Invented for life

Evolution of electric steering systems: The future of steering has begun

Bosch electric steering systems are already automated, connected and independent from the type of powertrain. Steer-by-wire starts a new era of automotive engineering.

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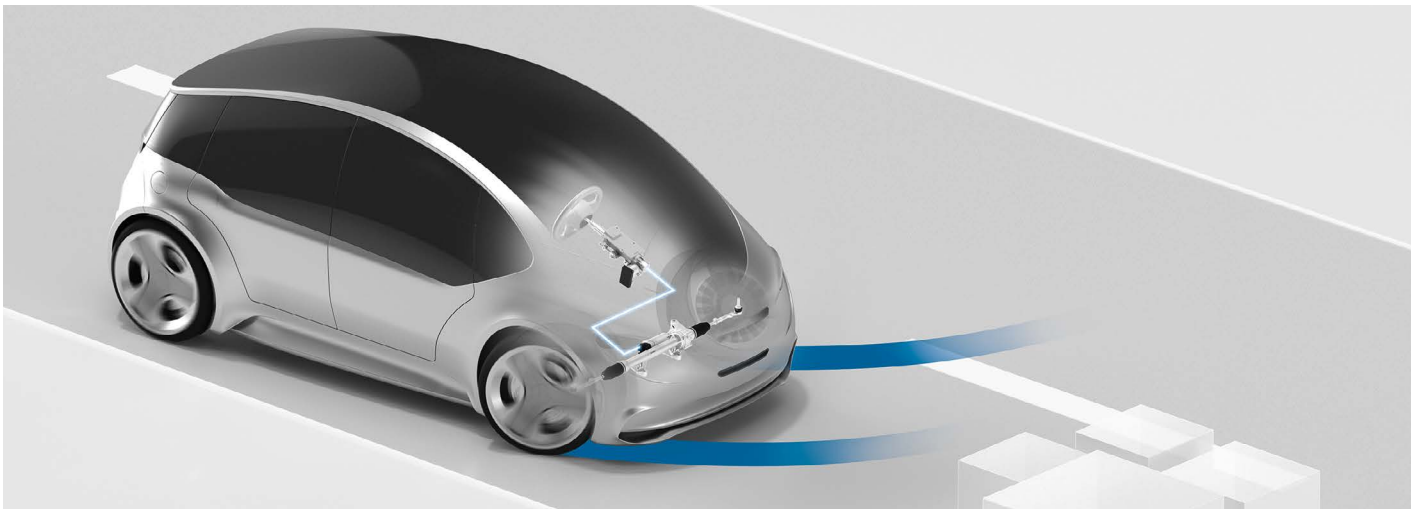


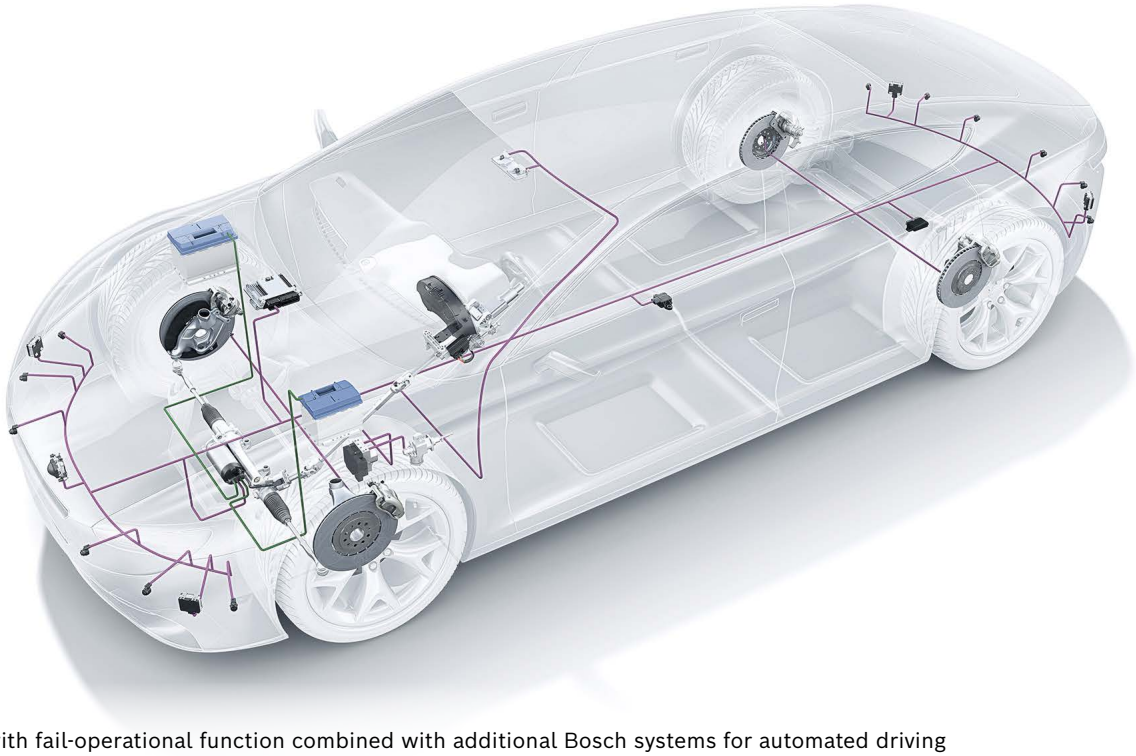
Electric steering systems are the basis of numerous assistance systems and automated driving. They will – in future – also lay the foundations for steer-by-wire systems.

Gasoline, diesel, hybrid, electric or gas powertrains – in order to meet as many customer demands as possible, most vehicle manufacturers launch their vehicles with a wide range of different powertrains. This large variety of drive concepts requires different versions of numerous vehicle components. This is where electric power steering (EPS) plays to its strengths. In general, the system is powered by the on-board power supply. EPS systems can thus be used to equip vehicles featuring different powertrains and drive concepts. Additional advantages of EPS compared to hydraulic power steering systems are a reduction of both fuel consumption and CO_2 emissions, the possible integration into driver assistance systems – up to automated driving – as well as the possibility to select different steering modes. For these reasons, most of the recently registered cars are equipped with this system. Modern EPS systems even allow for connectivity via over-the-air technology. By now, Bosch EPS versions steer all types of vehicles reaching from compact to middle-class cars, sports cars and through to light commercial vehicles.

Key role of electric steering systems for automated driving

EPS systems are a key technology for assisted and automated driving. They control and assist vehicle steering systems by means of an electromotor combined with a control unit for optimum steering behavior and a great feeling when steering. By now, the electronic interface already allows Bosch electric steering systems to be used for automated driving concepts up to SAE level 4. Besides sophisticated software and connectivity of different vehicle components such as powertrain, braking and steering systems, the redundancy of safety-relevant features is a prerequisite for high levels of automation. Systems are known as redundant, if they are doubled for safety reasons.

Bosch EPSapa with fail-operational function



EPS system with fail-operational function combined with additional Bosch systems for automated driving

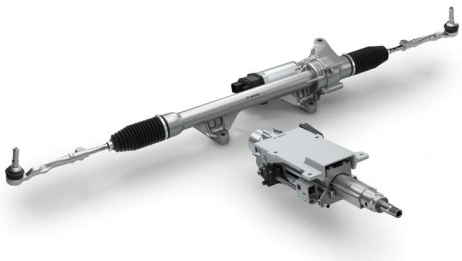
EPS system as fail-save steering system

As all other electric steering systems, EPS systems with fail-operational functions are equipped with a torque sensor detecting the steering signal and sending it to the control unit calculating the optimum steering support. The required steering force is provided by the electromotor. This doesn't just make driving much more comfortable. At this fail-operational version, power supply, electronic circuits, the control unit and the dividing machines within the servo unit are doubled. If one of the components fails, the other one continues operating the respective function. Even in case of a defect, at least 50 percent of the steering support remain. Besides steering systems, fail-safe Bosch systems are also used for braking systems, environment sensors, control units and the on-board power supply.

Bosch electric steering systems – independent from the vehicles' powertrain concepts

A preview of the automotive future: steer-by-wire

As automated driving functions become increasingly common, the demands placed automotive technologies increase as well. Vehicle weight is meant to lower whereas safety and comfort shall increase – and so do personalization and customization possibilities. So-called steer-by-wire systems help starting into a new era of automotive technologies. At these systems designed for both manual and automated driving, the steering wheel is not mechanically linked to the steered wheels. The elimination of the mechanical connection between the steering wheel actuator and the steering rack actuator provides additional options concerning the interior vehicle cabin design and the realization of previously impossible functions. In future, the steering wheel could, for instance, be positioned individually for the driver during automated driving, or – in the case of highly automated vehicles – could be temporarily stowed away completely. Several vehicle manufacturers already announced the market launch of such systems. First vehicles equipped with steer-by-wire solutions will be launched throughout the upcoming years. This will gradually also create the corresponding demands on the aftermarket. Bosch thus also pays attention to ensuring a reliable supply of high-quality spare parts for workshops – right from the development stage.



Bosch steer-by-wire steering system