

Application News

Micro-focus X-ray Inspection System Xslicer™ SMX™-6010

Realizes high definition, high resolution and high throughput! Rich features of the latest X-ray inspection system

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User Benefits

- ◆ High definition and wide dynamic range images allow observations of detailed internal structures and defects.
- ◆ Easy switching from fluoroscopic imaging to CT imaging allows a variety of inspection and applications.
- ◆ Abundant functions that support inspections allow to reduce the inspection time.

Introduction

With the advance demands in electronics technology and high-performance electronic devices such as smartphones and tablets, Micro-focus X-ray inspection system is used to evaluate the quality of electronic components and devices mounted on mounting (printed circuit) boards.

This document introduces the features and main functions of Shimadzu latest Micro-focus X-ray Inspection system Xslicer SMX-6010 (Fig. 1).



Fig. 1 Xslicer™ SMX™-6010

Features of Xslicer SMX-6010

Table below shows the specifications of Xslicer SMX-6010.

Table 1 Specifications of Xslicer SMX-6010

| | |
|---|---|
| Maximum X-ray output | 160 kV, 100 μA (Max. 16 W) |
| X-ray detector | Flat panel detector |
| Fluoroscopic image resolution | Resolves 1μm (JIMA RT RC-02B microchart) |
| Samples size | Max. W470 x D420 x H100 mm Max. 5 kg |
| Fluoroscopic sample size | X: 460 mm Y: 410 mm Z: 100 mm Rotation angle: ±180° Tilting angle: Max. 60° |
| CT scan range | W350 x D350 mm |
| Lamino angle | 45° or 60° |
| Fluoroscopic field of view (Carbon plate) | Vertical 0.75 x Horizontal 1.3 mm to Vertical 21 x Horizontal 38 mm |
| CT scan field of view size (Carbon plate) | 3 to 30 mm (for lamino angle of 45°) 3 to 14 mm (for lamino angle of 60°) |

Xslicer SMX-6010 is equipped with our proprietary open-tube micro-focus X-ray generator, new 3-million-pixels high resolution flat panel detector and a fast high-speed manipulation XY stage (Fig. 2).

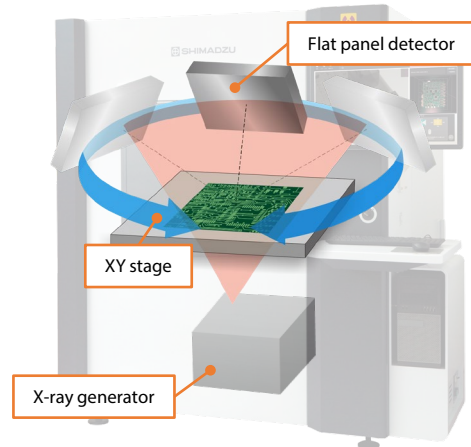


Fig. 2 System configuration

This instrument has four main features.

(1) High definition and wide dynamic range images

New 3-million-pixels high resolution flat panel detector and Shimadzu's exclusive image processor (High Dynamic Range Processing), it is possible to acquire high definition and wide dynamic range images.

(2) Simple and stress-free operation

Shimadzu's unique user interface allows users to easily inspect with simple and stress-free operation, regardless of operator skill. Fluoroscopic imaging can be started in only three steps (STEP 1: Setting a sample, STEP 2: Starting Inspection, STEP 3: Positioning a sample). In addition, seamless switching from fluoroscopic imaging to CT imaging with the click of a button, various observations can be made according to the inspection applications.

(3) Rich features to support inspection

Built-in functions for continuous fluoroscopic imaging and CT imaging (Teaching, Step Feed, etc.) and measurement functions (BGA, Area Ratio, Dimension, etc.) dramatically reduces operator's inspection time.

(4) Straight-forward Maintenance

Filament adjustment and calibration has been simplified and automated to reduce the down-time for maintenance.

■ Main features

Here are four main features of Xslicer SMX-6010.

(1) Fluoroscopic Imaging

It is possible to clearly observe and analyze the BGA defects such bonding of solder balls, voids and bridges of solder ball in a short time (Fig. 3).

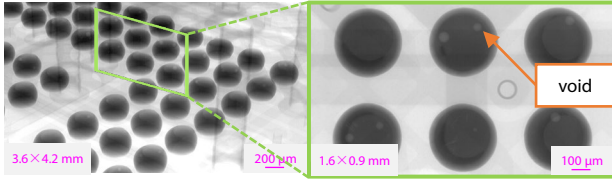


Fig. 3 BGA (Fluoroscopic image)

New 3-million-pixels high resolution flat panel detector highly define (high definition) the observation of the bonding wire conditions (Fig. 4).

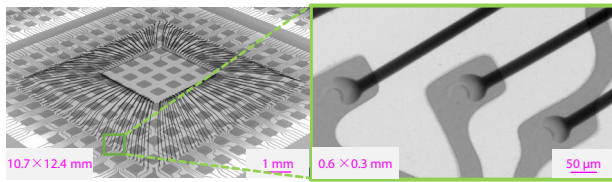


Fig. 4 Bonding wire (Fluoroscopic image)

Shimadzu's exclusive High Dynamic Range (HDR) processes differential the parts with good transparency and poor transparency at once (Fig. 5 & 6).

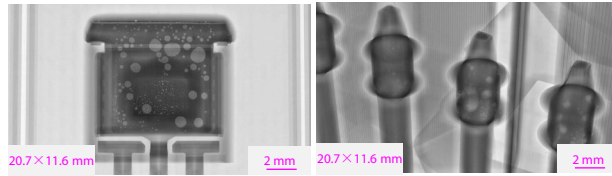


Fig. 5 IC (Fluoroscopic image) Fig. 6 Connector pins (Fluoroscopic image)

(2) CT Imaging

Due to the overlap of electronic components and multi-layered structure, CT imaging is effective to observe such difficult defective which may not be possible with fluoroscopic imaging. CT imaging also allows BGA observation in arbitrary cross section and visualization using three-dimensional display of the This makes it possible to display the extracted voids in a color map*1 by item such as diameter and volume (Fig. 7 & 8).

*1 optional software: VGStudio MAX Porosity / Inclusion Analysis Module.

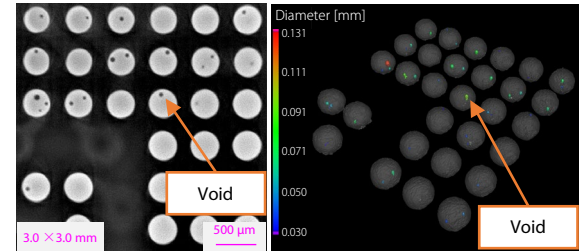
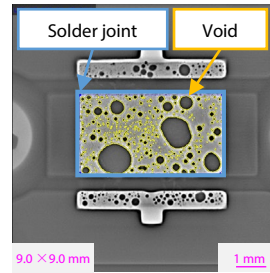


Fig. 7 Cross-section image Fig. 8 Three-dimensional image

(3) Measurement function (area ratio)

It is possible to observe and analyze multiple voids and poor wettability of LEDs (Fig 9). Under these conditions, the reliability of the product during long-term operation is greatly reduced, so it is necessary to evaluate the solder wettability. Measuring the area ratio of the voids (yellow area) to the solder joint surface (blue area) makes it possible to quantitatively inspect and analyze the solder wettability.

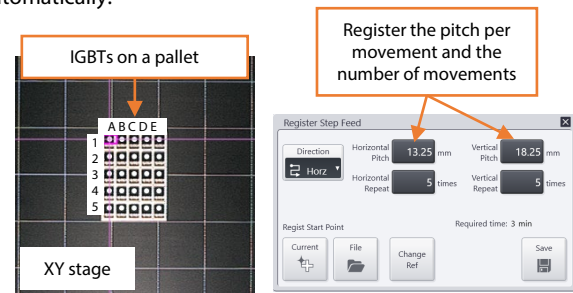


| | |
|---------------------------------|--------|
| Solder joint [mm ²] | 12.329 |
| Void [mm ²] | 4.884 |
| Area ratio [%] | 39.6 |

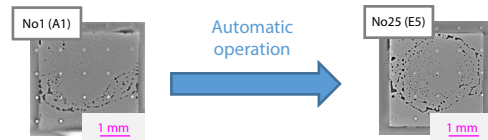
Fig. 9 LED (Cross-section image)

(4) Continuous function (step feed)

Fig. 10 shows an example of continuous CT imaging using step feed function of 25 IGBTs arranged on a pallet to observe solder wettability. This function register the start point, the pitch per movement and the number of movements. Since fluoroscopic imaging or CT imaging is continuously performed at specified pitch intervals from the starting point according to the setting, step feed function is useful for continuously observing samples arranged at regular intervals. Inspection can be performed efficiently without operator because all the images are taken automatically.



Step feed function



IGBT (Cross-section image)
Fig. 10 Continuous CT imaging

■ Conclusion

Xslicer SMX-6010, latest Micro-focus X-ray Inspection system, offers high-definition images, simple operation and rich features, anyone can easily inspect regardless of operator skill. X-ray inspection is indispensable for the inspection of increasingly compact electronic components, and high-density mounting (printed circuit) boards. This is an ideal instrument for all situations related to product quality in the electronics manufacturing industry.

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