NEW

High-speed automated X-ray CT inspection system
VT-X700

OMRON

High-speed automated X-ray CT inspection system for production sites

VT-X700

realizing

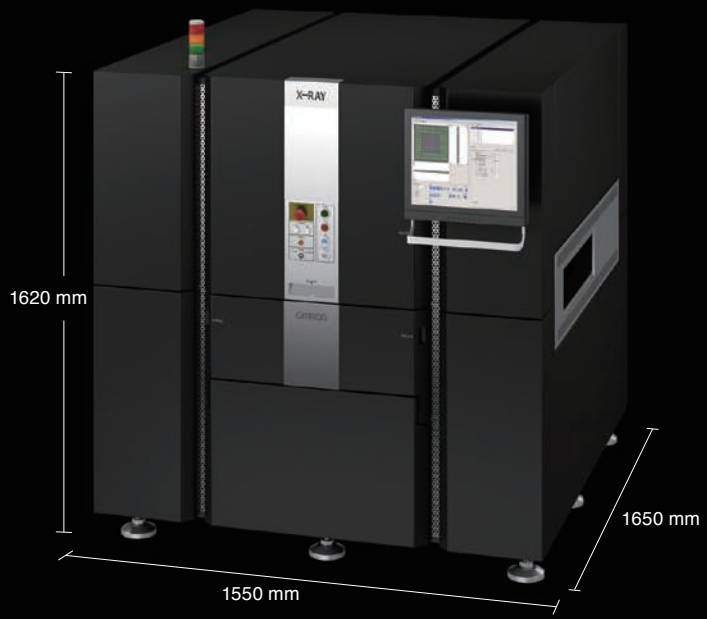
VT-X700

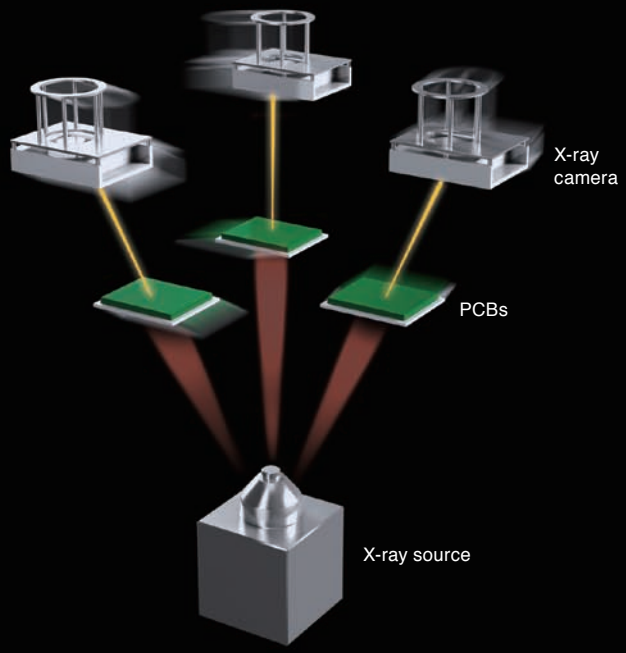
High-precision X-ray CT imaging revolutionizes PCB inspection efficiency

With the recent automotive and digital appliance industrial trend towards greater compactness coupled with greater functionality and higher performance, more products are incorporating high-density chip-mounted component packages. The PCBs built into these products increasingly use components, such as BGAs and CSPs, with hidden soldering. This makes automatic inspection of such components problematic since conventional fluoroscopic X-ray imaging tends to give false calls (judge good products as defective) and to overlook defects, resulting in inconsistent detection of defective products.

Using Omron's unique X-ray CT inspection technology and inline systems technology, the VT-X700 is able to gather 3D component data at extremely high speeds. The VT-X700 then precisely identifies the inspection locations within the 3D data, enabling it to maintain consistent inspection quality in an automated inline system that inspects every item on the SMT line.
Furthermore, the safety-oriented design is backed up by a comprehensive maintenance and support system. The result is a groundbreaking inspection system capable of providing consistently accurate inspection results.

Compact size with high-performance features





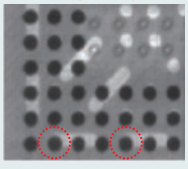
The solution to your production process problems

Precise check of easily missed defects

Reliability

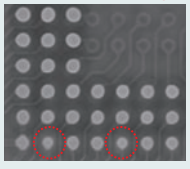
Inspection that uses CT imaging makes it possible to check shapes that cannot be inspected by visual checks or by a fluoroscopic X-ray imaging, such as the shapes of solder joints in BGA components. Precise judgment is possible.

Fluoroscopic X-ray image



No difference from normal

VT-X700 CT image

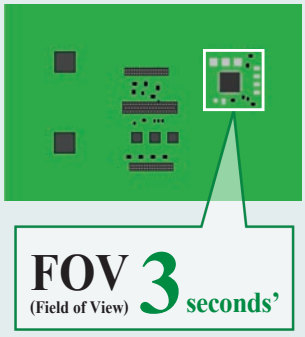


Clear difference from normal

High-speed performance compatible with mass-production

Productivity

Inspection imaging is performed so quickly that each FOV (field of view) is inspected in only 3 seconds'.



Provides safe and secure working environment

Safe and Secure

Safe

X-ray leakage of less than 0.5 μSv/h during irradiation

The pulse shot method that emits X-ray only as needed reduces emissions and extends the device lifetime.

Secure

Uses closed X-ray tube

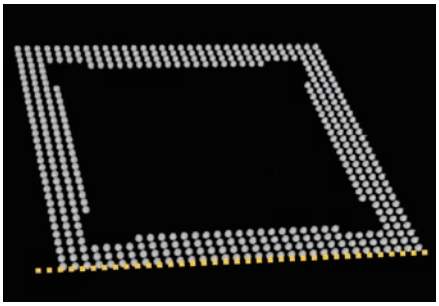
A micro-focus closed tube is used for X-ray source. This minimizes down-time and provides consistent detection accuracy.

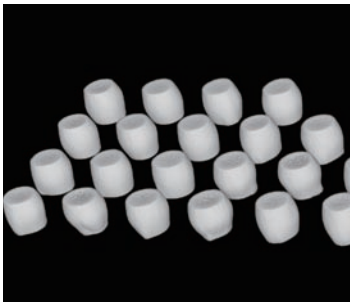
Reliability

Perform precise 3D inspection of invisible areas through CT imaging.

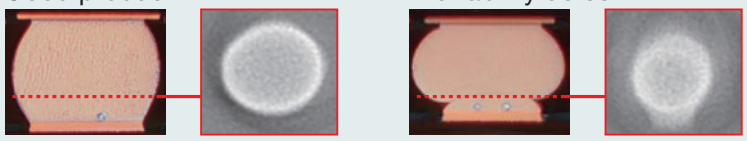
Recognize BGA wettability defects in cross-sections, which was difficult with conventional fluoroscopic X-ray systems.

The VT-X700 can perform 3D analysis for components through CT imaging. It provides precise inspection for things such as BGA solder joint wettability, which analysis was difficult without cross-section inspection.

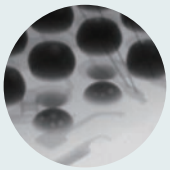




Enlarged view of rendered image

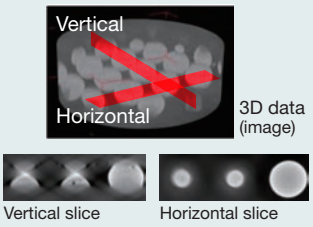


VT-X700 high accuracy X-ray CT imaging mechanism



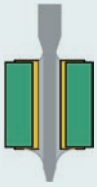
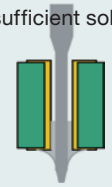
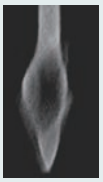
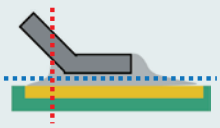
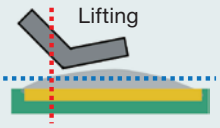
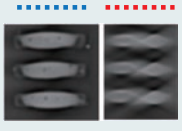
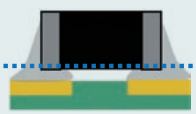
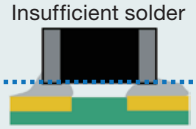
Fluoroscopic image & imaging from various angles

Computed 3D synthesis process (CT algorithm)



NEW Precise automated inspection of components other than BGAs.

The VT-X700 can inspect not only BGAs but also bottom-side terminal components such as CSPs, QFPs, QFNs, R/C chip components, and THD components. Inspection efficiency improves dramatically.

Component types	Normal	CT image	Defect	CT image
Through Hole Device (THD)			Insufficient solder 	
Lead components Transistors, gull-wing type (SOP, QFP)			Lifting 	
QFN			Insufficient solder 	
Chips			Insufficient solder 	

* The 3D graphic images used in this catalog were created using “VGStudio” from Volume Graphics GmbH.

Productivity

Support for each production stage to allow for more efficient vertical startup and operation of processes.

Design → Trials → Evaluation → Mass production → Analysis

- Evaluation: Analysis imaging
- Mass production: Inspection imaging
- Analysis: Analysis imaging

[Inspection Imaging]

Both-sided PCBs with several components can be precisely inspected at one time.

During inspection imaging, the CT images required for inspection can be acquired rapidly at the needed resolution (15 µm to 30 µm) and number of projections (16, 24, or 32), allowing all PCBs to be inspected inline.

FOV (Field of View) 3 seconds'

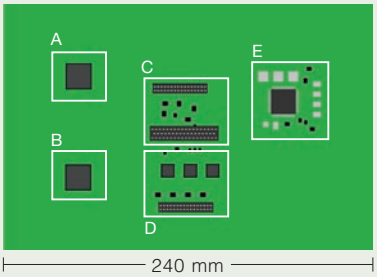
[PCB Inspection Conditions]

BGA	x2 (208 pin, 1.0 pitch)
THD components	x3 (53 pin x 1.32 pin x 2)
QFN	x3 (32 pin, 0.75 pitch)
QFP	x1 (64 pin, 0.5 pitch)
Transistors	x9
Chip components	x21

[Imaging Conditions]

BGA : 20 µm resolution, 16 projections
Other: 30 µm resolution, 16 projections

(Projections and resolutions vary depending on the inspected component and PCB.)



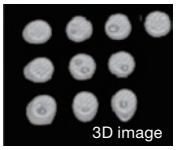
Inspection Tact Time
36* sec

* Inspection time for 5 FOV CT imaging of A to E, including PCB transfer in and out.

[Analysis Imaging]

High-precision PCB check identifies the causes of defects.

During analysis imaging, high resolution (10 µm) is combined with a large number of projections (128) to obtain high-quality 3D data, allowing the trial sample to be evaluated and the causes of any defects arising during processes to be analyzed.



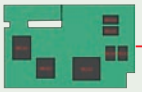
Defect Analysis

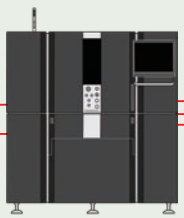
Detailed check of line defects and returned products.

Analysis imaging on the VT-X700 is used to check measurement values for PCBs during trials, during mass production, and after shipment. The 3D data and inspection results for defective components can be acquired and used to identify the causes of defects.

[Line defects]

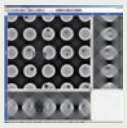
[Returned products]





Product check

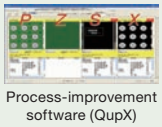
Check actual defects by reading 3D image data of CT imaging. Refer to the precise measured value.



Defect-check terminal (Q-upX_3D-Viewer)

Process verification

All the manufacturing processes for the PCB, including printing, mounting, and reflow, are thoroughly checked.



Process-improvement software (QupX)

3D data verification

Create a detailed 3D image with VT-X700 data, allowing a fine check of defects.

Option
3D data processing software

Ease of use

Designed for greater ease of use from the user's standpoint.

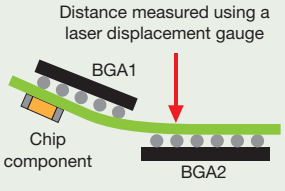
Automatic window pasting

The inspection window is automatically pasted into place in alignment with the detected pin positions to complete the inspection program settings.

Inspection window

Warpage correction using a laser displacement gauge

The area enclosed by the window is recomposed in 3D. The height near the center of each ball is calculated and the pin positions and sizes are automatically detected.



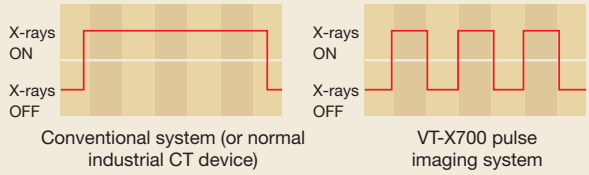
Safety

X-ray leakage of less than 0.5 µSv/h during irradiation

Achieve both safety and longer lifetime by using the pulse shot method.

OMRON has developed an original pulse imaging method that irradiates only at the moment of imaging (prior method irradiated continuously). This method reduces the amount of radiation and allows for more safety. With the effective use of the X-ray source, the lifetime is increased. The maintenance cost is also reduced.

[X-ray irradiation during inspection imaging]



Conventional system (or normal industrial CT device)

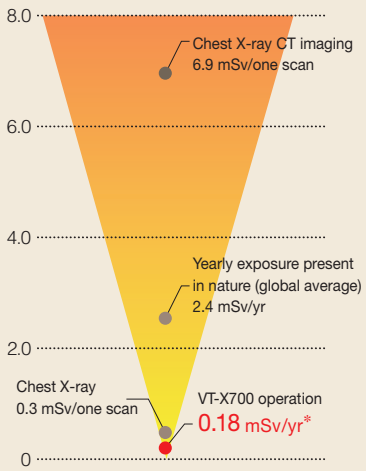
VT-X700 pulse imaging system

With a design that limits exposures to minute amounts, yearly radiation leakage is less than one-tenth of natural environmental levels.

The VT-X700 is designed to limit exposure to minute amounts, with a yearly exposure level of only 0.183 mSv*. This is less than one-tenth of the exposure levels from the natural environment (2.4 mSv/yr, global average). This safety-oriented design means the VT-X700 can be used in ordinary manufacturing without posing health problems.

* For a teaching operator working for an average of 1 hour per day. 0.5 µSv/h x 1 h/day x 365 days = 0.183 mSv

[Radiation exposure (mSv)]



Security

Comprehensive maintenance and support system

Uses a closed-tube X-ray source. Replacement is simple.

As the VT-X700 uses a closed-tube X-ray source, source replacement is simple, keeping downtime to an absolute minimum. Also, because the closed-tube source keeps high detection accuracy consistent, operation is worry-free.

Prepare various maintenance menus

A lot of maintenance options are available according to the varying needs of customers. Please contact your OMRON sales representative for details.

Reliable operation by OMRON engineer support

Omron's highly skilled engineer specialists can provide for all your maintenance needs. Please install at ease.

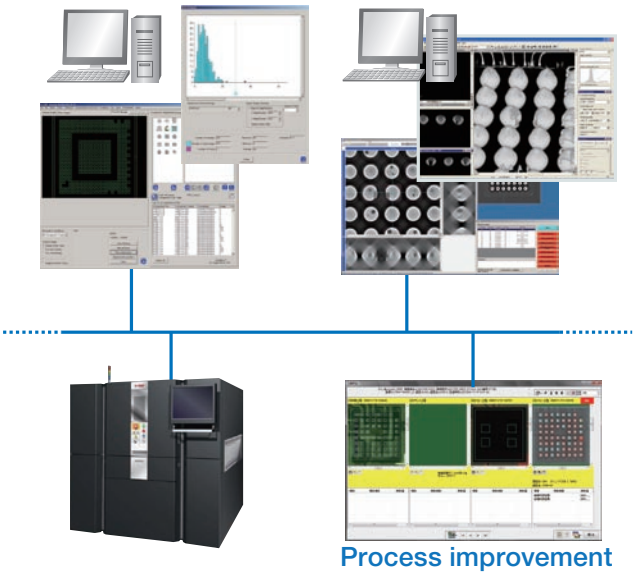
A lot of options for the X-ray system

External programming terminal (CTS)

An external programming terminal (CTS) is available for programming. This allows you to create or overwrite a program and reload it even while running the VT-X700.

Defect checking terminal (RVS + 3D Viewer)

Use this terminal to analyze solder joints using 3D data during analysis imaging, etc. The terminal can be used for tasks such as analyzing defects in returned products or defects from production processes.



Process improvement software (Q-upNavi)

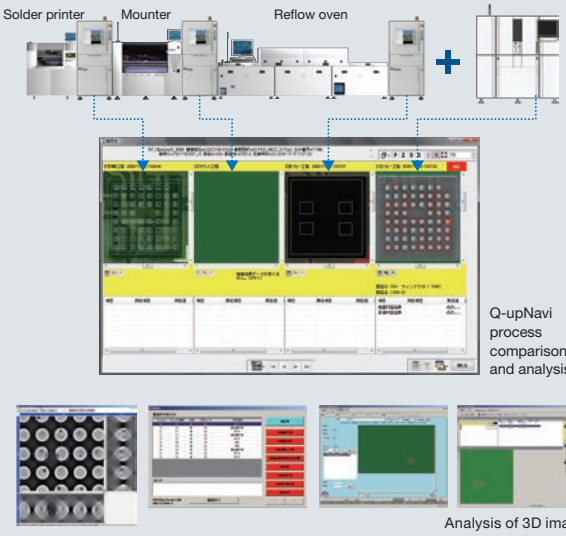
Q-upNavi

Fully integrated support for process review, from inspection to cause identification and countermeasure implementation.

Q-upNavi is quality control software that analyzes inspection results and provides feedback to the production line. This software allows operators, regardless of operator level of experience or expertise, to identify the causes of problems and adjust the line settings accordingly.

Electronic components that can see solder wettability should be inspected with AOI.

Electronic components that cannot see solder wettability, like BGA and QFN, must be inspected with CT-method AXI.



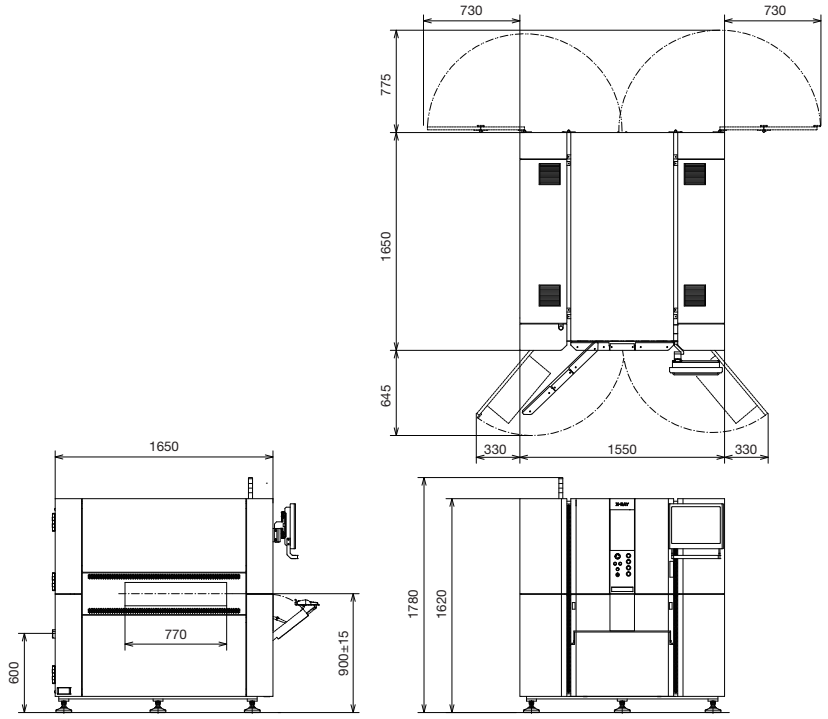
The Q-UpNavi x-ray inspection operations and part of the inspection logic were developed jointly with Aisin AW Co., Ltd.

Specifications

■ **Hardware configuration/function specifications**

Item		Description
Model		VT-X700-M
Inspected components		BGA/CSP, inserted components, SOP, QFP, transistors, R/C chips, bottom-side terminal components, QFN
Inspected items		Openings, dewetting, solder amount, shifting, foreign object stuck, bridging, lead presence, etc. (selectable to suit detected item)
Imaging specifications	Imaging method	3D-slice imaging using parallel CT
	Resolution	10, 15, 20, 25 or 30 µm (selectable to suit detected item)
	X-ray source	Micro-focus closed tube (110 kV)
	X-ray detector	Flat panel detector (5 megapixels)
Inspected PCBs	Size	M-size PCB (50 mm x 50 mm to 330 mm x 255 mm); thickness: 0.4 mm to 3.0 mm
	Weight	2.0 kg or lighter (with components mounted)
	Mounted component height	Top: 50 mm or shorter; bottom: 20 mm or shorter
	Warpage/Flexure	2.0 mm or less
Device specifications	Dimensions	1,550 (W) x 1,650 (D) x 1,620 (H) mm
	Weight	Approx. 2,900 kg
	PCB transfer height	900±15 mm
	Power supply voltage	Single phase, 200 to 240 VAC (±10%)
	Rated power	8.0 kVA
	X-ray leakage	Less than 0.5 µSv/h

Dimensions



- **This document provides information mainly for selecting suitable models. Please read the Instruction Sheet carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.**
- **This product may cause interference if used in residential areas.**

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