INTERNATIONAL STANDARD

# ISO 105-A06

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# Textiles — Tests for colour fastness —

## Part A06:
Instrumental determination of 1/1 standard depth of colour



*Textiles — Essais de solidité des teintures —*
*Partie A06: Méthode instrumentale pour la détermination de la profondeur de nuance standard 1/1*



Reference number
ISO 105-A06:1995(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-A06 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.

Annexes A and B of this part of ISO 105 are for information only.



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# Textiles — Tests for colour fastness —

# Part A06:
## Instrumental determination of 1/1 standard depth of colour

## 1 Scope

This method is intended for determining 1/1 standard depth of a dyeing on any textile material by a colorimetric method as a permitted alternative to the visual method described in clause 12 of ISO 105-A01:1994.

This method is applicable to 1/1 standard depth of colour only. Its use for other standard depths is under consideration.

NOTE 1 Specimens which this colorimetric method indicate to be of 1/1 standard depth may differ from specimens which are visually assessed to be of 1/1 standard depth by comparison with physical standards known to be of 1/1 standard depth. These differences may lead to differences in the results of tests applied subsequently. It is recommended that the method of assessment of 1/1 standard depth, i.e. ISO 105-A06 or visual, be included in the report of tests subsequently applied.

## 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 105. At the time of publication, the edition indicated was 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 edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

CIE Publication No. 15.2:1986, *Colorimetry*, (second edition).[1)]

## 3 Principle

The CIELAB colour coordinates $L^*$ (lightness), $C^*_{ab}$ (chroma) and $h_{ab}$ (hue) of the dyeing to be checked for 1/1 standard depth are measured instrumentally. The lightness $L_{SD}$ for 1/1 standard depth is calculated by means of a given equation. The lightness difference $\Delta L$ between the measured lightness $L^*$ of the dyeing and the calculated lightness $L_{SD}$ required for 1/1 standard depth is determined to decide if the dyeing represents 1/1 standard depth.



## 4 Apparatus

**4.1 Spectrophotometer or colorimeter**, meeting any one of the definitions described in CIE publication 15.2, subclause 1.4.

## 5 Test specimen

Cut a representative specimen of the dyeing to be checked for 1/1 standard depth and mount it on an opaque white backing which has not been pretreated with a fluorescent whitening agent. The size of the specimen shall fit at least the aperture of the instrument to be used for measurement. A minimal specimen size of 50 mm × 50 mm is recommended.

When presented to the instrument, the specimen shall be of sufficient thickness to be opaque, otherwise light will pass through the specimen and reflect off the backing material. Check the opacity of the specimen by measuring it over a black background and separately over a white background. If complete opacity cannot be achieved, then it is sufficient if the

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

difference between the $L^*$ resulting from measurements over black and white backgrounds is less than 0,2.

## 6 Procedure

Place the test specimen against the sample port of the instrument in such a way that it provides a smooth surface and read the CIELAB coordinates $L^*$ (lightness), $C^*_{ab}$ (chroma) and $h_{ab}$ (hue), using the CIE 10° observer and illuminant D65. Take at least two readings, preferably from different areas of the test specimen, and average them.

## 7 Calculation

**7.1** Calculate the lightness $L_{SD}$ required for 1/1 standard depth using the equation:

$$L_{SD} = 20{,}4 + C{\cdot}P + 6[\exp(-C{\cdot}P/6)]$$

where

$$C = C^*_{ab}$$

$$P = \sum_{m=0}^{3} K_{n,m}(h_{ab} - h_n)^m \quad \text{for } h_n \leqslant h_{ab} < h_{n+1}$$

in which

$h_n$ are the limiting angles of the different colour sectors in the CIELAB colour diagram, for $n = 1$ to 9;

$K_{n,m}$ are the coefficients of the polynominal $P$, for $m = 0$ to 3.

$h_n$ and $K_{n,m}$ are listed in table 1.

**7.2** Calcualte the lightness difference between the measured and calculated values: $\Delta L = L^* - L_{SD}$. If $\Delta L$ is not more than ± 0,5, the specimen represents 1/1 standard depth of colour.

**7.3** Typical data which may be used to verify a computer program for direct calculation of $\Delta L$ are given in annex A. Annex B suggests corrective action if the test specimen does not adequately represent 1/1 standard depth.

## 8 Test report

The test report shall include the following information:

a) the number and year of publication of this part of ISO 105; i.e. ISO 105-A06:1995;

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

c) identification of the spectrophotometer or colorimeter used, including the CIE geometry type selected;

d) the value of $\Delta L$ calculated for the sample (see 7.2);

e) the test date.



**Table 1 — Limiting angles $h_n$ and coefficients $K_{n,m}$ of the polynomial $P$**

| $n$ | $h_n$ | $K_{n,0}$ | $K_{n,1}$ | $K_{n,2}$ | $K_{n,3}$ |
|---|---|---|---|---|---|
| 1 | 0 | $3{,}27 \times 10^{-1}$ | $1{,}73 \times 10^{-3}$ | $-2{,}13 \times 10^{-5}$ | $8{,}68 \times 10^{-7}$ |
| 2 | 52 | $4{,}81 \times 10^{-1}$ | $6{,}57 \times 10^{-3}$ | $1{,}14 \times 10^{-4}$ | $-3{,}50 \times 10^{-6}$ |
| 3 | 79 | $6{,}73 \times 10^{-1}$ | $5{,}08 \times 10^{-3}$ | $-1{,}69 \times 10^{-4}$ | $1{,}07 \times 10^{-6}$ |
| 4 | 135 | $6{,}14 \times 10^{-1}$ | $-3{,}83 \times 10^{-3}$ | $1{,}02 \times 10^{-5}$ | $6{,}40 \times 10^{-8}$ |
| 5 | 203 | $4{,}21 \times 10^{-1}$ | $-1{,}56 \times 10^{-3}$ | $2{,}32 \times 10^{-5}$ | $-4{,}82 \times 10^{-7}$ |
| 6 | 267 | $2{,}90 \times 10^{-1}$ | $-4{,}51 \times 10^{-3}$ | $-6{,}93 \times 10^{-5}$ | $2{,}43 \times 10^{-6}$ |
| 7 | 302 | $1{,}51 \times 10^{-1}$ | $-4{,}40 \times 10^{-4}$ | $1{,}85 \times 10^{-4}$ | $-2{,}30 \times 10^{-6}$ |
| 8 | 340 | $2{,}76 \times 10^{-1}$ | $3{,}69 \times 10^{-3}$ | $-7{,}66 \times 10^{-5}$ | $9{,}22 \times 10^{-7}$ |
| 9 | 360 | $3{,}27 \times 10^{-1}$ | $1{,}73 \times 10^{-3}$ | $-2{,}13 \times 10^{-5}$ | $8{,}68 \times 10^{-7}$ |

# Annex A
(informative)

## Representative test data

To help check computer programs giving $\Delta L$ values directly from measured colour coordinates of the test specimen, some representative test data are given in table A.1.

**Table A.1 — Test data for computer program check of $\Delta L$ calculation**

| $L^*$ | $C^*_{ab}$ | $h_{ab}$ | $\Delta L$ |
|---|---|---|---|
| 30,0 | 20,0 | 0,0 | + 1,043 |
| 30,0 | 20,0 | 1,0 | + 1,020 |
| 30,0 | 20,0 | 180,0 | − 1,023 |
| 30,0 | 20,0 | 359,0 | + 1,072 |

# Annex B
(informative)

## Corrective action

If the lightness difference $\Delta L$ is greater than $\pm$ 0,5, the test specimen does not adequately represent 1/1 standard depth. A fresh dyeing should be made using a lower concentration of dye if $\Delta L$ is negative, or a higher concentration of dye if $\Delta L$ is positive.

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