

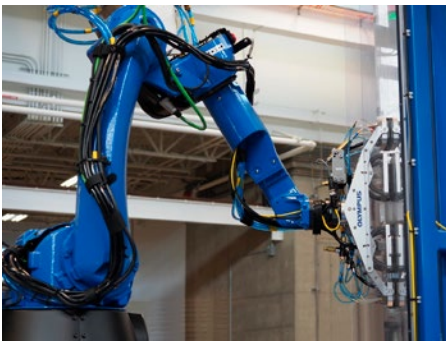
Friction Stir Weld (FSW) Inspection System



In friction stir welding, a rotating tool is moved along the joint line of two pieces of metal, generating frictional heat that softens and melds the pieces together. Because it provides high strength welds with few defects, FSW is increasingly being used on aluminum alloys such as the large cylindrical sections of rocket fuel tanks. However, FSW may produce defects that are small and difficult to detect. Phased array (PA) ultrasonic testing has widely been adopted as a reliable nondestructive method to locate potential defects.

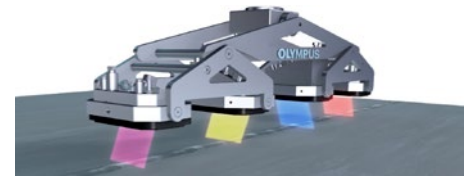
Automated Robotic FSW Inspection System

The FSW system's inspection head contains several types of PA probes in orientations that provide complete inspection coverage of a weld. Randomly oriented flaws such as voids, tunnels, and lack of penetration are detected in a single inspection pass.



A collaborative robot (cobot) positions the inspection head against the moving or rotating welded section until the entire weld is inspected, after which the head retracts. This cycle automatically repeats for each welded section that is presented to the system.

Before and after inspection cycles, the head is moved over the reference material on the calibration station for validation on known defects. The cobot maintains uniform pressure on the inspection head to ensure optimal ultrasonic coupling of all probe wedges on the welded surface. Coupling water is constantly supplied to the wedges, which use suction ports between double seals to minimize water loss.





FSW Turnkey Inspection Solution Features

- Fully automated FSW system is compact and self-contained for direct installation in a production line.
- Probes and wedges can easily be changed, and angles mechanically adjusted to provide desired coverage on a variety of potential flaws.
- The cobot operation is safer and does not require a protective perimeter or special safety measures.
- Inspection sequences need only one click to start, using a simple web-based motion software with preprogrammed calibration and check sequences.
- Dedicated calibration station enables quick validation on known defects, before and after inspections. The calibration reference can easily be changed when part inspection requirements change.
- WeldSight™ data acquisition software supports large data files to enable long, uninterrupted inspections, and includes volumetric views for efficient analysis.
- Users can optimize the scan plan workflow using WeldSight software's embedded scan plan tools, including the ability to edit the weld profile, probes, and wedges, as well as configure the focal laws and visualize the weld coverage using raytracing.

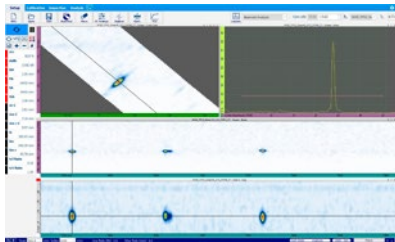
System Performance

Standard Product Range	Size	Thickness: 2.5 mm–25 mm (0.1 in.–1.0 in.) Diameter: 2.03 m (80 in.) minimum
	Speed	Up to 70 mm/s (13.8 ft/min)
	Coverage	100% of weld, using four probes with wedges
Data Presentation	Real-Time Inspection Results	A-scan, B-scan, C-scan, and D-scan
Inspection Modes	Typical Inspection Modes	Shear waves, volume inspection
Surface Temperature		Up to 40 °C (104 °F)
Detection Capabilities for Typical Reference Defects	Repeatability	Artificial flaws: 0.25 mm (0.01 in.) wide × 10 mm (0.39 in.) long, 0.5 mm (0.02 in.) deep (longitudinal, transverse, and oblique orientation on OD and ID) Side-drilled holes (SDH): 1.2 mm (0.04 in.) diameter, parallel or perpendicular to weld Defect orientation settings: 0°, 45°, and 90°, mechanically adjustable
Reporting and Data Storage	Report Types	Inspection, calibration, and calibration-check user-configurable reports
	Storage	Real-time database inspection data storage

This solution is powered by



FOCUS PX Acquisition Unit



FocusPC Software



Olympus PA Probes and Wedges

www.olympus-ims.com

OLYMPUS

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