

DAOA I

Precision Detection Actionable Insights

AI AOI for PCBA

Multi-dimensional AIDetection • Full Defect Coverage

5-Min AI Programming

No CADfiles or component library
Auto-draws ROIs and sets thresholds

AI Cuts False Alarms

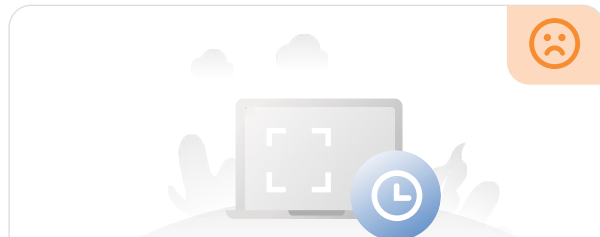
Single golden-sample learning
Feedback loop reduces misreports

Ultra-low Miss Rate

Solves same-colour substrate detection
SOD/ LED polarity challenges

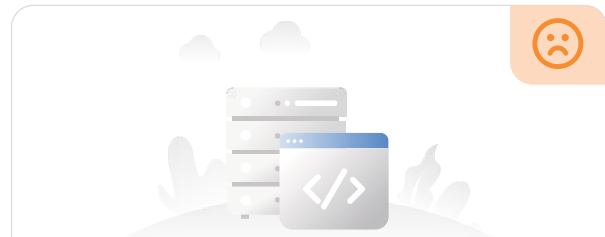
Pain Points of Traditional AOI

Manufacturing industries suffer from efficiency losses caused by traditional AOI every day. These problems not only slow down production lines, but also directly affect the competitiveness of enterprises.



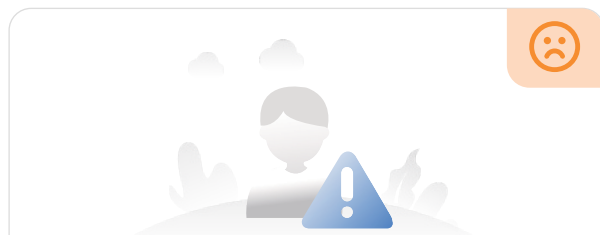
Lengthy Changeover Time

Manually drawing inspection boxes/regions and parameter configuration are time-consuming. Switching products takes 3–5 hours and relies on CAD files or component libraries.



Data Silo

Systems operate in isolation with no data interoperability. Management cannot obtain meaningful quality insights.



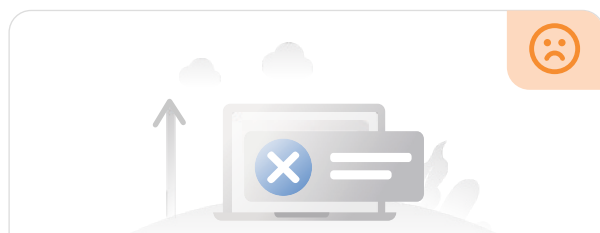
High Dependency on Key Personnel

Heavy reliance on experienced engineers. Personnel are difficult to replace. When employees leave, production lines face immediate shutdown risk.



High Training Costs

Operators require lengthy training. High staff turnover forces continuous investment in retraining resources.



Persistently High False Positive Rate

Excessive false calls consume large amounts of labor for manual re-inspection. Line stoppage costs severely compress profit margins.



Massive Losses from Line Stoppages

Each changeover period stoppage directly results in capacity loss, unsustainable in a highly competitive environment.

Factory Exclusive Visual AI

DaoAI AI AOI for PCBA is not a generic AI. It is a dedicated visual AI trained specifically for your processes.



Full-Stack AI Capability

Single-sample anomaly detection, MARK recognition, component alignment, automatic panel detection, automatic parameter calculation, DIP classification, and OCR — all AI-powered.



Data Never Leaves the Factory

Fully on-premise deployment ensures data security. Core process know-how stays within your facility at all times.



Smarter with Every Use

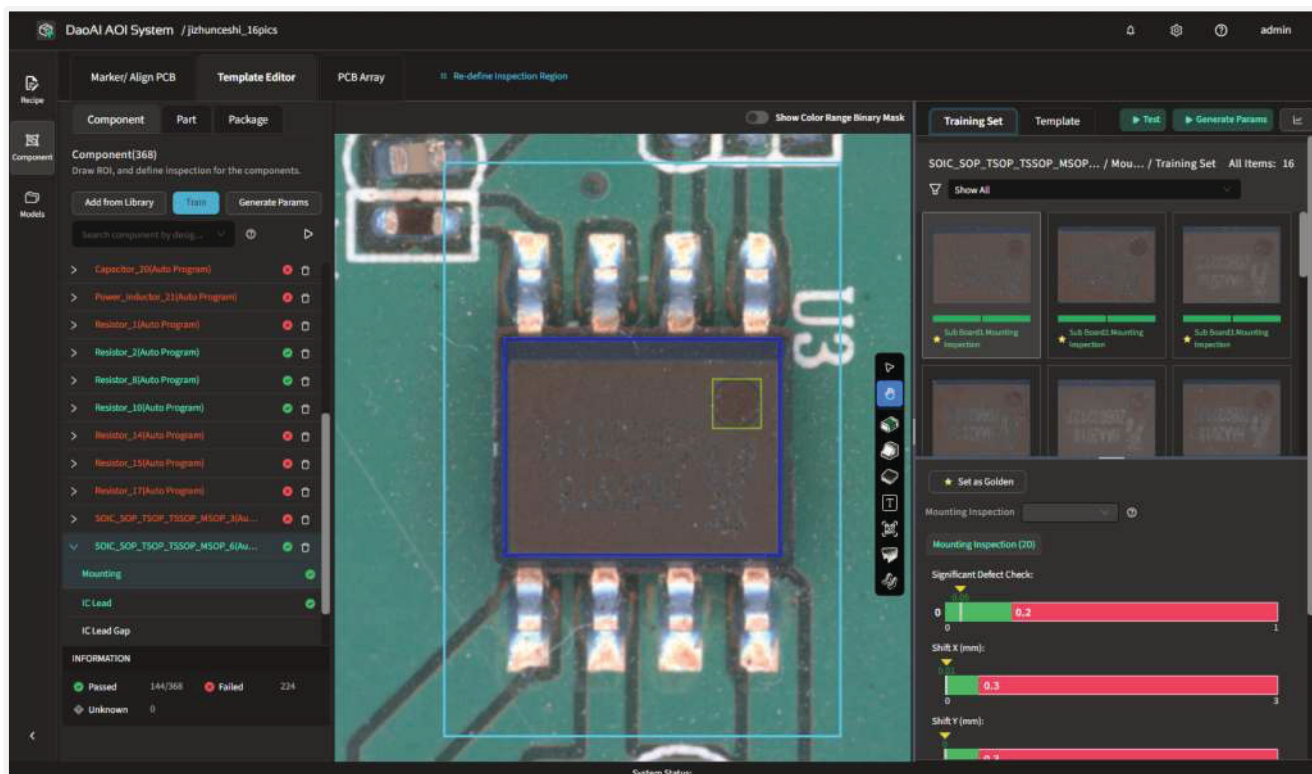
Continuously learns from operator feedback. The AI model keeps improving, with accuracy increasing over time.



No AOI Programming Engineer Required

Operators manage the entire training workflow independently, lowering the skills threshold and increasing organizational agility.

✓ DaoAI AOI PCBA provides an intuitive and user-friendly interface.



4 Steps to Complete PCBA Programming

**Key Advantage:** Only a single Golden Board is required to get started — the lowest possible onboarding barrier. Factories of any size can be up and running quickly.



Programming Time
Traditional AOI
requires 3–5 hours

AI Auto-Component Detection & Threshold Generation

No manual region drawing or threshold configuration. AI automatically identifies all components on the PCB, generates inspection regions, and calculates optimized parameters from the Golden Board, significantly reducing programming time.

Intelligent Panel Recognition

Supports automatic panel (array board) recognition — including mirrored panels. One-click alignment and automatic top/bottom side switching, improving programming efficiency.





Scan the QR code to watch the video.

Step 1

Step 2

Step 3

Step 4

Capture the Golden Board

Capture components on the golden good PCB to establish a reference. No CAD files required.

AI Auto-Modeling

AI automatically generates inspection regions, computes parameters, and identifies panel layout.

Review Results

Operator conducts training, evaluation and refines programming.

Feedback & Optimization

Operator launches inspection, reviews false positive components, and provides feedback. AI automatically updates parameters to

Overcoming Difflcult Challenges

Multi-Dimensional AI Detection

> AI Component Alignment

Component surface contamination can degrade alignment accuracy, causing false positive. DaoAI uses AI algorithms for precise localization of contaminated components.

> Same-Color Component Detection

When component body color matches PCB laminate, RGB color-based algorithms fail completely. DaoAI extracts multi-dimensional feature embeddings beyond RGB- reliably detecting components regardless of component color match.

> DIP Solder Joint Classification (AI-Based)

DIP accept/reject criteria vary across customers, board types, and etc. Conventional correlation algorithms can not accommodate this variability. DaoAI trains a local AI classifier to your accept criteria — fast to deploy, high accuracy, no vendor dependency.

> Black Inductor & Crystal Oscillator-Character Interference Mitigation

Chip inductors and crystal oscillators are notorious false-positive generators due to dense surface markings resembling defects. DaoAI's multi-feature AI discriminator separates marking signatures from true defect signals — eliminating the root cause of false positives for both component types without rule-writing.

Productivity Features

Program components by part number and package type; synchronize parameter updates across all instances

AI-optimized imaging path planning - minimizes cycle time per board

One-click alignment of panel inspection regions - no manual adjustment required

Automatic panel recognition: supports irregular, mirrored, and top/bottom combined panels

Automatic top/bottom side switching for double-sided inspection

Auto-generated solder bridge (short circuit) detection regions

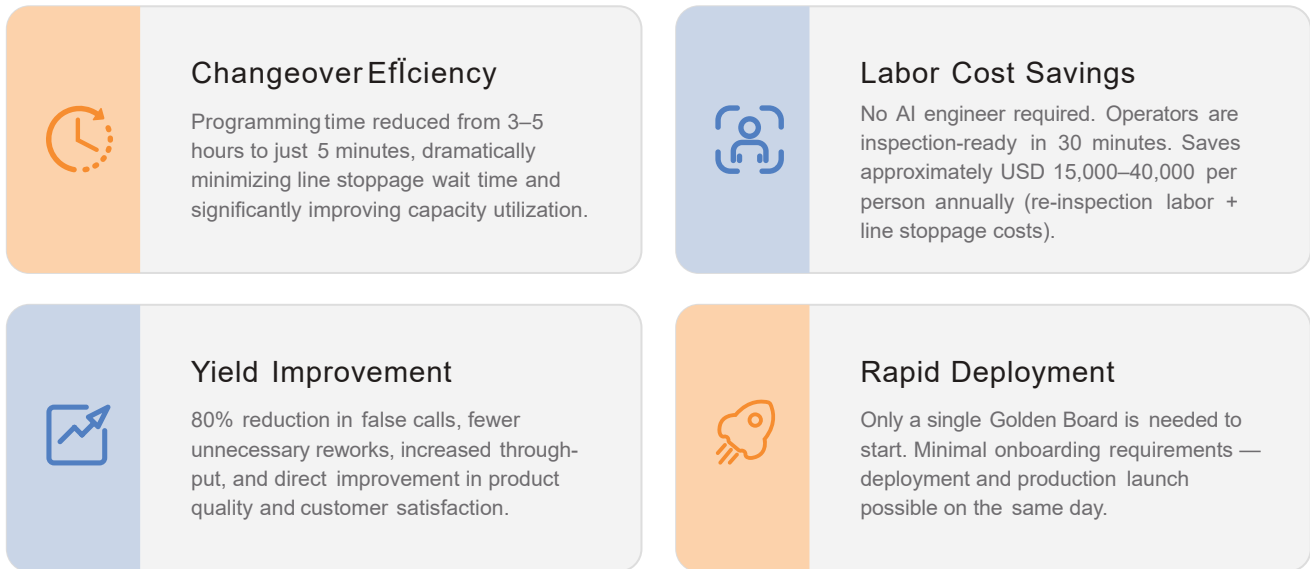
Integrated bad-board rejection - automated, zero manual intervention

Traditional AOI VS. DaoAI AI AOI

Evaluation Criteria	Traditional AOI	Generic AI AOI	DaoAI AI AOI
Training Methodology	Manual rule-based programming	General pre-trained model, not customized	Trained specifically on your golden boards
Programming Time	3-5 hours per board	Depends on AI engineer config	Operator completes in 5 minutes
Data Security	N/A	Risk of IP exposure via cloud	Fully on-premise — data never leaves factory
Optimization	Fixed algorithms, no auto-iteration	Improvements require vendor involvement	Continuously learns from operator feedback
False Call Rate	High false call rate; escape defects present	Limited adaptability to specific processes	Reduced by 80%; accuracy improves over time

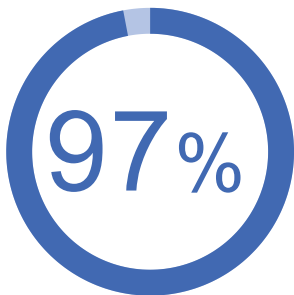
Core Business Value

DaoAI AI AOI is a measurable ROI driver — not just a technology refresh. It directly improves throughput, labor efficiency, first-pass yield, and time-to-market.



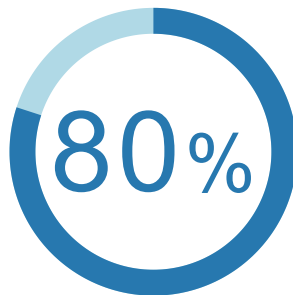
Impact at a Glance — KPIs

From programming efficiency to quality improvement, DaoAI AI AOI delivers quantifiable and significant enhancements across all key metrics.



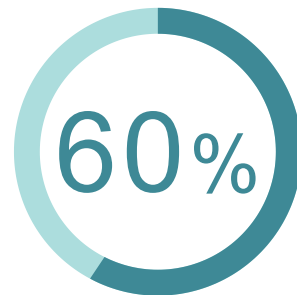
Reduction in
Programming Time

Live on the production line immediately; instant go-live, 5-minute changeover.



Reduction in
False Call Rate

AI-driven judgment reduces unnecessary manual re-inspection.

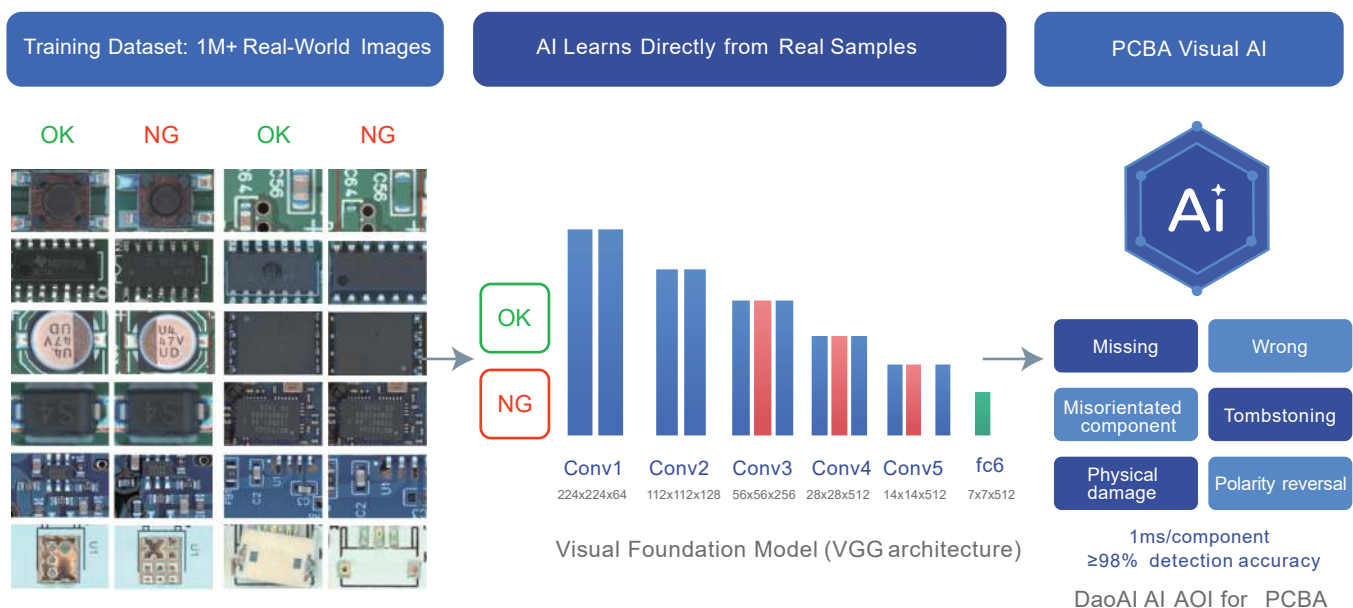
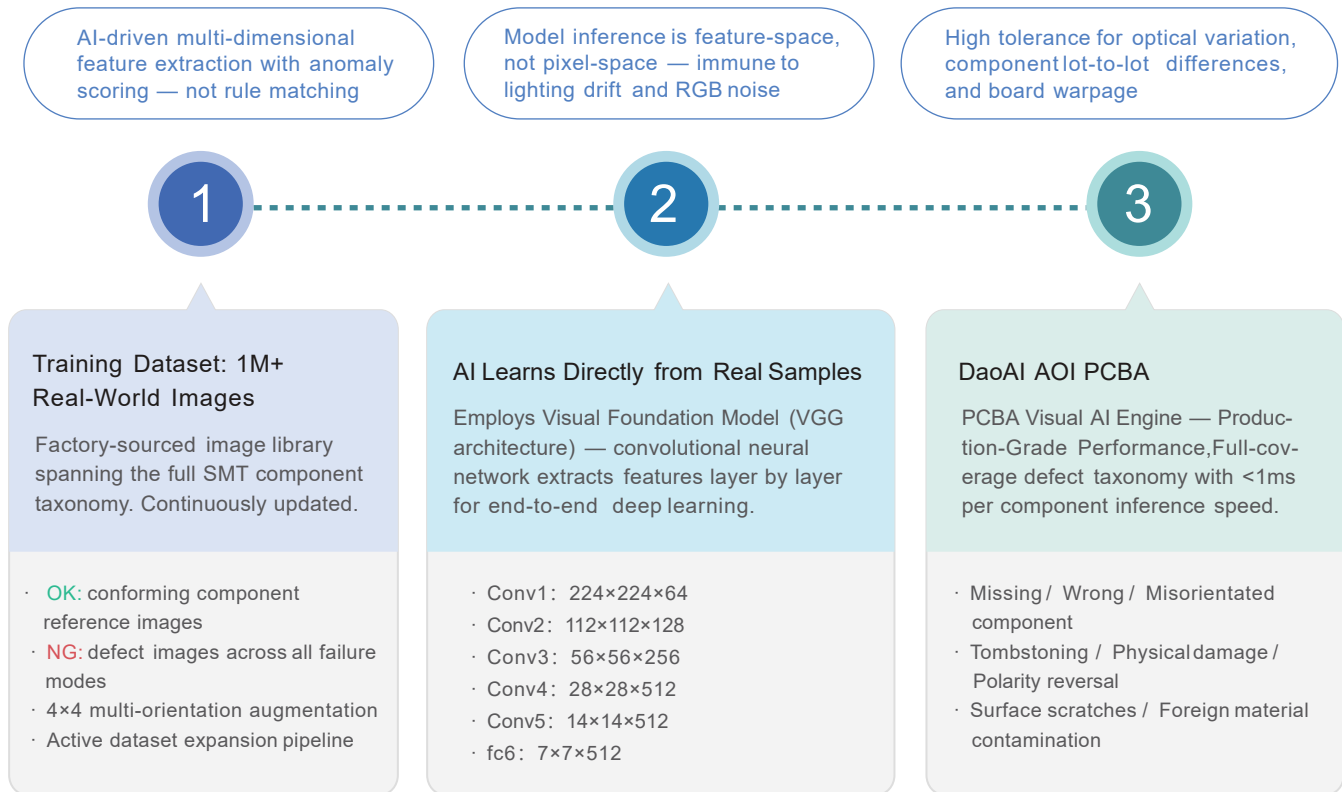


Reduction in Overall
Operating Costs

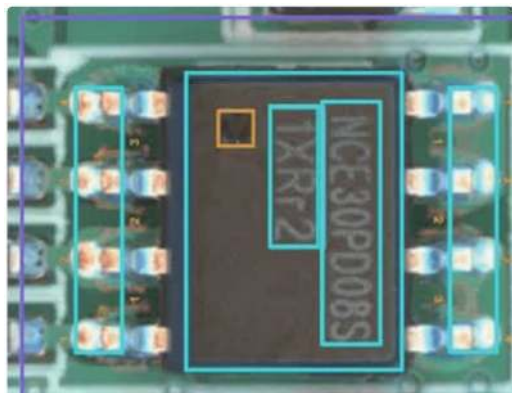
Reduces dependency on specialized labor, shortens line stoppage time, and lowers rework losses from escaped defects — delivering significant combined operational savings.

Technical Features

Built on an industry-leading visual foundation model and trained on large-scale real-world SMT production data. Industrial-grade accuracy from day one.



Technical Features



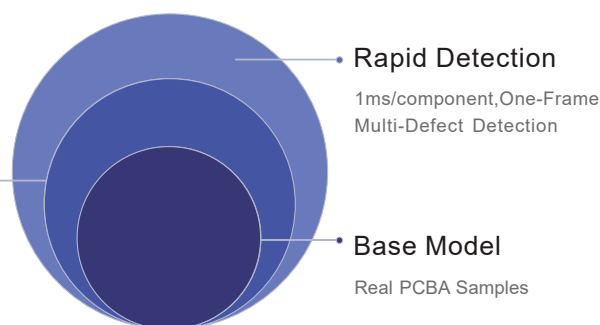
Processing Speed:
CPU/GPU parallel processing,
1ms/component | 45 cm²/s throughput

✓ One-Frame Multi-Defect Detection

A single inspection region simultaneously detects:
[Missing](#), [Wrong](#), [Reversed](#), [Damage](#), [Tombstoning](#).

Features and
Anomaly Scores

AI Automatic
Feature Extraction



Integration & Extensibility

DaoAI AI AOI is not an isolated inspection system, but an intelligent platform that can be deeply integrated into your existing manufacturing ecosystem, enabling data interoperability and comprehensive quality control.



MES Integration

MES connectivity via open API. Real-time defect data push enables full digital traceability, closed-loop quality control, and compliance-ready audit trails.



SPC Statistical Analysis

Built-in Statistical Process Control module automatically generates quality trend reports, helping management make data-driven decisions.



Remote Access Support

Log in via browser anytime to remotely view inspection status, access reports and exception records — no on-site presence required. Enables flexible multi-site management.



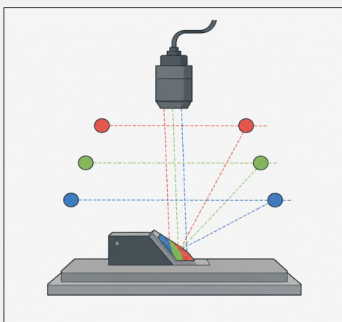
Offline Programming

Supports offline pre-programming — train and prepare new product models without disrupting ongoing production.



Open API Architecture: RESTful API design supports plug-and-play integration with MES platform. Protects existing IT investments and eliminates vendor lock-in.

Optical System Hardware Configuration



Tri-Color Dome Lighting

RGB Tri-Color LED with Multi-Angle Dome Light Design.

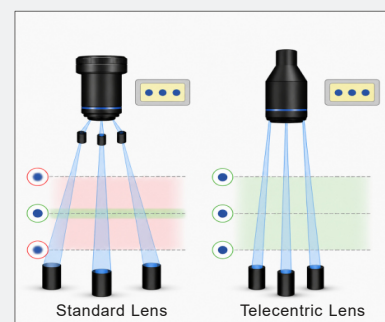
Provides accurate detection of surface contours and layer information on inspected objects.



High-Speed Industrial Camera

0.238 sec/FOV High-Speed Image Capture.

Ensures fast and clear image acquisition.



Dual Telecentric Lens

Minimizes image distortion and effectively suppresses reflected light interference.

Reduces shading caused by tall components and improves inspection accuracy.

Offline 2D PCBA AOI Turn-Key Solutions

P1



Offline 2D PCBA AOI

Standard Offline Inspection

Best fit: High-mix / low-volume (HMLV) shops, contract manufacturers, and facilities transitioning from manual visual inspection or legacy AOI.

Rapid deployment with zero CAD dependency.

P1L



2D Large PCB Inspection

Large PCB Inspection

Supports PCB sizes up to 680 × 510 mm.

Designed for large-format board inspection, improving both inspection accuracy and production efficiency.

P2



Advanced 2D Inspection

High-Accuracy (12MP/ 10μm)

Equipped with a 12MP high-resolution telecentric lens and 10μm precision imaging.

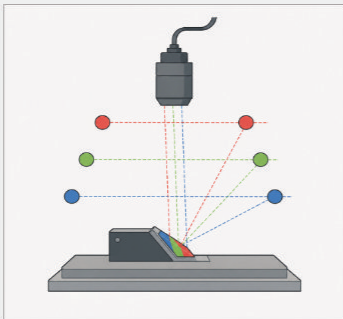
Suitable for precision electronic components, micro-packages, and other high-accuracy inspection applications.

P1/ P1L/ P2

Offline 2D PCBA AOI

Model / Spec		P1	P1L	P2
Vision System	Camera	5MP	5MP/12MP	12MP
	Resolution	15µm	15µm/12MP	10µm
	Light source	Multi-spectrum ultra-high-speed RGB six-channel light source		
	Lens	Dual telecentric optical lens		
	Speed	0.238 sec/FOV		
Conveyor & PCB Size	PCB size	50×50 mm – 470×330 mm	50×50 mm – 680×510 mm	50×50 mm – 470×330 mm
	PCB thickness	0.5 mm – 5 mm		
	Max. PCB Clearance	Top 25 mm; Bottom 110 mm		
	In-process PCB	±3 mm		
	Max. PCB thickness	2.5 mm		
Hardware	X/Y stage repeat positioning accuracy	±0.01 mm		
	Stage speed & PCB clamping	900 mm/s / automatic or manual		
	Power & drive	AC 220 V 50/60 Hz 1 kW / Panasonic AC servo motors + ground ball screws		
	Controller & system	Nvidia 3060 12 GB / Win 10 Enterprise / i5-12600 16-thread / 64 GB RAM / 23.8" LCD		
	Dimensions & weight	860 × 1040 × 1318 mm / 345 kg		
Inspection Capability	Component inspection	Missing, reversed, offset, polarity, wrong part, damaged, bent leads, foreign material on PCB, gold-finger solder contamination, glue overflow, etc.		
	Solder inspection	Excess/insufficient solder, billboarding, solder bridging, tombstoning, cold solder joints, lifted leads, solder balls, post-wave soldering (incl. through-hole components)		
	Special items	Inspects assembly and solder-joint quality for solder-paste, red-glue and post-wave-solder processes; 3D height measurement of components; lifted-lead / cold-joint detection		
Software	Inspection algorithms	AI embodied spatial-intelligence algorithms, feature-vector analysis, silkscreen OCV/OCR		
	Programming & marking	AI smart programming, CAD coordinate import, automatic component-library indexing, smart panelization, PCB Mark / panel Mark / bad-board Mark		
	Multi-angle inspection	0 - 360°, inspection accuracy = 1		
	Human-machine interface	Voice-command control of the software frees both hands and boosts efficiency		
	Reporting	Automatic SPC statistical analysis and data reports		
	Remote control	Via network: offline programming, remote real-time debugging, remote viewing / remote machine operation		

Optical System Hardware Configuration



Tri-Color Dome Lighting

RGB Tri-Color LED with Multi-Angle Dome Light Design.

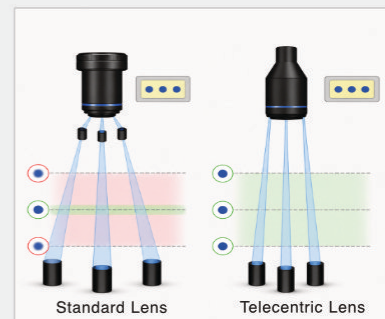
Provides accurate detection of surface contours and layer information on inspected objects.



High-Speed Industrial Camera

0.238 sec/FOV High-Speed Image Capture.

Ensures fast and clear image acquisition.



Dual Telecentric Lens

Minimizes image distortion and effectively suppresses reflected light interference.

Reduces shading caused by tall components and improves inspection accuracy.

Inline 2D PCBA AOI Solutions

P3



Inline 2D PCBA AOI

Single-rail automated production line

Seamlessly integrates into existing SMT lines, supporting single-rail automated conveyance for true inline, real-time inspection.

P3D



Dual-Rail High-Throughput Inline AOI

Dual-rail high-throughput production line

Dual-rail design maximizes throughput capacity, ideal for high-volume mass-production environments — the go-to solution for high-output factories.

P3 / P3D

Inline 2D PCBA AOI

Model / Spec		P3	P3D
Conveyor & PCB Size	Conveyor	Single lane	Dual lane
	Conveyor height	900±25 mm	
	PCB size	50 × 50 mm – 500 × 600 mm	50 × 50 mm – 500 × 325 mm
	PCB thickness	0.3 mm – 6 mm	
	Clearance	Top ≤30 mm, bottom ≤20 mm (custom on request)	
	Min. component	0201 components, 0.3 mm pitch and above ICs (01005 optional)	
	Board weight & air pressure	≤3 kg / 0.4–0.8MPa	
Vision System	Camera	26 MP high-speed global-shutter camera	
	Resolution	10 μm/pixel standard (FOV: 51 mm x 51 mm)	
	Light source	High-brightness RGB coaxial ring multi-angle LED	
	Lens	10 MP telecentric optical lens	
	Depth of field	8–10 mm	
Hardware	PCB flow direction	Left-to-right or right-to-left, selectable by button	
	PCB clamping	Automatically opening/retracting dual clamping fixture	
	PC configuration	Motherboard: ASUS B850-Plus; CPU: AMD Ryzen 9 7900X; RAM: Kingston DDR5 5600 64 GB; storage: WD 512 GB SSD + WD 2 TB HDD; GPU: RTX 4070	
	Cabinet power	AC 220 V ±10%, 50/60 Hz, rated power 1.2 kW	
	W-axis mounting	Dual M1.4 rail mounting; 2.3 rails with automatic adjustment	
	W-axis rail adjustment	Automatic width adjustment	
	Machine dimensions	1000×1500×1600mm (L×W×H), height excl. signal tower	
	Machine weight	1000 kg	
Inspection Capability	Component inspection	Missing, reversed, offset, polarity, wrong part, damaged, bent leads, foreign material on PCB, gold-finger solder contamination, glue overflow, etc.	
	Solder inspection	Excess/insufficient solder, billboarding, solder bridging, tombstoning, cold solder joints, lifted leads, solder balls, post-wave soldering (incl. through-hole components)	
	Special items	Inspects assembly and solder-joint quality for solder-paste, red-glue and post-wave-solder processes; 3D height measurement of components; lifted-lead / cold-joint detection	
Options	Software functions	Offline programming software, external barcode scanner, open MES traceability interface, repair-station host	

Inline PCBA Through-Hole AOI

A3



Inline PCBA Through-Hole AOI

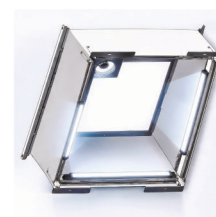
Best fit: Pre-wave soldering through-hole (insertion) inspection

Built on AI deep-learning algorithms with fully automatic programming. Bench-top straddle installation — no modification to the existing production line; height and width are adjustable.



High-Resolution Industrial Camera

26 MP color high-precision industrial camera.

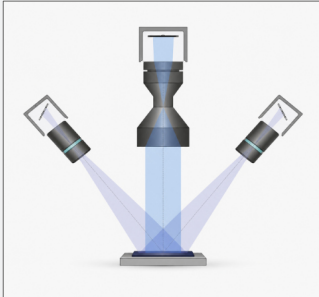


Optimized Lighting Design

High-brightness LED open-aperture flat light + high-brightness low-angle light.

Model/ Spec		A3
Vision System	Camera	26 MP color high-precision industrial camera
	Light source	High-brightness LED open-aperture flat light + high-brightness low-angle light
	Lens	18 mm industrial imaging lens
Conveyor & PCB Size	PCB Size	50×50 mm – 420×420 mm
	Mounting	Straddle-type structure; simple installation
Hardware	PC Configuration	CPU: i5-12600KF RAM: 64 GB GPU: RTX 3060 12 GB Storage: 512 GB SSD + 2 TB HDD OS: Windows 10 (64-bit) Professional, Chinese
	Machine Dimensions	841 × (1000–1200 adjustable) × (1435–1635 adjustable) mm
	Machine Weight	100Kg
	Machine Power	220 V, 10 A, 50–60 Hz
Inspection Capability	Component Inspection	Wrong part, missing component, polarity, skew, excess insertion, OCR
	Inspection Method	Deep-learning neural-network algorithms, image comparison, color comparison, contour recognition, OCR
	Software Functions	Automatic programming, offline programming, remote control, open MES traceability interface, SPC, repair-station host, mixed-board production mode (up to 5 types)

3D Optical System Hardware Configuration



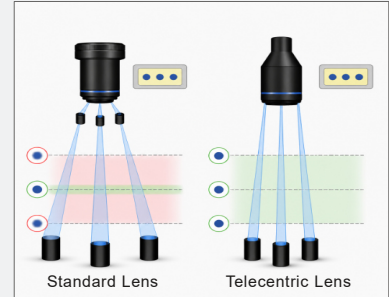
4-Directional Sömmmer Projection Light

Shadowing causes measurement blind spots and false defects. Our camera and light source are arranged at four directions and at specific angles, using a four-light design to eliminate shadow interference.



2D + 3D Simultaneous High-Precision Inspection

20 MP core lens with bidirectional structured-light projection, synchronized to achieve standard 20 μm -grade 3D high-precision inspection across the full 2D field of view — no 3D blind spots.



Dual Telecentric Lens

Minimizes image distortion and effectively suppresses reflected light interference.

Reduces shading caused by tall components and improves inspection accuracy.

Inline 3D PCBA AOI Solutions

P5



Inline 3D PCBA AOI

Single-rail automated production line

Seamlessly integrates into existing SMT lines, supporting single-rail automated conveyance for true inline, real-time inspection.

P5D



Dual-Rail High-Throughput Inline AOI

Dual-rail high-throughput production line

Dual-rail design maximizes throughput capacity, ideal for high-volume mass-production environments — the go-to solution for high-output factories.

P5 / P5D

Inline 3D PCBA AOI

Model / Spec		P5	P5D
Conveyor & PCB Size	Conveyor	Single lane	Dual lane
	Conveyor height	900±20 mm	
	PCB size	50 × 50 mm – 500 × 600 mm	50 × 50mm – 500 × 300 mm
	PCB thickness	0.6 mm – 5 mm	
	Clearance distance	Top side 50 mm, bottom side 40 mm	
	Height accuracy	≤6 μm (with calibration tool)	
	Min. component size	0603 (mm) / 0201 (inch)	
Vision System	Camera & 3D technology	21 MP high-speed industrial camera / 4-direction Scheimpflug projection units	
	FOV	50 mm × 40 mm	
	Optical resolution	10 μm	
	Inspection speed (range)	>10 cm ² /s	
	Max. height measurement range	25 mm	
Hardware	PCB flow direction	Left-to-right or right-to-left (user-definable)	
	Drive system & ball screws	X/Y/Z, AC servo motors / ±0.01 mm	
	PC configuration	Motherboard: ASUS B850-Plus; CPU: Intel I9 12900K; RAM: Kingston DDR5 5600 64 GB; storage: WD 512 GB SSD + WD 2 TB HDD; GPU: RTX 4070	
	Machine power	AC 220 V, 50/60 Hz international power inlet, power 8.8 kW	
	Air supply	4–6 bar	
	Machine dimensions	L1290 × W1710 × H1990 mm (excl. signal tower and other accessories)	
Inspection Capability	Component inspection	Missing, tombstoning, billboarding, polarity, misalignment, wrong part, damaged, flipped, lifted component, foreign material, lifted solder joints, silkscreen	
	Solder inspection	Solder wetting height, solder wetting volume %, excess solder, insufficient solder, bridging, lifted leads, gold-finger surface scratches / solder contamination	
	Min. component size	0603 (mm) / 0201 (inch)	
	Special items	Inspects assembly and solder-joint quality for solder-paste, red-glue and post-wave-solder processes; component height measurement; lifted-lead / cold-joint detection; micro-height inspection	
Options	Software functions	Offline programming software, external barcode scanner, open MES traceability interface, repair-station host	

DAOAI

Connect with us

Make DaoAlvision intelligence your factory's dedicated AI

business@daoai.com

daoai.com

The information in this publication is based on internal research and evaluation by DaoAI Robotics Inc. at the time of release and may be updated without prior notice. All company and product names mentioned in this catalog are trademarks of their respective owners. © 2026 DaoAI Robotics Inc. All rights reserved.