

Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device

ICS 83.060

National foreword

This British Standard reproduces verbatim ISO 4649:2002 and implements it as the UK national standard. This publication supersedes Method A of BS 903-A9:1988 which is amended.

The UK participation in its preparation was entrusted to Technical Committee PRI/22, Physical testing of rubber, which has the responsibility to:

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- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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a rotating cylindrical drum device**

*Caoutchouc vulcanisé ou thermoplastique — Détermination de la
résistance à l'abrasion à l'aide d'un dispositif à tambour tournant*



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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 4649 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analyses*.

This second edition cancels and replaces the first edition (ISO 4649:1985), which has been technically revised.

Annexes A and B form a normative part of this International Standard.

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WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard 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.

1 Scope

This International Standard specifies two methods for the determination of the resistance of rubber to abrasion by means of a rotating cylindrical drum device.

The methods involve determination of the volume loss due to the abrasive action of rubbing a test piece over a specified grade of abrasive sheet. Method A is for a non-rotating test piece and method B for a rotating test piece. For each method, the result can be reported as a relative volume loss or an abrasion resistance index.

NOTE 1 Users of previous editions of this International Standard should be aware that method A and method B in this edition have been changed. In this edition, method A (non-rotating test piece) with the calculation of relative volume loss (see 3.2) corresponds to method A of the previous editions. Method A (non-rotating test piece) and method B (rotating test piece) with calculation of abrasion resistance index (see 3.3) were both included in method B in the previous editions.

Because factors such as the grade of abrasive sheet, the type of adhesive used in the manufacture of the sheet and contamination and wear caused by previous testing lead to variations in the absolute values of abrasion loss, all tests are comparative. Runs with a reference compound are included so that the results may be expressed either as a relative volume loss compared to a calibrated abrasive sheet or an abrasion resistance index compared to a reference compound.

NOTE 2 The abrasion loss is often more uniform using the rotating test piece because the whole surface of the test piece is in contact with the abrasive sheet over the duration of the test. However, there is considerable experience using the non-rotating test piece.

These test methods are suitable for comparative testing, quality control, specification compliance testing, referee purposes, and research and development work. No close relation between the results of this abrasion test and service performance can be inferred.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 471:1995, *Rubber — Temperatures, humidities and times for conditioning and testing*

ISO 2393:1994, *Rubber test mixes — Preparation, mixing and vulcanization — Equipment and procedures*

ISO 2781:1988, *Rubber, vulcanized — Determination of density*

ISO 5725-2:1994, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

ISO 7619:1997, *Rubber — Determination of indentation hardness by means of pocket hardness meters*

ISO 9298:1995, *Rubber compounding ingredients — Zinc oxide — Test methods*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1

abrasion resistance

the resistance to wear by mechanical action upon a surface

NOTE For the purposes of this International Standard, the abrasion resistance is expressed either as a relative volume loss compared to an abrasive sheet calibrated using a standard reference compound, or as an abrasion resistance index compared to a reference compound.

3.2

relative volume loss

the volume loss, in cubic millimetres, of the test rubber after being subjected to abrasion by an abrasive sheet which will cause a reference compound to lose a defined mass under the same specified conditions of test

NOTE A value of 200 mg has been established as the mid-point of the calibration range (see B.2.4.3) for the abrasive sheet using method A with standard reference compound No. 1 (see B.2) and considerable experience has been accumulated using the relative volume loss calculation in 9.2. A relative volume loss can be calculated for method B (rotating test piece), or with either test method with another reference compound, if the defined mass loss is known [(150 mg) has been indicated as a possible value for method B with standard reference compound No. 2 (see B.3) but its accuracy has not been documented to the degree of the value (200 mg) using method A with standard reference compound No. 1 (see B.2)].

3.3

abrasion resistance index

the ratio of the volume loss of a reference compound to the volume loss of the test rubber measured under the same specified conditions of test and expressed as a percentage

NOTE A smaller number indicates a lower abrasion resistance.

4 Principle

A cylindrical rubber test piece is made to slide over an abrasive sheet of specified abrasive grade at a specified contact pressure over a given distance. The test piece may be non-rotating or rotating during the test.

Abrasion takes place over one of the end surfaces of the cylindrical test piece (see Figure 1). The abrasive sheet is attached to the surface of a rotating cylindrical drum against which the test piece is held and across which it is traversed.

The loss in mass of the test piece is determined and the volume loss is calculated from the density of the material used for the test piece. The volume loss of the test piece is compared to that of a reference compound tested under the same conditions.

A very important part of this method is the preparation of the abrasive sheet and its calibration using standard reference compound No. 1 (see B.2) with a non-rotating test piece.