

Electric two-speed drive for passenger cars

ZF's two-speed electric drive for passenger cars integrates an advanced electric motor with a shift element and appropriate power electronics. The CAN enables to devise other shift strategies, possibly linked to digital map material and GPS, too.

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More range or better performance? Due to this concept, manufacturers of electric vehicles can pursue both approaches with the two-speed drive (Source: ZF)

"For electric vehicles in everyday use, it is important to obtain as much range as possible from each battery charge", stated Bert Hellwig, Head of System House at ZF's E-Mobility division. "Every percent of improvement in energy conversion efficiency translates into two percent more range." To increase the performance rating of the new electric axle drive system, ZF leveraged its expertise in systems to develop a new electric motor with a maximum power rating of 140 kW paired with a two-stage shift element. "Bringing together our know-how in relation to electric motors, gearboxes, and power electronics ensures that we achieve the best possible range from each battery charge", states Hellwig.

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ZF is offering its new drive concept as an electric motor solution incorporating the shift element and power electronics (Source: ZF)

Vehicles with the two-speed drive consume less energy, which in turn extends range by up to five percent when compared to a one-speed unit. Shifts take place at 70 km/h. By connecting to the vehicle's CAN communication it is also possible – if the customer wishes – to devise other shift strategies, possibly linked to digital map material and GPS. For example, the vehicle could identify from the GPS route programming how far it is to the next charging station, enabling it to respond predictively by switching into Eco-mode.

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(Source: ZF)

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More effective shifts would also be possible in accounting for topography on the interstate, and on inter-city journeys. The software in the drive can also be updated thanks to the network link to Cloud services via over-the-air updates. For vehicle manufacturers, the two-speed drive offers two options for using improved energy conversion efficiency. The original equipment manufacturer (OEM) could either go for an extended range while retaining the same size of accumulator, or utilize a smaller accumulator.

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The design of the unit can also be fine-tuned and scaled up for use in sports and performance vehicles (Source: ZF)

Due to the design of this unit that optimizes installation space, the two-speed system is suitable for compact passenger cars where interior space is at a premium. The concept offers benefits for OEMs who are pursuing performance. "Until now, with electric motors, vehicle manufacturers have had to choose between high initial torque and a high top speed", explained Hellwig. "We are now resolving this conflict and the new drive will be compatible for performance and heavier vehicles – for example for passenger cars towing a trailer." ZF's modular approach combines the two-speed gearbox with electric motors rated for up to 250 kW. This delivers enhanced acceleration and, potentially, faster top speeds. With its modular concept, the new drive can meet a variety of requirements. The design of this unit can therefore also be fine-tuned and scaled up for use in sports and performance vehicles.

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