C251-E039

SHIMADZU
Excellence in Science

Microfocus X-Ray Inspection System

Xslicer SMX-1010/1020

The New Standard for X-Ray Inspections

Microfocus X-Ray Inspection System

Xslicer™ SMX-1010/1020

The Xslicer SMX-1010/1020 is a vertical emission X-ray system equipped with 90 kV microfocus X-ray generator and a high-resolution flat panel detector. Image quality has been significantly improved over the previous model (SMX-1000 Plus), and Shimadzu' s renowned operability has advanced even further.
In addition to operability improvements, the stage movement speed and detector acquisition speed have also increased, significantly shortening inspection times. The inspection process is now more efficient.
The workflow has also been simplified for the CT unit (optionally available), and operability has been improved.
With the Xslicer SMX-1010/1020, everything from X-ray fluoroscopic inspections of surface mounted circuit boards, sensors, and harnesses to 3D defect analysis using CT can be accomplished with a single unit.

High Image Quality Exceeding the Level of General-Purpose Models

Top class high-resolution detector + unique image processing

The system is equipped with a top class 3 megapixel high-resolution detector (SMX-1020), enabling high-resolution observations with a wide field of view.
Unique image processing (High Dynamic Range processing) is also included as standard. Images with the optimal contrast are obtained with a single scan, even when samples differ in thickness and material properties, thereby improving the visibility of voids and other defects.

Software Significantly Shortens Inspection Times

Operating sequence automation + operating time reduction

Operability is significantly improved by the latest software. The sequence from sample replacement to observation has been simplified, so X-ray fluoroscopic inspections can start a mere 5 seconds after sample replacement.
The inspection tact time has been significantly shortened thanks to faster detector acquisition and stage movements.

Diverse Functions Provide 3D Analysis with a Single Unit

VCT functions that substantially improve operability + easy measurement functions

Using the optional CT functions, not only fluoroscopic inspections but also 3D analyses are available. The calibration process has been automated, so CT imaging is easy for anyone. In addition, with the panoramic imaging function, up to 32 megapixel X-ray fluoroscopic images can be obtained, enabling the inspection of circuit boards and other large samples in their entirety in a single frame.


High-Performance


Software

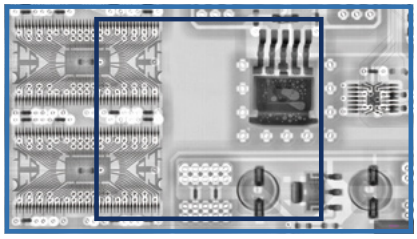

3D VCT

High Image Quality Exceeding the Level of General-Purpose Models

Equipped with ultra-high-resolution 3 megapixel flat panel detector*

*Xslicer SMX-1020

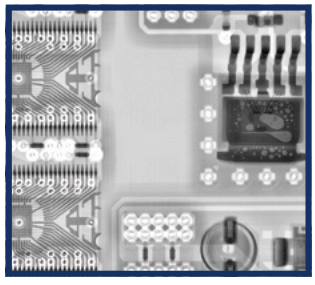
The Xslicer SMX-1020 is equipped with a 3 megapixel flat panel detector. Users can assess internal structures or defects in detail while observing a wide field of view.
The Xslicer SMX-1020 can inspect sizes with twice the field of view as the SMX-1010.



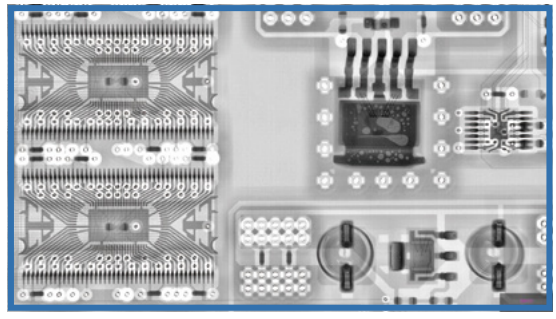
Xslicer SMX-1010 imaging area
Xslicer SMX-1020 imaging area

Item	SMX-1000 Plus	Xslicer SMX-1010	Xslicer SMX-1020
Detector Area Size	50 × 50 mm	64 × 57 mm	114 × 64 mm
Pixels	1 million pixels	1.5 million pixels	3 million pixels

X-Ray Fluoroscopic Image
SMX-1000 Plus



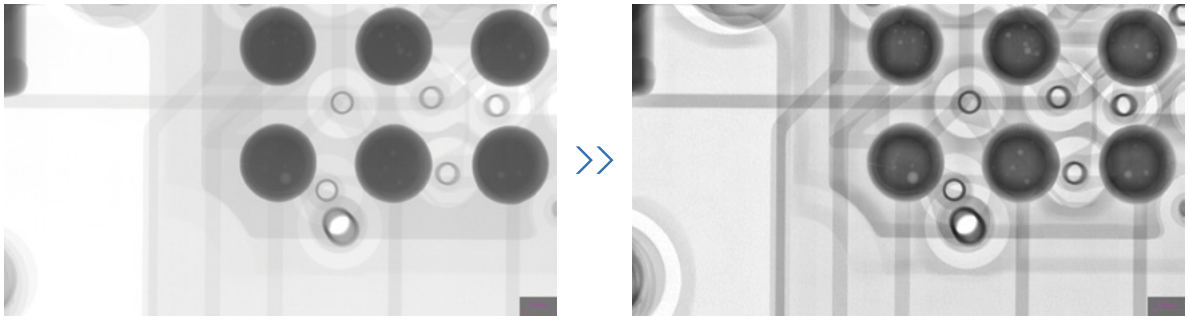
X-Ray Fluoroscopic Image
Xslicer SMX-1010



X-Ray Fluoroscopic Image
Xslicer SMX-1020

New HDR Processing Function

Shimadzu's unique, proprietary image processing technique/algorithm allows fluoroscopic images with a higher dynamic range. Regions that are both easy and difficult to penetrate can be observed at the same time, which shortens inspection times.



Without HDR Processing

With HDR Processing

Software Significantly Shortens Inspection Times

Inspections Start in 3 Steps and 5 Seconds

Just a 3-step process before starting observations. After the start button is clicked, X-ray emission and exterior camera imaging are automatic. X-ray fluoroscopic imaging can start 5 seconds after sample placement (4.6 times faster than the previous model).

5 seconds

01 STEP / Replace the previous sample.

- The stage automatically moves to a position where it is easier to replace the sample.
- Unlocks the electromagnetic lock on the front door.

Replace the previous sample.

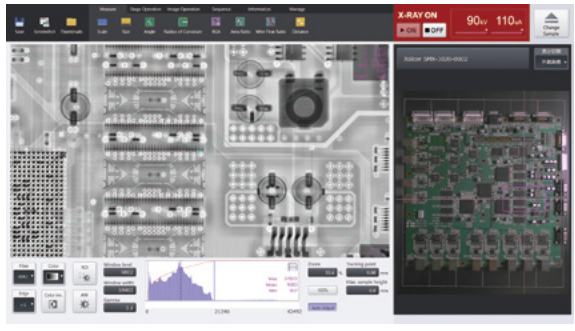
02 STEP / Start the inspection.

Click the start button.

- X-rays are emitted automatically.
- Exterior images of the entire stage area are automatically captured.

03 STEP / Start observations immediately.

X-ray fluoroscopic observations can start 5 seconds after sample replacement.



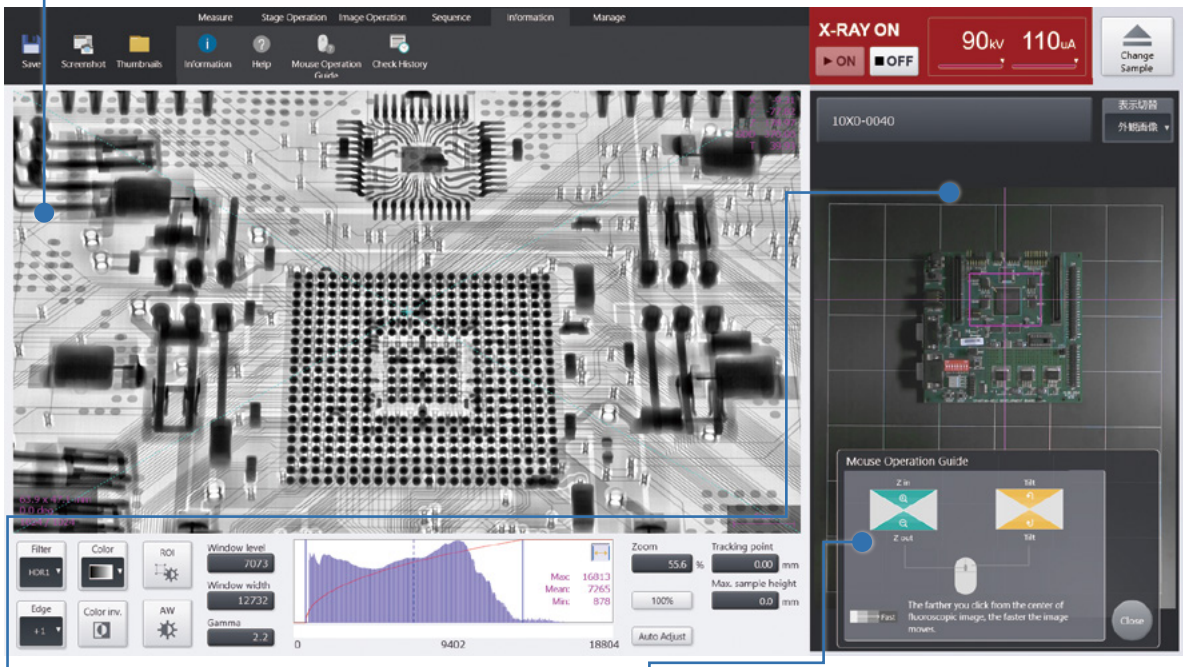
Simple Operation

Simple UI and Easy Positioning Operations

A large monitor screen and simple button layout provide excellent visibility for intuitive operability. X-ray inspections can be performed easily, even by operators using the system for the first time.

❶ Stage Positioning via the Live X-ray Image

Simply click on any point in an X-ray image to control all stage movements, such as changing the XY position, tilt, or field-of-view size.



❷ Using Exterior Images for Stage Positioning

An observation camera provides a top-down view of the entire sample region. The user can alter the position of the sample using this top-down view. Just select a point of interest in the top-down view to accordingly move the stage. The image can be magnified to allow for fine positioning over individual components.

❸ Positioning with a Mouse

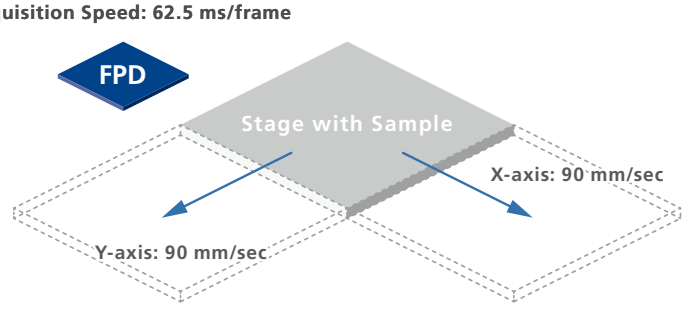
An observation camera provides a top-down view of the entire sample region. The user can alter the position of the sample using this top-down view. Just select a point of interest in the top-down view to accordingly move the stage. The image can be magnified to allow for fine positioning over individual components.

Faster Detector Acquisition and Stage Movements

The flat panel detector acquisition is 4× faster than the previous model, and the stage movement (XY direction) is 1.6× faster. In addition to ordinary use, this contributes to faster tact times during consecutive inspections.

FPD Acquisition Speed **4×**

Stage Movement Speed **1.6×**



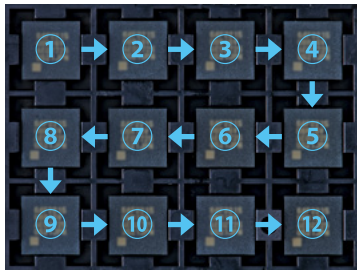
Example of Continuous Inspections Using the Step Feed Function

Inspection times were compared for consecutive X-ray inspections of 25 samples using the step feed function on the previous SMX-1000 Plus and the SMX-1020. Inspection times are approximately 40 % shorter in comparison to the SMX-1000 Plus. Additionally, X-ray emission times are reduced by at least 35 %, which also reduces running costs. The time reduction ratio increases as the number of samples increases.

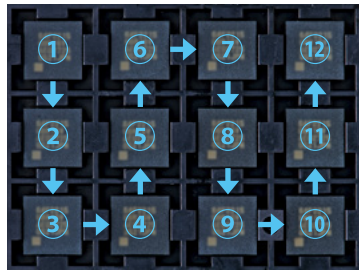
Item	SMX-1000 Plus	Xslicer SMX-1020
Exterior Image Acquisition	00:22	00:04
Movement to the Start Position	00:12	00:04
25-Sample Step Feed	03:28	02:17
Movement to the Sample Replacement Position	00:09	00:07
Total	04:11 >>>>>>>>>>	02:32

Approx. **40 %** less time

Samples arranged at fixed intervals can be observed consecutively. The starting position, movement amount, and number of movements can be specified. During implementation, consecutive movements and observations are made in accordance with the settings from the start position. After the inspection, a table of the pass/fail/hold results can be displayed.



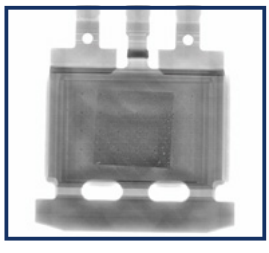
Observation Direction: Horizontal

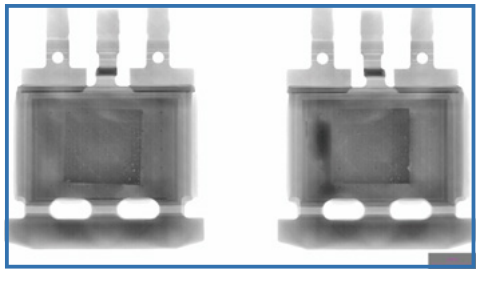


Observation Direction: Vertical

Inspections with the Xslicer SMX-1020 Take Half the Time of the Xslicer SMX-1010

The Xslicer SMX-1020 can inspect twice the horizontal area of the SMX-1010. The area in a single inspection is twice the size, so the inspection takes about 1/2 the time. The time can be shortened even more in consecutive inspections of samples arranged on a pallet.





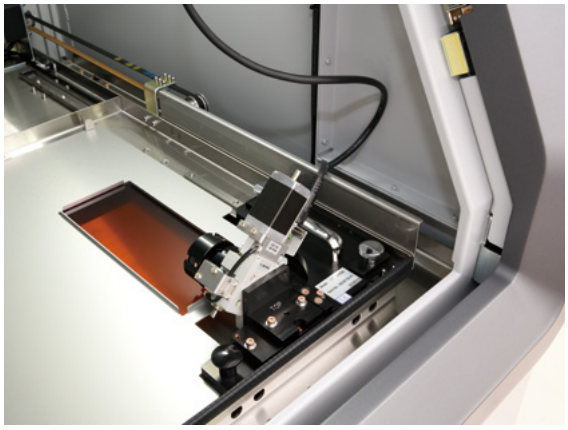
Xslicer SMX-1010 imaging area

Xslicer SMX-1020 imaging area

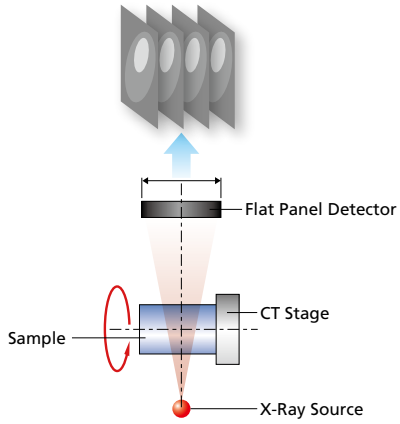
Diverse Functions Provide 3D Analysis with a Single Unit

Simple CT Function with High Image Quality (Optionally Available)

Simply position the compact CT unit on the fluoroscopic stage and switch the software tab to enable 3D analyses unobservable with fluoroscopic functions. There is no need to switch software programs, so CT imaging can start easily.

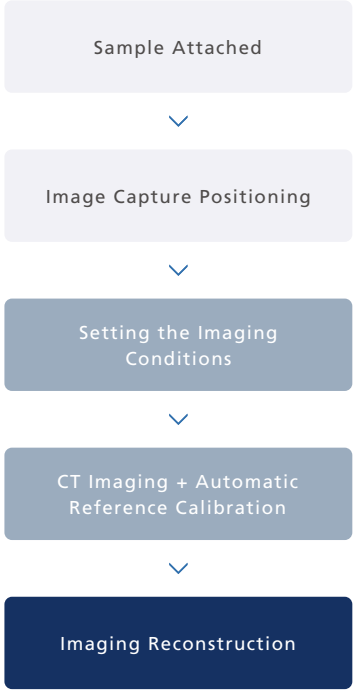


CT Unit Attached

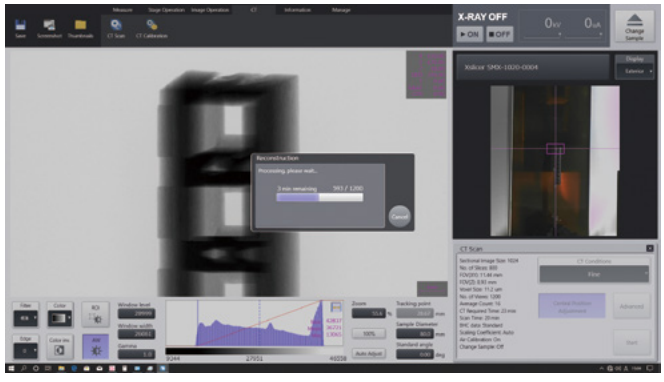


Automated Calibration (Shorten the time for process before imaging by 80 %)

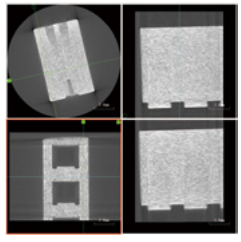
Calibration has been automated, simplifying CT imaging. There is no need for calibration each time a sample is loaded as previously. Imaging is started simply by selecting either [Simple], [Normal], or [Fine].



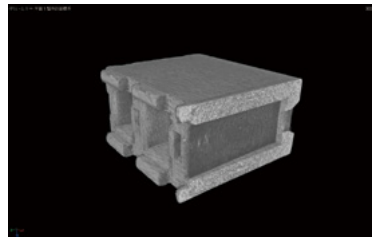
Imaging Process



Software Window



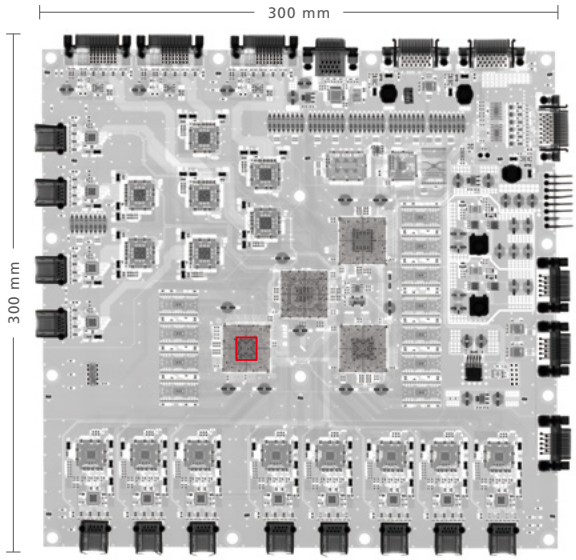
Cross-Sectional Image



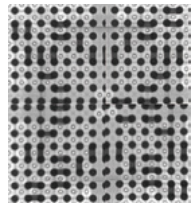
3D Image

Panoramic Imaging Function

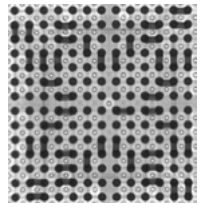
A wide X-ray fluoroscopic image can be obtained just by specifying the imaging range on the exterior image. An improved stitching process ensures a panoramic X-ray fluoroscopic image up to 32 megapixels in size can be obtained with no conspicuous marks where the images are spliced together.



32 Megapixel Panoramic Image
Combined 9 × 10 images by Xslicer SMX-1020



Panoramic Image
No Splicing (region enlarged)



Panoramic Image
Splicing (region enlarged)

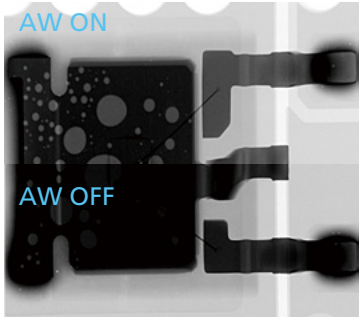
Imaging Mode	Pixels		300 x 350 mm Scanning time for entire range
Simple	Equivalent to 2K (full HD) in size	Approx. 2 million pixels	SMX-1010 : 115 sec / SMX-1020 : 100 sec
Normal	Equivalent to 4K in size	Approx. 8 million pixels	SMX-1010 : 135 sec* / SMX-1020 : 120 sec
Fine	Equivalent to 8K in size	Approx. 32 million pixels	SMX-1010 : 590 sec / SMX-1020 : 495 sec

*The SMX-1000 Plus takes 395 seconds at the fastest.

Image Adjustment Functions (Auto Window Function and Area of Interest Function)

The contrast can be automatically optimized to make the area of interest easy to see.

The optimal window level and window width are configured in real time even if the conditions change.



When selecting an area of interest, the window level and window width are optimized for the specified range.

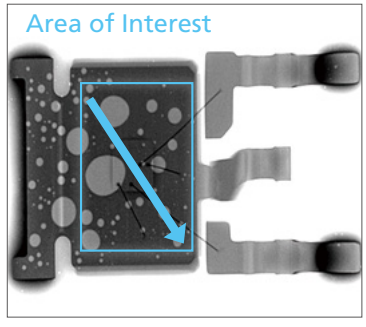


Image Measurement Functions

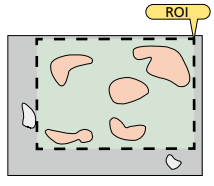
Ball Grid Array (BGA) Measurements

BGA bump diameters and void ratios can be measured.
With our proprietary image processing algorithm, complicated parameter settings are unnecessary.*
Multiple settings can be saved and applicable ones can be accessed for each inspection target prior to measurement.
* Manual adjustments may be required depending on the sample.

(Measurable Items)
- Total void ratio
- Maximum void ratio
- Bump diameter
- Bump roundness

Area Ratio Measurements

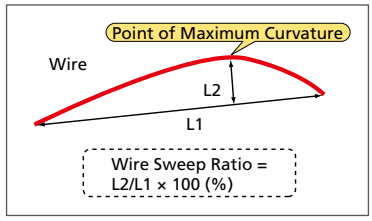
Die bonds, solder paste wettability, and other area ratios can be measured.
The parameter settings are not required thanks to Shimadzu's proprietary image processing algorithm.*
It is also possible to save multiple settings, and then call up the applicable settings for each inspection target prior to measurement. Furthermore, pass/fail determinations can be made based on the area ratio.
* Manual adjustments may be required depending on the sample.
* The measurement range (ROI) can be configured manually.

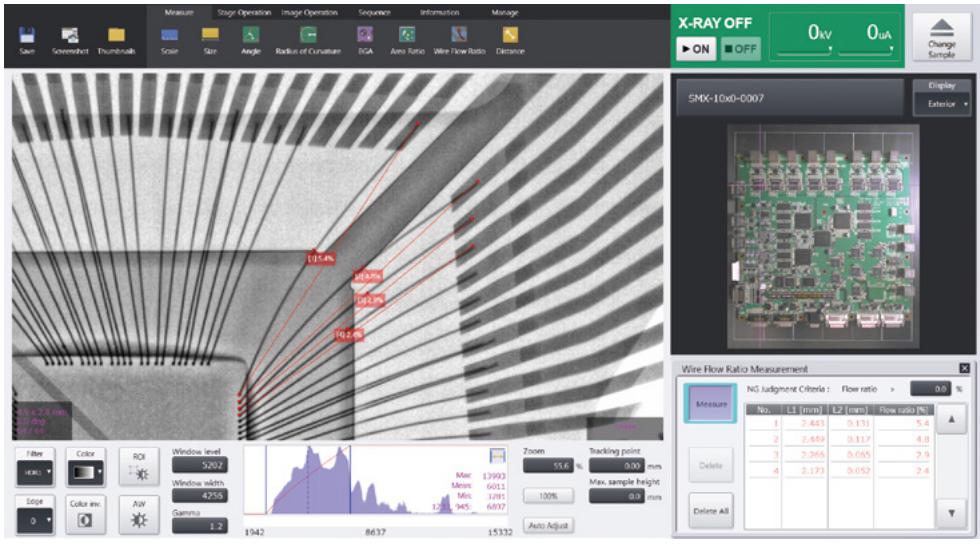


Static Image

Wire Sweep Ratio Measurements

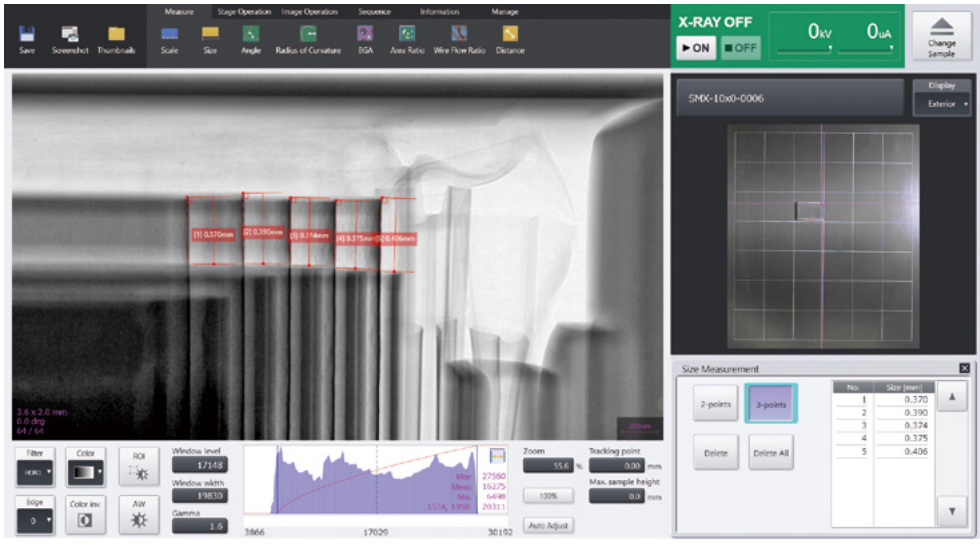
The wire sweep ratio can be measured by specifying both ends of the bonding wire and the point of maximum curvature. Pass/fail determinations can be made depending on the wire sweep ratio.





Dimension Measurements

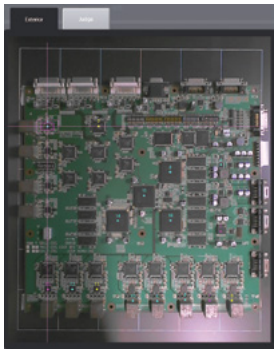
The Xslicer SMX-1010/1020 supports both 2-point distance and 3-point measurements.
With this system, sizes are measured efficiently by calculating calibration data internally in synchronization with the fluoroscopic magnification.

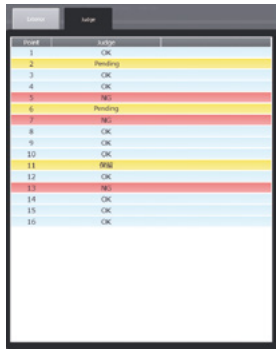


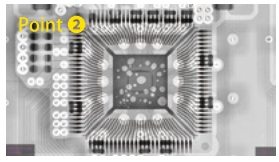
A Wealth of Functions for Facilitating Inspections

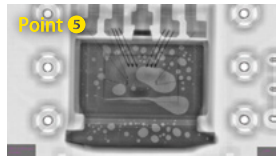
Teaching Function

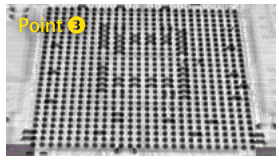
Fluoroscopic and CT imaging can be automated using the Teaching Function, which moves the sample stage to preregistered points of interest.
Additionally, for visual inspection, OK and NG judgment functions are included.





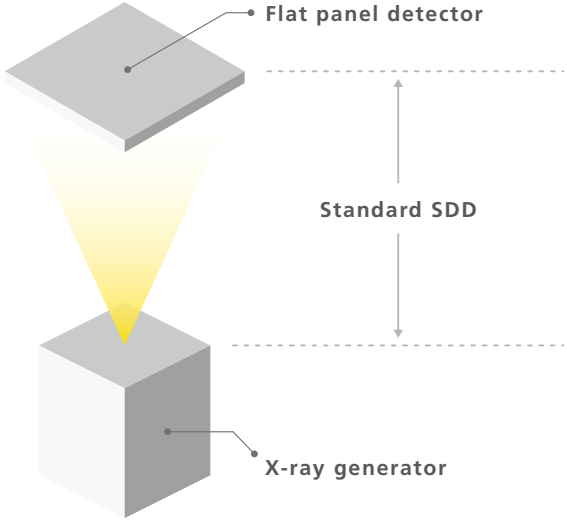


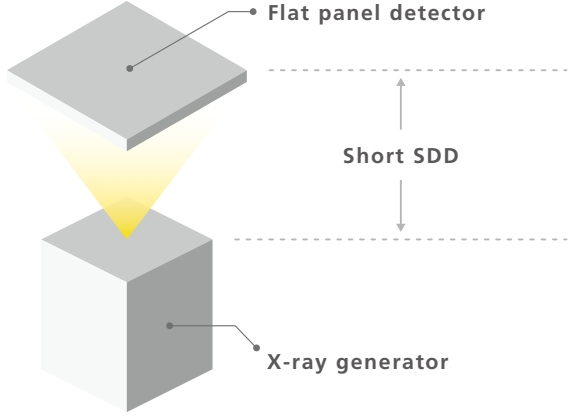


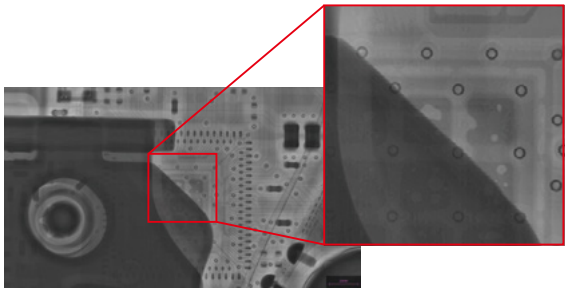


Shortened Source-Detector Distance (SDD) Function

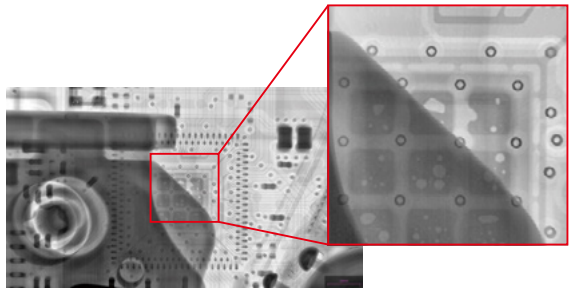
The distance from the X-ray generator to the X-ray detector (SDD) can be switched to 185 mm (The standard distance is 370 mm)
By shortening the SDD, images with sufficient penetration can be obtained even for samples that are hard to penetrate.







SDD:370mm

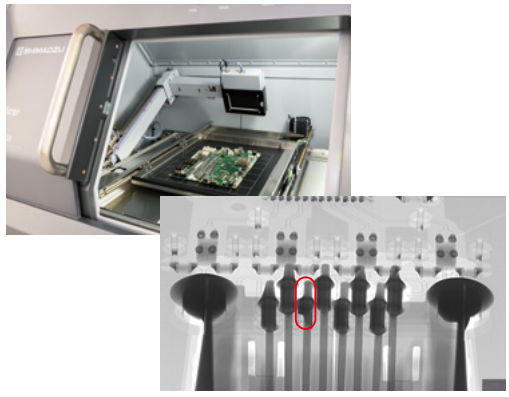


SDD:185mm

Inclined Fluoroscopy Function

The flat panel detector can be tilted up to 60 degrees. Since the detector tilts, the sample does not need to be fixed. Inclined fluoroscopy ensures that the specified sites are particularly easy to see.

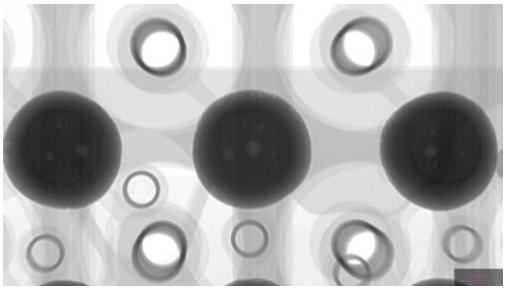
Detector not tilted



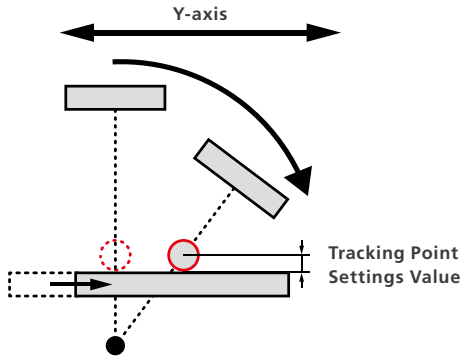
Detector tilted 60 degrees

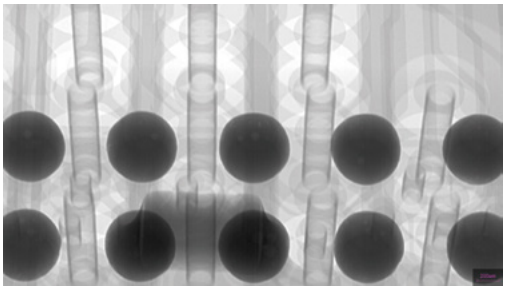
Set Tracking Points Easily

If a tracking point is set, the observation position of interest when tilted and rotated never leaves the center of the window.
As a result, the point of interest is never lost.
To set a tracking point, simply tilt the detector and double click the position of interest.

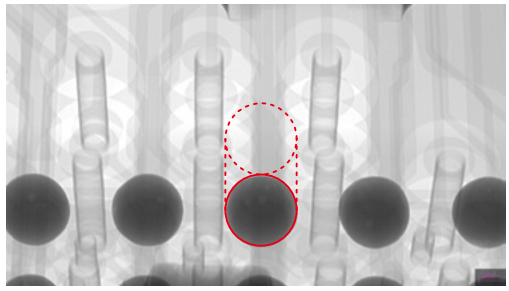


Tilt





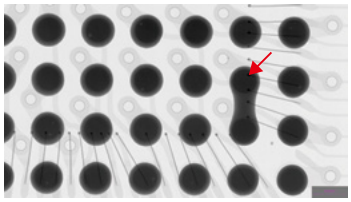
Tracking ON



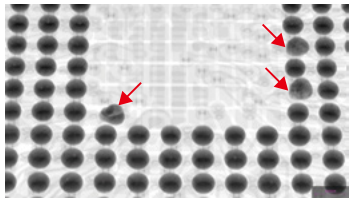
Tracking OFF
(It moves as the point of interest tilts.)

Applications

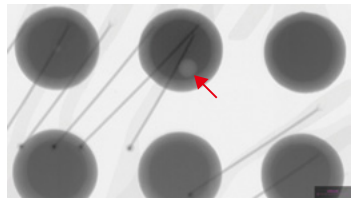
BGA



Short

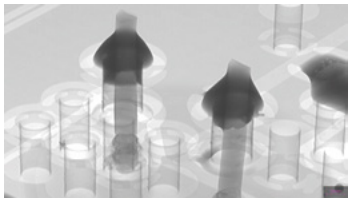


Open

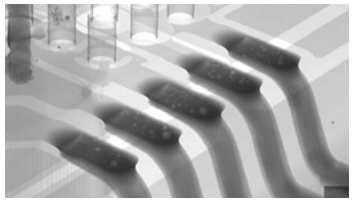


Void

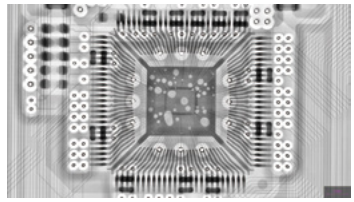
Mounting parts



Solder wicking



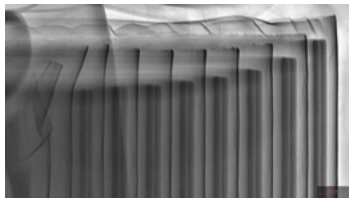
Terminal



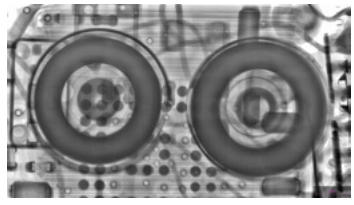
QFP solder wettability

Wireless earphone

Whole perspective image

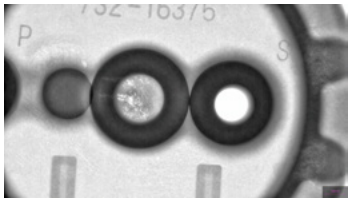


Lithium ion battery

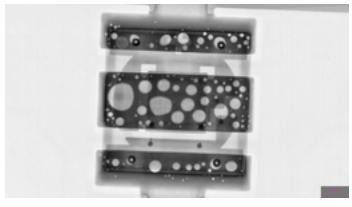


Speaker coil

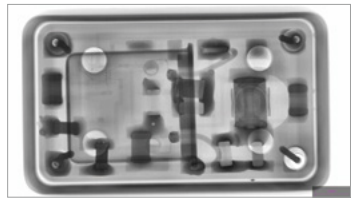
Aluminum die-cast



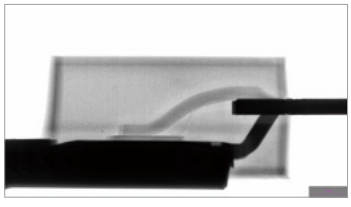
LED



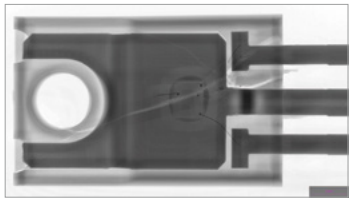
Crystal oscillator



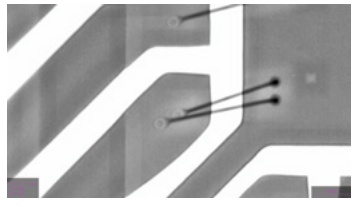
FET aluminum wire



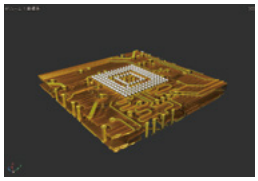
Damaged power IC



Wire bonding

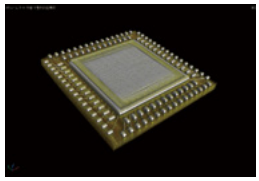


Mounting board



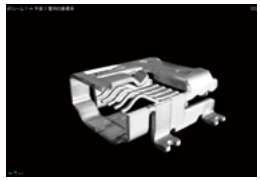
VR image

IC chip copper wire

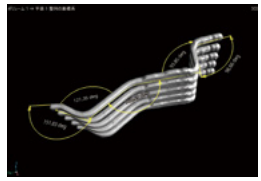


VR image

USB

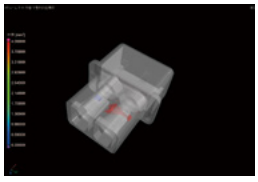


VR image



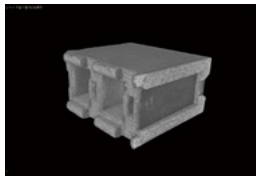
Dimension measurement

Resin connector



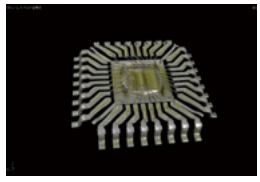
Void analysis

GFRP



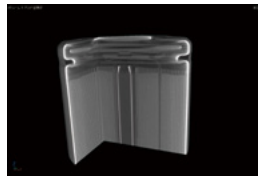
VR image

QFP



VR image

21700 lithium ion battery



VR image

Available Options

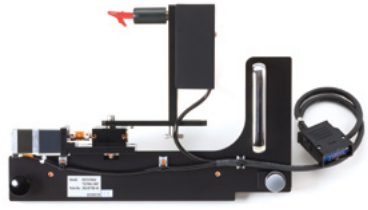
Hardware Options

Rotation/Inclination Unit

Adding the detachable rotation/ inclination unit enables X-ray fluoroscopy of small parts from a number of directions, reducing omissions in inspections.

Main Specifications

1. Weight of Mounting Grip : 20 g max.
2. Rotation : Continuous rotation
3. Tilt : ±30°

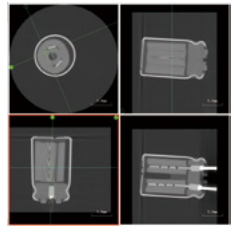


VCT Unit

See page 7

Main Specifications

1. Size : 50 mm × 100 mm circuit boards (with a thickness of 1 mm to 2 mm) max. Small Samples: φ30 mm × 25 mm max.
2. Weight : 100 g max.

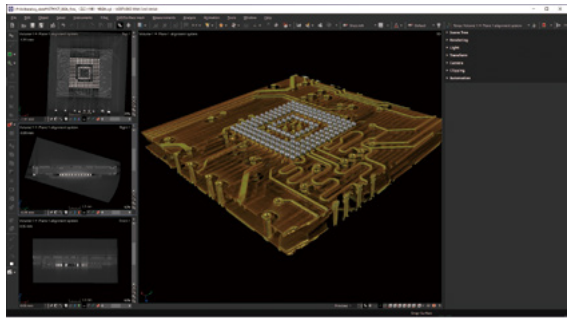


Optional Software

VGSTUDIO

Three-Dimensional Image Processing Software

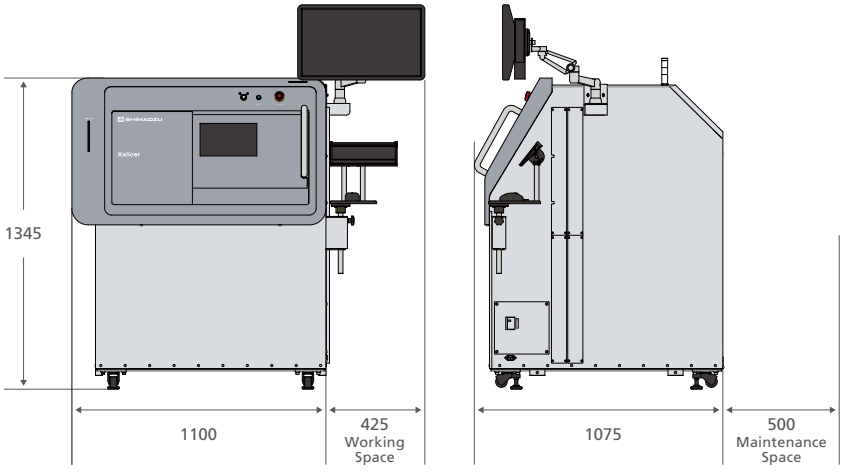
This software uses volume rendering (VR) to display three-dimensional images from cross-sectional images obtained using X-ray CT imaging. It includes functionality for creating basic animation and simple measurements.



Specifications

Model	Xslicer SMX-1010	Xslicer SMX-1020
Spatial Resolution	Equivalent to 5μm on the JIMA RT RC-05 micro chart (theoretical value) (Min. 0.1 modulation transfer function (MTF) for 7μm on the JIMA RT RC-05 micro chart on a carbon plate)	
Maximum Sample Size	350 × 450 mm max. 100 mm height max. 5 kg max.	
Fluoroscopic Inspection Stroke	Tilt: 60°	
X-Ray Output	Maximum Tube Voltage: 90 kV Maximum Tube Current: 250μA Rated Output: 10 W	
Detector	Size of Light Receiving Surface: 64 mm × 57 mm Approximately 1.50 million pixels	Size of Light Receiving Surface: 114 mm × 64 mm Approximately 3.00 million pixels
Fluoroscopy FOV (on Carbon Plate)	1.9 mm (vertical) × 2.2 mm (horizontal) to 38 mm (vertical) × 43 mm (horizontal)	2.2 mm (vertical) × 3.8 mm (horizontal) to 42 mm (vertical) × 76 mm (horizontal)
Rated Output	Single Phase 100 VAC to 240 VAC ±10 % 50/60 Hz, 0.5 kVA	
Weight	700 kg	
Operating Environment Conditions	Ambient Temperature: 10 to 30 °C Ambient Humidity: 40 to 80 % RH (no condensation)	
External Leakage Dose	1μSV/h or less	

Size Layout and Dimensions (Unit: mm)



This product is a certified as Shimadzu's Eco-products Plus.
Energy savings: 34.3% reduction as compared to the previous model.

Shimadzu Corporation
www.shimadzu.com/an/