Решения для систем Smart Vision

Описание

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Cell Phone Glass Assembly Inspection

In this consumer electronics (CE) application, a laser sensor scans the cell phone glass edge and generates high-resolution 3D data. The data is then used to extract edge and gap features, and to measure flushness and offset of the glass and frame

The Requirements

High resolution is required for this application in order to accurately measure demanding flushness and offset tolerances. This requires a sensor that can sample data at 8 microns across a gap (X resolution) and deliver repeatable height data down to 0.2 microns (Z performance) to measure offset.

Other critical requirements for the sensor in this application include low sensitivity to the target angle; the ability to eliminate noise caused by laser scattering at the edge of the target surface; accurate measurement of different surface colors and surface types (e.g., coated, glossy, transparent); and a low total cost of ownership to ensure maximum profitability. In addition, scanning and inspection must be carried out at speeds greater than 5 kHz in order to handle a continuous flow of production.

The Challenge

The problem is that no solution currently available on the market meets all of these application requirements. Standard laser profilers are highly sensitive to target angle and are therefore unable to generate sufficient data on specular surfaces. Coordinate measurement machines (CMMs) use probes that cannot measure the narrow gaps between glass and frame. Confocal technologies are relatively large and expensive with limited fields of view and measurement range

The sensor scans the glass and metal frame simultaneously

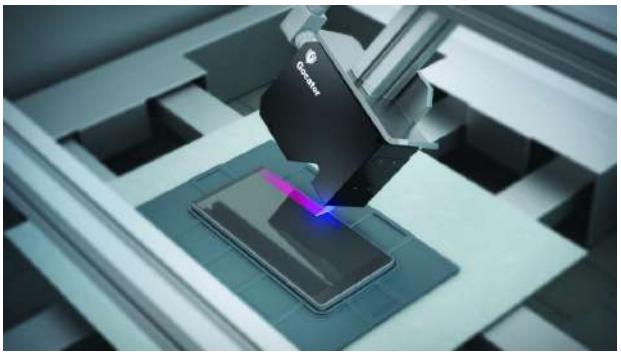
A Smart 3D Solution for Scanning Glass

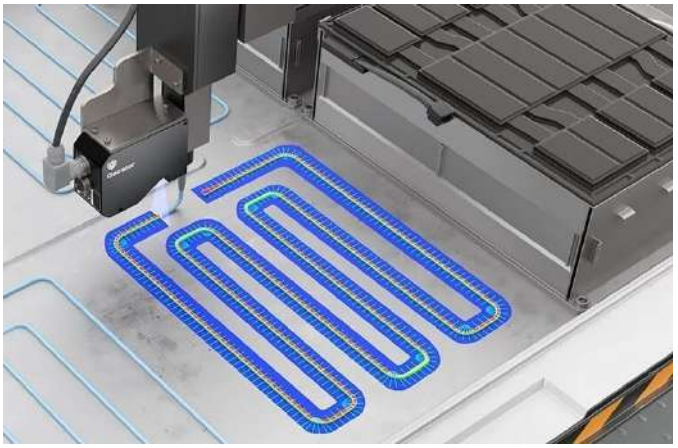
Gocator® 2512 is a new smart 3D laser profiler optimized for scanning glass and other specular surfaces. This sensor is precision-engineered to overcome the limitations of standard line and point laser profile sensors, as well as CMMs and confocal scanners.

The 2512 delivers superior 3D data on glass and other specular surfaces, with onboard software to not only scan but carry out measurement and decision-making at speeds up to 10 kHz. Specialized laser projection technology allows the 2512 sensor to be mounted at a variety of surface angles for superior performance on a wider range of surface materials (e.g., anti-glare, coated/uncoated, low/high contrast, transparent, glossy).

The Implementation

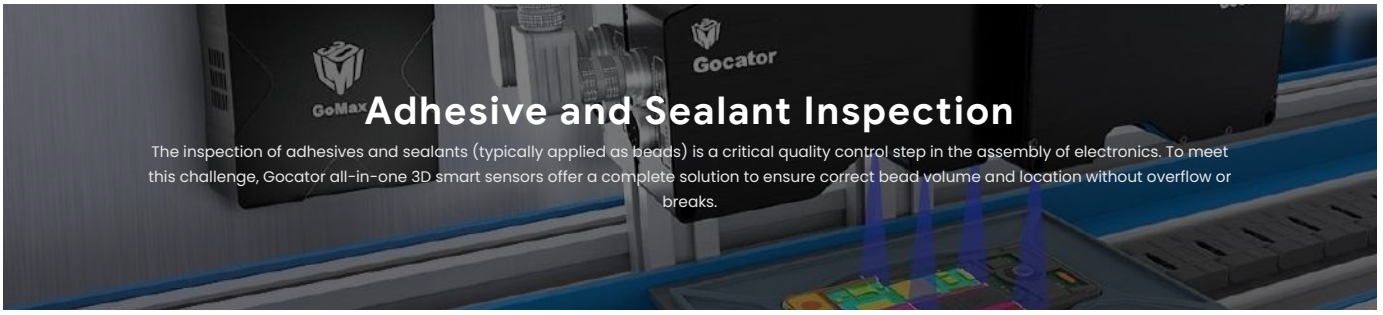
A Gocator® 2512 laser line profiler scans the edge of the glass in its frame, generating highresolution 3D scan data, and then applies built-in measurement tools to inspect for gap, flush, and offset





The Benefits of Smart 3D

2D technology cannot be used for cell phone glass assembly inspection because 2D vision is unable to generate shape data. Gocator® 2512 sensors, in comparison, provide height information at a density which allows users to identify and inspect surface edges and gaps between mated components (e.g., glass and frame) with micron accuracy.



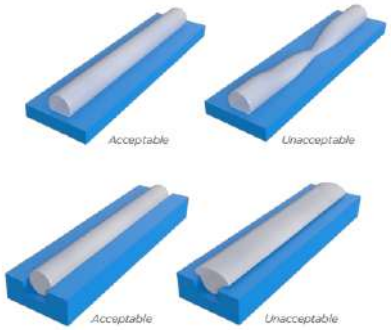
Adhesive and Sealant Inspection

The inspection of adhesives and sealants (typically applied as beads) is a critical quality control step in the assembly of electronics. To meet this challenge, Gocator all-in-one 3D smart sensors offer a complete solution to ensure correct bead volume and location without overflow or breaks.

The Application

Adhesives and sealants are used in a wide range of applications in consumer electronics. Whether they are applied as continuous or individual beads, it is important to verify correct volume and location before moving to the next assembly step.

Excess volume can result in leakage and rejection of the final part. Alternatively, insufficient or broken beads can lead to poor adhesion or seal and premature failure as a result.



The Implementation

A Gocator line profiler is mounted on a robot or dispenser to scan the adhesive or sealant after it is applied to open or groove-filled surfaces. Scanning after dispensation ensures the beading is properly applied and within the correct tolerance.

Gocator provides built-in measurement tools to set up automatic pass/fail requirements. These tools can detect excessive coating, dents/gaps, or flaws (incorrect position). For example, to calculate the correct position of the adhesive bead, the width between the bead and the edge of the part can be measured using the Surface Dimension tool (top image) at chosen locations.

Additional measurements, such as height, length, and angle can be applied to ensure adherence to desired shape. In Profile mode, the sensor calculates the amount of material applied using the Profile Area tool (bottom image). This can be achieved continuously in real-time and produce multiple profile crosssections along the target.

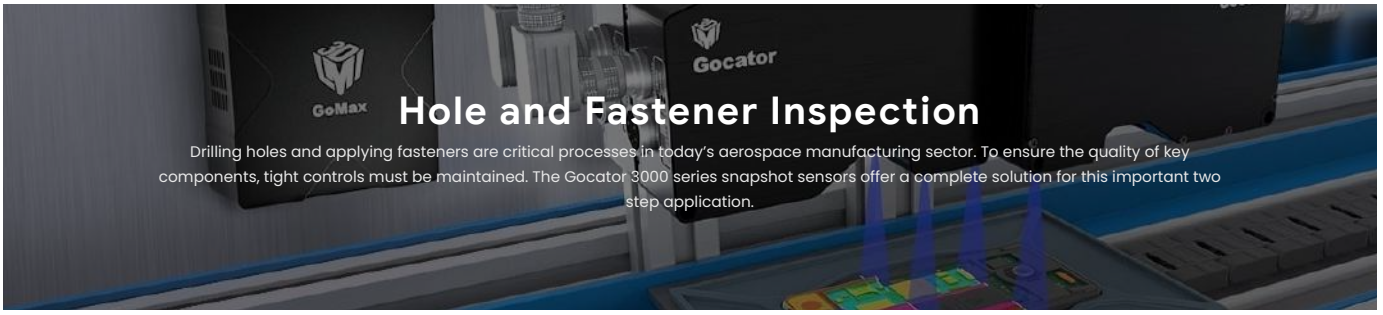
Built-in measurement tools, including Surface Dimension and Profile Area for calculating bead volume and location

The Benefits of 3D

2D technology cannot be used for adhesive and sealant inspection because 2D images are unable to distinguish transparent glues from the surrounding area. Gocator 3D smart sensors provide features for scanning materials that vary from transparent to opaque, including multiple exposure and automatic top surface detection.

In addition, 2D is unable to measure height data and volume. Gocator 3D smart sensors, in comparison, provide high-resolution height data, which allows users to accurately determine bead location and volume.


Gocator



Hole and Fastener Inspection

Drilling holes and applying fasteners are critical processes in today's aerospace manufacturing sector. To ensure the quality of key components, tight controls must be maintained. The Gocator 3000 series snapshot sensors offer a complete solution for this important two step application.

The Application

Countersunk holes drilled into curved parts and assemblies (such as airplane fuselages) must meet tight tolerances. The Gocator 3000 series snapshot sensors can be mounted on robotic systems and used to quickly scan and analyze the hole geometry.

After the holes are verified, fasteners (such as rivets) are inserted to join components together. These fastener heads need to be inspected for flushness, gap and angle in relation to the surrounding surface in order to ensure the quality of each join.

Thousands of fasteners can be required in the assembly of a plane and checking each fastener manually is time-consuming and error-prone. Gocator 3000 series is a powerful automated solution for this inspection challenge.

The Implementation

For hole inspection, a Gocator 3210 sensor, mounted to a robotic system, moves to a group of holes drilled into a piece of material and quickly scans them with a single 3D snapshot. Multiple instances of the built-in Countersunk Hole tool return a set of measurements for each hole, including inner and outer radius, depth, and counterbore.

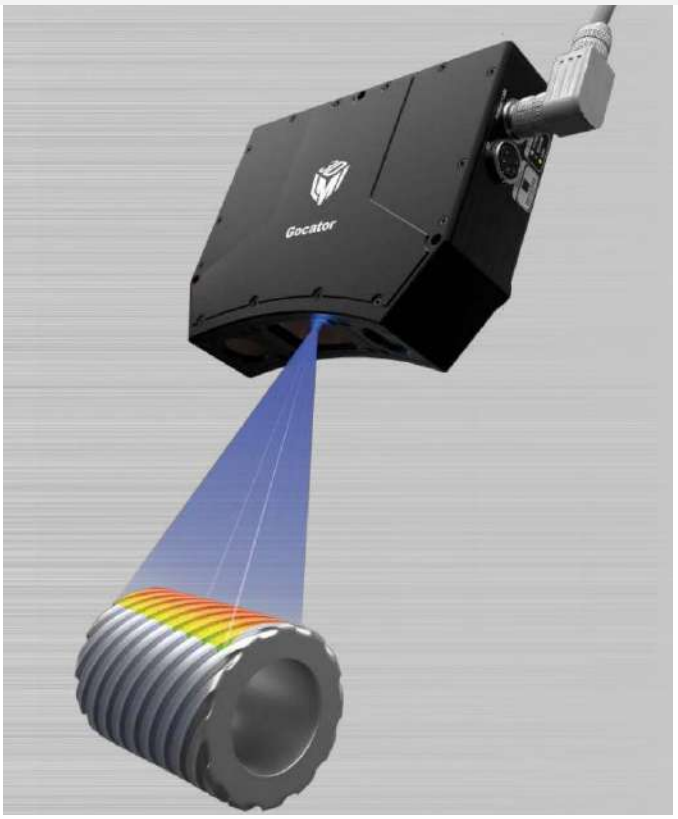
For fastener flushness inspection, multiple Gocator 3506 sensors are mounted onto robot arms. As a fuselage or other component moves into a station, the sensors move close to the surface to scan the fasteners. The built-in Surface Fastener tool returns measurements on and around the fastener. This tool can account both for fasteners that protrude and are set too deeply. It also has the ability to measure other types of fasteners, such as flat heads and dimpled heads, as well as fastener buttons on the underside of the material.

The Benefits

Gocator snapshot sensors offer a complete 3D quality control solution for this critical two step inspection process

Gocator 3210's reliable, accurate measurements (down to 35 µm) help ensure the smallest deviations from strict tolerances are caught with every scan, reducing the risk of costly mistakes. In addition, the Gocator 3210 sensor's high speed and large FOV let you quickly measure multiple holes and/or fasteners in a single scan, saving your organization time and money.

Gocator 3506 offers a smaller FOV with even higher resolution (down to 12 µm) so you can meet the strict tolerances required on small holes and fasteners. Similarly, the sensor's high speed lets you scan one or more features in less than half a second, so you can quickly determine if intervention is necessary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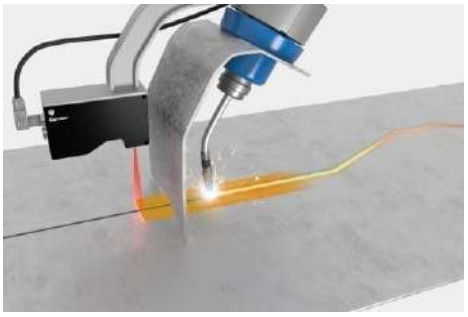
Battery Weld Inspection

Battery weld inspection in GoCater devices involves a thorough examination of the welded joints in the battery assembly. This process ensures the integrity and quality of the welds, preventing potential issues such as poor connections or safety hazards.

Industry Application

There is a growing demand for high-performance batteries, such as lithium-ion for mobile and stationary energy storage. Reliable manufacturing processes are essential during battery production as they prevent premature performance degradation or, in the worst case scenario, cell/battery explosion.

3D machine vision systems play a critical role in ensuring battery quality and minimal waste. In this feature application we'll focus on four key phases of battery weld inspection using 3D smart sensors.



Pre-welding gap & flush measurement

The Challenge

Before the battery is welded, engineers need to detect the gap & flush of the battery shell and top cover. If the measurement is in excess of 0.5 mm (for gap) or 1 mm (for flush), it will be impossible to weld the shell and the top cover together.

The Solution

Gocator® offers high-speed 3D laser profiling and a built-in gap & flush tool to solve this challenge. The typical system configuration involves a Gocator® 2330 multi-sensor network to achieve the required field of view.

Weld seam inspection of the battery cells

The Challenge

The second application comes after the laser welding of the battery cells is complete. This weld has to be verified for quality in order to detect if there are any overflows or breaks/ openings in the seam.

The Solution

Networked Gocator® 3D laser profile sensors are mounted at a 45 degree angle in the Z and X axes in order to scan all four edges of the battery, while delivering the same high performance on each edge

Spot welding inspection on the connector module

The Challenge

After the cells are welded, connectors are spot welded to the electrodes in order to build them out in series. The connector is spot-welded to the electrodes in order to build them out in series. The spot welds need to be inspected for correct height and position.

The Solution

Gocator® offers two built-in tools to solve this challenge. The first is a native height* detection tool that is based on blob analysis, and the second is a position detection tool that leverages data from all four sides of the battery for high-accuracy results.

Package weld seam quality

The Challenge

In the next step, cells are combined into a single package that requires welding in the corner of the shell. The corner weld seam has to be inspected in order to ensure the package is stable.

The Solution

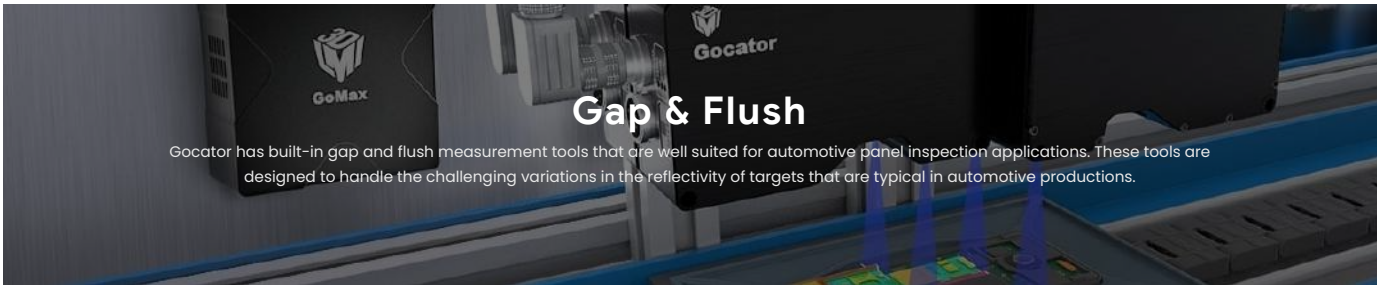
Engineers can use either Gocator® 3D line profile sensors or snapshot sensors for this application, depending on their needs. Gocator® locates the seam and produces height and intensity data, as well as accurate pass (OK) counts on compliant corner weld seams and fail (NG) counts on overflowing/broken/missing seams.

Conclusion

Gocator® 3D smart sensors offer a variety of built-in features and functionality designed to easily solve the specific challenges of battery weld inspection in today's growing consumer electronics (CE) industry

Only with 3D sensing are you able to measure the following features on a battery:

- Surface
- Edges
- Dimensions
- Weld seams
- Cell height



Gap & Flush

Gocator has built-in gap and flush measurement tools that are well suited for automotive panel inspection applications. These tools are designed to handle the challenging variations in the reflectivity of targets that are typical in automotive productions.

The Application

The gap size and flushness between the various panels on a vehicle body are important factors for build quality and appearance. Misalignments between doors, hoods, deck lids, lamp covers etc. are not only unaesthetic, but can also cause excessive wind noise and water leaks.

The desired gap size depends on the function of the joint and the position on the car, and can vary between 0 and 10 mm. In most cases perfect flushness is desired. A joint is typically considered faulty if the gap or flush is off the desired target by more than 0.5 to 1 mm.

This application is well suited for a laser-line based 3D sensor. The part of the laser line that falls on the flat part of the panel forms a natural reference for the measurements. With a compact and pre-calibrated smart sensor, using only a single light source, it's possible to get both the gap and the flush in a single snap shot at very high accuracy.

The result of the gap and flush measurement is used in the vehicle assembly process:

- to correct and error proof any build problem
- to reduce unexpected cost in repairing misassembled panels
- to reduce waste from discarding damaged panels due to fit problems
- to reject the vehicle if the panels are badly misaligned

The Implementation

The Gocator is mounted on a robot that is used to position the sensor so that two panels are in the view of the sensor. Once the sensor is positioned, the robot will initiate a start signal to the sensor to begin measuring. The sensor will then perform the gap and the flush measurement and on completion signal the robot with the inspection results. The robot is programmed to move to a number of pre-defined inspection positions around the vehicle body. At each position the panels are measured against a specific target and tolerance.

With the Gocator's built-in measurement tools, configured through a standard web browser, the entire application can be solved quickly and efficiently without any custom software programming. The sensor is capable of storing thousands of configurations, allowing the robot to call for specific measurement parameters at each inspection position. The Gocator supports several industrial PLC protocols to control the sensor and to collect measurement results. Additionally, an open source Software Development Kit (SDK) is available for engineers who want to do their own programing.

The Benefits

In today's automotive market it is critical to produce a quality vehicle. The consumer will not tolerate appearance flaws such as misaligned doors or hoods, wind noise or water leaks. Manual inspection of 50 or more inspection points around the vehicle body is not feasible, and traditional 2D vision technology is poorly suited for the 3D nature of the measurement. Stereo based 3D with unstructured light is costly and unreliable.

The Gocator offers a compact and reliable solution to:

- Automate in-line inspection
- Enable 100% inspection on every vehicle without affecting production time
- Verify and improve product quality
- Use the data with comprehensive Statistical Process Control packages to track the quality in the assembly process
- Decrease unexpected costs for rework and warranty repair, which can be thousands of dollars per vehicle


3D
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