

Australian Standard®

Methods of test for elastomers

Method 15.2: Durometer hardness

PREFACE

This Standard was prepared by the Standards Australia Committee on Analysis and Testing of Elastomers under the direction of Committee RU/—, Standards for the Rubber Industry to supersede, in part, AS 1683.15—1976, *Methods of Test for Rubber Part 15: Indentation Hardness of Rubber and Plastics by Means of a Durometer*.

This edition corrects some errors in equations and introduces standard rubbers as a means of verifying durometers. At the same time, the opportunity has been taken to introduce the dead load hardness procedure which is specified in Method 15.1.

In the preparation of this Standard, account was taken of the following:

ISO	
48—1979	<i>Vulcanized rubbers—Determination of hardness (hardness between 30 and 85 IRHD)</i>
BS	
903—1969	<i>Methods of testing vulcanized rubber Part A26: Determination of hardness</i>
2719—1975	<i>Methods of use and calibration of pocket type rubber hardness meters</i>
ASTM	
D 2240—1986	<i>Test method for rubber property—Durometer hardness</i>

FOREWORD

Hardness is determined by the penetration of specified indentors into the material under prescribed conditions. The method permits measurement of initial indentation or the indentation after specified periods, or both. The indentation hardness is inversely related to the penetration of the indenter and is dependent on the elastic modulus and visco-elastic behaviour of the material. The shape of the indenter and the force applied to it influence the results obtained and thus there may be no simple relationship between the results obtained using the different types of hardness-measuring instruments.

Hardness of elastomeric materials is measured on three scales, as follows:

- (a) International Rubber Hardness Degrees (IRHD), as used in the dead load method (AS 1683.15.1).
- (b) Durometer Hardness Degrees, Type A, used for measuring softer materials (AS 1683.15.2).

NOTE: Such materials would have a value approximating 30-90 IRHD.

- (c) Durometer Hardness Degrees, Type D, used for measuring harder materials (AS 1683.15.2).

NOTE: Such materials would have a value above 90 IRHD.

No simple relationship exists between indentation hardness determined by AS 1683.15.2 and any fundamental property of the materials tested.

METHOD

1 SCOPE This method sets out the procedure for determining durometer hardness of elastomeric materials.

Procedures are also given for verification of testing equipment.

This method uses two types of durometers, Type A and Type D. The Type A durometer is used for measuring elastomeric materials in the normal hardness range (30-90 IRHD) and Type D for elastomeric materials in the high hardness range (above 90 IRHD).

2 PRINCIPLE Hardness is determined by the penetration of specified indentors into the material under prescribed conditions.

3 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS	
1683	Methods of test for rubber
1683.15.1	Method 15.1: International rubber hardness (IRHD).
ISO	
48	Vulcanized rubbers—Determination of hardness (hardness between 30 and 85 IRHD).
ASTM	
D 2240	Test method for rubber property—Durometer hardness
BS	
903	Methods of testing vulcanized rubber Part A26: Determination of hardness

4 APPARATUS A durometer is required, which shall consist of the following components:

- (a) *A Pressor foot*—having a hole between 2.5 mm and 3.2 mm in diameter, centred at least 6 mm from any edge of the foot.
- (b) *Indentor*—formed from hardened steel rod, of between 1.15 mm and 1.40 mm in diameter, to the shape and dimensions shown in Figure 1 for Type A durometers or in Figure 2 for Type D durometers.
- (c) *Indicating device*—on which the amount of extension of the point of the indentor may be read in graduations ranging from 0 degrees hardness for full extension of 2.46 mm to 2.54 mm, to 100 degrees hardness for zero extension. Zero extension is obtained by placing the pressor foot and indentor in firm contact with a flat piece of glass.

NOTE: Type A 'Shore' Durometers serial numbers 1 to 16300 and 16351 to 16900 and type A-2 'Shore' Durometers numbers 1 to 8077 do not meet the requirements of 2.46 mm to 2.54 mm extension of the indentor at 0 degrees hardness reading. These durometers will give readings which are low by amounts ranging from 3 degrees at 30 degrees hardness to 1 degree at 90 degrees hardness.

- (d) *A calibrated spring*—for applying force to the indentor in accordance with one of the following equations:

$$(i) \quad F = 0.550 + 0.075 H_A \quad 4(1)$$

where

F is the force, in newtowns, and

H_A is the hardness reading on a Type A durometer.

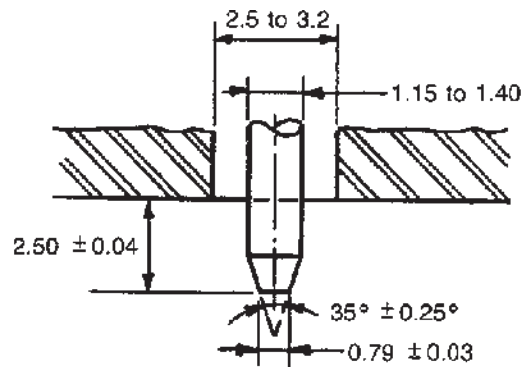
$$(ii) \quad F = 0.445 H_D \quad 4(2)$$

where

F is the force, in newtowns, and

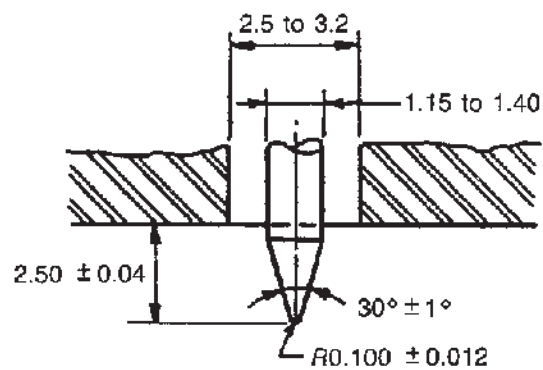
H_D is the hardness reading on a Type D durometer.

5 CALIBRATION OF DUROMETERS BY MECHANICAL MEANS The spring shall be calibrated by mechanical means. This is achieved by supporting the durometer in a vertical position and by resting the point of the indentor on a small spacer at the centre of one pan of a balance, as shown in Figure 3, in order to prevent interference between pressor foot and pan. The spacer shall have a small cylindrical stem approximately 2.5 mm in height and 1.25 mm in diameter, and shall be slightly cupped on top to accommodate the indentor point. The mass of the spacer may be balanced by a tare on the opposite pan of the balance. Known masses may be added to the opposite pan to balance the force on the indentor at various scale readings. The measured force shall equal the force calculated by either Equation 4(1) to within ± 0.08 N, or Equation 4(2) to within ± 0.44 N. (See Clause 4(d).)



DIMENSIONS IN MILLIMETRES

FIGURE 1 INDENTOR FOR TYPE A DUROMETER



DIMENSIONS IN MILLIMETRES

FIGURE 2 INDENTOR FOR TYPE D DUROMETER

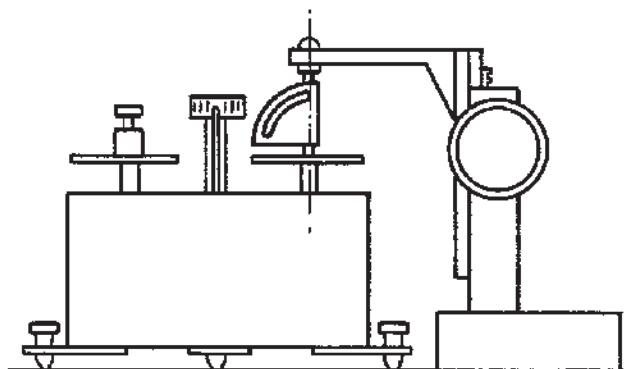


FIGURE 3 APPARATUS FOR CALIBRATION OF DUROMETER SPRING