

Combining motor, power electronics, and transmission

Bosch has introduced the e-axle, a combination of electric motor, power circuitry, and transmission. This single powertrain device reduces development times for e-vehicles.



The e-axle provides CAN connectivity (Photo: Bosch)

"With its e-axle, Bosch is applying the all-in-one principle to the powertrain," said Dr. Rolf Bulander, member of the board of management of Robert Bosch and chairman of the Mobility Solutions business sector. The product can be used in hybrids and electric cars, compact cars, SUVs, and even light trucks. "Economically speaking, the e-axle may turn out to be a major coup for Bosch," Bulander said. The novel CAN-connectable electrical powertrain is playing a key role in the company's drive to be the global mass-market leader for electro-mobility from 2020. On the world's roads, there are already well over 500 000 electric and hybrid cars fitted with Bosch products. "The e-axle is the 'start-up' powertrain for electric cars – also at established automakers. It allows them to save valuable development time and to get their electric vehicles to market considerably faster," Bulander stated. As Bosch customizes the powertrain to each automaker's requirements, customers no longer have the time-consuming task of developing new sub-systems. Samples of the electric axle have already been tested with customers. The start of mass production is planned for 2019.

"Instead of reams of specifications, a few parameters are enough for Bosch to customize the e-axle," explained Dr. Mathias Pilin, the executive vice president for electro-mobility. All the customer has to do is state what performance, torque, and installation space they require, and the supplier then optimizes the rest of the powertrain to fit these parameters. In this way, a complete, customized powertrain can be delivered directly to an automaker's assembly line. This is a further reason why the e-axle is the next logical step for powertrain engineering.

The powertrain can deliver between 50 kW and 300 kW, and is therefore also capable of powering large vehicles such as SUVs completely electrically. Torque at the vehicle axle can range from 1000 Nm to 6000 Nm. When installed in hybrid and electric vehicles, front- and rear-axle drive is possible. A 150-kW electric axle weighs roughly 90 kg, and thus far less than the combined individual components used so far. This reduces power consumption. Compared with other products, the distinguishing feature of the Bosch electric axle is an especially high-peak performance combined with a high-level of continuous performance. In other words, the electrical powertrain can accelerate better and maintain a high speed for a longer period. To achieve this, Bosch has not only redesigned the system as a whole, but also improved the motor and power electronics components.

Placing the transmission close to the motor saves valuable installation space, which is always an important factor in the auto industry. Since the e-axle combines electric motor, power electronics, and transmission in a single device, fewer parts are needed. For example, the electric powertrain does completely without thick and expensive copper cables linking the parts. In addition, the cooling system can be simplified, and there is no need for bearings for rotating components. This reduces the powertrain's cost while increasing its efficiency.

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