
**Rubber, vulcanized or thermoplastic —
Determination of abrasion resistance
using 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 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 4649 was prepared by 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 4649:2002), which has been technically revised. The main changes concern the addition of a calibration schedule (see Annex C), updating the normative references and moving the precision statement to Annex D.

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

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.

CAUTION — Certain procedures specified in this International Standard 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 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.

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 can be expressed either as a relative volume loss compared to a calibrated abrasive sheet or as an abrasion resistance index compared to a reference compound.

NOTE 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 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 2230, *Rubber products — Guidelines for storage*

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

ISO 2781, *Rubber, vulcanized or thermoplastic — Determination of density*

ISO 7619-1, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 1: Durometer method (Shore hardness)*

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

ISO 18899:2004, *Rubber — Guide to the calibration of test equipment*

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

3 Terms and definitions

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

3.1

abrasion resistance

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

ΔV_{rel}

volume loss 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 1 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).]

NOTE 2 Relative volume loss is expressed in cubic millimetres.

3.3

abrasion resistance index

ARI

I_{AR}

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.