
Audi e-tron – Integrated Brake Control System

Instant pressure buildup: the electrohydraulic brake system

Audi is the first manufacturer worldwide to use the electrohydraulically integrated brake control system technology in a series production vehicle with electric drive. The compact module weighs less than six kilograms (13.2 lb) and is thus 30 percent lighter than a conventional brake system.

Powerful 18-inch brakes work on the large wheels –with six-piston fixed calipers at the front and single-piston floating calipers at the rear. Optionally they stand out brightly with their e-tron-specific finish in the high-voltage signal color orange. At the front the internally ventilated disks have a diameter of 375 millimeters (14.8 in) and 350 millimeters (13.8 in) at the rear. They are used when the driver presses the brake pedal so hard that deceleration exceeds 0.3g; otherwise, the Audi e-tron decelerates through recuperation via the two electric motors. The controller computes the required amount of braking power within milliseconds. If the recuperation torque is not sufficient, a displacement piston in the brake hydraulics generates additional pressure. Put into motion by an electric spindle drive, it pushes brake fluid into the brake lines and generates brake force through the conventional friction brake in addition.

The transition between electric and hydraulic braking is smooth and homogeneous, so the driver does not even notice it; the brake forces remain constant. Using a pressure-resistant element, a second piston generates the familiar pedal feeling for the driver's foot. Thanks to this brake pedal simulator, the driver is not affected by what is happening in the hydraulics. In the case of ABS braking, pressure buildup and reduction are not noticeable in the pedal in the form of irritating hard pulsations. Even at a very slow speed, such as during maneuvering, the Audi e-tron decelerates via the wheel brakes because this is more efficient than electric braking in this case. Otherwise, the electric motor would have to use valuable battery current to decelerate actively at low rotational speeds.

The new electrohydraulic actuation allows the brake control system to build up brake pressure for the wheel brakes with great precision and roughly twice as fast as a conventional system. This enables a larger air gap, i.e. a greater distance between the brake pad and brake disk, to be set. This minimizes possible friction and heat generation and contributes actively to the long range of the Audi e-tron. When automated emergency braking is performed, there are only 150 milliseconds – ever so slightly more than a blink of the eye – between the initiation of the brake application and the presence of maximum brake pressure between the pads and disks. Thanks to this rapid pressure buildup, the

electrohydraulically integrated brake control system shortens the braking distance by up to 20 percent compared with a conventional brake system.

The wheel brakes are seldom needed in normal operation, which has a positive effect on wear. The Audie-tron is equipped with a brake cleaning function that helps the steel disks to remain free of oxidation as far as possible. During deceleration, it automatically uses the friction brake instead of recuperation at specific intervals. This way, the system is always in optimum operating condition.

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