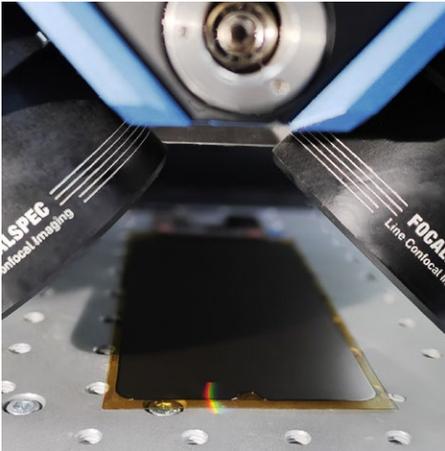


INDUSTRY APPLICATION:
OLED DISPLAY INSPECTION



OLED Display Inspection with 3D Sensor Technology

An organic light-emitting diode (OLED or Organic LED) is an LED in which the emissive electroluminescent layer is a film made from organic compounds that emit light in response to an electric current.

OLEDs are used to create digital displays in devices such as TV and computer monitors, and portable systems such as smartphones, smart watches, tablets, and handheld game consoles. OLED displays provide a wide 160° viewing angle and exceptional definition for both monochromatic and color display, with high brightness and low power consumption.

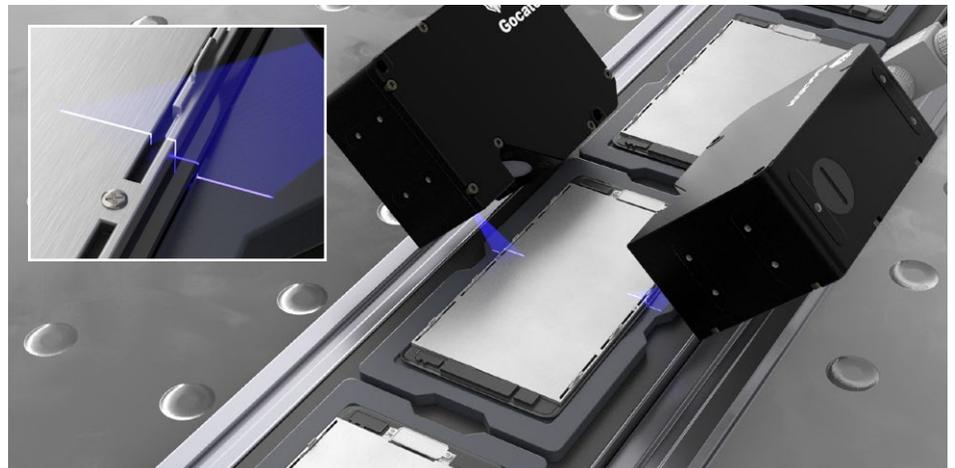


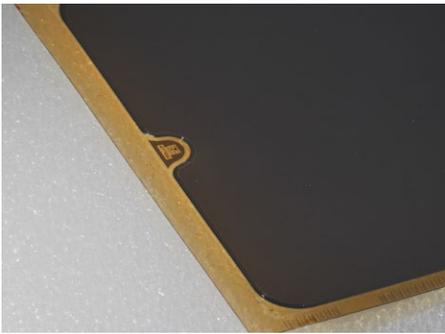
OLED display manufacturing is a multi-step process comprising two primary streams:

1. Cells
2. Modules

Various steps within each of these manufacturing streams require 100% quality inspection using 3D machine vision technology to capture height data, carry out surface defect inspection, and scan transparent materials such as glue and the multiple reflective glass layers that make up an OLED display.

A combination of Gocator® 3D Smart Sensors and FocalSpec® 3D Line Confocal Sensors provides a fast, accurate, and cost-effective solution for these applications. By networking multiple Gocator® or FocalSpec® sensors, engineers are able to build an **inline system** for high throughput assembly verification.

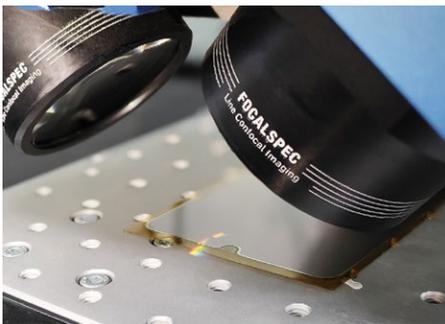




Cells: Curved Edge Defect Inspection

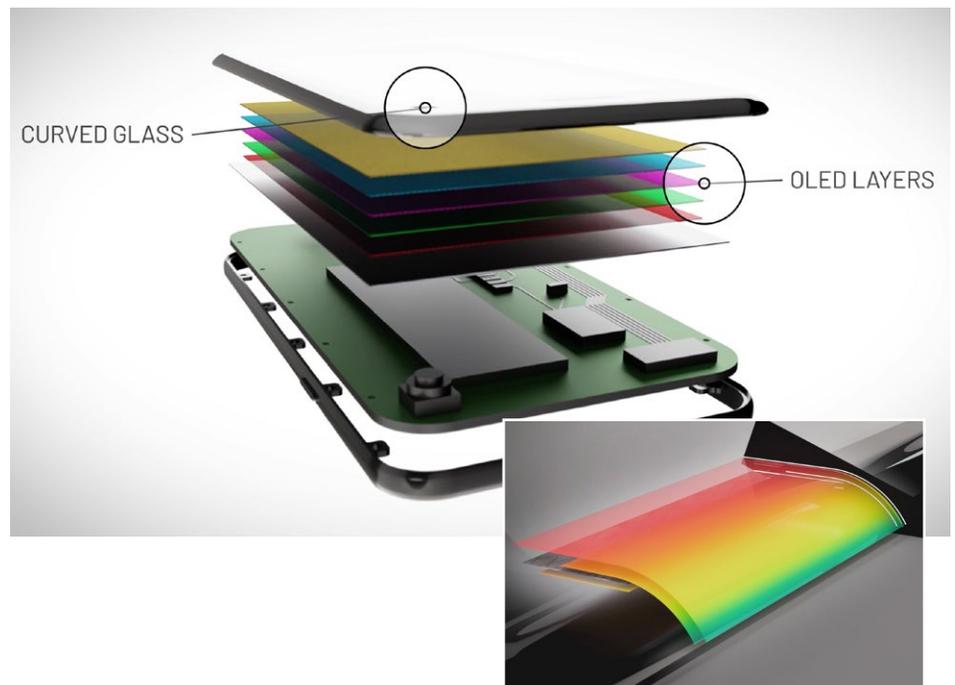
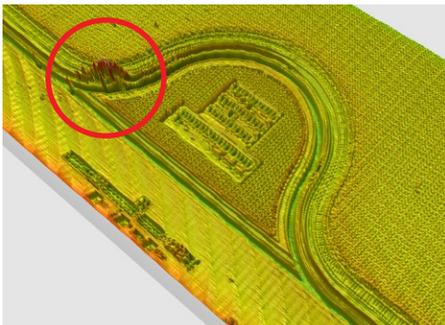
In this stage, laser technology is used to cut the display panels into dewdrop screens and notched screens to meet the specific needs of customers or product design.

Due to the high intensity of the laser light, a large temperature gradient often occurs in the chamfered (i.e., curved) edge of the screen. This heat fluctuation can cause deformations along the display edge, resulting in both micro- and macro-level defects such as thermal stress fractures and cracking.



Cells: Multi-layer OLED Inspection

This key application requires the sensor to capture the many layers that make up an OLED display to carry out defect inspection. FocalSpec's unique line confocal technology can scan and build 2D and 3D data for up to five transparent layers from just a single scan of the display surface.



Solution



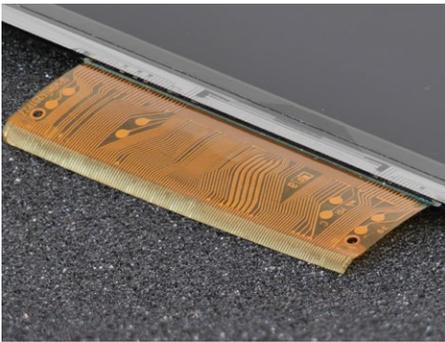
Sensor Type

FocalSpec® 3D Line Confocal Sensor

Inspection Task

Delivers excellent scanning performance on curved edges (± 20 deg), and precision inline defect detection such as chipping and cracking—regardless of the thickness of the glass.

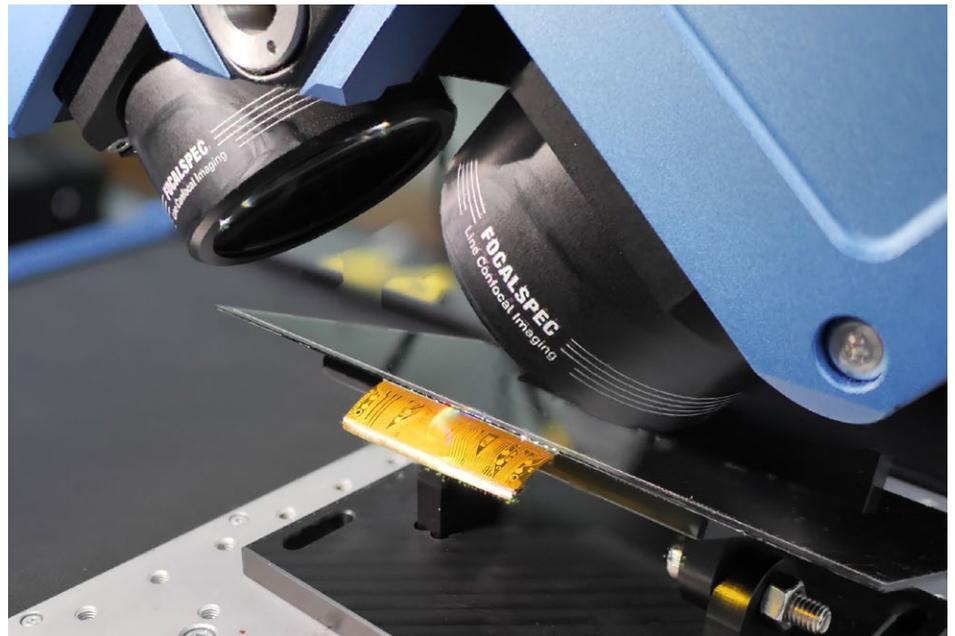
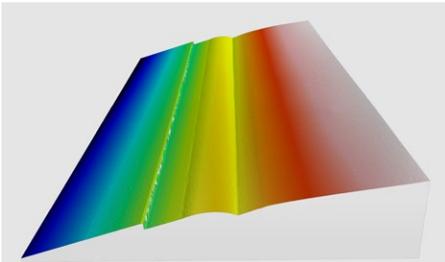
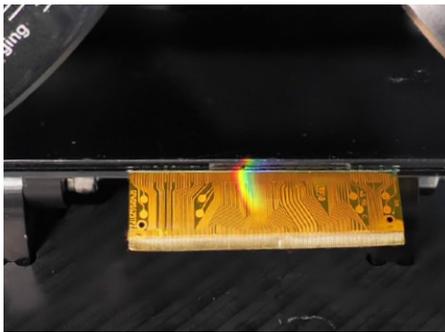
Combination of 3D tomography (multi-layer) and 2D intensity imaging identifies defects such as delamination, scratches, or dust on the surface or the inside layers of an OLED display.



Modules: UV-Protective Glue Dispensing Inspection

UV-protective glue provides a high light transmittance, fast curing, tough adhesive layer that is resistant to vibration and temperature variation and provides excellent insulation. The UV protective adhesive strengthens the bonding of ICs (integrated circuits) and FPC (flexible printed circuit) substrates and makes the assembly waterproof, dustproof, and protects against salt spray (from outdoor environments).

In addition to the protection of solder joints, UV-protective glue is typically used for bonding, sealing, insulating and fixing of electronic components, inductors, capacitors, circuit boards, cables, data lines, and connectors.



Solution

Sensor Type

Gocator® 3D Line Profiler

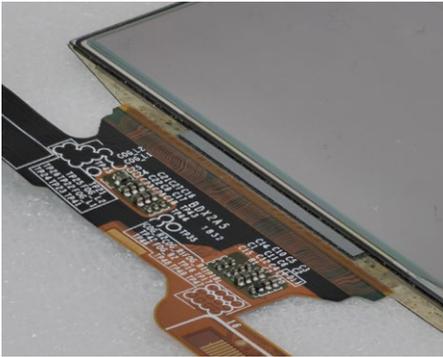
FocalSpec® 3D Line Confocal Sensor

Inspection Task

Accurately measures and inspects glue volume before it is cured, which prevents the occurrence of excess adhesive volume or broken glue beads.

Captures precision height data and volume of the highly transparent glue.

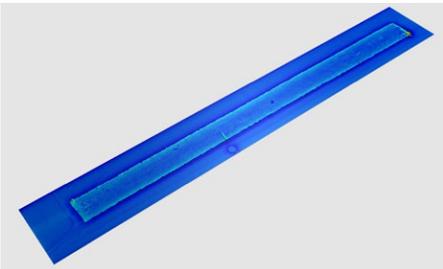




Modules: ACF Glue Flatness Inspection

Anisotropic conductive film (ACF) is a lead-free and environmentally friendly adhesive interconnect system that is commonly used in liquid crystal display manufacturing to form the electrical and mechanical connections from the driver electronics to the glass substrates of the liquid crystal display (LCD). ACF bonding is the process of creating electrical conductive adhesive bonds, with anisotropic conductive adhesive/film, between flexible and rigid circuit boards, glass, panel displays, and flex foils.

Quality inspection of the ACF adhesive requires a 3D solution to ensure correct position, surface flatness, and to ensure that the entire IC bonding area is sealed. This application also requires defect inspection such as identifying air bubbles in the adhesive.



Solution

Sensor Type

Gocator® 3D Line Profiler

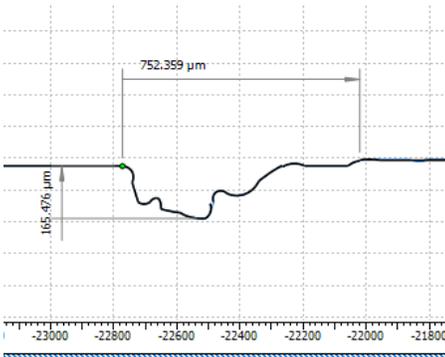
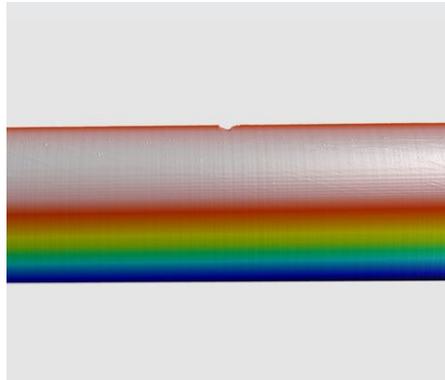
Inspection Task

Scans and inspects the flatness of the glue. After the bonding is completed, Gocator ensures the bonding position is accurate and there is no warpage after peeling away the protective film.

FocalSpec® 3D Line Confocal Sensor

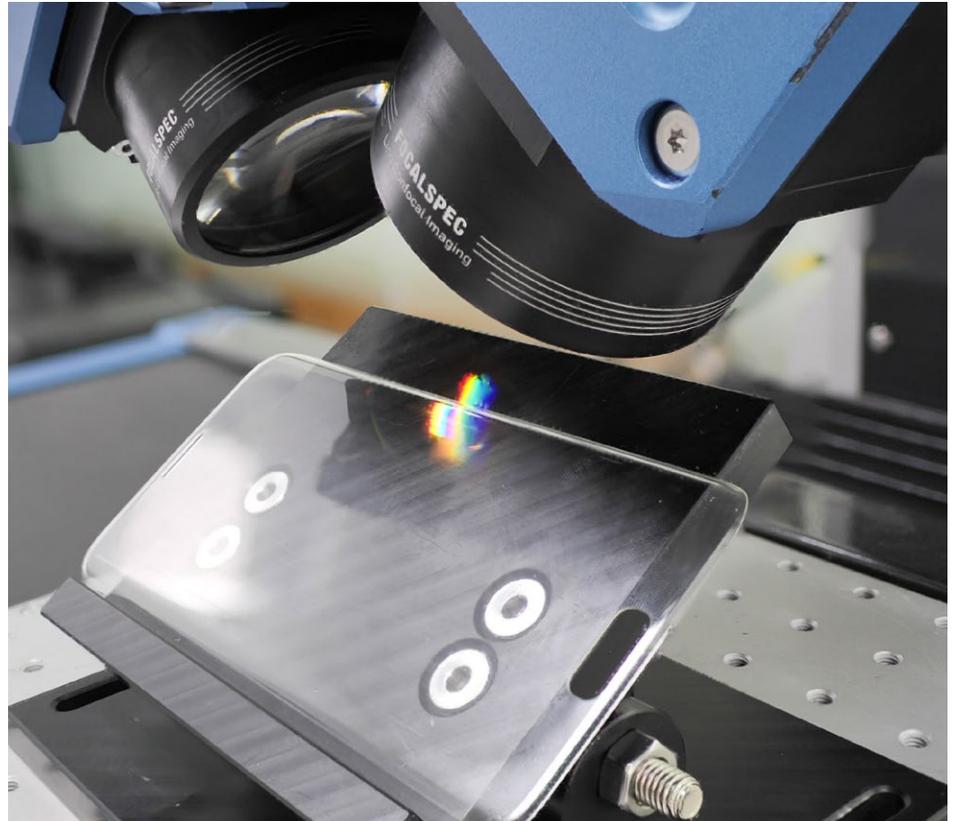
Scans and inspects surface defects such as bubbles and impurities inside the ACF glue.





Modules: 3D Glass Measurement and Edge Defect Inspection

In this stage, manufacturers need to ensure the quality of the finished OLED 3D display glass after the hot bending process is complete. Quality inspection is required in order to detect defects such as scratches and bumps in the finished 3D glass. This application prevents the failure of the entire module.



Solution

Sensor Type

Gocator® 3D Line Profiler

FocalSpec® 3D Line Confocal Sensor

Inspection Task

Provide precision measurement of display glass and plastic/metal display housing simultaneously.

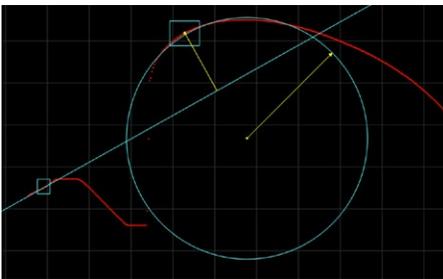
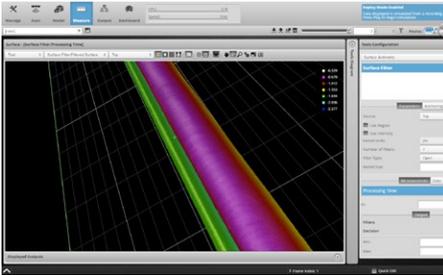
Generates sub-micron 3D surface data used for inspection of fine details such as glass roughness and submillimeter defects.





Modules: FPC Bending Inspection

Bend radius of the FPC is determined by its thickness and layer structure. This layer structure has to be inspected to ensure the lamination at both ends of the centerline of the curved surface are symmetrical. In addition, there are small defects that need to be identified, such as delaminations and copper foil fractures in the FPC that occur due to excessive bending.



Solution

Sensor Type

Gocator® 3D Line Profiler

Inspection Task

Measures the bending radius and position of the bending area. The bending radius needs to meet a specified threshold in order to ensure that the bonding wires do not break. The correct position of the bending area needs to be verified in order to ensure that the top module does not overlap with the bending area. This type of inspection is required for both OLED displays and cell phone housings.



FocalSpec® 3D Line Confocal Sensor

Scans and inspects surface defects caused by bending of the FPC.



Conclusion

OLED display manufacturing is a complicated, multi-step process that requires 100% quality control. The combination of Gocator 3D smart sensors and FocalSpec 3D Line Confocal Sensors delivers a complete solution for this demanding manufacturing process.

It's Better to Be Smart.

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