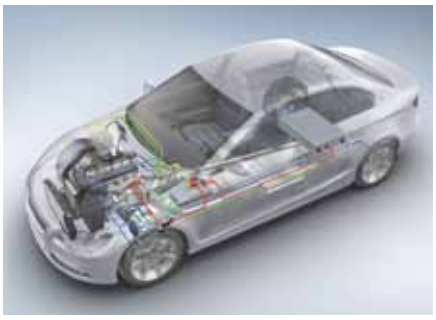
Robert Bosch GmbH

The Bosch Group is a leading global supplier of technology and services. It employs roughly 375,000 associates worldwide (as of December 31, 2015). The company generated sales of 70.6 billion euros in 2015. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiaries and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing and sales network covers some 150 countries. The basis for the company's future growth is its innovative strength. At roughly 118 locations across the globe, Bosch employs 55,800 associates in research and development. The Bosch Group's strategic objective is to create solutions for a connected life. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life."

Power electronics: from technologies to product innovations

Power electronics is a key enabling technology in many areas in which Bosch does business, including e-mobility (fig. 1), industrial drives, power tools, and renewable energy (fig. 2).



1 Power electronics is a key enabling technology for the electric powertrain in hybrid and electrical vehicles, electric power steering, start-stop systems, and for body electronics

2 Photovoltaic inverters combined with intelligent energy management and storage solutions such as the VS5 Hybrid are innovative products of Bosch Power Tec

Cars in particular pose special challenges such as space and weight requirements, robustness under extreme mechanical and climatic conditions, and how to achieve volume production at low cost. Power electronic inverters, for instance, control the energy flow for electric driving in hybrid and electrical vehicles. More precisely, they convert direct current from the traction battery into the three-phase alternating current that powers the electric motor. Inverters also control energy recuperation, which saves on fuel, as well as the currents recharging the battery. The second generation of Bosch inverter systems has already entered series production (fig. 3 - 4).

3 Bosch power inverters are controlling the electric drives in hybrid and electrical cars (example: Inverter-Converter Gen. 2.3)

4 Modular design of automotive power inverters enables demanding design spaces in hybrid cars, resulting in individual solutions (example: Inverter_L7)

Miniaturization of power electronics plays a central role in product innovation: reducing space requirements, decreasing weight, improving efficiency, and ultimately lowering the cost of power electronics will make fuel-saving hybrid technology affordable to more and more drivers. In interdisciplinary teams of engineers, Bosch is developing miniaturization and next-generation power-electronics system integration on all technology levels, from semiconductor-components, power-modules and control units to overall electric drive systems.