
**Footwear — Test methods for outsoles
— Needle tear strength**

*Chaussures — Méthodes d'essai applicables aux semelles d'usure —
Résistance du point de couture*

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Foreword

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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).

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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 20874:2001), which has been technically revised.

Footwear — Test methods for outsoles — Needle tear strength

1 Scope

This document specifies a method for the determination of the needle tear strength for outsoles, irrespective of the material.

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

needle tear strength

quotient by division of the maximum force, occurring during tearing-out of the needle, by the thickness of the test piece

4 Apparatus and material

The following apparatus and material shall be used:

4.1 Tensile-testing machine, shall comply with the requirements of ISO 7500-1, with an accuracy corresponding to grade B, with a constant rate of traverse of 100 mm/min \pm 10 mm/min.

Autographic recording of force or a maximum force pointer is recommended.

4.2 Needle, either a smooth-surfaced steel needle of 1 mm \pm 0,01 mm diameter or a corresponding piece of spring steel wire, ground to a point.

4.3 Clamping device, as shown in [Figure 1](#).

The distance between the support links for the needle shall be adjustable, so that it can be adjusted to the thickness of the specimen. The clamping device shall be equipped with a suitable protective device to prevent the needle from jumping out.

4.4 Thickness gauge, standing on a firm base and loaded with a dead weight such that the presser foot applies a pressure of $10 \text{ kPa} \pm 3 \text{ kPa}$. The gauge has a presser foot which is flat, circular and $10 \text{ mm} \pm 0,1 \text{ mm}$ in diameter, and a scale division of $0,01 \text{ mm}$.

5 Sampling and conditioning

The test pieces to be tested are taken in accordance to ISO 17709. All test pieces shall be conditioned in accordance with ISO 18454 before testing for a minimum of 24 h.

Test pieces are strips of $50 \text{ mm} \pm 1 \text{ mm}$ length and $20 \text{ mm} \pm 1 \text{ mm}$ width. 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 outsoles, the original thickness shall be tested.

The test is being performed with at least 3 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 piece, using the thickness gauge (4.4). Pierce the piece with a needle of 1 mm diameter (4.2), 5 mm from the edge at the centre of the narrow side (see [Figure 1](#)), as nearly perpendicular as possible with the aid of a template. The piece shall not have been previously bored or punched. Place the needle, which is now stuck in the piece in the clamping device (4.3). The distance between the support links shall be adjusted so that they just touch the piece. Clamp the lower end of the piece in the lower grip (shown in [Figure 1](#) as a scissors-clamp). Stress the piece with a feed-rate of $100 \text{ mm/min} \pm 10 \text{ mm/min}$ on the clamps. Read off the maximum strength in newton which occurs during the tearing-out of the needle.

7 Expression of results

The needle tear strength, S_s , expressed in newtons per millimetre of thickness is given by [Formula \(1\)](#):

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

where

F is the maximum force, in newtons;

d is the thickness, in millimetres.

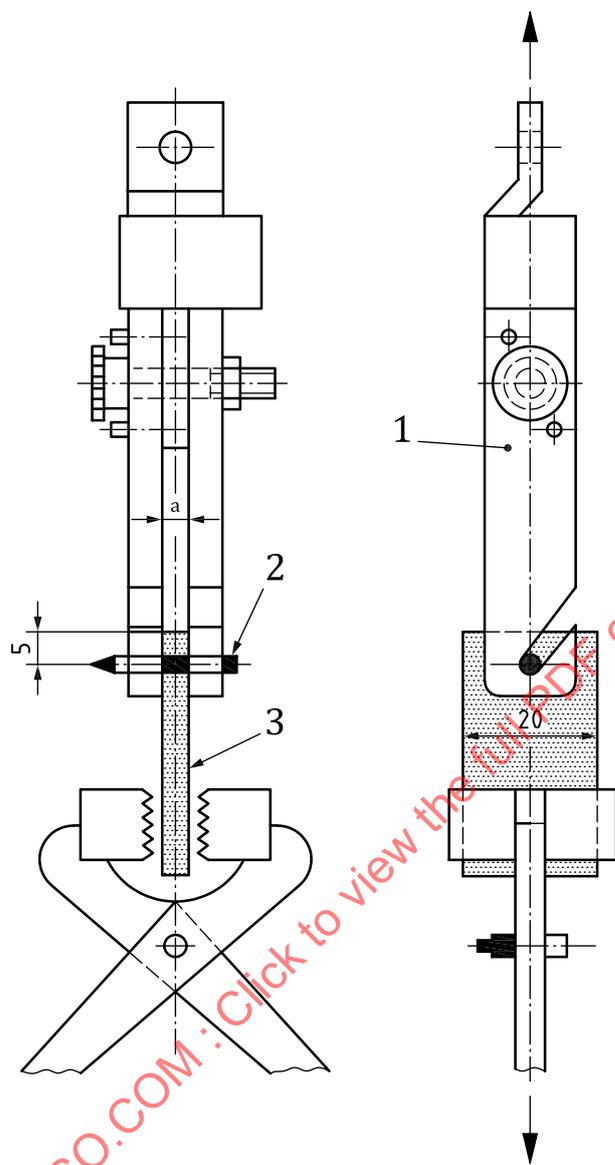
The result will be the average of the three determinations.

8 Test report

The test report shall include the following information:

- a) a reference to this document, i.e. ISO 20874:2018;
- b) full description of the samples tested including commercial styles, codes, colours, nature, etc.;
- c) type (see [Clause 5](#)) and thickness of the test pieces;
- d) results, expressed in accordance with [Clause 7](#);
- e) date of testing;
- f) any deviation from this test method;
- g) standard atmospheric conditions observed during the test.

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Key

- 1 support links
- 2 steel needle ($\varnothing 1$)
- 3 specimen
- a Thickness.

Figure 1 — Example of clamping device