INTERNATIONAL STANDARD

ISO 105-E03

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Textiles — Tests for colour fastness —

Part E03: Colour fastness to chlorinated water (swimming-pool water)

Textiles — Essais de solidité des coloris —

Partie E03: Solidité des coloris à l'eau chlorée (eau de piscine)

Reference number
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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-E03 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

This fourth edition cancels and replaces the third edition (ISO 105-E03:1994), of which Clauses 2 and 5 have been technically revised and instrument assessment added to the appropriate clauses.

ISO 105 consists of many parts designated by a part letter and a two-digit serial number (e.g. A01), under the general title *Textiles — Tests for colour fastness*. A complete list of these parts is given in ISO 105-A01.

Textiles — Tests for colour fastness —

Part E03:
Colour fastness to chlorinated water (swimming-pool water)

1 Scope

This part of ISO 105 specifies a method for determining the resistance of the colour of textiles of all kinds and in all forms to the action of active chlorine in concentrations such as are used to disinfect swimming-pool water (break-point chlorination).

Three alternative test conditions are specified. The active chlorine concentrations of 50 mg/l and 100 mg/l are intended for swimwear. The active chlorine concentration of 20 mg/l is intended for accessories such as beach robes and towels.

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

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

3 Principle

A specimen of the textile is treated with a weak chlorine solution of a given concentration and dried. The change in colour of the specimen is assessed by comparison with the grey scale or instrumentally. Three alternative test conditions are specified.

4 Apparatus

4.1 Suitable mechanical device, consisting of a water bath containing a rotatable shaft which supports, radially, glass or stainless steel containers with a diameter of (75 ± 5) mm and a height of (125 ± 10) mm of (550 ± 50) ml capacity, 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.

Other mechanical devices may be used for the test, provided that the results are identical to those obtained in the apparatus described above.

4.2 **pH-meter**, having an accuracy of 0,02 units.

4.3 **Grey scale for assessing change in colour**, complying with ISO 105-A02.

4.4 **Spectrophotometer** or **colorimeter for assessing change in colour**, complying with ISO 105-A05.

4.5 **Analytical balance**, accurate to ± 0,01 g (see ISO 105-A01).

5 Reagents

5.1 **Sodium hypochlorite** (NaOCl), aqueous solution, having the following composition:

— active chlorine: 140 g/l to 160 g/l;

— sodium chloride (NaCl): 120 g/l to 170 g/l;

— sodium hydroxide (NaOH): 20 g/l maximum;

— sodium carbonate (Na_2CO_3): 20 g/l maximum;

— iron (Fe): 0,01 g/l maximum.

All sodium hypochlorite solutions should be prepared just prior to use.

5.2 **Sodium hypochlorite** (NaOCl), aqueous solution, containing 100 mg of active chlorine per litre, at pH = 7,50 ± 0,05.

Prepare solutions as follows, using grade 3 water (5.7):

— Solution 1: dilute 20,0 ml of sodium hypochlorite solution (5.1) to 1 litre;

— Solution 2: 14,35 g of KH_2PO_4 (5.5) per litre;

— Solution 3: 20,05 g of $Na_2HPO_4{\cdot}2H_2O$ (5.6) per litre, or 40,35 g $Na_2HPO_4{\cdot}12H_2O$ (5.6) per litre.

To 25,0 ml of Solution 1, add excess potassium iodide (KI) and hydrochloric acid (HCl), and titrate the liberated iodine with a sodium thiosulfate solution, $c(Na_2S_2O_3) = 0{,}1$ mol/l, using starch as indicator.

Let the volume of sodium thiosulfate solution required be V ml.

For each litre of working solution at pH 7,50 ± 0,05, use:

$\frac{705{,}0}{V}$ ml Solution 1

100,0 ml Solution 2

500,0 ml Solution 3

Dilute to 1 litre, with water.

Before use, check the pH of the solution using the calibrated pH-meter (4.2).

If necessary, adjust the pH using either sodium hydroxide, $c(NaOH) = 0{,}1$ mol/l, or acetic acid, $c(CH_3COOH) = 0{,}1$ mol/l.

5.3 Sodium hypochlorite (NaOCl) aqueous solution, containing 50 mg of active chlorine per litre, at pH = 7,50 ± 0,05.

Follow the same procedure as in 5.2, except that, for each litre of working solution at pH 7,50 ± 0,05, use $\frac{705,0}{2V}$ ml of Solution 1.

5.4 Sodium hypochlorite (NaOCl), aqueous solution, containing 20 mg of active chlorine per litre, at pH = 7,50 ± 0,05.

Follow the same procedure as in 5.2, except that, for each litre of working solution at pH 7,50 ± 0,05, use $\frac{705,0}{5V}$ ml of Solution 1.

5.5 Potassium dihydrogenphosphate (KH_2PO_4).

5.6 Disodium hydrogenphosphate dihydrate ($Na_2HPO_4 \cdot 2H_2O$), or **disodium hydrogenphosphate dodecahydrate** ($Na_2HPO_4 \cdot 12H_2O$).

5.7 Grade 3 water, complying with ISO 3696.

6 Test specimen

6.1 If the textile to be tested is fabric, use a specimen measuring (40 ± 2) mm × (100 ± 2) mm.

6.2 If the textile to be tested is yarn, knit it into fabric and use a specimen measuring (40 ± 2) mm × (100 ± 2) mm, or make a wick of parallel lengths, (100 ± 2) mm long and about (5 ± 2) mm in diameter, tied near both ends.

6.3 If the textile to be tested is loose fibre, comb and compress enough of it to form a sheet measuring (40 ± 2) mm × (100 ± 2) mm. Determine the mass of the fibre and sew it onto a piece of polyester or polypropylene cloth to support the fibre. The liquor ratio (see 7.1) shall be based on the mass of fibre only.

7 Procedure

7.1 Each specimen shall be tested in a separate container in the mechanical device (4.1). Immerse the specimen in the sodium hypochlorite solution (5.2, 5.3 or 5.4), of liquor ratio 100:1, ensuring that the specimen is thoroughly wetted. Close the container and agitate at (27 ± 2) °C for 1 h in darkness.

7.2 Remove the specimen from the container, squeeze or hydroextract it, and dry it by hanging it in air at room temperature in subdued light.

7.3 Assess the change in colour of each specimen with reference to the original specimen by comparison with the grey scale (4.3) and/or instrumentally (see 4.4).

8 Test report

The test report shall include the following information:

a) a reference to this part of ISO 105 (ISO 105-E03:2010);

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

c) the numerical grey scale ratings and/or instrument assessment for the change in colour of each specimen;

d) the concentration of active chlorine used (see 5.2, 5.3 and 5.4.);

e) any deviation, by agreement or otherwise, from the procedure specified.