GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW14184

Axle Interface Attachments - Drive Point Dynamic Stiffness and Mobility Level Evaluation Procedure

1 Introduction

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 for obtaining drive point dynamic stiffness/drive point mobility levels on the axle at interfaces to the suspension, frame, cradle, or body. These measurements are used to compare axle mobility to the specifications.

1.2 Applicability. This test procedure is appropriate to use for all car and truck axle systems.

1.3 Remarks. The drive point dynamic stiffness/drive point mobility level of the axle at suspension, frame, cradle, or body interfaces is a factor in isolation performance. The dynamic stiffness of attachments is inversely proportional to mobility.

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 Test Equipment.

3.2.1.1 Data acquisition system (DAS).

3.2.1.2. Accelerometer (weight less than 0.004 kg).

3.2.1.3 Small or medium impact hammer with tip capable of providing uniform force input out to 800 Hz or hand held shaker and force transducer.

3.2.1.4 Transducer cabling.

3.2.1.5 Signal conditioning. See GMW14181, Appendix A, Table A2 for transducer key characteristics.

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3.2.2 Test Fixtures.

3.2.2.1 Suspension Links with Bushings. An aluminum cylinder can be bolted inside the bushing outer sleeve so that it clamps tightly to the outer sleeve.

3.3 Test Vehicle/Test Piece. The complete axle system including all components (not isolated to the axle) with designed attachments.

3.4 Test Time.

Calendar time:	0.75 days
Test time:	4 hours
Coordination time:	2 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. See GMW14181.

4 Procedure

4.1 Preparation.

4.1.1 Attach test bushings and mount interface hardware at appropriate interface attachments.

4.1.2 Mount the axle on elastic cords for free-free mounting boundary condition.

4.1.3 Manipulate the elastic compliance to achieve less than a 1 Hz rigid bounce frequency.

4.2 Conditions.

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 Set up DAS to acquire accelerance FRF in the units of meters per second squared per Newton [(m/s2)/N] from 0 Hz to 1024 Hz with at least 1 Hz resolution.

4.3.2 Instrument an axle attachment with an accelerometer.

4.3.3 Using an impact hammer or hand held shaker, apply a force at the axle attachment in the same direction.

4.3.4 Continue measuring driving point FRF's in three (3) orthogonal directions at all of the axle attachment points. See GMW14181 for GM standard vehicle coordinate directions and appropriate accelerometer mounting adhesives.

4.3.5 For each FRF, measure accelerance, check coherence and verify levels. Upon measurement completion, store accelerance frequency response function, coherence and force auto-power spectrum.

5 Data

Data may be presented in four ways:

- ⅓ octave drive point dynamic stiffness spectrum
- ⅓ octave mobility spectrum,
- Narrow band mobility spectrum
- Narrow band drive point dynamic stiffness spectrum

5.1 Calculations.

5.1.1 One-Third (⅓) Octave Drive Point Dynamic Stiffness Spectrum.

5.1.1.1 Integrate the narrow band accelerance to obtain mobility.

5.1.1.2 Calculate ⅓ octave mobility spectrum according to GMW14181, Appendix C.

5.1.1.3 Integrate the ⅓ octave mobility to obtain ⅓ octave compliance.

5.1.1.4 Invert the ⅓ octave compliance to obtain ⅓ octave dynamic stiffness.

5.1.1.5 Recalculate the units from Newtons per meter (N/m) to kiloNewtons per millimeter (kN/mm).

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