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**Footwear — Test methods for upper  
components and insoles — Colour  
fastness to rubbing and bleeding**

*Chaussures — Méthodes d'essai des composants de la tige et des  
premières de propreté — Solidité des coloris au frottement et à  
l'exsudation*

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Published in Switzerland

# Contents

	Page
Foreword.....	iv
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>1</b>
<b>3 Terms and definitions.....</b>	<b>1</b>
<b>4 Apparatus and materials.....</b>	<b>2</b>
4.1 Method A.....	2
4.2 Method B.....	3
4.3 Method C.....	4
4.4 Method D.....	5
<b>5 Sampling and conditioning.....</b>	<b>6</b>
5.1 Method A.....	6
5.2 Method B.....	7
5.3 Method C.....	7
5.4 Method D.....	7
<b>6 Test method.....</b>	<b>8</b>
6.1 Principle.....	8
6.1.1 Methods A and B.....	8
6.1.2 Method C.....	8
6.1.3 Method D.....	8
6.2 Procedure.....	9
6.2.1 Method A.....	9
6.2.2 Method B.....	10
6.2.3 Method C.....	12
6.2.4 Method D.....	12
<b>7 Test report.....</b>	<b>13</b>
7.1 Methods A and B.....	13
7.2 Method C.....	14
7.3 Method D.....	14
<b>Annex A (informative) Summary of test conditions normally used for method B.....</b>	<b>15</b>
<b>Bibliography.....</b>	<b>16</b>

## 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.

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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 [www.iso.org/iso/foreword.html](http://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 17700:2004), which has been technically revised. The main changes compared with the previous edition are as follows:

- a new method (method C) to perform the colour fastness to rubbing has been introduced;
- in method D, the possibility to perform the colour fastness to bleeding in shoe laces and yarns has been introduced.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Footwear — Test methods for upper components and insoles — Colour fastness to rubbing and bleeding

## 1 Scope

This document specifies three test methods (method A, method B and method C) for assessing the degree of transfer of a material's surface colour during dry or wet rubbing and a method (method D) for determining the likelihood of colour bleeding.

The methods are applicable to all footwear uppers, linings and insoles, irrespective of the material. Method D is also applicable to sewing threads and shoelaces.

The methods are:

- method A: to-and-fro square rubbing finger fastness testing machine;
- method B: rotative rub fastness testing machine;
- method C: to-and-fro circular rubbing finger fastness testing machine;
- method D: colour fastness to bleeding.

## 2 Normative references (standards.iteh.ai)

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 105-A01, *Textiles — Tests for colour fastness — Part A01: General principles of testing*

ISO 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

ISO 105-A03, *Textiles — Tests for colour fastness — Part A03: Grey scale for assessing staining*

ISO 105-F09, *Textiles — Tests for colour fastness — Part F09: Specification for cotton rubbing cloth*

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

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 4045, *Leather — Chemical tests — Determination of pH and difference figure*

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

#### colour fastness

ability of a footwear material or component to maintain its colour after the action of various agents

### 3.2

#### thick leather

leather with a thickness greater than 2 mm

## 4 Apparatus and materials

### 4.1 Method A

The following apparatus and materials shall be used.

**4.1.1 Test machine**, with the elements given in [4.1.1.1](#) to [4.1.1.8](#).

**4.1.1.1** A 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 a distance of 35 mm to 40 mm and back again at a rate of 40 cycles/min ± 2 cycles/min.

**4.1.1.3** A pair of clamps positioned at the ends of the platform at 90° to the 80 mm edges and designed to clamp the test specimen against the platform. The clamp faces shall be at 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 %.

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**4.1.1.5** A rubbing finger with a flat horizontal lower surface capable of holding a square felt pad ([4.1.2](#)). The depth of the cavity that holds the square felt pad should be 3,9 mm ± 0,1 mm. 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 or 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 white or black pure wool felt**, with the requirements given in [4.1.2.1](#) to [4.1.2.4](#).

**4.1.2.1** Sides of length: 15 mm ± 1 mm.

**4.1.2.2** Mass per unit area: 1 900 g/m<sup>2</sup> ± 150 g/m<sup>2</sup>.

**4.1.2.3** Thickness: 6,0 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.

**4.1.2.4** pH of water extract: between 4,5 and 8,0, in accordance with ISO 4045.

Black felts shall be dyed with Acid Black 24 (C.I. 26370).

**4.1.3 Grey scales**, for assessing changes in colour and staining with half step ratings, conforming to ISO 105-A02 and ISO 105-A03.

**4.1.4 Assessment cabinet**, with artificial lighting as specified in 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 deionised water**, conforming to grade 3 of ISO 3696.

**4.1.6 Synthetic alkaline perspiration solution**, containing, per litre of solution:

- 0,5 g of l-histidine monohydrochloride monohydrate ( $C_6H_9O_2N_3 \cdot HCl \cdot H_2O$ );
- 5 g of sodium chloride (NaCl);

and either:

- 5 g of disodium hydrogen orthophosphate dodecahydrate ( $Na_2HPO_4 \cdot 12H_2O$ );

or:

- 2,5 g of disodium hydrogen orthophosphate dihydrate ( $Na_2HPO_4 \cdot 2H_2O$ ).

The solution is brought to pH 8 ( $\pm 0,2$ ) with 0,1 M sodium hydroxide solution.

**4.1.7 White spirit**, general purpose reagent grade.

NOTE Information about the producers of test machines and accessories can be requested from the Committee Manager of TC 216.

## 4.2 Method B

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The following apparatus and materials shall be used.

**4.2.1 Test machine**, with the elements given in [4.2.1.1](#) to [4.2.1.5](#).

**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  $24,5 \text{ N} \pm 0,5 \text{ N}$  or  $7,1 \text{ N} \pm 0,2 \text{ N}$ .

**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: measured by one of the methods given in [Table 1](#);
- c) density:  $190 \text{ kg/m}^3 \pm 20 \text{ kg/m}^3$ .

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

Table 1 — Methods to measure the thickness

Thickness	Downward pressure/presser foot size	Specimen
5,0 mm ± 0,5 mm	49 kPa ± 5 kPa/10 mm ± 1 mm	Cut pads or uncut sheet material
6,5 mm ± 0,5 mm	2,0 kPa ± 0,2 kPa/19 mm ± 1mm	Cut pads

**4.2.3 Grey scales**, for assessing changes in colour and degree of staining, conforming to ISO 105-A02 and ISO 105-A03, respectively.

**4.2.4 Metal plate**, approximately 75 mm × 65 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 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**, conforming to grade 3 of 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 an alkaline solution containing, per litre of solution:

- 0,5 g of l-histidine monohydrochloride monohydrate ( $C_6H_9O_2N_3 \cdot HCl \cdot H_2O$ );
- 5 g of sodium chloride (NaCl);

and either:

- 5 g of disodium hydrogen orthophosphate dodecahydrate ( $Na_2HPO_4 \cdot 12H_2O$ );

or:

- 2,5 g of disodium hydrogen orthophosphate dihydrate ( $Na_2HPO_4 \cdot 2H_2O$ ).

The solution is brought to pH 8 ( $\pm 0,2$ ) with 0,1 M sodium hydroxide solution.

**4.2.10 White spirit** (e.g. CAS n.64742-48-9), for the spirit rub test described in [6.2.2.5](#).

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

NOTE Information about the producers of test machines and accessories can be requested from the Committee Manager of TC 216.

### 4.3 Method C

The following apparatus and materials shall be used.



**4.3.1 Rubbing finger**, consisting of a cylinder of 16 mm ± 0,1 mm diameter, which is driven to carry out a linear reciprocating motion along a 100 mm ± 5 mm track on the specimen, exerting a downward force of 9 N ± 0,2 N.

Soft-back waterproof abrasive paper, or grating of stainless steel wire 1 mm in diameter and with a mesh width of about 20 mm.

Attention should be paid to the characteristics of the grating or abrasive paper used to hold the specimen as they may leave an imprint through the textile, which would cause a false rating to be made.

The use of the abrasive paper may be preferred for testing textile fabrics.

**4.3.2 White cotton rubbing cloth**, desized, bleached, without finish, conforming to ISO 105-F09. The cloth is cut into squares measuring approximately 50 mm × 50 mm, for the rubbing finger (4.3.1).

**4.3.3 Grey scales**, for assessing the degree of staining, conforming to ISO 105-A03.

**4.3.4 Assessment cabinet**, with artificial lighting as specified in 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.

NOTE Information about the producers of test machines and accessories can be requested from the Committee Manager of TC 216.

## 4.4 Method D iTeh STANDARD PREVIEW

The following apparatus and materials shall be used. (standards.iteh.ai)

**4.4.1 Glass vessel**, large enough to accommodate a glass plate (4.4.2) for each test specimen assembly. [https://standards.iteh.ai/catalog/standards/sist/d98e6538-2138-4767-](https://standards.iteh.ai/catalog/standards/sist/d98e6538-2138-4767-1099-95618a1b1485/iso-17700-2019)

**4.4.2 Glass plate**, length at least 110 mm and width at least 55 mm, with a mass of 100 g ± 2 g for each test specimen assembly.

**4.4.3 Rectangular pieces of multifibre fabric type DW**, as specified in ISO 105-F10, dimensions (100 ± 2) mm × (40 ± 2) mm.

**4.4.4 Oven**, maintained at a temperature of 37 °C ± 2 °C.

**4.4.5 Grey scales**, for assessing changes in colour and staining with half steps, conforming to ISO 105-A02 and ISO 105-A03.

**4.4.6 Assessment cabinet**, with artificial lighting as specified in 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.

**4.4.7 Balance**, capable of measuring mass up to 100 g to the nearest 0,1 g, for testing yarns or loose fibres.

**4.4.8 Distilled or deionised water**, conforming to grade 3 of ISO 3696.

**4.4.9 Alkaline perspiration solution**, containing, per litre of solution:

- 0,5 g of l-histidine monohydrochloride monohydrate (C<sub>6</sub>H<sub>9</sub>O<sub>2</sub>N<sub>3</sub>·HCl·H<sub>2</sub>O);
- 5 g of sodium chloride (NaCl);

and either:

— 5 g of disodium hydrogen orthophosphate dodecahydrate ( $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ );

or:

— 2,5 g of disodium hydrogen orthophosphate dihydrate ( $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}$ ).

The solution is brought to pH 8 ( $\pm 0,2$ ) with 0,1 M sodium hydroxide solution.

The solution should be stored at  $4\text{ }^\circ\text{C} \pm 1\text{ }^\circ\text{C}$ . If the solution is more than one week old, its pH should be checked and adjusted as necessary before use. Discard the solution if precipitated solids develop.

**4.4.10 Acid perspiration solution**, containing, per litre of solution:

— 0,50 g l-histidine monohydrochloride monohydrate;

— 5,00 g sodium chloride;

— 2,20 g sodium dihydrogen orthophosphate dihydrate.

After preparation, the solution is brought to pH 5,5 with 0,1 M hydrochloric acid solution.

The solution should be stored at  $4\text{ }^\circ\text{C} \pm 1\text{ }^\circ\text{C}$ . If the solution is more than one week old, its pH should be checked and adjusted as necessary before use. Discard the solution if precipitated solids develop.

NOTE Information about the producers of test machines and accessories can be requested from the Committee Manager of TC 216.

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## 5 Sampling and conditioning

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### 5.1 Method A

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**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 × 25 mm. In case of stretch materials, the test specimen should be cut from the direction that is less elastic.

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.

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 ISO 18454 for 24 h prior to testing.

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 (4.2.1.1). Typically, test specimens shall be either squares of 60 mm × 60 mm, or circles of 60 mm diameter. Alternatively, a 60 mm wide strip can be used for several tests.

For materials, cut the test specimens from a range of positions across the full usable width and length of the sheet material. For materials 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 ISO 18454 for 24 h prior to testing.

## 5.3 Method C

**5.3.1** Two representative test specimens, each measuring not less than 140 mm × 50 mm, are required. One for dry rubbing and the other for wet rubbing. In cases of stretch materials, the test specimen should be cut from the direction that is less elastic.

**5.3.2** Place the test specimens in a conditioned atmosphere as specified in ISO 18454 for 24 h prior to testing.

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## 5.4 Method D

**5.4.1** Test specimens can be taken either from materials likely to be used for uppers, linings and insoles or from made-up uppers, linings and insoles, or from finished products.

**5.4.2** For sheet material or specimens from shoe uppers, linings and insoles, follow the instructions given in 5.4.2.1 to 5.4.2.3.

**5.4.2.1** Cut one rectangular test specimen to 110 mm ± 10 mm × 55 mm ± 5 mm for each method of the test to be carried out. If insufficient material is available, cut several smaller test specimens that can be fitted together to produce a rectangle of this size.

**5.4.2.2** 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 (4.4.3).

**5.4.2.3** Assemble the test specimen by placing pieces of multifibre fabric (4.4.3) 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 both surfaces of the test specimen are being tested, sandwich the test specimen between two pieces of multifibre fabric.

**5.4.3** For yarn, shoe laces or loose fibre, follow the instructions given in 5.4.3.1 to 5.4.3.3.

**5.4.3.1** For each method of test to be carried out (D.1, D.2 and D.3), lay out sufficient yarn, shoe lace or fibre to completely cover the surface of one piece of the multifibre fabric (4.4.3).

**5.4.3.2** If more convenient, the yarn, shoe lace or fibre can be cut into lengths of 100 mm ± 5 mm.

**5.4.3.3** Place the yarn, shoe lace or fibre between two pieces of the multifibre fabric (4.4.3) so that approximately equal amounts of the yarn, shoe lace or fibre are in contact with each of the six components of the multifibre fabric. It is likely that the yarn, shoe lace or fibre will overlap one another to some extent