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

Australia

# 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 indenter 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 indenter 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 **Indenter** 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 indenter :	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 indenter 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 indenter in firm contact with a flat piece of glass.

3.4 **Calibrated spring** for applying a force  $F$ , expressed in newtons, to the indenter 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 indenter 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 indenter 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 indenter 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 indenter 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 indenter within 0,02 N.