

# MVP Aurora – Dual-Technology, Multi-Side Package Inspection

MVP Aurora, Ensuring Device Packaging, Reliability and Performance  
Paul Groome, Machine Vision Products. July 2025

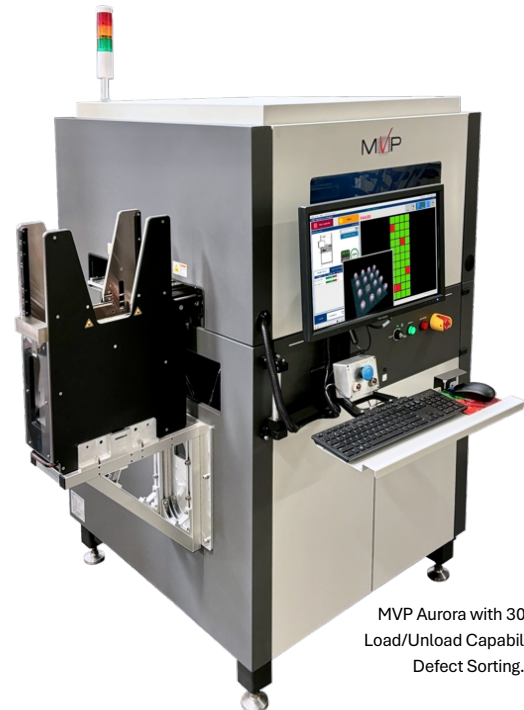
BGA's, QFP's, Connectors, PLCC's, LCC's, and other package styles are widely used in electronics manufacturing. Inspection and measurement of these devices is critical to ensure their form factor, (Pin Positions and Coplanarity) marking and molding. Given the nature of hidden solder joints on final assemblies, finding any issues prior to the device shipment is key to increasing manufacturing yields and quality. Below is an overview of the inspection requirements, metrology and techniques deployed by Machine Vision Products to ensure the quality these devices.

## Implementing Package Inspection – Base Requirements

To ensure full measurement and defect coverage device package inspection involves multiple technologies and inspection techniques. At minimum a system needs to include:

- Accurate Shadow Free 3D Capabilities to:
  - Measure and Inspect pin/ball/bump heights
  - Measure and Inspect Coplanarity
  - Measure Package Warpage
  - Identify Package Damage
- Optics With Structured Lighting to:
  - Inspect Part Markings and Quality
  - Provide Ball/Pin Measurements
  - Check Pitch and pin/ball/bump Positions
  - Measure Package Dimensions
- Tray Handling
  - Automatic Loading (in-line or From Stack)
  - Tray Lifting
  - Automatically Handle Stacks of Thick and Thin Trays

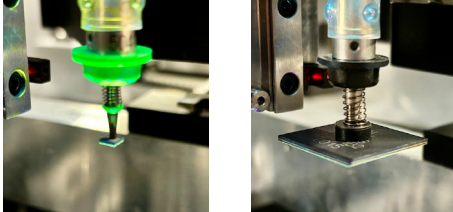
- Part Sorting
  - Keep Original Stack with Good Parts
  - Move Defective Parts from Inspection Tray -> Bad Parts Tray (Separate Tray)
  - Refill Inspection Tray by Moving Good Parts (Separate Tray) -> Inspection Tray
  - Return Passing Parts.  
Inspection Tray -> Inspection Tray
- Data Traceability
  - Part, Lot and Tray Reports
  - Measurement Data and Customer Reports
  - Sql Based Data Storage



MVP Aurora with 30 Tray  
Load/Unload Capability and  
Defect Sorting.

MVP's Aurora platform provides automated capabilities that meet all these requirements. Additionally, the systems provide the smallest footprint that can work for low volume operations while scalable for high volume manufacturing.

Furthermore, the system is capable to work with any size products. **There is no limitation to the size of the package inspected as the Aurora is not limited to the FOV of the system.**



Interchangeable Vacuum Nozzles on MVP's Aurora Platform

## Inspection Capabilities

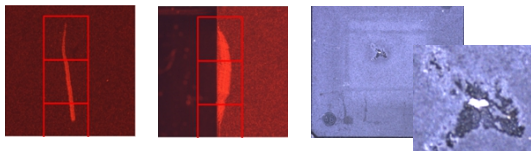
### 1. Top-Side - Optical Inspection Capabilities

First, while still in the tray, the top side of the all the packages are inspected. This needs to be done with a telecentric optics system that allows for high resolution and metrology.



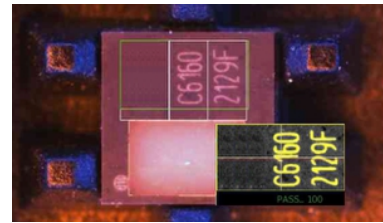
JEDEC Tray – Topside Inspection

- The optical inspection requirements need to include:
  - Capability to inspect for physical damage, FM or surface contamination
  - Provide metrology for part size measurements and lead dimensions
  - Inspect for edge damage, scratches and metallization defects



Example Edge, Metallization and Surface defects found on MVP's Aurora system

- Inspect part markings and print quality

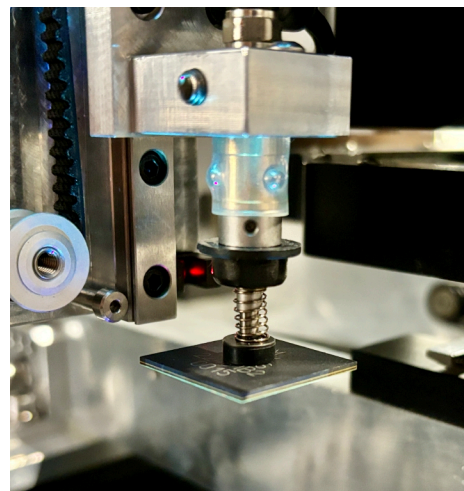


MVP Aurora System Inspecting Part Markings

- Inspect other aspects of the product:  
Additional components, epoxy, underfill

### 2. Bottom-Side - 3D Inspection

To ensure a clear view of the device balls, bumps or pins, the part will be picked from the tray and moved to the bottom side 3D inspection projector. This allows for all pin/balls to be imaged without obstruction or shadows. In addition, to allow the inspection of any size devices the system shouldn't be limited by a FOV. To allow the system to work with any dimension devices

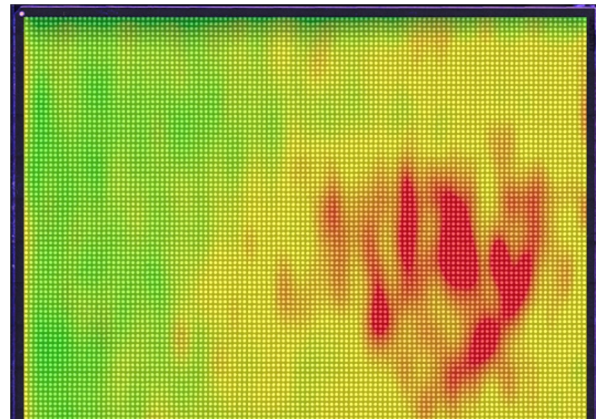


Vacuum or gripper head lifting device for bottom side inspection

The Aurora platform has the capability to step parts, allowing registration, complete inspection and full metrology across any size device.

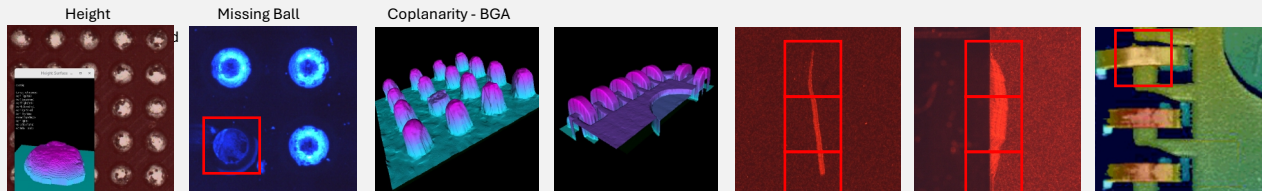
### 3D Measurement Capabilities Need to Include:

- Solder ball, bump or pin integrity
- Measure size, position and pitch
- Measure width, length, and height
- Surface inspection
- Edge cracks, FM, scratches
- Ball/pin coplanarity
- Measure per ball/pin heights
- Measure ball/pin coplanarity (either seating plane or regression plane)
- Highest level defect detection



Coplanarity measurement map, large ball count BGA

#### Defect Examples

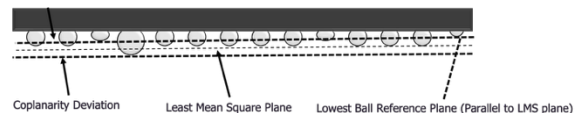


MVP Aurora Provides Packaged IC and Component Inspection. examples for: Ball Grid Arrays (BGA), Quad Flat Packs (QFP), Thin Quad Flat Package (TQFP), Chip Scale Package (CSP), Wafer-Level Package (WLP), Quad Flatpack No-Leads (QFN), Bump Chip Carrier (BCC), Land Grid Array (LGA), Micro-Coil Spring Arrays and more...

### Quality Standards

The Aurora system is flexible and allows adherence to multiple industry standards. At a minimum a system should adhere to the following:

- JEDEC Publication 95 Design Guide 4.10E (Tray Handling Standards)
  - The Aurora system provides the flexibility for stacks of 30 thin tray or 20 thick trays without any reconfiguration
- SECS/GEM Communications Standards
  - MVP's Aurora fully complies with the SECS (SEMI Equipment Communications Standard)/GEM (Generic Equipment Model) standards
- JEDEC Publication 95 Design Guide 4.17C (Coplanarity Measurement Standards)
  - MVP's software allows for coplanarity measurements that meet all standards. You can use the regression plane, seating plane or min-max height
- And NIST Traceability is Essential
  - All are verified against NIST traceable verification plates

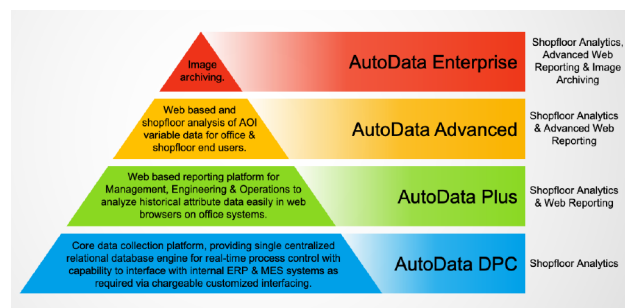


These standards define guidelines for trays, quality, alignment, and acceptable defect levels. MVP's software tools and hardware capabilities allow for compliance for all requirements.

## Real-Time Process Control and Traceability

Achieving reliable packaging/balling/bumping processes also depends heavily on accurate process control during manufacturing. In real-time, all metrology data, heights and coplanarity measurements are kept in our AutoData, SPC and traceability tools. These capabilities include:

- Device pass/fail data by tray, lot or serial number
- Device image by tray, lot or serial number
- Parametric data per device, including coplanarity, pitch, dimensions
- Traceability for devices manufactured over multi-year manufacturing cycles
- Review devices off-line using MVP's iRepair tools
- In real-time, monitor yields, UPH, OEE, uptimes, trend analysis
- All verified defect devices are sorted to separate trays, ensuring the purity of the initial stack of trays



MVP's AutoData Product Capabilities

## In Conclusion

With resolutions to meet any device requirements the Aurora provides the capabilities to improve all back-end packaging processes.

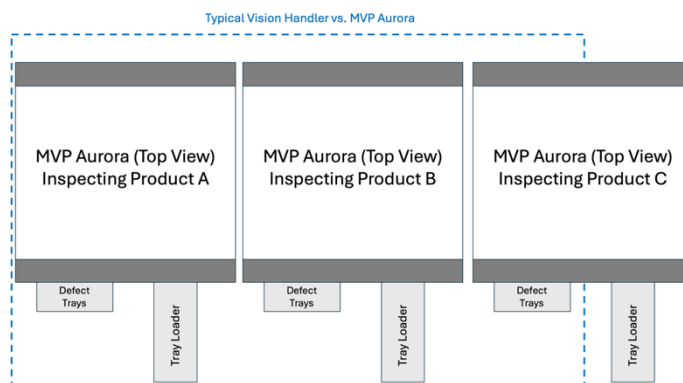
## Inspection and Metrology.

MVP's Aurora systems, by providing the most advanced inspection and metrology combined with their adherence to industry standards can inspect and measure any device.

In addition, the Aurora provides dual-technology, multi-side, optical and 3D inspection capabilities that provide the best measurements when they are needed.

## Flexibility.

The Aurora's small footprint and flexibility allows for multi-site deployment. Multiple systems can be deployed in the same space as a typical vision handler system. In addition, each system can be used inspecting different parts, increasing your process capability.



## Quality.

Quality and standards are followed with all of MVP's tools and software. As well as providing defect detection and metrology, the Aurora system automatically sorts bad devices to defect trays ensuring the accuracy of the parts in the good trays.

## Traceability.

All data for each tray, lot, and device is recorded in MVP's AutoData tools to be retrieved for review and traceability as required.

When you incorporate all of the Aurora's flexible inspection capabilities, will not only ensure the quality of your packaging process but also improves your customer satisfaction and their confidence in your delivered product.