



Intermediate Shaft DCCV Joint Clunk Test

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 provide a method to test the lower dual cardan constant velocity (DCCV) joint of a lower intermediate shaft for clunk.

1.2 Applicability. This procedure applies to body on frame and body frame integral vehicles.

1.3 Remarks. This procedure may be used for development or validation. The test provides excitation by means of a linear actuator in position control. Result of the test will be pass/fail characterization.

2 References

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

2.1 External Standards/Specifications.

ISO 9001

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- Component Technical Specification (CTS): Defines the component level testing and reliability requirements of the component.
- Loctite, Henkel Corporation, (www.henkel.com).
- MB Dynamics Technology, Test Processes and Engineering Services, Cleveland, Ohio (www.mbdynamics.com).
- PCB Piezotronics (www.pcb.com).

3 Resources

3.1 Facilities. A bedplate/slotted table approximately 1.2 m × 1.8 m (4.0 ft × 6 ft). The bedplate/slotted table must be isolated from outside influences that can affect the data collection portion of the test.

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.

Note: 3.2.1 through 3.2.5 include test rig, fixtures, transducers, instrumentation, and controllers typically used by the GMNA Global Steering Development Laboratory to perform this test. Other equipment may be substituted at the discretion of the local testing facility as long as it provides equivalent accuracy as specified herein or by the requestor. Any setup must be approved by the intermediate shaft Bill of Material (BOM) Family Owner (BFO).

3.2.1 Linear Actuator. One (1) linear actuator with low friction bearings. The actuator must have the ability to operate in position control without noise or internal friction that may affect the response from the intermediate shaft. An example of an actuator with these characteristics is the MB Dynamics Linear Actuator/Road Load Simulator (RLS).

3.2.2 Accelerometer. One (1) triaxial accelerometer. An example of an appropriate triaxial accelerometer with is the PCB Piezotronics 356A15.

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3.2.3 Fixtures. Fixtures necessary to support the intermediate shaft at the actuator end and the reaction end. The fixtures must simulate the interfacing parts of the steering gear/steering column. The actual interfacing parts may be used as fixtures.

3.2.4 Miscellaneous Cabling. Cabling with appropriate end connectors will be required to connect the accelerometer to the instrumentation and controllers to the linear actuator and instrumentation.

3.2.5 Data Acquisition System. A data acquisition system capable of recording triaxial acceleration is necessary in order to quantify the clunk performance of a DCCV/intermediate shaft. Data shall be collected at a minimum of 24 000 samples/s.

3.3 Test Vehicle/Test Piece.

3.3.1 Sample quantity of the lower intermediate shaft as specified by the Design Engineer or Component Technical Specification (CTS). All test material should be certified prior to receipt to confirm that it is representative of design intent.

3.3.2 The lower intermediate shaft shall be in line with the actuator and extended to match the vehicle design position. The upper intermediate shaft shall be connected to the lower intermediate shaft and the slider joint is to be extended to represent nominal in-vehicle geometry.

3.4 Test Time.

Calendar time: 1 day

Test hours: 1 h

Coordination hours: 2 h

3.5 Test Required Information. The requesting engineer is responsible for providing the CTS which must include the vehicle design geometry and torque specifications.

3.6 Personnel/Skills. Operator must be qualified and documented as capable to run this test as required by ISO 9001.

4 Procedure

4.1 Preparation.

4.1.1 Fix steering gear end of lower intermediate shaft to linear actuator. Fasten bolt to torque specification stated in the CTS.

4.1.2 Fix end of the upper intermediate shaft which mates to the steering column to the fixture which will later be grounded to supporting bed plate/slotted table. Fasten bolt to torque specification stated in the CTS.

4.1.3 Adjust shaft so that DCCV joint angle is nominally representative of in vehicle geometry (140°) and upper cardan joint is at 0°. See Appendix A, Figure A1.

4.1.4 Ground the fixture which mates to the upper intermediate shaft.

4.1.5 Attach a triaxial accelerometer near the dual cardan constant velocity joint on the side towards the upper intermediate shaft. See Appendix A, Figure A1. The accelerometer is attached using an instant cyanoacrylate-based adhesive. An example of the appropriate type of adhesive is Loctite QuickTite (Henkel Corporation) instant adhesive gel.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

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 Data Collection Parameters. Unless otherwise specified, record the accelerations near the dual cardan constant velocity joint. Data shall be collected at a minimum rate of 24 000 samples/s.

4.3.2 Test Parameters. The shaft will be cycled to the following parameters:

- Displacement: 2 mm.
- Speed: 500 mm/s.
- Acceleration: 2000 mm/s².

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