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Rubber, vulcanized or thermoplastic — Determination of indentation hardness —

Part 1:
Durometer method (Shore hardness)

Caoutchouc vulcanisé ou thermoplastique — Détermination de la dureté par pénétration —

Partie 1: Méthode au duromètre (dureté Shore)

ICS: 83.060

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is Technical Committee ISO/TC *45*, *rubber and rubber products*, Subcommittee SC 2, *testing and analysis*.

This third edition cancels and replaces the second edition (ISO 7619-1:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

— In 6.3.1, the description has been improved to distinguish hand-held instruments and on-a-stand instruments more clearly.

— In Clause 8, the description for the required time for conditioning has been improved for better understanding.

— In 9.2, the use of talcum powder has been removed.

A list of all parts in the ISO 7619- series can be found on the ISO website.

Introduction

The hardness of rubber, as measured by a durometer (Shore hardness) or an IRHD pocket meter, is determined from the response of the rubber to an applied indentation. The response is complex and will depend on:

a) the elastic modulus of the rubber;

b) the viscoelastic properties of the rubber;

c) the thickness of the test piece;

d) the geometry of the indentor;

e) the pressure exerted;

f) the rate of increase of pressure;

g) the interval after which the hardness is recorded.

Because of these factors, it is inadvisable to relate results using a durometer (Shore hardness) directly to IRHD values, although correlations have been established for some individual rubbers and compounds.

Durometers were originally portable hand-held instruments that have proved to be particularly convenient for making measurements on products. By now a lot of laboratories also use them on a stand with a weight applied to the pressure foot in order to improve precision significantly.

NOTE ISO 48 specifies hardness measurements for determination of hardness between 10 IRHD and 100 IRHD. Further information on the relationship between the durometer values and IRHD values is given in the literature[5][6][7].

Rubber, vulcanized or thermoplastic — Determination of indentation hardness —

Part 1:
Durometer method (Shore hardness)

WARNING 1 — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

WARNING 2 — Certain procedures specified in this document might involve the use or generation of substances, or the generation of waste, that could constitute a local environmental hazard. Reference should be made to appropriate documentation on safe handling and disposal after use.

1 Scope

This document specifies a method for determining the indentation hardness (Shore hardness) of vulcanized or thermoplastic rubber using durometers with the following scales:

— the A scale for rubbers in the normal-hardness range;

— the D scale for rubbers in the high-hardness range;

— the AO scale for rubbers in the low-hardness range and for cellular rubbers;

— the AM scale for thin rubber test pieces in the normal-hardness range.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

An indentor of specified dimensions is pressed into a test piece under a specified load and the depth of indentation measured. This indentation is converted to a hardness value by means of a specified relation.

5 Choice of durometer

When using durometers, the scale should be chosen as follows:

— for values less than 20 with a type D durometer: type A;

— for values less than 20 with a type A durometer: type AO;

— for values over 90 with a type A durometer: type D;

— for thin test pieces (less than 6 mm thick): type AM.

6 Apparatus

6.1 Durometer types A, D and AO

These durometers consist of the components specified in 6.1.1 to 6.1.5.

6.1.1 Pressure foot

The pressure foot for types A and D shall have a diameter of 18 mm ± 0,5 mm and a central hole of diameter 3 mm ± 0,1 mm. For type AO, the pressure foot shall have a minimum area of 500 mm^2 with a central hole of diameter 5,4 mm ± 0,2 mm. The tolerances on the dimension of the central hole and the requirement for the size of the pressure foot only apply to instruments used on a stand.

6.1.2 Indentor

The indentor shall be formed from a hardened-steel rod of diameter 1,25 mm ± 0,15 mm to the shape and dimensions shown in Figure 1 for type A durometers and Figure 2 for type D durometers. Type AO durometers shall have a round indentor with a radius of 2,5 mm ± 0,02 mm in accordance with Figure 3.

6.1.3 Indicating device

This is a device for allowing the extent of protrusion of the point of the indentor beyond the face of the pressure foot to be read. It shall be calibrated directly in terms of units ranging from 0 for the maximum protrusion of 2,50 mm ± 0,02 mm to 100 for zero protrusion obtained by placing the pressure foot and indentor in firm contact with a suitable flat, hard surface (e.g. glass).

6.1.4 Calibrated spring

This is used to apply a force, *F*, expressed in millinewtons, to the indentor in accordance with one of the following equations:

– For type A durometers:

$$F = 550 + 75H_{\mathrm{A}}$$

where H_A is the hardness reading taken from the type A durometer.

– For type D durometers:

$$F = 445H_{\mathrm{D}}$$

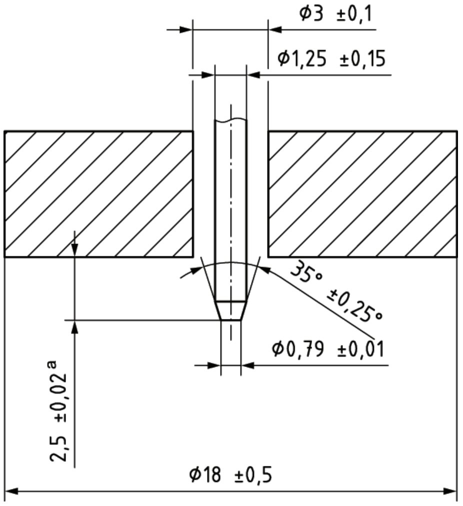
where H_D is the hardness reading taken from the type D durometer.

– For type AO durometers:

$$F = 550 + 75H_{AO}$$

where H_{AO} is the hardness reading taken from the type AO durometer.

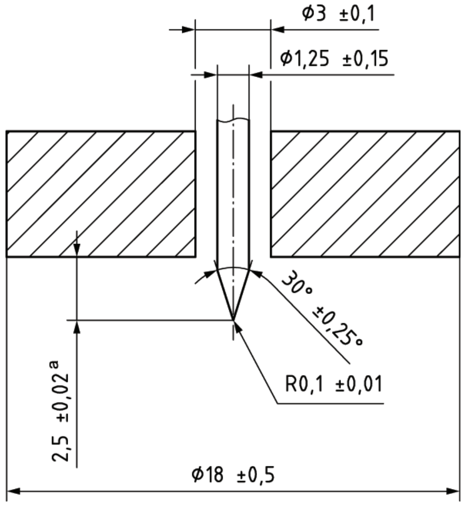
Dimensions in millimetres



a The protrusion shown is valid for a reading of 0.

Figure 1 — Indentor for type A durometer

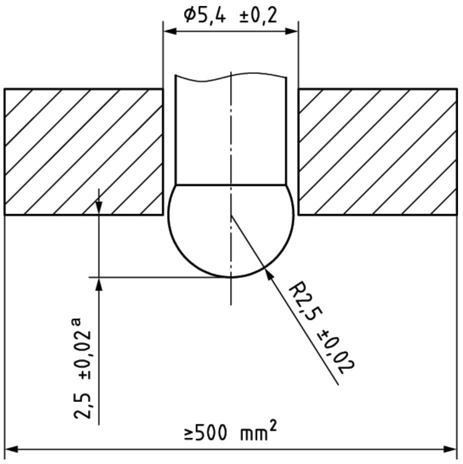
Dimensions in millimetres



a The protrusion shown is valid for a reading of 0.

Figure 2 — Indentor for type D durometer

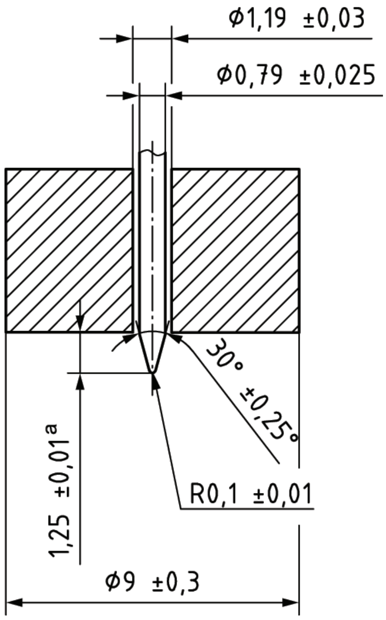
Dimensions in millimetres



a The protrusion shown is valid for a reading of 0.

Figure 3 — Indentor for type AO durometer

Dimensions in millimetres



a The protrusion shown is valid for a reading of 0.

Figure 4 — Indentor for type AM durometer

