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ZF develops electric brake-by-wire system for future software-defined vehicles

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The new brake system from ZF eliminates the need for brake fluid

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According to a press release on Nov. 13, ZF has announced that it will present a new, purely electro-mechanical brake system for the first time at its Next Generation Mobility Day in Shanghai. The brake system features braking force that is generated at each wheel by an electric motor, i.e., without a hydraulic system and brake fluid. The brake system was developed at ZF's development centers in China, the US and Germany for the global market.

“Our purely electrically controlled braking system is a significant addition to our portfolio of networked chassis systems,” said Holger Klein, CEO of ZF Group. “With such by-wire systems, we are opening the door to a new era of vehicle control.” Klein added that this is especially true in software-defined and electrically driven vehicles, where this type of brake system has even more advantages and opens up new freedom in design and development.

In a so-called "dry" brake system, brake fluid is not required any more. Brake pressure is therefore no longer generated by the pressure of fluids in the hydraulic system, but by electric motors. Brake signals from the pedal to the electric motor are also transmitted purely electrically, which is why the term "dry brake-by-wire" is used.

Compared with conventional braking systems, the new brake-by-wire system, such as integrated brake control (IBC), enables shorter braking distances, better recovery of braking energy and lower maintenance costs.

During automatic emergency braking, the braking distance at a speed of 100 km/h can be up to nine meters shorter than with conventional braking systems. In addition, electric cars can achieve up to 17% more range via even better recuperation of braking energy.

With dry brake-by-wire systems in particular, the residual drag torques that occur with conventional braking systems due to minimal contact between the brake pads and the brake discs can be reduced to almost zero. This results in even fewer particulate emissions due to brake abrasion. This lower resistance during driving also saves energy and can increase range in an electric vehicle.

Dispensing with a hydraulic system means significantly lower assembly and logistics costs even during vehicle production, as the system consists of fewer parts. During the vehicle's service life, the user benefits because brake fluids no longer need to be changed, reducing the amount of servicing required in the workshop.

Although there is no longer a mechanical connection between the brake pedal and the brake actuators, the braking feel is the same as that of a hydraulic brake. The safety of the data transmission and processing as well as the energy supply to the electric motors is ensured by the duplication of all connections and systems, as is also common in by-wire systems in aviation.

CONTACTS

The Americas
+1 877 863 1306

Europe, Middle East & Africa
+44 20 7176 1234

Asia-Pacific
+852 2533 3565

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