



Steering Shudder 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. Determination of hydraulic power steering system shudder (vibration).

1.2 Applicability. The test is applicable to any/all passenger vehicles with hydraulic assisted power steering system.

1.3 Remarks. This procedure describes the vibration measurement of the hydraulic assisted power steering system.

2 References

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

2.1 External Standards/Specifications.

ISO 2631 ISO 5349

2.2 GM Standards/Specifications.

GMW14172 GMW14227

2.3 Additional References.

- 3M products available at solutions.3m.com/wps/portal/3M/en_EU/FacilitiesCleaningEU
- Accelerometers available from PCB Piezotronics at www.pcb.com/Products.aspx
- Vehicle Technical Specification (VTS)

3 Resources

3.1 Facilities. A test room.

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.

- Data Acquisition System (DAS)
- Two (2) Accelerometers (e.g., PCB 356B07 or equivalent)
- Transducer cabling
- Signal conditioning

Refer to GMW14227 for transducer key characteristics.

3.2.1 In addition, the following equipment is needed to perform the test procedure:

- Tire surface contact patch (3M "Safety Walk" Series 600 anti-slip self-adhesive coating or equivalent)
- Temperature meter

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3.3 Test Vehicle/Test Piece. The tests shall be performed on a vehicle that represents the current release status. Deviations (e.g., obvious faults) shall be eliminated or recorded.

3.4 Test Time.

Calendar time: 1 day

Test time: 4 hours

Coordination time: 2 hours

3.5 Test Required Information. Record engine revolutions per minute (rpm) (or power steering pump rpm) and the steering wheel and seat track acceleration.

3.6 Personnel/Skills. Engineer or qualified technician with basic knowledge of vibration.

4 Procedure

4.1 Preparation. Check the vehicle according to 3.3. Adjust tires pressures to nominal values (cold). Install measuring instruments. Place the front wheels of the car on the tire-surface contact patch. Accelerometers are also positioned at the front, outboard position of the driver's seat track to measure acceleration in the fore/aft, lateral and vertical directions and also at the top center or 12 o'clock position on the steering wheel to measure acceleration in the fore/aft, lateral, and vertical directions.

The vehicle is unloaded except for the driver and the test equipment. All windows, sliding roof and sunscreen are closed.

The engine or power steering pump rpm should be measured by a tachometer. Connect the tachometer and accelerometers to the analyzer. Switch the headlamps on (high-beam) and the rear window defroster to the on position. Switch the Heating Ventilation and Air Conditioning system on, set the temperature control to the coldest position and set the blower to the lowest speed.

4.2 Conditions.

4.2.1 Environmental Conditions. The temperature of the hydraulic fluid should be at approximately 80 °C in the power steering reservoir when measuring steering shudder. It is important to check the temperature during the whole test to ensure that the temperature does not significantly increase.

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. Before the start of the test, the instrument settings and the vehicle settings shall be checked again.

4.3.1 Calibration Verification. Wholly contained in GMW14172.

4.3.2 Measurement Pre-test. Make a pre-test if necessary.

4.3.3 Transducer Location. Triaxial accelerometers are positioned at the outboard position of the driver's seat track and at the top center or 12 o'clock position of the steering wheel.

4.3.4 Data Acquisition System (DAS). Set up DAS to acquire the narrow band acceleration spectrum in the units of decibel(s) (dB) re: 1 m/s² from 0 Hz to 100 Hz with 1 Hz resolution. The acquisition time for one (1) sweep is 30 s. Apply Root Means Square (RMS) averaging using a Hanning window with enough averages to achieve stable amplitude values.

4.3.5 Measurement of Idle in Drive, Accessories On. Operate the vehicle in Drive at idle with either a brake pedal fixture or driver applying pressure to the brake pedal to keep vehicle from moving. Ensure that the engine rpm has stabilized and does not vary more than 20 rpm. Ensure that the engine cooling fan does not cycle on/off. Position the steering wheel at the "on center" or 12 o'clock position. Acquire and record data for 30 s. Perform a minimum of three (3) measurements, check and record the temperature after each sweep, verify the repeatability and store each sweep.

4.3.6 Measurement of Steering Shudder – Full Travel Turn. Operate the vehicle in Drive at idle with either a brake pedal fixture or driver applying pressure to the brake pedal to keep vehicle from moving. Ensure that the engine rpm has stabilized and does not vary more than 20 rpm. Ensure that the engine cooling fan does not cycle on during the sweep. A 30 s sweep consists of turning the steering wheel from the "on center" or 12 o'clock position to the maximum position (full lock), which usually will occur at about 1.25 turns traveling in either the

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