INTERNATIONAL STANDARD

ISO 48-5

First edition
2018-08

Rubber, vulcanized or thermoplastic — Determination of hardness —

Part 5: Indentation hardness by IRHD pocket meter method

Caoutchouc vulcanisé ou thermoplastique — Détermination de la dureté —

Partie 5: Dureté par pénétration par la méthode au duromètre de poche étalonné en DIDC

Reference number
ISO 48-5:2018(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

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 of the voluntary nature of standards, 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.

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

This first edition of ISO 48-5 cancels and replaces ISO 7619-2:2010, of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

— A new standard number has been given.

— In the Introduction, an explanation of the purpose of the grouping work has been added.

A list of all parts in the ISO 48 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO/TC 45/SC 2 established a principle that it would be helpful for users if standards on the same subject but covering different aspects or methods were grouped together, preferably with an introductory guidance standard, rather than being scattered throughout the numbering system. This has been achieved for some subjects, for example curemeters (ISO 6502) and dynamic properties (ISO 4664).

In 2017, it was decided to group standards for hardness and, subsequently, it was agreed that they would be grouped under the ISO 48 number. The new standards together with the previously numbered standards are listed below.

— ISO 48-1: former ISO 18517

— ISO 48-2: former ISO 48

— ISO 48-3: former ISO 27588

— ISO 48-4: former ISO 7619-1

— ISO 48-5: former ISO 7619-2

— ISO 48-6: former ISO 7267-1

— ISO 48-7: former ISO 7267-2

— ISO 48-8: former ISO 7267-3

— ISO 48-9: former ISO 18898

The hardness of rubber, as measured by an IRHD pocket meter or a Shore durometer, is determined from the complex response of the rubber to an applied indentation. An IRHD pocket meter is a portable hand-held durometer calibrated to measure on the IRHD scale. The measurement 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 obtained using an IRHD pocket meter directly to Shore durometer hardness values, although correlations have been established for some individual rubbers and compounds.

NOTE Further information on the relationship between the durometer values and IRHD values is given in References[3][4][5].

Rubber, vulcanized or thermoplastic — Determination of hardness —

Part 5:
Indentation hardness by IRHD pocket meter method

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 determine the applicability of any other restrictions.

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 of vulcanized or thermoplastic rubber by means of a pocket hardness meter calibrated in IRHD. The use of such meters is primarily intended for control, not specification, purposes (for specification, see ISO 48-2). It is possible to increase precision by fixing the pocket hardness meter on a support.

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 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 48-9, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 9: Calibration and verification of hardness testers*

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 https://www.iso.org/obp

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

4 Principle

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

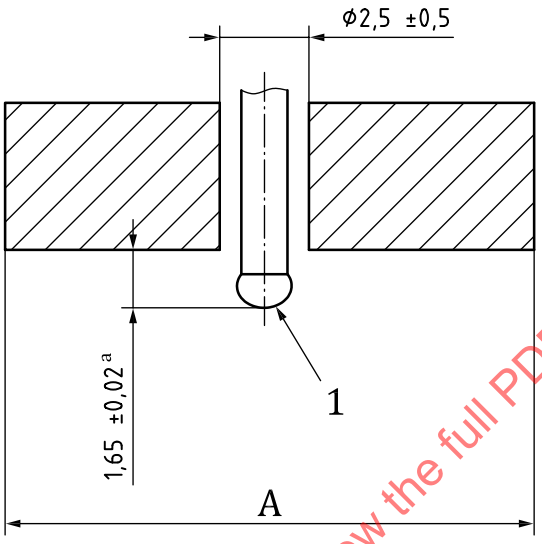
5 Apparatus

5.1 IRHD pocket hardness meter

5.1.1 Pressure foot

The pressure foot (see A in Figure 1) shall be square with sides 20 mm ± 2,5 mm long or circular with a diameter of 22,5 mm ± 2,5 mm. It shall have a central hole of diameter 2,5 mm ± 0,5 mm (see Figure 1).

Dimensions in millimetres



Key

1 hemispherical (diameter 1,575 mm ± 0,025 mm)

a Valid at 30 IRHD.

Figure 1 — Indentor for IRHD pocket meter

5.1.2 Indentor

The indentor end shall be hemispherical, with a diameter of 1,575 mm ± 0,025 mm (see Figure 1).

5.1.3 Indicating device

This device allows the extent of protrusion of the indentor beyond the face of the pressure foot to be read. It shall be calibrated directly in terms of IRHD from the value 30 for the maximum protrusion of 1,65 mm to the value 100 for zero protrusion obtained by placing the pressure foot and indentor in firm contact with a flat and hard surface (e.g. glass).

5.1.4 Calibrated spring

This shall be used to apply a substantially constant force to the indentor of 2,65 N ± 0,15 N over the 30 IRHD to 100 IRHD range.

6 Test pieces

6.1 General

Test pieces shall be prepared in accordance with ISO 23529.

6.2 Thickness

For the determination of hardness by pocket hardness meters, the thickness of the test piece shall be at least 6 mm.

For sheets thinner than 6 mm, the test piece may be composed of not more than three layers, none of which shall be thinner than 2 mm, in order to obtain the necessary thickness. However, determinations made on such test pieces might not agree with those made on single-thickness pieces.

For comparative-test purposes, the test pieces shall be similar.

6.3 Surface

The other dimensions of the test piece shall be sufficient to permit measurements at least 12 mm away from any edge. The surface of the test piece shall be flat over the area in contact with the pressure foot.

Satisfactory hardness determinations cannot be made on rounded, uneven or rough surfaces using pocket meters. However, their use in certain specialized applications is recognized, e.g. ISO 48-6 for the determination of the hardness of rubber-covered rolls. In such applications, the limitations to their use shall be clearly identified.

7 Conditioning and test temperature

Where practical, test pieces shall be conditioned immediately before testing for a minimum period of 1 h at one of the standard laboratory temperatures specified in ISO 23529. The same temperature shall be used throughout any single test or series of tests intended to be comparable.

8 Procedure

8.1 General

Place the test piece on a flat, hard, rigid surface (e.g. glass). Hold the hardness meter in position with the centre of the indentor at least 12 mm from the edges of the test piece. Apply the pressure foot to the test piece as rapidly as possible, without shock, keeping the foot parallel to the surface of the test piece and ensuring that the indentor is normal to the rubber surface.

8.2 Test time

Apply a force sufficient only to obtain firm contact between the pressure foot and the test piece and take the reading at the specified time after the pressure foot is in firm contact with the test piece. The standard test time is 3 s for vulcanized rubber and 15 s for thermoplastic rubber. Other test times may be used, provided they are stated in the test report. Rubbers of unknown types shall be treated as vulcanized.

NOTE A test time of 15 s has been introduced for thermoplastic rubber, as the hardness value continues to decrease over a longer period of time than for vulcanized rubber, this test time being the same as that specified for plastics in ISO 868[2].

8.3 Number of measurements

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

If the time interval after which each reading was taken is different from 3 s, record the individual values of the indentation hardness together with the time interval after which each reading was taken, and determine the median value and the maximum and minimum values obtained.