Technical Bulletin

Cold Brake Judder

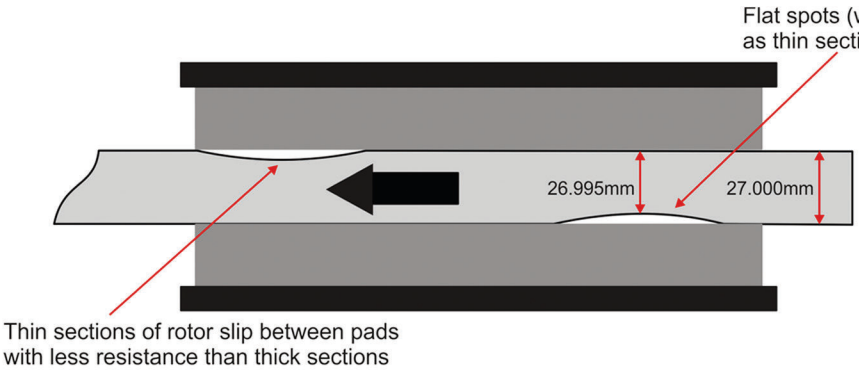
"Cold brake judder" occurs during normal braking and can be identified by pulsation in the brake pedal, torque fluctuations in the steering wheel and/or vibration of axle and chassis components.

The characteristic differentiating this from "thermal judder", is that cold judder can occur virtually every time the brake is applied, and has a much lower frequency range (about 5 to 50 Hz). The intensity of the judder may also vary with the vehicle's speed.

Cold judder is caused mainly by variations in the thickness of the disc and similar to thermal judder, can be amplified by faulty bearing components and out-of-balance wheels.

The cause of cold brake judder

Essentially it is a function of installation of the disc on the hub assembly and the resulting intermittent contact between the brake pads and brake disc in the "brakes off" running period of vehicle operation. This very light contact between pad and disc is most pronounced at the diametrically opposite high points on either side of the brake discs and although the contact forces are relatively low, with time and mileage they cause wear at these points on the brake disc. This results in a disc thickness variation, which eventually causes judder.



20µm (0.2mm) of DTV (Disc Thickness Variation) can often be detected as brake judder

In summary the following factors influence the generation of disc thickness variation (DTV):

- The radial run-out of the brake discs once it has been installed on the vehicle.
- The brake calipers failing to fully release and retract both the piston side and reaction side brake pads once the brakes are released.
- The ability of the disc brake pads to reduce or remove disc thickness variations during normal braking.

The effects of disc thickness variation can vary significantly from one model to the next and depend on the force transmission factors and the damping capabilities of the axle, steering and chassis components.

Investigating the Causes of Brake Judder

1.Radial run-out of brake discs should be tested with the disc installed on the vehicle, ideally with a correctly fitted wheel. Radial run-out is tested with a dial gauge with a measurement accuracy of at least 0.01 mm and applied about 10 to 15mm below the outer disc radius. The reading should be taken over several revolutions and the run-out should not exceed 0.100 mm with new brake discs and ideally should be < 0.070mm (Problem vehicles: < 0.040mm)

Measuring radial run out on the vehicle – this must be below 0.100mm, ideally below 0.070mm to help prevent generation of DTV

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Investigating the Causes of Brake Judder - continued

2.On older cars 0.070mm may not be possible due to component wear but optimum results can still be achieved through trial and error positioning of the brake disc on the hub so that the lowest measured value is achieved. But even on older cars, brake disc radial run-outs must not exceed 0.100 mm. If necessary, the component(s) causing the run-out (hub, brake disc, bearings) must be replaced. Take care that the contact surfaces is kept clean and free from defects.

3.The hub can also cause excessive radial run-out and therefore must be measured. A maximum value of 0.030 mm, referred to the outer measurable radius is allowed. If the deviation exceeds this value, the hub should be replaced.

4.The brake disc's parallelism should not exceed 0.050 mm. Brake discs such as Juratek brake discs, which hold UNECER90:02 approval are produced in accordance with this requirement.

5.Depending on the vehicle type, thickness variations as low as 0.015 mm (Problem vehicles: < 0.008mm) can cause judder. On new discs these values must not be exceeded. Brake discs such as Juratek brake discs, which hold UNECER90:02 approval are produced in accordance with this requirement.

The causes for excessive radial run-out and disc thickness variations can be difficult to identify. But by performing the possible measurements on the affected components and – if necessary – replacing them, these faults can largely be limited to acceptable levels.

As already mentioned, driving style as well as traffic and road conditions also play a part in causing brake disc thickness variations. Journeys of several thousand kilometers with little braking can result in sufficient disc thickness variations to cause judder. A subsequent driving phase containing a lot of braking can regenerate the discs again.

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