
Footwear — Test methods for outsoles — Tear strength

*Chaussures — Méthodes d'essai applicables aux semelles d'usure —
Résistance au déchirement*

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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 on 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 216, *Footwear*.

This second edition cancels and replaces the first edition (ISO 20872:2001), which has been technically revised.

Footwear — Test methods for outsoles — Tear strength

1 Scope

This document specifies a method for the determination of the tear strength of outsoles, irrespective of the material, using trouser test pieces.

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 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 17709, *Footwear — Sampling location, preparation and duration of conditioning of samples and test pieces*

ISO 18454, *Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear*

3 Terms and definitions

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

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 <http://www.electropedia.org/>

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

3.2

median

< n is odd> $[(n+1)/2]^{\text{th}}$ value, if n measured values are arranged in increasing order of magnitude and numbered 1 to n

3.3

median

< n is even> arithmetic mean of the $(n/2)^{\text{th}}$ and the $(n/2+1)^{\text{th}}$ values, unless further specified

4 Apparatus and material

The following apparatus and material shall be used.

4.1 Dies, used for cutting trouser test pieces shall have the outline dimensions shown in [Figures 1](#) and [2](#).

4.2 Nick cutter, sharp razor blade or sharp knife free from ragged edges used for producing a cut or a nick in the test piece.

The test piece shall be cut to a depth of $40\text{ mm} \pm 5\text{ mm}$ in the direction indicated in [Figures 1](#) and [2](#). The last 1 mm (approximately) of the cut shall be made with a razor blade or a sharp knife.

4.3 Tensile-testing machine, complying with the requirement of ISO 7500-1, to an accuracy corresponding to class 2, with a constant rate of traverse of $100\text{ mm/min} \pm 10\text{ mm/min}$. A low-inertia machine having autographic force recording facilities is essential.

4.3.1 Grips.

The machine shall be provided with a type of grip which tightens automatically as the tension increases and exerts a uniform pressure across the clamped end of the test piece. Each grip shall incorporate a means for positioning so that the test pieces are inserted symmetrically and in axial alignment with the direction of the pull.

4.4 Thickness gauge.

Thickness gauge, standing on a firm base and loaded with a dead weight such that the presser foot applies a pressure of $10\text{ kPa} \pm 3\text{ kPa}$ (see ISO 23529).

The gauge has a presser foot which is flat, circular and $10\text{ mm} \pm 0,1\text{ mm}$ in diameter. The gauge has scale division of 0,01 mm.

5 Sampling and conditioning

At least three test pieces to be tested shall be taken in accordance with ISO 17709. All test pieces shall be conditioned according to ISO 18454 before testing for a minimum of 24 h. Cut the test pieces with the die (see [4.1](#)).

The thickness of the test piece shall be preferably:

- $2,0\text{ mm} \pm 0,2\text{ mm}$ for polymeric and elastomeric compact outsoles;
- $4,0\text{ mm} \pm 0,2\text{ mm}$ for semi-expanded and cellular outsoles;
- for leather outsole, the full thickness shall be tested.

Measure the thickness in three different points and take the average. See also ISO 20876:2018, 6.1.

The test is being performed with at least three specimens. Their uniform thickness (see specification below) shall be obtained by means of an appropriate splitting machine. If feasible, smooth original "skin" surfaces of the sample shall remain unchanged in the specimens. This leads to three possible types of specimen:

- specimen with 2 original "skins" – S 2;
- specimen with 1 original "skin" – S 1;
- specimen with no original "skin" – S 0.

The final result shall be based on only specimens of the same type, which shall be stated in the report.

6 Test methods

Measure the thickness of the test pieces, using the thickness gauge (see 4.4).

Mount the test piece in the testing machine; apply a steadily increasing traction force at a rate of separation of the grips of 100 mm/min $\pm$ 10 mm/min until the piece breaks. Record the force throughout the tearing process.

7 Expression of results

The tear strength, T_s , expressed in newton per millimetre thickness, is given by [Formula \(1\)](#):

$$T_s = F/d \quad (1)$$

where

F is the median force in newton, calculated in accordance with the following procedure:
From the force peak values of the trace for tear strength, the median peak force (see 3.2) of peak force values is determined by the appropriate method specified below.

NOTE In applying the methods described in this document, it is assumed that the trace being evaluated is a time record of the variation of force during the period of test.

Method A (for traces having less than five peaks)

Determine the median of the values of the force peaks in the trace.

If there is only one force peak, consider its value to be the median.

Method B (for traces having five to 20 peaks)

Consider only the peak values of the central 80 % of the complete trace and determine the median peak force of these values.

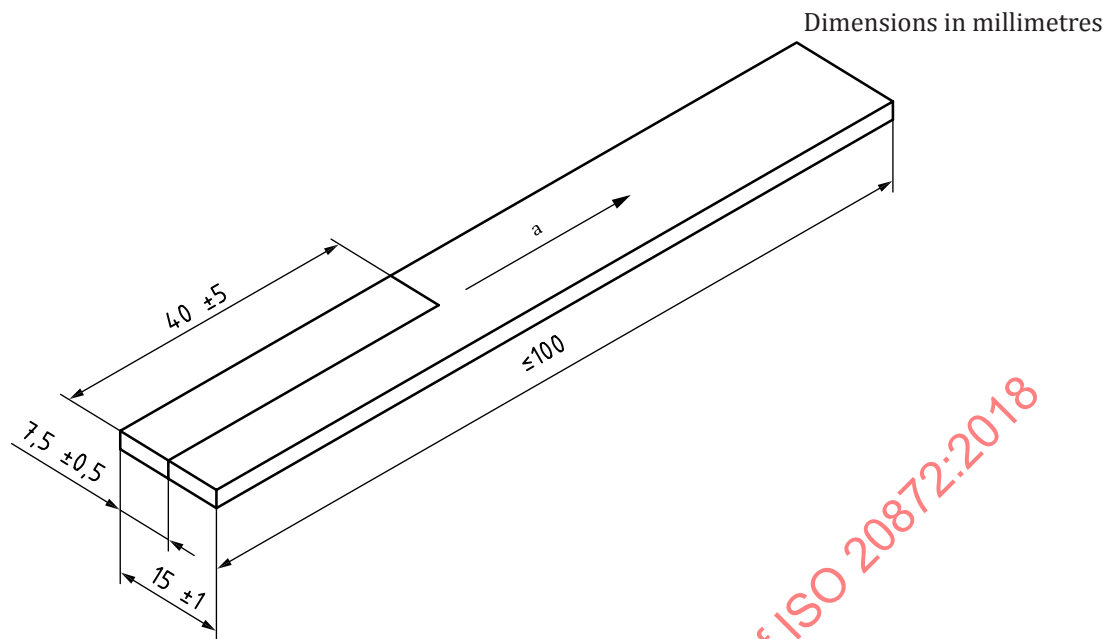
d is the median thickness, in millimetres, of the test piece.

The result is expressed as the average of the three determinations.

8 Test report

The test report shall include the following information:

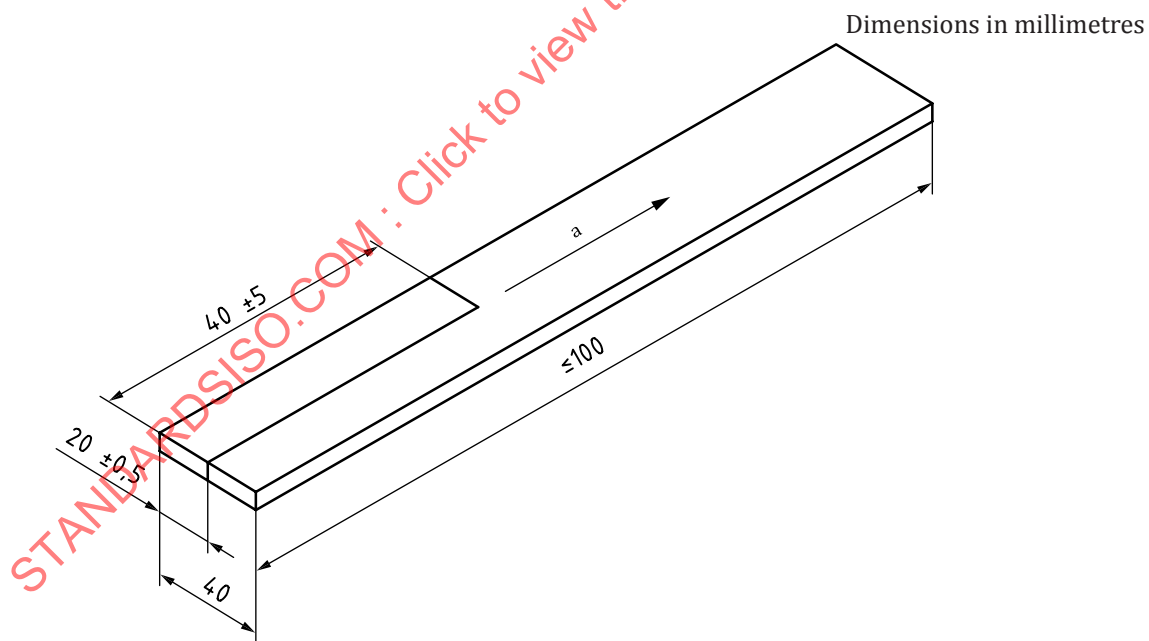
- a) a reference to this document, i.e ISO 20872:2018;
- b) thickness of the test pieces;
- c) full description of the samples tested including commercial styles, codes, colours, nature, etc.;
- d) results, expressed in accordance with [Clause 7](#);
- e) date of testing;
- f) any deviations from this test method.
- g) standard atmospheric conditions observed during the test.



Key

a Direction of cut.

Figure 1 — Trouser test piece



Key

a Direction of cut.

Figure 2 — Trouser test piece for leather outsoles

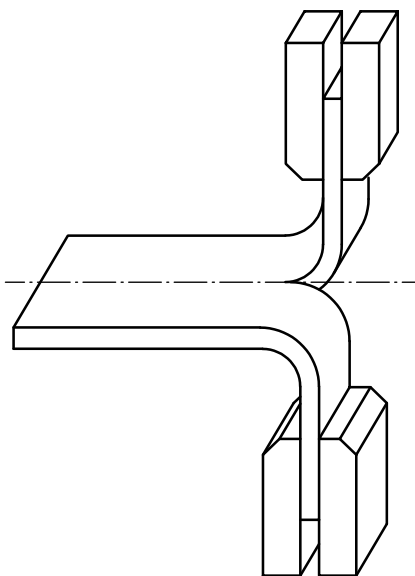


Figure 3 — Positioning of trouser test piece in testing machine