



Exhaust Hanger Bracket Interface Attachments - Drive Point Dynamic Stiffness and Mobility Level Evaluation Procedure

1 Introduction

This procedure describes the measurement process for obtaining the drive point dynamic stiffness/mobility of an exhaust side hanger bracket. This procedure also includes the process for measuring bolt on body/frame side exhaust brackets which are not Part of Assembly (POA) of the body/frame.

The Hand Held Force Input Frequency Response Function (FRF) Acquisition Master Test Procedure, GMW14181 and the Transducer Calibration Master Test Procedure, GMW14172, shall be referenced for more detailed information corresponding to the following procedure.

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. Define the process of determining the drive point dynamic stiffness/mobility of an exhaust hanger bracket.

1.2 Applicability. This test procedure is appropriate for use with all cars and trucks (see GMW14181).

1.3 Remarks. The driving point dynamic stiffness/mobility of the exhaust hanger bracket attachment interfaces is a factor in the isolation performance (see GMW14181).

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14172 GMW14181

2.3 Additional References.

- Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities. A test room or an area which is free of extraneous vibration (per GMW14181).

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 Data acquisition system (DAS).

3.2.2 Accelerometer (mass < 0.006 kg).

3.2.3 Small impact hammer with tip capable of providing uniform force input out to 800 Hz.

3.2.4 Transducer cabling.

3.2.5 Signal conditioning (see GMW14181 for transducer key characteristics).

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3.3 Test Vehicle/Test Piece. Exhaust system or full vehicle (see GMW14181).

3.4 Test Time.

Calendar time: 1 day

Test time: 4 hours

Coordination time: 2 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Wholly contained in GMW14181.

4 Procedure

4.1 Preparation.

4.1.1 Boundary Conditions.

4.1.1.1 Exhaust Side Hanger Bracket. For exhaust side bracket measurements use one of the following:

- a. Free-free boundary condition with the exhaust system removed from the vehicle.
- b. Quasi free-free with the exhaust isolators removed but exhaust still attached to the powertrain. The exhaust may need to be supported with low stiffness materials.

The exhaust isolator must be removed at the measurement location (see GMW14181).

4.1.1.2 Bolt on Body/Frame Side Exhaust Hanger Bracket. For body/frame side bracket measurements, bolt the bracket to ground. The exhaust isolator must be removed at the measurement location (see GMW14181).

4.2 Conditions. See GMW14181.

4.2.1 Environmental Conditions. See GMW14181.

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. Mount accelerometer in the middle of the exhaust hanger, in the appropriate direction (see GMW14181 for suitable adhesives).

4.3.2 Set up DAS to acquire data between 0 Hz and 1024 Hz with a resolution of at least 1 Hz.

4.3.3 Acquire, verify and store a drive point FRF for directions of interest (see GMW14181).

5 Data

Data may be presented in four ways:

- $\frac{1}{3}$ octave drive point dynamic stiffness spectrum
- $\frac{1}{3}$ octave mobility spectrum
- Narrow band mobility spectrum
- Narrow band drive point dynamic stiffness spectrum

5.1 Calculations.

5.1.1 One-Third ($\frac{1}{3}$) Octave Drive Point Dynamic Stiffness Spectrum.

5.1.1.1 Integrate the narrow band accelerance to obtain mobility.

5.1.1.2 Calculate $\frac{1}{3}$ octave mobility spectrum according to GMW14181.

5.1.1.3 Integrate the $\frac{1}{3}$ octave mobility to obtain $\frac{1}{3}$ octave compliance.

5.1.1.4 Invert the $\frac{1}{3}$ octave compliance to obtain $\frac{1}{3}$ octave dynamic stiffness.

5.1.1.5 Recalculate the units from newton per meter [N/m] to kilonewton per millimeter [kN/mm].

5.1.1.6 Display:

- X-axis: 20 Hz to 800 Hz ($\frac{1}{3}$ octave scale)
- Y-axis: kilonewton per millimeter [kN/mm], log scale

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