INTERNATIONAL STANDARD

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Textiles — Tests for colour fastness —

Part A05:
Instrumental assessment of change in colour for determination of grey scale rating

Textiles — Essais de solidité des teintures —

Partie A05: Évaluation instrumentale de la dégradation pour la détermination du degré de l'échelle de gris

Reference number
ISO 105-A05:1996(E)

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.

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.

International Standard ISO 105-A05 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

ISO 105 was previously published in thirteen "parts", each designated by a letter (e.g. "Part A"), with publication dates between 1978 and 1985. Each part contained a series of "sections", each designated by the respective part letter and by a two-digit serial number (e.g. "Section A01"). These sections are now being republished as separate documents, themselves designated "parts" but retaining their earlier alphanumeric designations. A complete list of these parts is given in ISO 105-A01.

International Organization for Standardization
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Textiles — Tests for colour fastness —

Part A05:
Instrumental assessment of change in colour for determination of grey scale rating

1 Scope

This part of ISO 105 specifies an instrumental method for assessing the change in colour of a test specimen in comparison to an identical untreated reference, and the calculations undertaken to convert the instrumental measurements into a grey scale rating.

This method is intended as an alternative to the many national methods for visual evaluation of the effect of a colour fastness test on any textile material.

NOTE 1 There may be a difference between instrumental and visual assessments of specimens due to fluorescence, and/or other factors.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 105. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 105 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 105-J03:1995, *Textiles — Tests for colour fastness — Part J03: Calculation of colour differences.*

CIE Publication No. 5.2, *Colorimetry,* 2nd ed., 1986.[1)]

3 Principle

The colour of the specimen which has been subjected to the colour fastness test and the colour of an identical untreated specimen are measured instrumentally. The CIELAB coordinates for lightness L^*, chroma C^*_{ab} and hue h_{ab} are determined for both specimens, and the CIELAB differences ΔL^*, ΔC^*_{ab} and ΔH^*_{ab} are calculated and converted to a grey scale rating by means of a series of equations.

1) Available from the CIE Central Bureau, Kegelgasse 27, A-1030 Vienna, Austria.

4 Apparatus

4.1 Spectrophotometer or colorimeter, meeting any one of the illuminating and viewing conditions for reflecting specimens as described in CIE Publication 15.2, subclause 1.4.

5 Test specimen

Choose a representative sample of material which has been subjected to a colour fastness test, of adequate size to fit the sample holder of the instrument used and having no visible defects. Back a single layer of the test specimen with an opaque white material containing no fluorescent whitening agents (FWA). Both the test specimen and the untreated reference shall be backed in an identical manner.

NOTE 2 Alternatively, back the test specimen with a number of thicknesses of the identical untreated material sufficient to give an acceptably opaque specimen.

6 Test procedure

6.1 From the untreated material, prepare a reference consisting of the same number of thicknesses of material as that used to prepare the test specimen (see clause 5). Mount the reference in the sample holder and measure its colour values with the instrument (see 4.1). From the instrument system, obtain CIE tristimulus values using CIE illuminant D65 and 10° observer. Calculate the CIELAB L^*, C^*_{ab} and h_{ab} values using the data obtained, as specified in ISO 105-J03.

NOTE 3 Permitted illuminant/observer alternatives for colorimetric calculations are: D65/2°; C/2°; C/10°.

6.2 Measure the colour of the specimen (see clause 5) in the same manner and calculate the CIELAB L^*, C^*_{ab} and h_{ab} values.

7 Calculation of change in colour

7.1 Calculate the differences in lightness ΔL^*, chroma ΔC^*_{ab} and hue ΔH^*_{ab} between the reference and specimen from the data obtained in clause 6.

7.2 Calculate the change in colour ΔE_F using the following equations, where:

the subscripts S and R refer to test Specimen and Reference respectively;

the subscript N is used to indicate functions of the means of the values of the specimen and reference;

the subscript K is used to indicate corrected hue and chroma functions;

the subscript F is used to indicate special colorimetric values, to distinguish them from the CIELAB colorimetric values in common usage.

$$\Delta E_F = [(\Delta L^*)^2 + (\Delta C_F)^2 + (\Delta H_F)^2]^{1/2}$$

$$\Delta H_F = \Delta H_K/[1 + (10C_M/1\ 000)^2]$$

$$\Delta C_F = \Delta C_K/[1 + (20C_M/1\ 000)^2]$$

$$\Delta H_K = \Delta H^*_{ab} - D$$

$$\Delta C_K = \Delta C^*_{ab} - D$$

$$D = (\Delta C^*_{ab} \cdot C_M \cdot e^{-x})/100$$