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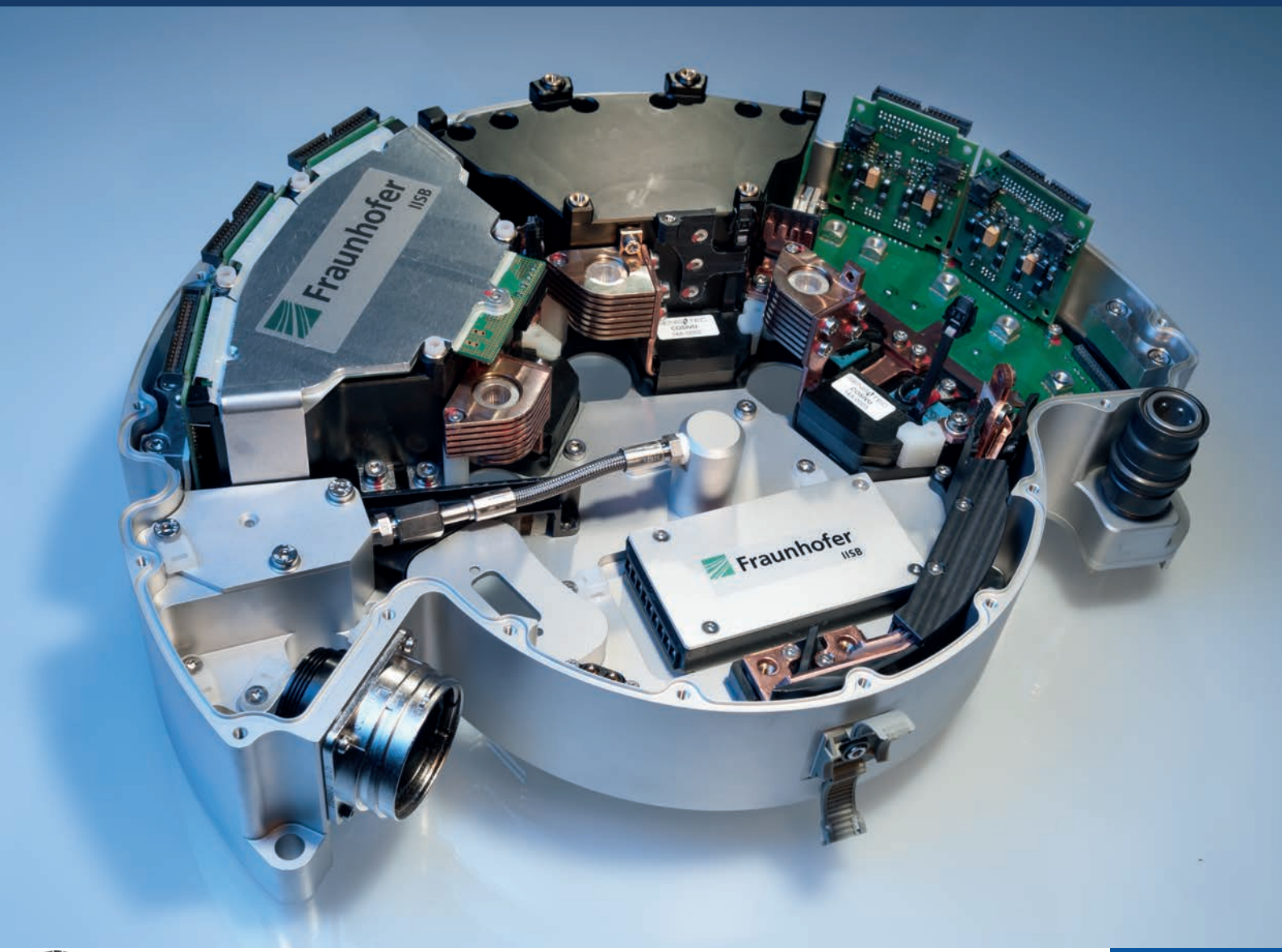
Modular & Wheel-Hub Integrated SiC Inverter for Commercial Vehicles



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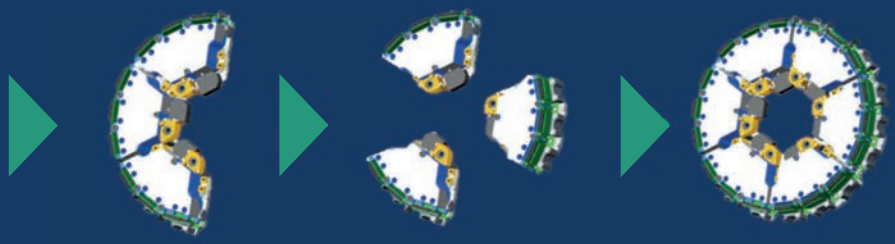
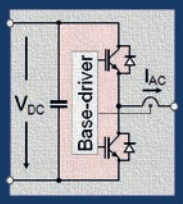
Inverter building block

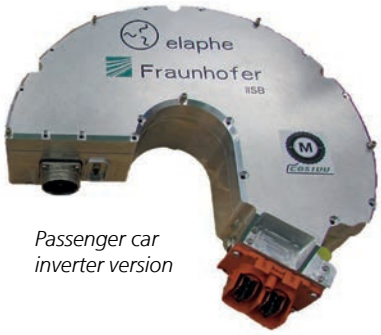




Modular system architecture

COSIVU Project

The EU-funded project 'COSIVU' (**CO**mpact **S**mart and reliable dr**IV**e **U**nit for commercial electric vehicles) aims at new system architectures for electric drive-trains by developing a smart, compact, modular, and durable in-wheel drive unit. The main goals for the mechatronic integration concept of the COSIVU Inverter is to provide easy servicing of the complete powerstage, good manufacturability, and flexibility due to the modular approach. This helps to increase the durability and availability of hybrid and electric vehicles, which are even more demanding for commercial vehicles than for other types of vehicles. The new architecture is also adapted to a passenger car platform.



Passenger car inverter version

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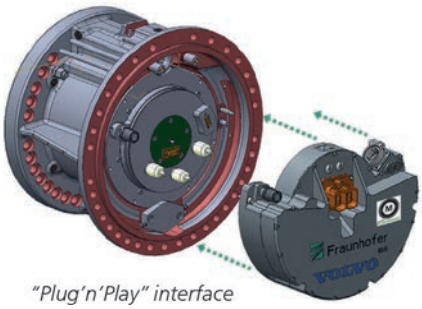


"Plug'n'Play" interface

Inverter Building Block

Main component of the modular integration approach is a newly designed Inverter Building Block (IBB). The IBB is a mechanically self-supporting structure with optimized commutating cell and all necessary components to drive one half-bridge of the inverter system. It consists of a cooling plate, three parallel half-bridge 1200V SiC BJT power modules, each with its own base driver module (including isolated driver supply), the AC-current-sensor, and its own foil DC-link-capacitor.

The whole structure can be pre-assembled and tested prior to the integration in an overall inverter system.

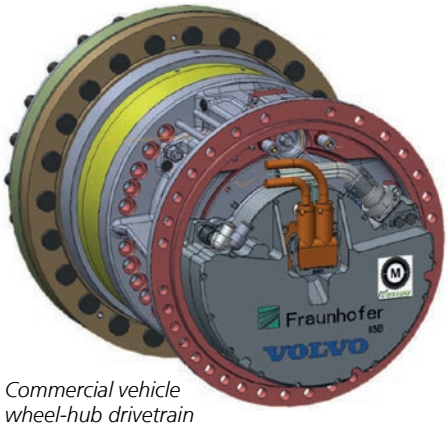
Technical Data

Max. output power	290 kVA
Nom. input voltage range	600 V_{DC} to 800 V_{DC}
Max. phase current	300 A_{rms}
Switching frequency	10 kHz to 16 kHz
Max. junction temperature	175 °C
Topology	Modular B6

Modular Inverter Design

Consequently, three IBBs are necessary to drive one three phase electric motor. With the modular design of the powerstage, easy adaption to different designspaces is possible, while using identical system architecture and not affecting the internal commutating cell of each half bridge. The compact design of the IBB also gives availability to design up to six-phase inverter systems.

Making use of latest SiC BJT developments, test results showed a significant reduction in inverter losses compared to competitive Si based inverter solutions.



Commercial vehicle wheel-hub drivetrain

Acknowledgement

The work has been performed in the research project '**COSIVU**', funded by the European Commission under grant agreement number 313980.

COSIVU
compact, smart and reliable drive unit for fully electric vehicles