Knowledge and expertise from the OEM

FAULT ANALYSIS MADE EASY:

Checks on brake discs and brake pads, carried out visually and using measuring instruments
Brake discs and brake pads:
A "friction partnership" characterised by day-to-day challenges

The faultless performance of the brake disc as ‘friction partner’ to brake pads is crucial to the efficiency of all other components of the braking system as it is one of the parts subjected to the heaviest brake load in the entire system. Even at temperatures exceeding 800 °C, e.g. after a long drive downhill in a mountainous region or in a traffic jam on the motorway, when the brake discs are red-hot, they still have to transmit several tons of power to decelerate the vehicle.

Brake faults, such as squeaking or rattling, a pulsating brake pedal, a weak braking effect, a flutter in the steering when braking or unevenly worn brake pads can be caused by a badly fitted or worn brake pad. Brake discs generally show normal signs of wear and tear such as corrosion, ridges, cracks and warpage, which are predominantly a result of overheating. However, as the brake discs are also exposed to a number of outside influences, they are susceptible to additional faults such as lateral impact or variations in thickness and in systematic operation.

It doesn’t matter whether it’s excessively hard day-to-day use, gruelling environmental impacts, a lack of care or minor negligence during installation – all of these can sooner or later lead to faults and risks during braking. This brochure will help with troubleshooting and rectifying the causes of faults.
100 years of experience: The tried-and-tested basis for successful fault analysis

For the past 100 years, Jurid has been developing and producing brake pads for original equipment. Jurid makes the specialist knowledge it has gathered from engineering and practical work over this period available to its workshop partners – for example the knowledge, equipment and methods for correctly interpreting traces of wear on brake discs and brake pads.

All the phenomena and faults detailed above leave traces that can be read and understood. These brief guidelines will help to establish the cause of brake faults, meaning that reliable fault analyses can be made with just a simple visual inspection. In addition, the Jurid brake disc tester device backs up the visual check with concrete data relating to lateral run-out and thickness tolerance. Our knowledge and expertise as an original equipment manufacturer makes troubleshooting easy, whether it’s a case of unsuitable brake pads or incorrect assembly, or whether the origins of a fault are concealed behind corrosion or structural changes.

Index:

Brake discs

Visual inspection
• Droplet formation
• Traces of corrosion
• Formation of ridges
• Raised bridge at the edge
• Hot spots
• Blue colouring
• Structural changes
• Partial wear of the friction surface
• Corrosive pad impression

Brake disc tester device

Components

Check using measuring instruments
• Lateral run-out – Procedure
• Lateral run-out – Cause
• Wear on brake discs
• Wheel attachment torque

Brake pads

Visual inspection
• Paper/Protective foil
• Uneven wear
• Wear on piston side/outer side
• Deposits linked with direction
• Thickness of residual deposit
• Other causes of brake noise
Brake discs

Checking the data:

- Was the brake disc supplied by JURID? You can tell by the embossed stamp on the face of the disc.

- Does the brake disc correspond to the article number specified?

- Does the brake disc fit the brake of the specified vehicle?

Visual examination

The general condition of the brake disc can be ascertained simply by looking at the brake disc surfaces in the area of the disc cup.

- If this reveals that residue from the protective coating – in the form of droplets – or remains of paste (copper etc.), these agents would have been applied by the garage as precautionary measures for disassembly at a later date. A completely even coating of grease or paste containing lubricants, even if they are temperature resistant, is almost impossible in practice.

- Fairly obvious traces of corrosion indicate a long service run or a corroded hub. As a result of this corrosion optimum contact of the brake disc with the vehicle hub cannot be guaranteed. The tolerances arising from this show an increase towards the outer edge of the friction ring surface and, in some cases, are considered to be the cause of lateral impact.
• **Ridges forming on the face** indicates outside influences, whether the brake pads have been worn to below the minimum tolerance of 2 mm or through direct interference from a foreign body, the latter being an exception.

• **A raised bridge at the edge of the friction ring surface** always signifies the existence of material erosion, which is either due to an advanced service run or to an extreme sports driving technique of the end user. This leads to an increased deposit of brake dust in the disc cup. In any event, the pads must also be inspected.

• If the contact pattern of the friction ring surface shows **hot spots**, this is attributable to a ‘wobbling motion’ while driving; in this case, the brake pad repeatedly touches the disc in the same spot. This ‘wobbling motion’ can lead to erosion at different points of the friction ring surface and consequently to unsteady operation. Cause of the ‘wobbling motion’ can be a brake caliper that is not moving freely or a wheel bearing clearance that has been badly set.
Brake discs

• **Light or heavy blue colouring on the friction ring surface** indicates that the brake disc is overheating. These so-called tempering colours show that a structural change has already started in the pearlitic matrix. This results in the parallel values exceeding the maximum tolerance and consequently in imbalance. The process can be verified in every case by the mechanical examination described at a later stage. Even if the values recorded do not exceed the maximum permitted, the disc will most likely need to be refitted.

• If only one of the two brake discs on an axle shows blue colouring, this is a clear indication that the caliper is stuck or at least not moving freely. This is frequently caused by the guide pins on floating calipers.

How does a structural change come about?

A frequent reason is the fact that the rules and regulations for running the brake pads and brake discs in, for the first 200 – 300 km are not observed. The driver should also avoid braking in rapid succession as this considerably increases the disc temperature.

In contrast to brake discs in racing cars, passenger car brake discs are manufactured using the grey-cast iron process and are therefore only suitable for use up to maximum 750 °C. If this is constantly exceeded, a structural change will arise. Due to the subsequent cooling there is a risk of the structure becoming uneven over the entire friction ring area. This leads to faults in thickness and consequently to grating when braking again.
• If the brake band is only worn in the centre or if the inner and outer brake band is corroded, there may be a number of reasons for this:
  
  – low brake torque due to low brake effort of the rear axle
  
  – the brake pad is not completely fitted
  
  – the wrong brake pads have been used
  
  – part of the friction material of the brake pads has been lost
  
• A corrosive pad impression is formed by the metal parts contained in the brake pad. Together with the brake disc, these metal parts constitute an electrochemical element that can lead to damage of the brake disc through corrosion in certain conditions. If the vehicle is constantly in service, the risk of corrosion is low. However, if the vehicle is idle for a long period of time, for example for several days, so-called corrosive pad impressions, or rust film, are formed on the friction ring surface. This means that the corrosion has penetrated several millimetres into the brake disc, leading to squeaking, grinding and a reduction in braking comfort. A brake disc with a corrosive pad impression cannot be rebuilt; even grinding over it is of no use. In this case, there is no alternative but to replace the disc.
Brake disc testing device

The Bendix JURID testing device for brake discs allows you to check lateral impact and thickness tolerance without having to remove the disc from the vehicle.

The device is made up of a support with magnetic base (1), a dial gauge (2) and a micrometer (3).

**N.B.:** Set to zero with enclosed tool
Brake disc testing device

To check the lateral impact of the brake disc please proceed as follows:

• If the brake disc is only fastened with one screw, secure it with two additional screws at the wheel hub.

• Image 1: Attach the dial gauge with the aid of the magnet at the strut.

• Image 2: Place the sensor 1 cm from the outer diameter and read the oscillation value on the dial gauge during a full rotation.

The reading at the disc must be below 0.08 mm and at the hub below 0.02 mm.

If the figure is not within the tolerance, adjust the position of the disc to the wheel hub by 45° and check again.

• Image 3: Also check the concentricity of the wheel hub.

N.B.: The hub impact approximately doubles the disc impact.

An increase in lateral impact can be caused by the following:

• Excessive wheel bearing clearance
• Soiled face surface of the disc and hub
• Wrong torque on the wheel screws
• Overheating of the disc (‘blue colouring’)

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• Image 1: You can measure the difference in thickness of the disc radially with the aid of the micrometer screw at a minimum of 8 points spread over the entire friction area. The thickness tolerance is 0.01 mm; it must not be exceeded.

**If no fault was found on fitting the brake disc nor wear of the disc ascertained, check the following points:**

• Image 2: The face surface of the hub must be absolutely clean, without rust or burr and with a bright metal finish. Under no circumstances should you use assembly paste.

• Image 3:
  – The wheel suspension system, together with tie rods, silent blocks and steering sockets must not be soft, twisted or otherwise damaged.
  – The pistons and guide pins of the brake calipers must be moving freely.
  – The brake pads and springs must be correctly assembled.
  – The wheel bearings must be correctly aligned.

**Wear on brake discs**

It is vital that brake discs with wear shapes as shown in Image 4_3 are replaced.

If brake discs with wear shapes as shown in Image 4_2 are to be repaired, this shall be dependent on the depth of wear, which must not exceed the maximum permitted machining dimension specified by the vehicle manufacturer for the relevant type of vehicle.
Always tighten wheels with torque

95% of all impact wrenches are not suitable for pre-tightening the wheel screws. Today’s ½” impact wrenches provide up to 1300 Nm of torque. Forces of 300 Nm and more are obtained at even the lowest setting. However, the majority of vehicles require a tightening torque of 120 Nm. Even before the torque key is used, the tightening torque is up to 100% higher than the manufacturer’s specifications.

• When assembling the wheels you must tighten the wheel screws crosswise in two phases ensuring they are even and that they have the right tightening torque.

Please let your customers know that they should brake as gently as possible with new brake pads and brake discs and avoid unnecessarily forceful braking during the first 200 km.
• If the brake pad shows wear at the upper and lower edge of the friction surface, an old 'run-in' brake disc has been used.

- Wear at the edges

• Ridges on the brake pad are a mirror image of the brake disc (see page 4 for scoring of the face surface)

- Ridges

• Overheating of the brake pads is caused if the brake caliper is stuck or not moving freely.

- Overheating

• Glazing of the brake pads is a consequence of repeated light braking (bad parking), which polishes the pad surface blank. Heavy braking can cause the braking effect to weaken.

- Glazing

• If the pad has broken away, this is a result of the pad being wrongly fitted.

- Cavity
- **The back of the brake pad** is often protected against contamination with **paper foil**. Ensure that the foil is removed before assembly.

- If the **brake pad is unevenly worn**, the ability of the brake caliper to move freely must be checked.

- If the more heavily worn brake pad is on the **outer side** of the brake caliper (floating caliper), this is due to the sliding sleeves being stuck or not moving freely.

- If the more heavily worn brake pad is on the **piston side**, this is due to the piston being stuck or not moving freely.

  In any event, the ability of the brake pads to move freely in the caliper shaft must be guaranteed.

- **Brake pads with directional arrows on the back plate** are assembled on the side of the piston and in the run-in of the brake discs (running direction forwards).
• In our experience, brake pads are often replaced to late. In order to ensure the reliable performance of the braking system in any situation it is absolutely essential that the brake pads are replaced at the latest when the thickness remaining on the pad is 2 mm or when the brake pad wear warning light is on.

Possible causes of brake noises:

• Low braking pressure

• New pads mounted with old discs

• Old or hardened brake caliper cups

• Piston shoulder not set at 20°

• Foreign bodies (dirt, lubricating gel) in the pad surface

• Brake caliper and pads not moving freely (surrounding area of braking system must be cleaned (suspension system))