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Rubber, vulcanized or thermoplastic — Determination of hardness —

Part 7: Apparent hardness of rubber-covered rollers by Shore-type durometer method

Caoutchouc vulcanisé ou thermoplastique — Détermination de la dureté

Partie 7: Dureté apparente des cylindres revêtus de caoutchouc par la méthode au duromètre type 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.

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 48-7 cancels and replaces ISO 7267-2:2008, 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 a roller covering has traditionally been determined on the finished roller, since it is this hardness that is critical to the correct functioning of the roller in its end application. Values of hardness, determined by whichever method is chosen, are therefore dependent not only on the method employed and on the rubber, but also on the diameter of the roller, the thickness of the covering and, in the case of thin coverings, on the nature of the roller core. For this reason, the term “apparent hardness” is used to distinguish between the values obtained by methods described in the various parts of this document and those that would be obtained for the rubber if it was possible to use the standard test methods for standard test pieces forming the subjects of other International Standards.

Since rollers vary considerably in size, construction and end use, and in view of the fact that hardness determinations are made for such different purposes as specification and factory process control, it has not been possible to standardize on one test method. Consequently, three methods are described in ISO 48-6, ISO 48-7 and ISO 48-8, each capable of standing alone.

Rubber, vulcanized or thermoplastic — Determination of hardness —

Part 7: Apparent hardness of rubber-covered rollers by Shore-type durometer 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 the determination of the apparent hardness of vulcanized- or thermoplastic-rubber roller covers, expressed in Shore hardness, for measurement where only medium precision is required. The method and apparatus used are essentially those described in ISO 48-4, the measurements in this case being made on the curved surface of the conditioned rubber-covered roller rather than on a flat test piece. Shore type A and type D instruments are specified, the latter being used for measurements on rollers of high hardness.

NOTE With some rollers, there can be significant variation in the thickness of the rubber over the surface of the roller, which could affect the measured apparent hardness.

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 48-4, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 4: Indentation hardness by durometer method (Shore hardness)*

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 Time interval between forming and finished grinding, and testing

Tests shall not be carried out less than 16 h after forming and/or finished grinding and, for arbitration purposes, not less than 72 h after forming.

5 Conditioning and temperature of test

Whenever possible, the test shall be carried out at a standard laboratory temperature in accordance with ISO 23529. The product under test shall, if possible, be maintained under the test conditions for sufficient time to reach temperature equilibrium with the test environment. Where this is impracticable, the period of time and the conditions shall be as given in the product specification (see Note).

The same temperature shall be used throughout any one test or series of tests intended to be comparable.

NOTE For large rollers having heavy, metal cores, ambient conditions might not allow equilibrium temperatures to be obtained.

6 Apparatus

The apparatus used shall be either the Shore type A or the Shore type D instrument described in ISO 48-4.

Measurements shall be made with a type D instrument when values above 90 are obtained with the type A durometer, and with the type A instrument when values less than 20 are obtained with the type D durometer.

7 Procedure

7.1 Firmly locate the roller to be tested with its major axis horizontal and with the area in which the hardness is to be measured uppermost. Hold the hardness meter in position with the indentor immediately above the area which is to be measured. Apply the presser foot to the roller surface as rapidly as possible, without shock, ensuring that the indentor is normal to the rubber surface. Apply just sufficient force to obtain firm contact between the presser foot and the roller. Normally, the reading is taken 3 s after the presser foot is in firm contact with the roller surface for vulcanized rubber or 15 s after the presser foot is in firm contact with the roller surface for thermoplastic rubber. Other test times may be used, however, provided they are stated in the test report.

Better reproducibility can be obtained by using either a stand or mass centred on the axis of the indentor, or both, to apply the presser foot to the test piece. Masses of 1 kg and 5 kg are recommended for type A and type D durometers, respectively.

7.2 Make three measurements at different points at least 6 mm apart within the test area in which the hardness is to be determined.

NOTE Several test areas along the length and around the circumference of the roller might be required to determine the average hardness of the covering and the hardness variation over a single roller (see ISO 6123-1).

8 Expression of results

Express the apparent hardness as the median of the three measurements for each test area, reported to the nearest whole number in Shore A or Shore D units.

9 Test report

The test report shall include the following information:

a) a full description of the roller and its origin;

b) a full reference to the test method used, i.e. the number of this document (ISO 48-7:2018);

c) test details:

   1) the time and temperature of conditioning prior to testing,

   2) the temperature of test, and the relative humidity, if necessary,

   3) the test time used (see 7.1),

   4) details of any procedures not specified in this document;

d) test results:

   1) the number of areas or rollers tested,

   2) the individual test results,

   3) the apparent hardness, expressed as Shore A or Shore D (see Clause 8);

e) the date of the test.