Wheel hub drive

In comparison with conventional drive concepts that revolve around a central engine, the wheel hub motor or wheel hub drive is a drive system that is installed directly into the wheel or rim of a vehicle. These units are electric motors.

Function

Location

On a wheel hub drive, the motors are located directly in the wheels. The wheel hub motors are located on the wheel hubs, which are the points where the wheel is mounted. Unlike conventional engines located centrally in the vehicle, these drives constitute a decentralised system.

Design

On a wheel hub drive, the drive unit generally combines both the electric motor and the mechanical brake. In many cases it also includes the power electronics, but these can also be located outside the wheel depending on which system is being used. A gearbox and a cooling system may also be integrated depending on the specific design in question.

Because this type of drive system is decentralised and located directly in the wheel, there is no need for the drive shafts, central gearbox or differential gear that are required for a drive system based on a central engine. This, in turn, means there is potential to make the drive system more efficient, and it is also advantageous in terms of the vehicle’s overall design.

All-wheel drive

Using several wheel hub motors together is a relatively simple way to provide all-wheel drive, without the need for the complex mechanical structures necessary on concepts based on a central engine.

Torque vectoring

The fact that each wheel can be braked and accelerated individually makes it relatively simple to provide what is known as a torque vectoring system. These systems enable the drive torque to be actively and individually distributed to specific wheels, which optimises the vehicle’s handling.

Braking and recuperation

When vehicles with an electric drive are braked, some of the kinetic energy can be recovered and reused by switching the electric motor to generator mode during braking. This is known as “recuperation” and generates a braking torque that decelerates the vehicle. Recuperation is also possible with wheel hub drives. Just like on a vehicle with a central engine, a wheel hub motor also optimises the way the engine brake and mechanical brake interact, allowing for a high recuperation rate without affecting comfort.

Disadvantages of the wheel hub drive

One theoretical disadvantage of the wheel hub drive is its high unsprung weight. This is caused by the weight of the wheel hub modules and can negatively impact the vehicle’s road-holding, steering and suspension comfort. However, this disadvantage can be compensated by adjusting the chassis set-up.

Another issue is that wheel hub motors are exposed to dirt and mechanical loads because they are located very close to the roadway.

Protection of the environment

Electric motors designed as wheel hub motors also do not emit any emissions at a local level, which makes them more environmentally friendly than internal combustion engines. However, the production of the electrical power itself may produce harmful substances. The most environmentally friendly solution is when 100% renewable energy sources are used to generate power. The vehicle’s energy consumption can be reduced further using recuperation. Emissions of brake particles from the mechanical brake are also reduced because the system uses the braking torque of the wheel hub electric motor in generator mode when the vehicle is braked.

Bilder

Hersteller

Quelle:
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