ABB Ultrasonic spot welding quality inspection

Robotic spot welding quality inspection solution based on ultrasonic technology

ABB Robotics, Body-in-White Global Solution Center
Introduction
Reducing the amount of manual testing

Effective and efficient screening of weld spots

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Key message also...
- Capture trends
- System advised actions for personnel

Total amount of weld spots

Increasing cost and delay from time of manufacturing

Automatic Screening of weldspot quality

- Weld data monitoring
- Ultrasonic inspection (automated)
- Visual inspection (operator)
- Ultrasonic inspection (manual)
- Destructive testing (manual)
Ultrasonic spot welding quality inspection
A solution for automotive industry demands

Manual Testing

- Low sampling
- Time and resource intensive
- Long response time
- Low repeatability
- No systematic traceability of the workpiece quality

ABB Ultrasonic spot welding quality inspection

- Reliable process
- Cost reduction
- Fast response time
- Repeatability
- Data analysis
Automated Ultrasonic Inspection of weld spots

Ultrasound technology basics

Automated robot-guided ultrasonic testing:
– Same quality of results as with manual testing
– Additional benefits of automation:
  • Cycle time
  • Accuracy
  • Efficiency
  • Reproducibility

Automation does not influence the physical principles of ultrasound
Ultrasonic spot welding quality inspection
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Video
Ultrasonic spot welding quality inspection

Complete Functional Module ready-to-use

- Complete robotic solution based on ultrasonic technology, for quality inspection of spot welds
- A ready-to-use integrated solution that includes all the components and functionalities required for a fast and accurate inspection:
  - Hardware and Software (Equipment/ Dresspack/ Controller)
  - PHAsisBLU* (from VOGT) ready to go ultrasonic instrument for spot weld and short stick weld inspection, real phased array ultrasonic technology, for quality inspection of spot welds
  - Complete Programming-Wizard for easy and simplified programming and system tuning
  - ABB UltraReporter for reliable data and quality assurance

A complete solution for fast and accurate spot welding quality inspection
Ultrasonic spot welding quality inspection

- Protective cover
- Grinding head
- Ultrasonic probe
- Camera
- Spray head and blow-off unit
Ultrasonic spot welding quality inspection
One combined tool – fully integrated solution

Functionality

- Recognition of weld spot position
- Automatic removal of weld spatter
- Automatic ultrasonic weld spot inspection

Design

- Compact
- Few disturbed contours
- Collision protection housing

Specification

- Typical cycle time to inspect*: 3-6 sec
- High accessibility of the welding points

* Depending on spot weld quality and according to lab tests
PHAsisBLU* (VOGT equipment)
Ultrasonic measurement device with probe

- PHAsisBLU*, ready to go ultrasonic instrument for spot weld and short stick weld inspection, real phased array ultrasonic technology, for quality inspection of spot welds
- An instrument built for Ultrasonics applications with robotics as an integrated solution with best technical data:
  - 16/128 Ultrasonic PHASED ARRAY Hardware (16 parallel channels and up to 128 multiplex channels)
  - PHAsis* Spotweld and short stick welds software with inspection plans and a robot interface for bidirectional communication
  - Highest frequency of up to 20 MHz supports spot weld and short stick weld testing
  - Fast pulse repetition rate of 20,000 Hz for effective cycle times
Ultrasonic spot welding quality inspection
Functionality and process flow

- Recognition of spot weld position
- Automatic removal of weld spatter
- Ultrasonic weld spot measurement
- Capture and visualization of the result
Automated ultrasonic inspection of weld spots
From component to system integration – Modular standard solutions

SpotInspect Functional Module
- Complete Functional Module Ready-to-Use
  - Hardware and Software (Equipment/ Dresspack/ Controller)
  - Complete Programming-Wizard for easy and simplified programming and system tuning
  - Reliable data and quality assurance

Modular Standard System
- Application Cells Easy-to-integrate
  - Standardized cell concepts “ready-to-use”
  - Capacities up to 8,000 WSPs per day
  - Considerable cost saving potential through reduction of manual inspection workstations

Smart Solutions
- Smart system solutions for high volumes
  - Modular and scalable automation solution based on ABB products
  - Capacities from 8,000 up to 22,000 WSPs per day
  - Considerable cost saving potential through reduction of manual inspection workstations
Benefits in all areas

**What are the main benefits?**

**Support**
- Single supplier that guarantees functionality
- Simulation models available

**Performance**
- Higher inspection rate
- High accessibility on testing workpieces
- Typical cycle time to inspect* 3-6 sec
- Ultrasonic automated inspection gives 10 times increased capacity relative operator**

**Operation**
- Easy-to-use and fast start up with programming setup wizard
- Simple system tuning under running production

**Data analysis**
- Web-based data visualization/storage
- Allows analysis of historical data and to see trends like spot welds position and quality
- Automated notification of suspicious (out of spec.) spot welds

**Solution**
- Complete Functional Module Ready-to-Use
- Modular and scalable automation solution
- Coordinated components

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*Depending on spot weld quality and according to lab tests
**Estimation measurements based in 1 operator over one year
Increase in productivity, scalability and flexibility

Ultrasonic spot welding quality inspection

Customer value proposition

Worker requirements
-85% Reduction of the labor-intensive testing activities

High efficiency*
Automated inspection gives 10 times increased capacity relative operator

Reproducibility
100% Reproducible measurement results through process automation

Industry 4.0 pioneer
100% Data provision for further optimizations / analyzes

*Estimation measurements based in 1 operator over one year