

Rubber, vulcanized or thermoplastic — Abrasion testing — Guidance

ICS 83.060

National foreword

This British Standard is the UK implementation of ISO 23794:2010. It supersedes BS ISO 23794:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/22, Physical testing of rubber.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

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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 23794 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 23794:2003), of which it constitutes a minor revision designed to update the normative references to reflect the fact that ISO 471, ISO 4648 and ISO 4661-1 cited in Clause 10 have been replaced by ISO 23529.

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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.

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 provides guidance on the determination of the abrasion resistance of vulcanized and thermoplastic rubbers. It covers both solid and loose abrasives.

The guidelines given are intended to assist in the selection of an appropriate test method and appropriate test conditions for evaluating a material and assessing its suitability for a product subject to abrasion. Factors influencing the correlation between laboratory abrasion testing and product performance are considered, but this International Standard is not concerned with wear tests developed for specific finished rubber products, for example trailer tests for tyres.

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 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

loss of material from a surface due to frictional forces

[ISO 1382:2008^[1]]

3.2

abrasion resistance

resistance to wear resulting from mechanical action upon a surface

NOTE Abrasion resistance is expressed by the abrasion resistance index.

[ISO 1382:2008^[1]]

3.3

abrasion resistance index

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

[ISO 1382:2008^[1]]

3.4

relative volume loss

loss in volume of a test rubber due to abrasion by a specified abradant which will cause a reference rubber to lose a defined mass under the same conditions

4 Wear mechanisms

The mechanisms by which wear of rubber occurs when it is in moving contact with another material are complex, but the principal factors involved are cutting and fatigue. It is possible to categorize wear mechanisms in various ways and commonly distinction is made between:

- abrasive wear;
- fatigue wear;
- adhesive wear.

Additionally, wear by roll formation is sometimes considered as a separate mechanism.

Abrasive wear is caused by sharp asperities cutting the rubber.

Fatigue wear is caused by particles of rubber being detached as a result of dynamic stressing on a localized scale.

Adhesive wear is the transfer of rubber to another surface as a result of adhesive forces between the two surfaces.

Wear by roll formation is where there is progressive tearing of a layer of rubber which forms a roll.

There can also be corrosive wear due to direct chemical attack on the surface.

The term erosive wear is sometimes used for the action of particles in a liquid stream.

In any particular wear situation, more than one mechanism is usually involved, but one may predominate. Abrasive wear requires hard, sharp cutting edges and high friction. Fatigue abrasion occurs with smooth or rough but blunt surfaces and does not need high friction. Adhesive wear is much less common, but can occur on smooth surfaces. Roll formation requires high friction and relatively poor tear strength. Roll formation results in a characteristic abrasion pattern of ridges and grooves at right angles to the direction of movement.

Abrasive wear or roll formation results in much more rapid wear than fatigue processes. The mechanism and hence the rate of wear can change, perhaps quite suddenly, with the conditions, such as contact pressure, speed and temperature. In any practical circumstances, the mechanisms may be complex and critically dependent on the conditions. Consequently, the critical factor as regards testing is that the test conditions