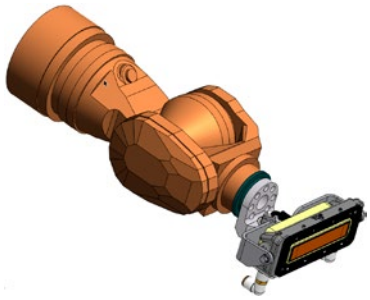
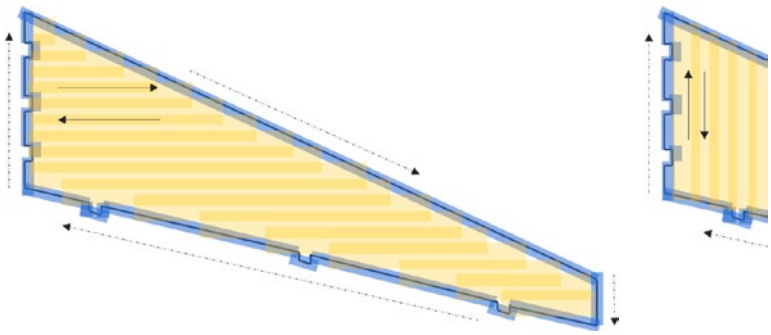
Carbon-Fiber Skin Panel Inspection System

Carbon fiber composites are increasingly used in aerospace parts for their light weight and high strength. After large carbon-fiber skin panels are manufactured, they must be inspected for potential flaws before assembly into a complete structure (wings, stabilizers, fins, etc.). Phased array (PA) ultrasonic testing, which is already widely used in aerospace inspections, can be integrated into the manufacturing process to locate defects such as delamination, voids, porosities, or foreign material.

Automated Skin Panel Inspection System

This system performs full volumetric inspection of an entire skin panel using a PA probe with a water wedge mounted on the end of a robot arm (a second robot is available to minimize operational downtime). The long support frame securely holds up to two skin panels—one on each side of the frame. Cameras mounted on the robot arm both help locate the part edges for accurate water-wedge positioning and provide visual surveillance for the operator. The robot arm travels the full length and width of the panel and uses overlapping scans to cover the entire area. Before and after the inspection cycles, the probe is moved over a reference standard on a calibration station for validation on known defects.





The robot ensures accurate positioning and maintains a uniform pressure on the probe and wedge to ensure optimal ultrasonic coupling on the slightly curved surface. Coupling water is constantly supplied to the wedge, which uses suction ports to minimize water loss.

Skin Panel Turnkey Inspection Solution Features

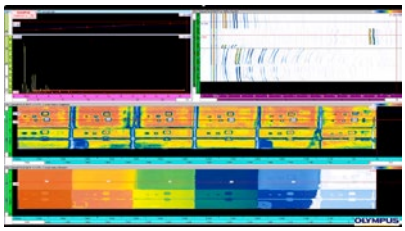
- The long inspection frame's fixtures enable skin panels of varying lengths to be mounted on either side of the frame.
- The standard industrial robots are proven, durable, and simple to program and operate through an application-dedicated motion interface.
- The central operator station contains all system controls, which are integrated with FocusPC and AeroView™ software for data collection and analysis.
- FocusPC software supports large data file sizes, which enables long, uninterrupted inspections.
- C-scans of the inspection are continuously displayed in real time as the robot progresses along its scanning pattern.
- AeroView software's analysis quickly detects indications and automatically returns the probe to those that require a second, prove-up inspection.
- The reference standard on the calibration station can easily be changed when part inspection requirements change.

System Performance

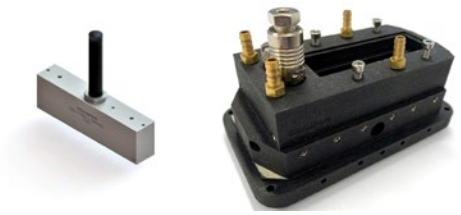
Standard Product Range	Size	4 mm–20 mm (0.16 in.–0.8 in.) thickness variable along the product, 10–15 m (32.8 ft–49.2 ft) long, 1.5–2.5 m (4.9 ft–8.2 ft) wide, on flat to slightly curved surfaces
	Speed	Up to 145 mm/s (14.2 ft/min) Typical scan time: approximately 100–140 minutes, depending on product size.
	Coverage	100% of skin panel, using a single probe with wedge
Data Presentation	Real-Time Inspection Results	A-scan, B-Scan, C-scan, and D-scan
Inspection Modes	Typical Inspection Modes	Longitudinal, volume inspection
Surface Temperature		Up to 40 °C (104 °F)
Detection Capabilities for Typical Reference Defects	Repeatability	Typical composite reference defects according to industry-required standard and probe type. (For example, phased array (PA) pulse-echo (PE) to detect voids, porosity, delamination, and inclusions.)
Reporting and Data Storage	Report Types	Inspection, calibration, and calibration-check user-configurable reports
	Storage	Data storage in .fpd files accessible via FocusData library

This solution is powered by

FOCUS PX Acquisition Unit



FocusPC Software



Olympus PA Probes and Wedges

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