

**New Technology**

Our unique technology “Planar CT” enables to make high-precision 3D data

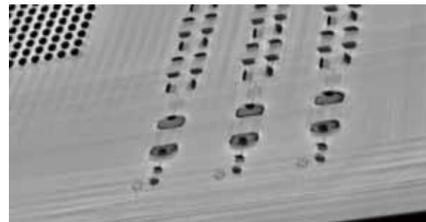
Saki's unique “Planar CT Technology” analyzes the internal structures of planar objects. The detector moves parallel with the planar object capturing images from various directions. By using these diagonal images, it calculates the tomographic views of the planar object quickly and accurately. By the unique movement which both the detector and the objects moves parallel, it enables to correct the position reflecting to create high resolution image by less images taken.



3D X-Ray inspection technology will open the new world of inspection.

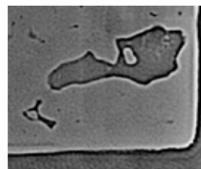
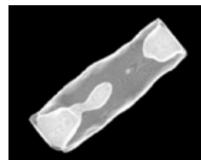
**Visualize the inner structure to realize zero flow of defects**

We now see the road to perfect quality. BF-X2 erases the concern that you cannot see from optical inspection. It provides security by high-resolution images and numerical judgment. We will visualize everything inside of the objects and contribute to “zero defects” production by the automatic measuring system.



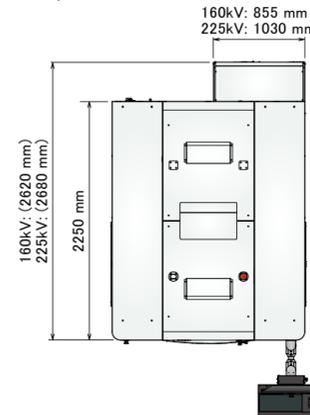
**Covering wide range of solutions from Semiconductor to Power module**

BF-X2, the 3D X-ray inspection system, is the ideal inspection platform which can ensure various tests applications. This is adjustable system using 160kV or 225kV micro focus open X-Ray tubes. With such customized solutions, BF-X2 can inspect and detect various objects, such as flip chip soldering, void in TSV and LTH in semiconductor field, and also IGBT power module soldering in power device field. BF-X2 offers a wide range of solutions for NDT.

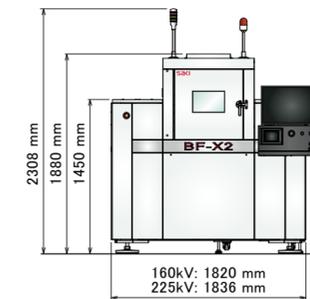


**External View**

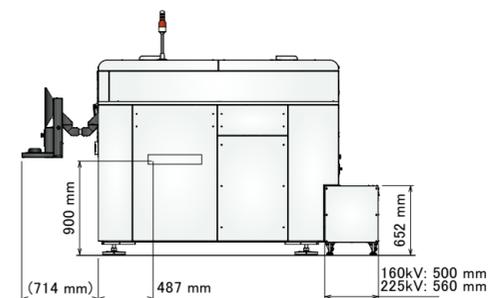
■ Top View



■ Front View



■ Side View



**Product Specifications**

Model Name	BF-X2
Resolution	1 to 25 μm (a jig is required for objects smaller than 5 μm)
PCB Size	50 x 100 to 460 x 510 mm (1.97 x 3.94 to 18.11 x 20.08 in.)
PCB Thickness	0.5 to 4.0 mm (0.02 to 0.16 in.)
PCB Warp	+/- 2 mm (0.08 in.)
Component Height	Top: 40 mm (1.57 in.), Bottom: 40 mm (1.57 in.)
Inspection Categories	<ul style="list-style-type: none"> <li>• Surface Mount Device</li> <li>• Presence/Absence, Misalignment, Tombstone, Bridge, Foreign material, Absence of solder, Insufficient solder, Dryjoint, Lifted lead, Lifted bump, Lifted chip, Fillet defect, Void, HIP</li> <li>• IGBT Device</li> <li>• Void inspection of a solder</li> <li>• Packaged Print Circuit Board</li> <li>• Void inspection of a through hole</li> <li>• Flip Chip Device (Inner bump)</li> <li>• Dryjoint, Void</li> </ul>

3D Capturing Speed (Planar CT)*	Approx. 5 sec./FOV
Detector	16 bit, 4M Pixel
X-ray Tube	160 kV 50 W Open X-ray Tube (225 kV is optional)
X-ray Leakage	0.5 μSv/h or less
Conveyor Method	Flat Belt Transfer
Conveyor Height	880 to 920 mm (34.65 to 36.22 in.)
Width Adjustment	Automatic
Operating System	Windows 7 English Version

\* It may change according to capturing settings.

**System Requirements**

Electric Power	Three Phase ~ 400 V +/- 10 %, 50/60 Hz
Power Consumption	7 kVA
Air Requirement	0.5 MPa, 60 L/min (ANR)
Usage Environment	15 °C (59 °F) to 30 °C (86 °F) / 15 to 80 % RH (Non-condensing)
Dimensions	1820 x 2620 x 1880 mm (71.65 x 103.15 x 74.02 in.) (160kV model) 1836 x 2680 x 1880 mm (72.28 x 105.51 x 74.02 in.) (225kV model)
Weight	Approx. 5500 kg (12125.3 lbs) (160kV model) Approx. 6500 kg (14329.9 lbs) (225kV model)

**Optional Systems**

- Repair Terminal
- Offline Teacher System

**SAKI Saki Corporation**

**Headquarters**  
Ogawa Building, 4-14-7, Nakanobu,  
Shinagawa-ku, Tokyo, Japan, 142-0053  
TEL: +81-3-5788-6280 FAX: +81-3-5788-6295  
E-mail:sakicorp@sakicorp.com



In-line 3D automated X-ray inspection system for Semiconductor, Power module inspection

# BF-X2

Visualize the inner structure and achieve an innovative automated inspection



In-line 3D automated X-ray inspection system for Semiconductor, Power module inspection

# BF-X2

The X-ray “measurement” exceeds “inspection”.

Saki boosts up the inspection to another stage by this ultimate inspection system.

The high-accuracy 3D image makes the detection of defects much easier.

BF-X2 is our proudly offered 3D X-ray inspection system which provides a new standard of inspection system.



## Three strengths useful in production site

### 1 Automated high-resolution 3D measuring technology

Enables to detect the defects by using the high quality image.

### 2 Reliable hardware design

Achieved both machine safety and easy maintenance.

### 3 Worldwide service

We are offering satisfactory supports all over the world.

## 1 | Technology Automated high-resolution 3D measuring technology

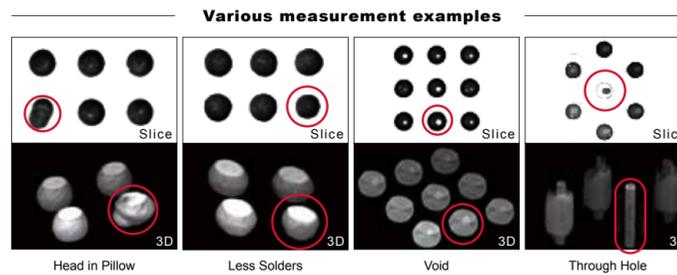
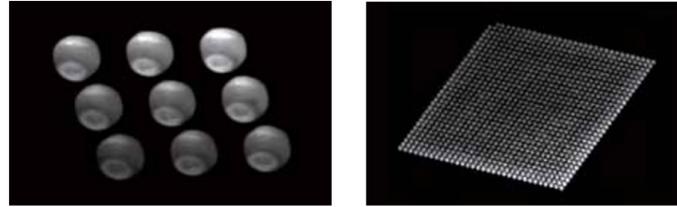
By using high-accuracy 3D data of Planar CT, BF-X2 is capable to capture various defects with 3D configuration. Automated inspection completely separates top and bottom of the board, corrects position gap and warpage based on board pattern, and measures/classifies defects such as dryjoint and void.

### Measuring various defects by using high resolution CT data

Saki employed special and/or customized high-resolution open X-ray tube among micro focus X-ray tubes. The size, volume, and defect point of the object is measured from the 3D data of planar CT.

Based on these, BF-X2 measures the dimension of each component.

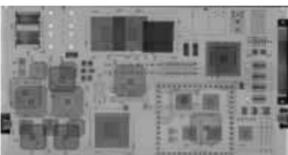
BF-X2 has superb inspection ability for various inspections such as electronic components inspection, soldering inspection, void inspection in microscopic pore, Head in Pillow (non-wetting) and multi-layer soldering inspection for power modules.



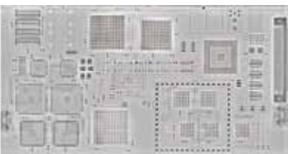
### Seamless 3D data which improves inspection efficiency

Planar CT has high resolution in both horizontal and vertical direction. This will not be affected by back side mounting because of its capability to separate surface and back side completely. Also, it can capture the warpage of a PCB and joint images completely and correct those automatically by the optimal combination of both the imaging principle and CT reconstruction principle. Even though the original data is FOV images, the achieved 3D data is seamless.

We achieved smooth connection of joint areas, which contributes to speeding up, and enlargement of viewing field. Inspection of large parts could also be easily done.



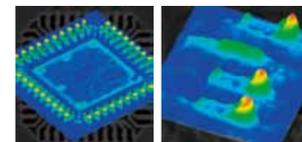
Separate the surface image from the transfer imaging of the whole board



Enables to inspect without any influence from mount condition of flip side

### Integrate 3D reconstruction and its view to implement the analysis and automated inspection at the same time

All automatic inspection is practiced by high-resolution 3D data. The high resolution image of the defect is shown immediately. Now, there is no further need to check the defective points by analytical equipments. This is enabled by the software for precise machine control, 3D reconstruction, 3D inspection, 3D view which are all developed by Saki.



### Achieves further efficiency by the peripheral systems

The operator is able to check the defects in 3D view on external PC. The optional “Repair terminal” shows inspected points in 3D movies. Using the mouse, you will feel like having a good look of invisible parts as though they are in your hands. Also, the “Offline teacher system” provides inspection data automatically from CAD data. Based on our abundant AOI experience, we designed this system to accommodate to both high-mix and high-volume production.



## 2 | Hardware Reliable hardware design



### High-resolution and stable open tube

Although open X-ray tube has an advantage in small focal spot and high resolution image, it had its problem in its stability of X-ray intensity. BF-X2 has overcome this problem by employing all-new target material and directly controlling the target current instead of tube current. From the contribution of these new developments, we succeeded in making X-ray intensity during inspection stable and accurate. This machine is secured to be used even in prolonged periods of operation.



### Prolonged stability and high rigidity gantry structure

In order to control the detector and object in submicron accuracy and millisecond speed, we developed a high rigidity two-layer gantry structure which combines granite plate and linear motors. Its mechanism provides high reliability, with long-term stability which sustains the high resolution Planar CT calculation.



### High safety based on European standard

BF-X2 is possible to keep X-ray dosage stable and start inspection quickly by the combination of 3 shutters placed in PCB entrance, exit, and X-ray infestation site. Due to these shutters, it secures safety and at the same time provides quick inspection as it doesn't need to stop X-ray source during plate carry-in and carry-out. It is designed to meet European standard which shows that the X-ray leakage dose must be lower than 0.5 μSv/h considering operator's safety. Converting this to working hours, each operator would be able to work about 40 hours per week / 2,000 hours per year.\* The operator would be able to work with security.

\* The time is calculated according to dose constraints in public exposure (1 mSv per year) indicated in the 2007 recommendations of the ICRP.

## 3 | Global Support Worldwide service

We provide quick service and support all around the world using 15 of our worldwide network which currently supports 7000 AOI machines.

