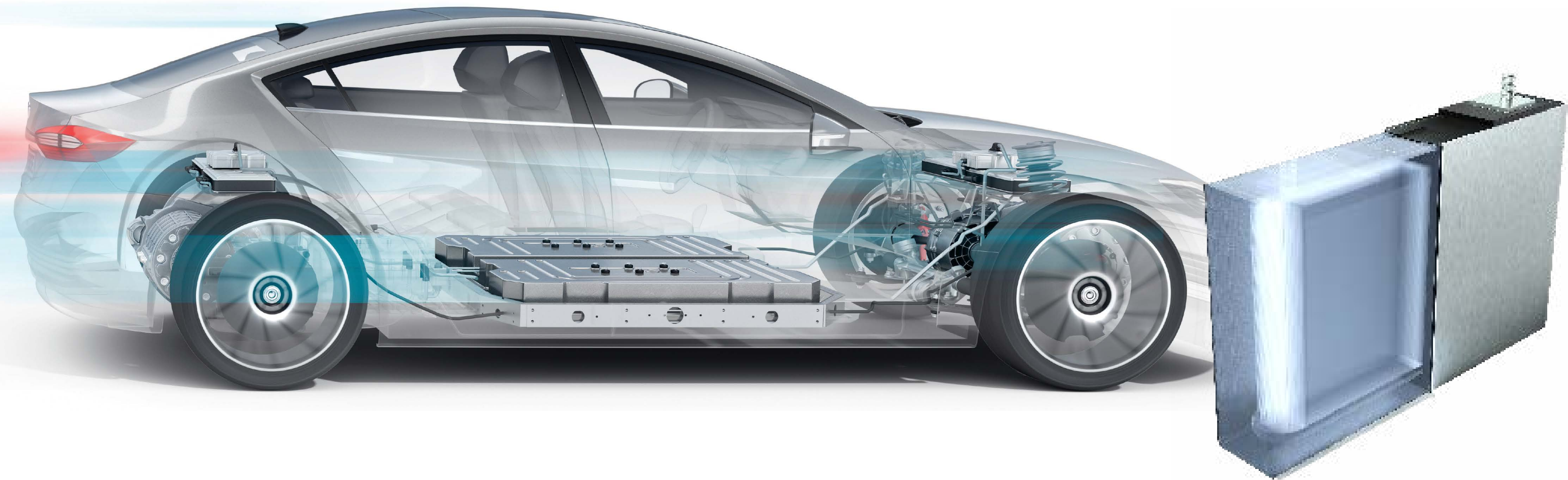


ZEISS eMobility Solutions



Seeing beyond

Battery Cell Non-destructive 3D Inspection by Industrial Computed Tomography



Battery cell quality control

High importance of cell quality and safety

Battery cell is the cornerstone of electric vehicles (EVs), as it significantly affects driving range, performance, safety, and charging rate. Improper engineering of battery cells can pose risks like overheating or fire, making stringent safety standards essential.

Battery energy capacity determines how far an EV can travel on a single charge, addressing range anxiety among consumers. Additionally, battery performance influences vehicle acceleration and overall efficiency, and charging speed impacts everyday convenience.

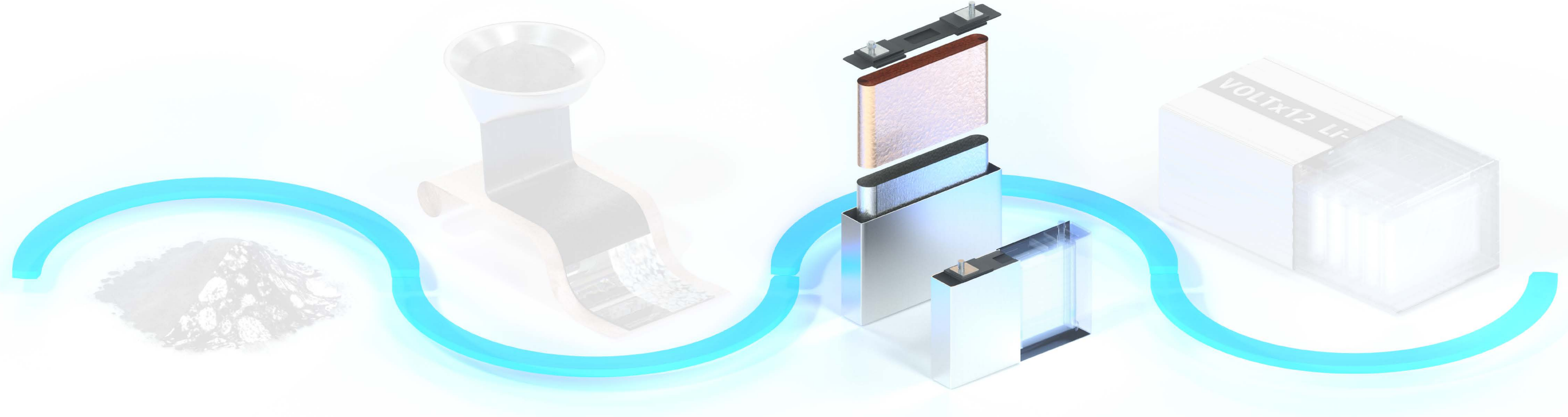
With rapid advancements in materials, design, and production processes, battery manufacturers must constantly adapt to meet stringent safety and quality requirements, while also pushing the boundaries of performance and cost-effectiveness. Therefore, ensuring high standards of quality and safety in battery design and manufacturing remains a major challenge for manufacturers.



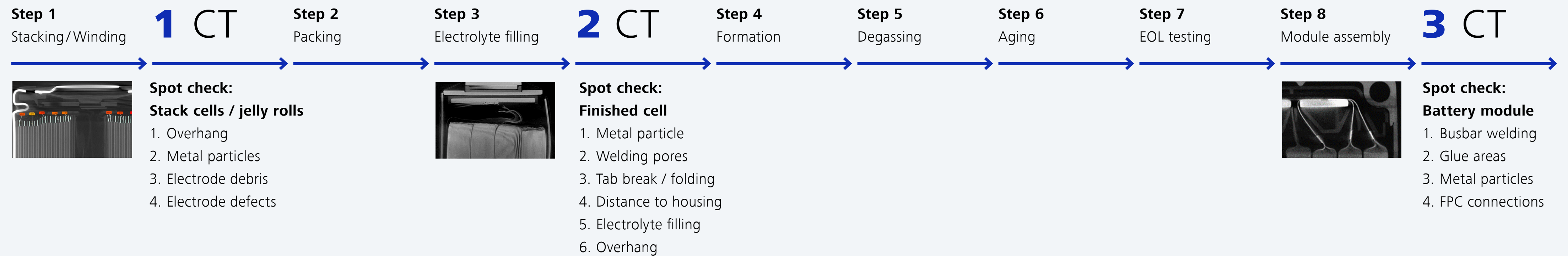
Ensuring quality production

Problem identification with CT

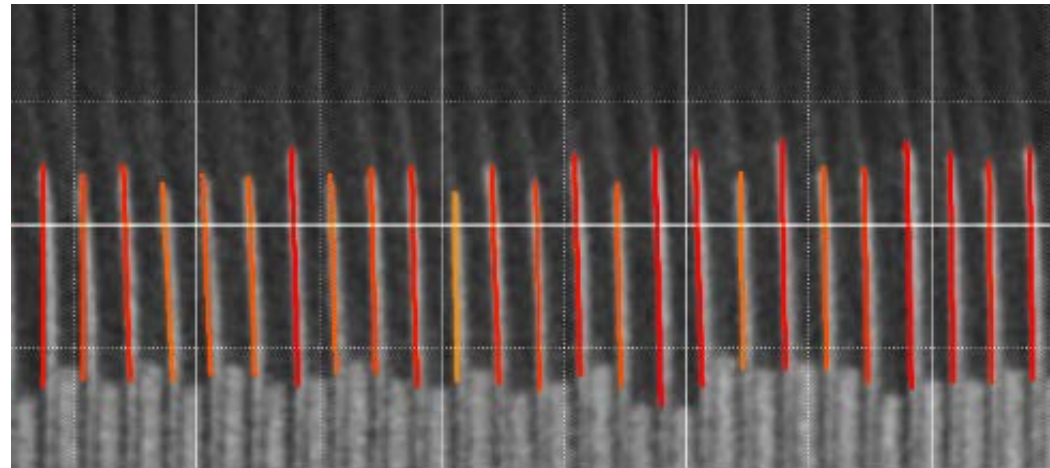
There are several critical quality checkpoints in the cell production process. CT solutions support major steps in cell production, from jelly roll to post-packaging and module testing, allowing for precise detection of potential defects. Advanced CT technology can identify even the tiny foreign particles or welding issues that are invisible to the naked eye, enabling manufacturers to identify the root cause in early stage and minimize the risk of costly failures at later stages.



Production process of battery cell

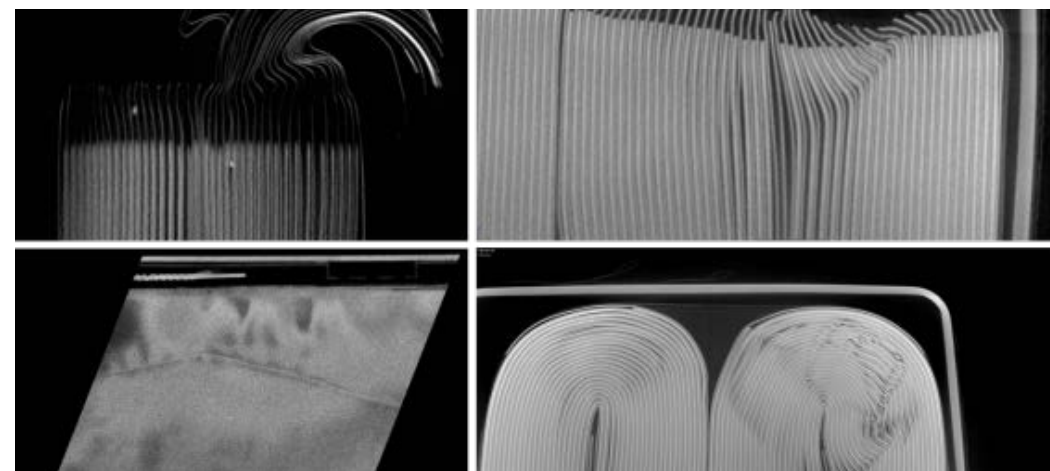


Application areas of industrial CT



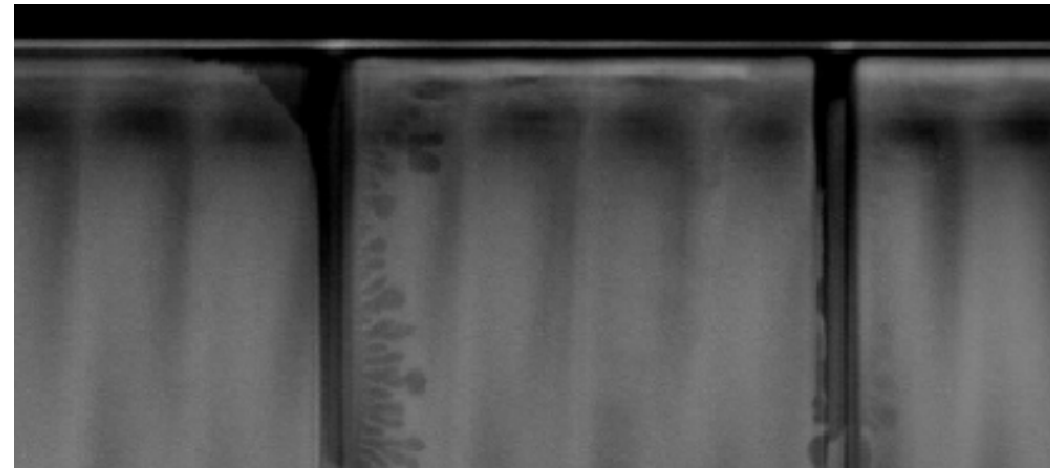
Jelly roll / stack cell inspection

- Overhang distance measurement for stacking cells which is not achievable with 2D X-ray
- CT performs spot checks to ensure proper alignment for overhang



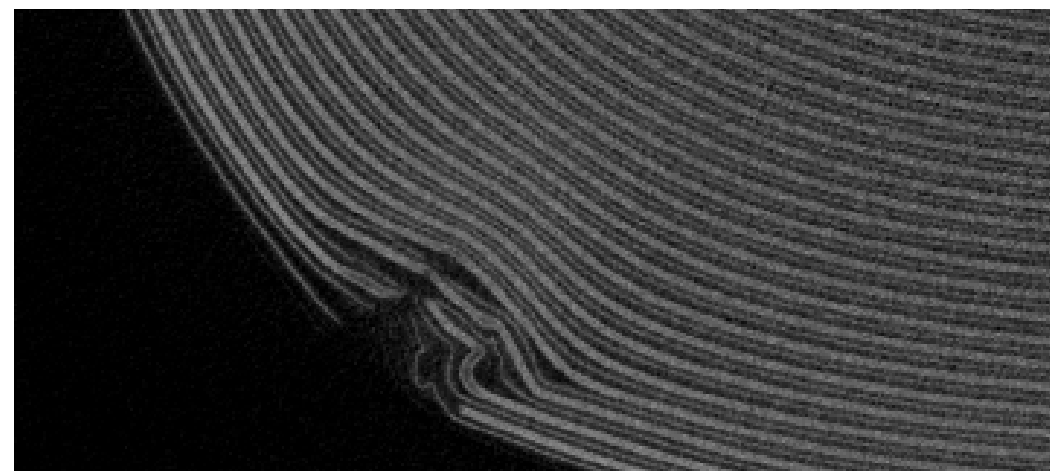
Finished cell

- Production defects inspection, including electrode wrinkles, metal particles, and delamination
- Identification of defects and early-stage process optimization



Module inspection

- Inspection of new defects introduced during battery module assembly
- Inspection of busbar welding, connector and sensors, glue area and foreign particles

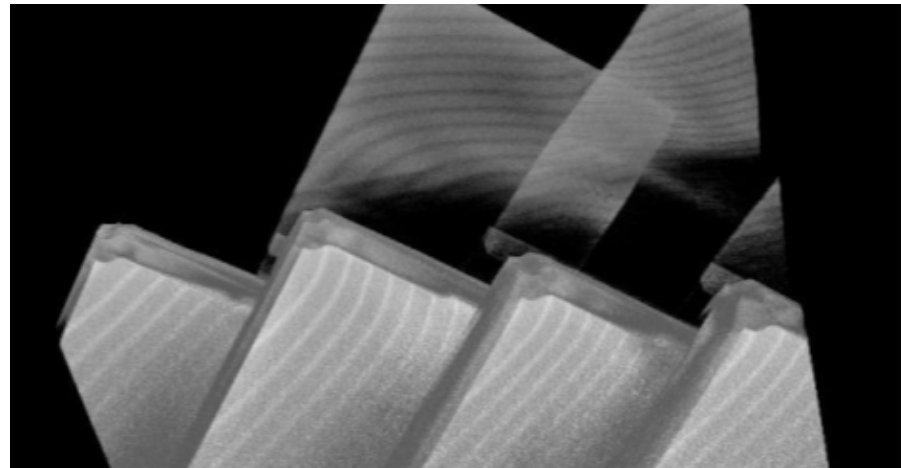


Failed battery inspection

- Disassembly-induced shift or destruction of defects
- CT scans for non-destructive battery to keep defects in their current position

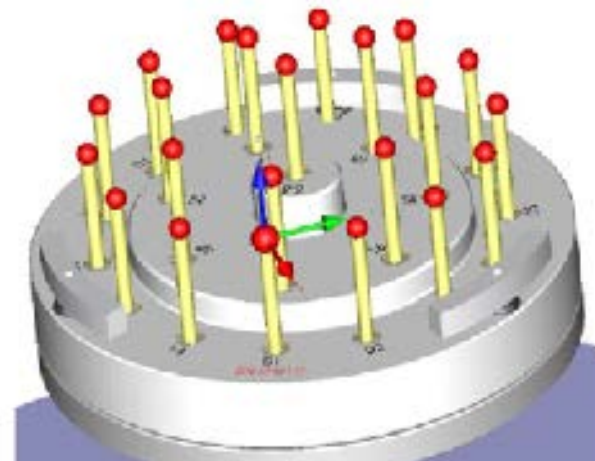


Value proposition of ZEISS solution



Productivity

- Simultaneous scanning of multiple parts and automatic cell separation
- High throughput and maintaining precision with powerful X-ray tube



Precise inspection

- Flexibility of switching between stop/go and fast scan modes
- Highly accurate measurements for evaluating cell structural integrity with sphere center point uncertainty of (MPESD) of $4.5 + L/50 \text{ um}$



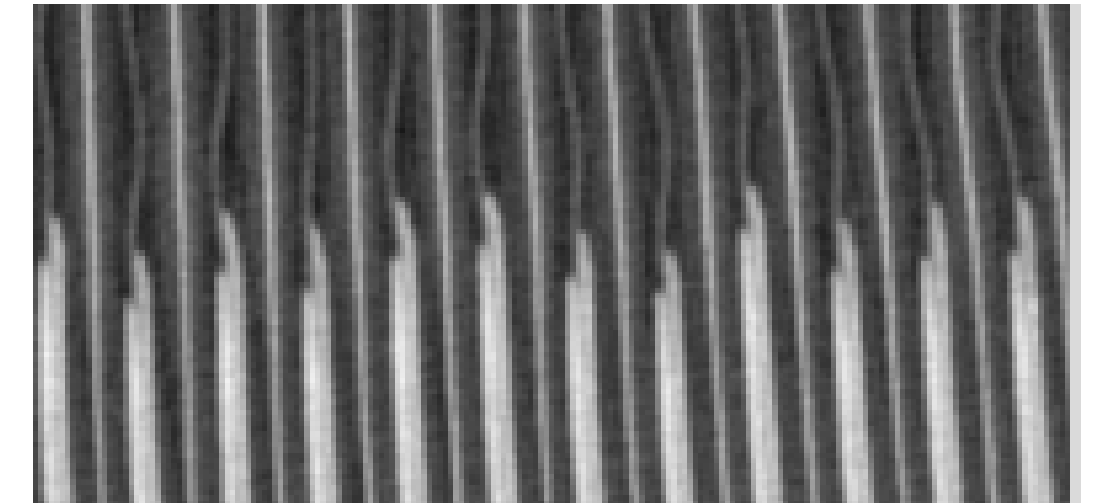
Continuous output

- A well-designed ventilation system and long-lasting filament without frequent maintenance
- Fast response time with service to minimize downtime



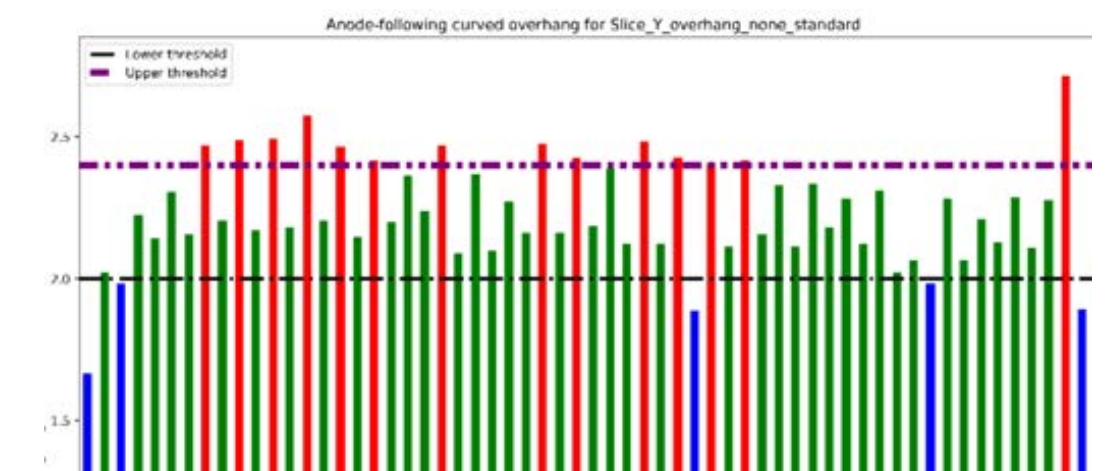
Cost savings

- One single machine handling all types of battery cell, reducing equipment and maintenance costs
- Long service life and durability to reduce operational expenses



Better results

- Higher magnification for R&D analysis of battery structures
- Seamless volume merging and precise geometrical and rotational axis calibration for clear inspection of longer and bigger battery cells



Data visualization

- Quality task and data management solution with automated X-ray software processes
- Well-documented and easy-to-interpret data and findings

Recommended portfolio

Reliable advanced CT system

ZEISS METROTOM 1500

X-ray tube 225 kV / 500 W

Source-to-detector 1500 mm

Detector size 427 mm x 427 mm

Detector resolution 3072 px x 3072 px

Pixel size 139 μ m

Measuring volume 615 mm x 800 mm
(diameter x height)

Benefits:



- High resolution imaging using advanced detectors
- Measurement resolution & accuracy conform to international standards
- Small 6.7 m² footprint for flexible installation
- 870 mm part height and 50 kg weight
- Large cavity holds pouch or prismatic cells



38
Sales & Service
Organizations

63
Quality
Excellence
Centers

11
Locations

245
Sales Partners
Worldwide

Global Metrology Network

Our global service network provides easy access to ZEISS expertise around the world. We use local teams to ensure a swift response and reduced downtime. Make your operations even more secure and reliable with ZEISS.

Find your perfect solution today.
Contact our global experts.

