moviTHERM
advanced thermography solutions

BWI

Active Thermography for Battery Weld Inspection

Welded connections are the primary method for adding electrode tabs and joining battery cells. Resistance, laser, and ultrasonic techniques are standard for electrical connections in electrodes and battery systems. The cell and battery pack weld quality is critical as it affects the function and performance of the entire energy storage system.

MoviTHERM *BWI* (Battery Weld Inspection) is an "out of the box" solution for in-line monitoring of battery electrode and cell welding processes. Leveraging infrared camera technology, B*WI* provides fast and reliable non-contact measurements to ensure proper temperatures are maintained across the entire welded surface, resulting in a high-quality, low-resistant connection.

Defects Detected:

- ✓ Cold Welds: Weak connections that lead to increased resistance, reduced current flow, and diminished battery performance.
- ✓ Weld Cracks: Fractures or fissures that increase the potential for battery failure or safety hazards.
- ✓ Incomplete Penetration: Results in reduced mechanical strength, compromising the structural integrity of the battery.
- ✓ Excessive Penetration: Causes damage to internal components or compromises the battery's overall performance and lifespan.

ENHANCED QUALITY CONTROL

Infrared imaging allows for non-destructive testing of battery welds, ensuring high-quality and reliable connections without compromising the battery's integrity.

IMPROVED SAFETY

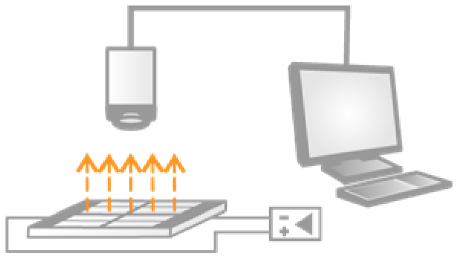
By identifying and addressing weld defects, infrared inspection minimizes the risk of battery failure, electrical malfunctions, or safety hazards caused by faulty welds.

ENHANCED BATTERY PERFORMANCE

High-quality welds achieved through infrared imaging optimize the battery's electrical conductivity and mechanical strength, improving overall performance and longevity.

How does *BWI* work?

BWI uses Active Lock-in Thermography (LiT) which consists of applying a periodic electrical signal to the battery and monitoring the resultant temperature variation with a synchronized thermal camera. The electrical signal is applied by an external power supply or the source load during the end-of-line load test. A computer captures multiple IR images and applies a processing algorithm to produce a surface map identifying localized hotspots. LiT produces images with greater resolution and temperature distribution over passive IR thermography.



Active vs. Passive Thermography

Active thermography offers several advantages over passive thermography for battery weld quality inspection. Here are the key advantages of active thermography:

- ✓ Increased Sensitivity: Active thermography can produce up to a 100 times improvement in sensitivity for improved defect and thermal variation sensing. This enables the detection of subtle defects providing more accurate and detailed detection.
- ✓ Defect Localization: Active thermography provides better localization of defects and severity overcoming thermal bleed due to conduction within the test sample.
- ✓ Reduced Reflection Interference: Active Lock-in thermography is less influenced by emissivity allowing for reliable inspection of reflective materials.
- ✓ Defect Detection and Quality Control: Active thermography facilitates the earliest identification of defects, ensuring high-quality battery production and reducing the risk of potential failures or safety hazards.

Supported Infrared Cameras

	Teledyne FLIR® A6781	Teledyne FLIR® A8581	Teledyne FLIR® X8581
			
Resolution	640 x 512	1280 x 1024	336 x 256 / 640 x 512
Full Frame Rate	Programmable; 0.0015 Hz to 125 Hz	Programmable; 0.0015 Hz to ~45 Hz (GigE), 60 Hz (CXP)	Programmable: ~0.5 Hz to 181 Hz
Standard Temperature Range	-20°C to 350°C (-4°F to 662°F)	-20°C to 350°C (-4°F to 662°F)	-20°C to 350°C (-4°F to 662°F)
Optional Temperature Range	45°C to 600°C (113°F to 1112°F) (ND1) 250°C to 2000°C (482°F to 3632°F) (ND2) 500°C to 3000°C (932°F to 5432°F) (ND3)	45°C to 600°C (113°F to 1112°F) (ND1) 250°C to 2000°C (482°F to 3632°F) (ND2) 500°C to 3000°C (932°F to 5432°F) (ND3)	45°C to 600°C (113°F to 1112°F) (ND1) 250°C to 2000°C (482°F to 3632°F) (ND2) 500°C to 3000°C (932°F to 5432°F) (ND3)
Accuracy	≤100°C (≤212°F), ±2°C (±3.6°F) accuracy (±1°C/1.8°F typical); >100°C ±2% of reading (±1% typical)	≤100°C: ±2°C (±1°C typical), >100°C: ±2% of reading (±1% typical)	≤100°C: ±2°C (±1°C typical), >100°C: ±2% of reading (±1% typical)
Sensitivity	≤20 mK (typical)	≤30 mK (typical)	≤30 mK (typical)

*Specifications are subject to change without notice. 6/2023

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