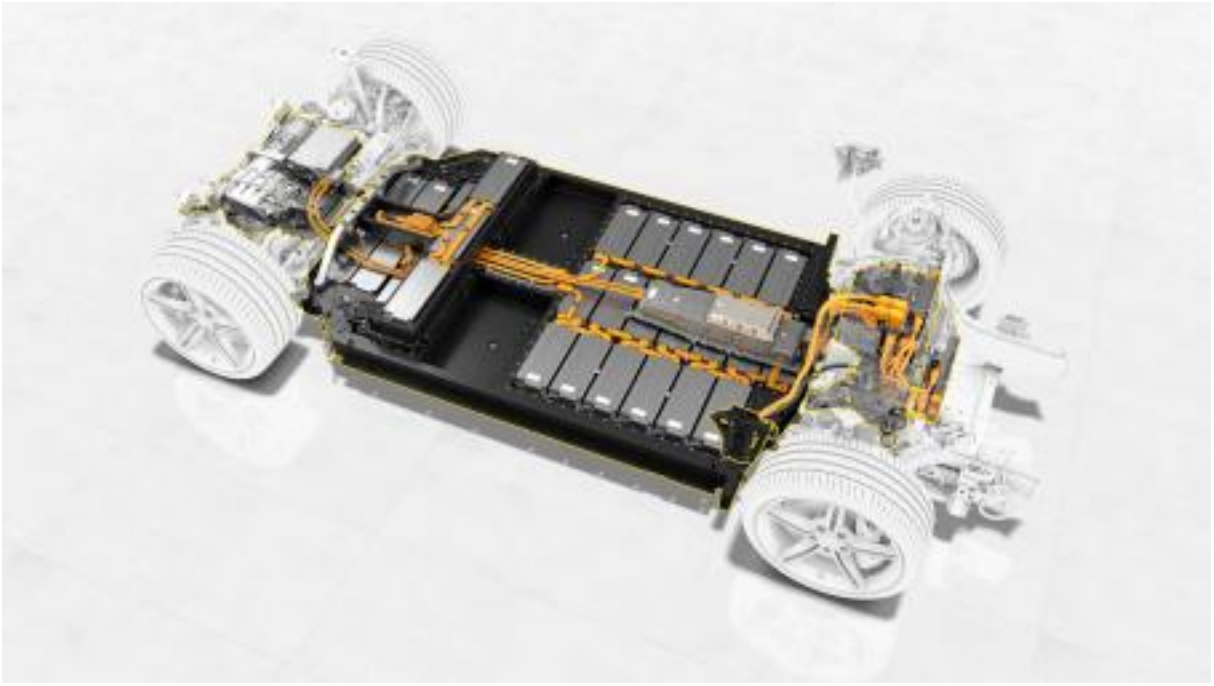
Automatically detect damage: intelligent battery protection system for electric cars

About this project



I-Detekt

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Markets:

Material: Laminates

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Climate Action.

Technology Transfer Program Leichtbau

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Context

For the energy transition to succeed in the long term, it is crucial to gradually electrify the transport sector. One of the biggest obstacles is currently the comparatively short range of electric vehicles. Lightweight construction offers considerable potential here, as it can help to reduce the moving masses and thus increase the vehicle range.

The battery protection structure of an electric vehicle is located underneath the traction battery and protects it from mechanical loads such as stones thrown up from the road. Up to now, it has usually been made of thick-walled aluminium, steel or titanium and is therefore heavy and expensive.

In addition, there is currently no way to automatically determine the extent of damage after a mechanical load without removing components, meaning that a visit to the workshop and possibly a replacement of the entire structure may be necessary even on mere suspicion.

Purpose

In the I-Detekt project, the project partners want to develop an intelligent battery protection system for electric vehicles that automatically recognises damage to the battery protection structure, but also to the battery itself.

The project team wants to develop a battery protection structure made of a glass fibre-reinforced plastic with integrated sensors. The latter should automatically recognise and classify relevant damage. Thanks to the lower component weight, resources can be saved both during production and throughout the entire utilisation cycle. The integrated sensor technology also leads to further significant savings in material resources, as the battery protection and the battery itself only need to be replaced if there is actually a defect.

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Procedure

The team wants to test and verify the structures both virtually - using digital twins - and experimentally in order to enable subsequent industrial series production. This is made possible by the broad technical composition of the consortium across the entire supply chain. In the future, the intelligent battery protection system should also be transferable to other sectors and applications, such as rail vehicles or mechanical and plant engineering.

The project partners anticipate potential greenhouse gas savings of up to 440,000 tonnes of CO2 equivalent. This calculation is based on the VW Group's annual production of electric vehicles from 2025 onwards, with an average mileage of 200,000 kilometres.

The research result shows that the detection of damage levels via the underbody protection system is possible in principle. The technical challenges such as component complexity and differentiation of the damage stages now need to be clarified in more detail, as do the potential economic and ecological issues.

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Funding duration:

Project partner:

Funding sign:	03LB2001	**Funding amount:**	EUR 2 million

Further websites

plattform-forel.de/i-detekt/
foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2001A - I-Detekt in the federal funding catalogue

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Project coordination

Contact:

Mr Dr. Philipp Kellner

+49 0170/911-8027

philipp.kellner@porsche.de

Organisation:

Dr Ing. h.c. F. Porsche AG

Porscheplatz 1
70435 Stuttgart
Baden-Württemberg
Germany

www.porsche.com/germany/

Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts	✓
Services & consulting	

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight design, Hybrid structures	✓
Functional integration Sensor technology	✓
Measuring and testing technology Component and part analysis, Non-destructive analysis	✓
Modelling and simulation Life-cycle analysis, Reliability validation	✓
Plant construction & automation Automation technology, Handling technology	✓
Recycling technologies	
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming Compression moulding	✓
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites Laminates	✓
Fibres	
Functional materials	
Metals	
Plastics	
Structural ceramics	
(Technical) textiles	