BS EN ISO 11641:2012

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Leather — Tests for colour fastness — Colour fastness to perspiration

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National foreword

This British Standard is the UK implementation of EN ISO 11641:2012. It supersedes BS EN ISO 11641:2003 which is withdrawn.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

This document (EN ISO 11641:2012) has been prepared by Technical Committee CEN/TC 289 “Leather", the secretariat of which is held by UNI, in collaboration with the International Union of Leather Technologists and Chemists Societies.

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of an identical text or by endorsement, at the latest by May 2013, and conflicting national standards shall be withdrawn at the latest by May 2013.

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The text of ISO 11641:2012 has been approved by CEN as a EN ISO 11641:2012 without any modification.

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INTERNATIONAL STANDARD

ISO 11641:2012(E)
IULTCS/IUF 426:2012(E)

Leather — Tests for colour fastness — Colour fastness to perspiration

1 Scope

This International Standard specifies a method for determining the colour fastness to perspiration of leather of all kinds at all stages of processing. It applies particularly to gloving, clothing and lining leathers, as well as leather for the uppers of unlined shoes.

The method uses an artificial perspiration solution to simulate the action of human perspiration. Since perspiration varies widely from one individual to the next, it is not possible to design a method with universal validity, but the alkaline artificial perspiration solution specified in this International Standard will give results corresponding to those with natural perspiration in most cases.

NOTE In general, human perspiration is weakly acidic when freshly produced. Micro-organisms then cause it to change, the pH usually becoming weakly alkaline (pH 7,5 to 8,5). Alkaline perspiration has a considerably greater effect on the colour of leather than has acid perspiration. Therefore, for coloured leather, an alkaline perspiration solution is used to simulate the most demanding conditions encountered in practice.

2 Normative references

The following referenced documents are indispensable for the application 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-A04, *Textiles — Tests for colour fastness — Part A04: Method for the instrumental assessment of the degree of staining of adjacent fabrics*

ISO 105-A05, *Textiles — Tests for colour fastness — Part A05: Instrumental assessment of change in colour for determination of grey scale rating*

ISO 105-E04, *Textiles — Tests for colour fastness — Part E04: Colour fastness to perspiration*

ISO 105-F01, *Textiles — Tests for colour fastness — Part F01: Specification for wool adjacent fabric*

ISO 105-F02, *Textiles — Tests for colour fastness — Part F02: Specification for cotton and viscose adjacent fabrics*

ISO 105-F03, *Textiles — Tests for colour fastness — Part F03: Specification for polyamide adjacent fabric*

ISO 105-F04, *Textiles — Tests for colour fastness — Part F04: Specification for polyester adjacent fabric*

ISO 105-F05, *Textiles — Tests for colour fastness — Part F05: Specification for acrylic adjacent fabric*

ISO 105-F06, *Textiles — Tests for colour fastness — Part F06: Specification for silk adjacent fabric*

ISO 105-F07, *Textiles — Tests for colour fastness — Part F07: Specification for secondary acetate adjacent fabric*

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

ISO 2418, *Leather — Chemical, physical and mechanical and fastness tests — Sampling location*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*

3 Principle

A leather specimen is soaked in artificial perspiration solution and a piece of adjacent fabric, also soaked in artificial perspiration solution, is laid against each side to be tested. The composite specimen is left under pressure for a specified time in a suitable apparatus. The leather specimen and adjacent fabric are then dried, and the change in colour of the specimen and the staining of the adjacent fabric assessed with the grey scales.

Leathers with a finish may be tested intact or with the finish broken.

The general colour fastness testing principles shall be in accordance with those described in ISO 105-A01, taking into account that the substrate is leather.

4 Apparatus and materials

Ordinary laboratory apparatus and

4.1 Test apparatus, consisting of a stainless-steel frame, into which a rectangular weight-piece approximately 5 kg in mass and approximately 115 mm × 60 mm in cross-section fits accurately, so that a uniform pressure of 12,5 ± 1,0 kPa can be applied on the composite specimen placed between rectangular plates of an inert material, e.g. glass or acrylic-resin, of the same length and width as the weight-piece and about 1,5 mm thick.

The test apparatus shall be constructed so that if the weight-piece is removed during the tests, the pressure of 12,5 kPa remains unchanged.

Other devices may be used provided that equivalent results are obtained.

NOTE An example of a suitable apparatus available commercially is given in Annex A.

4.2 Oven, maintained at 37 °C ± 2 °C.

4.3 Adjacent fabrics (see ISO 105-A01). Either

a) a multifibre adjacent fabric, complying with ISO 105-F10, measuring approximately 100 mm × 40 mm, or

b) two single-fibre adjacent fabrics, complying with the relevant specification in ISO 105-F01 to F07.

NOTE Examples of suitable commercial sources are given in Annex A.

4.4 Demineralized water, grade 3 in accordance with ISO 3696:1987.

4.5 Alkaline artificial perspiration solution, containing, per litre of solution:

5,0 g of sodium chloride [NaCl],

5,0 g of tris(hydroxymethyl)aminomethane [$NH_2C(CH_2OH)_3$],

0,5 g of urea [$CO(NH_2)_2$] and

0,5 g of nitrilotriacetic acid [$N(CH_2COOH)_3$] (**SAFETY NOTE — Not to be ingested)**,

and adjusted to pH 8,0 ± 0,1 with hydrochloric acid (2 mol/l).

SAFETY NOTE — This artificial perspiration solution must not be ingested. It must not be pipetted by mouth.

To prepare 1 litre of alkaline perspiration solution, dissolve the weighed-out components in about 900 ml of demineralized water (4.4) in a 2 litre beaker. Transfer to a 1 litre volumetric flask (4.14) and make up to volume with demineralized water. Check the pH of this solution with a pH meter (4.13) and add 2 mol/l hydrochloric acid solution (4.15) drop by drop until the pH reaches 8,0 ± 0,1. Smaller volumes can be prepared as required.

Check the pH of the solution periodically and discard it if the pH is not within 8,0 ± 0,1. Also discard the solution if colonies of microbes become visible.

NOTE The composition of this pH 8,0 alkaline perspiration solution differs from that specified in the textile method, ISO 105-E04. Typically, leather test laboratories are small and this perspiration solution can be kept for some weeks without changes in the pH. Whereas, the ISO 105-E04 alkaline perspiration solution is not pH stable and a fresh solution must be prepared each day. Experience has shown that for colour fastness testing of leather the most important aspect in making artificial perspiration solutions is the pH and not the composition.

4.6 Acid artificial perspiration solution, if required, composition according to ISO 105-E04.

A freshly prepared solution using demineralized water (4.4), containing, per litre:

0,5 g of L-histidine monohydrochloride monohydrate [$C_6H_9O_2N_3 \cdot HCl \cdot H_2O$];

5,0 g of sodium chloride [NaCl];

2,2 g of sodium dihydrogen orthophosphate dihydrate [$NaH_2PO_4 \cdot 2H_2O$].

While stirring, the solution is brought to pH 5,5 ± 0,2 with the drop-wise addition of a 0,1 mol/l sodium hydroxide. This solution shall be freshly prepared each day.

NOTE Since the leather dyes are fixed under acid conditions, the colour fastness to acid perspiration has much less significance for leather compared with the colour fastness to alkaline perspiration. However, the acid perspiration solutions are often used in other test procedures and therefore are included here. For example, these are used to extract substances, such as heavy metals in ISO 17072-1, from leather.

4.7 Fine-grained adhesive paper, grade P 180.

4.8 Grey scale for assessing staining, in accordance with ISO 105-A03.

4.9 Grey scale for assessing change in colour, in accordance with ISO 105-A02.

4.10 Spectrophotometer or colorimeter for assessing change in colour and staining, complying with ISO 105-A04 and ISO 105-A05.

4.11 Vessel suitable for evacuation, e.g. vacuum-desiccator.

4.12 Vacuum pump, capable of evacuating the desiccator vessel (4.11) to approximately 5 kPa (50 mbar) within 4 min.

4.13 pH meter.

4.14 Volumetric flask, 1 000 ml.

4.15 Hydrochloric acid solution, 2 mol/l.

5 Test specimens

5.1 If the piece of leather available for testing is a whole hide or skin, then first take a sample in accordance with ISO 2418.

5.2 If the leather has a finish and is to be tested with the finish broken, prepare the test specimen as follows.

Cut out a piece of leather approximately 120 mm × 50 mm and lay it out, finish-side down, on a sheet of abrasive paper (4.7), measuring approximately 150 mm × 200 mm, held flat on a work surface. Load the upper side of the piece of leather uniformly with a 1 kg weight. Move the piece of leather approximately 100 mm to and fro on the abrasive paper, carrying out 10 to-and-fro cycles.

NOTE With practice, the same roughening effect can be achieved holding the abrasive paper in the hand.

Brush the roughened area thoroughly to remove all dust. From the roughened area of the leather, cut out a test specimen measuring approximately 100 mm × 40 mm.

To test leather for upholstery application with a surface coating, larger leather pieces, e.g. approximately 110 mm × 50 mm can be used to avoid staining caused by contact of water with the leather fibres at the edge.

The fact that the finish has been broken shall be mentioned in the test report.

5.3 If the leather has no finish, or if it has a finish but is to be tested with the finish intact, simply cut out a test specimen measuring approximately 100 mm × 40 mm. If the colour fastness to both alkaline and acid perspiration is being tested, a separate leather test specimen is required for each.

5.4 For each leather specimen, cut out a piece (or pieces) of adjacent fabric (4.3), i.e. enough to cover the leather sample measuring approximately 100 mm × 40 mm. If both sides are to be tested, then another piece(s) of adjacent fabric is required.

6 Procedure

6.1 Immerse the leather specimen and adjacent fabric(s) in the artificial perspiration solution(s) (4.5 and/or 4.6) in separate containing vessels, using, for example, bent glass rods to keep them immersed. (If testing more than one specimen simultaneously, several pieces of adjacent fabric may be immersed in the same containing vessel, but each leather specimen shall be immersed in a separate vessel.) Place the containing vessels in the vacuum vessel (4.11), produce a vacuum of approximately 5 kPa within 4 min, and hold this vacuum for 2 min. Restore normal pressure. Repeat the procedure a further two times.

In the case of testing leather for upholstery with a surface coating, wet the surface with artificial perspiration solution but do not immerse the leather specimen in the solution.

Lay a piece (or pieces) of adjacent fabric (4.3) out on a glass or acrylic-resin plate and cover it with the leather specimen, with the side under test facing down. If both sides are to be tested, cover the leather specimen with a second piece (or pieces) of adjacent fabric. Cover the composite specimen with a second glass or acrylic-resin plate.

6.2 Preheat the loading weight-piece in the oven (4.2) at 37 °C ± 2 °C for at least 1 h. Place the composite specimen, between the two plates, in the test apparatus (4.1) and load it with the weight-piece. In order to allow excess perspiration solution to run off, tilt the apparatus about 30° to each side for a few seconds. (When testing several composite specimens simultaneously, take care that to ensure that each is placed centrally between two plates in such a way that the pressure is exerted evenly on it.) Place the loaded apparatus in the oven and leave at 37 °C ± 2 °C for 180 min ± 10 min.

6.3 At the end of the 180 min period, take off the load, remove the composite specimen from the apparatus, fix it together at one corner (by stitching or stapling), and dry it by hanging it in air at room temperature, with the specimen and its adjacent fabrics in contact only at the point they are fixed together.

7 Evaluation

7.1 When the composite specimen is dry, using D65 illumination according to ISO 105-A01 illumination visually assess the staining of each kind of fibre in the adjacent fabric(s), using the appropriate grey scale (4.8) in accordance with ISO 105-A03. Also assess the change in colour (4.9) of the leather specimen in accordance with ISO 105-A02.

7.2 Alternatively, provided the staining and colour change is even, the grey scale staining and colour difference can be assessed instrumentally (4.10) in accordance with ISO 105-A05 and ISO 105-A04 respectively.

8 Precision

For the visual grey scale evaluations, an inter-person precision of ± 0,5 grey scale units is normal.

9 Test report

The test report shall include the following information:

a) a reference to this International Standard, ISO 11641;

b) a description of the type of leather tested and which surface of the leather was tested;

c) whether there was a finish and, if so, whether the finish was broken;

d) the type of perspiration solution used;

e) the numerical grey scale ratings obtained for the staining of the adjacent fabric(s), giving a separate grey scale rating for each of the different types of fibre;

f) the numerical grey scale rating obtained for the change in colour of the leather specimen;

g) details of any deviations from the procedure specified.

Annex A
(informative)

Commercial sources for apparatus and materials

Examples of suitable products available commercially are given below. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products.

A.1 Examples of suitable test apparatus (4.1) include:

— the Perspirometer (Hydrotest apparatus) from Karl Schröder KG, Karrillonstrasse 32, D-69469 Weinheim, Germany. Website: www.schroeder-prueftechnik.de

— the AATCC Perspiration Tester from SDL Atlas UK, Shawcross St., Stockport, SK13JW, UK. Website: www.sdlatlas.com

— the Perspirometer from James H. Heal & Co. Ltd, Richmond Works, Halifax, West Yorkshire HX3 6EP, UK. Website: www.james-heal.co.uk

— the Perspirometer from PFI Germany, Test and Research Institute, Marie-Curie-Strasse 19, D-66953 Pirmasens, Germany. Website: www.pfi-germany.de

Any other suitable apparatus may be used, provided it gives the same results.

A.2 Examples of suppliers for the adjacent fabrics (4.3) conforming to ISO 105 Standards:

— EMPA Testmaterialien AG, Mövenstrasse 12, CH-9015 St. Gallen-Winkeln, Switzerland. Website: www.empa-testmaterials.ch

— SDC Enterprises Limited, Pitcliffe Way, Upper Castle Street, Bradford, BD5 7SG, UK. Website: www.sdcenterprises.co.uk

— Testfabrics Inc., P.O. Box 26, West Pittston, PA 18643 USA. Website: www.testfabrics.com

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