INTERNATIONAL STANDARD 2783

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Ebonite — Determination of hardness by means of a durometer

Ébonite — Détermination de la dureté au moyen d'un duromètre

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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.

International Standard ISO 2783 was drawn up by Technical Committee ISO/TC 45, *Rubber and rubber products*, and circulated to the Member Bodies in July 1972.

It has been approved by the Member Bodies of the following countries :

Austria	Germany	South Africa, Rep. of
Belgium	India	Sri Lanka
Brazil	Italy	Sweden
Canada	Netherlands	Switzerland
Czechoslovakia	Poland	Thailand
Egypt, Arab Rep. of	Portugal	United Kingdom
France	Romania	U.S.A.

The Member Body of the following country expressed disapproval of the document on technical grounds :

Australia

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Ebonite – Determination of hardness by means of a durometer

1 SCOPE AND FIELD OF APPLICATION

1.1 This International Standard specifies a type of durometer and the procedure suitable for determining the indentation hardness of ebonite.

1.2 This method measures the penetration of a specified indentor forced into the material under specified conditions. The indentation hardness is inversely related to the penetration as defined in 3.3 and is dependent on the elastic modulus and viscoelastic behaviour of the material.

The shape of the indentor and the force applied to it influence the results obtained so that there may be no simple relationship between the results obtained with one type of durometer and those obtained with either another type of durometer or another instrument for measuring hardness. This method is an empirical test intended primarily for control purposes. No simple relationship exists between indentation hardness determination by this method and any fundamental property of the material tested.

2 REFERENCE

ISO/R 471, *Standard atmospheres for the conditioning and testing of rubber test pieces.*

3 APPARATUS

Durometer consisting of the following components :

3.1 Presser foot with a hole between 2,5 and 3,5 mm diameter, centred at least 6 mm from any edge of the foot.

3.2 Indentor formed from hardened steel rod to the following dimensions, as shown in figure 1 :

diameter of hole :	3,0 ± 0,5	mm
diameter of rod :	1,25 ± 0,10	mm
protrusion of indentor :	2,50 ± 0,04	mm
radius of point :	0,100 ± 0,012	mm

3.3 Indicating device on which the amount of movement of the point of the indentor may be read in terms of a uniform scale ranging from zero (for full extension of 2,46 to 2,54 mm) to 100 for zero extension obtained by placing presser foot and indentor in firm contact with a flat piece of glass.

3.4 Calibrated spring for applying a force F, expressed in newtons, to the indentor in accordance with the following equation :

$$F = 0{,}444\,8\,H_D$$

where H_D is the hardness reading on a durometer.

NOTE – The Shore durometer type D complies with these requirements.

4 TEST PIECE

4.1 The test piece shall be at least 3 mm thick.

4.2 The lateral dimensions of the test piece shall be sufficient to permit measurements at least 12 mm from any edge unless it is known that identical results are obtained when measurements are made at a lesser distance from any edge. The surface of the test piece must be flat over sufficient area to permit the pressure foot to contact the test piece over an area having a radius of at least 6 mm from the indentor point. Satisfactory durometer hardness determinations cannot be made on rounded, uneven, or rough surfaces.

5 CALIBRATION

The spring is calibrated by supporting the durometer in a vertical position and resting the point of the indentor on a small spacer at the centre of one pan of a balance, as shown in figure 2, in order to prevent interference between presser foot and pan (see note below). The spacer has a small cylindrical stem approximately 2,5 mm in height and 1,25 mm in diameter, and is slightly cupped on top to accommodate the indentor point. The weight of the spacer is balanced by a weight on the opposite pan of the balance. Weights are added to the opposite pan to balance the force on the indentor at various scale readings. The measured force shall be equal to the force calculated within ± 0,5 N.

NOTE – Instruments specifically designed for calibration of durometers may be used. Balances or instruments used for calibration shall be capable of measuring or applying a force on the point of the indentor within 0,02 N.

6 TIME-LAPSE BETWEEN VULCANIZATION AND TESTING

Unless otherwise specified for technical reasons, the following requirements for time-lapses shall be observed.

6.1 For all test purposes, the minimum time between vulcanization and testing shall be 16 h.

6.2 For non-product tests, the maximum time between vulcanization and testing shall be 4 weeks and for evaluations intended to be comparable, the tests, as far as possible, should be carried out after the same time-interval.

6.3 For product tests, whenever possible, the time between vulcanization and testing should not exceed 3 months. In other cases, tests shall be made within 2 months of the date of receipt by the customer of the product.

7 CONDITIONING

The test piece shall be conditioned at the test temperature for at least 3 h immediately before testing.

8 TEMPERATURE OF TEST

Tests shall be made at 23 ± 2 °C or 27 ± 2 °C, unless another temperature is specifically required.

9 PROCEDURE

9.1 Place the test piece on a hard, horizontal plane surface. Hold the durometer in a vertical position with the point of the indentor at least 12 mm from any edge of the test piece. Apply the presser foot to the test piece as rapidly as possible without shock, keeping the foot parallel to the surface of the test piece. Apply just sufficient pressure to obtain firm contact between presser foot and test piece (see note below).

Unless otherwise specified, read the scale immediately after the presser foot is in firm contact with the test piece.

NOTE – Better reproducibility may be obtained by using either a durometer stand or a mass centred on the axis of the indentor, or both, to apply the presser foot to the test piece; the recommended mass is 5 kg.

9.2 Make five measurements of hardness at different positions on the test piece at least 6 mm apart and determine the median value.

10 TEST REPORT

The test report shall include the following particulars :

a) complete identification of material tested;

b) description of test piece, including thickness;

c) temperature of test;

d) indentation hardness and time-interval after which the reading was taken;

e) the time elapsed between the preparation of the test piece and the measurement of hardness;

f) date of test.

Dimensions in millimetres

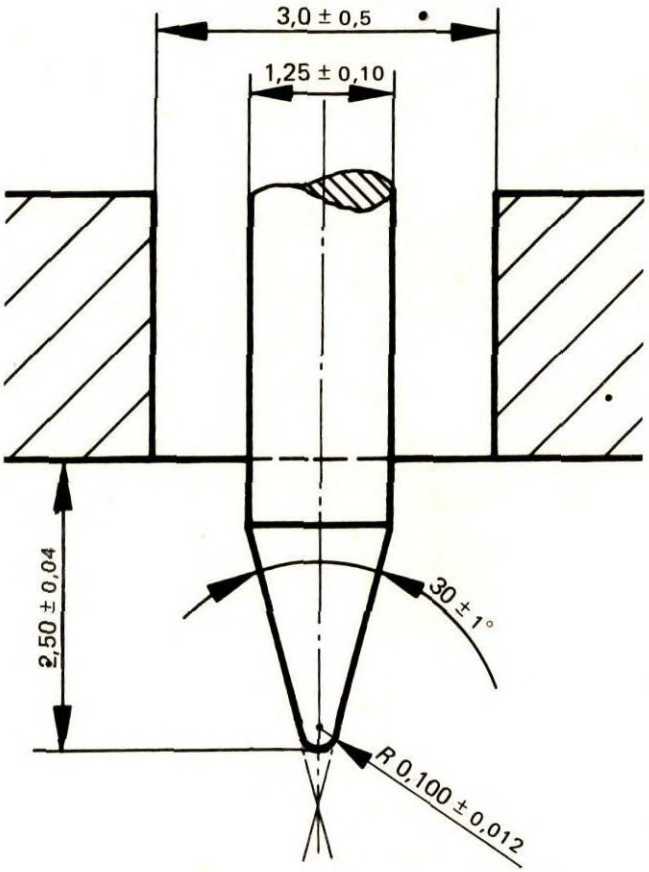

FIGURE 1 – **Durometer indentor**

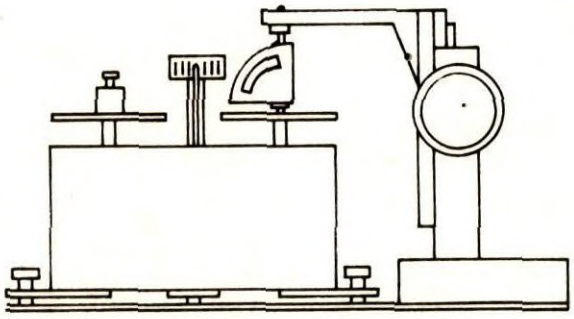

FIGURE 2 – **Apparatus for calibration of durometer spring**