



The Determination of the Force-Deflection Characteristics and Creep Properties of Elastomeric Components

1 Scope

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 deflection and creep shown by elastomeric components used in vehicles under a constant force at a temperature of $+ 23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

1.1.1 The determination of the force-deflection and creep characteristics shown by elastomeric components. The data given by this test procedure will also enable an indication of the state of cure of the elastomer to be obtained.

1.1.2 The determination of the installed dimensions of the elastomeric components in the **as-assembled** condition.

1.2 Foreword. Not applicable.

1.3 Applicability. Not applicable.

2 References

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

2.1 External Standards/Specifications.

DIN 862

DIN 876-2

DIN 878

2.2 GM Standards/Specifications.

None

3 Resources

3.1 Facilities. Not applicable.

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 Test Equipment. The test machine for applying a constant force to elastomeric components hereafter referred to as "test machine", shall consist of a device which will allow a force to be gradually applied to the component up to a value of $F = F_v + F_k$, at a velocity $(v) = 1.25 \pm 0.10 \times 10^{-3}$ m/s, and shall also be capable of maintaining a constant force. The time of application of the full load shall be indicated. The force range of the test machine shall normally be from 50 to 10 000 N, and the accuracy of force indication shall be ± 0.2 N minimum up to 500 N force, and ± 10 N above this. Test machines, which apply the force by means of suitable masses, with the use of lever systems if required, shall be preferred.

3.2.1 Dimensional Measuring Equipment. Dimensional change measuring equipment, e.g., linear dial gauge to DIN 878, with a range of 0 mm to 10 mm, an accuracy of ± 0.01 mm and exerting a substantially constant force of < 2 N over its range of travel.

3.2.2 Dimensional measuring equipment, e.g., gauge blocks DIN 862.

3.2.3 Dimensional measuring equipment, e.g., precision height vernier accurate to 0.1 mm, height 500 mm maximum.

3.2.4 Stop watch or clock, indicating range 600 s, sub-divided to 0.1 s.

3.2.5 Temperature indicating and recording device, range of +15 °C to + 35 °C, accuracy ± 1 K.

3.2.6 Workbench with vice.

3.2.7 Surface plate to DIN 876-2, 400 mm $\times$ 400 mm minimum.

3.2.8 Suitable fixtures for locating and attaching test sample to test machine.

3.2.9 Inspection of test equipment. The test equipment shall be calibrated at intervals not exceeding one (1) year, and certification retained.

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time. Not applicable.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation. For initial sample approval and arbitration purposes, the time period between vulcanization and testing shall be seven (7) days minimum. For quality control purposes, the period shall be 72 h minimum.

The test samples shall remain at a temperature of $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ 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.

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

4.2.4 Test Sample Quantity. At least three (3) test samples shall be tested.

4.3 Instructions.

4.3.1 General. Tests shall normally be carried out at $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. Successive measurements shall not, unless otherwise stated, be carried out at intervals of less than 24 h on the same test sample. The test samples shall be tested in accordance with this test procedure, using the parameters for magnitudes and directions of forces, etc., as shown on the relevant part drawing or test specification.

If the force F_i or the force indicating device of the test machine is influenced by the weight of the test sample and associated fixtures, compensation for these shall be made prior to commencement of the test.

The dimensional change measuring equipment shall be attached to the test machine such that the dimensional change of the test sample may be determined in the direction of application of the force F .

4.3.2 Test Method. See Appendix A, Figure A1.

4.3.2.1 Where indicated by a suffix C following the test method number GMW14734-C, the test sample shall be mechanically conditioned prior to test as follows, at a temperature of $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

4.3.2.1.1 The test sample shall be deflected by a force of $F_i = 1.25 (F_{vi} + F_{ki})$, and then released.

4.3.2.1.2 This force shall be applied and released for a total of five (5) deformations.

4.3.2.1.3 The direction of force shall be marked on the test sample.

4.3.2.1.4 Sixteen hours (16 h) minimum and 48 h maximum at $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ shall elapse between this conditioning and further testing.

4.3.2.2 Determine height h_{0i} with the dimensional measuring equipment.

4.3.2.3 The test sample shall be stressed by $F_i = F_{vi}$ acting in the same direction as any previous mechanical conditioning at a velocity of $v = 1.25 \pm 0.1 \times 10^{-3}$ m/s the dimensional change measuring equipment zeroed, and the stress reduced with an equal speed to zero. This cycle is repeated until the deflection change under stress is < 0.01 mm. (Normally, three (3) cycles will be sufficient.)