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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

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 105-C06 was prepared by Technical Committee ISO/TC 38, *Textiles*.

This second edition cancels and replaces the first edition (included in ISO 105-C : 1982), 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.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Textiles — Tests for colour fastness —

Part C06:
Colour fastness to domestic and commercial laundering

0 Introduction

The test methods in this part of ISO 105 are intended to reflect the effect of comprehensive laundering by either domestic or commercial procedures, as distinct from the washing test methods given in ISO 105-C01 to C05.

1 Scope and field of application

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 "S" (single) test closely approximates to one commercial or domestic laundering. The results of one "M" (multiple) 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 References

ISO 105, *Textiles — Tests for colour fastness —*

Part A01: General principles of testing.

Part A02: Grey scale for assessing change in colour.

Part A03: Grey scale for assessing staining.

Part F01: Specification for reference adjacent fabric: Wool.

Part F02: Specification for reference adjacent fabric: Cotton and viscose.

Part F03: Specification for reference adjacent fabric: Polyamide.

Part F04: Specification for reference adjacent fabric: Polyester.

Part F05: Specification for reference adjacent fabric: Acrylic.

Part F06: Specification for reference adjacent fabric: Silk.

Part F07: Specification for reference adjacent fabric: Secondary acetate.

Part F08: Specification for reference adjacent fabric: Triacetate.

Part F10: Specification for reference adjacent fabric: Multifibre. [1]

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 with the grey scales.

4 Apparatus and reagents

4.1 Suitable mechanical device (see 8.1), consisting of a water bath containing a rotatable shaft which supports, radially, stainless steel containers (75 ± 5 mm diameter × 125 ± 10 mm high) of capacity 550 ± 50 ml, the bottom of the containers being 45 ± 10 mm from the centre of the shaft.

1) At present at the stage of draft.

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.

4.2 Non-corrodible (stainless) steel balls, approximately 0,6 cm in diameter.

4.3 Adjacent fabrics.

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 — see note — also at 60 °C);

NOTE — These cases should be indicated in the test report [see 7a)].

— 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, one of the same fibre (or the predominant fibre in the case of blends) as the fabric under test and the second made of the fibre specified in table 1 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 (see 8.2).

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

4.6 Sodium hypochlorite or **lithium hypochlorite** (see 8.3).

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

4.8 Distilled water (see 8.4).

4.9 Grey scales for assessing change in colour and staining (see clause 2).

4.10 If required for pressing treatment, **flat-iron,** of mass not exceeding 2,5 kg and capable of giving the temperature indicated in 6.9 b).

4.11 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 10 cm × 4 cm to a piece of the multifibre adjacent fabric (4.3.1), also 10 cm × 4 cm, 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 10 cm × 4 cm 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 10 cm × 4 cm piece of the multifibre fabric (4.3.1) and a 10 cm × 4 cm piece of the non-dyeable fabric (4.3.3) and sew them along all four sides (see subclause 8.6 of ISO 105-A01), or

b) place it between 10 cm × 4 cm 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 distilled water (see 8.4). 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 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 or lithium hypochlorite solution to provide the concentration of available chlorine specified in table 2.

6.4 Add to each container 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

Table 2 — Test conditions

Test No.	Temperature °C	Liquor volume ml	Available chlorine %	Sodium perborate g/l	Time min	Steel balls	Adjust pH to
A1S	40	150	None	None	30	10*	Not adjusted
A1M	40	150	None	None	45	10	Not adjusted
A2S	40	150	None	1	30	10*	Not adjusted
B1S	50	150	None	None	30	25*	Not adjusted
B1M	50	150	None	None	45	50	Not adjusted
B2S	50	150	None	1	30	25*	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

* 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 7c)].

together with the specified number of steel balls. 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 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 the acetic acid reagent (4.11) for 1 min at 30 °C. Then rinse each composite specimen in a 100 ml portion of water 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 one of the following procedures:

a) by hanging it in air at a temperature not exceeding 60 °C, with the parts in contact only at the line of stitching;

b) in countries where the practice is to dry fabrics by pressing, each specimen may be dried by pressing it with the flat-iron (4.10) at the temperature appropriate to the fabric under test, but in no case at a temperature above 150 °C, with the adjacent fabric uppermost and in contact with the face of the specimen.

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

7 Test report

The test report shall include the following information:

a) the numerical ratings for the change in colour of the specimen and for the staining of the adjacent fabric used;

b) the number of the method of test used (as listed in table 2);

c) whether steel balls have been used in some of the A or B tests;

d) whether the treatment in the acetic acid reagent described in 6.7 was conducted;

e) whether the specimen was air dried or dried by pressing as described in 6.9; if the latter, the temperature of the pressing treatment shall be reported;

f) whether the AATCC Reference Detergent WOB or the ECE Reference Detergent for colour fastness testing, without optical brightener, was used.

8 Notes

8.1 Other mechanical devices may be used for this test, provided that the results are identical with those obtained by the apparatus described in 4.1.

8.2 Either of two detergents may be used:

a) AATCC Reference Detergent WOB with the following properties and composition:

The detergent is low sudsing; the surfactants composing the detergent are anionic with a small proportion of non-ionic. They are biodegradable.

Nominal composition :	% (*m*/*m*) (± 0,02 %)
Linear alkyl sulfonate, sodium salt (LAS)	14,00
Alcohol ethoxylate	2,30
Soap — high molecular mass	2,50
Sodium tripolyphosphate	48,00
Sodium silicate (SiO_2/Na_2O = 2/1)	9,70
Sodium sulfate	15,40
Carboxymethylcellulose (CMC)	0,25
Water	7,85
	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 — Information on the availability of this detergent can be obtained from national standards organizations.

The composition of the ECE Detergent is as follows:

	Composition as such % (*m*/*m*) (± 0,02 %)
Linear sodium alkyl benzene sulfonate (mean length of alkane chain C 11,5)	8,0
Ethoxylated tallow alcohol (14 EO)	2,9
Sodium soap, chain length C_{12} — C_{16} : 13 — 26 % C_{18} — C_{22} : 74 — 87 %	3,5
Sodium tripolyphosphate	43,7
Sodium silicate (SiO_2/Na_2O = 3,3/1)	7,5
Magnesium silicate	1,9
Carboxymethylcellulose (CMC)	1,2
EDTA, sodium salt	0,2
Sodium sulfate	21,2
Water	9,9
	100,0

8.3 The pH value and available chlorine content of a large number of trade-named products of sodium hypochlorite (NaOCl) vary from pH 9,8 to 12,8 and the Cl_2 content from 40 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 distilled water. 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

$$\frac{V \times c \times 0{,}035\,5}{V_0 \times \varrho_0} \times 100$$

where

V_0 is the volume, in millilitres, of sodium hypochlorite solution taken;

ϱ_0 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.

8.4 Distilled water or water of near-zero hardness (not over 5 ppm) shall be used to dissolve the detergent for the test solution.

A minimum volume of 1 litre of detergent solution shall be prepared because of possible lack of homogeneity of the detergent powder.