INTERNATIONAL STANDARD

ISO 105-E12

Fourth edition
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Textiles — Tests for colour fastness —

Part E12: Colour fastness to milling: Alkaline milling

Textiles — Essais de solidité des coloris —

Partie E12: Solidité des coloris au foulon: Foulon alcalin

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 105-E12 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

This fourth edition cancels and replaces the third edition (ISO 105-E12:1989), which has been technically revised. It also incorporates ISO 105-E12:1989/Cor.1:2002 and ISO 105-E12:1989/Amd.1:2002

ISO 105 consists of many parts designated by a part letter and a two-digit serial number (e.g. A01), under the general title *Textiles — Tests for colour fastness*. A complete list of these parts is given in ISO 105-A01.

Textiles — Tests for colour fastness —

Part E12:
Colour fastness to milling: Alkaline milling

1 Scope

This part of ISO 105 specifies a method for determining the resistance of the colour of wool and part-wool textiles to the action of soap and sodium carbonate solutions used in alkaline milling (severe method) or of a soap solution only (mild method).

The mild method can be applied to light- or medium-weight wool (or wool-containing) clothing fabrics.

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-A01:2010, *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-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 3696, *Water for analytical laboratory use — Specification and test methods*

SDC[1)], *Colour Index International* (Fourth Edition Online)

3 Principle

A specimen of the textile in contact with either two single-fibre adjacent fabrics or a multifibre adjacent fabric is milled in a jar containing steel balls and a solution of soap and sodium carbonate or a solution of soap. In the first case (severe milling), the severity of the action is controlled by means of a test-control dyeing milled separately in the same way. After rinsing and drying separately, the change in colour of the specimen and the staining of the adjacent fabrics are assessed with the grey scales or instrumentally.

4 Apparatus

4.1 Suitable mechanical device, consisting of a water bath containing a rotatable shaft which supports, radially, glass or stainless steel containers with a diameter of (75 ± 5) mm and a height of (125 ± 10) mm of (550 ± 50) ml capacity, the bottom of the containers being (45 ± 10) mm from the centre of the shaft. The shaft/container assembly is rotated at a frequency of (40 ± 2) min^{-1}. The temperature of the water bath is thermostatically controlled to maintain the test solution at the prescribed temperature of (40 ± 2) °C.

Other mechanical devices may be used for the test, provided that the results are identical to those obtained in the apparatus described above.

4.2 Non-corrodible stainless-steel balls, ≈ 6 mm in diameter.

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

4.4 Analytical balance, accurate to ±0,01 g (see ISO 105-A01).

4.5 Means of heating the soap solution, such as a hotplate.

5 Reagents and materials

5.1 Soap.

The soap shall contain not more than 5 % moisture and comply with the following requirements based upon dry mass:

— free alkali, calculated as Na_2CO_3: 0,3 % maximum;

— free alkali, calculated as NaOH: 0,4 % maximum;

— total fatty matter: 850 g/kg minimum;

— titre of mixed fatty acids prepared from soap: 30 °C maximum;

— iodine value: 50 maximum.

The soap shall be free from fluorescent whitening agents.

The soap should be well stirred to ensure thorough dispersion and to prevent setting.

1) The Society of Dyers and Colourists, Perkin House, 82 Grattan Road, Bradford, West Yorkshire BD1 2JB, UK; Tel: +44 1274 725138; http://www.sdc.org.uk

5.2 Sodium carbonate, anhydrous (Na_2CO_3).

5.3 Milling solutions.

5.3.1 General.

Milling solutions should be heated for better dispersion, with a hotplate for instance.

5.3.2 Milling solution A (severe), containing 50 g of soap (5.1) and 10 g of anhydrous sodium carbonate (5.2) per litre of water (5.8).

It is recommended to vigorously disperse the soap and sodium carbonate in grade 3 water (5.8) at (40 ± 2) °C and stir for (10 ± 1) min.

5.3.3 Milling solution B (mild), containing 10 g of soap (5.1) per litre of water (5.8).

5.4 Test control (for severe method "A" only): a dyeing of CI Acid Blue 7 (see SDC, *Colour Index International*, Fourth Edition Online) on wool fabric.

Enter a well wetted-out pattern of wool serge at 40 °C into a dye-bath containing 3 % CI Acid Blue 7 (SDC, *Colour Index International*, Fourth Edition Online), 10 % sodium sulfate decahydrate ($Na_2SO_4 \cdot 10H_2O$) and 3 % sulfuric acid (ρ 1,84 g/ml), all percentages being calculated with respect to the mass of the wool, at a liquor ratio of 40:1.

Raise the dye bath to the boil in 30 min and boil for 45 min. Remove the pattern, rinse and dry.

5.5 Adjacent fabrics (see ISO 105-A01).

Either

5.5.1 A DW-type multifibre adjacent fabric complying with ISO 105-F10.

Or

5.5.2 Two single-fibre adjacent fabrics, complying with the relevant part of ISO 105-F01 to ISO 105-F07.

One of the adjacent fabrics shall be made of the same kind of fibre as that of the textile to be tested, or that predominating in the case of blends, and the second piece shall be made of the fibre as indicated in Table 1 or, in the case of blends, of the kind of fibre second in order of predominance or as otherwise specified.

Table 1 — Single-fibre adjacent fabrics

If first piece is:	Second piece is to be:
Cotton	Wool
Wool	Cotton
Viscose	Wool
Polyamide	Wool
Polyester	Wool or cotton
Acrylic	Wool or cotton

5.5.3 A non-dyeable fabric (for example, polypropylene), if required.

5.6 **Grey scale for assessing change in colour**, complying with ISO 105-A02.

5.7 **Grey scale for assessing staining**, complying with ISO 105-A03.

5.8 **Grade 3 water**, complying with ISO 3696.

6 Test specimen

6.1 If the textile to be tested is a fabric, either

a) place a specimen measuring (40 ± 2) mm × (100 ± 2) mm between a piece of the multifibre adjacent fabric (5.5.1) and a non-dyeable fabric (5.5.3), also measuring (40 ± 2) mm × (100 ± 2) mm, by sewing along all four sides to form a composite specimen, or

b) place a specimen measuring (40 ± 2) mm × (100 ± 2) mm between the two appropriate single-fibre adjacent fabrics (5.5.2) (see Table 1), also measuring (40 ± 2) mm × (100 ± 2) mm, by sewing along all four sides to form a composite specimen.

6.2 Yarn may be knitted into fabric and tested in this form. Where yarn or loose fibre is to be tested, take a mass of the yarn or loose fibre approximately equal to one-half of the combined mass of the adjacent fabrics, and either

a) place it between a (40 ± 2) mm × (100 ± 2) mm piece of the multifibre adjacent fabric (5.5.1) and a (40 ± 2) mm × (100 ± 2) mm piece of the non-dyeable fabric (5.5.3) and sew them along all four sides (see ISO 105-A01:2010, 10.3, *Preparation of composite specimens*), or

b) place it between a (40 ± 2) mm × (100 ± 2) mm piece of each of the two specified single-fibre fabrics (5.5.2) and sew along all four sides.

6.3 Prepare the composite specimen of the test control (5.4) in the way outlined for fabric in 6.1 (for severe method only). Determine the mass, in grams, of the composite specimen using the analytical balance (4.4) to aid accurate liquor-ratio volumes (see 5.4).

7 Procedure

7.1 Procedure A: severe method

7.1.1 Prepare the milling solution A (see 5.3.2).

7.1.2 Carry out the operations described in 7.1.3 to 7.1.5 inclusive with the composite specimen and the composite test-control specimen in parallel, in separate baths and containers.

7.1.3 Put the composite specimen and the composite test-control specimen in separate containers in the mechanical test device (4.1), each with three times its own mass of the milling solution (5.3.2) and 50 of the stainless-steel balls (4.2). Clamp the cover and run the device for 2 h at (40 ± 2) °C.

7.1.4 Stop the device, open the container, and add sufficient grade 3 water (5.8) at (40 ± 2) °C to give a liquor ratio of 100:1. Clamp the cover and run the device for an additional 10 min.

7.1.5 Remove the composite specimens, rinse twice in cold water (5.8) then rinse for 10 min in cold, running tap water. Open out the composite specimen (by breaking the stitching on all sides, except one of the shorter sides, if necessary) and dry it by hanging it in air at a temperature not exceeding 60 °C with the two or three parts in contact only at the line of stitching.

7.1.6 Assess the change in colour of the test control and the staining of its adjacent fabric(s) with reference to the original test control and adjacent fabrics with the grey scales (5.6 and 5.7) and/or instrumentally (see 4.3). If the change in colour is not equal to rating 3 on the appropriate grey scale, the test has not been carried out correctly, and the operations described in 7.1.2 to 7.1.5 shall be repeated with a fresh composite specimen and a fresh composite test-control specimen.

7.1.7 Assess the change in colour of the test specimen and the staining of its adjacent fabric with reference to the original test control and adjacent fabrics with the grey scales (5.6 and 5.7) and/or instrumentally (see 4.3).

7.2 Procedure B: mild method

7.2.1 Prepare the milling solution B (5.3.3).

7.2.2 Put the composite specimens in a container in the mechanical test device (4.1) with three times their own mass of the milling solution (5.3.3) and 10 stainless-steel balls (4.2). Clamp the cover and run the device for 30 min at (40 ± 2) °C.

7.2.3 Stop the device, open the container and add sufficient grade 3 water (5.8) at (40 ± 2) °C to give a liquor ratio of 100:1. Clamp the cover and run the device for an additional 10 min at (40 ± 2) °C.

7.2.4 Proceed as in 7.1.5.

7.2.5 Assess the change in colour of the specimen and the staining of its adjacent fabric(s) with reference to the original specimen and adjacent fabrics with the grey scales (5.6 and 5.7) and/or instrumentally (see 4.3).

8 Test report

The test report shall include the following information:

a) a reference to this part of ISO 105 (ISO 105-E12:2010);

b) all details necessary for the identification of the sample tested;

c) the method used (mild or severe);

d) the numerical grey scale rating and/or instrumental assessment for change in colour of the specimen;

e) if single-fibre adjacent fabrics were used, the numerical grey scale rating and/or instrumental assessment for staining of each kind of adjacent fabric used;

f) if a multifibre adjacent fabric was used, the numerical grey scale rating and/or instrumental assessment for staining of each type of fibre in the multifibre adjacent fabric, and the type of multifibre adjacent fabric used;

g) if a test control was used for the severe method, the numerical grey scale rating and/or instrumental assessment for change in colour of the test control specimen;

h) any deviation, by agreement or otherwise, from the procedure specified.