

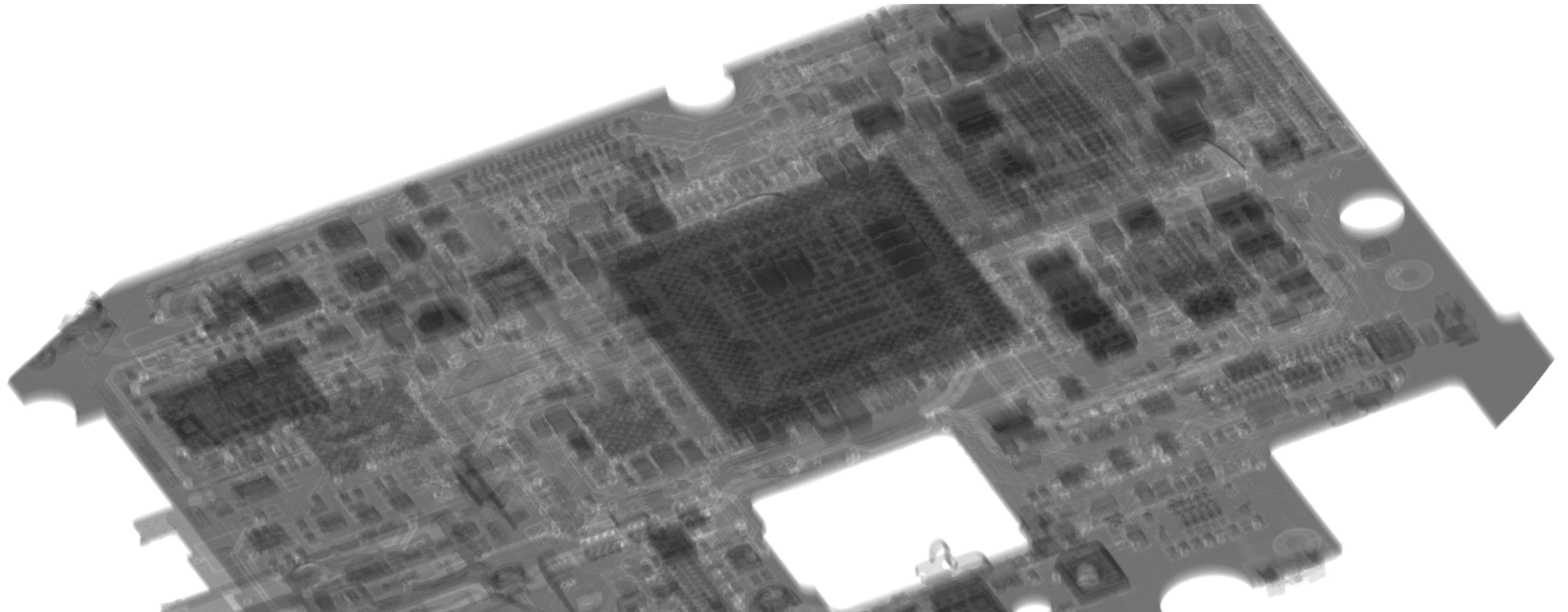
ZEISS eMobility Solutions



Seeing beyond

Power Electronics IGBT & PCBA

Non-destructive Inspection by CT



Power Electronics quality control IGBT & PCBA non-destructive inspection by CT

Power Electronic assemblies are crucial components in the powertrain system of new energy vehicles (NEVs), converting battery energy into the required electrical forms for various components.

As the development of NEV, power electronic is increasingly integrated, aiming for higher output in smaller sizes, hereby raising reliability requirements.

The quality of power modules and Printed Circuit Board Assembly (PCBA), core components of power electronic, is of utmost importance. The internal assembly quality and soldering quality of Insulated Gate Bipolar Transistor (IGBT) modules and PCBAs directly impact the overall safety and reliability of the vehicle.

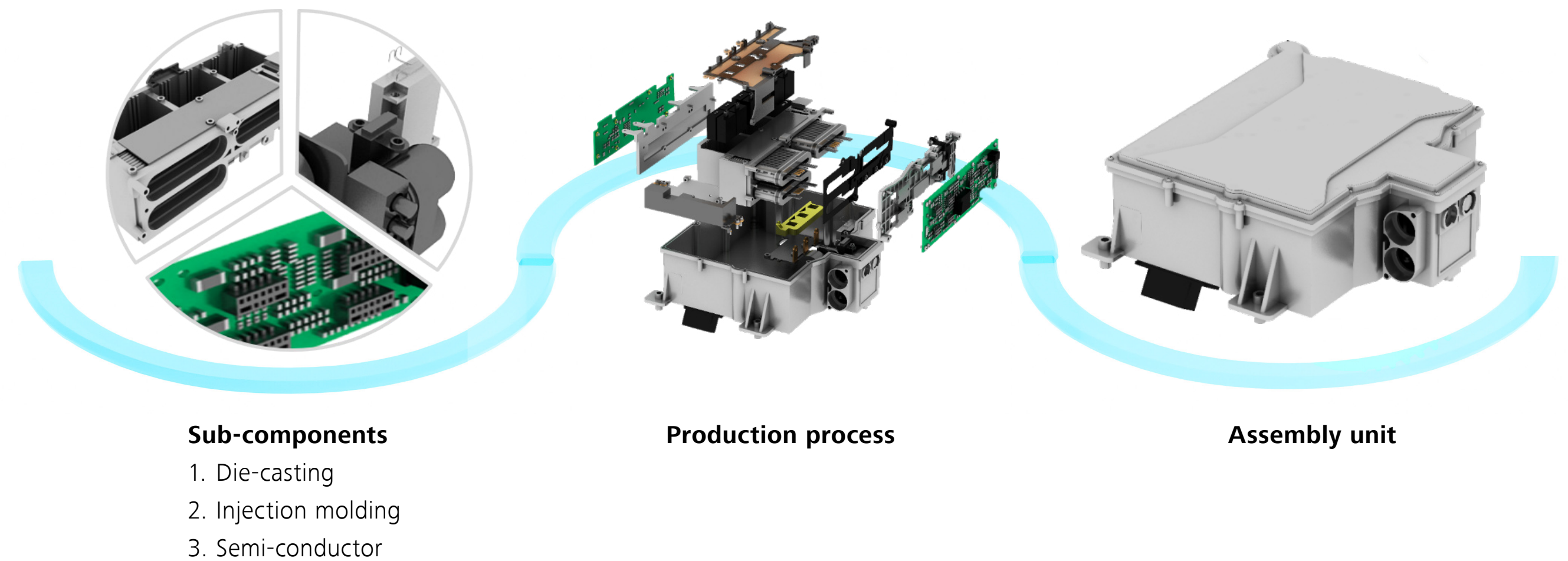
Non-destructive Computed Tomography (CT) testing offers an efficient and accurate method to assess the quality of automotive power devices.



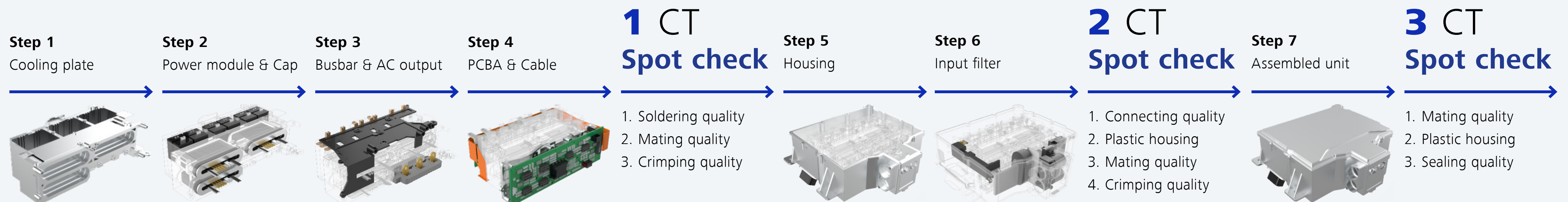
Enhance quality control of Power Electronics

Throughout manufacturing process

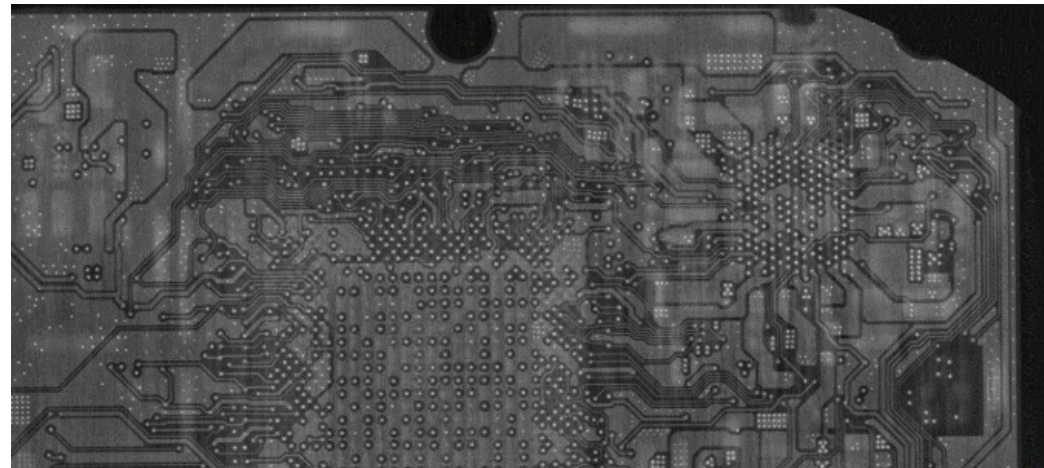
Power Electronics assembly follows a linear production process, with most components supplied externally and assembled in sequence. The connection of mechanical and electrical properties is achieved through methods such as screws and welding. Incoming inspections only verify component delivery quality, while new issues may arise during assembly. Therefore, it is necessary to add inspection processes alongside each critical procedure to ensure production stability. Traditional testing mainly relies on electrical performance measurements. However, integrating CT scanning allows for more reliable assessments by providing a secondary confirmation of internal structures, enhancing overall quality assurance.



Production process of Power Electronics

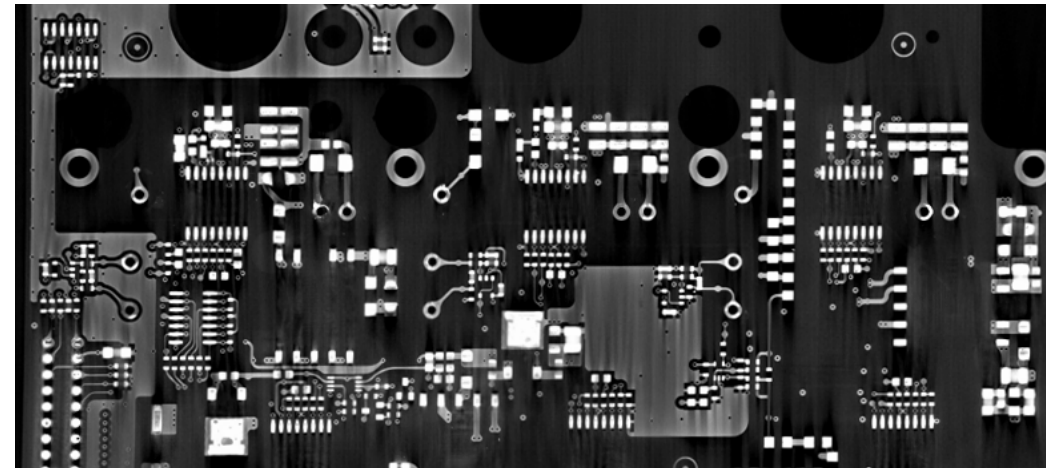


Application areas of CT non-destructive inspection



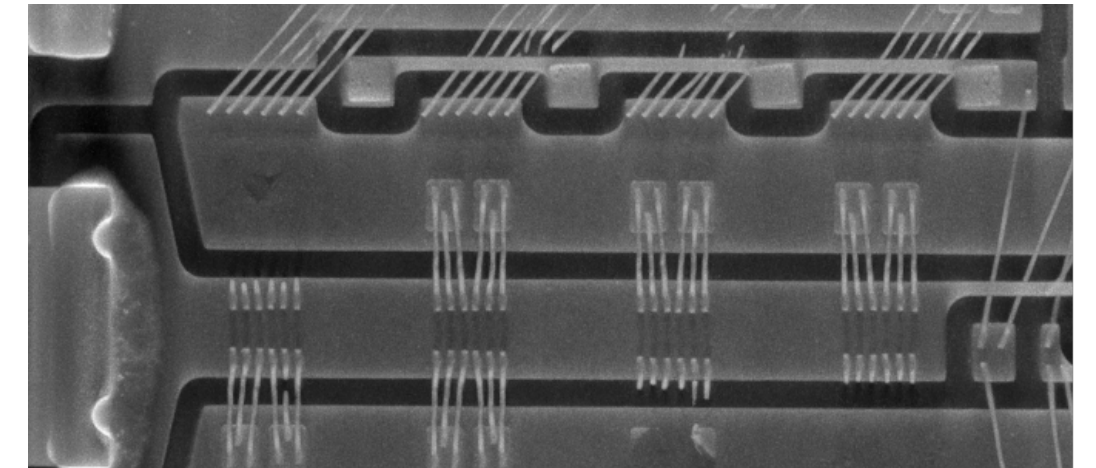
R&D - PCB internal routing

- High-resolution & high-magnification CT for the entire PCBA
- Excellent imaging quality enhancing internal trace detection in PCBA



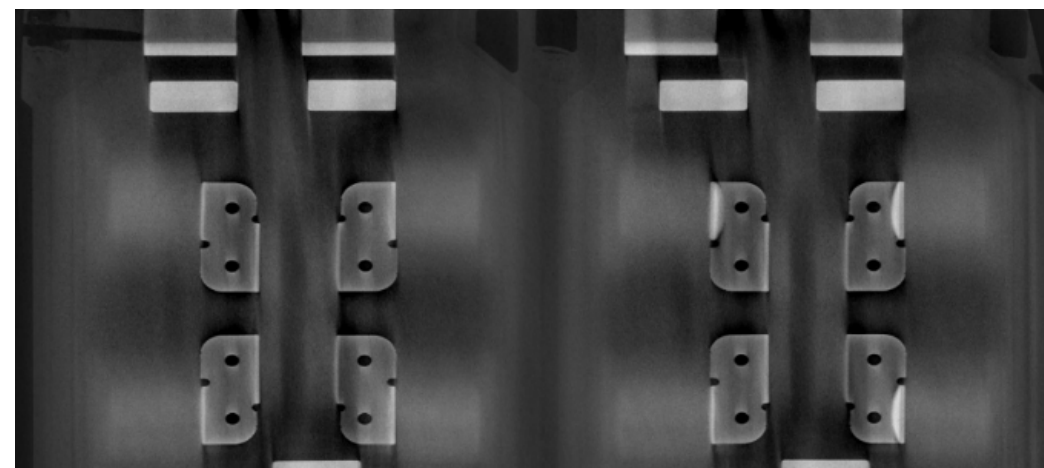
R&D - soldering quality

- Excellent imaging quality enhancing the soldering quality inspection results



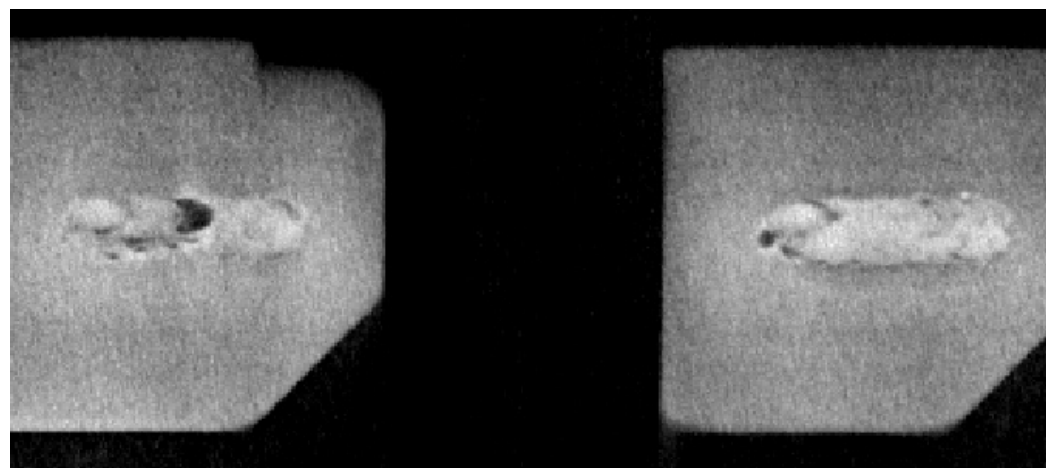
R&D - power module failure analysis

- Delivering clear failure overview and identifying root cause
- Scans for causes of varying severity, including welding defects, connecting failure and internal crack



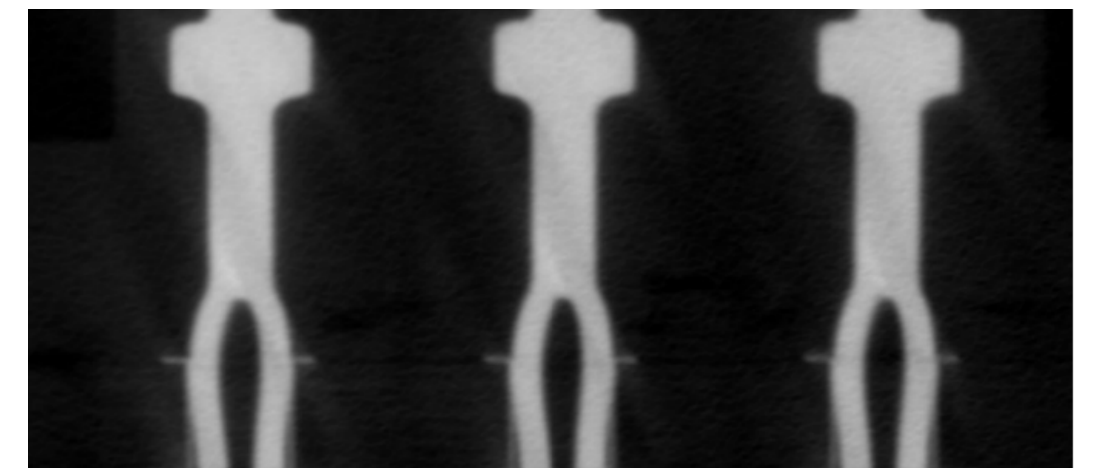
Quality lab - power module internal structure inspection

- One-stop CT solution for comprehensive understanding of entire unit
- Statistical data and quantification of results for determining manufacturing standards and validating the process



Quality lab - laser welding process control

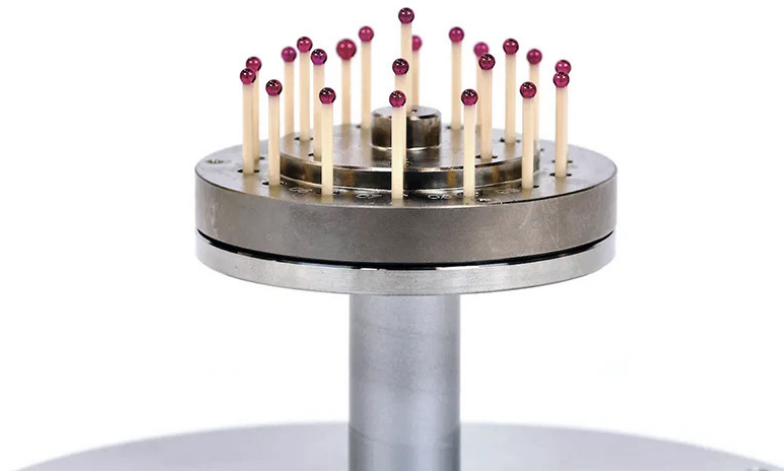
- Non-destructive inspection for welding process during production
- Clear scan results effectively to determine the state of molten pool



Quality lab - press-fit process quality control

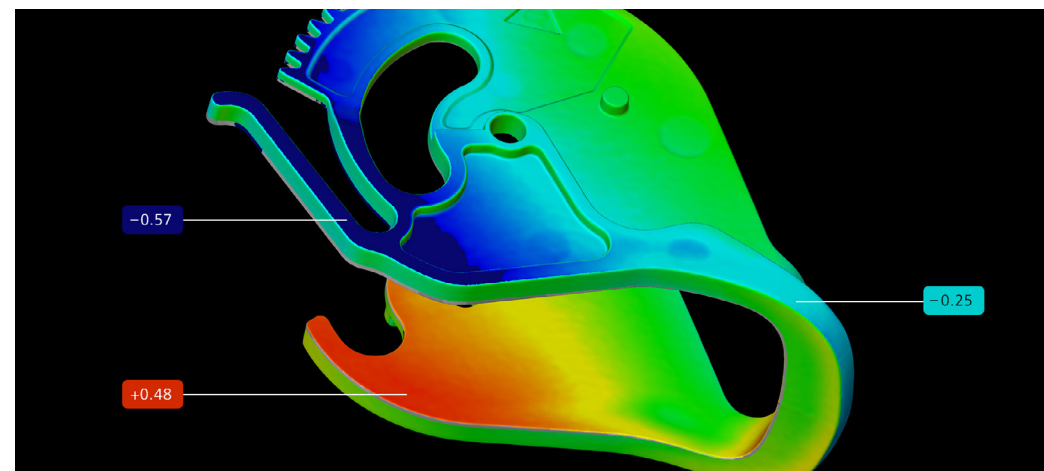
- High-precision detection results for measuring press-fitting quality
- Spot checks to ensure the internal press-fit quality between power module and PCBAs

Value proposition of ZEISS solution



High accuracy in any position

- High-precision CT inspection as an alternative to traditional inspection
- Non-destructive inspection for internal dimensions to reduce costs of destructive testing



Powerful metrology for CT data with ZEISS INSPECT X-Ray

- Automated inspection of multiple parts
- Evaluate defects, structures, and assembly situations, and bundle all results in easy-to-understand reports



Effective reduction of scattering artefacts

- Scatter-Control making high-density regions in multi-material products clearer
- Clear observation of various internal quality details



High load capacity with huge cabin volume

- Measurement of the entire PCBA in one scanning time
- high-magnification precision measurement for small parts



Recommended portfolio

Reliable advanced CT system

ZEISS METROTOM 800



X-ray tube	225kV / 500 W
Source to detector	800 mm
Detector size	243 x 195 mm
Detector resolution	1920 px x 1536 px
Pixel size	127µm
Measuring volume (diameter x height)	360 mm x 300 mm

Benefits:



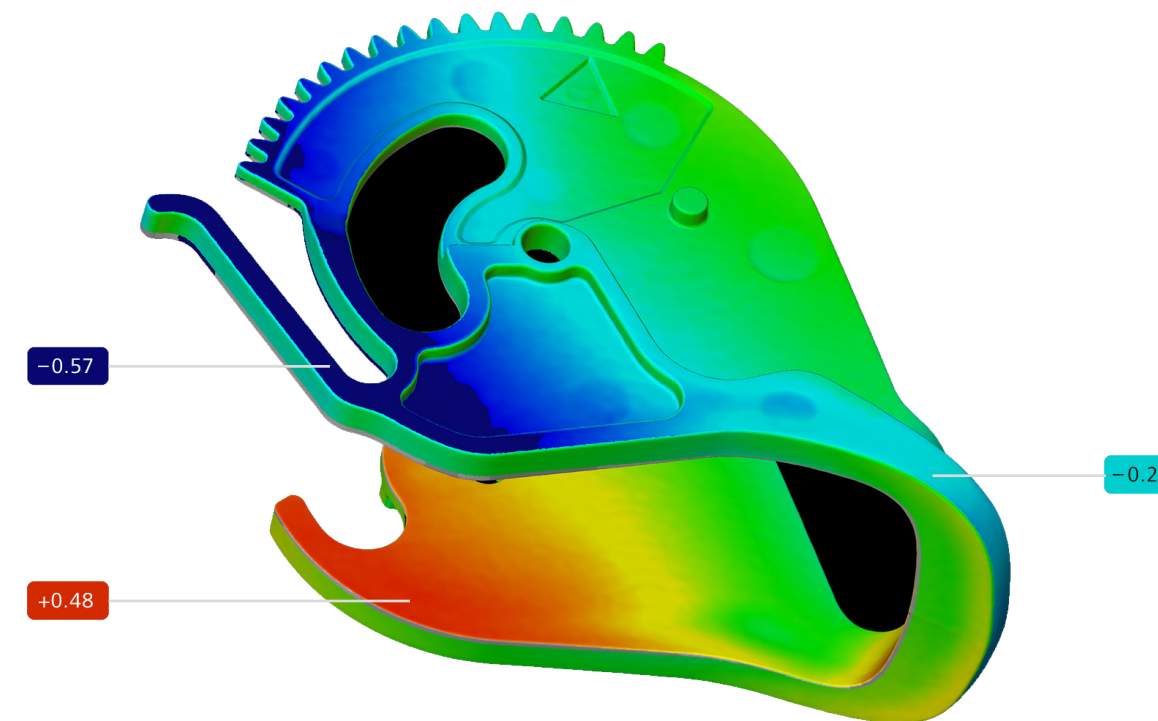
- The 500W open micro-focus tube in combination with a 1.5k detector provides a good image quality, a fast acquisition and higher resolution.
- The small footprint is less than 8m² including the service area and the compact design (control unit included) allows flexible installation on a small space.
- With the positioning system with two axis, the size of parts fitting into the system is up to 700mm in height on 5.8m² system area.
- The positioning systems provide a highly accurate movement of the part over the entire field-of-view guaranteeing a MPESD of 4.0+L/100µm referring to VDI/VDE 2630 sheet 1.3.

Software solutions

Customer challenges in focus

ZEISS Quality Software delivers high flexibility combined with high-precision analyses. Depending on your requirements, you create data evaluations analyses and reports across technologies and systems.

With the digital ecosystem for **ZEISS Quality Software**, the ZEISS Quality Suite, you have access to the various software solutions via one central platform and can access all services with just a few clicks.



ZEISS INSPECT X-Ray

ZEISS INSPECT X-Ray is a powerful inspection software for any CT on the market with large scope of functionality. Evaluate defects, structures, and assembly situations. Analyze geometric dimensions. Bundle your results in easy-to-understand reports even with video and share them with others.

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.

