INTERNATIONAL STANDARD

ISO 34-1

Third edition
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Rubber, vulcanized or thermoplastic — Determination of tear strength —

Part 1: Trouser, angle and crescent test pieces

Caoutchouc vulcanisé ou thermoplastique — Détermination de la résistance au déchirement —

Partie 1: Éprouvettes pantalon, angulaire et croissant

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 34-1 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 34-1:2004), which has been technically revised. In 5.3 the force-measuring accuracy of the tensile-testing machine has been changed to class 1. In Clause 10, the permissible range of the median thickness of each group for comparative purposes has also been changed.

ISO 34 consists of the following parts, under the general title *Rubber, vulcanized or thermoplastic — Determination of tear strength*:

— *Part 1: Trouser, angle and crescent test pieces*

— *Part 2: Small (Delft) test pieces*

Rubber, vulcanized or thermoplastic — Determination of tear strength —

Part 1:
Trouser, angle and crescent test pieces

WARNING — Persons using this part of ISO 34 should be familiar with normal laboratory practice. This part of ISO 34 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 part of ISO 34 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 part of ISO 34 specifies three test methods for the determination of the tear strength of vulcanized or thermoplastic rubber, namely:

— method A, using a trouser test piece;

— method B, using an angle test piece, with or without a nick of specified depth;

— method C, using a crescent test piece with a nick.

The value of tear strength obtained depends on the shape of the test piece, speed of stretching, and temperature of test. It can also be susceptible to grain effects in rubber.

Method A: Using a trouser test piece

Method A, using the trouser test piece, is preferred because it is not sensitive to the length of the cut, unlike the other two test pieces in which the nick has to be very closely controlled. In addition, the results obtained are more easily related to the fundamental tear properties of the material and are less sensitive to modulus effects (provided that the leg extension is negligible) and the rate of propagation of the tear is directly related to the rate of grip separation. With some rubbers, the propagation of tear is not smooth (knotty tear), and analysis of results can be difficult[3].

Method B, procedure (a): Using an angle test piece without nick

This test is a combination of tear initiation and propagation. Stress is built up at the point of the angle until it is sufficient to initiate a tear and then further stresses propagate this tear. However, it is only possible to measure the overall force required to rupture the test piece, and, therefore, the force cannot be resolved in two components producing initiation and propagation[4].

Method B, procedure (b): Using an angle test piece with nick

This test measures the force required to propagate a nick already produced in the test piece. The rate of propagation is not directly related to the jaw speed[5].

Method C: Using a crescent test piece

This test also measures the force required to propagate a nick already produced in the test piece, and the rate of propagation is not related to the jaw speed.

NOTE A separate method for the determination of the tear strength of small test pieces of rubber (Delft test pieces) is specified in ISO 34-2[1].

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 5893, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Specification*

ISO 6133, *Rubber and plastics — Analysis of multi-peak traces obtained in determinations of tear strength and adhesion strength*

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
trouser tear strength
median force required to propagate a cut in a specified trouser-shaped test piece by tearing, divided by the thickness of the test piece, the force acting in a direction substantially in the plane of the cut

NOTE The median force is calculated in accordance with ISO 6133.

3.2
unnicked angle tear strength
maximum force required to rupture a specified angle-shaped test piece, divided by the thickness of the test piece, the force acting in a direction substantially along the length of the test piece

3.3
nicked angle tear strength
crescent tear strength
maximum force required to cause a nick cut in a specified angle- or crescent-shaped test piece to extend by tearing of the rubber, divided by the thickness of the test piece, the force acting in a direction substantially normal to the plane of the nick

4 Principle

The test consists in measuring the force required to tear a specified test piece, in continuation of the cut or nick already produced in the test piece or, in the case of method B, procedure (a), completely across the width of the test piece.

The tearing force is applied by means of a tensile testing machine, operated without interruption at a constant rate of traverse until the test piece breaks. Dependent upon the method employed, the maximum or median force achieved is used to calculate the tear strength.

No correlation between data obtained by the alternative test pieces is implied.

