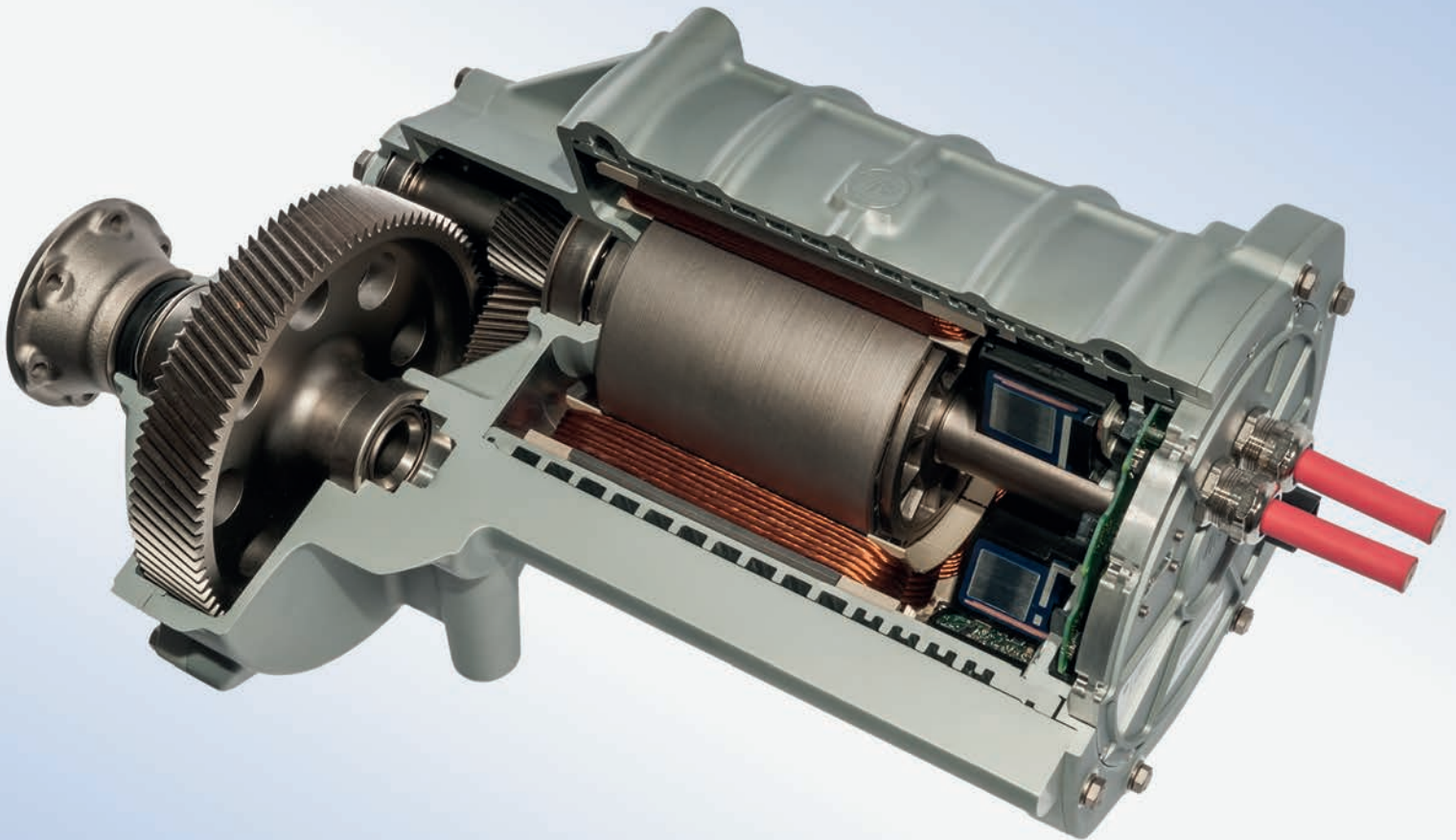


EMiLE

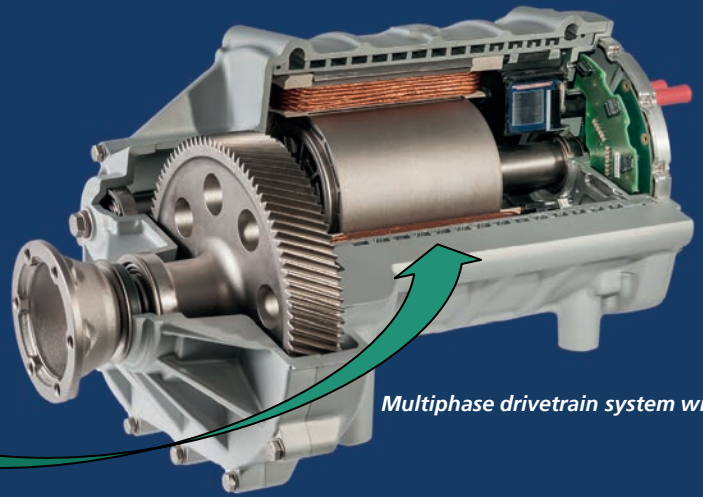
Electric motor integrated power electronics *with Smart Stator Teeth*



Smart Drive



Smart Stator Tooth (SST)



Multiphase drivetrain system with SST

Vision

In the EMiLE project, ten partners from the German industry and research-institutes are working on innovative drivetrain solutions for tomorrow's e-mobility.

The project focusses on compact and efficient electric vehicle traction-drives with a high degree of integration of electric machine, power electronics, and gearing, which are perspective suitable for large scale production.

High power density, high efficiency and cost minimization are benefits of the realized *Smart Stator Tooth* – structure within the drive unit. Each stator segment of the PMSM electric machine has its own local control and power electronics. The modular system approach can be adapted to different vehicle and drive classes.

Contact Us!

The Fraunhofer IISB is your research and development partner for innovative electric drives and power electronic components!

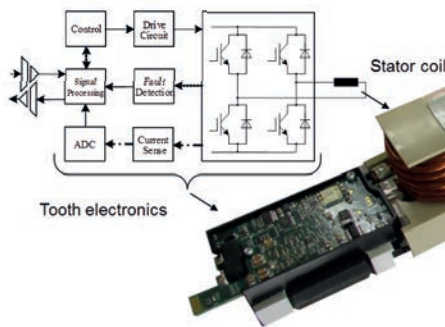
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Smart Stator Tooth (SST)

Drivetrain with Smart Stator Teeth

Each Smart Stator Tooth (SST) consists of a motor segment and an electronics assembly. Twelve SST form one PMSM stator and the corresponding inverter.

Each tooth electronic is built up of an IGBT full bridge power-module, phase current sensor, current control loop, gate driver unit, and a fault detection block. The stator windings are directly connected to the AC terminals of the power module, thus minimizing space and reducing the number of parts. The pre-assembled SST is fully testable before mounting the complete system.

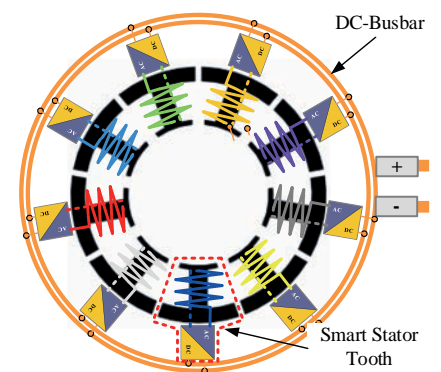
Technical Data

Max. power (@wheel)	80 kW
Max. speed (@wheel)	1.300 rpm
Max torque (@wheel)	2.500 Nm
Gear ratio	10,8 : 1
DC-Voltage	250 V – 450 V
Volume	~ 25 l

Novel Control and Safety Functions

The advanced SST control functionalities have two objectives: First, a failure in one phase power module does not lead to a full system failure. Second, after detecting faulty parts, the remaining SST can be used to actively compensate the influence of the failure.

The SST concept redefines and improves both availability and failure mitigation: The aim is to achieve a safe system state, concerning vehicle stability and passenger safety, without additional hardware effort. At the same time, the availability is increased, which means that partial faults do not stop the whole system. In summary, the drive system is fail-operational.



Multiphase inverter structure

Acknowledgement

The work has been performed in the research project EMiLE (**Elektromotor integrierte Leistungselektronik** – electric motor integrated power electronics), funded by the German Federal Ministry of Education and Research (BMBF).