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#RTR2026

HighScape

High efficiency, high power density, cost effective, scalable and modular power electronics and control solutions for electric vehicles

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2ZERO ERTRAC CCAM European Commission

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Overall project presentation

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Consortium

€ 5.090.000

45 months

12 partners

Contact:

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www.highscape.eu

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Objectives

- **Scalable** wide bandgap (WBG), i.e., SiC and GaN, based PE components, with so far unexplored levels of functional **integration** in in-wheel motors, battery systems, and auxiliaries / chassis actuators;
- **Density**: >100 kW/L and >80% volume reduction with respect to existing Si based solutions;
- **Efficiency**: up to 99%;
- **Costs**: >35% reduction with respect to the available WBG based PE products and prototypes;
- **Performance**: Improvements in functional safety, fault-tolerance, predictive maintenance, and electro-magnetic interference (EMI) and electro-magnetic compatibility (EMC).

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Results presentation

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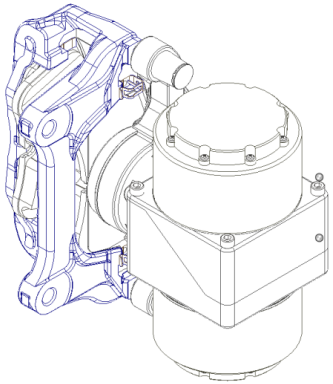
Smart components for the electric vehicle of tomorrow

Active suspension

Electro-mechanical brakes



In-wheel motors

New cooling pack

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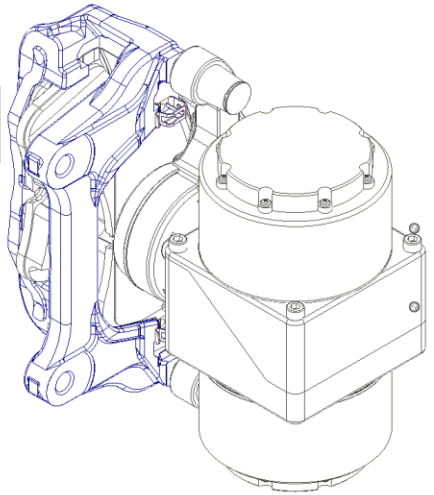
Powertrain & Chassis Components

- E-drive: in-wheel motor with integrated SiC-based inverter
- Innovative brake-by-wire design taking advantate of dual-motor

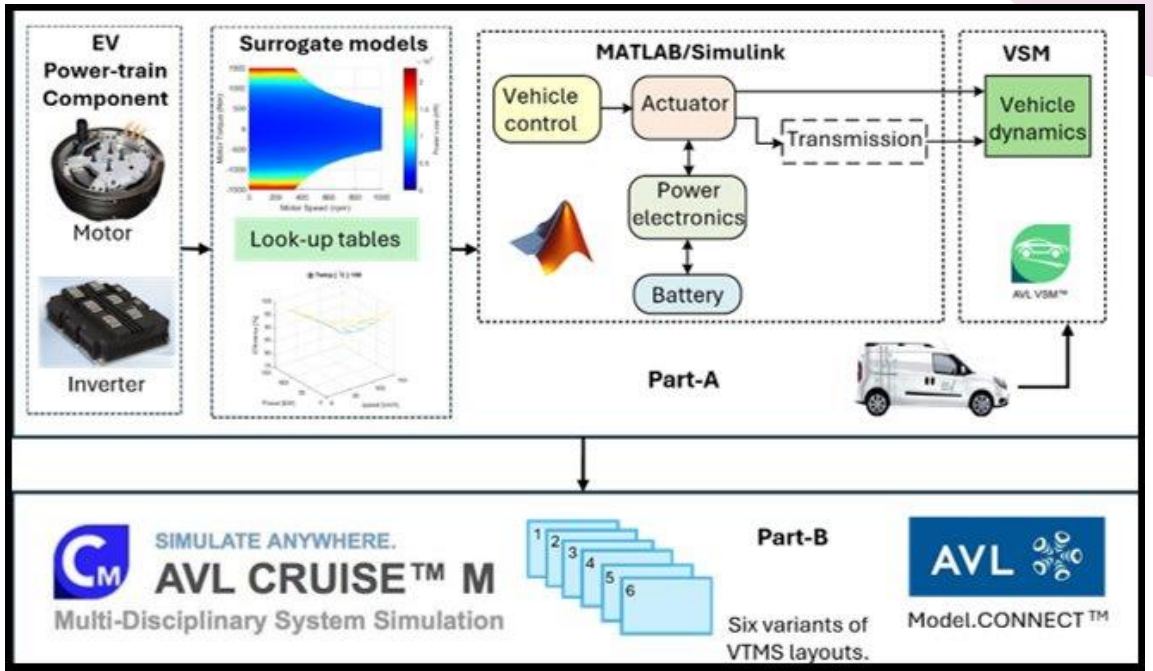
Brake caliper

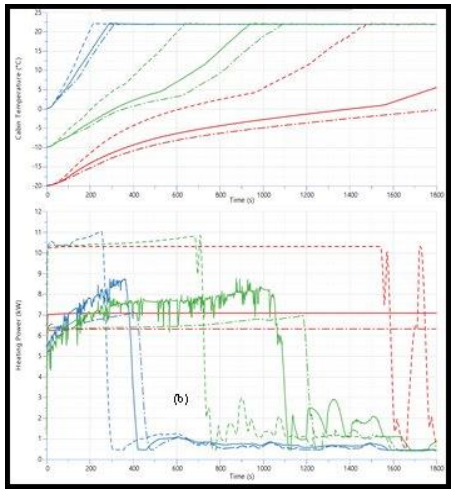


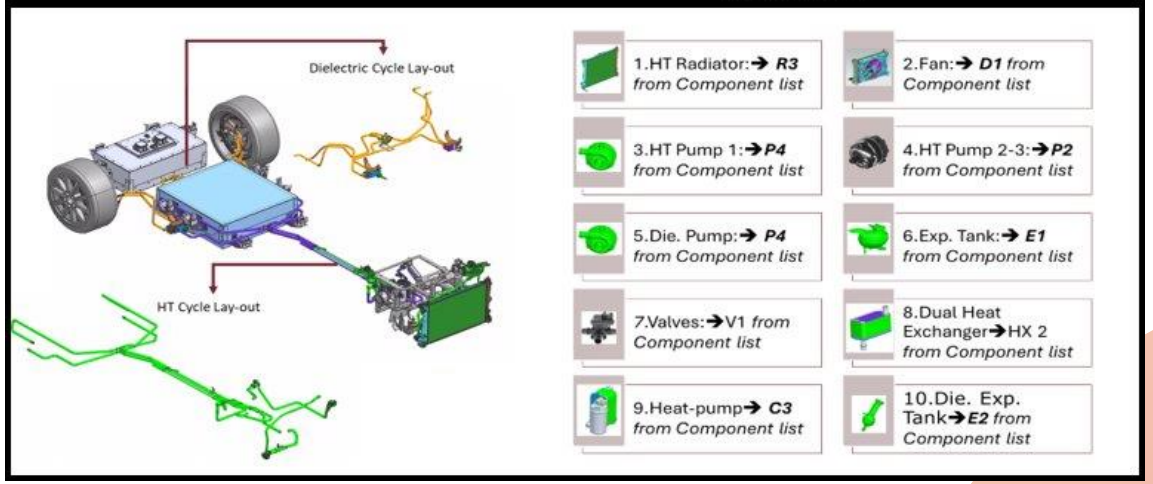
Dual motor actuator

Integrated Vehicle Thermal Management System

- Redesigning the thermal control strategy taking into account the reuse of heat







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Advanced Control Strategy

- Advanced motor control taking advantage of fast actuation time (<20ms) of in-wheel motors
  - →improvement of vehicle dynamics by reduction of longitudinal acceleration
  - →Improvement of energy efficiency with brake torque blending and pulse & glide strategies

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Virtual and Experimental Testing

Extension of the XiL concept by real-time networking complex testing facilities in different geographical locations, which enables co-verification and co-validation involving multiple partners

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EM-TECH

Demonstrators with innovative e-machine and/or power electronics solutions implemented

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Mid to long term expected impacts of the project

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Outcomes

Combined overall cost reduction of >35% by reducing number of parts
(dual use and simplification of mechanical and electrical interfaces)

Increased efficiency through power losses reduction by >40% and increased thermal performances achieved by reconfigurable windings and optimized cooling system and auxiliaries

Increased reliability and availability of powertrain through reconfigurable PE architectures, fault tolerant PE, smart predictive maintenance approaches and performance assessing strategies

Automotive quality level demonstrated with real vehicle demonstrators

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Impact

Scientific: new insights on advanced (two-phase)cooling and re-configuration options for electric drives comprising (integrated) high power electronics

Societal: Increased acceptance of electric vehicles due to increase of performance impacting / contributing to a more sustainable transportation

Environmental: Improvement of vehicle efficiency and therefore a reduction of energy usage and finally of CO2 emissions

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