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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)

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 7619-1 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

This second edition cancels and replaces the first edition (ISO 7619-1:2004), which has been technically revised to update the references to ISO 18898 for instrument calibration and ISO 23529 for the preparation of test pieces. It also incorporates the Amendment ISO 7619-1:2004/Amd.1:2008 which gives precision data (see Annex A).

ISO 7619 consists of the following parts, under the general title *Rubber, vulcanized or thermoplastic — Determination of indentation hardness*:

— *Part 1: Durometer method (Shore hardness)*

— *Part 2: IRHD pocket meter method*

Introduction

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

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 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. Some laboratories now also use them on a stand with a weight applied to the pressure foot in order to improve precision.

NOTE ISO 48[1] 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 — Persons using this part of ISO 7619 should be familiar with normal laboratory practice. This part of ISO 7619 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.

CAUTION — Certain procedures specified in this part of ISO 7619 may 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 part of ISO 7619 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 referenced documents are indispensable for the application 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 18898, *Rubber — Calibration and verification of hardness testers*

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

3 Principle and choice of durometer type

The property measured is the depth of penetration of a specified indentor forced into the material under specified conditions.

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.

4 Apparatus

4.1 Durometer types A, D and AO

These durometers consist of the components specified in 4.1.1 to 4.1.5.

4.1.1 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.

4.1.2 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.

4.1.3 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 (i.e. glass).

4.1.4 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:

$$F = 550 + 75H_A$$

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

— For type D durometers:

$$F = 445H_D$$

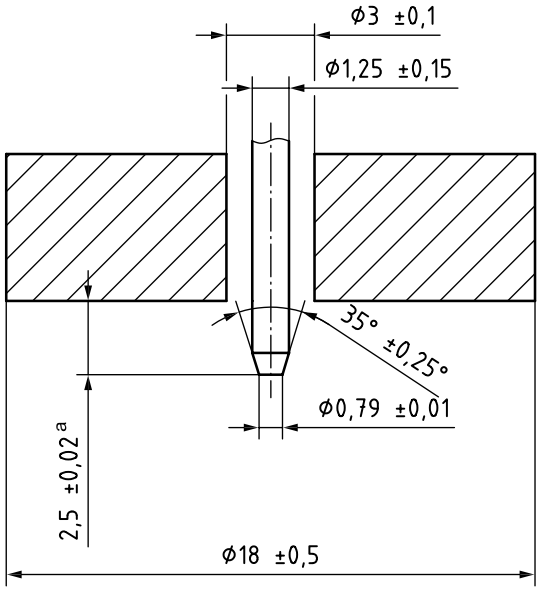
where H_D is the hardness reading taken from the type D durometer.

— For type AO durometers:

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

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

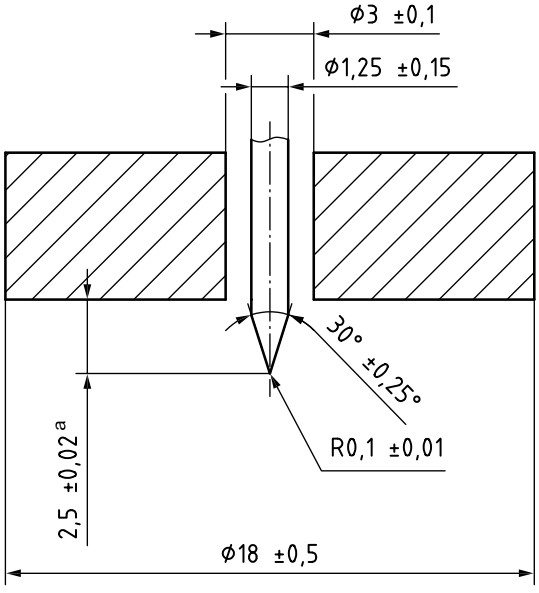
Dimensions in millimetres



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

Figure 1 — Indentor for type A durometer

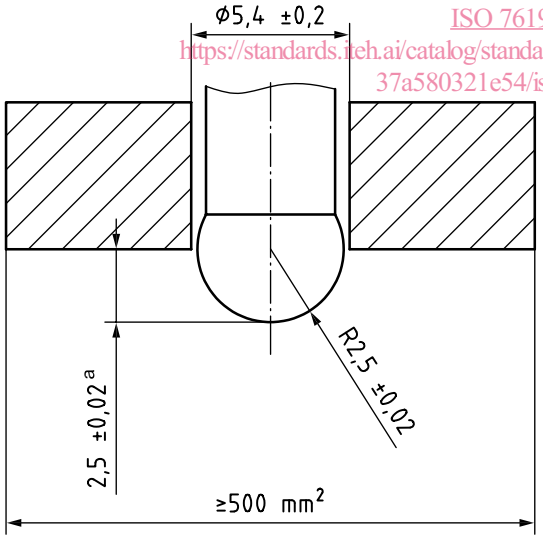
Dimensions in millimetres



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

Figure 2 — Indentor for type D durometer

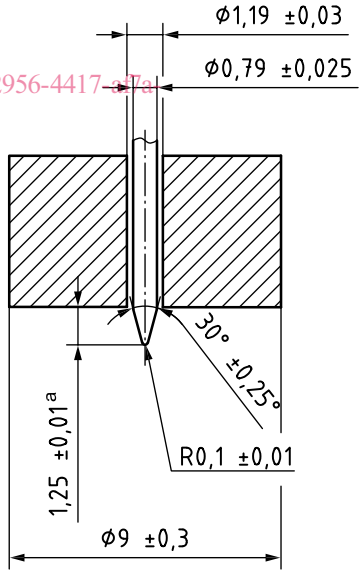
Dimensions in millimetres



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

4.1.5 Automatic timing device (optional)

The timer shall be automatically activated when the pressure foot is in contact with the test piece and shall indicate the end of the test time or lock the test value at its completion. Use of a timing device for the test time improves precision. When the instrument is used on a stand, the time tolerance shall be ±0,3 s.