LASERAX

DUAL-SOURCE, AI-POWERED WELD QUALITY MONITORING

"90,000,000 welds inspected —only one defective weld missed."

- Alex Fraser Ph.D. CTO and Cofounder of Laserax

VIEW PRODUCT VIDEO ON YouTube

Laserax's AI-powered weld quality monitoring solution delivers real-time insight into every weld, enabling immediate defect detection, reduced unnecessary rework, and stable high-throughput production.

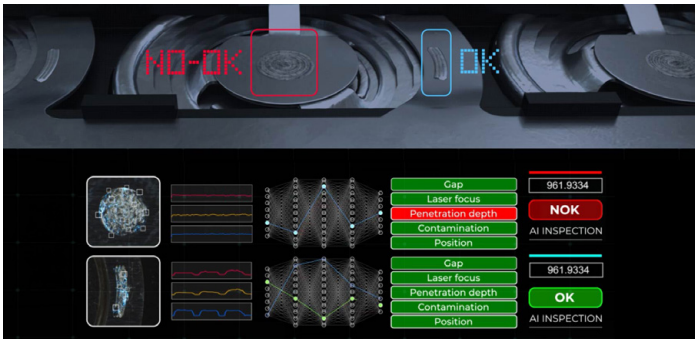
By combining advanced sensing with intelligent AI analysis, the system provides reliable in-process weld quality decisions that support consistent quality, higher yields, and confident manufacturing at scale.

+ 99.9997% yield
+ Ultra-low defect escape rate (1/90,000,000)
+ Near-zero false rejects (up to 20x less than other systems)

ADVANTAGES

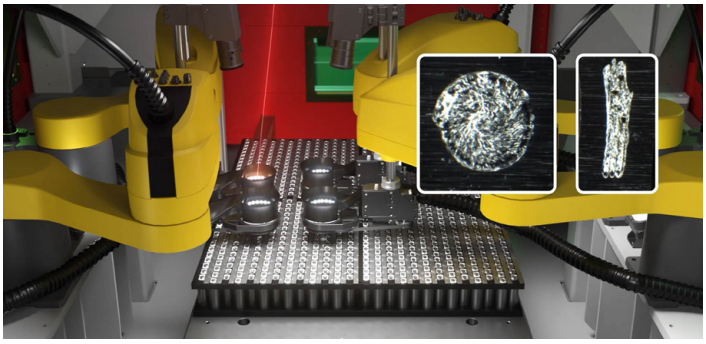
Highest Detection Rate

- Dual-source: vision + photodiode signals
- Ultra-low defect escape rate
- Up to 700x improved defect detection



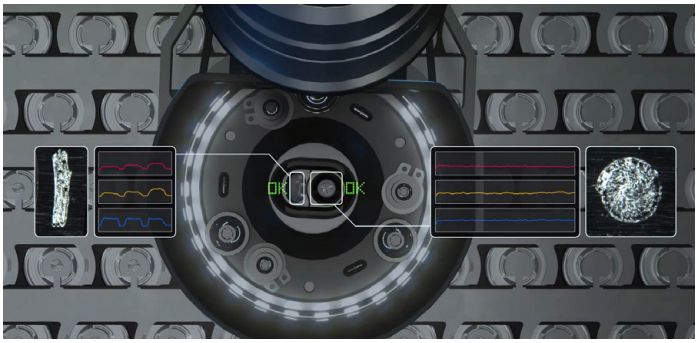
Lowest False Reject Rate

- AI distinguishes defects from normal variation
- Up to 20× fewer false rejects
- Stable flow, reduced unnecessary rework



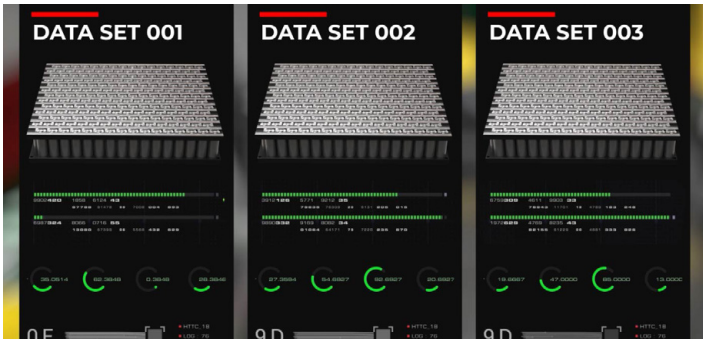
Real-Time Weld Decisions and In-Process Rework

- Instant OK/NOK at cycle time
- Automatic in-station rework to reach up to 99.9997% yield
- Prevents downstream defect propagation



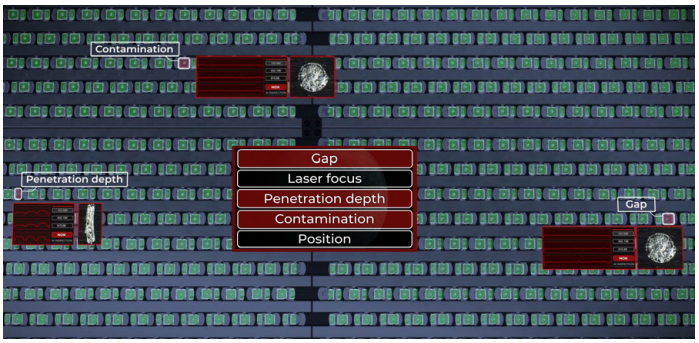
Fast and Simple AI Deployment

- Same-day model training with ~1,500 welds
- Combination of good and defect-induced welds
- Easy adaptation to new products or process changes



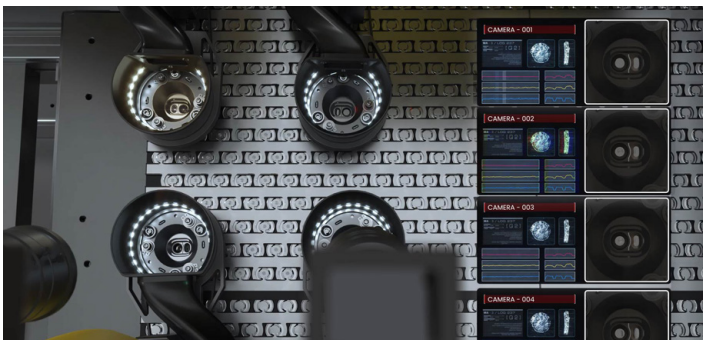
Intelligent Defect Classification

- Identifies common weld defect types
- Highlights likely process-related causes
- Enables targeted corrective actions



Complete Weld Traceability

- Full weld-level recording (images, signals, timestamps)
- Audit-ready data with station identification
- Enables continuous improvement and process stability

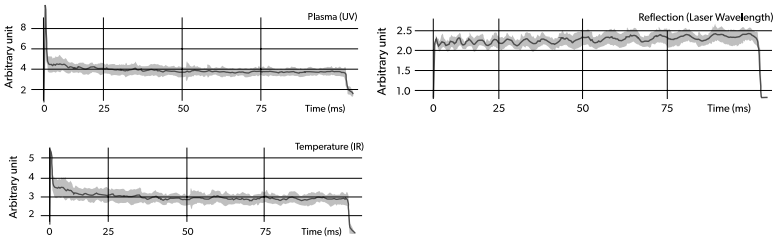
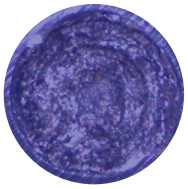
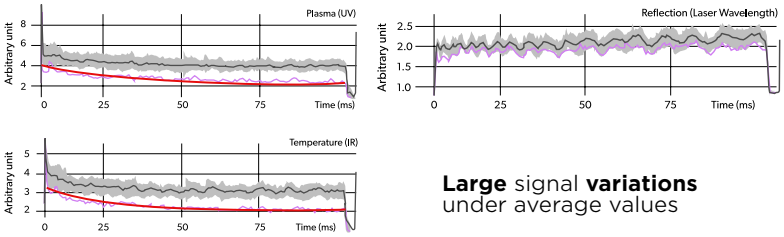
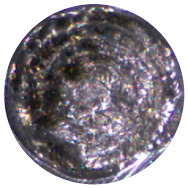
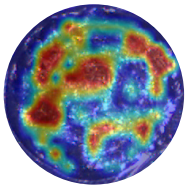
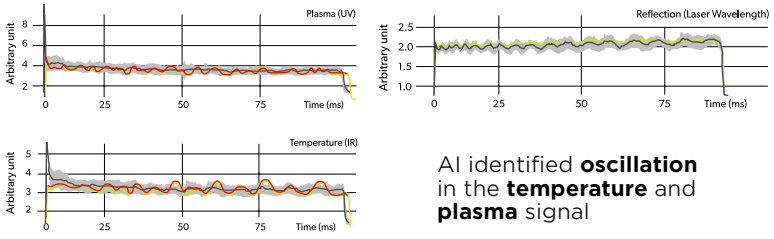
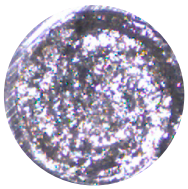
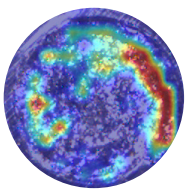
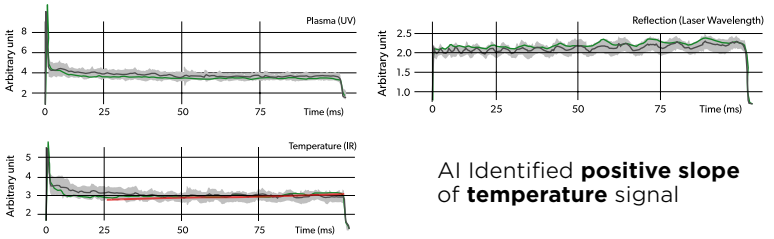
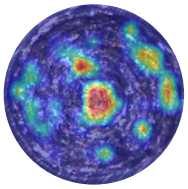


PINPOINT DEFECT IDENTIFICATION

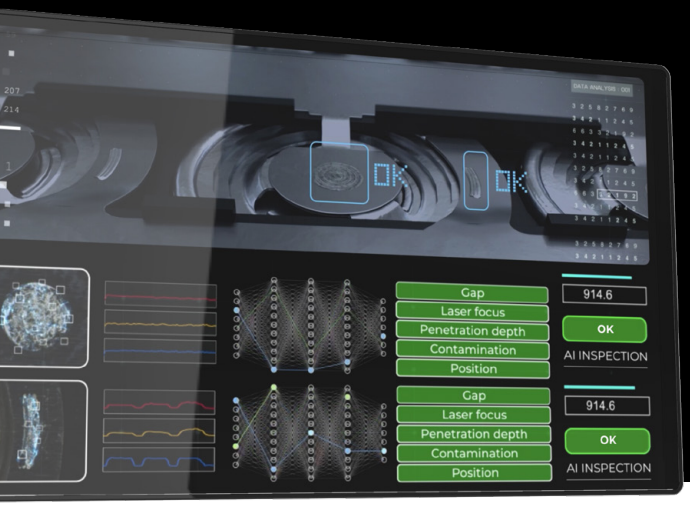
Every weld tells a story.

Two inputs — photodiode signal and post-weld vision — interpreted by one AI, across the full defect spectrum.

PHOTODIODE-AI	VISION-AI
In-Process Signal	**Post-Weld Image**
The AI reads the **full waveform** — shape, slope, and morphology — not just min/max envelope. Detects subtle deviations hidden inside the statistical tolerance band.	The AI classifies the weld surface and localizes the defect region via heatmap overlay — separating true defects from acceptable cosmetic variation.

WELD SCENARIO	IN-PROCESS PHOTODIODE SIGNAL - Analyzed by Laserax AI	POST-WELD VISION - Analyzed by Laserax AI - Heatmap Overlay	
Good Weld Reference baseline cosmetic variation accepted Typical statistical threshold based on distribution	**Reference good welds signals** 	Typical good weld image 	No Vision AI activations 
Large Defect Contamination Severe gap, blow-out, over-penetration, Contamination	**Contamination example**  **Large** signal **variations** under average values	Notable surface defect 	Global Vision AI activation 
Small Defect Defocus Beam misalignment, subtle morphology change	**Laser 2mm defocus example**  AI identified **oscillation** in the **temperature** and **plasma** signal	Subtle weld defect 	Vision AI activation on large and small areas 
Small Defect Gap Porosity, small under-penetration	**Small 50µm gap example**  AI Identified **positive slope** of **temperature** signal	Even visible weld 	Vision AI activation on multiple small areas 

SEE THE DIFFERENCE



"After evaluating multiple solutions, Laserax's AI gives us the speed and reliability we need for battery welding, with precise built-in quality monitoring and real-time validation ensuring consistently high throughput—supported by a team that excels from development to production"

- Karl Fahlström Manager Technology Development at SCANIA

Comparative Performance Benchmark

	Photodiode Typical / Depth Measurement	LASERAX Single-AI (Vision or Photodiode)	LASERAX Dual-Source AI
Unidentified Bad Weld*	1 / 130,000	1 / 9,000,000	**1 / 90,000,000**
False Reject Rate	1 / 15	1 / 300	**1 / 150****

**Based on typical defect rates observed in production* ***Value reflects prioritization of maximum detection reliability vs Single-AI*

AI Weld Monitoring – Executive Comparison

Key Performance Criteria	Photodiode Typical	Depth Measurement LDD/OCT	LASERAX Single-AI	LASERAX Dual-Source AI
Fine Defect Detection (Porosity, Gap, Contamination)	✗	✗	✓	✓
Ultra-Low Defect Escape Rate	✗	✗	–	✓
Lowest False Reject Rate	✗	✗	✓	✓
Intelligent Defect Classification	✗	✗	✓	✓
Real-Time OK/NOK Decision	✗	✗	–	✓
In-Process Post-Weld Vision Inspection	✗	✗	✓	✓
Complete Weld Traceability: Images, Signals, Metadata	✗	✗	✗	✓

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INDUSTRIAL LASER SOLUTIONS

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