
**Footwear — Test methods for uppers,
linings and insoles — Colour fastness to
rubbing**

*Chaussures — Méthodes d'essai des tiges, des doublures et des
garnitures intérieures — Stabilité de la couleur au frottement*

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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 17700 was prepared by the European Committee for Standardization as EN 13516:2001. This International Standard includes corrigendum EN 13516:2001/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...".

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1 Scope

1.1 This standard specifies two test methods (method A and method B) for assessing the degree of damage (marring) and transfer of a material's surface colour during mild dry or wet abrasion. The methods are applicable to all footwear uppers, linings and insocks irrespective of the material, in order to assess suitability for end use.

1.2 This standard also specifies a method (method C) for determining the likelihood of colour bleeding from materials and components such as sewing threads and shoe laces due to the action of water and artificial perspiration solutions, in order to assess suitability for 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 105-A01, *Textiles - Tests for colour fastness - Part A01: General principles of testing (ISO 105-A01:1994).*

EN 20105-A02, *Textiles - Tests for colour fastness - Part A02: Grey scale for assessing change in colour (ISO 105-A02:1993).*

EN 20105-A03, *Textiles - Tests for colour fastness - Part A03: Grey scale for assessing staining (ISO 105-A03:1993).*

EN ISO 3696, *Water for analytical laboratory use - Specification and test methods (ISO 3696:1987).*

ISO 105-F10, *Textiles - Tests for colour fastness - Part F10: Specification for adjacent fabric: Multifibre.*

3 Terms and definitions

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

3.1

colour fastness to rubbing

resistance of a material to damage (marring) and transfer of the materials surface colour during mild dry or wet abrasion

3.2

perspiration fastness

resistance of a material to colour bleed when exposed to an artificial perspiration solution

3.3

thick leather

leather with a thickness greater than 2 mm

4 Apparatus and material

The following apparatus and material shall be used:

4.1 Method A

4.1.1 Test machine with the following:

4.1.1.1 Flat horizontal metal platform of minimum dimensions 80 mm × 25 mm.

4.1.1.2 Means of moving the platform in a direction parallel to its 80 mm edges through distance of 35 mm ± 2 mm and back again at a rate of 40 cycles/min ± 2 cycles/min.

4.1.1.3 Pair of clamps positioned at the ends of the platform at 90° to the 80 mm edges and which are designed to clamp the test specimen against the platform. The clamp faces shall be a minimum distance of 80 mm apart.

4.1.1.4 Means of moving the clamps apart so that the test specimen is extended linearly by an amount adjustable up to 20 %.

4.1.1.5 Rubbing finger with a flat horizontal lower surface capable of holding a square felt pad (4.1.2). For machines with a platform wider than 25 mm the relative position of the rubbing finger shall be adjustable across the width of the platform.

4.1.1.6 Means of holding a square felt pad (4.1.2) on the lower surface of the finger.

4.1.1.7 Means of applying a downward force of 4,9 N ± 0,1 N and 9,8 N ± 0,2 N to the rubbing finger.

4.1.1.8 Means of counting the number of cycles traversed by the platform.

4.1.2 Square pads of scoured pure wool felt with the following requirements:

4.1.2.1 Sides of length 15 mm ± 1 mm.

4.1.2.2 Mass per unit area of 1750 g/m² ± 100 g/m² and thickness 5,5 mm ± 0,5 mm when measured using a dial gauge exerting a downward pressure of 49 kPa ± 5 kPa on a measuring foot diameter of 10 mm ± 1 mm.

4.1.2.3 The pH of an aqueous extract, made by shaking 5 g of ground felt in 100 ml of distilled or deionized water complying with EN ISO 3696 in a polyethylene bottle and leaving for 2 h, between 6 and 7.

4.1.3 Grey scales for assessing change in colour and staining with half step ratings conforming to EN 20105-A02 and EN 20105-A03

4.1.4 Assessment cabinet with artificial lighting as specified in EN ISO 105-A01. Alternatively, the assessment can be carried out in daylight from the north, when the test is carried out in the northern hemisphere, or daylight from the south when testing in the southern hemisphere.

4.1.5 Distilled or de-mineralized water complying with grade 3 of EN ISO 3696.

4.1.6 Synthetic perspiration solution containing per litre of solution;

- Sodium chloride, 5,0 g per litre of solution.

- Ammonia solution, density 0,880 g/cm³, 6,0 cm³.

4.1.7 White spirit, general purpose reagent grade.

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4.2 Method B

4.2.1 Test machine with the following:

- 4.2.1.1 Rigid horizontal platform (preferably metal) capable of clamping the test specimen.
- 4.2.1.2 Vertical rotating spindle capable of holding the circular felt pad.
- 4.2.1.3 Means of rotating the felt pad at a speed of $15,6 \text{ rad/s} \pm 0,5 \text{ rad/s}^1$.
- 4.2.1.4 Means of loading the rotating felt pad with a force of either $24,5 \text{ N} \pm 0,5 \text{ N}$ and $7,1 \text{ N} \pm 0,2 \text{ N}$.
- 4.2.1.5 Means of counting the number of revolutions of the felt pad.

4.2.2 Circular pads of scoured pure wool felt with central holes, with the following requirements:

- a) Outside diameter $25 \text{ mm} \pm 1 \text{ mm}$, bore diameter $3 \text{ mm} \pm 0,5 \text{ mm}$.
- b) Thickness, to be measured by one of the following methods:

| Thickness | Downward pressure/presser foot size | Specimen |
|---------------|---|----------------------------------|
| $6,5 \pm 0,5$ | $49 \text{ kPa} \pm 5 \text{ kPa}/10 \text{ mm} \pm 1 \text{ mm}$ | Cut pads or uncut sheet material |
| $5,0 \pm 0,5$ | $2,0 \text{ kPa} \pm 0,2 \text{ kPa}/19 \text{ mm} \pm 10 \text{ mm}$ | Cut pads |

- c) Density $190 \text{ kg/m}^3 \pm 20 \text{ kg/m}^3$.

4.2.3 Grey scales for assessing the change in colour and degree of staining complying with EN 20105-A02 and EN 20105-A03 respectively.

4.2.4 Metal plate approximately $75 \text{ mm} \times 65 \text{ mm}$ and thickness 5 mm with a hole diameter 25 mm through its centre for use in the wetting from the back with organic solvents test described in 6.2.2.6.

4.2.5 Polished aluminium disc (diameter approximately 50 mm and thickness approximately 12 mm) to help cool the test specimen in dry rub tests.

4.2.6 Balance, capable of weighing masses up to 5 g to an accuracy of 10 mg .

4.2.7 Assessment cabinet with artificial lighting as specified in EN ISO 105-A01. Alternatively, the assessment can be carried out in daylight from the north, when the test is carried out in the northern hemisphere, or daylight from the south when testing in the southern hemisphere.

4.2.8 Distilled or deionised water complying with grade 3 of EN ISO 3696 for the wet rub test described in 6.2.2.3.

4.2.9 Synthetic perspiration solution, for the perspiration rub test described in 6.2.2.4, consisting of:

- Sodium chloride, 5 g per litre of solution.
- Ammonia solution, density $0,880 \text{ g/cm}^3$, $6,0 \text{ cm}^3$.

4.2.10 White spirit for the spirit rub test described in 6.2.2.5.

4.2.11 Organic solvents (as used for solvent activated stiffeners) for the wetting from the back with organic solvents test described in 6.2.2.6.

1) $1 \text{ rad} \approx 0,16 \text{ rev}$.

4.3 Method C

- 4.3.1** Petri dish large enough to accommodate a glass plate (4.3.2) for each test specimen assembly.
- 4.3.2** Glass plate of length at least 110 mm and width at least 55 mm with a mass of 100 g \pm 2 g for each test specimen assembly.
- 4.3.3** Rectangular pieces of multifibre fabric type DW as specified in ISO 105-F10 of dimensions 100 mm \pm 5 mm \times 50 mm \pm 2 mm.
- 4.3.4** Oven maintained at a temperature of 37 °C \pm 2 °C.
- 4.3.5** Grey scales for assessing change in colour and staining with half steps as described in EN 20105-A02 and EN 20105-A03.
- 4.3.6** Assessment cabinet with artificial lighting as specified in EN ISO 105-A01. Alternatively, the assessment can be carried out in daylight from the north, when the test is carried out in the northern hemisphere, or daylight from the south when testing in the southern hemisphere.
- 4.3.7** Balance capable of measuring mass up to 100 g to the nearest 0,1 g for testing yarns or loose fibres.
- 4.3.8** Distilled or de-mineralized water complying with grade 3 of EN ISO 3696.
- 4.3.9** Alkaline perspiration solution containing, per litre of solution;
- l-histidine monohydrochloride monohydrate: 5,00 g.
 - Sodium chloride: 5,00 g.
 - Disodium hydrogen orthophosphate dihydrate: 2,50 g.

After preparation, the solution is brought to pH 8 with 0,1 M sodium hydroxide solution.

Store the solution at 4 °C \pm 1 °C. If the solution is more than one week old check its pH and adjust as necessary before use. Discard the solution if precipitated solids develop.

- 4.3.10** Acid perspiration solution containing, per litre of solution;
- l-histidine monohydrochloride monohydrate: 5,00 g.
 - Sodium chloride: 5,00 g.
 - Sodium dihydrogen orthophosphate dihydrate: 2,50 g.

After preparation, the solution is brought to pH 5,5 with 0,1 M sodium hydroxide solution.

Store the solution at 4 °C \pm 1 °C. If the solution is more than one week old, check its pH and adjust as necessary before use. Discard the solution if precipitated solids develop.

5 Sampling and conditioning

5.1 Method A

5.1.1 Rectangular test specimens of sufficient size to be clamped firmly on the test platform (4.1.1.1) are required. The test specimens can be cut from the material in any direction. Typically test specimens shall be of minimum dimensions 100 mm \times 25 mm.

For test machines that have test platforms of width 25 mm, separate test specimens are required for each number of rubs or test condition to be used.

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For test machines that have wider test platforms and the ability to position the test finger (4.1.1.5) at different positions across the width of the platform, wider test specimens can be used so that separate rubbing tracks can be used side by side.

5.1.2 Place the test specimens in a conditioned atmosphere as specified in EN 12222 for 24 h prior to test.

NOTE Test specimens can be cut either from materials likely to be used in footwear or from made-up uppers or finished footwear.

5.2 Method B

5.2.1 Test specimens shall be of a sufficient size to allow them to be fixed firmly to the test platform. Typically, test specimens shall be either squares of 60 mm × 60 mm, or circles 60 mm diameter; alternatively a 60 mm wide strip can be used for several tests.

For 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 should prevent any two specimens containing the same warp or weft threads.

For shoe uppers avoid seams, perforations and other areas where a flat test specimen cannot be cut.

5.2.2 Place the test specimens in a conditioned atmosphere as specified in EN 12222 for 24 h prior to test.

5.3 Method C

5.3.1 Test specimens can be taken either from materials likely to be used for uppers or from made-up uppers or finished products.

5.3.2 Sheet material or specimens from shoe uppers:

5.3.2.1 Cut one rectangular test specimen $110 \text{ mm} \pm 10 \text{ mm} \times 55 \text{ mm} \pm 5 \text{ mm}$ for each method of the test to be carried out. If insufficient material is available, cut several smaller size test specimens which can be fitted together to produce a rectangle of this size.

5.3.2.2 If the material to be tested is patterned, cut sufficient additional specimens to ensure that all the colours of the pattern are in contact with all six sections of the multifibre fabric (see 4.3.3).

5.3.2.3 Make test specimen assemblies by placing pieces of multifibre fabric (see 4.3.3) in contact with the surfaces of the specimens to be tested so that this surface of the specimen is in contact with all six components of the multifibre fabric. If testing both surfaces of the test specimen, sandwich the test specimen between two pieces of multifibre fabric.

5.3.3 Yarn or loose fibre:

5.3.3.1 For each method of test to be carried out, lay out sufficient yarn or fibre to completely cover the surface of one piece of the multifibre fabric (see 4.3.3).

5.3.3.2 If more convenient the yarn or fibre may be cut into lengths, $100 \text{ mm} \pm 5 \text{ mm}$.

5.3.3.3 Place the yarn or fibre between two pieces of the multifibre fabric (see 4.3.3) so that approximately equal amounts of the yarn or fibre are in contact with each of the six components of the multifibre fabric. It is likely that the yarns or fibres will overlap one another to some extent and this should be kept to a minimum. Avoid creating areas of several thicknesses of yarn or fibre as this will lead to uneven pressure on the test specimen assembly during the test.

5.3.4 Retain a portion of the material to use as a reference for visually comparing any colour change of the test specimen.