INTERNATIONAL STANDARD

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Textiles — Tests for colour fastness —

Part C06:
Colour fastness to domestic and commercial laundering

Textiles — Essais de solidité des teintures —

Partie C06: Solidité des teintures aux lavages domestiques et industriels

Reference number
ISO 105-C06:1994(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-C06 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

This third edition cancels and replaces the second edition (included in ISO 105-C06:1987), of which it constitutes a technical revision.

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.

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Textiles — Tests for colour fastness —

Part C06:
Colour fastness to domestic and commercial laundering

1 Scope

1.1 This part of ISO 105 specifies methods intended for determining the resistance of the colour of textiles of all kinds and in all forms to domestic or commercial laundering procedures used for normal household articles. Industrial and hospital articles may be subjected to special laundering procedures which may be more severe in some respects.

1.2 The colour loss and staining resulting from desorption and/or abrasive action in one single (S) test closely approximates to one commercial or domestic laundering. The results of one multiple (M) test may in some cases be approximated by the results of up to five domestic or commercial launderings at temperatures not exceeding 70 °C. The M tests are more severe than the S tests because of an increase in mechanical action.

1.3 These methods do not reflect the effect of optical brighteners present in commercial washing products.

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-A01:1994, *Textiles — Tests for colour fastness — Part A01: General principles of testing.*

ISO 105-A02:1993, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour.*

ISO 105-A03:1993, *Textiles — Tests for colour fastness — Part A03: Grey scale for assessing staining.*

ISO 105-F:1985, *Textiles — Tests for colour fastness — Part F: Standard adjacent fabrics.*

ISO 105-F10:1989, *Textiles — Tests for colour fastness — Part F10: Specification for adjacent fabric: Multifibre.*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods.*

3 Principle

A specimen of the textile in contact with specified adjacent fabric or fabrics is laundered, rinsed and dried. Specimens are laundered under appropriate conditions of temperature, alkalinity, bleaching and abrasive action such that the result is obtained in a conveniently short time. The abrasive action is accomplished by the use of a low liquor ratio and an appropriate number of steel balls. The change in colour of the specimen and the staining of the adjacent fabric or fabrics are assessed by comparison with the grey scales.

4 Apparatus, materials and reagents

4.1 Suitable mechanical device, consisting of a water bath containing a rotatable shaft which supports, radially, stainless steel containers (75 mm ± 5 mm diameter × 125 mm ± 10 mm high) of capacity 550 ml ± 50 ml, the bottom of the containers being 45 mm ± 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 ± 2 °C.

NOTE 1 Other mechanical devices may be used for this test, provided that comparable results are obtained.

4.2 Non-corrodible (stainless) steel balls, approximately 6 mm in diameter.

4.3 Adjacent fabrics (see ISO 105-A01:1994, 8.3)

Either:

4.3.1 A multifibre adjacent fabric, complying with ISO 105-F10, according to the temperature used:

— a multifibre adjacent fabric (DW) containing wool and acetate (tests at 40 °C and 50 °C and in certain cases, to be indicated in the test report, also at 60 °C);

— a multifibre adjacent fabric (TV) not containing wool and acetate (in certain tests at 60 °C, and in all tests at 70 °C and 95 °C).

Or:

4.3.2 Two single-fibre adjacent fabrics, complying with the relevant section F01 to F08 of ISO 105-F:1985. 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 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 — Pairs of adjacent fabrics

If first piece is:	Second piece to be:	
	For tests A and B	For tests C, D and E
cotton	wool	viscose
wool	cotton	—
silk	cotton	—
viscose	wool	cotton
linen	wool	viscose
acetate and triacetate	viscose	viscose
polyamide	wool or cotton	cotton
polyester	wool or cotton	cotton
acrylic	wool or cotton	cotton

4.3.3 If required, a non-dyeable fabric (e.g. polypropylene).

4.4 Detergent, without optical brightener. A minimum volume of 1 litre of detergent solution shall be prepared, because of possible lack of homogeneity of the detergent powder.

Either of two detergents may be used:

a) AATCC Reference Detergent WOB.

The detergent is low-sudsing; the surfactants composing the detergent are anionic, with a small proportion of non-ionic, and are biodegradable. It has the following properties and composition:

Composition:	Mass fraction (%)
Linear alkylsulfonate, sodium salt (LAS)	14,00 ± 0,02
Alcohol ethoxylate	2,30 ± 0,02
Soap — high molecular mass	2,50 ± 0,02
Sodium tripolyphosphate	48,00 ± 0,02
Sodium silicate (SiO_2/Na_2O = 2/1)	9,70 ± 0,02
Sodium sulfate	15,40 ± 0,02
Carboxymethylcellulose (CMC)	0,25 ± 0,02
Water	7,85 ± 0,02
	100,00

b) In countries where perborates are used in laundering, the ECE Reference Detergent for colour fastness testing, without optical brightener, may be used.

NOTE 2 Information on the availability of this detergent can be obtained from national standards organizations.

The composition of the ECE Detergent is as follows:

Composition:	Mass fraction (%)
Linear sodium alkylbenzenesulfonate (mean length of alkane chain C 11,5)	8,0 ± 0,02
Ethoxylated tallow alcohol (14 EO)	2,9 ± 0,02
Sodium soap, chain length $C_{12} - C_{16}$: 13 % – 26 % $C_{18} - C_{22}$: 74 % – 87 %	3,5 ± 0,02
Sodium tripolyphosphate	43,7 ± 0,02
Sodium silicate (SiO_2/Na_2O = 3,3/1)	7,5 ± 0,02
Magnesium silicate	1,9 ± 0,02
Carboxymethylcellulose (CMC)	1,2 ± 0,02
Ethylenediaminetetraacetic acid (EDTA), sodium salt	0,2 ± 0,02
Sodium sulfate	21,2 ± 0,02
Water	9,9 ± 0,02
	100,00

4.5 If required, **sodium carbonate** (Na_2CO_3).

4.6 Sodium hypochlorite or **lithium hypochlorite**

The pH value and available chlorine content of a large number of tradenamed solutions of sodium hypochlorite (NaOCl) vary from pH 9,8 to 12,8 and the Cl_2 content from 40 g/l to 160 g/l. The actual available chlorine shall be determined before use and the following method is suggested.

Pipette a 1,00 ml portion of the stock sodium hypochlorite solution into a conical flask and dilute to 100 ml with grade 3 water (4.8). Add 20 ml of 294 g/l sulfuric acid (H_2SO_4) solution and 6 ml of 120 g/l potassium iodide (KI) solution. Titrate with standard volumetric sodium thiosulfate solution, $c(Na_2S_2O_3.5H_2O)$ = 0,1 mol/l.

The available chlorine (Cl_2) content is given, as a percentage by mass, by the formula

$$\frac{V \times c \times 0{,}035\,5}{V_o \times \varrho_o} \times 100$$

where

V_o is the volume, in millilitres, of sodium hypochlorite solution taken;

ϱ_o is the density, in grams per millilitre, of the sodium hypochlorite solution;

V is the volume, in millilitres, of sodium thiosulfate solution used;

c is the amount-of-substance concentration, in moles per litre, of the sodium thiosulfate solution.

4.7 If required, **sodium perborate tetrahydrate** ($NaBO_3 \cdot 4H_2O$).

4.8 Grade 3 water, complying with ISO 3696.

4.9 Grey scale for assessing change in colour in accordance with ISO 105-A02 and **grey scale for assessing staining** in accordance with ISO 105-A03.

4.10 If required for souring treatment, **acetic acid solution** containing 0,2 g of glacial acetic acid per litre.

5 Test specimen

5.1 If the textile to be tested is fabric, either:

a) attach a specimen 100 mm × 40 mm to a piece of the multifibre adjacent fabric (4.3.1), also 100 mm × 40 mm, by sewing along one of the shorter edges, with the multifibre adjacent fabric next to the face side of the specimen, or

b) attach a specimen 100 mm × 40 mm between the two single-fibre adjacent fabrics (4.3.2) by sewing along one of the shorter edges.

5.2 Yarn may be knitted into fabric and tested in this form. Where yarns or loose fibres are 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 100 mm × 40 mm piece of the multifibre fabric (4.3.1) and a 100 mm × 40 mm, piece of the non-dyeable fabric (4.3.3), and sew them along all four sides (see ISO 105-A01:1994, 9.6.3.4);

or:

b) place it between 100 mm × 40 mm pieces of the two specified single-fibre fabrics (4.3.2) and sew them along all four sides.

6 Test procedures

6.1 Prepare the wash liquor by dissolving 4 g of detergent per litre of water (4.8). For all C, D or E tests, adjust the pH as stated in table 2 by the addition of approximately 1 g of sodium carbonate per litre of

solution. The liquor should be cooled to 20 °C before the pH is measured. For the A and B tests, no adjustment of pH is required.

6.2 For tests where perborate (4.7) is employed, prepare the washing solution containing perborate at the time of use by heating the liquor to a maximum temperature of 60 °C for not more than 30 min.

6.3 For tests D3S and D3M, add to the wash liquor sufficient sodium hypochlorite solution (4.6) or lithium hypochlorite solution (4.6) to provide the concentration of available chlorine specified in table 2.

6.4 Add to each stainless steel container (4.1) the volume of wash liquor specified in table 2. Except for tests D2S and E2S, adjust the temperature of the liquor to within ± 2 °C of the specified temperature and then place in the container the specimen together with the specified number of steel balls (4.2). Close the container and operate the machine at the temperature and for the time specified in table 2.

6.5 For tests D2S and E2S, place the specimen in the container at a temperature of approximately 60 °C, close the container and raise the temperature to within ± 2 °C of the specified temperature in not more than 10 min. Begin timing the test as soon as the container is closed. Operate the machine at the temperature and for the time specified in table 2.

6.6 For all tests, remove the composite specimen at the end of the wash and rinse twice for 1 min in two separate 100 ml portions of water (4.8) at 40 °C.

6.7 In countries where the practice is to sour at the end of the washing operation, the following optional operation may be conducted.

Treat each composite specimen in a 100 ml portion of acetic acid reagent (4.10) for 1 min at 30 °C. Then rinse each composite specimen in a 100 ml portion of water (4.8) for 1 min at 30 °C.

6.8 For all methods, extract the excess water from the composite specimen.

6.9 For all methods, dry the specimen by hanging it in air at a temperature not exceeding 60 °C, with the parts in contact only at the line of stitching.

6.10 Assess the change in colour of the specimen and the staining of the adjacent fabric using the grey scales.

Table 2 — Test conditions

Test No.	Temperature °C	Liquor volume ml	Available chlorine %	Sodium perborate g/l	Time min	Number of steel balls	Adjust pH to
A1S	40	150	None	None	30	10[1]	Not adjusted
A1M	40	150	None	None	45	10	Not adjusted
A2S	40	150	None	1	30	10[1]	Not adjusted
B1S	50	150	None	None	30	25[1]	Not adjusted
B1M	50	150	None	None	45	50	Not adjusted
B2S	50	150	None	1	30	25[1]	Not adjusted
C1S	60	50	None	None	30	25	10,5 ± 0,1
C1M	60	50	None	None	45	50	10,5 ± 0,1
C2S	60	50	None	1	30	25	10,5 ± 0,1
D1S	70	50	None	None	30	25	10,5 ± 0,1
D1M	70	50	None	None	45	100	10,5 ± 0,1
D2S	70	50	None	1	30	25	10,5 ± 0,1
D3S	70	50	0,015	None	30	25	10,5 ± 0,1
D3M	70	50	0,015	None	45	100	10,5 ± 0,1
E1S	95	50	None	None	30	25	10,5 ± 0,1
E2S	95	50	None	1	30	25	10,5 ± 0,1

1) For delicate fabrics and articles of wool or silk or blends containing these fibres, steel balls are not used in the test. Record the use of steel balls in the test report [see 7 g)].