



Vibration Test for Brake Calipers and Corners

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. The purpose of this test is to measure the durability of brake calipers or corner assemblies subjected to vibration.

1.2 Applicability. This procedure is applicable to calipers and brake corner assemblies for disc brakes for passenger cars, multipurpose passenger vehicles, and light-duty trucks. It may be run on a caliper assembly (component level) or, which sufficient actuator capability, on a brake corner assembly (typically including a knuckle, caliper, pads, rotor and wheel bearing).

1.3 Remarks. This current revision was updated to align more closely with JASO C448-80, a commonly referenced industry standard test for caliper durability. It also adds a second vibration axis to simulate fore-aft loads. The vertical vibration frequency was changed from 20 Hz to 60 Hz, the amplitude was changed from 18 g to 20 g, and the hydraulic pressure was changed from 20 bar every 10^4 cycles to 34 bar every 3600 cycles.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

JASO C448-80

2.2 GM Standards/Specifications.

None

3 Resources

3.1 Facilities. Chassis laboratory.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Rig assembly for endurance test for brake calipers under vibration. See Appendix A, Figure A1 and Figure A2 for sketch of rig assembly. Includes mounting plates, travel-controlled servo hydraulic actuator (or equivalent actuator).

3.2.2 Original steering knuckle or substitute fixture.

3.2.3 Original brake disc or disc spacer.

3.3 Test Vehicle/Test Piece.

3.3.1 Caliper assembly or corner assembly.

3.3.2 Hydraulic connection.

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3.3.3 Any additional components required to ensure that forces acting on and motion of moveable components are representative of in-vehicle installation shall be included. Examples include parking brake cables for drum in hat brake corners, and return springs for parking brake levers.

3.4 Test Time.

Calendar time:	5 to 7 days
Test hours:	125 hours per 4 parts
Coordination hours:	8 hours to 10 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Brake technician or engineer trained to perform the setup and instructions described in Section 4.

4 Procedure

4.1 Preparation.

4.1.1 Fix brake disc or disc spacer to the anchor or flanged housing or the original steering knuckle.

4.1.2 Fix brake caliper assembly to original steering knuckle or universal mounting plate. Measure caliper bolt torques and caliper pad spring forces.

Note: Caliper pad spring forces are typically measured by pushing on the brake pad as close to the spring as possible, directly against the spring (usually downward from the top of the caliper) with a calibrated force meter. This measurement is repeated for each end of the pad (both springs). The force required to lift the pad off of its seat is the value recorded. Measurements should be repeated at least three (3) times to ensure repeatability.

4.1.3 Fix the universal mounting plate on the travel-controlled actuator per instructions in 4.3 through 4.3.7.2. Vehicle design position for first (1st) test, 90 degrees rotated for second (2nd) test.

4.1.4 Install the hydraulic connection.

4.1.5 Connect pad wear sensor corresponding to vehicle condition.

4.1.6 Measure brake pad spring force or housing spring force (whichever is applicable).

Note 1: To measure pad spring force, it is acceptable to use a hand-held force gage to measure the force required to move the brake pad off of the bracket abutment surface, directly against spring force. This measurement is performed on each pad abutment, usually four (4) per caliper.

Note 2: To measure caliper housing spring force, it is acceptable to use a hand-held force gage to measure the force required to lift the caliper housing off of both of its contact points with the outer pad, directly against spring force.

4.1.7 Measure and record caliper guide pin bore diameters at the bore opening. Use at least two (2) orthogonal measurements.

4.2 Conditions.

4.2.1 Environmental Conditions. Indoor laboratory environment is required.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Caliper or corner installed in design position

4.3.2 Subject caliper or corner to sinusoidal vibrations:

- Frequency: $f = 60 \text{ Hz}$

Note: May be reduced to as low as 20 Hz to avoid resonance of components in the caliper or the brake corner.

- Amplitude: $a = 20 \text{ g}$
- Number of cycle = 5 cycles $\times 10^6$ cycles

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