



Halfshaft Boot Squeak Test Procedure

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 procedure is to measure any sounds created by rubbing parts of the halfshaft joint boot against itself, while rotating, when the joint is articulated through a range of specified angles. The procedure is intended to be conducted with the halfshaft outer joint, bar, and boot assembly mounted in a test fixture. The halfshaft supplier shall use this procedure for development and validation of half-shafts in compliance with the program specific SSTS document, commonly called "Appendix C2 15.04.04 Halfshaft".

1.2 Applicability. This procedure is applicable to all halfshafts for which a rotating angle requirement has been specified in the program specific halfshaft SSTS. This procedure is applicable to a halfshaft mounted in a bench level test fixture. It is not applicable to the halfshaft installed in the vehicle.

1.3 Remarks. The measured sound level is an integration driven subsystem requirement for noise and vibration (N&V). Exceeding the limit value specified in the program specific halfshaft SSTS may result in objectionable driveline induced noise and vibration caused by the halfshaft.

2 References

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

2.1 External Standards/Specifications.

IEC 651 ISO 532B

2.2 GM Standards/Specifications.

None

2.3 Additional References.

Subsystem Technical Specification (SSTS), program specific halfshaft, "Appendix C2 15.04.04 Halfshaft"

3 Resources

3.1 Facilities.

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.

3.1.3 Environment. The test shall be performed in a semi anechoic environment, with a hard, flat floor surface. The ambient temperature shall range from 18 °C to 25 °C (65 °F to 77 °F).

The facility must be free of noise which may limit the detection or measurement of squeaks. When noise measurements are being made, the background N10 Loudness level shall not exceed 1.5 Sones. The loudness shall be calculated as described in 5.1. Loudness background noise is considered to include:

- Room or test cell ambient noise
- Equipment noise (Motors, computers, and controllers)
- Fixture noise running the specified test rpm without the test part

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If the 1.5 Sones N10 requirement cannot be met, then a quieter facility and equipment must be used.

Performing an ambient measurement can provide insight as to whether the equipment or the test cell is too noisy. The drive motor for the test may be located outside of the test cell or acoustically isolated from the microphone if necessary.

3.2 Equipment.

3.2.1 Microphones. A 13 mm Free-field microphone meeting Class 1 accuracy corresponding to IEC 651 or be equivalent for the application (precision ± 0.7 dB or $\pm 8\%$).

3.2.2 Calibrator. A 94 dB, 1000 Hz calibrator is needed to perform a calibration of the microphone system before each test.

3.2.3 Data Acquisition Equipment. Data acquisition system capable of the following:

- Recording acoustic sound pressure
- Performing Loudness ISO 532B, free field calculation
- Playback of sound recordings

3.2.4 Test Fixture. Test fixture capable of supporting a front halfshaft outer joint, bar and boot assembly without applying a torsional, axial or radial load on the axle joint. The fixture shall incorporate a drive motor to rotate the halfshaft at Rotations per Minute (rpm) speeds ranging from 5 rpm to 110 rpm. The fixture shall also allow and control articulation of the joint from straight to its maximum bending angle in increments of 5 degrees or less.

3.2.5 Wetting Provisions. There shall be capability to wet the boot with water.

3.2.6 Thermal capability. A removable thermal chamber (or environmental test cell) to heat and cool the test specimen across a range from -40 °C to 30 °C (-40 °F to 86 °F).

3.3 Test Vehicle/Test Piece. This test shall be performed on a development level or production content front drive axle (halfshaft) outboard joint and bar shaft assembly with boot.

3.4 Test Time.

Calendar time: 2 days

Test time: 8 hours

Coordination time: 4 hours

3.5 Test Required Information. Prior to performing this procedure, the outboard joint maximum articulation angle must be known. This information is can be found in the halfshaft SSTS document for the specific halfshaft under test. Verify/establish that the boot length is correct per design specifications.

3.6 Personnel/Skills. A skilled technician or an engineer can perform this test procedure. Test personnel shall have a working knowledge of:

- Data acquisition system and equivalent analyzer
- Fixturing for noise testing
- A general knowledge of the product being tested

4 Procedure

4.1 Preparation. Not applicable.

4.2 Conditions.

4.2.1 Environmental Conditions. This procedure may be conducted at ambient laboratory conditions at a temperature ranging from 18 °C to 25 °C (65 °F to 77 °F) with allowances for the test piece to be cooled to -40 °C (-40 °F) or heated to 30 °C (86 °F).

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

4.3 Instructions.

4.3.1 Mount the test piece in the test fixture such that the outboard joint angle is fixed at 0 degrees. Ensure that the input and output shafts are securely supported by bearings that enable free rotation about the shaft axis.

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