INTERNATIONAL STANDARD

**ISO 17706**

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# Footwear — Test methods for uppers — Tensile strength and elongation

*Chaussures — Méthodes d'essai des tiges — Résistance à la rupture et allongement*



Reference number
ISO 17706:2003(E)

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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 17706 was prepared by CEN (as EN 13522:2001) 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.

For the purposes of international standardization, a list of corresponding International and European Standards for which equivalents are not given in EN 13522 has been added as Annex ZZ.

# Contents

# Foreword

This European Standard has been prepared by Technical Committee CEN/TC 309 "Footwear", the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

This European Standard is based on the IULTCS/IUP 6 method (the International Standard ISO 3376:1976 "Leather. Determination of tensile strength and elongation").

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

**EN 13522:2001 (E)**

## 1 Scope

This standard specifies a test method for determining the force required to break a test specimen from uppers irrespective of the material, in order to asses 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 ISO 7500-1, *Metallic materials – Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines – Verification and calibration of the force-measuring system (ISO 7500-1:1999).*

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

prEN 12987, *Leather - Chemical, physical and mechanical and fastness tests – Sampling.*

## 3 Terms and definitions

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

**3.1**
**breaking strength**
maximum tensile stress recorded in extending a test piece to breaking point

**3.2**
**tensile elongation**
tensile strain in the test length at breaking

**3.3**
**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

**3.4**
**complete upper assembly**
finished upper, fully seamed, joined or laminated 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 may be flat, 2-dimensional or comprise lasted upper in the final footwear.

**3.5**
**thick leather**
leather with a thickness greater than 2 mm

## 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 ± 5 mm/min, a force range appropriate to the specimen under test [this will usually be less than 1 kN for textile and coated textile upper materials but may be as high as 5 kN for thick leathers (see 3.5)], capable of measuring the force to an accuracy of better than 2 % as specified by class 2 in EN ISO 7500-1.

**4.2** Press knife or other means of cutting rectangular test specimens of length 160 mm ± 10 mm and width as

- Materials which can be frayed: 35 mm ± 2 mm
- Materials which cannot be frayed: 25 mm ± 0,5 mm

**4.3** Device for measuring distances up to 100 mm to an accuracy of 0,5 mm. A steel rule or vernier callipers is suitable.

## 5 Sampling and conditioning

**5.1** For test specimens cut from footwear uppers avoid any areas containing seams or perforations.

NOTE It may not be possible to cut a test specimen of sufficient size from certain types of footwear, especially children, and the test specimen size should not be reduced. If it is not possible to cut the correct size test specimen from a shoe upper, the materials themselves must be tested. Prepare test pieces from complete upper assemblies when the lining material is permanently attached to the upper material.

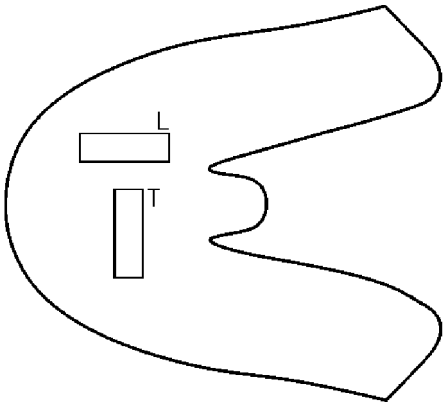
**5.2** For materials which can be frayed (for example textiles):

**5.2.1** Cut six rectangular test specimens of length 160 mm ± 10 mm and width 35 mm ± 2 mm, three with their longer edges parallel to the along direction of the material (machine direction for sheet materials), or X axis of the upper as defined in EN 13400, and three with their longer edges perpendicular to this.

**5.2.2** Remove approximately the same number of threads from both of the longer edges of each test specimen until the width of the specimen is reduced to 25,0 mm ± 0,5 mm.

**5.3** For materials which cannot be frayed, cut six rectangular test specimens of length 160 mm ± 10 mm and width 25 mm ± 0,5 mm, three with their longer edges parallel to the along direction, or X axis of the upper as defined in EN 13400, and three with their longer edges perpendicular to this.

For leather use prEN 12987 to select the sampling position from the butt region of the skin or side and the along direction shall be taken as the backbone direction (see Figure 1).




**Key**
L Longitudinal (Along direction)
T Transversal (Across direction)

**Figure 1 – Along and across directions**

**5.4** On each test specimen mark two lines which are a similar distance from the centre of the test specimen, at 90° to the longer edges of the test specimen, 100 mm ± 1 mm apart. Also mark the along direction on each test specimen.

**5.5** Measure and record the width of each test specimen to the nearest 0,5 mm.

**5.6** Store the cut test specimens in a standard controlled environment as specified in EN 12222 for at least 48 h before testing and carry out the test in this environment.

## 6 Test method

### 6.1 Principle

A rectangular test specimen is gradually stretched, by a tensile testing machine, until it fails. The breaking strength and the tensile elongation are both determined.

### 6.2 Procedure

**6.2.1** Adjust the tensile testing machine (4.1) so that the jaws are 100 mm ± 1 mm apart.

**6.2.2** Insert one end of a test specimen in each of the jaws of the tensile testing machine and clamp it[1], so that the lines (see 5.4) are aligned with the clamping edges of the jaws, the test specimen is neither taut nor slack, a similar area of the test specimen is clamped in each jaw.

**6.2.3** Operate the tensile testing machine so that the jaws separate at a speed of 100 mm/min ± 5 mm/min.

**6.2.4** Stop the machine when the test specimen fails and examine the type of failure and the alignment of the lines (see 5.4) with the clamping edges of the jaws. If any test specimen slips asymmetrically in the jaws by more than 2 mm or fails within 5 mm of either jaw, then reject the results and repeat the test with fresh specimens. If, however, three test specimens cut in the same direction fail within 5 mm of either jaw, then do not reject the results

[1] To minimise the chances of the test specimen slipping in the jaws, or failing at the clamping edge, during testing it is important that the clamping force and type of jaw used are suitable for the specimen under test.

but instead report the fact and quote the strength of the material as being better than or equal to the mean breaking strength calculated in 7.2.

**6.2.5** Record from the graph of force versus extension:

a) Breaking force F, in newtons, to the nearest 2 N.

b) Elongation at break E, in millimetres, to the nearest 1 mm.

**6.2.6** Repeat the procedure in 6.2.1 to 6.2.5 for the other test specimens.

## 7 Expression of results

**7.1** For each test specimen calculate the breaking strength, in N/mm, using the formula:

$$Breaking\ strength = \frac{F}{W}$$

where:

*F* is the breaking force, in N, recorded in 6.2.5;

*W* is the width of the test specimen, in mm.

**7.2** Calculate the arithmetic mean of the three breaking strength values (see 7.1) in each test direction.

**7.3** For each test specimen calculate the percentage tensile elongation, using the formula:

$$Tensile\ elongation = \frac{E \cdot 100}{GL}\%$$

where:

*E* is the elongation at break, in mm, recorded in 6.2.5;

*GL* is the initial jaw separation of the tensile testing machine, in mm (see 6.2.1)

**7.4** Calculate the arithmetic mean of the three tensile elongation values (see 7.3) in each test direction.

## 8 Test report

The test report shall include the following information:

a) the mean breaking strength for each principal direction as determined in 7.2;

b) the tensile elongation for each principal direction as determined in 7.4;

c) if testing finished footwear or uppers, a description of the style of shoe tested including commercial style codes;

d) a description of the material, including commercial reference if known;

e) a description of any lining or other reinforcement present;

f) reference to the method of test;

g) date of testing;

h) any deviations from this standard test method.