
**Footwear — Test methods for uppers,
linings and insoles — Tear strength**

*Chaussures — Méthodes d'essai des tiges, des doublures et des
premières de propreté — Résistance à la déchirure*



Reference number
ISO 17696:2004(E)

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Foreword

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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 17696 was prepared by the European Committee for Standardization as EN 13571:2001. This International Standard includes corrigendum EN 13571:2001/AC:2003 and was adopted under a special "fast-track procedure" by Technical Committee ISO/TC 216, *Footwear*, in parallel with its approval by the ISO member bodies.

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

1 Scope

This European Standard specifies a test method for assessing the tear strength of upper, linings and insoles or complete upper assembly, irrespective of material, in order to assess the suitability for the end use.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 12222, *Footwear - Standard atmospheres for conditioning and testing of footwear and components for footwear.*

EN 13400, *Footwear - Sampling location, preparation and duration of conditioning of samples and test pieces.*

EN ISO 7500-1, *Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines (ISO 7500-1:1999).*

3 Terms and definitions

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

3.1

tear strength

median force required to propagate a cut in a specified test specimen

3.2

upper

materials forming the outer face of the footwear which is attached to the sole assembly and covers the upper dorsal surface of the foot. In the case of boots this also includes the outer face of the material covering the leg. Only the materials that are visible are included, no account should be taken of underlying materials

3.3

complete upper assembly

finished upper, fully seamed, joined or laminated together as appropriate, comprising the centre material and any lining(s) together with all components such as interlinings, adhesives, membranes, foams or reinforcements, but excluding toe puffs and stiffeners

NOTE The complete upper assembly can be flat, 2- dimensional or comprise lasted upper in the final footwear.

4 Apparatus and material

The following apparatus and material shall be used:

4.1 Tensile testing machine with a jaw separation rate of 100 mm/min \pm 10 mm/min, a force range appropriate to the specimen under test (range of 0 N to 500 N is usually suitable for specimens of footwear upper materials).

4.2 Means of continuously recording the force to an accuracy greater than 2 % as specified by class 2 in EN ISO 7500-1.

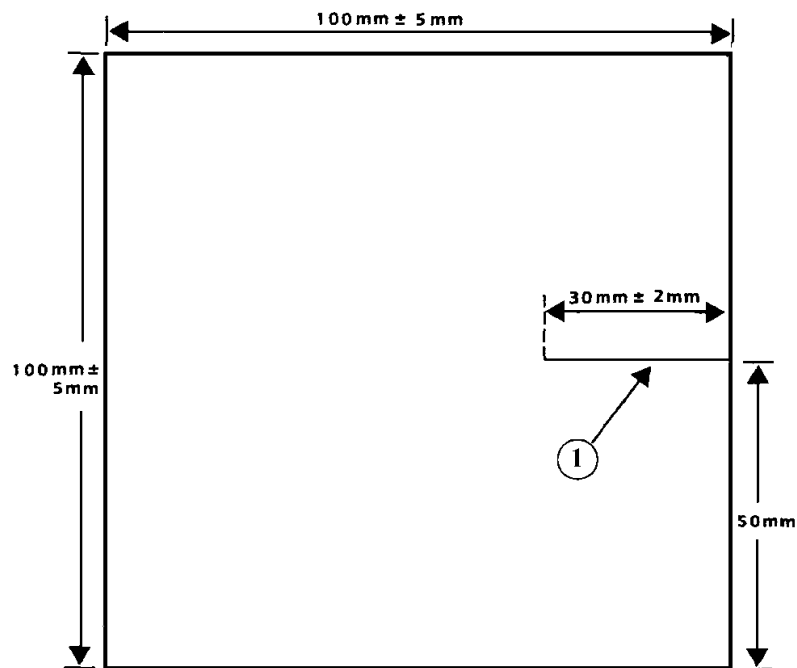
4.3 A **press knife**, or other cutting device, capable of cutting a test specimen of the dimensions shown in Figure 1, for non-leather sheet materials and Figure 2 for cutting samples from shoe uppers or leathers.

5 Sampling and conditioning

5.1 Test specimens can be cut from materials likely to be used for uppers or insoles or from made-up uppers or finished footwear. Prepare test pieces from complete upper assemblies when the lining material is permanently attached to the upper material.

5.2 Cut six test specimens from either the sheet material or shoe upper. If testing fabric shoe uppers, the test specimen dimensions shown in Figure 2 are to be considered minimum dimensions and a larger test specimen should be cut where possible to prevent yarn slippage.

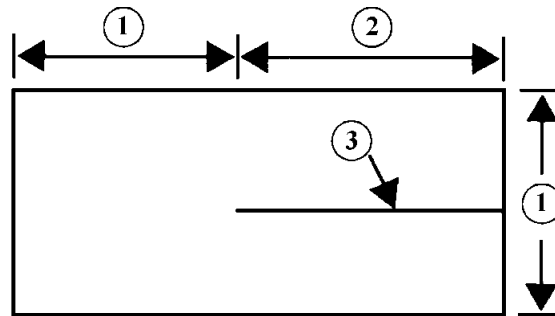
5.3 For sheet materials cut test specimens from a range of positions across the full usable width and length of the sheet material. For a material with a woven structure this will prevent any two specimens containing the same warp or weft threads.



Key

1 Slit

Figure 1 — Test specimen for non-leather sheet materials

**Key**

- 1 25 mm or more
- 2 30 mm \pm 2 mm
- 3 Slit

Figure 2 — Test specimen for leather and shoe uppers

5.4 Cut three test specimens with the slit parallel to the along direction of the material (backbone direction for leather and selvedge (warp) or machine direction for non-leather materials) and three with the slit perpendicular to this. In the case of woven fabrics, use the warp directions as the along direction and the weft direction as the across even if these are not at 90° to each other. For shoe uppers, the along direction is the X-axis as defined in EN 13400.

5.5 For shoe uppers, cut six test specimens through the full thickness of the upper taking care not to dislodge any lining or interlining which has been laminated to the outer material. Take similar care not to dislodge any lining material throughout the testing procedure. Cut three with the slit parallel to the along direction (X-axis) and three with the slit perpendicular to this.

5.6 Mark the along direction on all the test specimens.

5.7 Test specimens shall be conditioned in a standard atmosphere as specified in EN 12222 for 24 h prior to test.

6 Test method**6.1 Principle**

A test specimen, which has a single slit to produce two legs, is loaded into a tensile testing machine so that the slit is parallel to the axis of the machine and one leg is clamped in each jaw. The jaws are moved apart to tear the material until the tear has propagated to an edge of the test specimen. The initial force required to initiate tear, the median force required to continue the tear, the maximum force required to continue the tear and the type of tear are recorded.

6.2 Procedure

6.2.1 All tests shall be conducted in a conditioned atmosphere as specified in EN 12222. Where this is not possible, tests shall be carried out within 15 min of removing the samples from the conditioned atmosphere.

6.2.2 Zero the tensile tester force measuring system and move the jaws together to enable the test specimen to be fitted.

6.2.3 Hold the test specimen flat between the jaws of the tensile testing machine so that the slit is aligned and parallel with the axis of the machine.

6.2.4 Clamp one of the legs in the lower jaw and then fold the other leg upwards through 180° and clamp it into the upper jaw (see Figure 3). In each case ensure that the end of the leg is parallel with the clamping edge of the jaw and that the slit is positioned in the axis of the tensile tester.

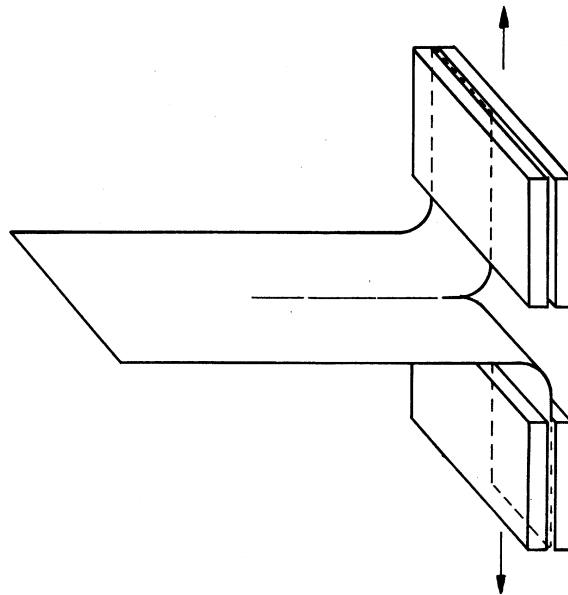


Figure 3 — Method of fixing test specimens in grips

6.2.5 Operate the tensile testing machine so that the jaws separate at a speed of 100 mm/min \pm 10 mm/min and note the type of tear that occurs as:

- Normal failure: Clean tear in approximate direction of the slit
- Abnormal failures:
 - Separate tearing of coating and base fabric
 - Fabric yarns pulling out instead of tearing
 - Tearing to the side of the test specimen

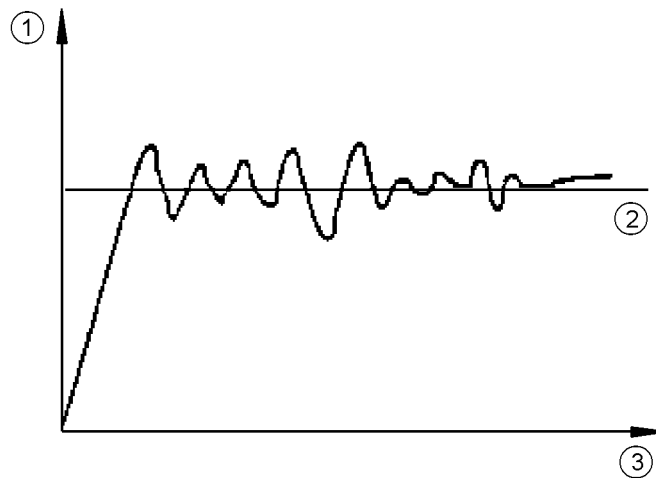
6.2.6 Stop the test when the tear has propagated to an edge of the test specimen.

6.2.7 From the trace of force versus extension produced by the tensile testing machine:

6.2.7.1 If there is a peak corresponding with the initiation of tearing, record this force value as '**Initial peak force**' to the nearest 1 N.

6.2.7.2 Record the maximum force applied to continue the tear once it had started as '**Maximum tear force**' to the nearest 1 N.

6.2.7.3 Record the average force (see Figure 4) required to continue the tear as '**Median force**' to the nearest 1 N.

**Key**

1 Tearing force, in N

2 Average

3 Deformation

Figure 4 – Example of diagram force/deformation

6.2.8 Repeat the procedure in 6.2.2 to 6.2.7 for the remaining test specimens. If one test specimen in either test direction shows an abnormal failure, see 6.2.5, and sufficient material is available, repeat the test until one more specimen shows a normal failure and discard the results for the abnormal failures. If two or more specimens in either test direction show an abnormal type of failure, stop the test when all the original six specimens have been tested and include the results for the abnormal types of failure.

7 Expression of results

For each test direction (along and across) and type of failure calculate the arithmetic mean of:

- a) the Initial peak forces if recorded in 6.2.7.1;

- b) the Maximum tear forces estimated in 6.2.7.2;
- c) the Median forces as recorded in 6.2.7.3.

8 Test report

The test report shall include the following information:

- a) the arithmetic mean forces determined in clause 7 together with the type(s) of failure;
- b) if testing finished footwear or uppers, a description of the style of shoe tested including commercial style codes;
- c) a description of any lining or other reinforcement present;
- d) a description of the material, including commercial reference if known;
- e) the number of test specimens if other than six;
- f) reference to the method of test;
- g) date of testing;
- h) any deviations from this test method.

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