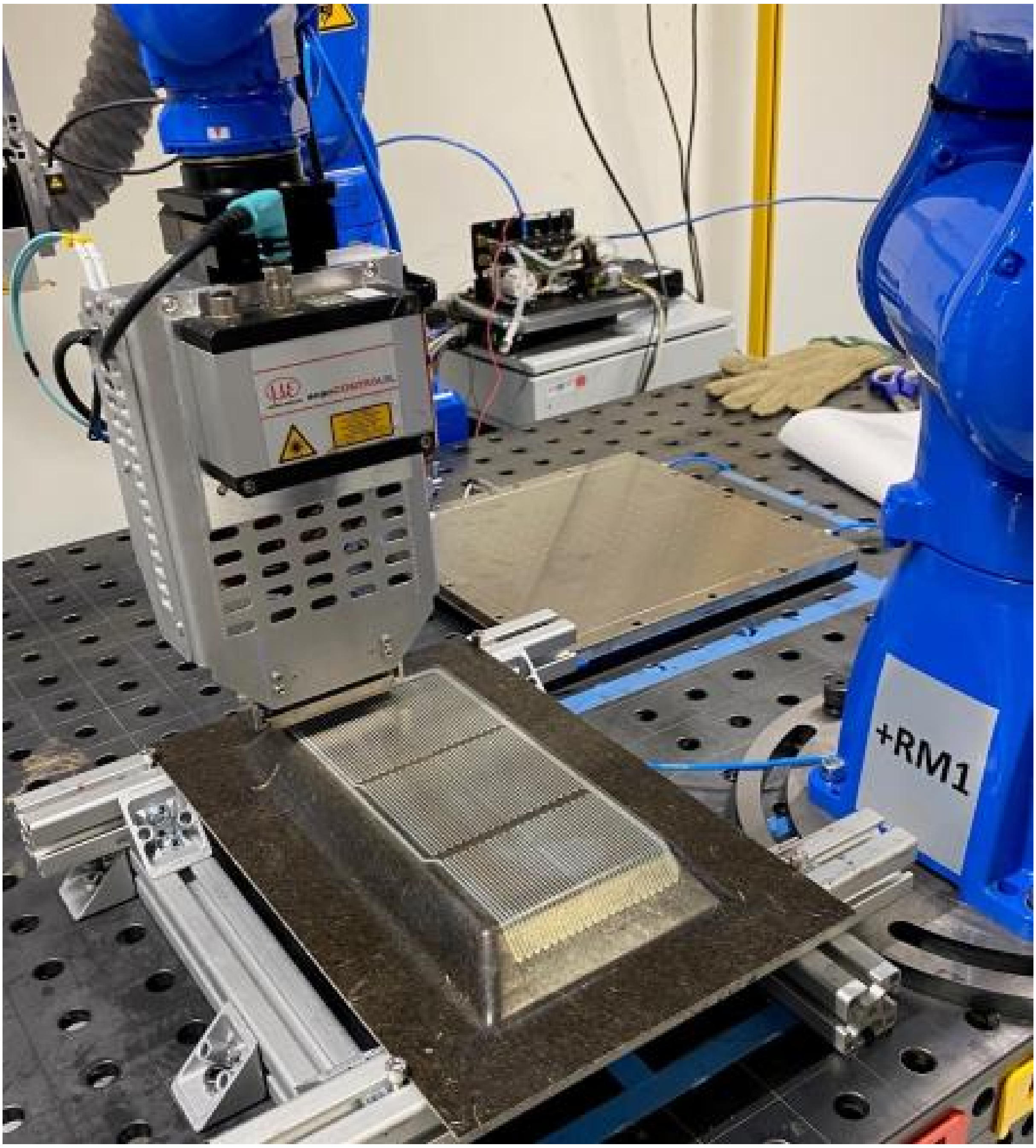
Efficient heating of e-car interiors: with zone-controlled printed heating structures

About this project



INSIDE

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Markets:

Material: Biocomposites, Carbon fibres, Thermoplastics, Others (Metallic ink - silver), Nonwovens, mats

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

Technology Transfer Program Leichtbau

Context

Heating the vehicle interior consumes a lot of energy. In electric vehicles, this significantly reduces the range as the heating energy comes directly from the battery. Conventional heating systems such as fan heaters or seat heaters often work inefficiently as they heat large volumes of air instead of providing targeted heat. In addition, existing solutions are comparatively heavy and comprise several components.

Alternative heating concepts such as printed heating structures and textile heating systems enable a more targeted and efficient heat supply. So far, these systems have mainly been used on a laboratory scale and can only be transferred to large or complex surfaces to a limited extent. In addition, many approaches require additional carrier materials or complex production steps. A key challenge is to develop lightweight, flexible heating systems that can be integrated over large areas, can be controlled efficiently and can be integrated into industrial production processes. This is where the project comes in.

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Purpose

The project team is developing a zone-specific heating system for vehicle interiors based on printed, flexible heating conductors. These can be applied to textiles and components and specifically integrated into different areas of the interior. Individual heating areas can be controlled individually so that only the areas actually used are heated. This should reduce energy consumption and increase the range of electric vehicles. At the same time, weight is reduced and production is simplified. Additive processes are used to utilise materials in a targeted manner and avoid waste. The result is a customisable, lightweight and resource-saving heating system for future mobility solutions.

Procedure

The researchers first analyse existing heating systems as well as suitable materials and substrates for printed heating conductors. Based on this, they develop heating conductor structures that are created using nanoparticle-based metallic ink. They apply this ink to textiles and components using a digital manufacturing process. The team uses inkjet, robot and laser technologies in the automated process.

The partners then develop zonable heating matrices that enable selective control of individual areas. They use simulation-based methods to optimise heat distribution and energy use.

Building on this, the project partners are developing a robot-assisted printing process that can also be used on three-dimensional surfaces. They are integrating the heating systems into vehicle components and setting up a pilot plant for production. Finally, the researchers will test and optimise the developed system with integrated, individually controllable heating surfaces under real conditions in electric vehicles.

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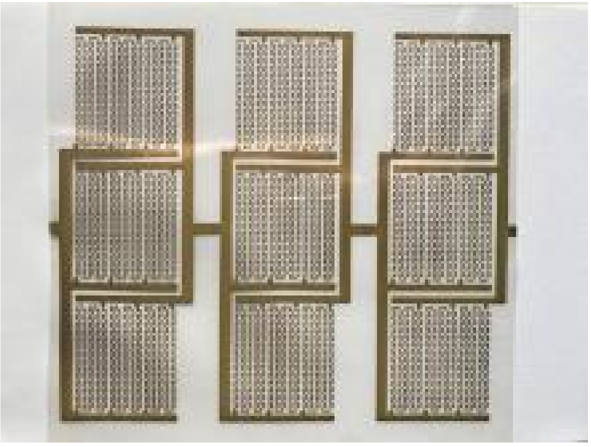

Funding duration:

Funding sign:	03LB2062	**Funding amount:**	EUR 1.3 million

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2062A - INSIDE in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

Technische Universität Chemnitz – Fakultät für Maschinenbau

Lightweighting classification

	Realisation
Offer	
Products Parts and components, Systems and end products, Materials	✓
Services & consulting Engineering, Prototyping, Technology transfer	✓

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight manufacturing, Hybrid structures	✓
Functional integration Thermal activation, Material functionalisation	✓
Measuring and testing technology Component and part analysis, System analysis	✓
Modelling and simulation Optimisation, Materials	✓
Plant construction & automation Automation technology, Robotics	✓
Recycling technologies	
Manufacturing process	
Additive manufacturing 3D printing	✓
Coating (surface engineering)	
Fibre composite technology	
Forming	
Joining	
Material property alteration Heat treatment	✓
Primary forming	
Processing and separating	
Textile technology Textile surface treatment and finishing, Nonwoven & mats production	✓

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Lightweighting classification

	Realisation
Material	
Biogenic materials Biocomposites	✓
Cellular materials (foam materials)	
Composites	
Fibres Carbon fibres	✓
Functional materials	
Metals Others (Metallic ink - silver)	✓
Plastics Thermoplastics	✓
Structural ceramics	
(Technical) textiles Nonwovens, mats	✓