# HHO Smart AVI Vision Inspection Systems

HHO SMART

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產業製程自動化 / 機械手臂整合自動化 / 夾治具設計

**We can provide you with standard pre-engineered equipment, modified to your needs or do custom machine per your request. We can design a suitable solution for : end user or resellers: equipment factory /equipment distributor. We are experts at designing and setting the defect identification you need in each system to specifically detect your defined “OK/pass” and “NG/don’t pass” criteria. All equipment comes with 1 year warranty.**

# AVI Surface Detection/Inspection Systems

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**Why Automated Visual Inspection?**

Manual inspection can't match AVI's speed, consistency, or ability to handle microscopic or high-volume checks. Systems like 2D or 3D vision with cameras, lasers, or AI-driven analytics are tailored to these materials and parts, often integrated into production lines for real-time quality control.

**Automated Visual Inspection** (AVI) is widely used across industries to ensure quality, consistency, and compliance by detecting defects, verifying assembly, and measuring features on materials, parts, and components. The specific items requiring AVI depend on the industry, manufacturing process, and product complexity. Our equipment design and application focuses on small to medium sized material parts, components, products. Below is a representative list, reflecting common applications in sectors like electronics, automotive, aerospace, pharmaceuticals, and consumer goods:

**Integrated Circuits (ICs)**: Dies, chips (for bonding issues, scratches, or misalignment).
**Printed Circuit Boards (PCBs)**: Bare boards, assembled boards (for solder joint defects, missing components, or shorts).
**Castings/Forgings/Stampings other Precision Machined parts (**for porosity, shrinkage, or flash).
**Syringes**: Needles, barrels (for burrs, contamination, or dimensional errors).
**Pills/Tablets**: Pharmaceuticals (for color, size, cracks, or imprint clarity).
**Packaging**: Blister packs, vials (for seal integrity, labeling errors, or contamination).
**Bottles/Cans**: Plastic, glass, metal containers (for dents, label misalignment, or fill levels).
**Packaging**: Cardboard boxes, plastic wraps (for tears, print quality, or barcode readability).
**Optics**: Lenses, mirrors (for scratches, coating uniformity, or optical distortions).

# Lead Frame AVI inspection System: LF1

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- This inspection equipment integrates multi-axis platform control, uniquely designed optical imaging modules and image processing technology, to provide the needed solution.
- Mates easily with the customer's station, to apply to inline inspection after plating and stamping. 100% inspection before shipment.
- The system also supports automatic marking and automatic classification functions.
- We developed a set of dedicated intelligent detection software, In conjunction with top professional machine vision software designers.
- Can stably detect: missing material, scratches, staining, denting, burrs, and foreign matter, and defects such as white haze and burning.
- Saves a lot of time for visual inspectors improving product competitiveness.

# Lead Frame Post-Stamping Inline AVI Inspection system: LF-2

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**Processing station: After stamping**

- **Purpose: The system is installed behind and connected to the stamping machine for real-time inspection. If continuous defects are found, the stamping machine can be auto stopped to prevent continuous defective products from being produced.**
- **Inspection items: crushing/burrs/scratches/punch breakage/backfilling/pin warping or deformation.**

- **It can be used in products such as LED/IC lead frames or stamping parts to perform online appearance defect inspection after stamping.**
- **Machine Specifications:**
- **L x W x H: 700 x 600 x 1600mm**
- **The stamping speed is 9-18/min and 100% full inspection can be achieved**
- **Minimum detectable defect size: 100x100μm**
- **When a defect is detected, connection to the punching machine can auto-stop processing.**
- **Camera Type: Area Scan (5M or adjust per customer needs)**
- **Lens FOV: Max 85mm**
- **Supports front and rear material inspection**

# Defect Detection Examples

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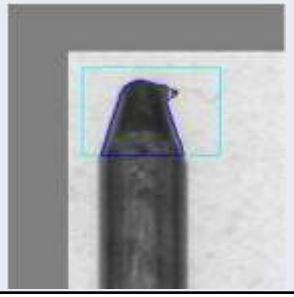
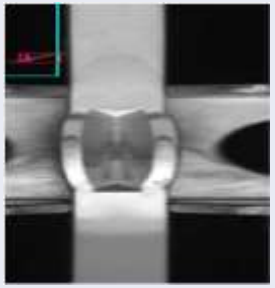
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Dent | Burr | Scratch | Copper Wire |
|  |  |  |  |

# Lead Frame Post-Plating Inline AVI Inspection System: LF-3

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**Processing station: Post-plating**

- **Purpose: The system is set up for real-time inspection after plating, and can support NG Marking function to mark NG locations.**
- **Detection for: white haze/discoloration/missing plating/uneven plating/deformation/foreign matter.**

- **It can be used in products such as LED/IC lead frames or electroplated parts to perform inline appearance defect inspection after electroplating.**
- **Machine Specifications:**
- **L x W x H: Designed according to the customer's production environment**
- **The electroplating speed is 9-18/min and 100% full inspection can be achieved**
- **Minimum detectable defect size: 100x100μm**
- **When a defect is detected, it supports the Marking function to mark the NG area**
- **Camera Type: Area Scan (5M or adjust per customer needs)**
- **Lens FOV: Max 85mm**
- **Supports front and rear material inspection**

# Defect Detection Examples

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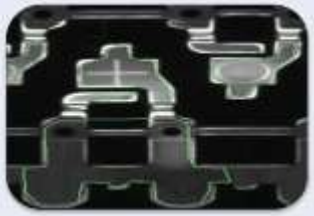
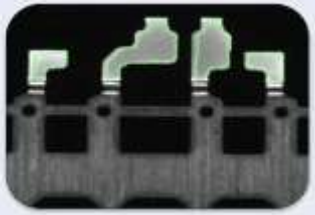
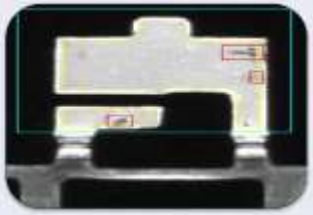
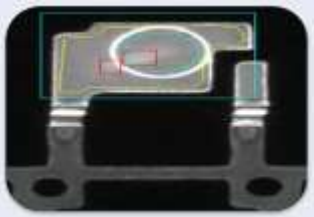
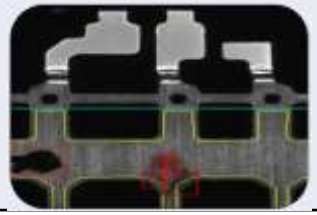
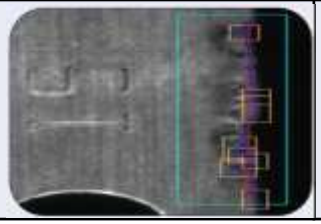
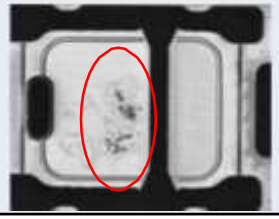
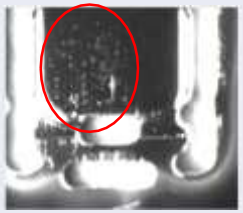
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| White Haze | Discolored | Un-plated Spot | Uneven Plating |
|  |  |  |  |
| **Anomaly Type** | **Anomaly Type** | **Anomaly Type** | **Anomaly Type** |
| Contamination | Deformation | Irregular Pattern | Pockmarks |
|  |  |  |  |

# Lead frame Mass Production AVI inspection system: LFMP

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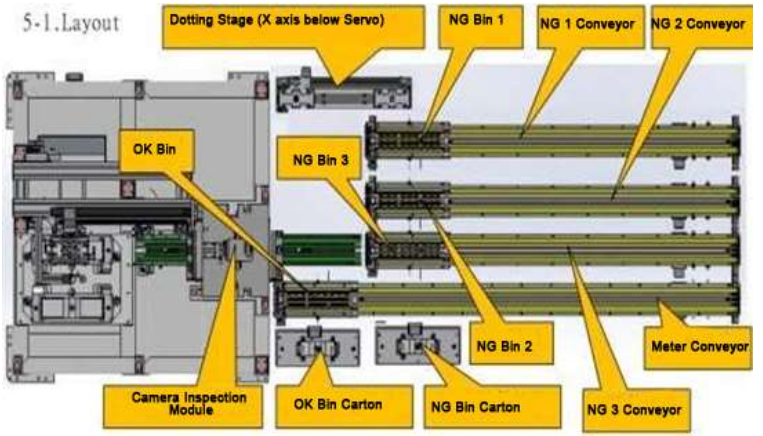
**Processing station: Pre-shipment**

- Purpose: To conduct 100% Auto inspection before shipment.
- Reduces inspection miss rate, averts customer complaints, and ensures consistent quality of shipments
- Reduces the overkill rate and avoids scrapping OK products as NG products saving on costs.
- NG products are classified into functional and non-functional types to improve review efficiency.
- Detection for: missing material, scratches, pollution, crushing, burrs, foreign matter, white haze, burning and other defects.
- It can be used to inspect appearance defects of products such as LED/IC lead frames or substrates.
- Machine Specifications:
- L x W x H: 3500 x 1500 x 1800mm
- Workable lead frame/substrate size: Max 285x85x2mm
- Minimum detectable defect size: 30x30μm
- Exception types can be divided into Bins: Bins are labeled according to the required types.
- Abnormal product marking: Automatic ink dot (can also be combined with laser marking upon request)
- Camera Type: Line Scan (8K, 16K)
- Lens FOV: Max 85mm
- UPH: 300~420 pieces
- Supports front and rear material inspection



# Defect Detection Examples

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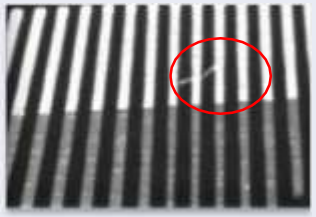
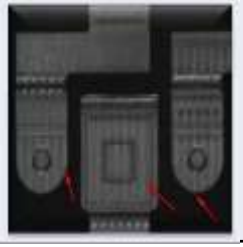
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Material Gap | Metal Burr | Bent Corners | Bright Spots |
|  |  |  |  |

# Ceramic Substrate/Circuit Board Testing AVI Inspection System: CB-1

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- This automatic optical inspection system combines 2-4 sets of high-resolution Line Scan cameras, exclusive patented lighting and custom visual inspection software.
- The system can be equipped with functions such as automatic marking and automatic classification to save on visual inspector time in reviewing NG.
- The system can be used with production lines for in-process inspection or 100% inspection before shipment.
- It can stably detect scratches, contamination, bruises, burrs, foreign matter, excess conductors, conductor deformation, small black holes and other defects.
- UPH can be up to 360 pieces based on 4.5” size, which saves on visual inspection staff need, enhancing product competitiveness.

# Ceramic Substrate Mass Production AVI Inspection System: CBMP

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Processing station: before shipment

- Purpose: To conduct 100% automatic inspection before shipment.
- Reduces inspection  miss rate, averting customer complaints, and ensuring consistent quality of shipments
- Reduces the overkill rate and avoids scrapping OK products as NG products thereby saving significant cost.
- NG products are classified into functional and non-functional types to improve review efficiency.
- Inspection items: dark cracks, chipping, depressions, convex spots, holes, protrusions and other defects
- Machine Specifications:
- L x W x H: 2000 x 1800 x 1500mm
- Workable ceramic substrate size: 4.3 inches / 4.5 inches / 5 inches / 5.5 inches * 7.5 inches
- Minimum detectable defect size: 30x30μm
- Exception types can be divided into Bins: Bins are divided according to the types required.
- Abnormal product marking: Automatic ink dot (can also be combined with laser marking upon request)
- Camera Type: Line Scan (8K, 16K)
- Lens FOV: Max 110 mm
- UPH: 360 pieces
- Supports front and rear material inspection

# Defect Detection Examples

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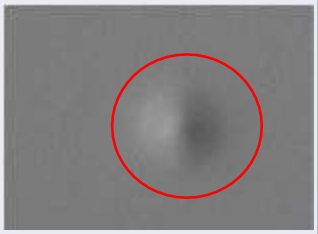
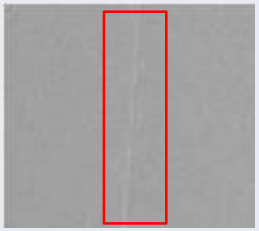
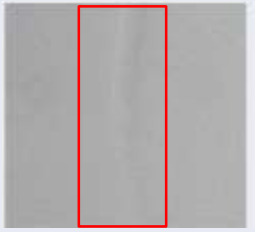
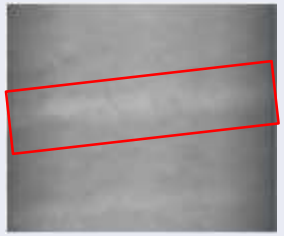
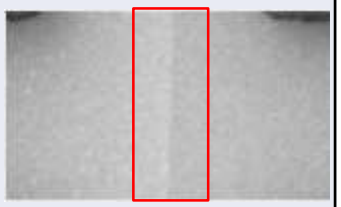
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Bumps | Dents | Scratches | Creases |
|  |  |  |  |
| **Anomaly Type** | **Anomaly Type** | **Anomaly Type** | **Anomaly Type** |
| Shrinkage Marks | Striping | Blotch | Dark Crack |
|  |  |  |  |

# Ceramic PCB Batch AVI Inspection System: CB-2

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**Processing station: Pre-shipment**

- **Purpose: To conduct 100% automatic inspection before shipment.**
- **Reduces inspection miss rate, avert customer complaints, and ensures consistent quality of shipments.**
- **Reduces the overkill rate and significantly saves cost by avoiding erroneous scrapping of OK products.**
- **NG products are classified into functional and non-functional types to improve review efficiency.**
- **Detection for : substrate cracks, conductor scratches, excess conductors, plating penetration and skipped plating defects**
- **Machine Specifications:**
- **L x W x H: 2000 x 1800 x 1500mm**
- **Workable ceramic substrate size: 4.3 inches /4.5 inches /5 inches /5.5 inches * 7.5 inches**
- **Minimum detectable defect size: 30x30μm**
- **Exception types can be divided into Bins: Bins are labeled per customer requirements.**
- **Abnormal product marking: Automatic ink dot (can also add laser marking upon request)**
- **Camera Type: Line Scan (8K, 16K)**
- **Lens FOV: Max 110 mm**
- **UPH: 360 pieces**
- **Supports front and rear material inspection**

# Defect Detection Examples

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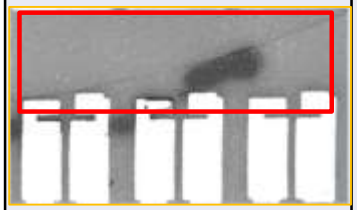
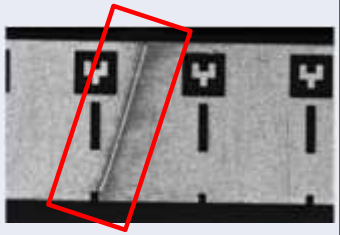
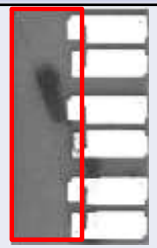
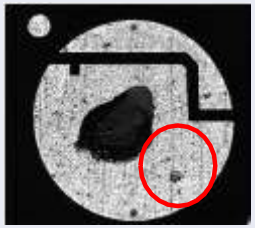
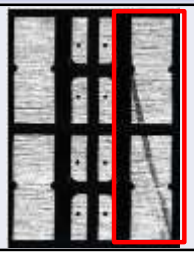
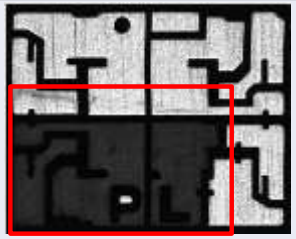
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Substrate Dark Crack | Coating Dark Cracks | Plating | Edge Discoloring |
|  |  |  |  |
| **Anomaly Type** | **Anomaly Type** | **Anomaly Type** | **Anomaly Type** |
| Hidden Substrate Cracks | Plating Indent | Coating Scratches | Plating Gap |
|  |  |  |  |

# Semiconductor Packaging and Testing AVI Inspection system: SC-1

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- The system integrates platform control technology and uses high-resolution Line cameras to perform in-line inspection during the manufacturing process.
- Exclusively designed high-brightness LED light source and innovative image processing technology.
- The system resolution is up to 3.5 um/Pixel.
- Customized machine design can be carried out according to production line space.
- Can stably detect: deviation, scratches, cracks, pollution and other defects.
- Inline instant 100% inspection prevents excessive production of defective products, saving significantly on production costs.

# Post Die Bond inline AVI inspection system: DB-1

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**Processing Station: Post-Die Bond**

- Purpose: Uses camera to detect the film lamination quality in real time on the machine, to prevent continuous defective production.
- Detection for: chip glue sticking/chip chipping/chip scratches/chip offset.
- The machine design is compatible with the current production space and no changes are required.
- Machine Specifications:
- Width: 800 mm Depth: 1200 mm Height: 2206 mm

- Machine function:
- Applicable products: FCCSP/ FCBGA.
- Directly connected to Die Bond, perform In-line inspection, Carrier in/Carrier out.
- After inspection, the samples can be diverted to the Reflow machine.
- Resolution up to 2.5um/pixel
- Line Scan speed: 40mm/sec. (can be adjusted according to product accuracy requirements)
- Conveyor speed: 25mm/sec.~250mm/sec.
- UPH: 15kps/hr (taking Package size 7*7 as an example)
- Can be used with SECS/GEM function

# Defect Detection Examples

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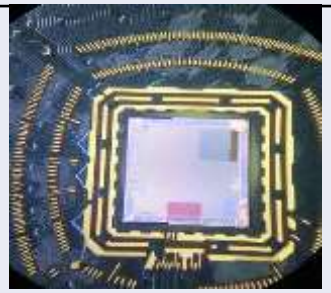
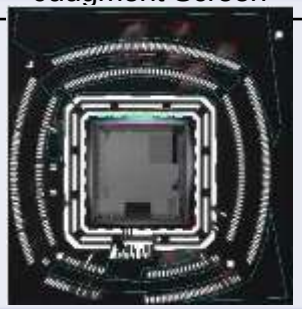
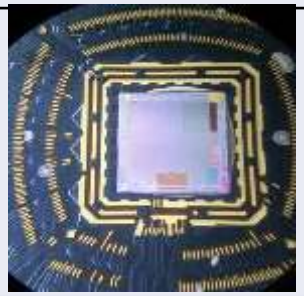
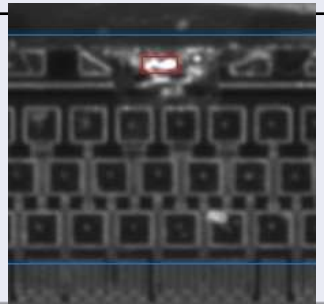
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Glue Spray | Judgment Screen | Glue Spray | Judgment Screen |
|  |  |  |  |
| Chip chipping | Judgment Screen | Chip chipping | Judgment Screen |
|  |  |  |  |

# Mass Production Semiconductor Packaging AVI Inspection System: SCMP

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**Processing station: Pre-shipment**

- Purpose: To conduct 100% auto inspection before shipment.
- Reduces missed inspection rate, averts customer complaints, and ensures consistent quality of shipments
- Reduces the overkill rate and avoids scrapping OK products as NG products to save costs.
- NG products are classified into functional and non-functional types to improve review efficiency.
- Detection for: scratches, contamination, crushing, discoloration, foreign matter and other defects

| No | Specifications | |
|---|---|---|
| 1 | Tray Size | 135 x 325mm |
| 2 | Tray Disk Detection Time (Scan & Detection) | <30 sec/tray(per station) Based on Aprox 168 ea (8 x 12) UPH=8k |
| 3 | Camera Specifications | 8K Line CCD x 4 Sets (1 per station) Pixel Size=0.0035 x 0.0035mm |
| 4. | Lens Specifications | Actual FOV=140mm |
| 5. | System Resolution | Resolution=0.025mm/Pixel |
| 6. | Detection Rate (per station) | Over 99% |

# Defect Detection Examples

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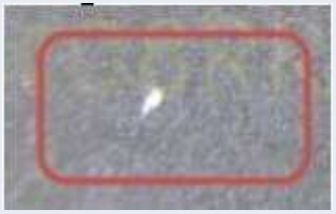
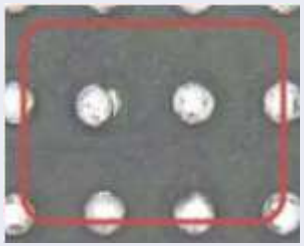
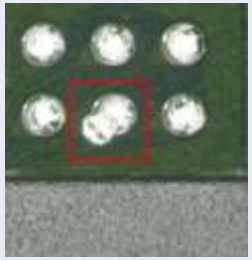
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Scratches | Holes | Edge Chipping | Pollution |
|  |  |  |  |
| Solder Ball Offset | Missing Solder | Malformed Solder | Foreign Matter |
|  |  |  |  |

# Food Product Date Coding Inline Detection System: FP-1

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- Uses a set of high-speed imaging area cameras to perform real-time inline inspection
- Detection Speed：0.5 sec /piece, up to 100-120 pieces can be detected in 1 minute
- With NG automatic removal mechanism, NG is sent to NG storage box at the same time, the relevant test data and test results are digitally processed and recorded. The digital images facilitate related process analysis and quality reporting.

- Detection function:

1. Missing: Letters, Single word or all words
2. Single word: Missing dots or printing failures exceeding N * M areas
3. Spacing variation between points
4. Supports multiple fonts

# Food Product Date Coding Inline Detection System: FP-1

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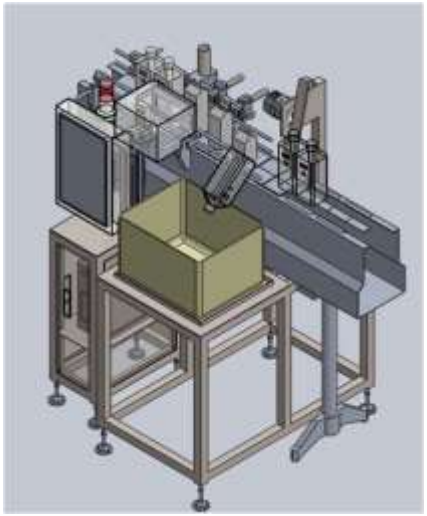
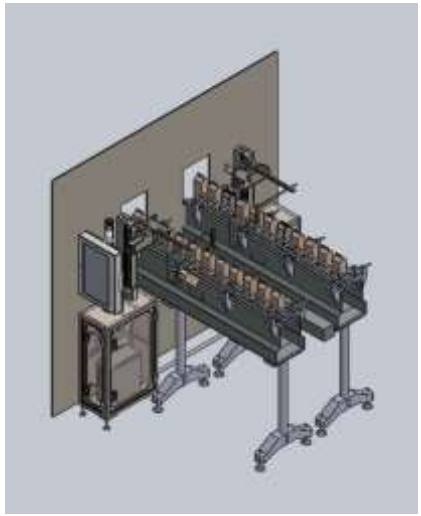
- Machine Specifications:
- Width: 535 mm
- Depth: 590 mm
- Height: 1610 mm
- Camera: You can choose 1.3M/ 2.3M/ 3M/ 5M high-speed imaging Area camera, according to production requirements.
- Production line: 1 machine x 1 line (lower left) or 1 machine x 2 lines (lower right)





# Contact Lens Inline Inspection System: CL-1

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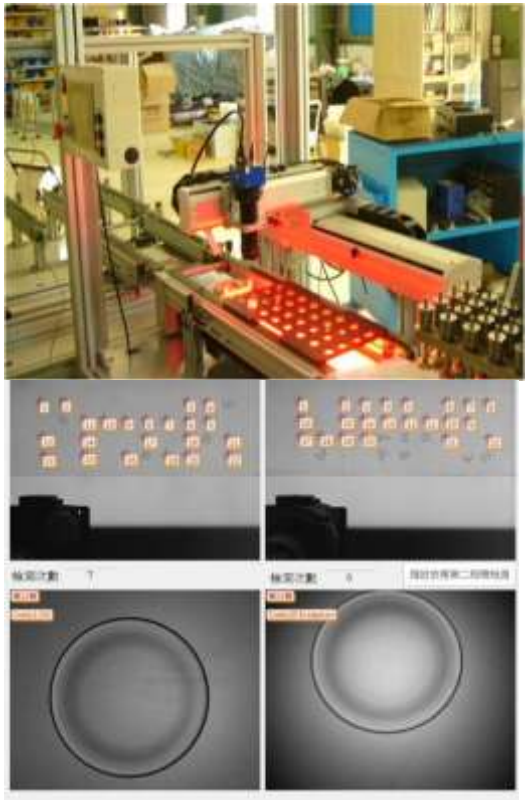
- Use 1-3 sets of high-speed imaging Area cameras for inspection. Detection speed: 1sec / Piece, UPH can reach 3600 pieces
- At the same time, the relevant test data and test results are digitized
- The data is stored in a bit-by-bit image format, which is convenient for the process analysis and quality reporting.
- Detection function:
- Visible area attachments, stains, bubbles and scratches
- Edge deformation, missing corners, cracks, ring un-broken
- Pattern Completeness
- Roundness and size measurement
- Camera: You can choose 2.3M/3M/5M high-speed imaging area camera, according to production requirements.



# Defect Detection Examples

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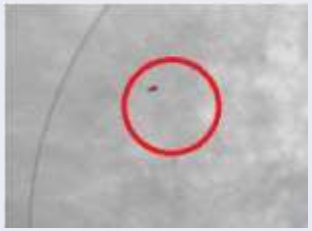
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Inadequate Cutting | Attached Matter | Missing Edge | Crack |
|  |  |  |  |
| **Anomaly Type** | **Anomaly Type** | **Anomaly Type** | **Anomaly Type** |
| Bubble | Scratch | Blotch | Dirty |
|  |  |  |  |

# FPCB: Flexible Boards  Mass Production AVI inspection system : FPCB-1

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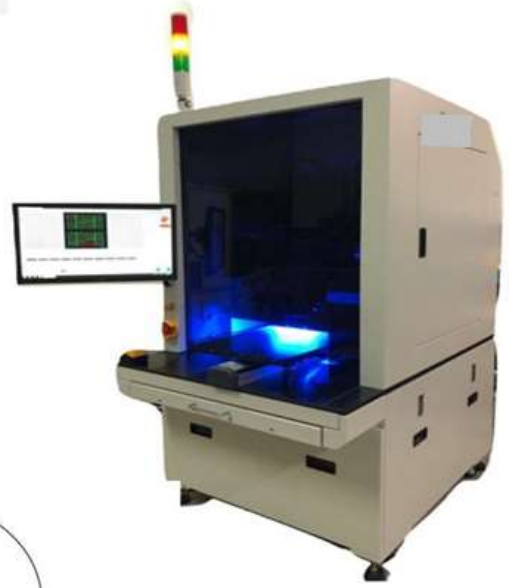
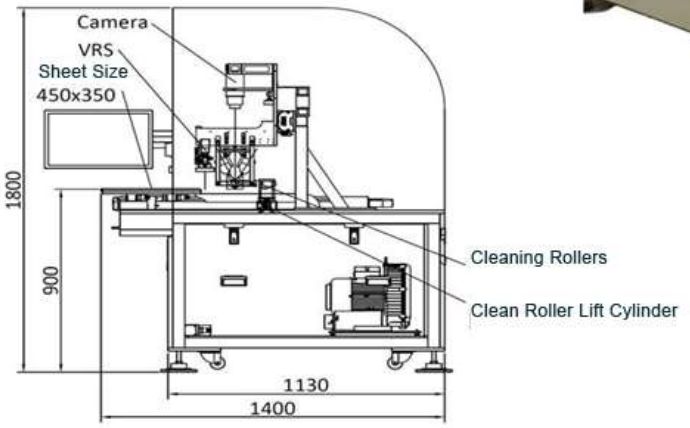
- Use 1-2 sets of high-resolution line cameras
- Equipped with smart automation AI, 100% inspection is performed before shipment.
- Relevant inspection , measurement data and test results are digitally processed and recorded.
- Digital image storage facilitates subsequent use in process analysis (machine learning) and quality reporting.
- One-time scanning detects gold finger and cover film half-etching defects
- Our uniquely designed detection software achieves a high detection rate.
- The resulting low overkill rate goal greatly reduces the need for re-inspection personnel.
- Can stably detect: copper leakage, scratches, poor covering film, creases, and defects such as dents and glue spots on the gold.





# Defect Detection Examples

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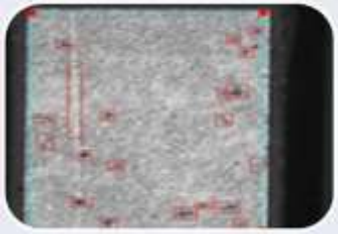
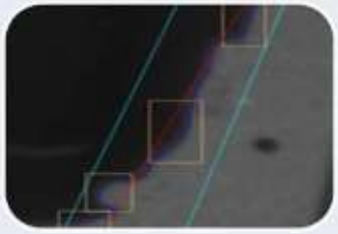
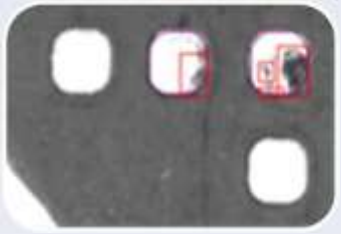
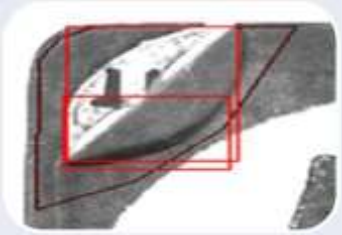
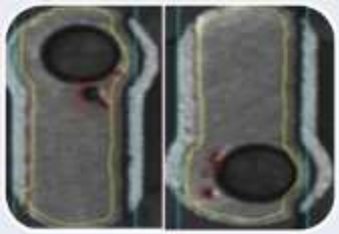
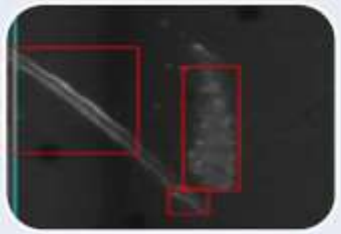
| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Pad Copper Leak | Pad Scratch | Poor Film Cover | Gold Finger Nickel Leak |
|  |  |  |  |
| Dent | Crease | Glue on Gold | Foreign Matter |
|  |  |  |  |

# Mobile Phone Back Cover AVI Inspection System

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**Application:**

**※ Single mobile phone back cover**

**※ Whole devic**

**Product technical parameters:**

**※ Number of cameras: 7K Line*1+ 5M Area dynamic*2 + 5M Area static*4**

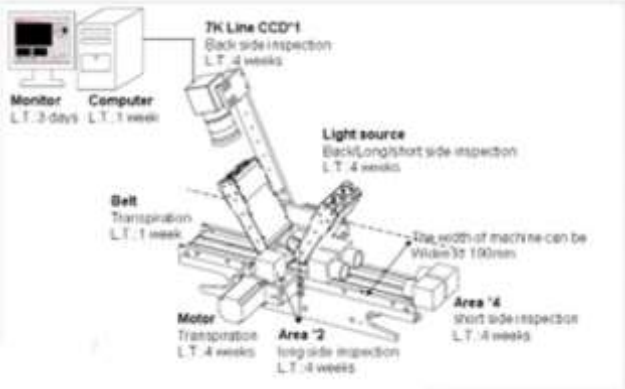
**※ System resolution: 20μm/pixel**

**※ Minimum detectable defect size: 100*100μm**

**※ UPH: ≒ 360 pieces**

**※ Detection size: 200mm*90mm**

***Can be adapted for other device inspection***




Detected Defect Examples


| Place | # | Type of Defect | Record | Defect Size WxL (um) | Remark |
|---|---|---|---|---|---|
| 正面 | 1 | Scratch |  | 80 * 11000 | Detectable |
| | 5 | Particles |  | 300 * 300 | ---- |
| | 6 | Foreign Matter |  | 500 * 700 | ---- |
| | 7 | Dent |  | 160 * 200 | ---- |
| 右側 | 8 | Scratch |  | 100 * 1660 | ---- |
| | 11 | Scratch |  | 100 * 700 | ---- |
| 底 | 12 | Depression |  | 160 * 160 | ---- |
| 頂 | 15 | Dirt |  | 1240 * 800 | Detectable |

Partial Set of Defects

# Packaged Drug AVI Inspection System: PD-1

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**Application:**

**※ Pre-packaging**

**※ Tablet screening**

**Product technical parameters:**

**※ Module size: 297(L)*297(W)*497(H)**

**※ Number of cameras: 5M Area color dynamic*2 (front and back)**

**※ System resolution: 50μm/pixel**

**※ Minimum detectable defect: 300um*300um**

**※ UPH ≒ 7K particles**

| | |
|---|---|
| Tablet | Bare tablets, film-coated tablets, sugar-coated tablets (tablets with printing on one or both sides, tablets with scoring lines and notched marks) |
| Size | Round pill: diameter 5~12mm, thickness 2~8mm<br>Rectangular Pill: width 5~12mm, diameter 5~21mm, thickness 2~8mm |
| Items | Stains, foreign objects (1mm in diameter or more), cracks, fragments, deformation, different colors |

# Heat sink AVI batch inspection system

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**Application:**

**※ After stamping/forging**

**※ After electroplating**

**Product technical parameters:**

**※ Machine size: 2800(L)*1900(W)*1850(H)**

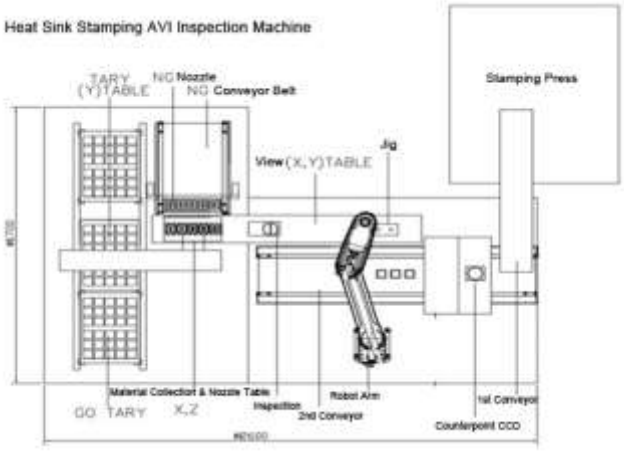
**※ Number of cameras: 8K Line*1+5M Area dynamic*2**

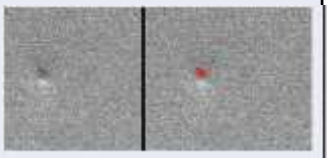
**※ System resolution: 10μm/pixel**

**※ Minimum detectable defect size: 30μ*30μm**

**※ UPH: ≒ 550-600 pieces**

**※ Heat spreader size: 250mm*70mm**




| Anomaly Type | Anomaly Type | Anomaly Type | Anomaly Type |
|---|---|---|---|
| Crease | White Haze | Scratch | Dent |
|  |  |  |  |

# 3D Laser Sensor

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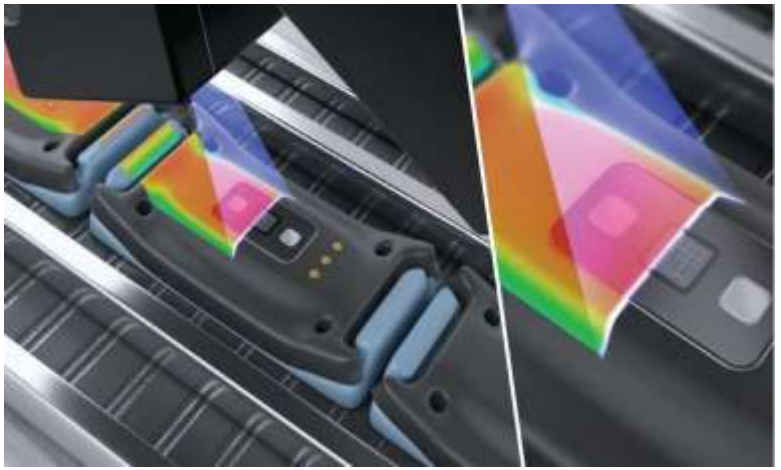
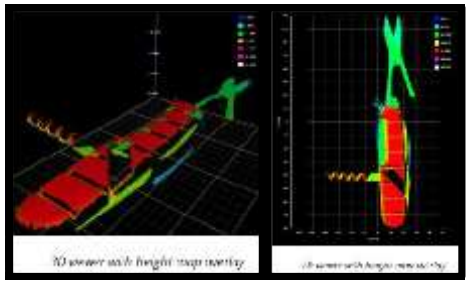
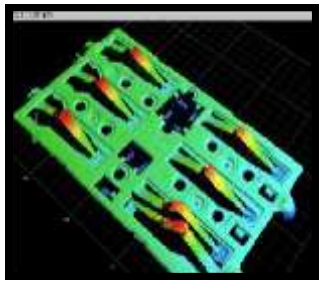
**Application:**
**※ Appearance inspection**
**※ Appearance inspection**
**Product technical parameters:**
**※ Point laser and Line laser are both available**
**※ Z-axis resolution can be up to 1.8μm/pixel**
**※ General object surface or chip, glass surface can be detected**
**※ Depending on the object and needs, there are various specifications to choose from**
**※ Multiple machines can be used together**

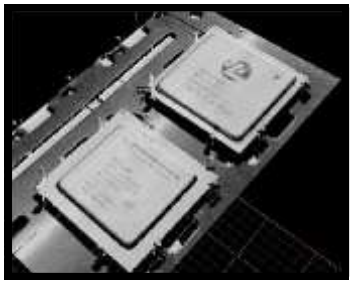




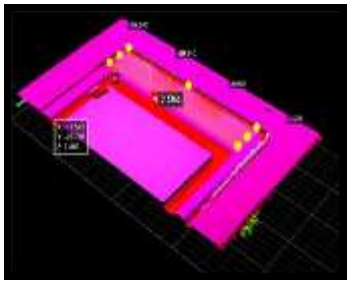
2D and 3D image presentation



Stamped parts testing application



Heat Sink Appearance Inspection Application



2.5D IC Testing Application

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designing and setting the defect identification you need in each system to specifically detect your defined “OK/pass” and “NG/don’t pass” criteria. This is the key point of AVI, harnessing the technology to fulfill your goals and objectives.

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