saki
The Future in Focus

3D Automated Optical
Inspection (AOI) Systems

3Di Series

SAKI's 3D AOI Series is designed
for the Smart Factory Connection

World map with locations:
Norway, Sweden, Austria, Denmark, Germany, Belgium, Switzerland, France, Czech Republic, Spain, Hungary, Italy, Romania, Portugal, Turkey, Tunisia, Israel, Korea, Japan, China, India, Vietnam, Malaysia, Thailand, Singapore, Philippines, Indonesia, United States, Mexico, Brazil, Australia

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saki Saki Corporation

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Global Network
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Saki's Total Smart Factory Inspection Solution

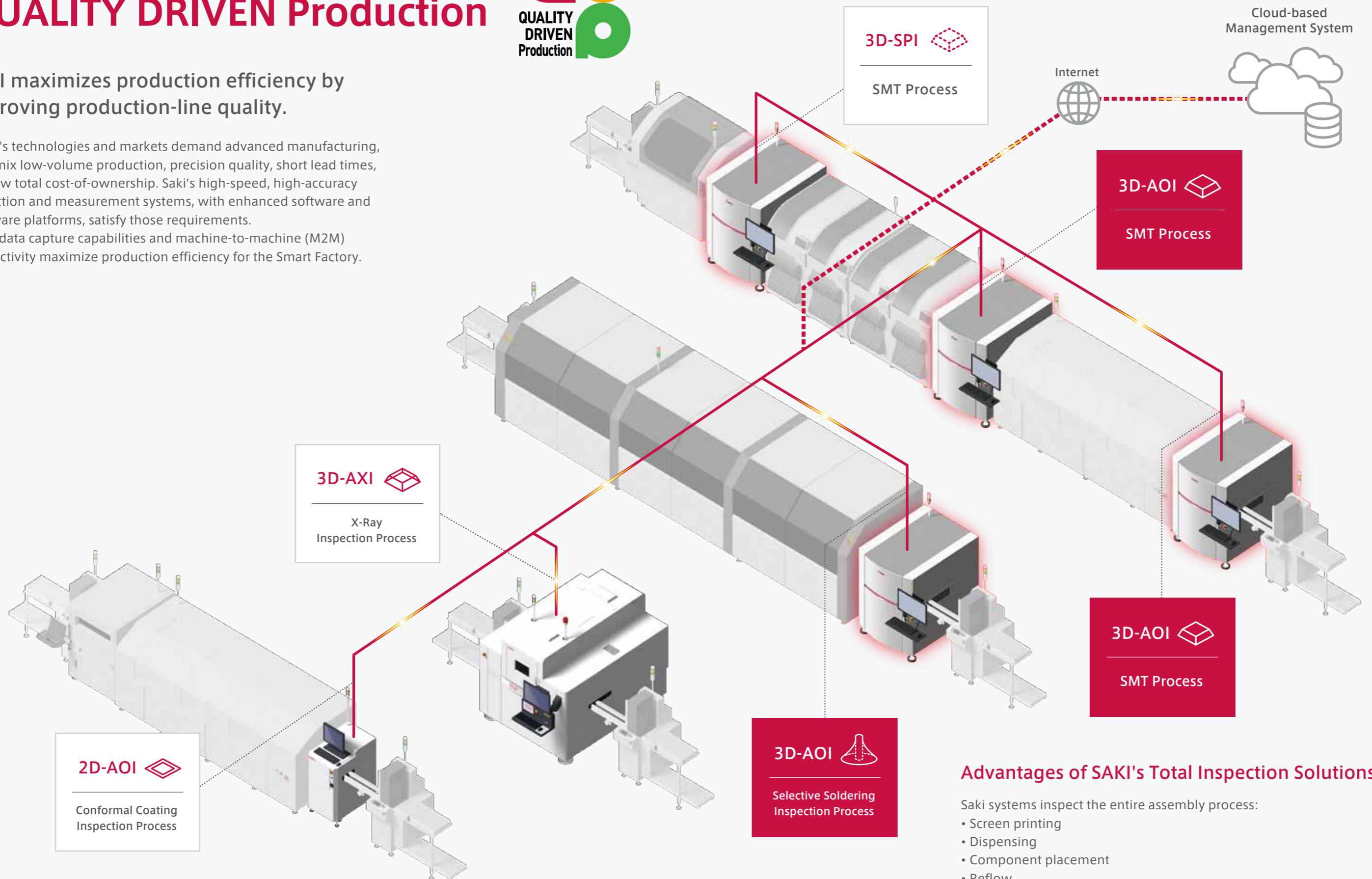# QUALITY DRIVEN Production

QUALITY DRIVEN Production

SAKI maximizes production efficiency by improving production-line quality.

Today's technologies and markets demand advanced manufacturing, high-mix low-volume production, precision quality, short lead times, and low total cost-of-ownership. Saki's high-speed, high-accuracy inspection and measurement systems, with enhanced software and hardware platforms, satisfy those requirements.
Saki's data capture capabilities and machine-to-machine (M2M) connectivity maximize production efficiency for the Smart Factory.

Cloud-based Management System

Internet

3D-SPI
SMT Process

3D-AOI
SMT Process

3D-AXI
X-Ray Inspection Process

3D-AOI
Selective Soldering Inspection Process

3D-AOI
SMT Process

2D-AOI
Conformal Coating Inspection Process

Advantages of SAKI's Total Inspection Solutions

Saki systems inspect the entire assembly process:
• Screen printing
• Dispensing
• Component placement
• Reflow
• Selective soldering
• Conformal coating

※ SPI: Solder Paste Inspection   AOI: Automated Optical Inspection

QUALITY DRIVEN Production

Quality First

Saki's 3D-AOI systems improve process quality, efficiency, and productivity to improve profits.

Costs

Productivity

Profits

Benefits provided with Saki's 3D-AOI series

Improve production quality

Improve production efficiency

Improve profits

Saki combines proprietary hardware and software to produce a stable, highly accurate system that improves production and maximizes process efficiency and product quality.

Key Factor 1 — Advanced Hardware Features

Machine Stability and Accuracy
- Self-diagnostic functions
- Rigid gantry structure and dual motor drive system
- High resolution linear scale for accurate positioning
- CoaXPress camera for faster inspection & measurement process

SPI | AOI

Flexible Configurations for Diverse Requirements
- Accurate 3D inspection & measurement for entire PCBA
- Scalable optical resolutions of 7μm, 12 μm, and 18 μm
- Flexible gantry for M/L/XL PCBA sizes and dual lanes

Key Factor 2 — Advanced Software Features

Programming
- One common platform supports 3D-SPI, 3D-AOI, and 3D-AXI
- Saki Self-Programming (SSP) Software
- Compliant with IPC standards

SPI | AOI

Measurement Inspection & Tuning Function
- Offline-debugging with real-time program adjustments
- Height and extra component detection (ECD) functions
- Through-hole device solder inspection

Verification
- History Management System for data logging and history
- Golden & Silver Sample Check Function for process verification
- Side cameras capture areas missed by overhead cameras
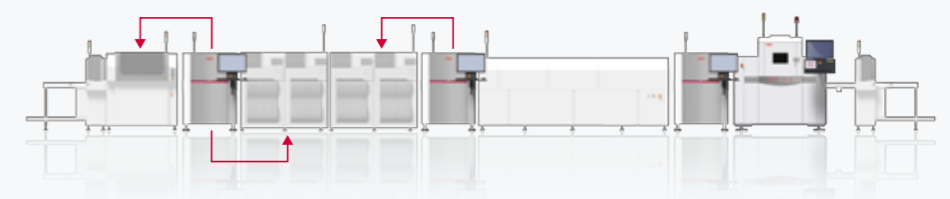
Key Factor 3 — Applied Technology

Machine-to-Machine Systems
- Feed-back from SPI to printer
- Feed-forward from SPI to Pick-and-Place
- Feed-back from AOI to Pick-and-Place

SPI | AOI

Stand-alone Systems
- RMS remotely manages multiple BF2-Monitors with one PC
- MPV lets operators see every inspection result in real time

SAKI Technology for M2M Communication

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The Future in Focus

Key Factor 1 | Advanced Hardware Features

Proprietary Hardware provides accurate measurements

- Saki's machines are built with hardware that's made to last.
- A closed-loop, dual servo-motor drive system, high-resolution linear scale, and rigid gantry structure provide unsurpassed accuracy and repeatability for absolute measurements.
- An optimized conveyor system, driven by step motors, enables fast PCBA loading and unloading.

Linear scale image

Self-diagnostic System

Saki's predictive and preventive maintenance management system assures stable machine conditions and repeatable, consistent performance. Every key component is monitored along with system conditions, and a detailed diagnostic log is recorded. The optimized preventive maintenance plan reduces maintenance time, machine down-time, manpower, and costs.

QUALITY DRIVEN Production
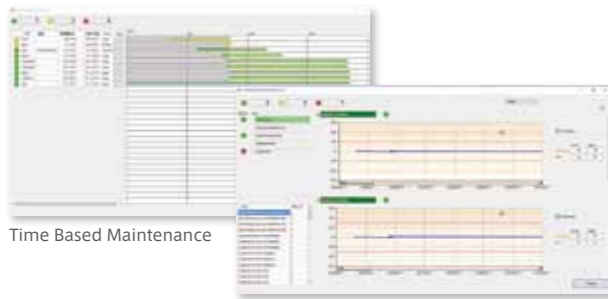
Time Based Maintenance

Condition Based Maintenance

Optical Unit

- Four, multi-frequency digital projectors provide accurate 3D measurements for high-quality images.
- Three camera resolution levels—7µm, 12µm, 18µm—are available to match application requirements.
- Saki's CoaXPress interface in the overhead camera captures images 1.7 times faster than previous models.
- Enhanced 2D and 3D calibration uses multiple calibration height targets for positive and negative heights to guarantee height measurement accuracy.
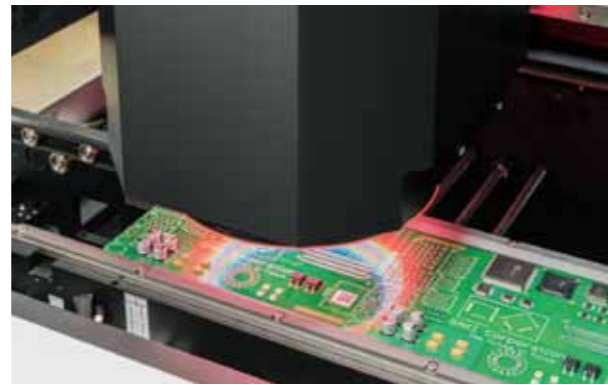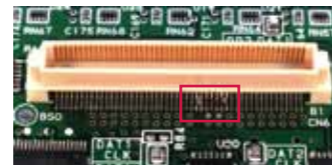
Side Cameras*

A quad side camera system ensures inspection of the entire board, including dead angles and areas missed by overhead cameras.
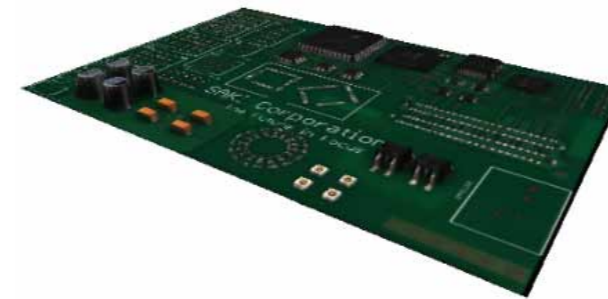*factory-installed option

TOP Camera Image

SIDE Camera Image

Key Factor 2 | Advanced Software Features

Programming

- Special BF2 software has a common user-interface for Saki's 3D SPI, AOI, and AXI systems.
- The software saves a full 3D image of the whole PCBA, so the operator can create inspection data without using the physical board.

- Saki Self-Programming (SSP) Software

Saki's Self-Programming Function was developed on the concepts of Board less, Skill less, and Stress less. Accurate libraries are automatically created for both SPI and AOI based on the database and BOM data associated with about 300,000 types of components.

Gerber
Gerber
CAD XY
ECAD Design
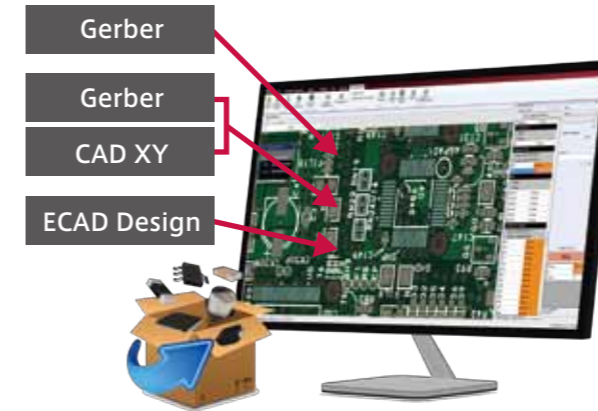
Inspection Data per IPC Standards

Default thresholds of inspection data conform to IPC standards.

Measurement Inspection and Tuning Function

Offline Debugging

Operator can edit inspection data to check previous Good/NG images, or real-time defect images, offline without any production interruptions.

Warpage Adjustment

Warpage is compensated automatically. An accurate height map is made of the entire PCBA surface, enabling the Extra Component Detection function to detect foreign material.
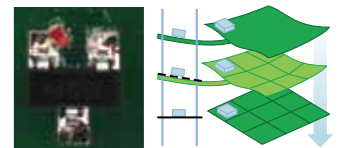
Height ECD function

Fujiyama (Through-hole Device Solder Inspection)

The Fujiyama algorithm provides complete through-hole joint inspection in a single step. It simultaneously inspects for copper exposure, pin detection, pin-holes, solder fillets, and bridges.
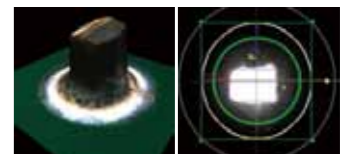
3D DIP Soldering

Inspection Data Verification

History Management System

The History Management System records the detailed data modification system in detail (who, what, when, where, why, and how)
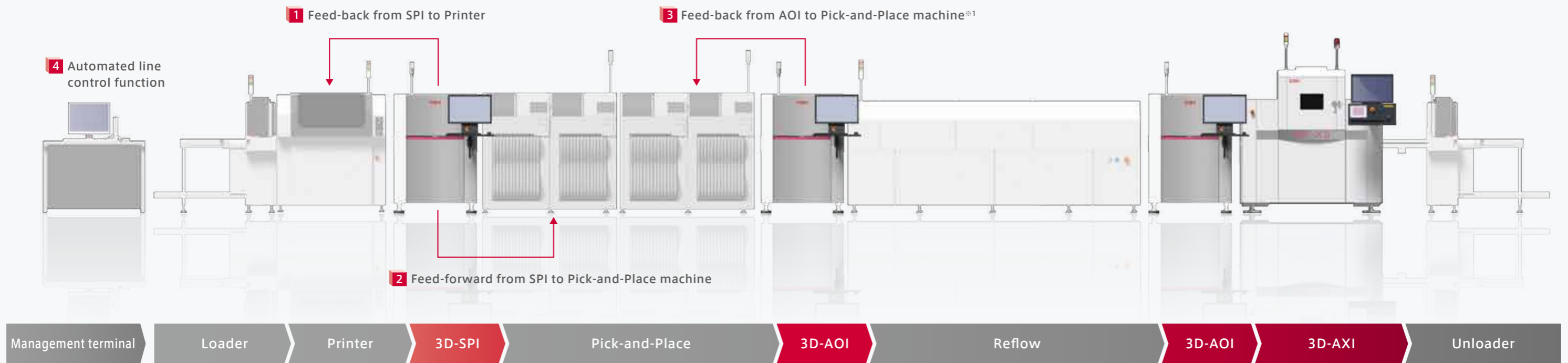
Golden & Silver Sample Check Function

Maintains inspection accuracy by checking machine status and inspection conditions before starting auto operation.

QUALITY DRIVEN Production

Saki's QUALITY DRIVEN Production Solution
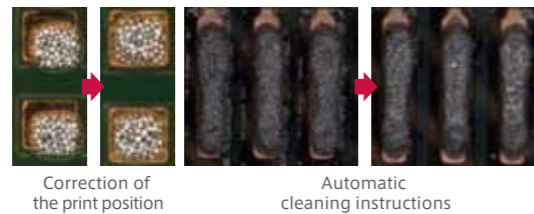
1 Feed-back from SPI to Printer

3 Feed-back from AOI to Pick-and-Place machine※1

4 Automated line control function

2 Feed-forward from SPI to Pick-and-Place machine

Management terminal	Loader	Printer	3D-SPI	Pick-and-Place	3D-AOI	Reflow	3D-AOI	3D-AXI	Unloader

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Key Factor 3	Applied Technology

M2M Solution

1 Feed-back from SPI to Screen Printer.

Feeds back misalignment data and prevents print errors by automatically alerting the user when the stencil needs cleaning.

Correction of the print position

Automatic cleaning instructions

2 Feed-forward from SPI to Pick-and-Place machine

Measures the degree the printing position shifts to correct placement positioning. A NG board skip function improves efficiency, quality, and cost.

NG board skip

3 Feed-back from AOI to Pick-and-Place machine

Feeds back placement position and location data from AOI to pick-and-place and feeds forward data from SPI to improve quality and efficiency.

*1 factory installed option

Placement position correction*1

4 Automated line control function

Automates control of the assembly line to reduce rework and waste and increase throughput.

※**1**~**4** Saki partners with the leading PCB equipment manufacturers. Ask us which products we connect with.
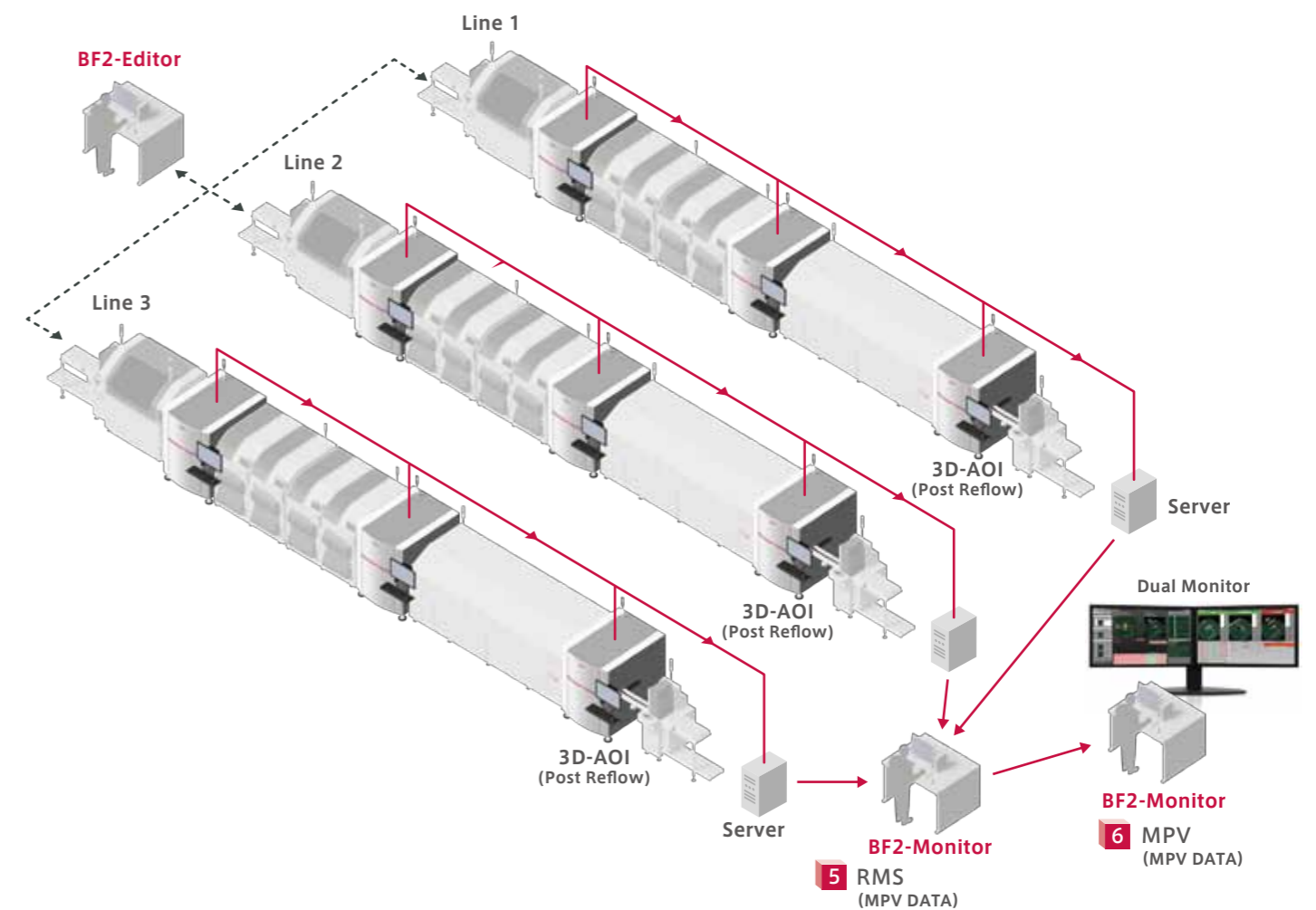
Options

BF2-Editor
Create data and debug the process offline

BF2-Monitor
(Offline verification terminal)

5 RMS (Remote Management System)
Remotely control multiple BF2-Monitors with a single PC. Reduces assembly-floor personnel. Moreover, the production status of each device can be confirmed.

6 MPV (Multi Process View)
The BF2-Monitor shows the results of all inspection processes (SPI, pre-reflow, and post reflow) on one screen in real time for operator review, simplifying the verification process and making it less subject to error. It is also useful for analyzing the cause of a defective board.

Line 1

BF2-Editor

Line 2

Line 3

3D-AOI (Post Reflow)

Server

Dual Monitor

3D-AOI (Post Reflow)

3D-AOI (Post Reflow)

Server

BF2-Monitor

BF2-Monitor

5 RMS (MPV DATA)

6 MPV (MPV DATA)

Product

3Di Series Product Specifications

Dual-lane system can inspect 2 different PCBAs simultaneously

Market	Asia		Global		
Dimensions	**M** Single lane	**M** Dual lane	**L** Single lane	**L** Dual lane	**XL** Single lane
Model Name	**3Di-MS2**	**3Di-MD2**	**3Di-LS2**	**3Di-LD2**	**3Di-ZS2**
Size (W)×(D)×(H) (mm, in.)	850 × 1430 × 1500, 33.46 × 56.30 × 59.06		1040 × 1440 × 1500, 40.94 × 56.69 × 59.06		1340×1440×1500, 52.75×56.69×59.06
Weight	850kg, 1873.93lb		900kg, 1984.16lb		
Electric Power	Single Phase ~ 200-240V+/-10%, 50/60Hz				
Air Requirement	0.5MPa, 5L/min（ANR）				
PCB Size (mm, in.)	— 50×60～330×330, 1.97×2.36～ 12.99×12.99	Single mode 50×60～ 330×330, 1.97×2.36～ 12.99×12.99	Dual mode 50×60～ 320×330, 1.97×2.36～ 12.60×12.99	— 【7μm camera head】 50×60～330×330, 1.97×2.36～12.99×12.99 【12/18μm camera head】 50×60～500×510, 1.97×2.36～19.68×20.07	Single mode 【7μm camera head】 50×60～ 330×330, 1.97×2.36～ 12.99×12.99 【12/18μm camera head】 50×60～ 500×510, 1.97×2.36～ 19.68×20.07	Dual mode 50×60～ 320×330, 1.97×2.36～ 12.60×12.99 50×60～ 320×510, 1.97×2.36～ 12.60×20.07	— 50×60～686×870, 1.97×2.36～27.00×34.25
PCB Clearance	Top : 40mm, 1.57in. Bottom：60mm, 2.36in.	Top : 40mm, 1.57in. Bottom : 50mm,1.96in.		Top : 40mm, 1.57in. Bottom：60mm, 2.36in.	Top : 40mm, 1.57in. Bottom：50mm, 1.96in.	Top : 40mm, 1.57in. Bottom：60mm, 2.36in.

(Note: PCB Size row columns — the M Single lane, L Single lane, and XL columns show "—" entries with the values beneath; the "Single mode"/"Dual mode" labels apply to the M Dual lane and L Dual lane pairs.)

	Front View (mm, in.)	Side View (mm, in.)
M	(1930, 75.98) (1500, 59.05) — 850, 33.46	(1000, 39.37) (900, 35.44) — 285, 11.23 / 1430, 56.30
L	(1930, 75.98) (1500, 59.05) — 1040, 40.94	(1000, 39.37) (900, 35.44) — 295, 11.62 / 1440, 56.70
XL	(1930, 75.98) (1500, 59.05) (986, 38.81) (775, 30.51) — 1040, 40.49 / 1340, 52.75	(1000, 39.37) (900, 35.44) — 295, 11.62 / 1440, 56.70

3Di Series Optical Unit Specifications

Wide selection of cameras based
on various optical resolutions and speeds

Resolution	7μm	12μm	18μm
Height measurement range	4mm, 0.15in.	10mm, 0.39in.	20mm, 0.78in.
Image capture time	1,063mm²/s 1.64in.²/s	3,600mm²/s 5.58in.²/s	5,700mm²/s 8.83in.²/s
Major characteristics	Meets requirements for production of advanced smart phones, wearable devices, and devices and modules for IoT. Capable of 0201mm (008004in.) component inspection.	High-end model with both high-speed and micro part inspection capability.	New optical head increases inspection speed 170% for the highest productivity and throughput speed.

High definition ←————————————————→ High speed

Substantially improves inspection speed

Comparison between BF-3Di and 3Di-LS2 using an optical unit with
18μm resolution and PCB size 330x250mm(12.99x9.84in.).

Faster !

25SEC → **15**SEC

BF-3Di

NEW 3Di-LS2