System

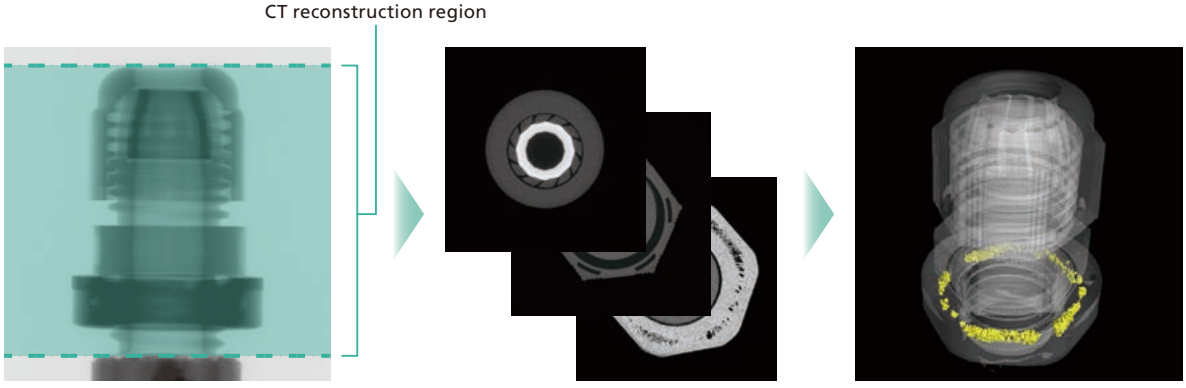
# inspeXio SMX-100CT Plus

# Basic System to Achieve High Performance

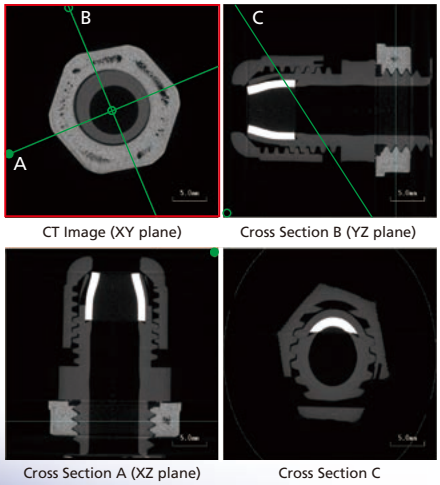
## System Structure and Basic Principles

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.

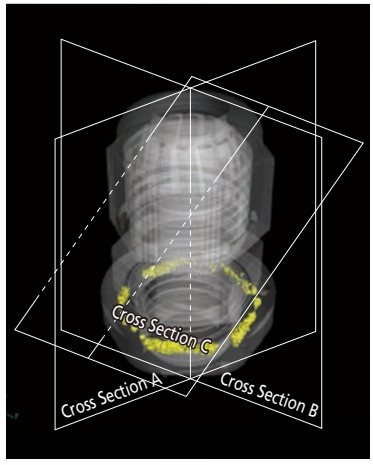



MPR Display




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.

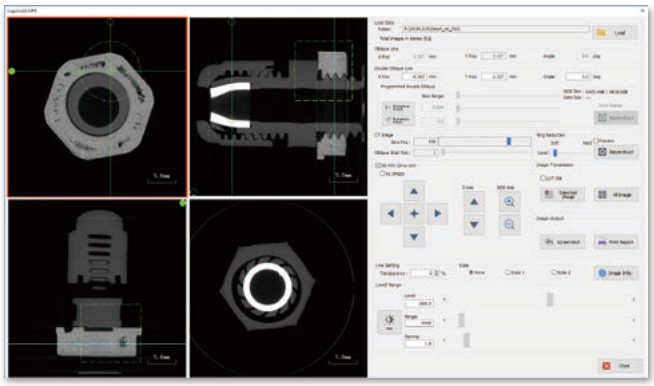
# Easy and Fast CT Scanning

## Intuitive User Interface

The new user interface features a simpler arrangement for intuitive operation.

**Main System Window** Displays the stage position, scan field of view, equivalent voxel length, and other information in real time (the yellow box), making it easy to scan images with the specified resolution and field-of-view size.

**MPR Window** Displays slice, oblique, and double-oblique images, enabling the easy observation of cross-sections.



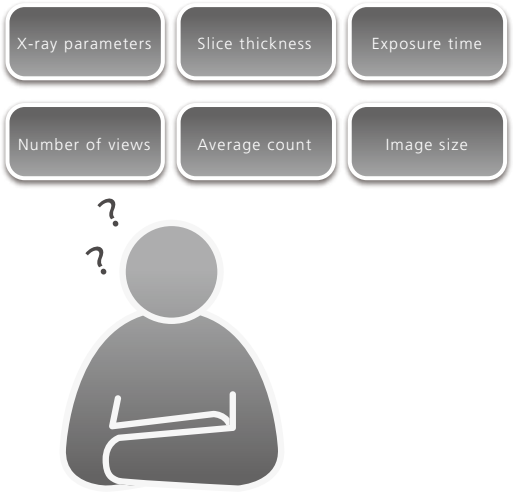
MPR Window

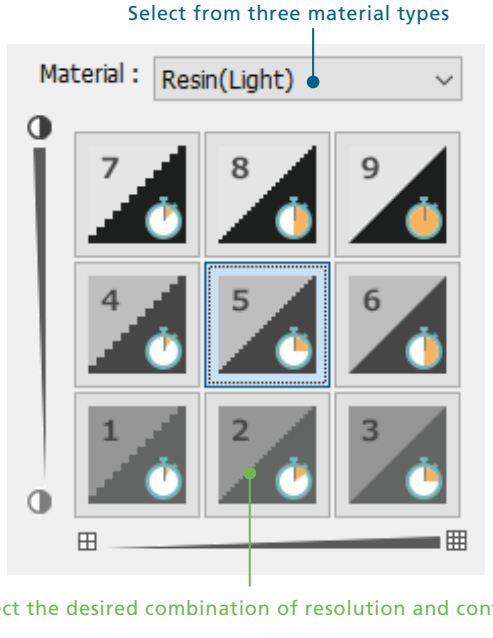

System Window

## Automated CT Scanning Function

ANALYTICAL INTELLIGENCE *New!!*

The new automated CT scanning function enables scan parameters to be specified easily.
Simply select the material, the desired CT image resolution, and the contrast level, and the system automatically optimizes the CT scanning parameter settings accordingly.



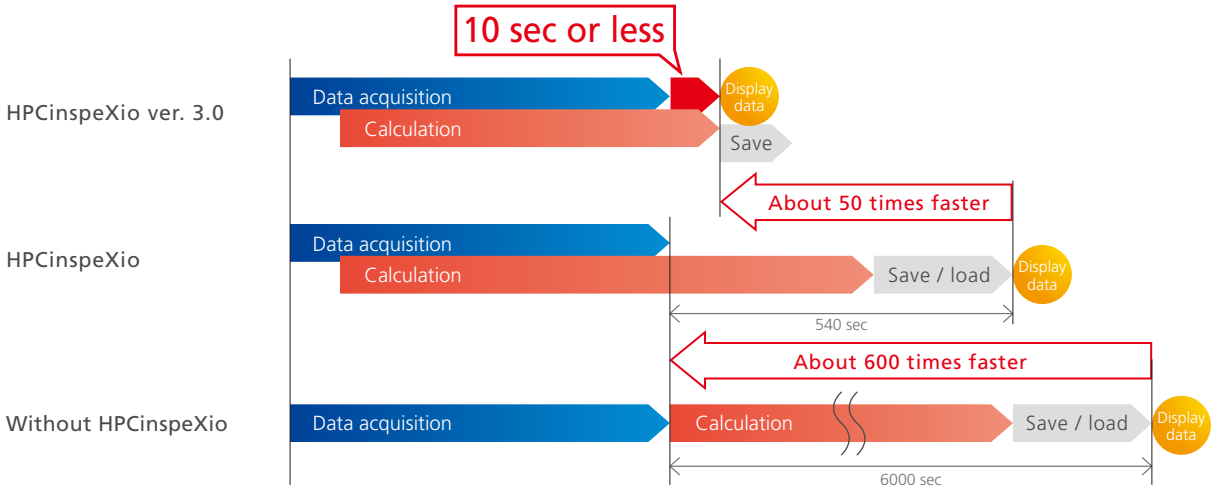



# Easy and Fast CT Scanning

## HPCinspeXio High-Performance Computing System ver. 3.0 *New!!*

The HPCinspeXio high-performance computing system is around 50 times faster* than the previous version.

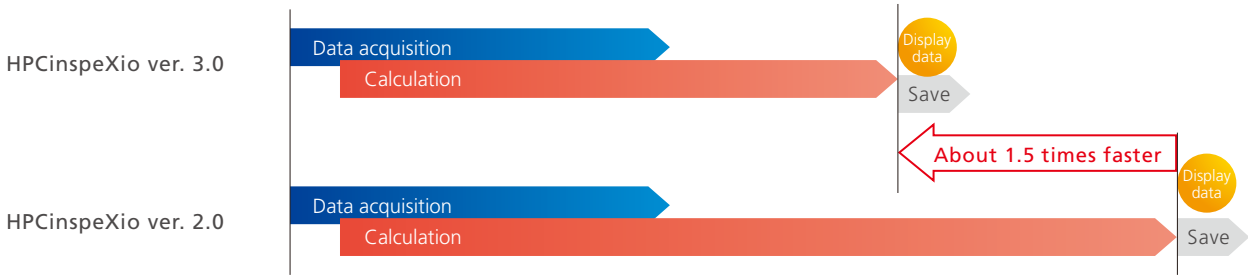
* When the fast acquisition mode is configured and the CT slice size is set to 1,024 × 1,024 pixels

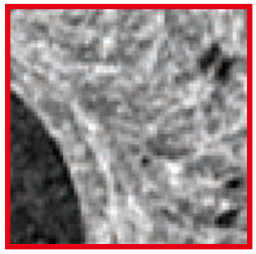



## Even Faster 2,048 × 2,048 Pixel Cone-Beam CT Reconstruction *New!!*

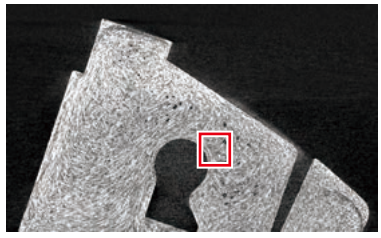
The high-performance computing system is updated. The processing time for 2,048 × 2,048 pixels Cone-Beam CT reconstruction* is around 1.5 times faster than the previous version.

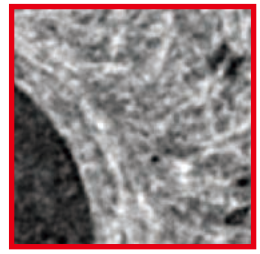
* 1200View, full scan, AUTO scaling factor, reconfiguration (2,048 × 2,048 pixels)



1,024 × 1,024 pixels





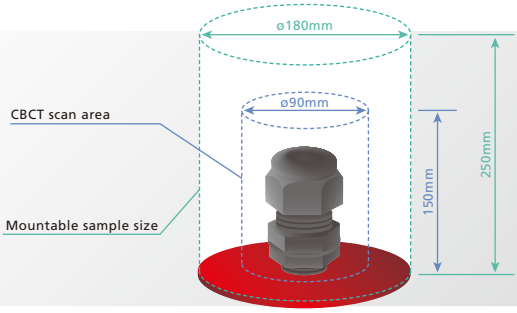
2,048 × 2,048 pixels

## Obtain CT Images in Three Easy Steps

No calibration process is necessary before scanning. Scans can be started immediately after sample placement.

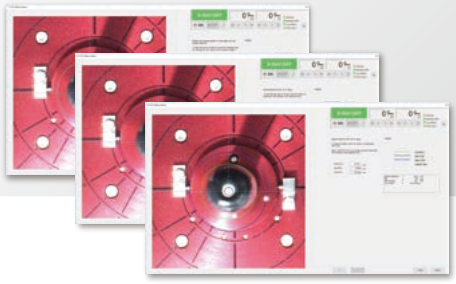
### step 1 Place the sample.

Mountable sample size: 180 mm in diameter and 250 mm in height.
【CT scan area】
CBCT: 90 mm in diameter and 150 mm in height
2DCT: 115 mm in diameter



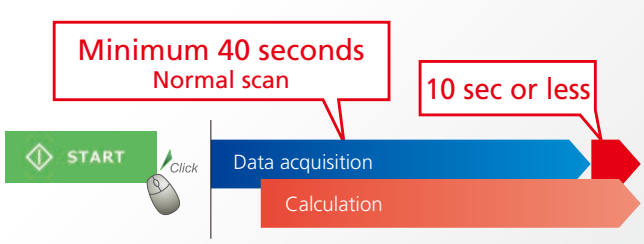

### step 2 Determine the scan position.

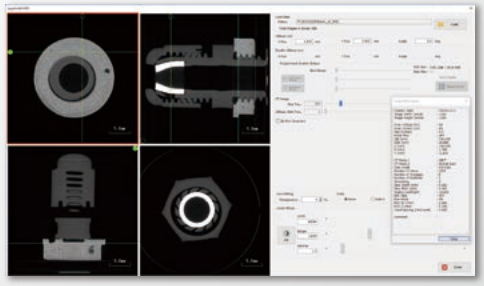
Samples are positioned using the camera mounted on the rotation axis.



### step 3 Start the scan.

Scans can be started immediately without prior calibration.
In normal scan (600 View), data acquisition can be done in as short as 40 seconds.
Due to the high-performance computing system, MPR images are displayed 10 seconds after scanning is finished.

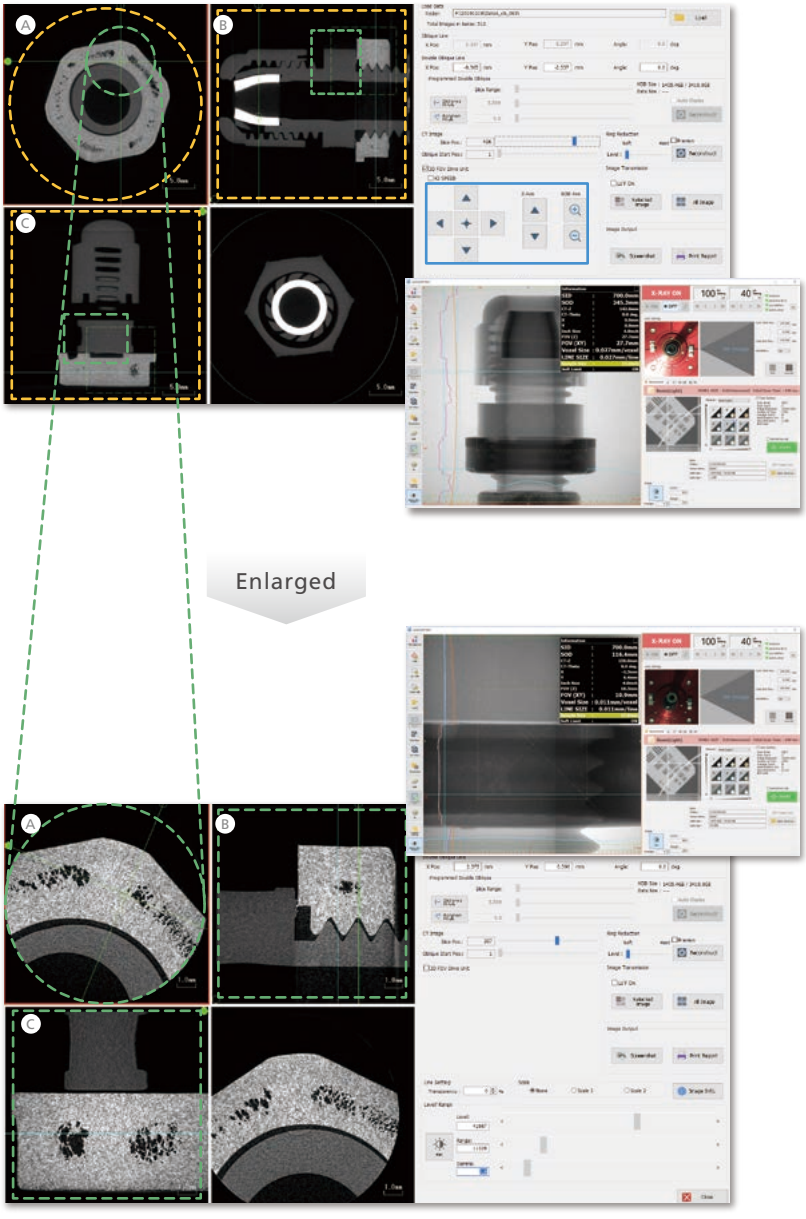


# Easy and Fast CT Scanning

## 3D CT Scan Region Display Function

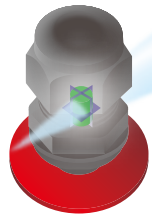
As the CT stage moves, the corresponding CT scan region is displayed and overlaid in real-time on the MPR display.
Based on the previous CT scan image, additional CT scans for areas of interest can be obtained.



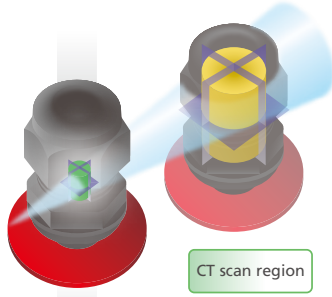

Ⓐ —— Cross-Sectional Image
ⒷⒸ — Oblique Image

To magnify this area

Click in the 3D FOV control buttons.



The scan region is updated
as the CT stage moves.



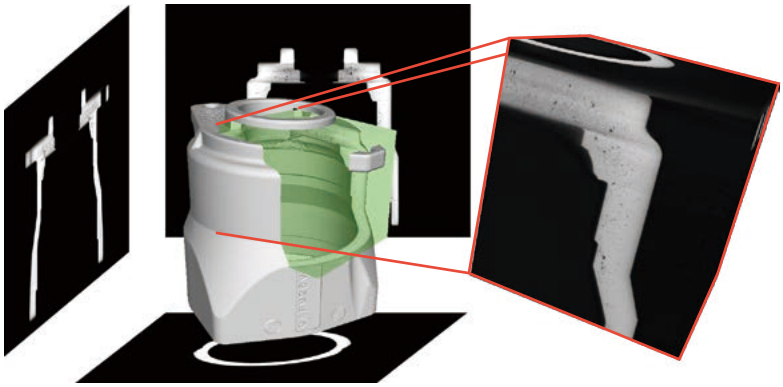
CT scan region

Start the scan.
The magnified scan image is obtained.

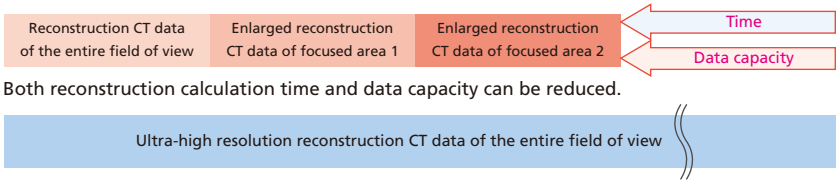
START Click

# Unique Functions

## Advanced 3D image Reconstruction *New!!*



It is possible to enlarge only the focused areas in images once acquired and perform the reconstruction calculation. High-magnification cross-sectional images can be obtained even in the works that enlargement ratio is difficult to be improved. Equipped with a high-resolution flat panel detector, clear cross-sectional images can be obtained even when performing reconstruction. It is not necessary to perform the CT scanning once again when performing reconstruction only.

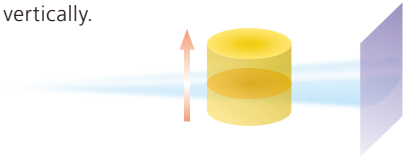



Both reconstruction calculation time and data capacity can be reduced.




## 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

## 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.

## 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.

# Unique Functions

## Routine Inspection Function

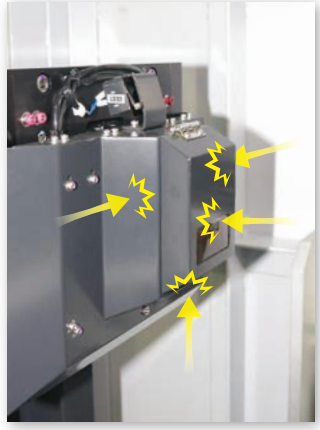
The minimum necessary routine inspections are performed when the system starts up. A software wizard has been adopted for the routine inspections, so that the system can always be used safely.


## 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.

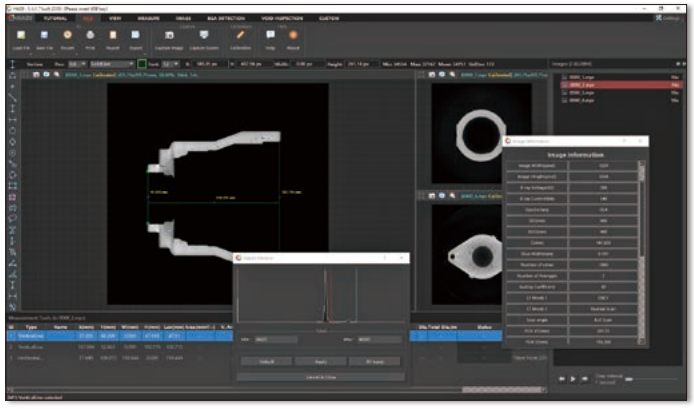
## Door Interlock Mechanism (for CT stage)

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

# Optional Software

## HADI-S
## 2D Image Processing Software

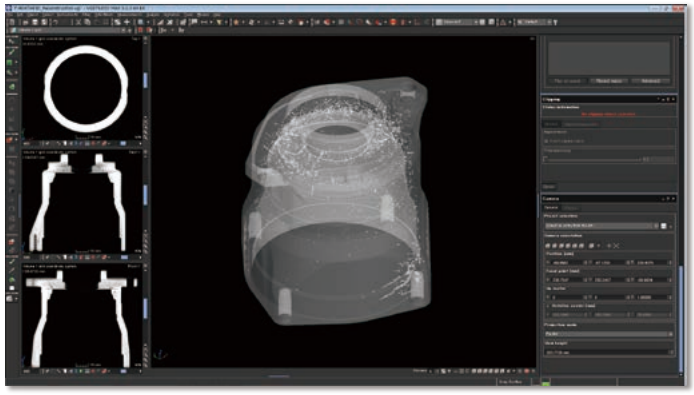
This two dimensional image processing software enables sophisticated image processing. Various image processing such as dimension measurement and filtering is possible for transmission images and cross-sectional images.



(Smart Vision Corporation)

## VGStudio MAX
## 3D Image Processing Software

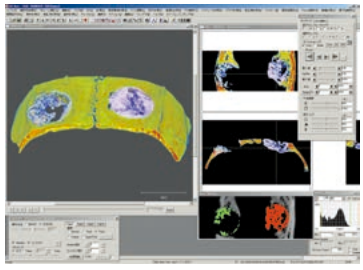
This is an extended version of VGStudio. Extended functionality includes animation creation (rotation, truncating, and viewpoint movement), measurement of length, angle, minimum distance, histogram, volume, surface area, void ratio, ROI extraction, image filtering, and multiple 3D image alignment.



(Volume Graphics GmbH)

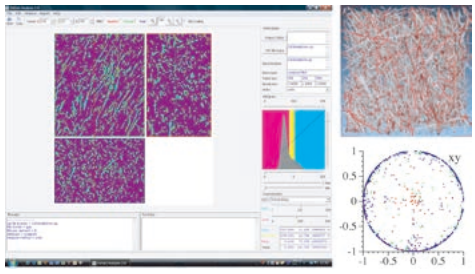
## TRI/3D-BON

3D Image Processing Software

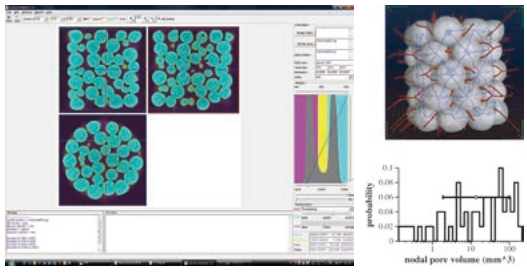


## ExFact Analysis

3D Image Processing Software



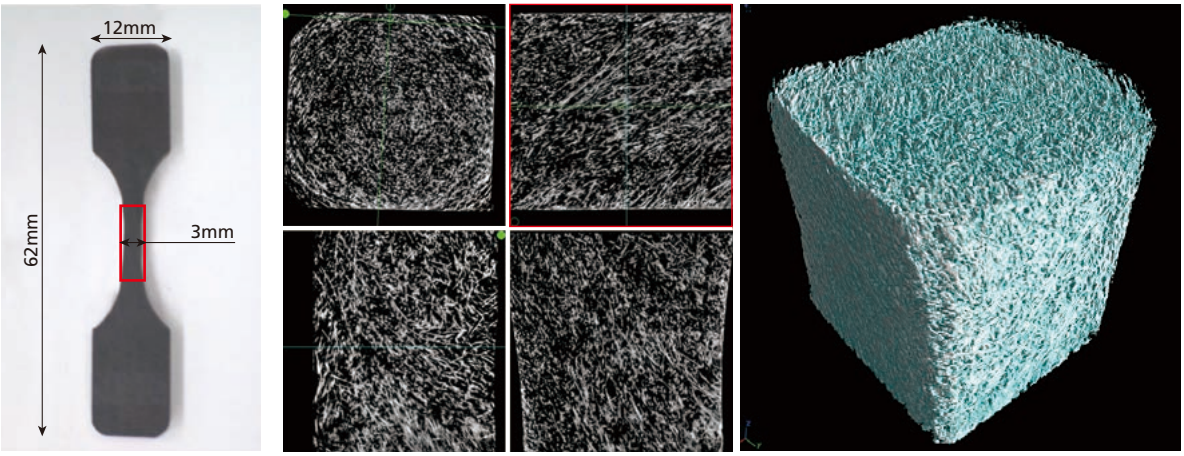
Exfact Analysis for Fiber



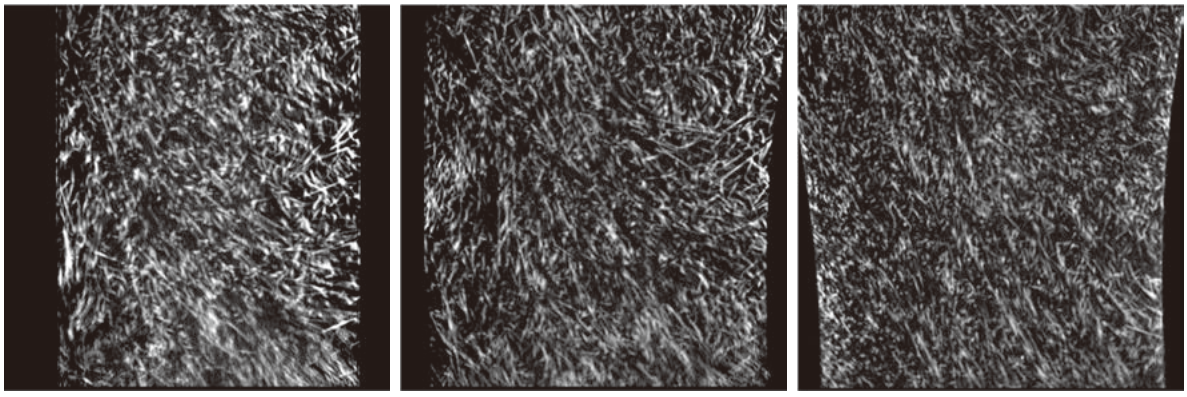

ExFact Analysis for Porous/Particles

# Applications

## GFRP (Glass Fiber Reinforced Plastics)

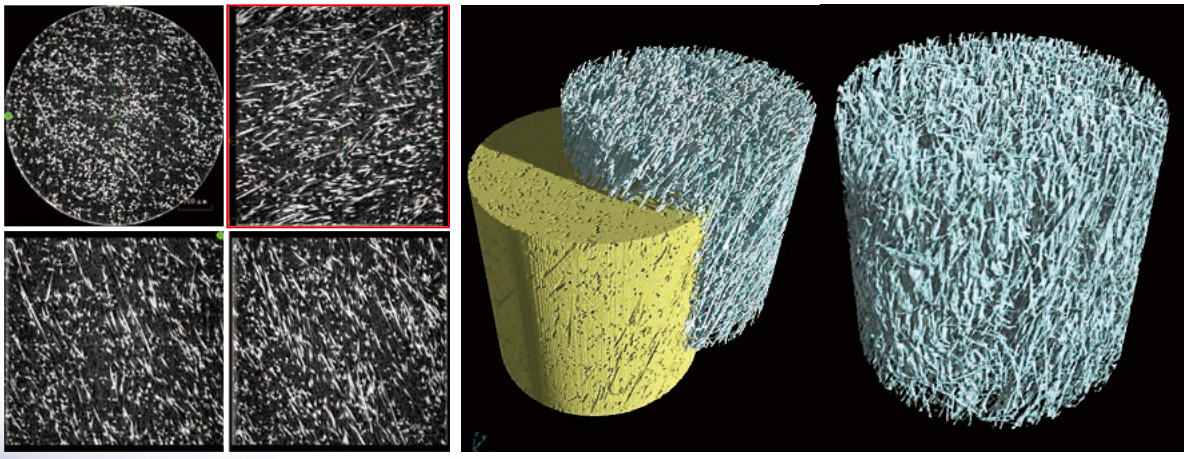



### Consecutive Cross Sectional Observations



Surface → Center

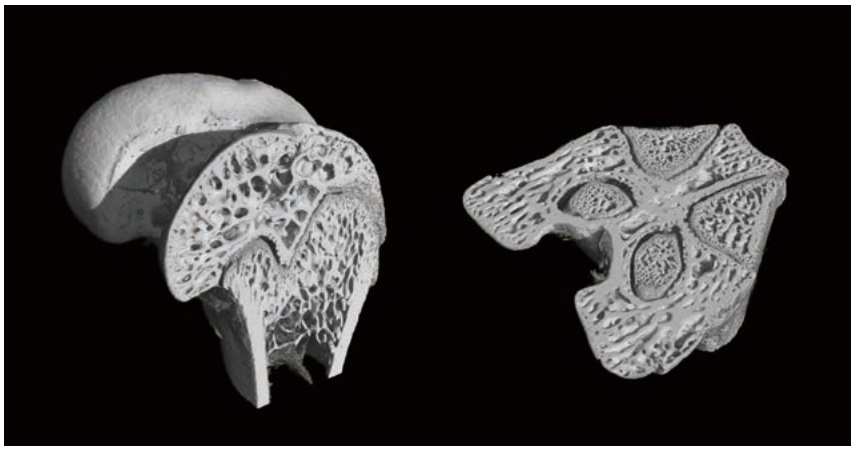
Magnified Image

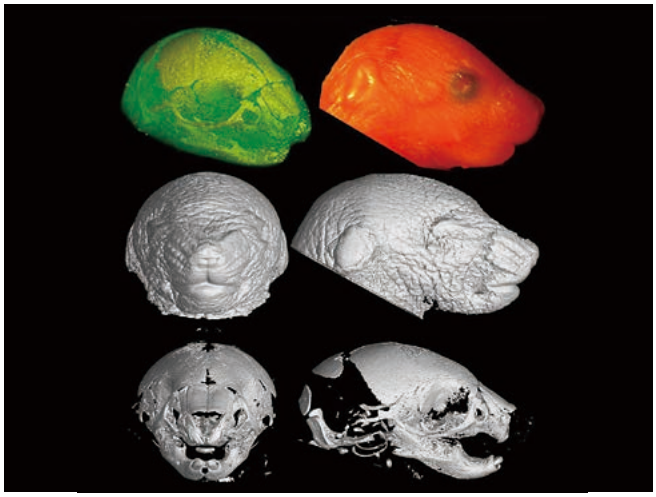


Base Resin + Glass Fibers

Glass Fibers

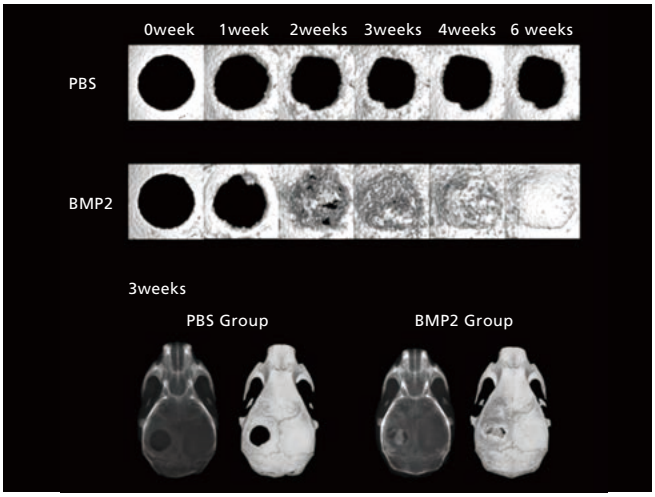
# Biological Samples





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

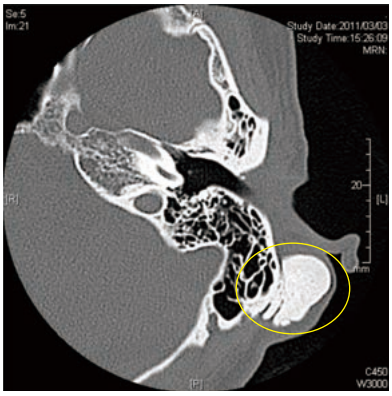
Presented by Dr. Okuhara, Section of Molecular Craniofacial Embryology,
Graduate School of Medical and Dental Sciences,
Tokyo Medical and Dental University



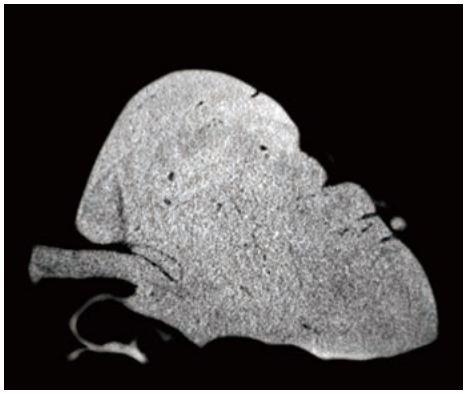

Sample Observations of Changes in Bone Defects
with Time, Created in a Mouse Calvarium

- 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)

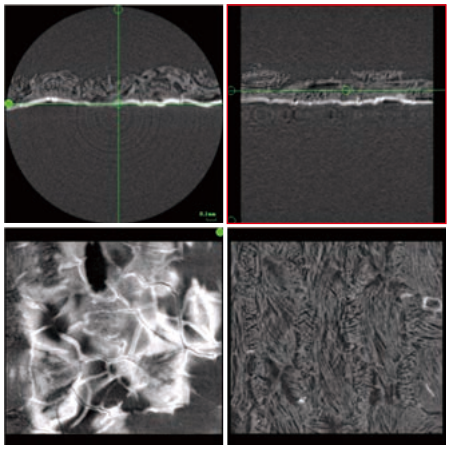


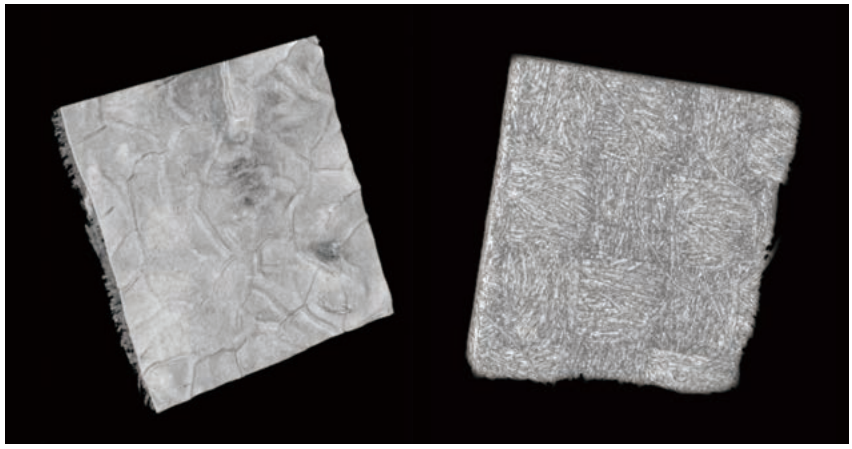
Sample Image of Osteoma
Removed This Patient

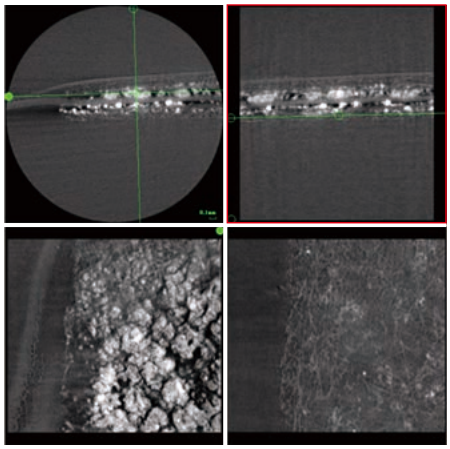
Presented by Dr. Tsunoda, Department of otolaryngology, Tokyo Medical and Dental University

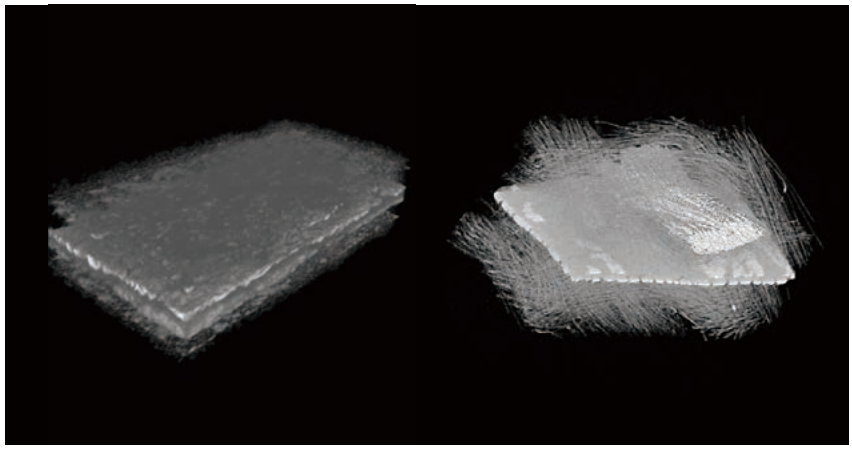
# Applications

## Fuel Cell (MEA)



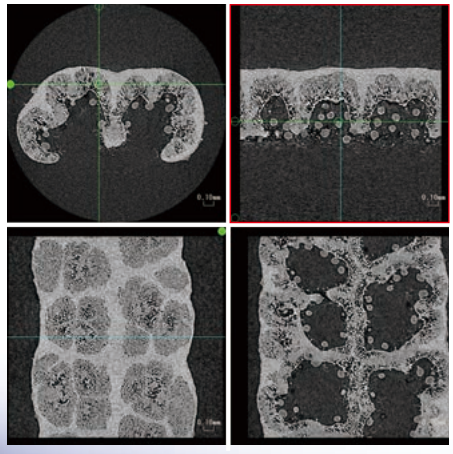


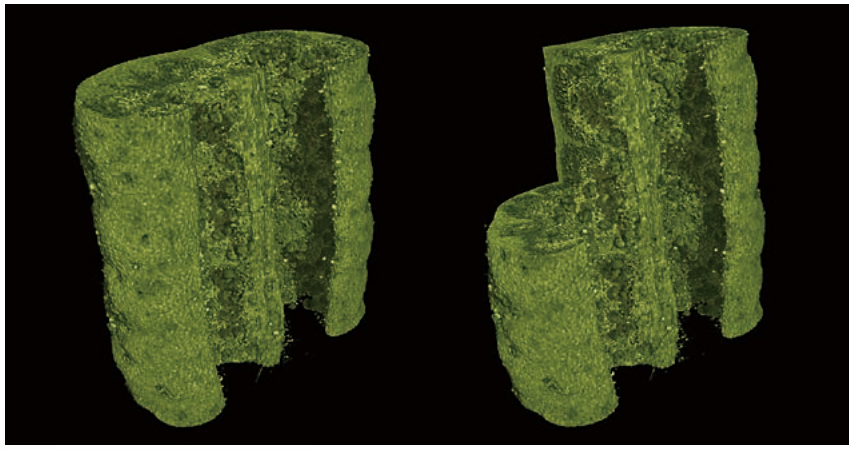




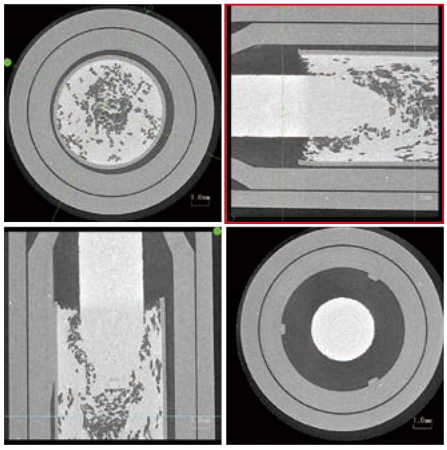
## Rosemary Leaf

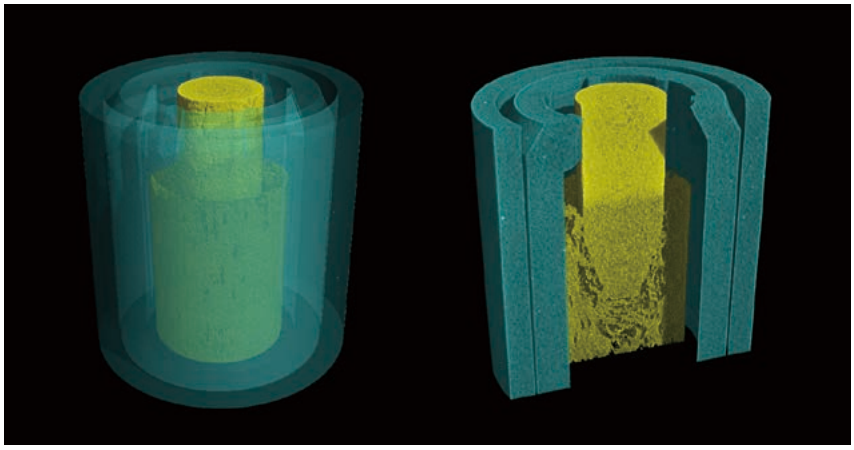
Sample Observation of Scutiform Glandular Hairs on the Inside and Outside of a Leaf



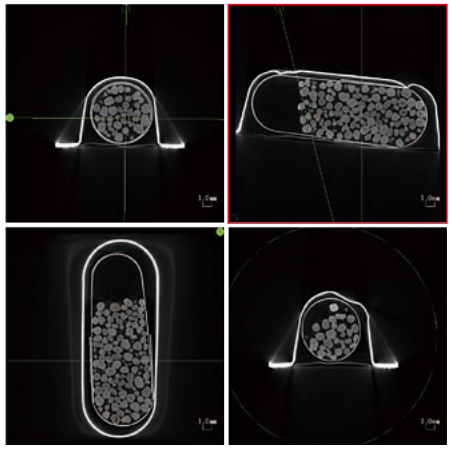


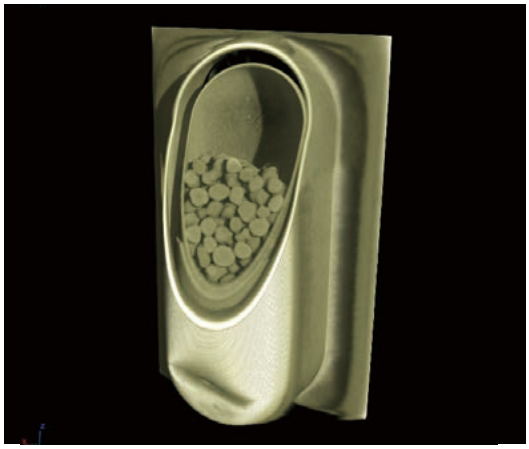
## Highlighter Pen



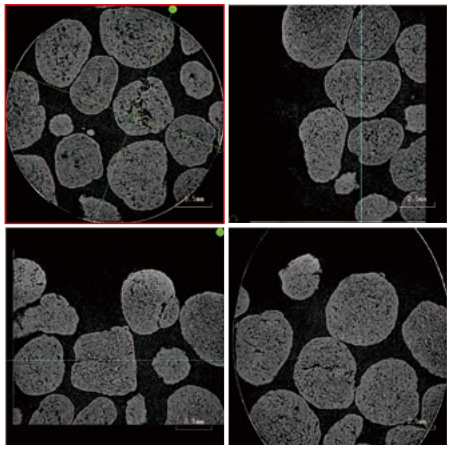


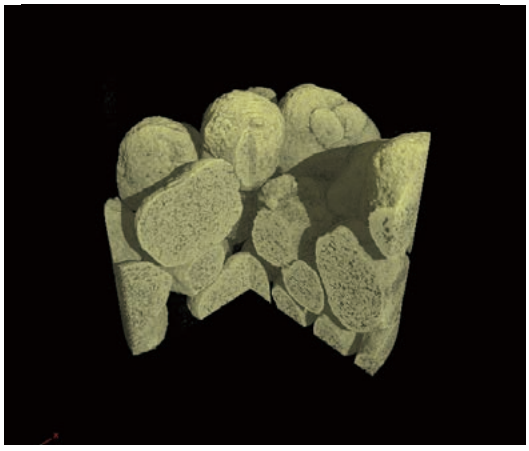
## Pharmaceutial Products





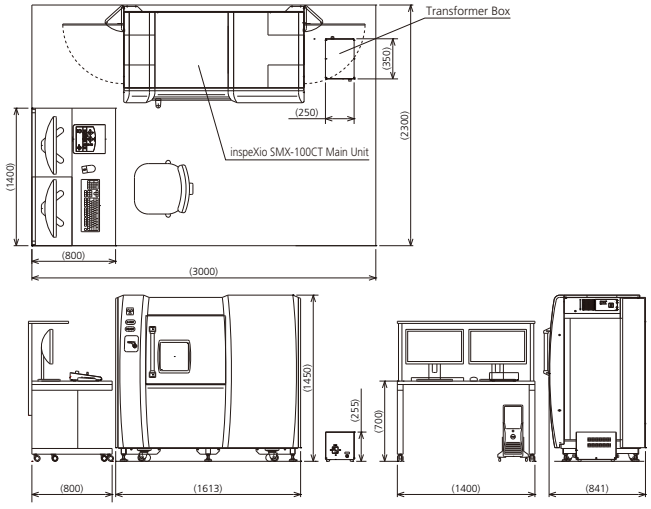
Magnified Image





# Standard Specifications

| Model | inspeXio SMX-100CT |
|---|---|
| P/N | S362-79800 |
| High-Performance Computing System | HPCinspeXio ver.3.0 |
| X-Ray Generator | Sealed tube type, Rated power: 20 W<br>Max. tube voltage: 100 kV<br>Max. tube current: 200 µA |
| X-Ray Detector | Image intensifier |
| Max. Stroke of CT Stage | SOD axis (*1): 540 mm<br>SID axis (*2): Can be switched between 4 levels<br>200, 300, 500, and 700 mm<br>Z axis: 150 mm |
| Max. Sample Size | 180 mm dia. × H250 mm, 4 kg max. |
| Max. CT Scan Area (FOV) | 90 mm dia. (for 2DCT: 115 mm dia.) |
| Scanning Methods | Normal scan, half scan, offset scan,<br>FS scan (*3),2DCT (*4)/CBCT (*5) |
| CT Data Acquisition Time | Any value from 10 sec to 30 min |
| CT Image Sizes | 512 × 512, 1024 × 1024,<br>2048 × 2048, 4096 × 4096 |
| Dimensions and Weight of Shield Box | W1,613 × D841 × H1,450 mm, approx. 1,200 kg |
| Dimensions and Weight of Dedicated Desk | W1,400 × D800 × H700 mm, approx. 60 kg |
| Power Requirements | Main unit: 100 V AC ±10 %, 50/60 Hz, 1 kVA<br>Control computer: 100 V AC ±10 %, 50/60 Hz, 1 kVA<br>Class D grounding (max. ground resistance of 100 Ω) |
| X-Ray Leakage Rate | 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.

ANALYTICAL INTELLIGENCE

- Automated support functions utilizing digital technology, such as M2M, IoT, and Artificial Intelligence (AI), that enable higher productivity and maximum reliability.
- Allows a system to monitor and diagnose itself, handle any issues during data acquisition without user input, and automatically behave as if it were operated by an expert.
- Supports the acquisition of high quality, reproducible data regardless of an operator's skill level for both routine and demanding applications.



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