



## **Determination of the Compressibility of a Cellular Elastomer at a Defined Deflection**

### **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 standard is the determination of the compressibility of a weatherstrip or other sealing or damping material of cellular elastomer at a defined deflection. The weatherstrip shall be mounted in the appropriate fixture; other sealing or damping material shall be positioned on an even surface and deflected at a uniform speed. The deflection specified shall be comparable to that of the sealing in service.

**1.2 Applicability.** Applicable to cellular elastomers, such as seals.

**1.3 Remarks.** Not applicable.

### **2 References**

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

#### **2.1 External Standards/Specifications.**

ISO 7500-1                      ISO 9513

#### **2.2 GM Standards/Specifications.**

GMW16676

#### **2.3 Additional References.**

Respective Part Drawing or Math Data File  
Statement of Requirements (SOR)

### **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 Test Equipment.**

**3.2.1.1 Test Machine.** The test machine shall fulfill the following requirements: The force measuring device of the test machine shall correspond to ISO 7500-1 Class 1; the deflection measuring device shall correspond to ISO 9513 Class 0.2. The test machine shall be such that the test piece can be compressed between its holder and a pressure foot in a vertical direction.

**3.2.1.2 Test Velocity.** Pieces shall be tested at a uniform rate defined in Table 1.

Table 1: Test Velocity Coding

| Coding | Test Velocity                                                                               |
|--------|---------------------------------------------------------------------------------------------|
| Code 1 | 30 mm/minute $\pm$ 3 mm/minute                                                              |
| Code 2 | 100 mm/minute $\pm$ 10 mm/minute                                                            |
| Code 3 | Other agreed upon test velocities as stated on the respective part drawing and test report. |

**3.2.1.3 Test Piece Mounting Fixture.** The test pieces of weatherstrips shall be supported by test fixtures, which shape and dimensions are defined in the respective part drawing or math data file. In special cases, the test piece may be positioned on an even surface. The length of the test piece mounting fixture shall be at least equal to that of the test piece. The fixture must allow for secure positioning in the test machine.

**3.2.1.3.1 Test Piece Mounting Fixture for Glass Run Channels.** The fixture must allow the glass to be inserted into the channel at the proper depth without compressing the lip being tested. (The lip must only be compressed vertically during the test).

**3.2.1.4 Metal Pressure Foot.** The shape and dimensions of the pressure foot is component dependent. Fixtures shall be made of an aluminum material or steel. Shaped pressure feet shall be made using an electro discharge machining (EDM) wire burn process. Unless otherwise stated, the finish of the pressure foot shall be as follows:

- $R_a = 0.03 \mu\text{m}$
- $R_{z1\text{max}} = 0.3 \mu\text{m}$

Surface finish shall be measured according to GMW16676.

**3.2.1.4.1** The metal pressure foot shall be cleaned with a soft cloth before measurement, if necessary, using a mild solvent.

**3.2.1.5 Glass Pressure Foot (Glass Run Channels).** The compression foot for parts in contact with glass, shall be made of tempered glass 4 mm minimum in thickness.

**3.2.1.5.1** The glass shall be cleaned once at the beginning of the test, and does not have to be cleaned again between specimens. The compression foot for glass run testing shall be cleaned according to the following procedure:

**3.2.1.5.1.1** Wet a lint free wipe with 2-propanol and wash the glass.

**3.2.1.5.1.2** Dry the glass with a dry lint free wipe, but do not polish the glass.

**3.2.1.5.1.3** Wet a third lint free wipe, and wash the glass again.

**3.2.1.5.1.4** Allow the glass to air dry.

**3.2.1.6 Dimensions of Pressure Foot.**

**3.2.1.6.1 Pressure Foot for Body Sealings.** In case of an even pressure foot, the width shall be approximately 50 mm. It shall be greater than the contact surface of the seal in compressed condition. Two (2) different lengths of pressure foot are used. See Table 2.

Table 2: Pressure Foot Length Coding

| Coding | Pressure Foot Length |
|--------|----------------------|
| Code A | 200 mm $\pm$ 1.0 mm  |
| Code B | 100 mm $\pm$ 1.0 mm  |

**3.2.1.6.2** Pressure foot for other sealing and damping material, which is compressed for a certain percentage (25%) of its initial height, complies with Table 3.

Table 3: Additional Pressure Foot Length Coding

| Coding | Pressure Foot Length                                               |
|--------|--------------------------------------------------------------------|
| Code C | Dimension of surface larger than the test piece surface dimensions |

**3.2.1.7 Supporting Table.** The test piece support for determination of compressive force per unit area (Code C, see Table 3) shall be horizontal and coplanar to the pressure foot and larger in dimensions than the respective pressure foot. The supporting table shall contain ventilation holes (approximately 6 mm in diameter) spaced in regular intervals (approximately 20 mm from hole center to hole center) so that air can escape rapidly during the test.

### 3.3 Test Vehicle/Test Piece.

#### 3.3.1 Test Material.

**3.3.1.1 Test Piece Dimensions.** Test piece dimensions are defined as follows:

**3.3.1.1.1 Code One (1): (Non-Destructive Test).** Test pieces of weatherstrips shall have a length that is at least 50 mm longer on both sides (edge effect) and can be cut from a component. (This enables to test on complete parts, which can be installed afterwards for tests in the vehicle.) If the above length cannot be obtained from a weatherstrip, a piece as long as possible shall be used. Test piece length must be agreed upon and stated in the respective test report.

**3.3.1.1.2 Code Two (2): (Destructive Test).** Test pieces of weatherstrips shall have the same length as the pressure foot. Cut the weatherstrip such that it is not significantly bent or deformed during cutting.

**3.3.1.1.3 Code Three (3).** Test piece must be shorter than pressure foot in the following cases:

- Test pieces of weatherstrips with a length less than 100 mm, or if formed corners shall be piece. If necessary, the test piece length must be specified on drawing.
- For other sealing and damping material, the test piece shall be the whole part or a section of it.

**3.3.1.2** For initial sample approval and arbitration purposes, at least five (5) test pieces cut from at least two (2) components shall be tested. For routine quality control purposes, at least three (3) test pieces, preferably from two (2) components shall be tested.

**3.4 Test Time.** Reference the lab test procedure(s) in Section 4 for timing details.

**3.5 Test Required Information.** Not applicable.

**3.6 Personnel/Skills.** Per laboratory accreditation requirements.

## 4 Procedure

**Summary of Test Method.** The compressibility of a cellular elastomeric component at a given deflection, shall be defined as the force required to obtain the deflection following compression at a uniform given velocity.

### 4.1 Preparation.

**4.1.1 Test Sample Preparation.** For initial sample approval and arbitration purposes, the minimum time period between vulcanization and testing of elastomers shall be 72 h. The test pieces shall remain at a temperature of  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  for at least 8 h before testing, and shall be free from strain during this period.

### 4.2 Conditions.

#### 4.2.1 Environmental Conditions.

**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.** The test shall be performed at a temperature of  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ . Other test temperatures shall be agreed upon in the Statement of Requirements (SOR) and stated in the respective part drawing or math data file.

**4.3.2 Determination of Absolute Compressive Force at Deflection to Absolute Dimension (Characteristic Curve, Compression Load Deflection (CLD) Curve).**