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Textiles — Tests for colour fastness —

Part B03: Colour fastness to weathering: Outdoor exposure

Textiles — Essais de solidité des coloris —

Partie B03: Solidité des coloris aux intempéries: Exposition en plein air

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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.

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).

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).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

This fifth edition cancels and replaces the fourth edition (ISO 105-B03:1994), of which it constitutes a minor revision. The changes compared to the previous edition are as follows.

— In line with the ISO/IEC Directives Part 2, 2016, *Clause 3 Terms and definitions* was added and the subsequent clauses renumbered. In addition, "this part of ISO 105" was changed to "this document".

— In 4.1 (former 3.1), "At the same time and in the same place" was changed to "At the same time and in the same condition of exposure".

— ISO 105-A01 and ISO 105-A02 were dated in Clause 2 but not where they were cited in the text as no specific elements were referred to. The years were removed from Clause 2. (For information, ISO 105-A01:1994 was revised by ISO 105-A01:2010.)

— ISO 105-B01:1994 was revised by ISO 105-B01:2014. The date (2014) was kept in Clause 2 as specific elements were cited.

  — In 4.1 (former 3.1), the reference to "ISO 105-B01:1994, 4.1.1" was changed to its equivalent "ISO 105-B01:2014, 4.1.2".

  — In 6.4 (former 6.3), the reference to "ISO 105-B01:1994, 6.1" was changed to its equivalent "ISO 105-B01:2014, 6.1".

  — In the footnote in Annex A, the reference to "ISO 105-B01:1994, 4.1.1" was changed to its equivalent "ISO 105-B01:2014, 4.1.2" and the reference to "ISO 105-B01:1994, 4.1.2" was changed to its equivalent "ISO 105-B01:2014, 4.1.3".

— ISO 105-C01:1989 was revised by ISO 105-C10:2006. The change in number was made in Clause 2 and in 7.5 (former 6.5). In Clause 2, the date was removed as no references to specific elements were made.

— In Clause 9 (former Clause 8), the year of publication was updated to "ISO 105-B03:2017".

A list of all the parts in the ISO 105 series can be found on the ISO website.

Textiles — Tests for colour fastness —

Part B03:
Colour fastness to weathering: Outdoor exposure

1 Scope

This document specifies a method intended for determining the resistance of the colour of textiles of all kinds except loose fibres to the action of weather as determined by outdoor exposure.

NOTE General information on colour fastness to light is given in Annex A.

2 Normative references

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-B01:2014, *Textiles — Tests for colour fastness — Part B01: Colour fastness to light: Daylight*

ISO 105-C10:2006, *Textiles — Tests for colour fastness — Part C10: Colour fastness to washing with soap or soap and soda*

3 Terms and definitions

No terms and definitions are listed in this document.

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/

4 Principle

4.1 Specimens of the textile are exposed under specified conditions in the open air without any protection from weathering. At the same time and in the same condition of exposure, eight dyed blue wool references are exposed to daylight but are protected from rain, snow, etc., by a sheet of glass. The fastness is assessed by comparing the change in colour of the specimen with that of the blue wool references.

4.2 The wide variations in conditions under which outdoor exposures are usually carried out make it desirable to make replicate exposures starting at different times of the year. The most reliable indication of weathering fastness is obtained by taking the mean of the assessment of several exposures.

4.3 The term "change in colour" includes not only true "fading", i.e. destruction of dyes, but also changes in hue, chroma, lightness or any combination of these characteristics of colour. If the difference in colour

is a change of hue or lightness, this can be indicated by adding abbreviations, as follows, to the numerical colour fastness rating:

Bl = bluer

Y = yellower

G = greener

R = redder

D = duller

Br = brighter

If the change in hue is accompanied by a change in chroma, this can also be indicated:

W = weaker

Str = stronger

5 Reference materials and apparatus

5.1 Reference materials

The references used in this test are those specified in ISO 105-A01 and ISO 105-A02, and in ISO 105-B01:2014, 4.1.2.

5.2 Apparatus

5.2.1 Exposure rack for specimens, facing due south in the Northern hemisphere, due north in the Southern hemisphere, and sloping at an angle from the horizontal approximately equal to the latitude of the place where the exposure is made. The rack shall be sited preferably in a non-residential, non-industrial area free from dust and automobile exhaust fumes.

The rack shall be placed so that shadows of surrounding objects will not fall on the exposed textiles and constructed so that the specimens or the cloth on which the specimens are sewn (see 6.1) is firmly held. There shall be free circulation of air behind the mounted specimens.

5.2.2 Exposure rack for references, oriented as in 5.2.1, but designed to take mounted sets of colour fastness references, the racks being covered with glass having a transmission of at least 90 % between 380 nm and 750 nm, falling to 0 % between 310 nm and 320 nm.

5.2.3 Opaque cardboard, or other thin opaque material, for example thin sheet aluminium or cardboard covered with aluminium foil, or, in the case of pile fabrics, a cover that avoids surface compression.

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

5.2.5 Instruments for determining climatological data during the exposure, operated in the immediate area of the exposure racks.

To characterize the conditions at the test frame, these instruments should be capable of recording ambient temperature (daily minimum and maximum), relative humidity (daily minimum and maximum), hours of precipitation (rain), total hours of wetness (rain and dew), total radiant energy and ultraviolet radiant energy (either broad or narrow bandpass), and relative humidity (daily minimum and maximum) at the same angle of exposure as the test specimens.

When requested, data obtained shall be reported as part of the results of the test.

6 Test specimens

6.1 If the textile to be tested is fabric, use two specimens each measuring at least 40 mm × 100 mm. The specimens can be attached directly to the exposure rack (see 7.1) or sewn along each side onto a piece of scoured, undyed cloth made of hydrophobic fibre such as polyester or acrylic.

6.2 If the textile to be tested is yarn, knit or weave it into fabric and treat it as described in 6.1.

Loose fibres are not suitable for weathering tests.

6.3 Reference samples identical to those to be tested are required for comparison with the specimen during weathering.

6.4 Mount strips of colour fastness references on cardboard and cover the middle one-third as described in ISO 105-B01:2014, 6.1.

7 Procedure

7.1 Procedure common to methods 1, 2 and 3

Firmly attach to the exposure rack (5.2.1) the specimens or the cloth to which the specimens have been sewn. Place the mounted and partially covered blue wool references on the glass-covered rack (5.2.2). Expose the specimens and references simultaneously, 24 h per day, for such times as are necessary to evaluate the weathering fastness, using method 1, 2 or 3 (see 7.2 to 7.4).

7.2 Method 1

7.2.1 This method is considered most satisfactory and is mandatory in cases of dispute over the numerical rating. The basic feature is the control of the exposure periods by inspection of the *specimen* and, therefore, one set of blue wool references is required for each specimen under test. It is therefore impracticable when a large number of specimens have to be tested concurrently; in such cases, method 2 (see 7.3) shall be used.

7.2.2 Expose the specimens and the blue wool references under the conditions described in 7.1 until the contrast between the exposed specimens and a portion of the original fabric is equal to grey scale grade 3. Remove one of the specimens and cover the left-hand one-third of the references with an additional opaque cover.

7.2.3 Continue the exposure until the contrast between the remaining specimen and a portion of the original fabric is equal to grey scale grade 2. If reference 7 fades to a contrast equal to grey scale grade 4 before the contrast between the specimen and a portion of the original fabric is equal to grey scale grade 2, the exposure may be concluded at this stage and the remaining specimen and the references removed.

7.2.4 Wash both specimens, and a portion of the original fabric, and prepare them for assessment (see 7.5 and 7.6).

7.2.5 Assess the colour fastness to weathering in accordance with the method given in 8.1 to 8.4.

7.3 Method 2

7.3.1 This method should be used when the number of specimens to be tested simultaneously is so large that method 1 is impracticable. The basic feature of this method is the control of the exposure period by inspection of the *references*, which allows a number of specimens differing in weathering fastness to be tested against only one set of blue wool references, thus conserving supplies of the latter.

7.3.2 Expose the specimens and the blue wool references under the conditions described in 7.1 until the contrast between the exposed and unexposed portions of Reference 6 is equal to grey scale grade 4. At this stage, remove one specimen from each pair and cover the left-hand one-third of the references with an additional opaque cover.

7.3.3 Continue the exposure until the contrast between the fully exposed and unexposed portions of Reference 7 is equal to grey scale grade 4. Remove the remaining specimens and the references.

7.3.4 Wash and dry the exposed specimens and a portion of the original fabric from each specimen and prepare them for assessment (see 7.4 and 7.5).

7.3.5 Assess the colour fastness to weathering of each specimen in accordance with the method given in 8.1 to 8.3.

7.4 Method 3

Where the test is to be used to check conformity to agreed-upon radiant energy levels, it is permissible to expose the specimens alone or with reference samples. The specimens shall be exposed until the specified amount of radiant energy is reached, then removed together with the reference samples and evaluated as directed in 8.4.

7.5 Washing

Wash the exposed specimens and a portion of the original fabric measuring at least 40 mm × 100 mm (in the absence of adjacent fabrics) in accordance with ISO 105-C10.

7.6 Mounting

Trim and mount the washed specimens, one on each side of the washed original fabric which has been trimmed to the same size and shape as the specimens. The specimen exposed for the shorter length of time shall be mounted on the left.

8 Assessment of colour fastness to weathering

8.1 Assess the magnitude of the contrast between the specimen exposed for the *shorter* time and the original fabric in terms of the contrasts produced in the blue wool references exposed for the same period: the assessment is the number of the reference showing the contrast closest to that of the specimen. If the specimen shows changes in colour approximately half-way between two references, an appropriate half-rating, for example 3-4, shall be given.

8.2 Assess the magnitude of the contrast between the specimen exposed for the *longer* time and the original fabric in terms of the contrasts produced in the blue wool references exposed for the same period: the assessment is the number of the reference showing the contrast closest to that of the specimen. If the specimen shows changes approximately half-way between two references, an appropriate half-rating, for example 5.6, shall be given.

8.3 If specimens larger than the references are exposed, a mask of a neutral grey colour approximately midway between that illustrating grade 1 and that illustrating grade 2 of the grey scale for assessing change in colour (approximately Munsell N5) shall be used in assessment, the mask covering the surplus area of the specimens and leaving an area equal to that of the references open for comparative evaluation.

8.4 The assessment of the colour fastness according to method 3 (see 7.4) is performed with the grey scale for assessing change in colour (5.2.4) in accordance with ISO 105-A02, or alternatively by comparison of the colour change of the sample with that of the blue wool references.

9 Test report

The test report shall include the following information:

a) the number and year of publication of this document, i.e. ISO 105-B03:2017;

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

c) for methods 1 and 2, the numerical blue wool rating for weathering fastness: outdoor exposure. If the two assessments (see 8.1 and 8.2) are different, report only the lower;

d) for method 3, either the numerical rating for the change in colour of the sample, or the numerical rating for weathering fastness: outdoor exposure;

e) the place of exposure and date/time of beginning and end of the exposure.