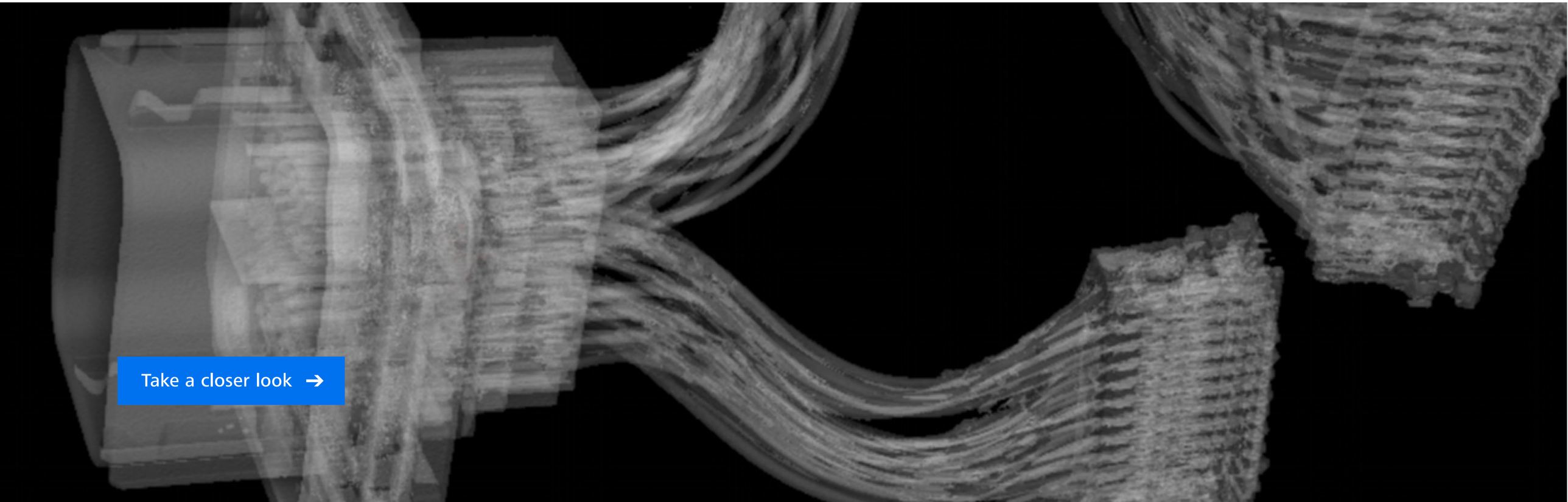
ZEISS eMobility Solutions

Seeing beyond

Power Electronics Connection Non-destructive Inspection by CT



Power Electronics quality control
Connection 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.

Connectors, essential for signal and current transmission within power electronics, are becoming more complex in structure, with more stringent reliability standards.

Computed Tomography (CT) scanning can not only detect the quality of product injection molding, but also inspect the assembly status and measure internal dimensions after assembly.

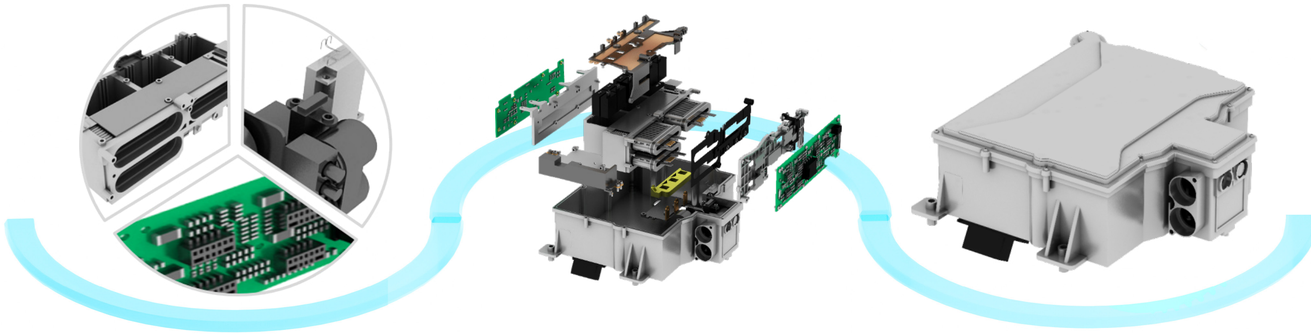
> Learn more about the process and applications

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.

Power Electronics production process →



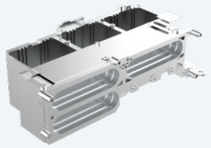
Sub-components
1. Die-casting
2. Injection molding
3. Semi-conductor

Production process

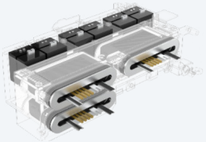
Assembly unit

Production process of Power Electronics

Step 1
Cooling plate



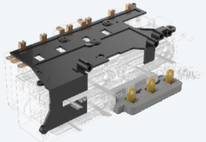
Step 2
Power module & Cap



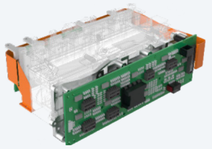
1 CT
Spot check

1. Soldering quality
2. Internal structure quality
3. Foreign particles testing

Step 3
Busbar & AC output



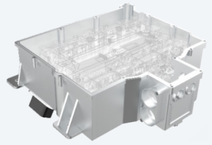
Step 4
PCBA & Cable



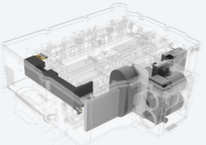
2 CT
Spot check

1. IGBT & PCBA connection quality

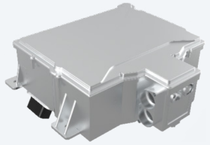
Step 5
Housing



Step 6
Input filter



Step 7
Assembled unit

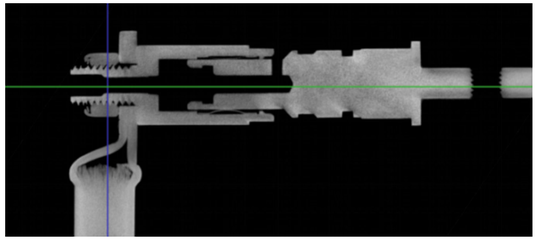


3 CT
Spot check

1. IGBT internal position inspection
2. Cooling channel sealing quality
3. Internal soldering quality after aging

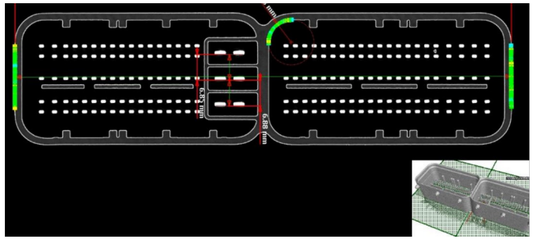
> See more details of the application areas

Application areas of CT non-destructive inspection



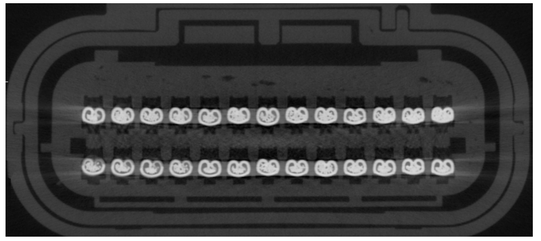
R&D - internal terminal contact condition

- High-resolution & high-magnification CT for the entire connector
- Excellent imaging quality enhancing internal mating detection



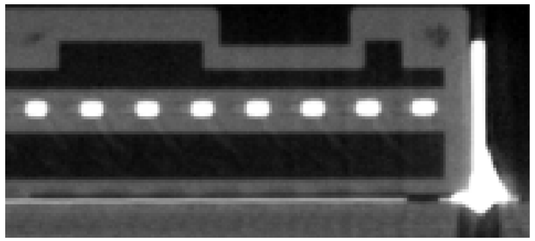
R&D - internal dimension inspection

- High-precision scanning results replacing traditional dimensional inspection



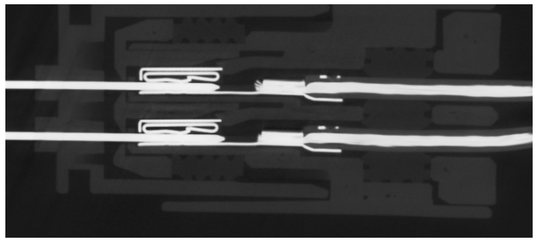
R&D - terminal crimping quality

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



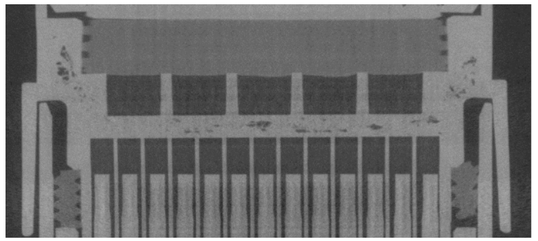
Quality lab - soldering quality control

- Statistical data and quantification of results for determining manufacturing standards and validating soldering process



Quality lab - terminal mating condition inspection

- Non-destructive inspection for mating process inside the unit
- Clear scan results effectively to determine the state of mating quality

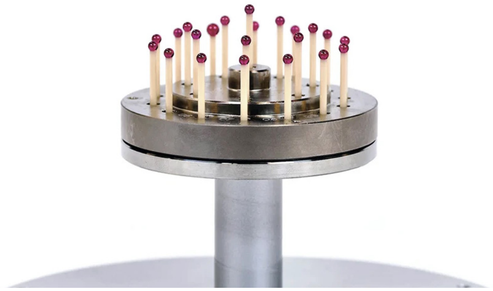


Quality lab - connector mating condition inspection

- Sealing ring position detection to ensure the reliability of connector lifespan

> Have a look into the value proposition

Value proposition of ZEISS solution

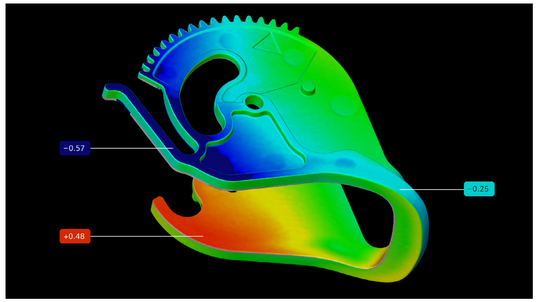


High accuracy in any position

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

Effective reduction of scattering artefacts

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



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

> See more details of recommended portfolio

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:

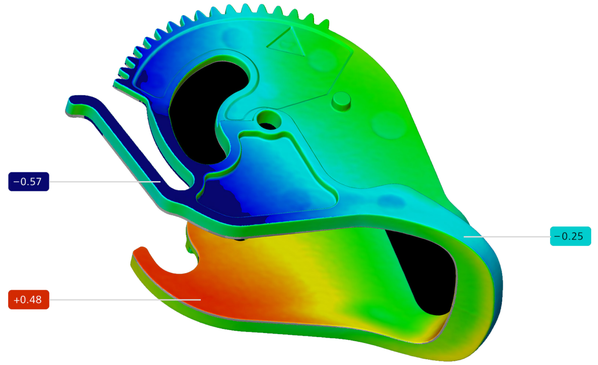
- The 500W open micro-focus tube in combination with a 1.5k detector provides a good image quality, a fast acquisition and higher resolution.
- The small footprint is less than 8m² including the service area and the compact design (control unit included) allows flexible installation on a small space.
- 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.

> Explore ZEISS METROTOM 800

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.

> Explore ZEISS INSPECT X-Ray

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