

Wheel End Bearings with ABS functionality

Challenge

Wheel End Bearings often have **impulse wheels** which allow sensors to send a signal to the car's ECU (Electronic Control Unit). The ECU calculates the wheel rotational speed based on this signal.

The wheel speed is **essential data for car safety systems** such as Anti-lock Braking System (ABS), Traction Control (TC / ASR / ASC) and Electronic Stability Control (ESC) also referred to as Vehicle Stability Control (VSC), Electronic Stability Program (ESP) and several other names depending on the car manufacturer.

The impulse wheel and sensor together act as passive or active encoder providing a signal depending on the rotational speed of the wheel.



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Easy Solutions

Passive:

The passive system makes use of the principle of variable reluctance to measure the wheel speed. It detects the change in presence or proximity of an object. The impulse wheel is a ring with teeth that rotates at the same speed as the wheel. The wheel is located on the bearing (1).

These impulse wheels rotate and the sensor which is located close to the impulse wheel generates a sinusoidal signal that is transferred to the car's ECU. The ABS system monitors the wheel speed continuously and intervenes when the wheel locks up.

Passive systems are efficient and reliable but the tight tolerances and location of the impulse wheel and the sensor need to be respected at all times. Sensors and impulse wheels are also exposed to harsh conditions so grit, water, road salt, dust and dirt may affect the system efficiency.

At very low speeds (< 5 Km/h) the signal amplitude created by the passive system is too low to detect the rotational speed of the wheel. To ensure an optimal function and performance of various safety and driver assistance features such as traction control, hill-start assistant and parking-assistant, car manufacturers nowadays are often using active instead of passive systems.

Active:

Active systems make use of a magnetic multi-pole impulse wheel affixed to the rotating part of the bearing to measure the wheel speed. The magnetic impulse wheel can be integrated into the seal (2) or mounted on the outer ring together with an integrated ABS sensor (3).

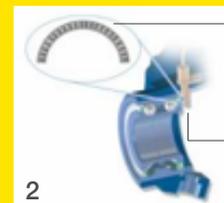
These impulse wheels generate a constant amplitude square wave to the car's ECU. Only the wave frequency varies with vehicle speed.

The magnetized poles on the impulse wheel pass the sensor and create the change between high and low voltage. This means that the signal can still be read at low speeds (< 5 Km/h).

*This type of impulse wheel is difficult to identify with the naked eye and requires special care when handling and installing. Check MOOG ESB "Wheel End Bearings with integrated magnetic ABS impulse wheels" for more information



Passive impulse wheel located on wheel end



Integrated magnetic impulse wheel*

ABS sensor



Integrated impulse wheel & ABS sensor



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