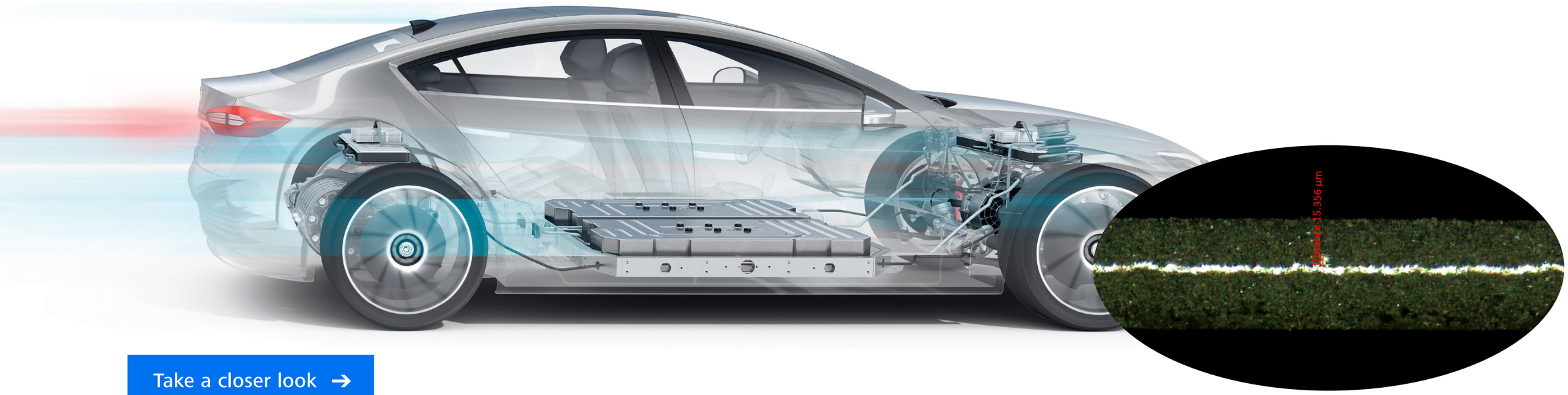
ZEISS eMobility Solutions

Battery Electrode Burr Inspection
by Digital Microscope

Seeing beyond



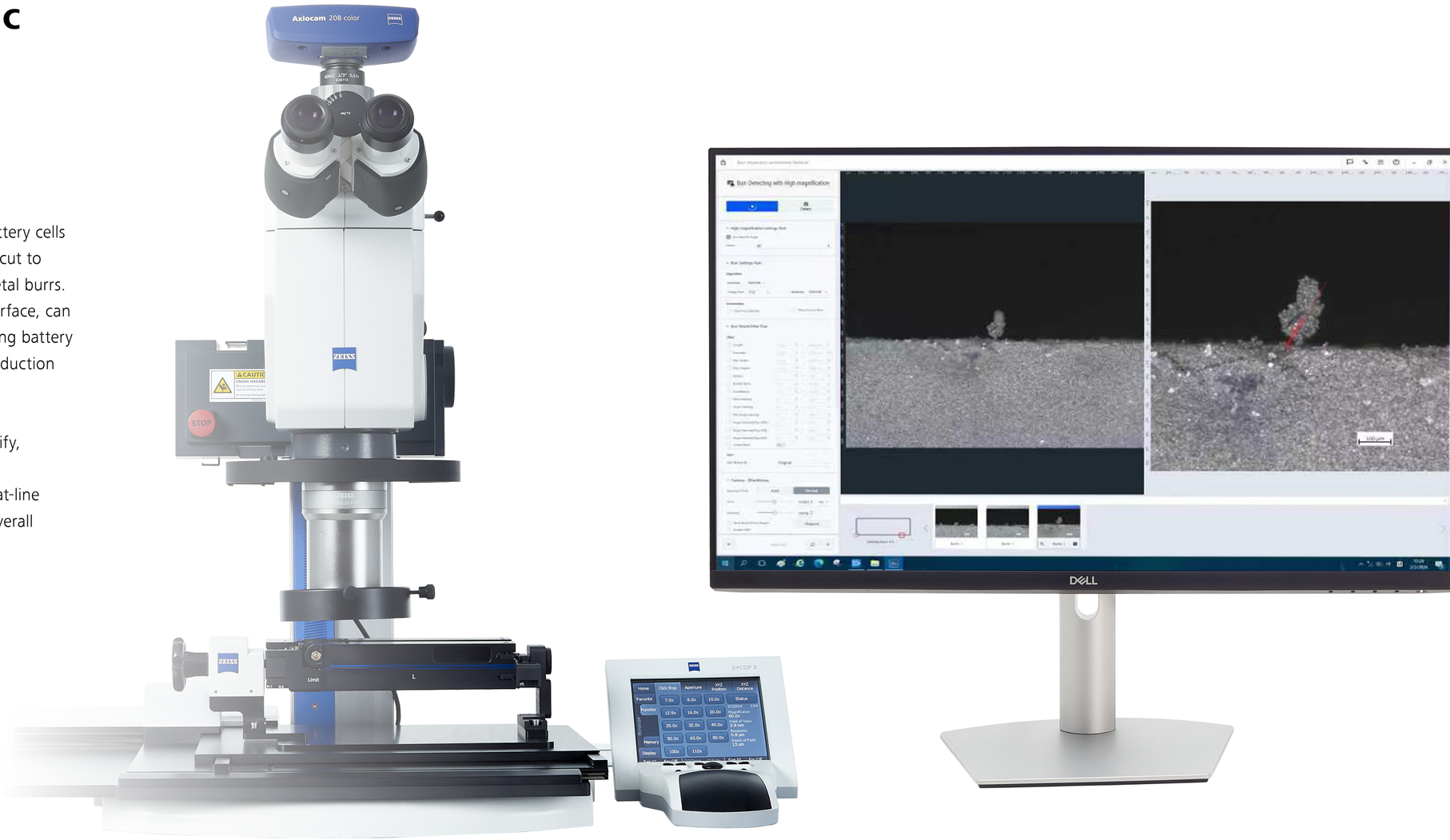
Take a closer look →

High-resolution automatic microscope

Burr inspection of battery electrode

The geometry and composition of electrodes located inside battery cells play a major role in safety and efficiency. When electrodes are cut to produce batteries with different dimensions, this may cause metal burrs. Burrs, the tiny imperfections or protrusions on the electrode surface, can cause short circuits, overheating, and other critical failures during battery operation. Reliable detection and removal of burrs improve production quality, efficiency, and battery reliability.

By using digital microscopes, manufacturers can precisely identify, analyze, and eliminate these defects, improving the safety and reliability of the batteries. Additionally, this method allows for at-line testing, enabling real-time quality control and enhancing the overall manufacturing process efficiency.



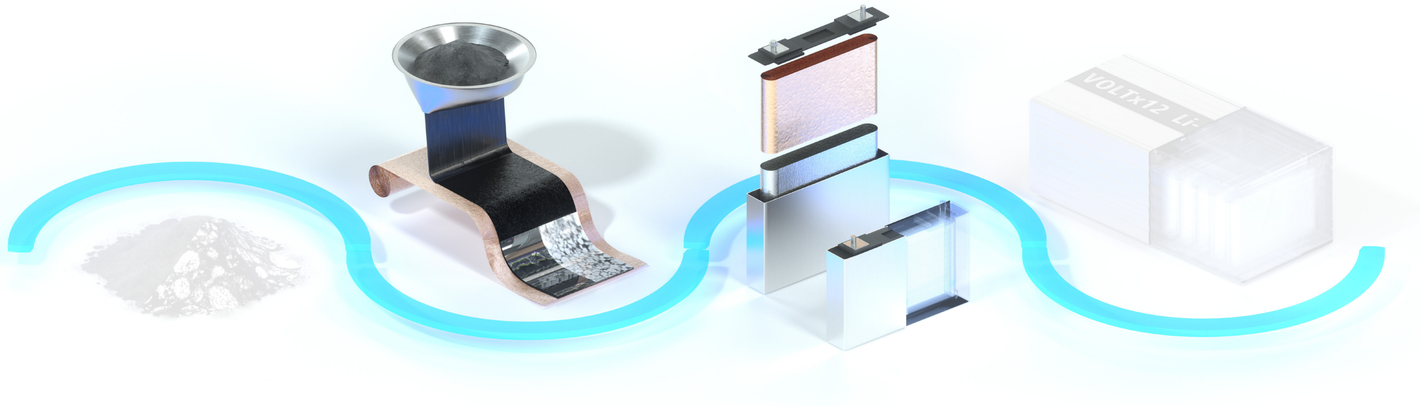
> Learn more about the process and applications

Battery manufacturing process

Microscope enhances quality of electrode production

This is the overview of battery manufacturing process. In the step of electrode production, including slitting, single electrode cutting, and electrode tab cutting, it is critical to perform precise burr inspection to ensure battery quality and safety. There are mainly two types of burrs, horizontal burrs and vertical burrs. Horizontal burrs form after slitting, potentially disrupting layering, and stacking, and vertical burrs form in cutting processes, which may cause separator damage and short circuits. Digital microscope can perform accurate high-resolution inspection of electrodes.

Battery production process →



R&D and production process evolution of battery

Step 1
New material demand

It is necessary to develop new battery materials with enhanced electrochemical performance, higher safety, and cost-effectiveness to fulfill societal demands.

Step 2
Material synthetic methods

Step 3
Single material evaluation

Step 4
Small cell performance

Inspection area:
1. Slitting to width
2. Cutting to single electrode
3. Electrode tab cutting

Digital microscope

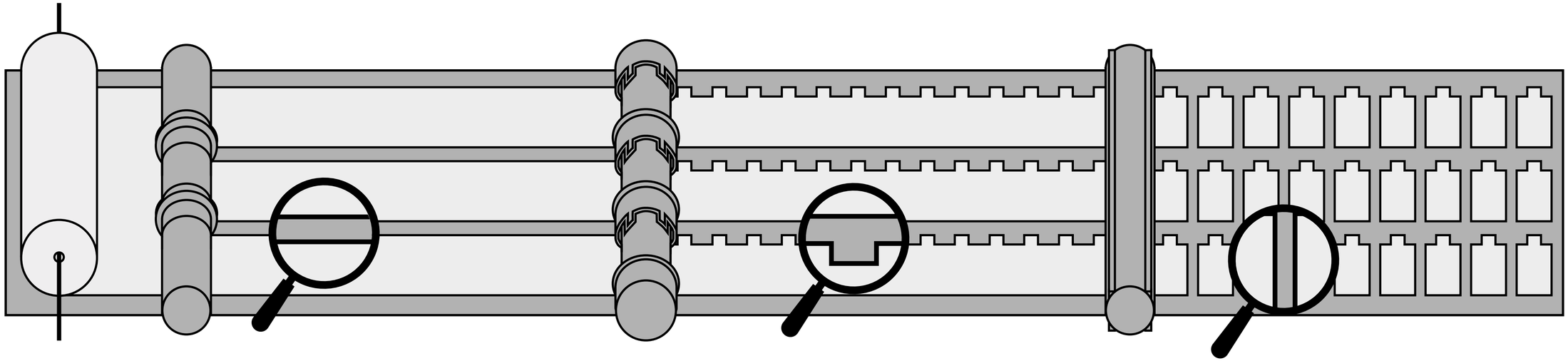
Inspection angle:
1. Horizontal burr
2. Vertical burr

Step 5
NEV cell performance

Step 6
Commercialization

> See more details of the application areas

Application areas of burr inspection



Slitting width burr inspection

- Ensure quality on both sides of the slitted electrode
- First quality checkpoint in electrode processing

Electrode tab cutting burr inspection

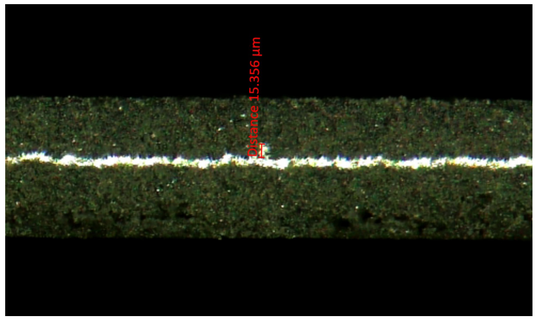
- Critical part of the production process to control burrs in electrode tab cutting
- Ensure issue detection in complex cutting areas

Single electrode cutting edge burr inspection

- Final step in the electrode assembly for battery production
- Ensure battery cell quality and safety

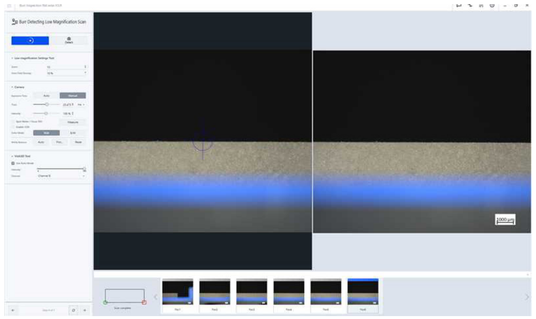
> Have a look into the value proposition

Value proposition of ZEISS solution



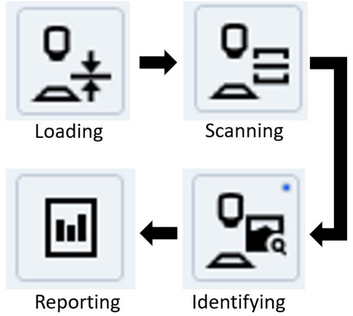
Accuracy

- Consistent burr detection software algorithms that can be configured based on the defined burr identification criteria
- New auto-focus algorithm, dedicated to electrode with high accuracy and efficiency



High efficiency

- Full automated detection based on ZEN core, including automatic identification and measurement of burrs on the electrode edges, automatic electrode scanning and image capture, and automatic report generation
- Optional adaptable illumination and light patterns auto-switch during the workflow



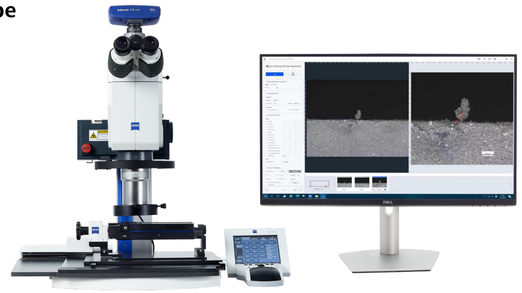
Reproducibility

- Consistent microscope hardware and software configuration for each inspection task through motorized and encoded components and automated software workflows
- Consistent results for the same task under the same workflow, even with different operators

> See more details of recommended portfolio

Recommended portfolio

Automated digital microscope
ZEISS Axio Zoom.V16



Resolution	• 0.7 – 5.0 µm with PlanNeoFluar Z 1.0x • 1.3 – 10.0 µm with PlanApo Z 0.5x • 0.4 – 3.3 µm with Apo Z 1.5x
Magnification	• 7x – 112x with PlanNeoFluar Z 1.0x • 10.5x – 168x with PlanApo Z 0.5x • 3.5x – 56x with Apo Z 1.5x
Sample stage	• Compatible with electrode samples up to 140 mm x 90 mm • Large Stage can be customized upon request
Illumination source	• Pattern switchable LED illumination • Optional auto adaptable illumination

Benefits:

- Fully automated detection workflow
- Burr detection algorithm can easily find different types of burrs
- ZEISS high-quality optical performance
- Various ZEISS Axiocam to match customer requirements

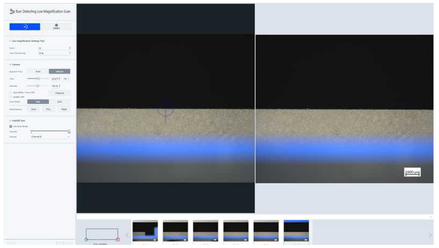
> Explore ZEISS Axio Zoom.V16

Software solutions
Co-developed with battery experts and powered by the ZEN core

ZEISS Quality Software provides versatile and high-precision analysis capabilities. Based on specific requirements, customers can conduct data evaluations and generate reports across various technologies and systems.

ZEN core

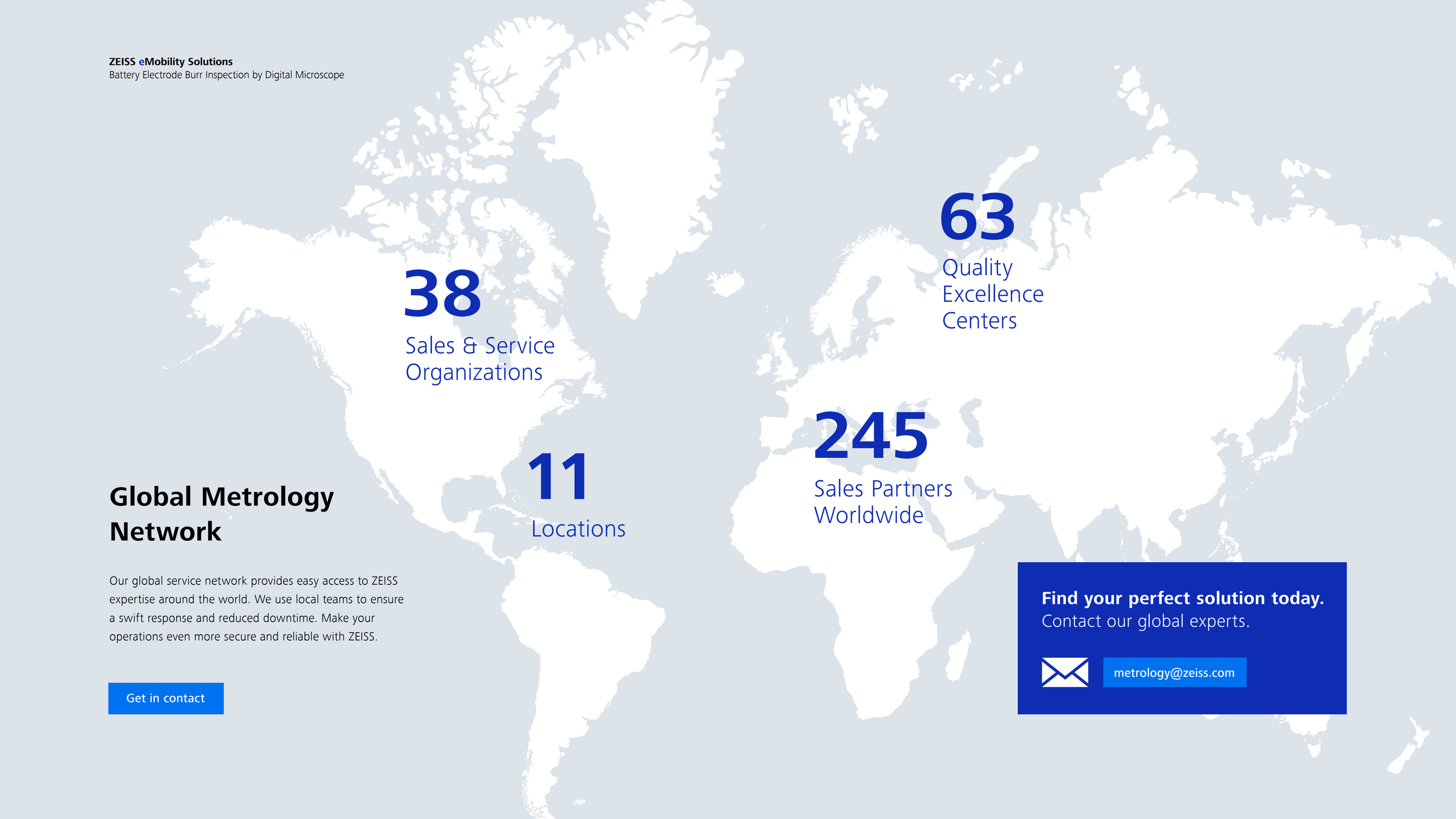
ZEN core is the command center for automated imaging and analysis functions on compound light microscopes. Use built-in automated image acquisition routines and benefit from the consistency of an advanced and repeatable workflow.



Burr inspection software

The burr Inspection software, built on ZEN core, serves as dedicated solution for automated burr detection across samples. Leverage fully automated routines and enjoy the precision of a customizable and consistent workflow tailored to specific inspection requirements.

> Explore ZEISS ZEN core



38
Sales & Service Organizations

11
Locations

63
Quality Excellence Centers

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.

Get in contact

Find your perfect solution today.
Contact our global experts.

metrology@zeiss.com