

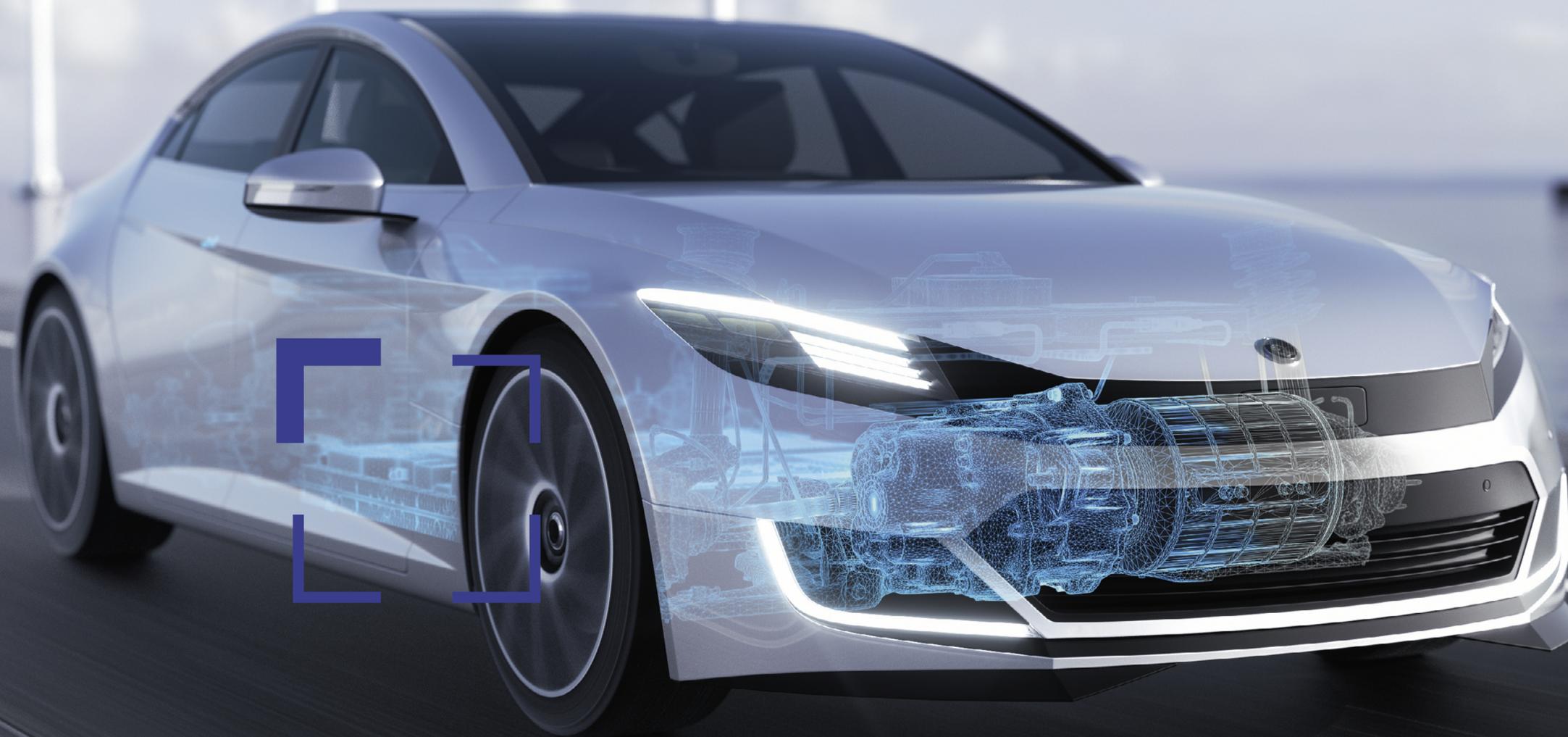
ZEISS eMobility Solutions

# Battery Trays Deep Dive

From **e**nergy to **e**Motion



Seeing beyond



Why Battery Trays need a holistic

# Quality Process

The battery tray is not just another part of an electric vehicle - it is the new core component serving as the interface between the drive and the structural element. For manufacturers and material suppliers it holds complex conceptual tasks:

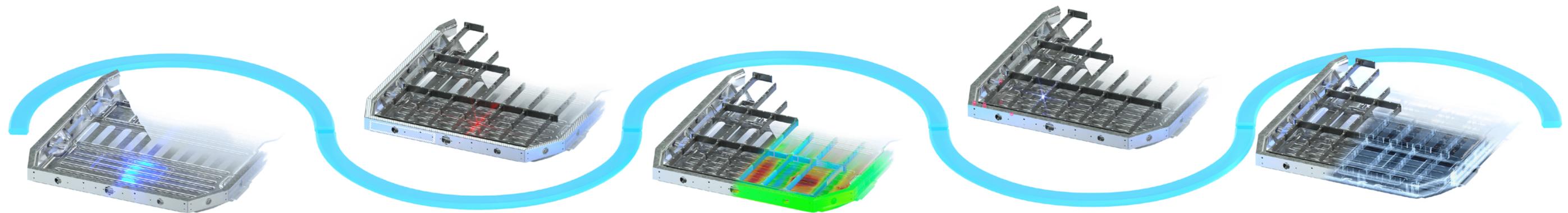
The battery must be crash- and leak-proof of corrosion-resistant, electromagnetically shielded and cooled.

## Get all steps of the manufacturing process right

Follow us along to learn about the ZEISS know-how at every stage of the production process: Five quality gates need to be mastered thoroughly to ensure the overall safety requirements and quality of the vehicle.

### Inline Inspection

### Atline and Offline Analysis



## Quality Gate 1

# Joining Process Control

Process control with correlation-free and traceable Inline Measurement Technology

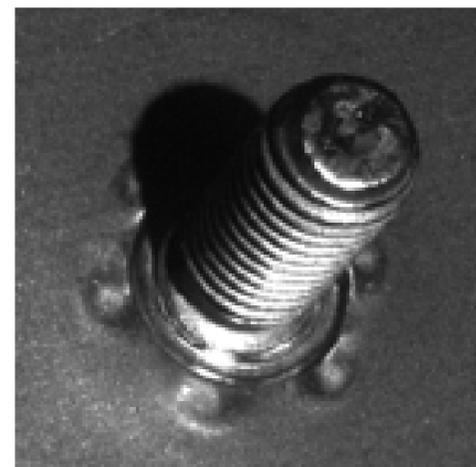
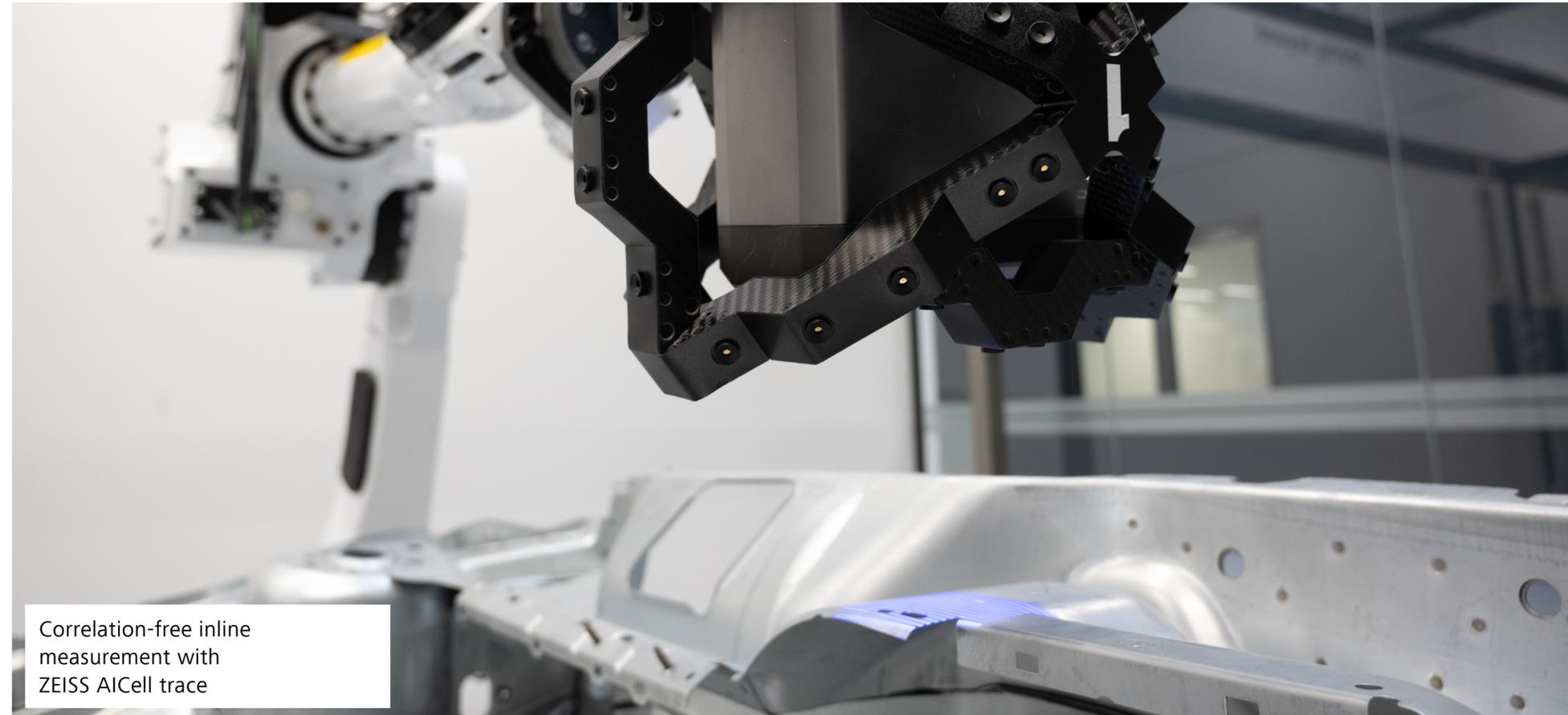
## Challenges

The battery tray consists of several individual components and serves as a structural part of the vehicle - consequently, it must meet many safety-related criteria. This makes the assembly process complex due to a high number of dependencies, such as individual component properties and welded joints.

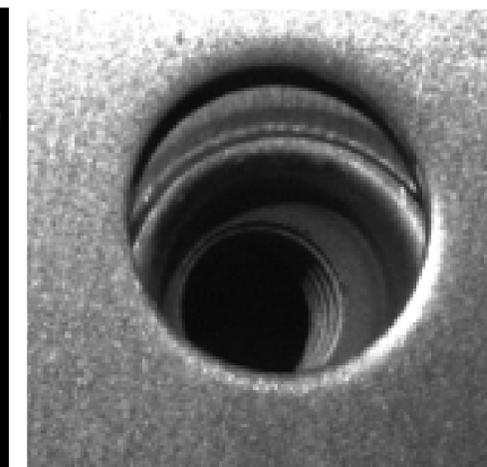
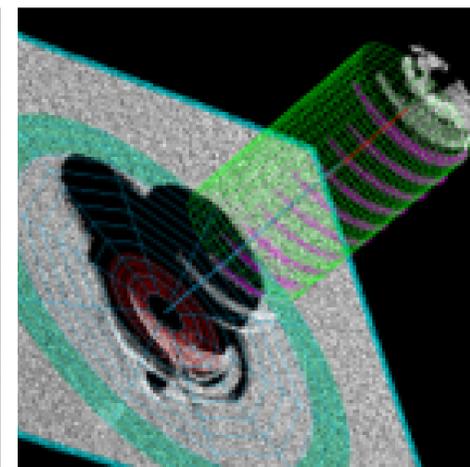
## Our Solution

ZEISS Inline Solutions deliver correlation-free inline measurement for real-time process monitoring of complex characteristics of the entire battery tray:

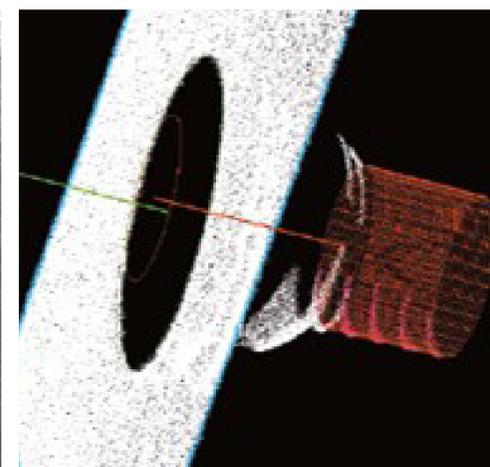
- Acquire reliable correlation-free and traceable measurement and inspection data
- Short measuring time for feature measurements due to high-end automated inline sensor, like ZEISS AIMax cloud
- Inline Metrology in one single cell, for inspection of every part produced
- Meet requirements of the DIN / ISO 10360-8 standard



Stud measurement of connection points



Measurability of complex features: Nut behind sheet Metal



## Quality Gate 2

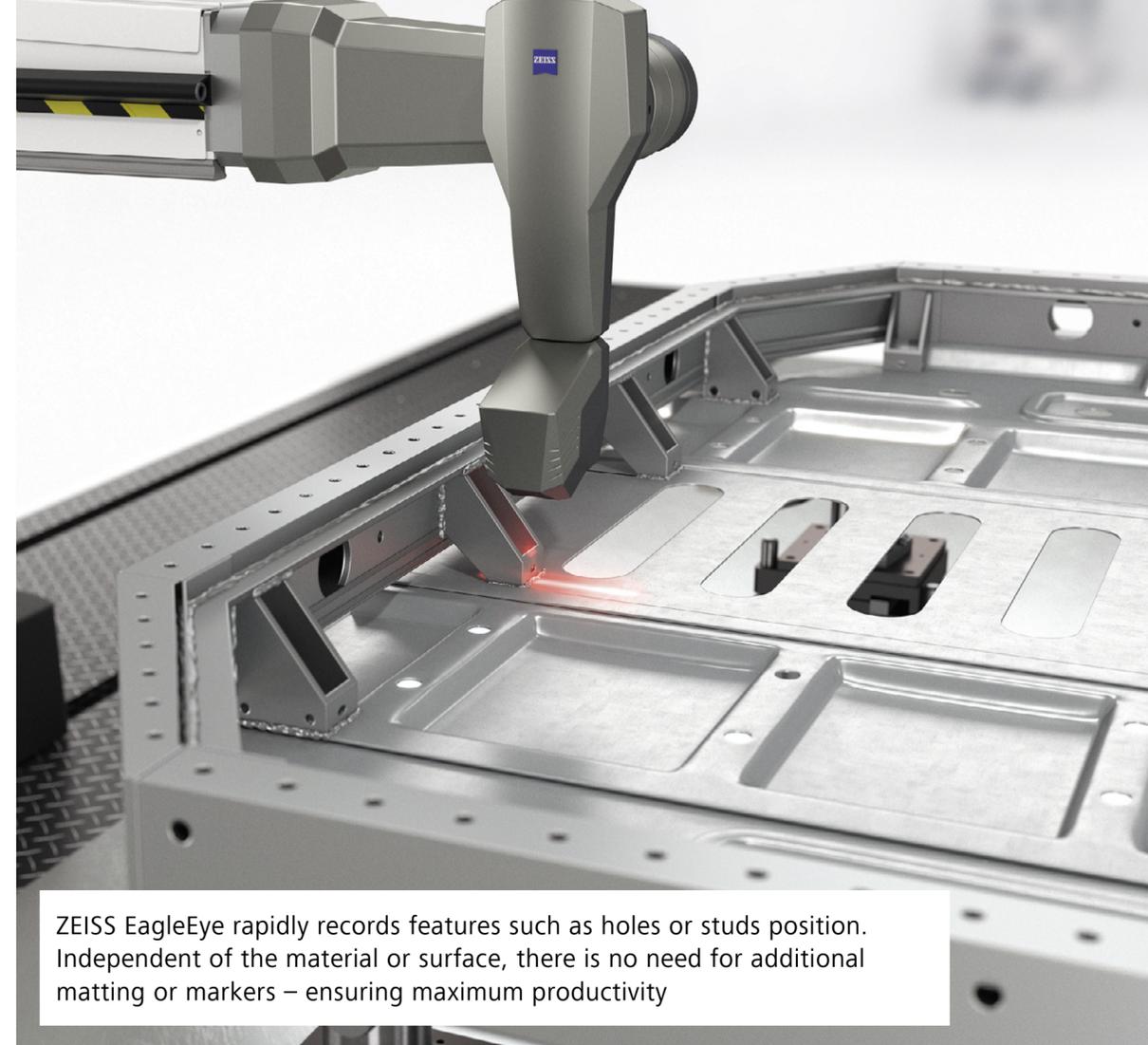
# Milling & Drilling Process Control

Process control of significant characteristics

## Challenges

Milling & drilling production processes are typically characterized by rough environmental conditions including dust, oil and changing temperature gradients.

Nevertheless, a large number of significant features with tight tolerances are crucial to be measured. Those requirements lead to the need for quick inspection cycles to keep up with the speed of production and a precise but robust quality solution.



ZEISS EagleEye rapidly records features such as holes or studs position. Independent of the material or surface, there is no need for additional matting or markers – ensuring maximum productivity



Tactile sensors cover optically inaccessible features, such as undercuts - ensuring maximum precision

## Our Solution

The horizontal-arm machine CALENO from ZEISS combines high performance optical and tactile sensors. With that, the large number of features in a battery tray can be inspected very fast - allowing to shorten inspection cycles without compromising on accuracy.

Thermal insulation and protection against dust and dirt in the working environment makes ZEISS CALENO a preferred system.

### Quality Gate 3

## Full-Field Inspection

Digital Twin and Digital Assembly

### Challenges

The evaluation of the surface as a whole is crucial:

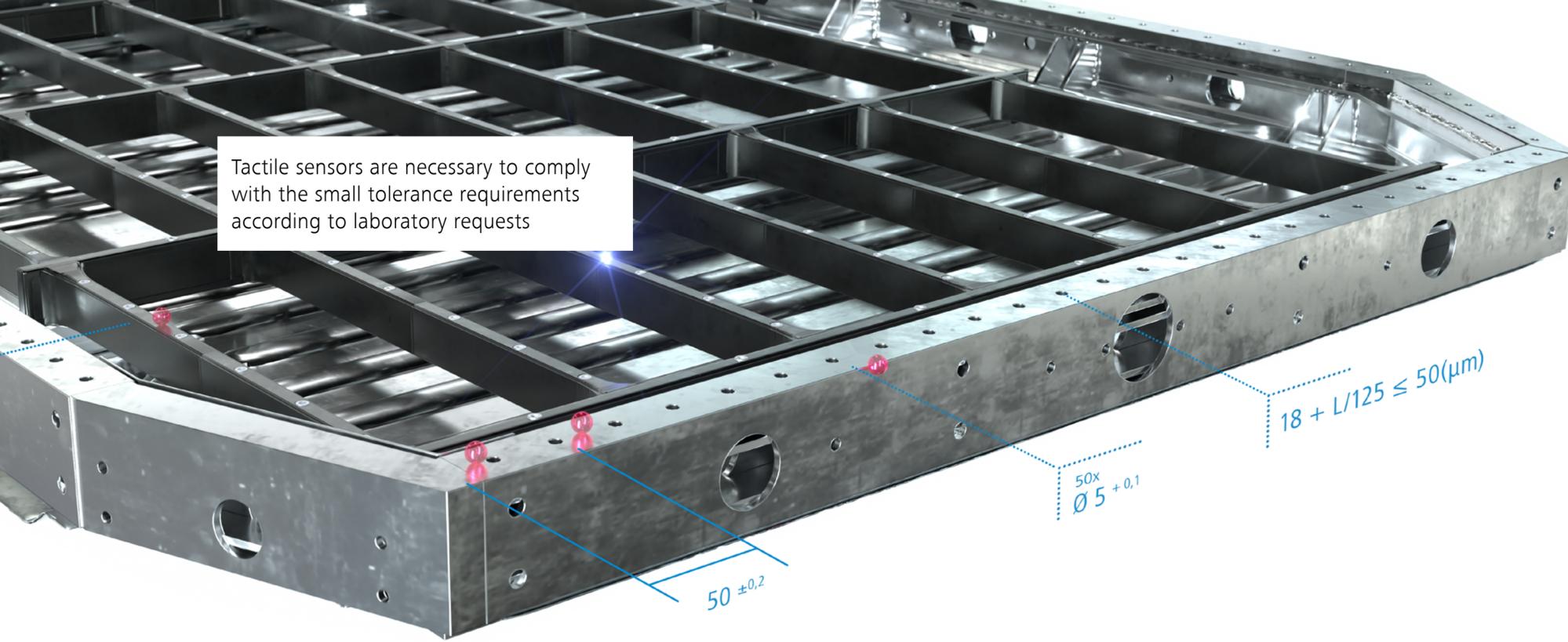
Flatness, Matching and sealing areas from the battery tray have impact on the dimensional accuracy of the complete car body. Further, flexible cables and connectors need to be positioned correctly to ensure a flawless assembly of the battery tray and cover. Also, battery modules must fit correctly to the battery compartments with thermal paste to ensure safe operation.

### Our Solution

ATOS ScanBox from GOM Metrology enables an automated and fast full-field measurement of the battery tray

- The fully automated optical 3D measuring machine generates a full digital twin of the battery tray within a few minutes
- Software Features in GOM Inspect Pro allow for a time saving digital assembly process, including all connecting components and their alignments
- Questions about gap size changes caused by thermal deformation of the battery modules after cycle tests can also be answered easily





#### Quality Gate 4

## Critical Functions Control

Analysis of the complete battery tray with high accuracy

### Challenges

The final safety check and certification of the complete battery tray represents a special challenge. Safety critical characteristics consist mostly of a complex welded aluminum profile that underlies thermal expansion when temperature increases e.g. during charging and driving. This can lead to torsion and bending in the tray and may cause serious safety issues.

### Our Solution

Multisensory ZEISS Coordinate Measuring Machines (CMMs) offer a big measuring field and allow the usage of both tactile and optical sensors on one machine. Combined with the powerful ZEISS software CALYPSO and PiWeb CMMs allow to compare and correlate measuring results inline as well as atline.



The use of optical sensors like ZEISS DotScan – a confocal white-light sensor – or laser triangulation sensors as ZEISS LineScan allow to measure battery tray features with high speed and high accuracy.

## Hidden defects analysis

### Quality Gate 5

## Structural Analysis

Analysis of the sealing and glue areas

### Challenges

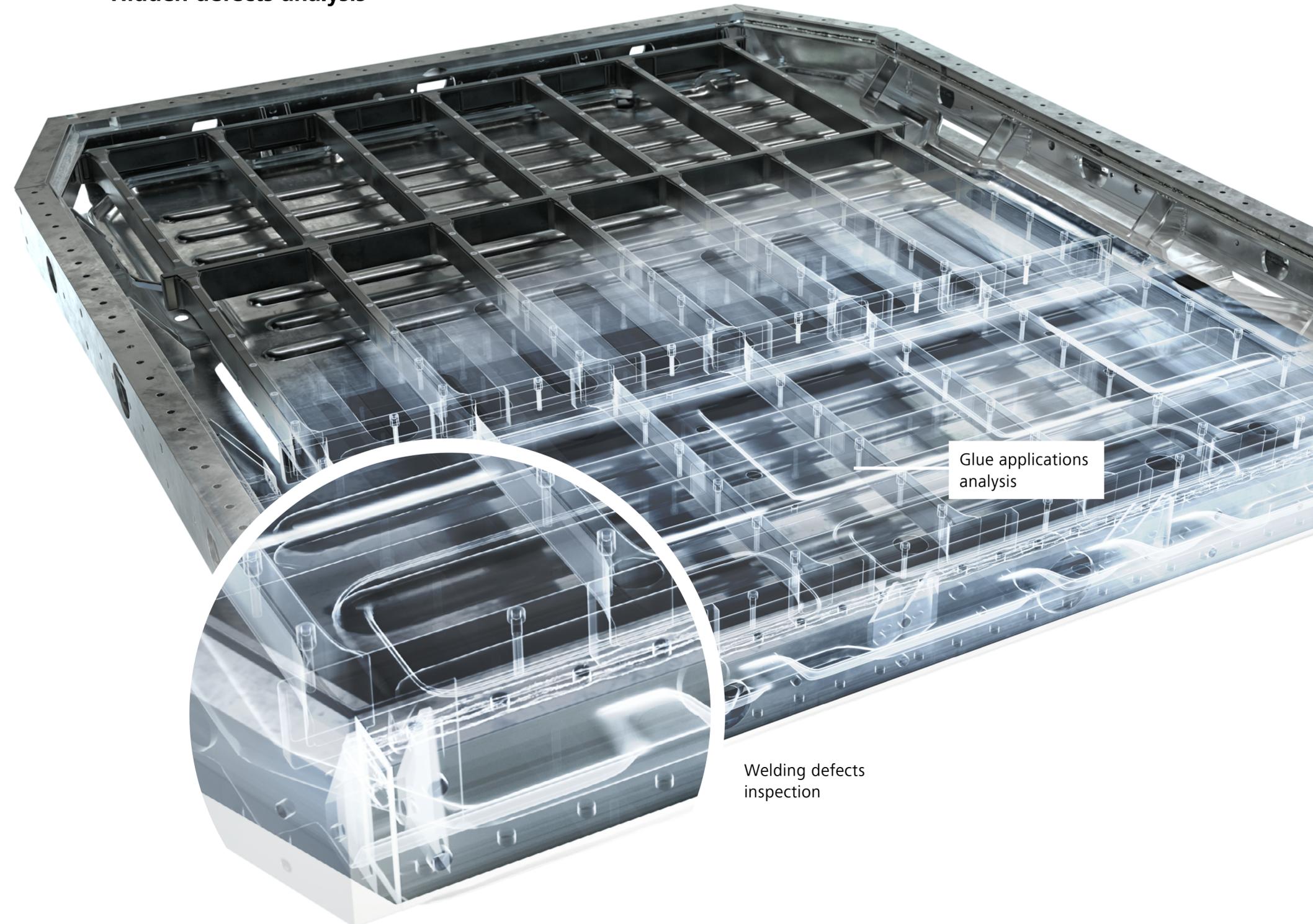
Welding and casting are the most commonly used technologies to create battery trays. Critical hidden defects and inner structure defects in the battery tray can emerge during the manufacturing process.

Finding those defects and looking inside the material is crucial to distinguish between a good tray and scrap. Especially challenging is to determine size and position of defects such as weld seams, casted structures, glue analysis and sealings.

### Our Solution

ZEISS 2D and 3D X-ray technology can detect, locate, classify and rate internal defects as cavities, pores, cracks in the critical areas to identify defective battery trays.

Systems, such as ZEISS METROTOM, digitize complex parts at the finest level of detail, even from the inside, in a fast and efficient way. Making the invisible visible is key to a reliable production process.



Glue applications analysis

Welding defects inspection

**ZEISS eMobility Solutions**

# Coordinate Measuring Machines

Customize your success

The broad portfolio of coordinate measuring machines from ZEISS combines very precise tactile and optical measurement with high measuring speed.

Due to increasing requirements to inspect components with ever smaller tolerances, coordinate measuring machines are becoming more important. For this ZEISS offers solutions such as:



## ZEISS Bridge-type CMMs

Bridge coordinate measuring machines from ZEISS have a precise probe system that convinces with high measuring speed. The various solutions and systems can be tailored directly to individual requirements.



## ZEISS CALENO

The multisensor horizontal-arm machine combines high performance optical and tactile sensors in one system. Maximum versatility and highest performance capabilities ensure higher travel speed, acceleration and accuracy in the measuring room and near production.

ZEISS eMobility Solutions

## 3D Optical Measuring Machines

Customize your success

For efficient quality control of different e-mobility components, the ZEISS & GOM Metrology portfolio includes standardized optical measuring machines. The systems cover every process step, from programming to automated digitization, inspection and reporting.

For fully automated analyses of full-field deviations between actual 3D coordinates and CAD data, the portfolio offers solutions such as:



### ATOS ScanBox 5120

Use this all-in-one solution to automatically digitize and inspect complex parts up to 2000 mm in size, such as automotive components.



### ScanBox 6130 / 6135 / 6235

Three models for large parts: ATOS ScanBox Series 6 increases throughput thanks to automated inspection and easy loading of parts.



### ZEISS AICell trace

ZEISS AICell trace correlation-free in-line measuring cell enables realtime process monitoring of complex characteristics and ramp-up support of the battery tray production processes.

## ZEISS eMobility Solutions

# X-Ray Solutions

Customize your success

ZEISS X-Ray Series reveals non-destructively what would otherwise remain hidden from even the most watchful of eyes. To overcome e-mobility related challenges, such as safety and performance requirements, inspecting, measuring, and analyzing internal and external structures of components is crucial.

To solve these challenges ZEISS offers a X-ray solution such as:



## ZEISS X radia 620 Versa

The 3D X-ray Microscope for faster sub-micron imaging of intact samples. Building on industry-best resolution and contrast, ZEISS Xradia 610 & 620 Versa expand the boundaries of your non-destructive sub-micron scale imaging.



## ZEISS METROTOM

The 3D computer tomograph from ZEISS allows to successfully perform measuring and inspection jobs with only one X-ray scan. The standard acceptance test, the precision engineering and the sophisticated calibration process ensure the traceability of the system.



## ZEISS BOSELLO OMNIA

The 2D X-ray technology solution ensures fast defect detection and quick cycle times for your inline inspection. The rotating dual turntable enables simultaneous loading and inspection. The Automatic Defects Recognition software allows automatic and reliable scrap of non-conforming parts in compliance with strictest ASTM standards



ZEISS eMobility Solutions

## There is so much more to know

We are happy to provide you with more information about our products and services for your battery tray application.