



Road Induced - Smooth Road Vibration Evaluation 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 test procedure is to excite engine resonance on appropriated, defined roads. Acceleration at seat rail has to be measured or other interface.

1.2 Applicability. This test procedure may be applied to all passenger cars, truck, and light commercial vehicles.

1.3 Remarks. This test procedure is used for measuring acceleration in order to get a frequency weighted acceleration value.

2 References

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

2.1 External Standards/Specifications.

ISO 2631

2.2 GM Standards/Specifications.

None

2.3 Additional References.

Vehicle Technical Specification (VTS)

3 Resources

3.1 Facilities. Tests shall be performed on a smooth road surface which is near 3.5 km in length. This road surface should be free from irregularities, and safely and legally allow this testing to be performed.

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. A single or multi-channel measurement system with accelerometers, recording device, and analysis equipment may be regionally specific depending upon capability. One (1) accelerometer is required. The recording device must be capable of recording data out to 20 Hz with a frequency resolution of 0.25 Hz.

3.3 Test Vehicle/Test Piece. It shall be ensured that the test vehicle corresponds to the current test and setup conditions. Deviations shall be corrected or recorded in writing. Correct functioning of the engine and transmission shall be ensured.

Tire manufacturer and size must be documented.

3.4 Test Time.

Calendar time: 1 day

Test time: 6 hours

Coordination time: 1 hour

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September 2016

Page 1 of 3

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. To complete these tests, one (1) technician or engineer skilled in noise and vibration data acquisition is required. The technician or engineer must be approved to drive on the Proving Grounds road system. For data analysis, one (1) engineer skilled in vibration data acquisition and analysis is required.

4 Procedure

4.1 Preparation.

4.1.1 Set tires to correct (manufacturer recommended) pressure.

4.1.2 Fill the fuel tank to full.

4.1.3 The accelerometer is to be fixed with adaptor at the outboard/left seat rail front left driver's seat. The alignment is to correspond with vehicle coordinate system in Z-Direction (vertical). Other interfaces can also be tested if so desired, the rear inboard seat track, steering wheel 12 o'clock position and/or the floor pan.

4.1.4 One-(1) axial accelerometer at the outboard seat rail of the driver's seat or interface of choice.

4.2 Conditions.

4.2.1 Environmental Conditions. For safety reason measurements should be done on dry lane.

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. Install measurement equipment. Before the start of the test, the instrument settings and the vehicle settings shall be verified. For data processing measuring instruments, the adjustments, according to Section 5, shall also be performed from the start of the test. Excitation source is road surface/tire.

4.3.1 Calibration. The instrumentation must be calibrated according to the operating instructions. The instrumentation shall have a valid calibration label.

4.3.2 Measurements. Tests shall begin at the determined point of the test road.

The vehicle is to be driven through the speed range of 90 km/h to 150 km/h in high gear in order to find the vehicle speed of maximum front end shake. Acceleration data is to be measured at the vehicle speed of maximum subjective front end shake. A minimum of 30 s of acceleration data is required.

5 Data

5.1 Calculations.

5.1.1 Fast Fourier Transform (FFT) Analysis from 1 Hz to 20 Hz ($\Delta f = 0.25$ Hz). The FFT data is to be exported to an MS Excel-type spreadsheet, Frequency Range 1 Hz to 20 Hz will be frequency weighted according ISO 2631 (Z-Direction) and calculated effective value.

Single value will be created in this way: weight

Z-Direction by appropriate curve of weighting function ISO 2631 and then a power summation from 1 Hz to 20 Hz.

5.2 Interpretation of Results. Acceleration value is shown as weighted effective value according to ISO 2631 in the VTS.

5.3 Test Documentation. Documentation is a single value for seat rail or other measured interface.

6 Safety

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

In general, a risk assessment needs to be performed for every driving instruction prior to executing this standard. (**Note:** National law needs to be considered while performing a risk assessment.) The required rating of risk by exposure probability and possible violation will be done in a separate document. Every identified risk must be named inside the risk assessment for the relevant driving instruction in order to announce that risk to employees. Within the risk assessment, the vehicle equipment and different vehicle build stages have to be considered. After

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September 2016

Page 2 of 3