Steering wheel vibration during braking - Addendum

DATE: May 1, 2024

This Technical bulletin serves as a guide and provides additional diagnostic info for possible steering wheel vibration when braking. **This Bulletin serves as an ADDENDUM to MAS002731**.

MODELS: All sedan models and SUVs within 3 MIS (Months In Service), i.e. with Warranty Start Date not older than 3 months.

CONCERN: steering wheel vibration during braking.

CONDITIONS: Customer feels a vibration on the steering wheel during braking.

DTCs in ECUs: No DTCs

ADDITIONAL CHECKS:

1. **Run-out measurement.**

After removing the wheels, by means of a micrometer, measure the difference in terms of brake disc thickness as better described below. The peak-to-peak difference should be less than or equal to 25 µm.

Perform at least 8 measures at 45 degrees between them at about 5-10 mm from the outer border of the brake disc as shown in the Figure 1.

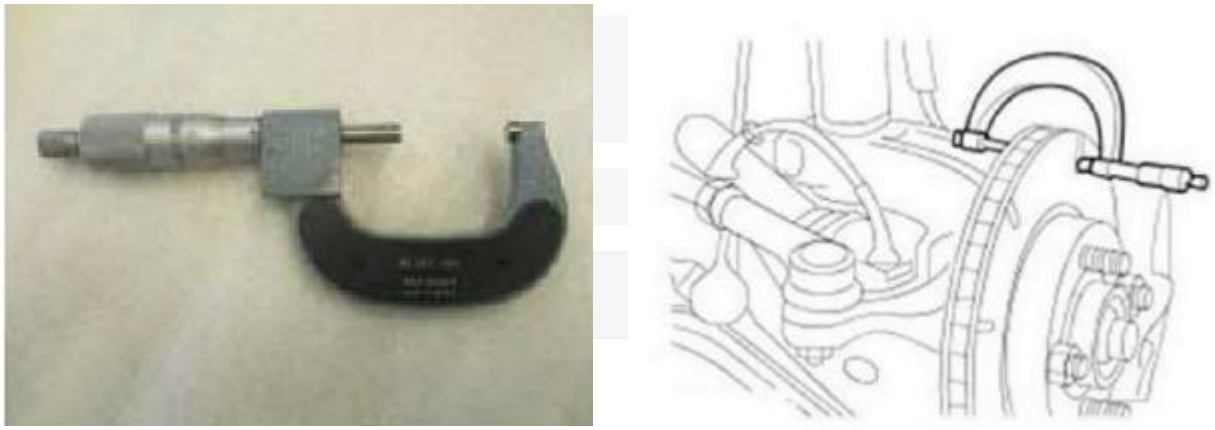

Figure 1: example of micrometer to be used for the measures (left) and measurement points on the brake disc (right).

Note: the measurement requires good accuracy because the expected values to be detected are very small and therefore easily influenced by external factors such as the expertise of the Technician performing the measurement and the braking surface conditions.

2. Residual Braking Torque check

With Vehicle lifted on hoist, the residual torque in each wheel of the axle presenting the anomaly shall be recorded using a torque wrench.

With Gearbox in Neutral position, disengaged parking brake and the wheels raised from the ground, measure the value detected as first detachment and then making an average minimum/maximum over three measures. Measures should be carried out with constant angular speed and without abrupt accelerations, as shown in the Figure 2.

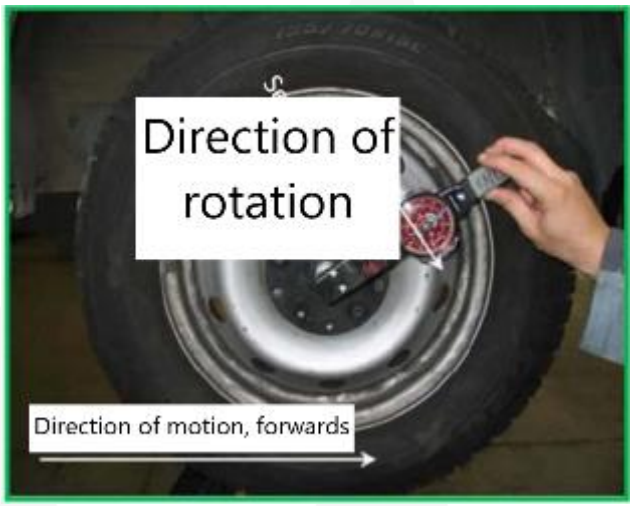

Figure 2: residual braking torque check.

Does the measured torque fall within the values of:
Case A - Driving wheels < 12 Nm?
Case B - Non-driving wheels < 5 Nm?
Case **YES**:
The investigation on the residual braking torque is finished.
Case **NO**:
Driving wheels with residual torque > 12 Nm: remove the affected wheel and brake pads and repeat the residual torque check.
Is the difference between the measured residual torque with and without pad < 5 Nm?
If **YES**, please investigate it further.
If **NO**, please investigate on the Transmission and Wheel Hub Bearings.
Non-driving wheels with residual torque > 8 Nm: remove the affected wheel and brake pads and repeat the residual torque check.

3. **Residual braking torque (floating caliper with high sliding load).**
   Please refer to the workflow in the chart below. **Figure 3**.

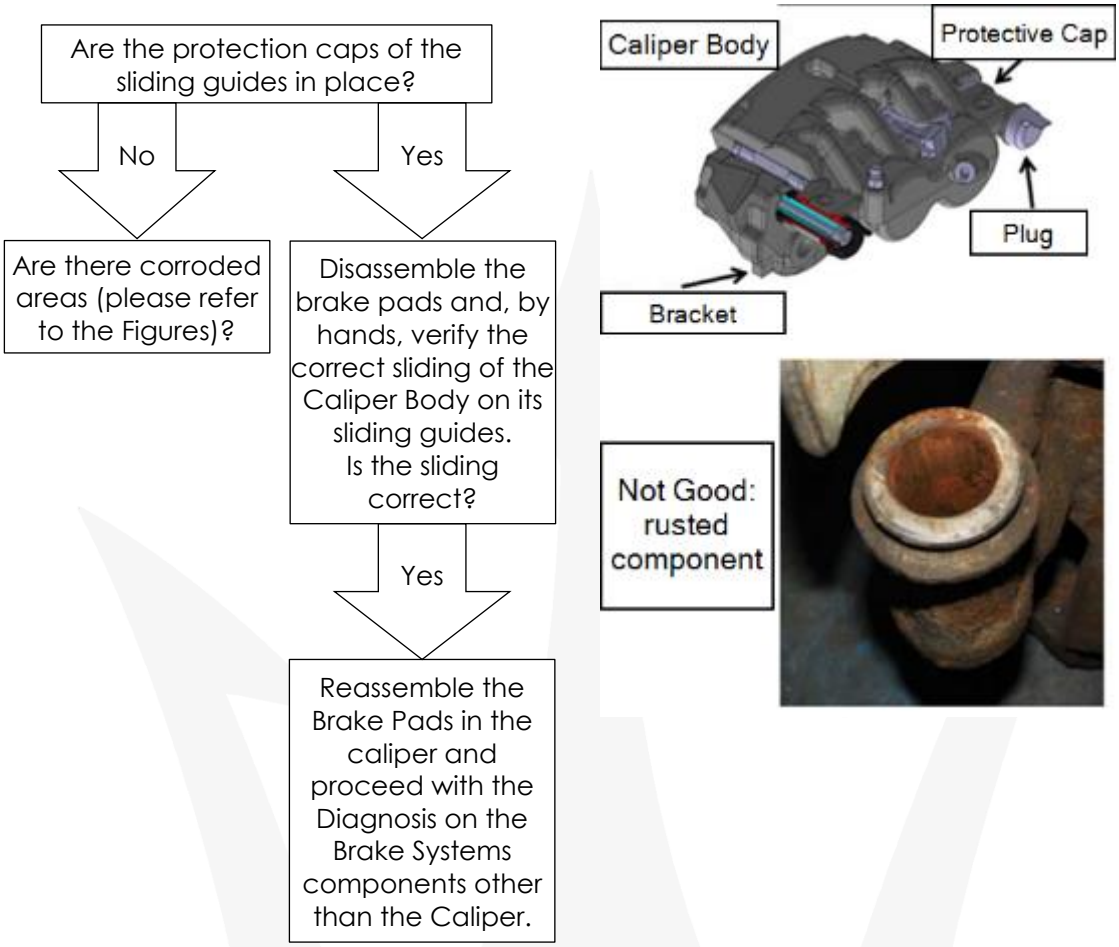

Figure 3: workflow in case of residual braking torque for Brake Calipers experiencing high sliding load.

4. **Residual braking torque (fixed calipers with pads locked in their respective seats)**

   a. If the Brake Pads are equipped with anti-vibration stainless or double-side adhesive shims, disassemble the retaining springs and the studs, to verify they are not blocked in their seats. This can be verified by moving them by hands.

   b. In case of blocked pads, unlock them by means of a suitable tool.

   c. Verify the status of the Brake Pads:

      i. Whether they are corroded.

      ii. Whether they have chippings.

      iii. If the thickness of the friction material is above minimum (4 mm).

      iv. Carefully clean the Brake Pads and their seats.

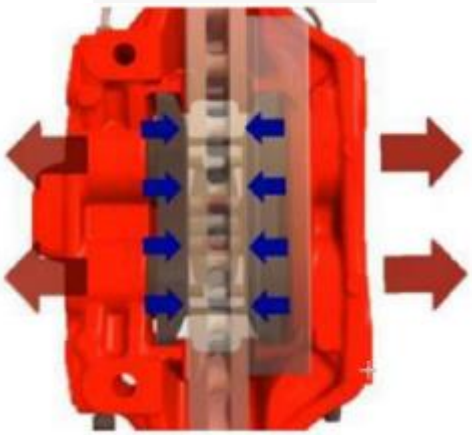

Figure 4: fixed brake calipers with stuck brake pads.

5. Residual braking torque (stuck calipers piston)

a. Disassemble the wheels, the Brake Calipers and the Pads

b. Verify if it is possible to push the Brake Calipers piston back by hands (for front brakes) or by a dedicated tool for the Rear Brakes. Please use the Diagnostic Tool according to Workshop Manual if required. Please refer to Figure 5 for an example.

Figure 5: stuck brake calipers piston and sample tool to push it back.

6. Residual braking torque (residual hydraulic pressure in the braking system)

a. Disassemble the Wheels, open the bleed points in order to verify if there is residual pressure in the brakes hydraulic system.

b. In case there is residual pressure, a small gush of hydraulic oil can be experienced.

c. Once the bleeding is complete, verify if there is residual braking torque on the wheels persists or not.

Figure 6: residual hydraulic pressure in the braking system.

7. Residual Braking Torque (aged flexible hoses and/or partially obstructed holes).

a. With Vehicle raised on hoist, verify the condition of all the flexible hoses of the brake system.

b. If one or more is (are) found to be in bad status, disconnect it (them) from the Brake Caliper they are connected to and verify if the Brake Oil comes out of it in the expected amount.

c. If the amount of Brake Fluid exiting from the Flexible Hose is not satisfactory, it may need to be replaced.

d. Possible problems are shown in the Figure 7.

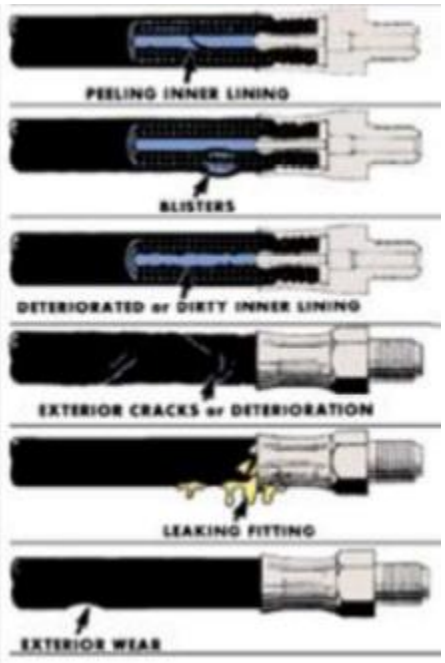

Figure 7: possible hose problems. From top to bottom: inner lining peeling, blister, deteriorated or dirty inner lining, exterior cracks or deterioration, leaking fitting, exterior wear.

8. Residual braking torque: floating calipers with brake pads stuck in their seats

a. If the Brake System is equipped with Brake Pads equipped with anti-vibration shims (e.g. double-sided adhesive ones), please verify they are not stuck by manually moving the Brake Pads in their seats.

b. In case they are stuck, try to unlock them by means of a hammer or a suitable tool.

c. Make sure that the Brake Pads are not broken or chipped, and that the residual thickness of the friction material is at least 4 mm.

d. Carefully clean the seats for the Brake Pads.

e. Reinstall the Brake Pads and make sure they are free to move.

f. Residual braking torque: partially detached anti-vibration shim on the Brake Pads.

g. In case the Brake Pads are equipped with metallic anti-vibration shim, make sure it is not partially or completely detached, as shown in the Figure 8.

h. If this happens, the complete Brake Pads Set of the affected axle requires replacement.

Figure 8: metallic anti-vibration shims detachment from the brake pad.

9. Residual braking torque: use of non-compliant brake fluid

Use only Brake Fluid compliant to the DOT prescription for the Vehicle according to the Workshop Manual.

The use of non-compliant braking fluid may compromise the correct functionality of the seals of the Brake Calipers and thus the Braking performance.

10. Wheel Hub with excessive freeplay

Verify the presence of abnormal freeplay in the Wheel Hub Bearing.

To verify this point, the measure needs to be carried out as it follows:

Apply the indicator in the position shown in the Figure 1, i.e. perform at least 8 measure at 45 degrees between them at about 5-10 mm from the outermost border of the Wheel Hub as shown in the Figure 1.

Apply a lateral (y-direction) load of about 30 kg and verify the deviation with respect to the "zero" load condition.

If the value of deviation is below 0,05 mm, the component is to be considered as compliant. Conversely, it possibly requires replacement.

11. Wrong tightening of the Wheel Hub screws (only for 2nd and 3rd generation wheel hubs)

Example of those are shown in the Figure 9.

Figure 9: 2nd (left) and 3rd generation (right) wheel hubs examples.

Verify the tightening torque of the nuts/screws of the Wheel Hubs, according to Workshop Manual.

If the tightening torque is not compliant, set it to the correct value and test the Vehicle again.

Please do not hesitate to contact us for any questions you may have.
Kind regards,

TECHNICAL SERVICE OPERATIONS