GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW15859

Steering Gear Pinion Bearing Durability 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 test procedure is to evaluate the pinion bearing used in a Rack and Pinion steering gear assembly.

1.2 Applicability. This procedure is applicable to all GM vehicles with Rack and Pinion steering gear pinion bearings that resist both axial and radial loads.

1.3 Remarks. This test provides a constant axial and cyclical load to the pinion bearing for component level validation. The axial and radial loads are calculated based on driver input torques.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- Component Technical Specification (CTS)
- Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities.

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 One (1) fixture to constrain the outer race of the test specimen. The fixture also provides axial load to the test specimen using a clamping force. Axial load should be monitored using a load cell.

3.2.2 One (1) load cell to provide cyclical radial load to the test specimen. Force measurement accuracy should be ± 2%. The cyclical loads are fully reversed with Stress Ratio = minimum/maximum = -1. The loads are in triangle waveform. Cyclical radial load shall be controlled and monitored.

3.2.3 One (1) load cell to provide input torque and input angle for rotating the inner race of the test specimen. Input torque and angle to the test specimen shall be controlled and monitored.

3.2.4 Equipment to control and monitor loading.

3.2.5 Equipment to monitor the number of cycles-to-failure.

3.2.6 All instrumentation is to be calibrated as required.

3.3 Test Vehicle/Test Piece. The test parts must represent production bearings to be used in Rack and Pinion steering gear assemblies for GM vehicles.

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3.4 Test Time.

Calendar time:	10 d
Test time:	240 h
Coordination time:	48 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Prior experience/training in setting up and running similar tests and the use of the referenced test equipment is required.

4 Procedure

4.1 Preparation. Install test part in the fixture described in 3.2.1. Apply axial load to the bearing using a clamping load. Attach the fixture to the load cell for cyclical radial load. Attach the fixture to the load cell for input torque and angle with misalignment angle α set as specified in the steering CTS/SSTS. See Figure 1.

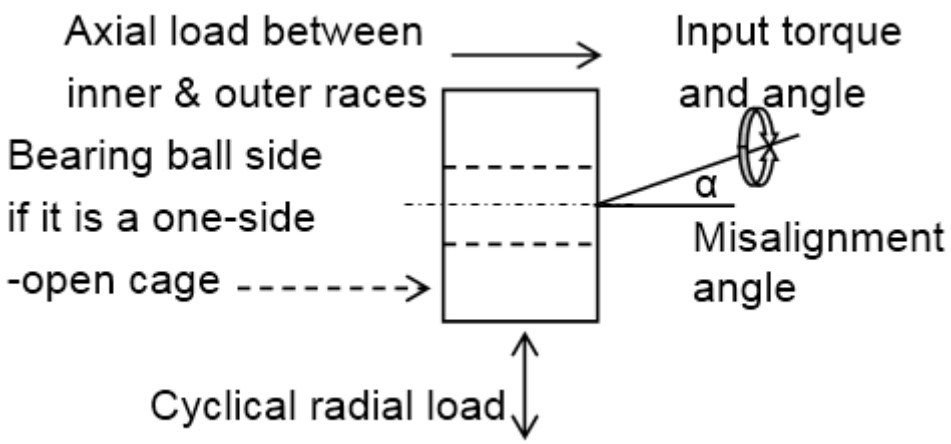

Figure 1: Test Bearing Load Orientations

4.2 Conditions.

4.2.1 Environmental Conditions. Testing to be done at normal room temperature.

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.

4.2.2.1 The test loading conditions shall be based on 175 Nm driver input torque or other maximum input torques as specified by the Program Specific CTS/SSTS. Each test cycle consists of ten ± 60 degrees bearing rotations followed by one ± 600 degrees bearing rotation, and takes about 15 s to complete one (1) cycle. See Figure 2 for Input Torque Angle Profile, and Figure 3 for Radial Load Profile.

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