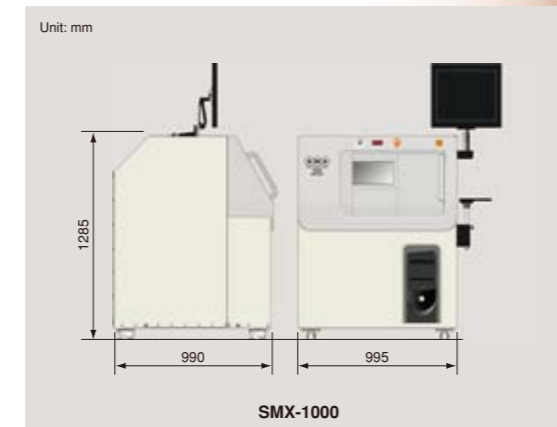


SMX-1000 General Specifications

	SMX-1000
P/N	362-61700-70
Spatial Resolution	5 μm (chart resolution)
Maximum Sample Size	350 x 400 mm
Stroke	300 x 350 mm
Maximum Sample Weight	5 kg
Detector Inclination	60° max
Maximum Output	90 kV (sealed X-ray tube)
Detector	Flat-panel detector
Inspection Visual Field	Approx. 2 to 35 mm
Magnification	Approx. 6 to 158x (dynamic images to 127x)
Power Supply	200-240V AC
Dimensions	W995 x D990 x H1285 mm
Weight	Approx. 500 kg

SMX-1000 External Dimensions



SMX-1000

Shimadzu
Digital Microfocus X-ray Inspection Systems

Comply with all local regulations when installing an SMX system.



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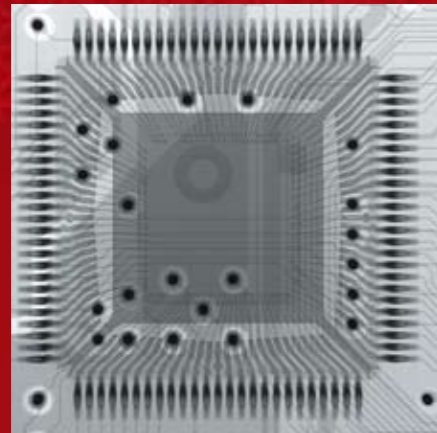


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Compact X-ray Inspection Systems
Combining Ease of Use with Advanced Functionality

SMX-1000

Shimadzu Digital Microfocus X-ray Inspection Systems

Compact X-ray Inspection Systems Combine Ease of Use with Advanced Functionality

Shimadzu's new SMX-1000 produce extremely clear, distortion-free images thanks to a flat-panel detector and sealed microfocus X-ray tube. Also, newly developed easy-to-use software lets you efficiently perform target inspections with just a few simple selections. Simply select the type of sample used from a list and the image display conditions are automatically set. No complex tasks are required. Additionally, images from the system's CCD-camera make navigation easy, together with step feed, teaching, image thumbnails, and comprehensive measurement functions.

<p>Applications</p> <p>Our SMX-1000 Digital Microfocus X-ray TV Systems are ideal for non-destructive, fluoroscopic inspection of high-density surface-mounted PCBs, and the condition (discontinuities and contacts) of fine BGA, CSP and system LSI connections.</p>	<p>Easy Operation</p> <p>Efforts were made to incorporate only those functions essential for easy and intuitive unit operation in a production environment.</p>
<p>Clear Images</p> <p>Combining a leading-edge flat-panel detector with Shimadzu image-processing technology produces crisp, clear, distortion-free images.</p>	<p>Inclined Fluoroscopy</p> <p>Defects normally invisible using vertical (0°) fluoroscopy often become visible if viewed from an angle (up to 60°). This useful function is included as a standard feature.</p>

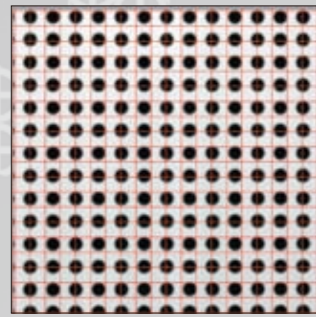
Contents	P 4 - Features	P 8 - Operation Functions	P 12 - Specifications
	P 6 - Image Adjustments	P10 - Measurement	

Flat-Panel Detector For Clear, Distortion-Free Images!

In combination with the microfocus X-ray tube, this flat-panel detector produces clear, high-resolution fluoroscopic images, even at high magnification.

1. Distortion-Free Images

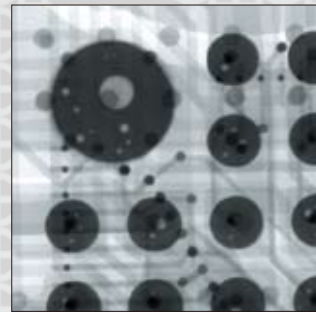
Flat-panel detector image



• Flat-panel detector images are free of the distortion typically produced by an image intensifier, ensuring accurate reproduction of surface shapes. (Gridlines added to show linearity.)

2. One Million Pixels

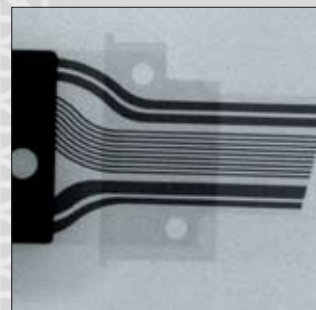
Flat-panel detector image
(1000 x 1000 pixels)



• Shimadzu's one million pixel flat-panel detector provides over three times as much information as a 300,000 pixel image intensifier.

3. No Shading

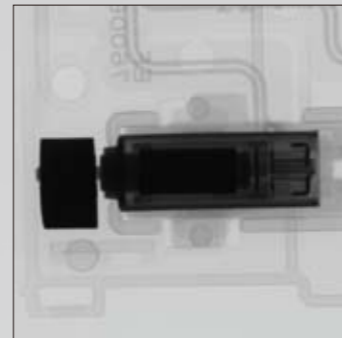
Flat-panel detector image



Our flat-panel detector image ensures uniform brightness across the entire image, without shading.

4. Excellent Contrast Resolution

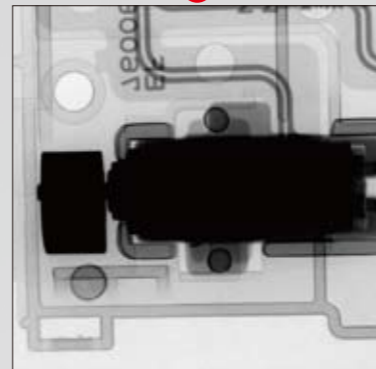
Flat-panel detector image 12-bit (4096 gradations)



Brightness and contrast adjustment



Brightness and contrast adjustment



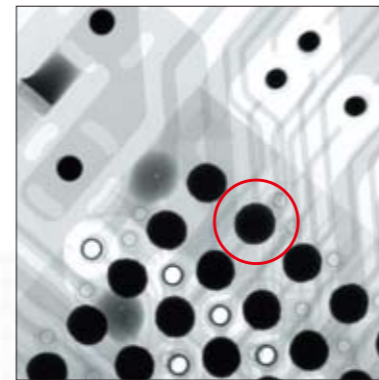
Setting conditions to allow observation of motor interior parts with high X-ray absorption causes the image's peripheral plastic parts with low X-ray absorption to appear white. However, a few simple brightness and contrast adjustments allow the flat-panel detector to accurately observe all areas of the image captured using a single set of fixed X-ray conditions. This improvement in visibility is possible thanks to a 16-fold increase in the amount of information in the image produced by the 12-bit flat-panel detector, compared to an image from an 8-bit image intensifier.

Fluoroscopy at up to a 60° Angle!

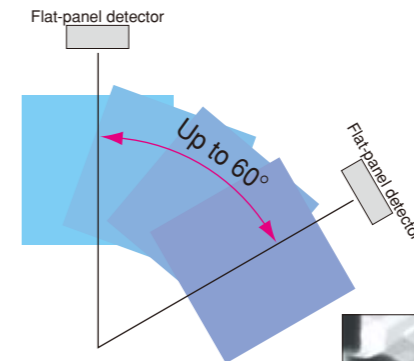
A flat-panel detector tilt angle of up to 60° allows fluoroscopy over an extensive range, while maintaining constant magnification.

Tracking minimizes displacement of the fluoroscopy position, even when the C-arm is tilted, ensuring you never lose track of observation points.

• Flat-panel detector at 0°



50x magnification at 0°

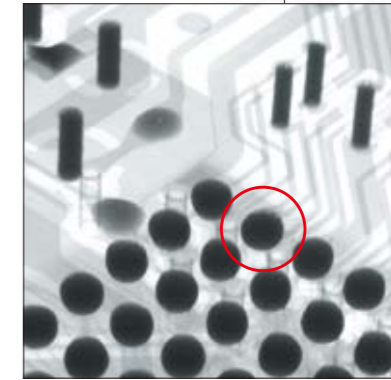


• Flat-panel detector tilted 60°



SMX-1000

Solder ball joint defects that cannot be identified at 0° (when viewed from above) can be easily identified when viewed at a 60° angle.



50x magnification at 60°

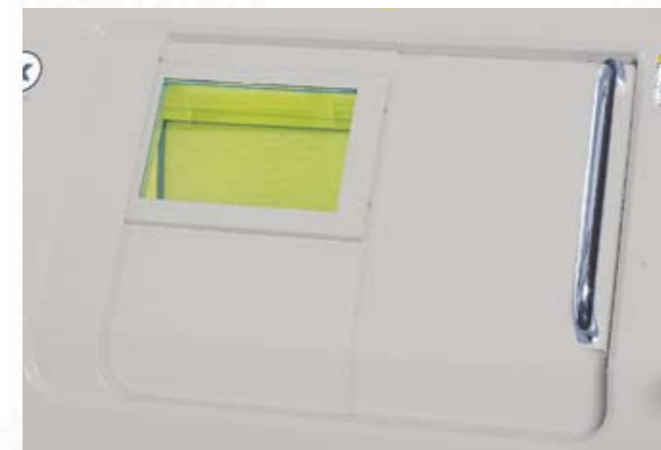
Large Door in a Compact, Unified Design

Ample opening and large table make operation easy!

New double-sliding doors provide a large 535 mm x 400 mm opening that is 2.2 times larger than previous Shimadzu models, in the top level of its class.

Generous 400 mm x 350 mm table accepts even large surface-mounted PCBs.

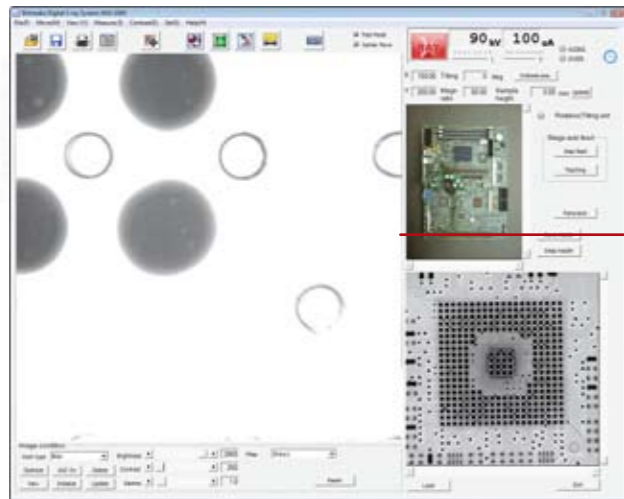
* A stroke is reduced 50 mm in each direction.



Simple Mouse Movements for Complete Function Control

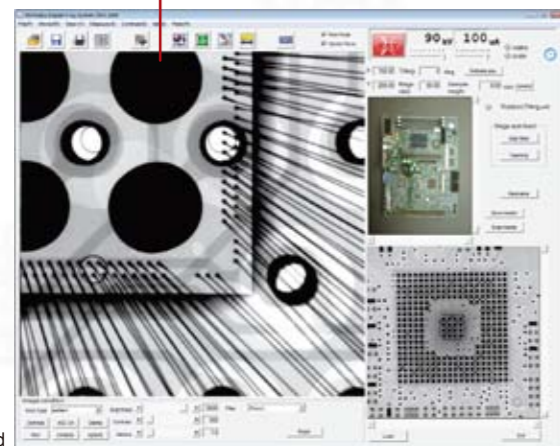
Preset Functions for Image Conditions

Simply select the desired work type from a list to instantly set the image display conditions for the target material.



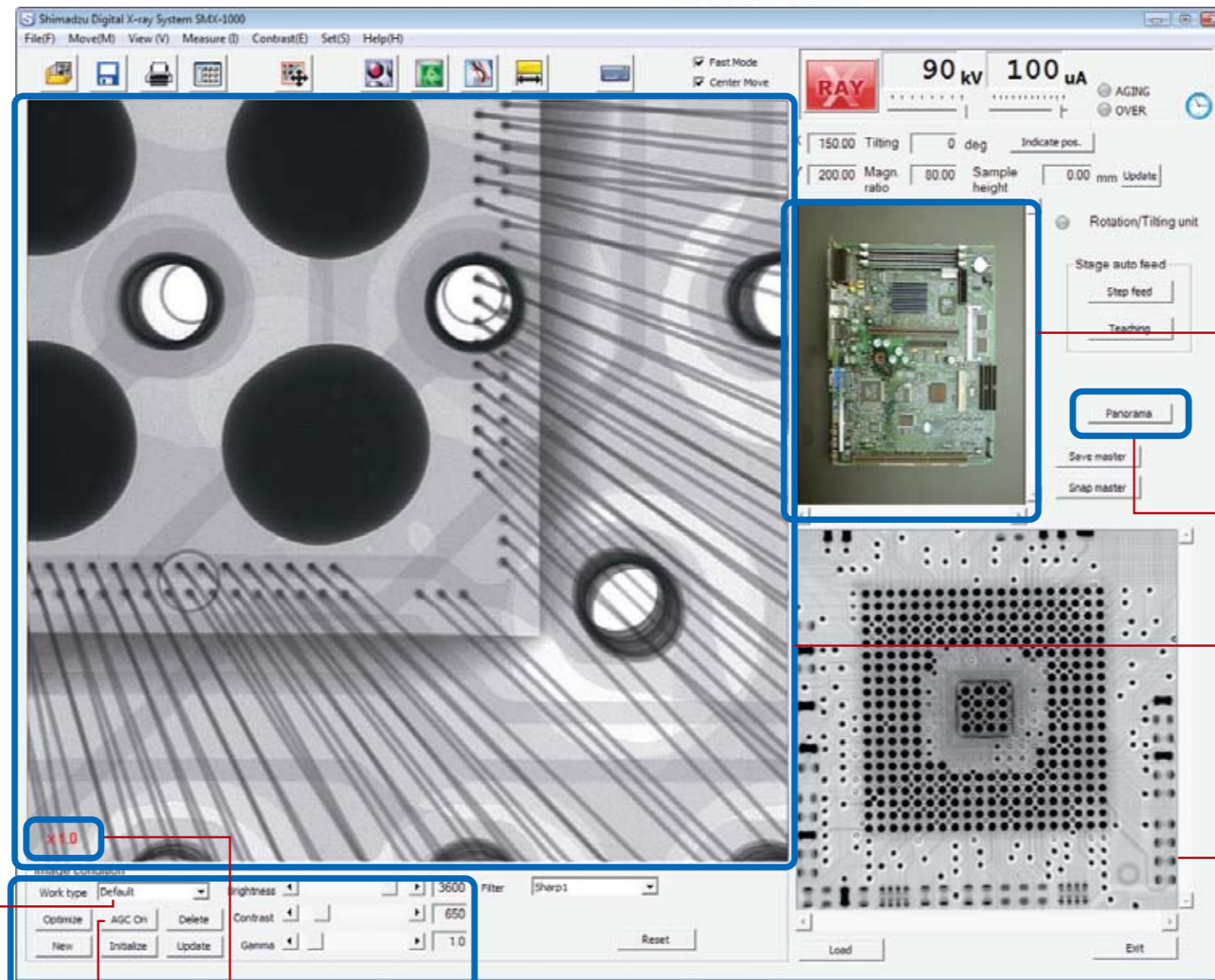
When BGA is selected

BGA



When Pattern is selected

Pattern



Digital zoom of live or saved fluoroscopic images is displayed in real time.

AGC stands for Automatic Gain Control. While this button is turned ON, the image brightness and contrast condition is optimized automatically.



CCD Camera for Fast Positioning

Use of a CCD camera image for stage positioning allows easy movement of the stage to the target position.

Simply click any point on the CCD image to move the stage to that position. Use the zoom function to accurately specify the target position. Compared to the conventional positioning method that requires a joystick and viewing a laser marker through the observation window, SMX-1000 / SMX-1000L dramatically improve ease of operation by enabling both stage and target positioning while viewing the monitor.

Panorama function displays a full image of a large sample that cannot be viewed using a single frame.

Click any point on the image's live display to move the stage on its X-Y axis, tilt, or zoom in and out. Stage movement is slowed by moving the cursor towards the image center. Stage travel speed is automatically optimized to match the current fluoroscopy magnification.

Sub-Image Display Area

Displays a reference image during inspection. Zoom function is also available in this area, and allows display of a reference image at same magnification as main display area.

Mouse-Based On-Screen Image Positioning

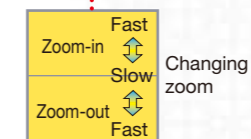
All stage and device positioning can be controlled via the mouse, allowing the operator to concentrate completely on examining the image in the monitor. Simply click a point to bring a location to the center of the display.



Move scroll-wheel



Left-click
Fast Fast
Slow
Fast Fast
X-Y movement



Changing zoom

Right-click
Fast
Tilt Slow
Tilt Fast
Tilting



Multitude of Functions That Improve Operator Efficiency

Step Feed

Moves the stage in a sequence of equally spaced steps.
Ensures efficient inspection of evenly-spaced samples, such as those on a pallet.
Operator can easily evaluate images of sequentially displayed samples.

Simply click points with the mouse to enter the visual evaluation results for each point.

After inspection of all set points is completed, easy-to-read color-based results are displayed in a table, as shown below. Refer to this table when sorting samples.

1	2	3	4	5
1	2	3	4	5
2	3	4	5	
3	4	5		
4	5			
5				

Enter the feed pitch and number of repetitions.

Inspection is repeated as the stage moves in a Z-pattern.

Stage

Image Directory

Images saved in a file can be displayed as thumbnails.
As shown below, display mode includes a variety of useful, easy-to-use functions.

Easily search for stored images using a Windows® Explorer-like interface.

Use the mouse scroll wheel to select a 2 x 2, 4 x 4, or 6 x 6 thumbnail display format.
Double-click on any thumbnail to display the full 1000 x 1000-pixel image (original size).

Inspection condition

- Tube current (uA): 100
- Brightness: 12850
- Contrast: 1000
- Gamma: 3.0
- Integration times: 32
- XY stage 1 coordinate: 159.55
- XY stage 2 coordinate: 154.29
- Magnification ratio: 20.58
- Special filter: Sharp 1
- ISO: 100
- TI: 1.0
- Date of photography: 2003/04/28
- Comment: SHIMADZU Corp. Test_Sample1

Create teaching file

Teaching name: []

Start to create [] Stop to create []

Condition settings... [] Delete []

Editing comments [] Exit []

Inspection conditions used to capture an image are saved with the image, and can be displayed together with the image.

Select any thumbnail and click [Condition settings] to automatically register all inspection conditions used to obtain the image. This allows easy repetition of the same inspection, and guarantees identical images, even if the operator changes.

Teaching

Teaching pre-registers inspection points and registers the observation conditions for each point. This function then automatically plays back the registered procedure to significantly enhance inspection efficiency during repeated inspections of multiple samples of the same type of item.

To repeat an earlier inspection, simply select a previously-registered teaching file.

Up to 10,000 points can be registered in a single file.

Inspection position changes automatically during teaching, allowing operators to concentrate on evaluating images.

Current inspection position

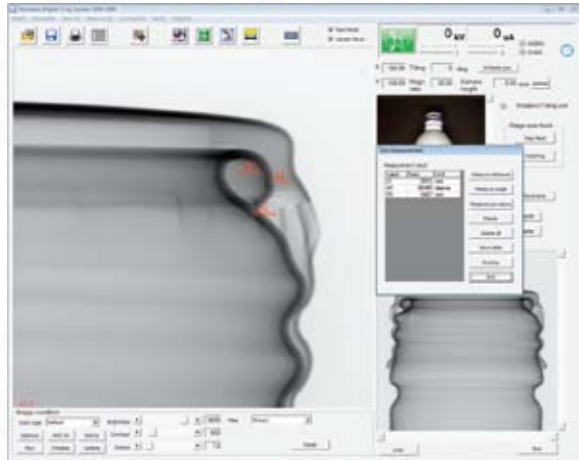
Useful Built-in Measurement Functions

Wide Range of Options

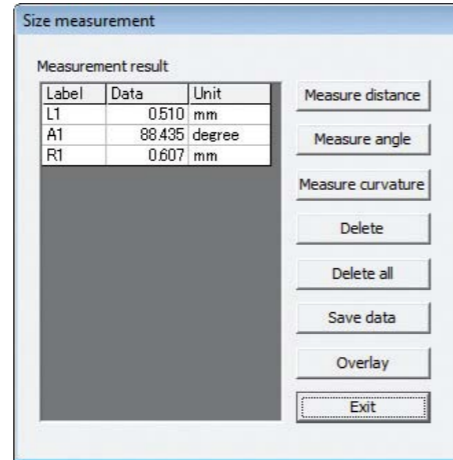
Measurement Functions

Dimensions

Measures distances between two points, angles and curvatures. Eliminating the conventional need for dimensional compensation, the SMX-1000 automatically calculates compensation data based on each fluoroscopy magnification, ensuring efficient dimension measurement.



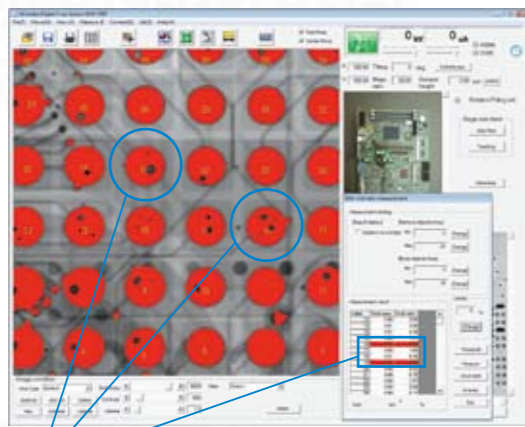
The flat-panel detector generates digital images free of distortion or shading, providing improved dimensional measurement accuracy.



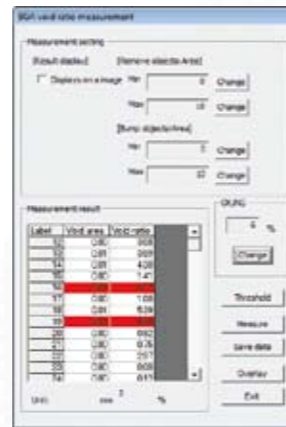
Measurement results displayed on the screen can be saved as a file in CSV format for statistical calculations with a commercial spreadsheet application.

BGA Void Ratio

Set the threshold value and begin measurement to display the measured results for each bump in the image. Pass/fail evaluation is performed automatically, according to preset evaluation criteria, and results can be saved in CSV format.

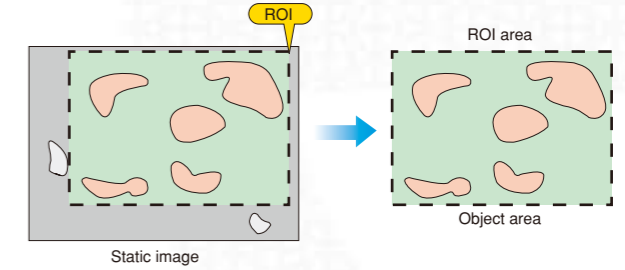
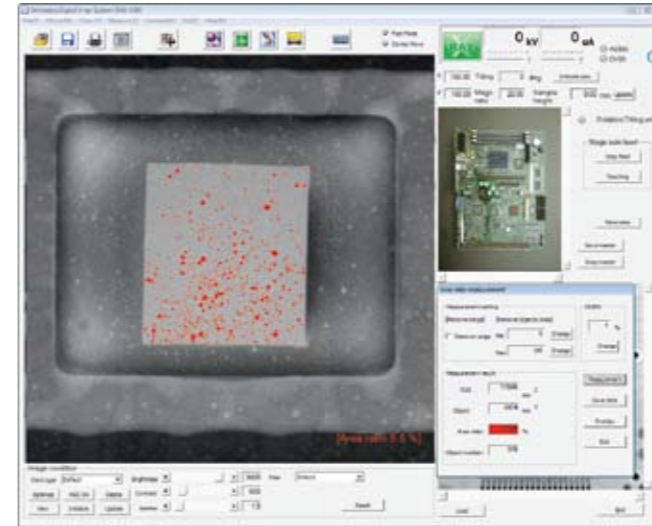


Items (16) and (19) fail.



Area Ratio

Measures the area ratio of objects in the designated ROI (region of interest). Area ratio is calculated as object area/ROI area, and is useful for evaluating die bond or solder paste wettability.



Wire Sweep Ratio

Simply click the end point of wires and the point of maximum sweep to calculate the wire sweep ratio. Easily save all results in CSV format.

