INTERNATIONAL STANDARD

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Textiles — Tests for colour fastness —

Part J03: Calculation of colour differences

Textiles — Essais de solidité des teintures —

Partie J03: Calcul des écarts de couleur

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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.

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-J03 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

This second edition cancels and replaces the first edition (ISO 105-J03:1995), of which it constitutes a technical revision and incorporates ISO 105-J03:1995/Cor.1:1996 and ISO 105-J03:1995/Cor.2:2006. Subclause 3.1 has been replaced with the current CIE recommended form. The equations produce identical results, but the decimal numbers are replaced by fractions, so as not to limit precision.

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.

Textiles — Tests for colour fastness —

Part J03: Calculation of colour differences

1 Scope

This part of ISO 105 provides a method of calculating the colour difference between two specimens of the same material, measured under the same conditions, such that the numerical value $\Delta E_{cmc}(l{:}c)$ for the total colour difference quantifies the extent to which the two specimens do not match. It permits the specification of a maximum value (tolerance) which depends only on the closeness of match required for a given end-use and not on the colour involved, nor on the nature of the colour difference. The method also provides a means for establishing the ratio of differences in lightness to chroma and to hue.

NOTE Annex A gives guidance on the interpretation of results. Annex B provides sample test data for use in checking computer programs. Annex C contains a sample computer program for calculating colour difference.

2 Principle

The CIE[1)] 1976 $L^*a^*b^*$ (CIELAB) colour space has been modified to enhance its visual uniformity when calculating the colour difference between two specimens. The modifications to CIELAB by the CMC equation provide a numerical value, ΔE_{cmc}, which describes the colour difference between a sample and a reference in a more nearly uniform colour space. This permits the use of a single-number tolerance ("acceptability tolerance" or "pass/fail tolerance") for judging the acceptability of a colour match in which the tolerance is independent of the colour of the reference. The ellipsoid semi-axes (lS_L, cS_C and S_H) used to derive ΔE_{cmc} provide a means to interpret the three separate components of colour difference (lightness, chroma and hue) in manners suitable for a wide range of uses.

The equation for ΔE_{cmc} describes an ellipsoidal boundary (with axes in the directions of lightness, chroma and hue) centred about a reference. The agreed-upon ΔE_{cmc} acceptability tolerance describes a volume within which all specimens are acceptable matches to the reference.

The colour difference is composed of three components that comprise the differences between the reference and the specimen. These are as follows.

a) A **lightness** component that is weighted by a lightness tolerance ($\Delta L^*/lS_L$). This is represented as ΔL_{cmc}.

If the ΔL_{cmc} is positive, the specimen is lighter than the reference. If the ΔL_{cmc} is negative, the specimen is darker than the reference;

b) A **chroma** component that is weighted by the chroma tolerance ($\Delta C^*_{ab}/cS_C$). This is represented as ΔC_{cmc}.

If the ΔC_{cmc} is positive, the specimen is more chromatic than the reference. If the ΔC_{cmc} is negative, the specimen is less chromatic than the reference;

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