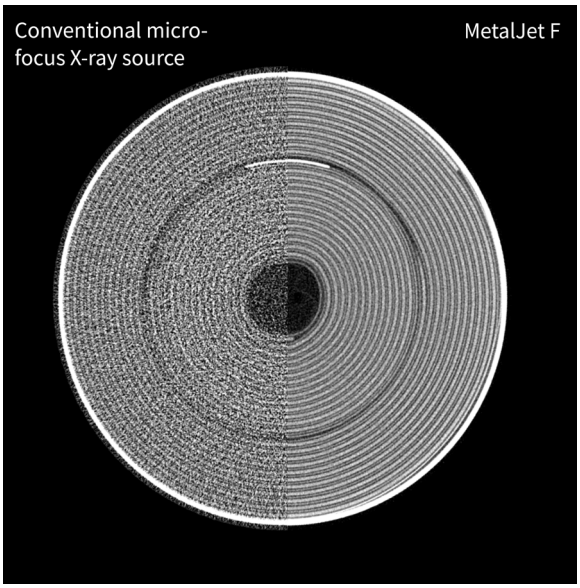
Redefining speed and precision in battery inspection

excillum

High-speed, high-precision 3D X-ray inspection is here

Higher production speeds. Stricter quality requirements. More complex battery designs. These trends are shaping the future of battery manufacturing — and making it harder than ever to ensure quality, reliability and safety. As traditional inspection methods struggle to keep up, Excillum's X-ray sources are enabling a new era of high-speed, high-precision battery inspection.

Battery defects are often microscopic, hidden deep within the cell structure, and impossible to detect from the outside. Conventional 2D X-ray and sample-based testing miss critical internal flaws, while slower computed tomography (CT) systems create production bottlenecks. But with Excillum's MetalJet X-ray technology, manufacturers can achieve high-speed inline CT with the resolution, power, and speed needed to inspect every cell — without slowing down production.



Excillum X-ray sources push the limits of today's most advanced CT techniques, delivering sharper images, faster scans, and the ability to detect defects smaller than ever before. The result? A new standard in battery inspection — ensuring safer, higher-quality, and more efficient battery production.

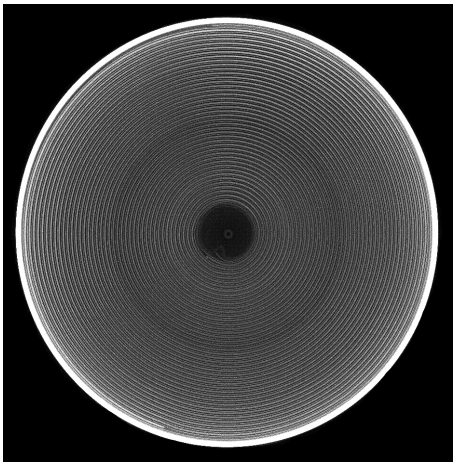
Typical defects identified in 3D X-ray inspection

- Electrode misalignments (AC overhang)
- Internal voids
- Foreign particles contamination
- Jellyroll buckling
- Delamination
- Welding defects
- Cracks in electrodes or casing

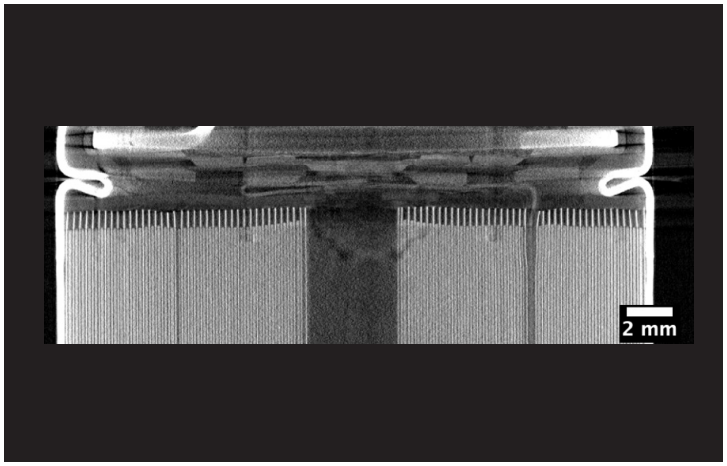
Cylindrical cells

Ensuring quality in cylindrical cell manufacturing is critical, as defects such as electrode misalignments, internal voids, and contamination can lead to reduced efficiency, increased scrap rates, or even safety risks. High-speed, high-resolution inspection solutions are essential for detecting these issues early — optimizing production yield and ensuring the safety and performance of every cell.

With the MetalJet F, region of interest (ROI) scans can be done in less than 1 second, and full cell scanning can be achieved in the matter of a few seconds.



High speed 3D X-ray scan of a 4680 NMC cell, acquired with a MetalJet X-ray source.



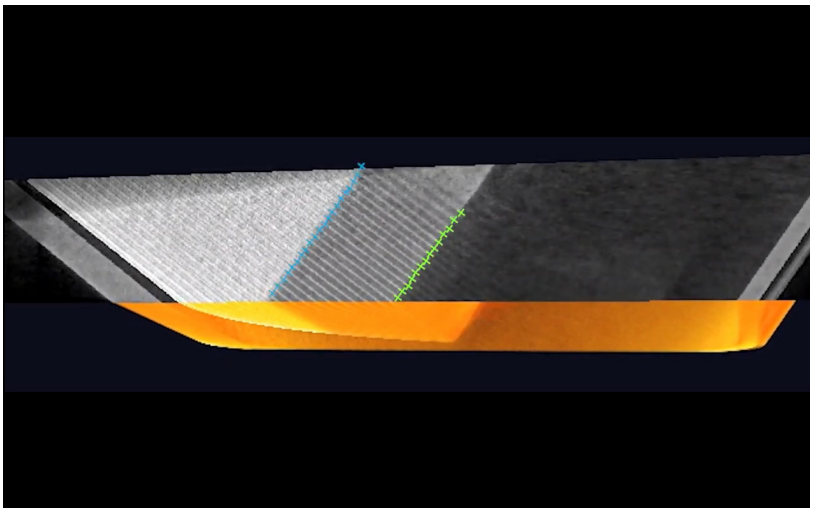
2170 EV cell scanned with a MetalJet X-ray source.

Prismatic cells

Manufacturing challenges such as welding defects, electrolyte leaks, and internal misalignments can impact the performance and safety of prismatic cells. High-precision inspection solutions are essential to detect these issues early, ensuring consistent quality, reliability, and safety in large-scale battery production.

With the MetalJet F, ROI scans of the corner of prismatic cells can be achieved in 1 second or less – to study e.g. electrode alignment.

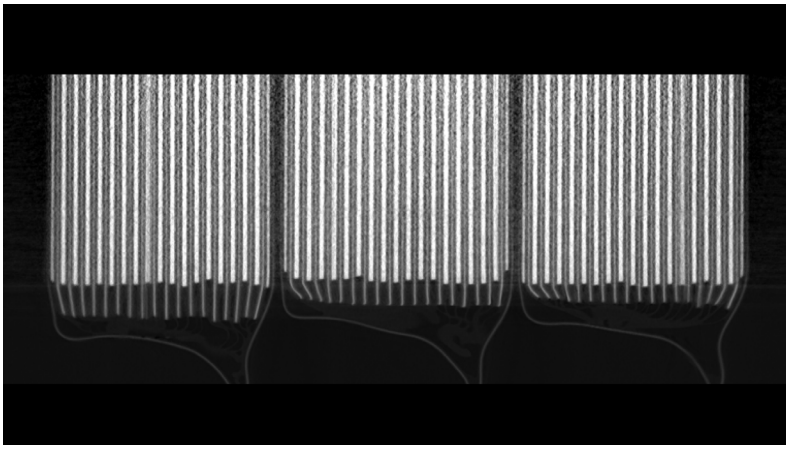
Scan to view a 1-second 3D X-ray scan of an EV battery cell.



Pouch cells

In EVs, pouch cells enable custom battery pack designs with improved cooling and packaging efficiency. In consumer electronics, they provide compact, high-performance power for smartphones, laptops, and other portable devices. However, their flexible casing makes them more susceptible to defects such as swelling, delamination, and internal contamination — issues that can compromise performance, lifespan, and safety. Advanced inspection techniques are essential for detecting these defects early, ensuring reliability, and maintaining the highest quality standards in mass production.

With the MetalJef F either ROI scans or full cell scans can be done – depending on form factor of the cells.



1 second 3D X-ray scan of 3 pouch cells for iPhone 15 stacked on top of each other.

Scan to view a 1-second 3D X-ray scan of a Li-ion battery cell.

MetalJet F for high-speed full inline CT scanning

The next generation of high-performance microfocus X-ray sources is here. The result of twenty years of integrated innovations, MetalJet F combines unparalleled speed, precision and versatility to meet the highest demands of high-throughput industrial inspection.

Want to know more about the X-ray source that can enable ultra-fast inline 3D X-ray inspection? Scan to find all the details.

Excillum AB • Jan Stenbecks Torg 17 • 164 40 Kista, Sweden • excillum.com

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