GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW14736

The Determination of the Torsional Force-Deflection Characteristics of Elastomeric Components under Uni-axial Stress

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 object of this test procedure is the determination of the torsional characteristics shown by elastomeric components used in vehicles under a constant angular rate of strain at a temperature of +23 °C ± 5 °C.

1.1.1 Objectives. The determination of the torsional force-deflection characteristics of elastomeric components. This test procedure supplies data on the viscoelastic properties of the elastomer, and also on the cohesive strength of interference fits between rubber and metal of the elastomeric components.

1.1.1.2 The determination of the torsional force acting on the elastomeric component when strained to the vehicle installation conditions.

1.2 Applicability. All elastomeric components.

2 References

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

2.1 External Standards/Specifications.

DIN 51220

2.2 GM Standards/Specifications.

None

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.

A torsion testing machine, capable of stressing elastomeric components up to a maximum torque M = 350 Nm maximum at a constant angular velocity ω (maximum deviation ± 10%).

The machine shall comply with DIN 51220, and also comply with the following requirements:

- Total accuracy of the torque measuring equipment: ± 2% of the measured value.
- Torsional displacement measuring equipment: ± 1.75 mrad (milliradians).

3.2.1. Suitable clamping devices for fixing the test sample to the torsion testing machine.

3.2.2 Work bench with machine vice.

3.2.3 Suitable press for forces up to 7 kN for press-fitting bushings into metal parts.

3.2.4 Inspection of Test Equipment. The test equipment shall be calibrated at intervals not exceeding 1 year and certification retained.

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3.3 Test Vehicle/Test Piece.

3.3.1 Test Material.

3.3.1.1 Test Sample Form. The test samples shall be elastomeric components, which are as assembled into the vehicle.

3.3.1.2 Test Sample Quantity. Three (3) test samples minimum shall be tested.

3.4 Test Time. Per Section 4.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Conform to company and/or laboratory requirements. Technician training records must be available upon request.

4 Procedure

4.1 Preparation.

4.1.1 Test Sample Preparation. For initial sample approval and arbitration purposes, the time period between vulcanization and testing shall be 7 days minimum. For quality control purposes the period shall be 72 h minimum. The test samples shall remain at a temperature of +23 °C ± 5 °C for 8 h minimum before testing, and shall be free from strain during this period.

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 Test Procedure.

4.3.1.1 General. The test samples shall be tested according to the data given on the test specifications and the relevant engineering drawing of the elastomeric component regarding method of assembly, direction of stressing, degrees of clearance, etc., in addition to compliance with this test procedure. A time of 24 h minimum should elapse before successive tests on the same sample are performed.

4.3.1.2 Test Method. Mount the test sample onto the torsion testing machine. Apply a torque until $M_i = M_{vi}$, stop torsion testing machine and adjust torque measuring equipment so that $M_i = 0$, adjust torsional displacement measuring equipment so that $\alpha_i = 0$. Then proceed as follows in compliance as shown in Appendix A, Figure A1.

- Stress test sample additionally with M_i = max M_i at an angular velocity ω_i and subsequently reduce this torque at the same angular speed by the value max M_i.
- Repeat this stress cycle three (3) times.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation.

5.3.1 Evaluation and Rating.

5.3.1.1 Record the initial curve $M_i = f(\alpha_i)$ in the diagram of torque.

5.3.1.2 Record the fourth curve $M_i = f(\alpha_i)$ in the same diagram over the range of values $M_i = M_{vi}$ to $M_i = M_{vi}$ + max M_i and also determine α_{fi}.

Note: For tolerance checking, the curve $M_i = f(\alpha_i)$ and the angle α_i determined in 5.3.1.2 shall be used.

The zero point of the tolerance band for the curve $M_i = f(\alpha_i)$ is variable along the abscissa of the diagram up to the angle maximum α_{fi}.

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