INTERNATIONAL STANDARD

ISO 105-C12

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Textiles — Tests for colour fastness —

Part C12: Colour fastness to industrial laundering

Textiles — Essais de solidité des teintures —

Partie C12: Solidité des teintures au lavage industriel

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Foreword

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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-C12 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 A02”). These sections are 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.

Introduction

The test method in this part of ISO 105 is intended to reflect the effect of comprehensive laundering during industrial laundry procedures, as distinct from the domestic washing test methods as given in ISO 105-C05, ISO 105-C06 and ISO 105-C08. Four test conditions are described, one at (92 ± 2)°C intended for the evaluation of workwear and three, as given below, at (75 ± 2) °C, for the evaluation of bed and table linen and corporate wear:

— without the addition of peroxy bleach compounds;

— with the addition of hydrogen peroxide (for the bleaching of white work with coloured trimmings);

— with the addition of sodium perborate tetrahydrate and tetra-acetylethylene diamine (TAED) (for the bleaching of white work with coloured trimmings).

NOTE The addition of TAED/perborate is a conveniently stable way of producing peracetic acid *in situ*.

This method of test does not reflect the effect of optical brightening agents.

This method and the single cycle test methods described in ISO 105-C06 and ISO 105-C08 may not reproduce the effect of coloured fabrics treated with certain dye fixing agents and finishes after multiple (5 to 10) industrial washes.

Textiles — Tests for colour fastness —

Part C12:
Colour fastness to industrial laundering

1 Scope

This part of ISO 105 specifies methods for determining the resistance of the colour of textiles of all kinds exposed to all forms of industrial laundering procedures.

One cycle approximates to the colour loss and cross staining resulting from chemical and/or mechanical action achieved after multiple (5 to 10) industrial launderings.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 105-A01:1994, *Textiles — Tests for colour fastness — Part A01: General principles of testing*

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

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

ISO 105-A04, *Textiles — Tests for colour fastness — Part A04: Method for the instrumental assessment of the degree of staining of adjacent fabrics*

ISO 105-A05, *Textiles — Tests for colour fastness — Part A05: Instrumental assessment of change in colour for determination of grey scale rating*

ISO 105-F02, *Textiles — Tests for colour fastness — Part F02: Specification for cotton and viscose adjacent fabrics*

ISO 105-F04, *Textiles — Tests for colour fastness — Part F04: Specification for polyester adjacent fabric*

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

ISO 139, *Textiles — Standard atmospheres for conditioning and testing*

3 Principle

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

4 Reagents

NOTE All chemicals should be of at least general purpose laboratory grade.

4.1 Detergent, as specified in Annex A.

4.2 Solution, containing 0,2 g/l of glacial acetic acid, if required for souring treatment.

4.3 Hydrogen peroxide solution, 30 %.

4.4 Sodium hydroxide (NaOH) pellets.

4.5 Tetra-acetylethylenediamine (TAED).

4.6 Sodium perborate tetrahydrate.

4.7 Distilled water, grade 3 water (see 8.2 of ISO 105-A01:1994)

5 Apparatus

5.1 Suitable mechanical device, 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. 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 Other mechanical devices may be used for this test, provided that the results are identical with those obtained by the apparatus described.

5.2 Mechanical stirrer, minimum (1 100 ± 100) min^{-1} or equivalent, to ensure dispersion and prevent settling.

5.3 Steel balls, non-corrodible (stainless), approximately 6,0 mm in diameter.

5.4 Adjacent fabrics.

5.4.1 A multifibre adjacent fabric complying to type (TV) of ISO 105-F10:1989

or

5.4.2 Two single-fibre adjacent fabrics, one cotton and one polyester, in accordance with ISO 105-F02 and ISO 105-F04 or as otherwise specified between interested parties.

5.4.3 If required, a non-dyeable fabric (e.g. polypropylene) (e.g. to mechanically stabilize a knitwear specimen).

5.5 Grey scale, for assessing change in colour in accordance with ISO 105-A02, or instrumentally ISO 105-A05, and for assessing staining in accordance with ISO 105-A03, or instrumentally ISO 105-A04.

5.6 Flat-iron, of mass not exceeding 2,5 kg (± 100 g) and capable of giving the temperature indicated in 7.2.5, if a pressing treatment is required. Condition the sample for 24 h before assessing to allow for temporary colour change caused by heat.

6 Test specimens

6.1 Fabric specimen

Cut two fabric test specimens each 80 mm × 160 mm, one specimen in the warp direction and one specimen in the weft direction. In the case of knitwear prepare two specimens. Weigh the two specimens to two decimal places (grams). Fold each specimen across the narrow dimension in the centre of the specimen with fabric face on the outside (see Figure 1). Using dimensionally stable thread, sew along the two sides to form a bag. Place 25 stainless steel balls inside each bag and seal by sewing.

6.2 Adjacent fabrics

Either:

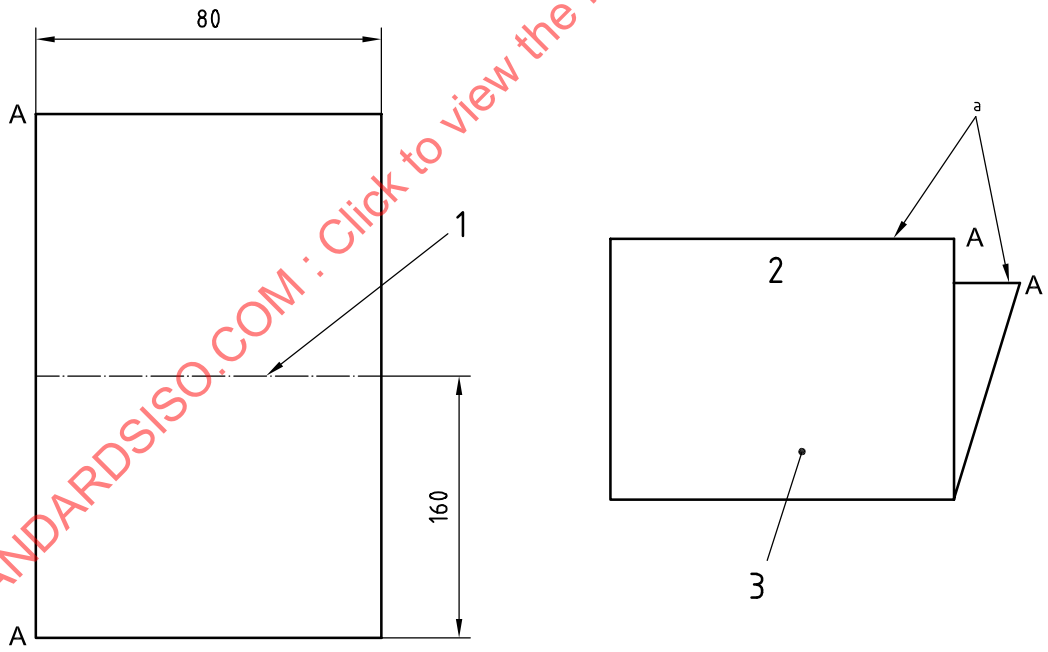
a) cut a sample of multifibre TV adjacent fabric (5.4.1) and weigh to two decimal places (grams);

or

b) cut a sample 100 mm × 80 mm, of the two single-fibre adjacent fabrics (5.4.2) and weigh to two decimal places (grams).

NOTE The two-fabric test specimen and adjacent staining fabrics are not sewn to each other. This allows fabric abrasion to occur.

Dimensions in millimetes



Key

1 fold line
2 folded edge
3 folded specimen

a Sew along two open sides.

Figure 1 — Preparation of test specimens

7 Test procedures

7.1 Preparation of wash liquor

7.1.1 Tests without the addition of hydrogen peroxide

Using the mixer (5.2), disperse 5 g/l of the industrial reference detergent (4.1) base powder (without optical brightener) in grade 3 water (4.7) at ambient temperature for (10 ± 1) min. Add 1 g of sodium hydroxide (4.4) per litre of solution. Using glacial acetic acid (4.2), adjust the pH to be within the range 12,0 to 12,5 and use immediately. Proceed as in 7.2.

7.1.2 Tests with the addition of hydrogen peroxide

Using the mixer (5.2), disperse 5 g/l of the industrial reference detergent (4.1) base powder (without optical brightener) in grade 3 water (4.7) at ambient temperature for (10 ± 1) min. Add 1 g of sodium hydroxide (4.4) per litre of solution. Using glacial acetic acid (4.2), adjust the pH to be within the range 11,0 to 11,5. Add 2 ml of 30 % hydrogen peroxide (4.3) and use immediately. Proceed as in 7.2.

7.1.3 Tests with the addition of sodium perborate and tetra acetylethylenediamine (peracetic acid)

Using the mixer (5.2), disperse 5 g/l of the industrial reference detergent (4.1) base powder (without optical brightener), 2 g of sodium perborate tetrahydrate (4.6) and 0,3 g TAED (4.5) (100 % activity) in grade 3 water (4.7) at ambient temperature for (10 ± 1) min. Using sodium hydroxide (4.4), adjust the pH to be within the range 10,0 to 10,5 and use immediately. Proceed as in 7.2.

7.2 Testing the specimens

7.2.1 To each container (see 5.1) add wash liquor at a ratio of 15:1 liquor:fabric (i.e., 15 ml of solution for each gram of combined specimen weight). Place both the prepared test specimens and the separate adjacent fabric in the container together with an additional 25 stainless steel balls (5.3). Close the containers, place them in the machine (5.1), commence rotation and raise the temperature at a rate of (1,5 ± 0,5) °C/min to the temperature specified in Table 1. Continue to run the test for a further 60 min at this temperature.

Table 1 — Test conditions

Test number	Temperature	pH	Additions of bleaching agents
1 S	92 ± 2 °C	12,0 to 12,5	nil
2 S	75 ± 2 °C	12,0 to 12,5	nil
1 P	75 ± 2 °C	11,0 to11,5	2 ml/l of 30 % hydrogen peroxide
2 P	75 ± 2 °C	10,0 to 10,5	2 g/l sodium perborate tetrahydrate 0,3 g/l TAED
NOTE During the test, pressure may develop within the container. Containers should always be cooled and the pressure released before opening.			

7.2.2 Remove the fabric test specimens and the adjacent fabric(s) at the end of the wash and rinse twice for 1 min in two separate 100 ml portions of grade 3 water (4.7), and then in cold, running tap water for 10 min.

7.2.3 Where the practice is to sour at the end of the washing operation, the following optional operation may be conducted.

Treat the fabric test specimens in a 100 ml portion of acetic acid solution (4.2) for 1 min at 30 °C then rinse each composite specimen in a 100 ml portion of grade 3 water (4.7) for 1 min.

7.2.4 Extract excess water from the fabric test specimen by squeezing.

7.2.5 Open out the specimens for measurement, by cutting along the seams. Dry the specimens and adjacent fabrics by hanging in air at a temperature not exceeding 60 °C.

If required, press dry each specimen by pressing with a flat iron (5.6) at a temperature appropriate to the fabric under test, but in no case at a temperature above 150 °C. Condition the specimen for at least 4 h at the standard atmosphere for testing, as defined in ISO 139.

7.2.6 Assess against the unwashed fabric, the change in colour of the specimen and the staining of the adjacent fabric, using the grey scale (5.5) or instrumentally.

Any change in colour at the fold line shall be visually assessed and commented on.

7.2.7 If agreed upon between parties, further wash cycles may be carried out on the same specimens in order to simulate a greater number of industrial washes.

8 Test report

The test report shall include the following information:

a) the number of this part of ISO 105, i.e., ISO 105-C12;

b) the instrumental and/or the grey scale ratings for the change in colour of the specimen and for the staining of the adjacent fabric(s) used;

c) the test number used;

d) whether the treatment in acetic acid solution described in 7.2.3 was conducted;

e) whether the fabric test specimens were air dried or dried by pressing as described in 7.2.5 and if the latter, the temperature of the pressing treatment;

f) the number of wash, rinse and drying cycles carried out (see 7.2.7);

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

h) testing authority and date of testing.