INTERNATIONAL STANDARD

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Footwear — Test methods for uppers — Water resistance

Chaussures — Méthodes d'essai des tiges — Résistance à l'eau

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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 17702 was prepared by CEN (as EN 13518:2001) 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 13518 has been added as Annex ZZ.

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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of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.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 10 method.

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.

1 Scope

This European Standard specifies a test method for determining the resistance of a footwear upper material to water penetration on flexing, 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 ISO 3696 *Water for analytical laboratory use – Specification and test methods (ISO 3696:1987).*

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

3 Terms and definitions

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

3.1
water resistance
resistance of a footwear upper material to water penetration on flexing

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 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 construction.

4 Apparatus and material

The following apparatus and material shall be used:

4.1 Test machine including the following:

4.1.1 One or more pairs of cylinders onto which the test specimens are clamped, each of diameter 30,0 mm ± 0,5 mm, mounted with their axes horizontal and coaxially aligned.

4.1.2 A maximum separation of the cylinders (4.1.1) in each pair of 40 mm ± 0,5 mm.

4.1.3 Means of reducing the separation of the cylinders (4.1.1) in each pair by a throw of 2,0 mm ± 0,1 mm; 3,0 mm ± 0,2 mm; 4,0 mm ± 0,4 mm; or 6,0 mm ± 0,6 mm and returning them back to their original separation at a rate of 50 cycles / min ± 1 cycles / min under a simple harmonic motion.

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4.1.4 Ring shaped clamps of internal diameter adjustable between 30 mm and 40 mm to fit around each cylinder.

4.1.5 Means of containing a fixed quantity of water (4.9) around the pair(s) of cylinders so that the water level can be adjusted to a maximum of 5 mm above the axes of the cylinders.

4.2 Press knife, or other cutting device, capable of cutting rectangular test specimens 75 mm ± 2 mm × 60 mm ± 1 mm.

4.3 Apparatus to measure the stiffness of the test specimen having:

4.3.1 Two cylinders of diameter (30,0 ± 0,5) mm mounted with their axes aligned and a maximum separation of 40,0 mm ± 0,5 mm.

4.3.2 Means of moving the cylinders (see 4.3.1) together.

4.3.3 Means of measuring the reduction in distance between the two cylinders (4.3.1) to the nearest 0,5 mm.

4.3.4 Means of measuring the force resisting movement along the axis of the cylinders (4.3.1) to the nearest 5 N.

4.3.5 Ring shaped clamps of internal diameter adjustable between 30 mm and 40 mm, to fit around each cylinder (4.3.1).

4.4 Standard laboratory balance capable of measuring mass to the nearest 10 mg.

4.5 Abrasive paper, grade 180.

4.6 Pieces of soft absorbent lint free material.

4.7 Laboratory timer capable of recording time to the nearest second over a 5 s period.

4.8 Clock capable of recording time to the nearest minute over a 24 h period.

4.9 Distilled or deionised water complying with grade 3 of EN ISO 3696.

5 Sampling and conditioning

5.1 Use the knife (see 4.2) to cut two rectangular test specimens 75 mm ± 2 mm × 60 mm ± 1 mm. Cut one with its longer edges parallel to the along direction (X-axis as defined in EN13400 for shoe uppers, the backbone direction for leather and the machine direction for other materials) of the material and cut the other test specimen perpendicular to this.

For non-leather 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.

5.2 Mark the principal direction of the material on each test specimen.

5.3 Unless otherwise specified, buff the outer surface of each test specimen lightly by rubbing it with the abrasive paper (4.5) until the central 50 % of its surface area shows evidence of mild abrasion (scratching and matting) damage.

NOTE Very thin surface finishes with low abrasion resistance are likely to be completely removed in some areas by this treatment whilst thicker and more abrasion resistant finishes and coatings may be scratched and dulled only.

5.4 Store the test specimens in a conditioned atmosphere as specified in EN 12222 for at least 24 h prior to test.

NOTE Specimens can be taken either from materials likely to be used for uppers or from made-up uppers or finished footwear.

6 Test method

6.1 Principle

A rectangular test specimen is bent partly round, and secured between, two cylindrical clamps so as to form a trough. The trough is then immersed in water and the clamps oscillate at a constant speed so that the specimen is repeatedly flexed. The time taken for water penetration through the test specimen to occur is recorded. The mass of water absorbed by, and transmitted through, the test specimen can also be measured.

6.2 Procedure

6.2.1 Stiffness: If the throw (see 4.1.3) to be used in the water resistance test has not been specified then it is necessary to determine the throw to be used based on the stiffness of the material:

6.2.1.1 Adjust the apparatus (4.3) so that the pair of cylinders (4.3.1) are at their maximum separation.

6.2.1.2 Bend, without creasing, the test specimen along its longer edges to form a trough. Loosely fit a ring shaped clamp (4.3.5) over each end of the test specimen. Bend, without creasing, one of the test specimens around, and between, the cylinders (4.3.1) so that its outer surface is facing outwards, its shorter edges are parallel to the axis of the cylinders and it overlaps each cylinder by approximately 10 mm.

The specimen forms a trough between the cylinders, open at the top and closed at the bottom.

6.2.1.3 Slide the ring shaped clamps (see 4.3.5) along the specimen until their inner edges are aligned with the facing ends of the two cylinders. Fully tighten one of clamps, ensure that the test specimen is not slack, and then fully tighten the other clamp.

6.2.1.4 Over a time of 5 s ± 2 s move the cylinders 2,0 mm ± 0,1 mm closer to each other, and watch the specimen to ensure that the centre section folds upwards. If this is not the case apply gentle pressure to the underside of the test specimen midway between the clamps as the clamps move together to encourage formation of an upward fold in the centre of the test specimen.

6.2.1.5 Immediately move the cylinders back to their original positions at the same speed.

6.2.1.6 Repeat the procedure in 6.2.1.4 and 6.2.1.5 recording the force, F_1, between the cylinders, at the point where the separation between the cylinders has been decreased by 2,0 mm $\pm$ 0,1 mm, to the nearest 5 N.

6.2.1.7 Repeat the procedure in 6.2.1.4 to 6.2.1.6 this time moving the cylinders together by 4,0 mm ± 0,2 mm and recording the force between the cylinders, F_2, when their separation has been reduced by 4,0 mm $\pm$ 0,2 mm, to the nearest 5 N.

6.2.1.8 If arithmetic mean of F_1 and F_2, F_a, calculated according to 7.1.1, is greater than 100 N then record the required throw X as 2,0 mm ± 0,1 mm. This is equivalent to 5 % of the test length or,

6.2.1.9 If F_a is between 50 N and 100 N then record X as 3,0 mm ± 0,2 mm. This is equivalent to 7,5 % of the test length or,

6.2.1.10 If F_a is less than 50 N, then repeat the procedure in 6.2.1.4 to 6.2.1.6 this time moving the cylinders together by 6,0 mm ± 0,6 mm and recording the force between the cylinders, F_3, when their separation has been reduced by 6,0 mm $\pm$ 0,6 mm, to the nearest 5 N.

6.2.1.11 If arithmetic mean of F_1, F_2 and F_3, F_b, calculated according to 7.1.2, is greater than 20 N then record X as 4,0 mm ± 0,4 mm (this is equivalent to 10 % of the test length) or,

6.2.1.12 If F_b is less than 20 N then record X as 6,0 mm ± 0,6 mm (this is equivalent to 15 % of the test length).

6.2.1.13 Repeat the procedure in 6.2.1.1 to 6.2.1.12 for the second test specimen. Use the higher of the recorded values for X when carrying out the test described below.

6.2.2 Initial penetration: If the mass of water absorbed or transmitted by the test specimen is also required, then refer to 6.2.3 and 6.2.4 respectively before proceeding further.