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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Rubber, vulcanized or thermoplastic — Determination of low temperature stiffening (Gehman test)

Caoutchouc vulcanisé ou thermoplastique — Détermination de la rigidité à basse température (Essai Gehman)

Reference number
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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 1432 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

This third edition cancels and replaces the second edition (ISO 1432 : 1982), of which it constitutes a minor revision.

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Rubber, vulcanized or thermoplastic — Determination of low temperature stiffening (Gehman test)

1 Scope

This International Standard specifies a static procedure, known as the Gehman test, for determining the relative stiffness characteristics of vulcanized or thermoplastic rubbers over a temperature range from room temperature to approximately −150 °C.

2 Apparatus[1)]

2.1 Torsion apparatus, one possible form of which is shown in figure 1. It consists of a torsion head (A), capable of being turned 180° in a plane normal to the torsion wire (B). The top of the wire is fastened to the torsion head through a loosely fitting sleeve (C). The bottom of the wire is fastened to the test piece clamp stud (D) by means of a screw connector (E). A device for "friction-free" indication or recording of angle by mechanical or electrical means shall be provided permitting convenient and exact adjustment of the zero point; the apparatus shown in the figure has a pointer (F) and a movable protractor (G) which perform these functions. The indicating or recording system shall allow reading or recording of the angle of twist to the nearest degree. The torsion apparatus is clamped to a supporting stand (H). It is advantageous to make the vertical portion of the stand from material of poor thermal conductivity. The base of the stand shall be of stainless steel or other corrosion-resistant material.

2.2 Torsional wires (B), made of tempered spring wire, of length 65 mm ± 8 mm, and having torsional constants of 0,7 mN·m, 2,81 mN·m and 11,24 mN·m.

In cases of dispute, the 2,81 mN·m wire shall be used.

2.3 Test piece rack (I), made of material of poor thermal conductivity, for holding the test piece (J) in a vertical position in the heat transfer medium. The rack may be constructed to hold several test pieces.[2)] The rack is clamped to the stand (H).

Two clamps shall be provided for holding each test piece. The bottom clamp (K) shall be a fixed part of the test piece rack. The top clamp (L) acts as an extension of the test piece and shall not touch the rack.[3)] The top clamp is secured to a stud (D) which in turn is connected to the screw connector (E).

2.4 Temperature-measuring device, capable of measuring the temperature to within 1 °C over the whole range of temperature over which the apparatus is to be used.

The sensitive element shall be positioned near a test piece equidistant from the top and bottom.

2.5 Heat-transfer medium, which may be liquid or gaseous. Any material which remains fluid at the test temperature and which will not affect materials being tested may be used. Among the liquids that have been found suitable for use at low temperatures are acetone, methanol, ethanol, butanol, silicone fluid and *n*-hexane. Air, carbon dioxide or nitrogen are commonly used gaseous media.

Vapours of liquid nitrogen are useful for testing at very low temperatures.

It should be noted that stiffness measurements in gaseous media may not give in each case the same results as the measurements made in liquid media.

2.6 Temperature control, capable of maintaining the temperature of the heat-transfer medium to within ± 1 °C.

2.7 Tank, for a liquid heat-transfer medium, or **test chamber** for a gaseous medium.

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1) The apparatus and its use are described in GEHMAN, S. D., WOODFORD, D. E., and WILKINSON, C. S., Low temperature characteristics of elastomers, *Ind. and Eng. Chem.*, **39** Sept. 1947: 1108.

2) Racks providing space for five or ten test pieces are commonly used.

3) Clearance between the top of the test piece rack and the test piece clamp stud is ensured by inserting thin spacers between the two. Slotted laminated plastics of thickness about 1,3 mm and width about 12 mm have been found satisfactory. At low temperatures the test pieces stiffen in position and the spacers may be removed without losing the clearance.