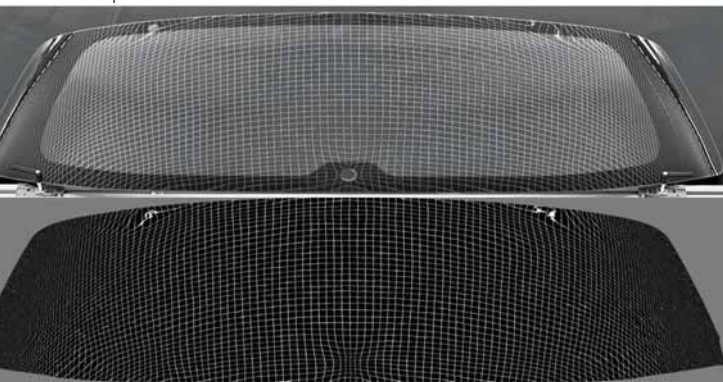


GLASSTECH

ADDRESSING THE AUTOMOTIVE INDUSTRY'S CHALLENGES FOR HIGHER QUALITY GLASS



Reflective Output Report comparing a simulated grid board and an actual photograph

TEN YEARS OF DEVELOPMENT

For nearly a decade, Glasstech's engineers and scientists have been developing a technology that can accurately measure the

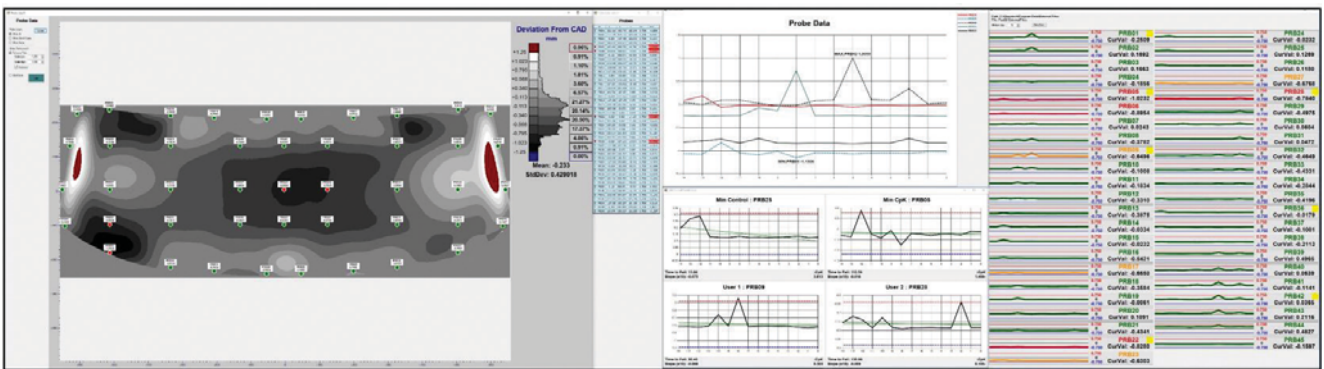
surface of complex glass shapes without touching the part, other than datums. Extensive testing has shown that the technology can measure the entire surface of complex

shaped glass with sufficient accuracy and repeatability to gauge glass to industry standards^[1].

This development addresses the challenges posed by the automotive

industry's higher quality requirements for glass. Glass shape measurement has evolved from perimeter glass support fixtures with 10 to 20 interior measurement points to glass measurement fixtures with hundreds of measurement points. Glass optical meas-

Example Display of AGI-G™



Glasstech announces that it has completed the development of a revolutionary technology that can dimensionally gauge and quantitatively measure the reflective optics of complex shaped automotive glass, all on the same system. This article gives us an idea of just what this new technology can do.

urements have evolved from a subjective evaluation or projection of patterns through or reflected off the glass in an optics lab to objective evaluation by various technologies.

The increased quality expectation has led to increasingly complex and costly gauging systems that can exceed USD 200,000 per fixture. In comparison, the Glasstech System only requires a part dedicated glass support structure that incorporates the A, B and C datum along with a simple glass positioner. The glass support structure eliminates all of the costly electronic probe gauges, so it is a fraction of the cost of traditional gauging systems. Yet, the technology can provide dimensional measurements at specific points as well as provide an accurate surface map of the entire glass part. The elimination of the costly probe gauges plus the measurement of the entire glass

surface offers a significant cost savings while giving much greater information to the automotive OEM that can be used to evaluate vehicle HUD, camera and wiper performance.

AGI-G/R™ FOR THE MEASUREMENT OF TYPICAL BACKLITES, WINDSHIELDS OR SUNROOFS

This new technology, AGI-G/R™, is capable of measuring typical backlites, windshields or sunroofs. It can be integrated with AGI-T™ to provide a complete quality report for a part, including glass shape to design, and both transmission and reflective optical distortion levels. The AGI-G/R technology has gone through extensive AGI-G/R™ will operate either in a laboratory or in the production facility. Glass parts are loaded onto AGI-G/R™ either manually or by robot. The glass parts are placed on the glass sup-

port structure and then the AGI-G/R™ system will measure the part in a sealed enclosure that controls the measurement environment allowing for very accurate results. The AGI-G/R system can measure glass either horizontally or at installation angle.

AGI-G/R's output has the basic measurement probe data and Statistical Process Control (SPC) analysis of traditional contact gauges. In addition, a full surface topographical off-form map can be superimposed to provide more part information. This additional information can assist in understanding wiper performance, HUD or other quality attributes to assist the glass fabricator by further enhancing their forming tool or process.

The output is displayed on two large monitors situated side by side. As an example of the display is shown below, where the most recent part measured including each probe measurement and the topographical map are shown on the left monitor, while trend graphs for each probe measurement data are displayed on the right monitor.

AGI-G/R measures the glass surface to a level that allows reflective optics to be determined. As an example, AGI-G/R can simulate any grid board reflected off the glass surface. Below is an example of that capability. AGI-G/R can report the local curvature

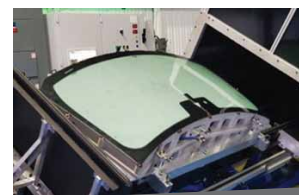
of the glass surface to be compliant with published standards.

AGI-G/R revolutionises glass inspection by:

- lowering the cost to gauge parts by replacing multiple probe checking systems with a much lower cost glass support structure and eliminating the multiple probe's ongoing maintenance cost;
- providing more meaningful shape information that can be used to improve operations;
- this single system can be used for the measurement of shape and reflective optics;
- it can be integrated into a production line or used in a laboratory setting.

Footnote:

[1] Automotive Industry Action Group, Measurement System Analysis, 4th edition



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