International Standard ISO 3175

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Textiles — Determination of dimensional change on dry cleaning in perchlorethylene — Machine method

Textiles — Détermination de la variation des dimensions au nettoyage à sec dans le perchloréthylène — Méthode à la machine

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FOREWORD

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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.

International Standard ISO 3175 was developed by Technical Committee ISO/TC 38, *Textiles*. The first edition (ISO 3175-1975) had been approved by the member bodies of the following countries :

Australia	Germany, F. R.	Poland
Belgium	Hungary	South Africa, Rep. of
Brazil	India	Sweden
Bulgaria	Iran	Switzerland
Canada	Ireland	Thailand
Chile	Israel	Turkey
Czechoslovakia	Italy	United Kingdom
Denmark	Japan	USSR
Egypt, Arab Rep. of	Netherlands	
Finland	New Zealand	

The member bodies of the following countries had expressed disapproval of the document on technical grounds :

France
USA

This second edition, which supersedes ISO 3175-1975, incorporates draft Amendment 1, which was circulated to the member bodies in May 1978. This draft amendment has been approved by the member bodies of the following countries :

Belgium	Iran	Romania
Bulgaria	Israel	South Africa, Rep. of
Canada	Italy	Spain
Czechoslovakia	Japan	Sweden
Denmark	Korea, Rep. of	Switzerland
Finland	Mexico	Thailand
Germany, F. R.	Netherlands	Turkey
Ghana	New Zealand	United Kingdom
Hungary	Poland	USA
India	Portugal	USSR

No member body expressed disapproval of the document.

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Textiles — Determination of dimensional change on dry cleaning in perchloroethylene — Machine method

0 INTRODUCTION

Dry cleaning is a process for cleaning textiles in an organic solvent that dissolves oils and fats and disperses particulate dirt substantially without the swelling and creasing associated with washing or wet cleaning. Small quantities of water may be incorporated in the solvent with the aid of a surfactant for the purpose of obtaining better soil and stain removal. Some moisture-sensitive articles are preferably dry cleaned without the addition of water to the solvent, but a surfactant can be used in order to assist soil removal and prevent greying.

Different solvents can be used for dry cleaning, of which perchloroethylene (tetrachloroethylene) is the most common in many countries. For this reason, the present method prescribes the use of perchloroethylene. However, it could be used with modification for the determination of the dimensional stability on dry cleaning in trichloroethylene or in white spirit (Stoddard solvent), or in trichlorotrifluoroethane.

Dry cleaning is normally followed by an appropriate restorative finishing procedure. In most cases, this comprises some form of steam treatment and/or hot pressing.

Dimensional change on dry cleaning and steaming and/or pressing is progressive and in some cases a single treatment may give little indication of the extent of dimensional change that may arise after repeated treatments. Generally, most of the potential dimensional change is released after three to five dry-cleaning and finishing treatments.

1 SCOPE AND FIELD OF APPLICATION

1.1 This International Standard specifies a dry-cleaning procedure, using a commercial dry-cleaning machine, for the determination of dimensional change of fabrics and garments after dry cleaning in perchloroethylene. It comprises a process for normal materials (see 12.4) and a process for sensitive materials (see 12.4).

1.2 Very sensitive materials (see 12.4), which can only be cleaned when special precautions are taken, are excluded from the scope of this International Standard.

1.3 The method is intended only for the assessment of dimensional changes undergone by a specimen subjected to a single dry-cleaning and finishing operation. When it is desired to determine the amount of progressive dimensional change, the method may be repeated a specified number of times, normally not exceeding five cycles.

2 REFERENCES

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

ISO 3759, *Textiles — Preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change.*

3 PRINCIPLE

Conditioned fabrics or garments are marked and measured, then subjected to a dry-cleaning procedure, followed by an appropriate finishing procedure. They are afterwards conditioned and measured. The dimensional change is expressed as a percentage of the original dimensions.

4 REAGENTS

4.1 Perchloroethylene (tetrachloroethylene), $CCl_2 = CCl_2$, dry-cleaning grade.

4.2 Sorbitan mono-oleate.

5 APPARATUS

5.1 Dry-cleaning machine. This shall consist of a commercial rotating cage type, totally enclosed machine for use with perchloroethylene. The diameter of the rotating cage shall be not less than 600 mm and not more than 1 080 mm. Its depth shall be not less than 300 mm. It shall be fitted with three or four lifters. The speed shall be such as to give a *g*-factor (see 12.1) between 0,5 and 0,8 for cleaning and between 60 and 120 for extraction.

The machine shall be equipped with a thermometer for the measurement of the solvent temperature.

The machine shall have suitable facilities so that the emulsion can be introduced gradually into the solvent between the inner and outer cages below the level of the solvent.

The machine may be of the single-unit washer/dryer type or a separate dryer may be used. Both types shall be equipped with temperature control of either the incoming or the outgoing air during the drying cycle. (Information on solvent recovery is given in 12.2.) The dimensions of the rotating drum of the separate dryer shall comply with those given for the dry-cleaning machine.

5.2 Apparatus for applying the appropriate finishing treatment to the test specimen (see 12.3).

5.3 Means of producing the standard atmosphere for conditioning and testing textiles.

5.4 Make-weight consisting of clean textile pieces or garments. These shall be white or a light colour and consist of about 80 % wool and 20 % cotton or rayon.

5.5 Means of marking the test specimen, as required by ISO 3759.

5.6 Stable measuring scale of dimensions suitable for the article being tested, graduated in millimetres.

5.7 Flat table of dimensions such that the article being tested can be laid flat for measurement.

6 ATMOSPHERE FOR CONDITIONING AND TESTING

The specimens and make-weight shall be conditioned and all measurements made in one of the standard atmospheres for conditioning and testing textiles specified in ISO 139.

7 SPECIMENS

7.1 Garments shall be tested as such.

7.2 Fabrics shall be cut into test specimens preferably not smaller than 500 mm × 500 mm and stitched on all sides with polyester thread to prevent unravelling.

7.3 Elastic circular knits shall be carefully opened by cutting in the direction of the ribs without causing distortion. After marking and measuring according to clause 8, the circular state shall be restored by sewing together the cut edges. After the test, the seam shall be cut again and distances between markings determined in the open state.

8 MARKING, CONDITIONING AND MEASURING

8.1 Follow the procedures for preparation of fabrics and garments given in ISO 3759.

8.2 When testing fabric specimens, lay out the specimen without tension on a flat, smooth surface, taking care to see that it is free from wrinkles and creases. Make three pairs of marks, each at least 250 mm apart, in the length direction and three similar pairs of marks in the width direction of the fabric.

If the specimen is a garment, mark and measure different parts of the outer fabrics and linings separately.

8.3 Condition the specimen and make-weight in the standard atmosphere for testing textiles for at least 24 h.

8.4 Lay the specimen out according to 8.2 and measure the distance between marks to the nearest millimetre. Measure overall dimensions of garments to within ± 2 mm. Make all measurements in the standard atmosphere for conditioning and testing textiles.

9 PROCEDURE

9.1 Process for normal materials

9.1.1 The mass of the complete load shall be 50 ± 2 kg for each cubic metre of the volume of the inner cage. Ensure that the mass of the textile part of the test specimen(s) is not more than 10 % of the total load, the remainder consisting of the make-weight unless the mass of the test piece or garment as such exceeds 10 % of the total load.

When loaded into the machine, the specimen(s) and the make-weight shall be in equilibrium with the standard atmosphere for testing textiles. Equilibrium is deemed to be attained after exposure for 24 h to this atmosphere.

9.1.2 Place the conditioned load in the machine and introduce perchloroethylene containing 1 g/l of sorbitan mono-oleate so that the liquor ratio, calculated on the volume of solvent in the outer and inner cages, is 6,5 ± 0,5 l for each kilogram of load (this corresponds to a solvent level of about 30 % of the inner cage diameter).

Maintain the solvent at 30 ± 3 °C throughout the cleaning operation.

9.1.3 Prepare an emulsion by mixing 1 part (by volume) of the sorbitan mono-oleate with 3 parts of perchloroethylene and then adding 2 parts of water (with stirring).

Start the machine with the filter circuit shut off and slowly (over a period of not less than 2 min and not more than 12 min) add an amount of emulsion, corresponding to 2 % of water calculated on the mass of the load, to the machine between the inner and outer cages below the level of the solvent.

9.1.4 Keep the machine running for 15 min after switching it on. Do not use the filter circuit for the duration of the test.

9.1.5 Drain the solvent and centrifugally extract the solvent from the load for 2 min (at least 1 min being at full extraction speed).

9.1.6 Introduce pure dry solvent at the same liquor ratio (see 9.1.2) and rinse for 5 min. Drain and extract again for 3 min (at least 2 min being at full extraction speed).

9.1.7 Dry the load in the machine or in a separate drying tumbler, by tumbling in circulating warm air for an appropriate time, preferably using an automatic solvent-dryness control. Either the outlet air temperature shall not exceed 60 °C, or the inlet temperature shall not exceed 80 °C.[1)]

After drying, blow air at ambient temperature through the rotating load for 3 to 5 min.

9.1.8 Take the specimen(s) immediately from the machine. Place garments individually on hangers and place fabric specimens on a flat surface, for not less than 30 min before finishing.

NOTE – If additional information on stability to dry cleaning only is required, condition and re-measure the specimen at this stage before completing the procedure. Include in the test report details of this procedure.

9.1.9 Carry out a finishing treatment by the method appropriate for the type of garment or fabric under test (see 12.3).

In most cases, this will involve pressing on a garment (steam) press supplied with steam at a pressure of from 370 to 490 kPa[2)] (3,8 to 5 kgf/cm^2) (over-pressure) or steaming on a steam/air garment former for 5 to 20 s followed by drying with warm air for 5 to 20 s.

9.1.10 Condition the specimen according to 8.3 and measure, according to 8.4, the distances previously marked and measured.

9.2 Process for sensitive materials

9.2.1 Proceed as in 9.1.1 but use a total load of mass 33 ± 2 kg for each cubic metre of the volume of the inner cage.

9.2.2 Proceed as in 9.1.2 but increase the amount of solvent to 10 ± 1 l for each kilogram of load (this gives about the same solvent level as in 9.1.2).

9.2.3 Proceed as in 9.1.3 but operating at solvent relative humidity of 63 ± 2 %. This means that no water emulsion addition is necessary.

9.2.4 Proceed as in 9.1.4, but reduce the running time to 10 min.

9.2.5 Proceed as in 9.1.5 to 9.1.10, but reduce the period of rinsing to 3 min and reduce the period of extraction at full extraction speed to 1 min.

10 CALCULATION AND EXPRESSION OF RESULTS

Calculate the average dimensional changes in the length and width directions of fabric specimens separately or in the principal dimensions of a garment. Express as a percentage dimensional change, rounded to the nearest 0,2 %, using a minus sign to indicate shrinkage and a plus sign to indicate an increase in dimensions.

11 TEST REPORT

The test report shall state that the tests were made in accordance with this International Standard and shall give the following information :

a) details of any optional or additional requirements that have been met;

b) whether the procedure in 9.1 or 9.2 was used;

c) the results obtained according to clause 10;

d) the percentage by mass of specimen(s) in the load, and the type of article comprising the make-weight;

e) the maximum inlet or outlet air temperature during drying;

f) details of the finishing treatment used;

g) the number of treatments given;

h) details of the dimensions of the garment or fabric specimen as required by the method used for marking and measuring (i.e. ISO 3759).

1) Textiles made of, or containing, heat-sensitive fibres, for example modacrylic fibres, shall be dried at an outlet air temperature not exceeding 40 °C (inlet air temperature up to 60 °C). Very heat-sensitive textiles, such as articles containing polyvinyl chloride fibres, shall be removed from the machine after extraction and dried at room temperature.

2) 1 kPa = 10^{-2} bar (1 bar ≈ 1 kgf/cm^2)

12 NOTES

12.1 The *g*-factor is calculated according to the following formula.

$$g = \frac{5{,}6\, n^2\, d}{10\,000\,000}$$

where

n is the number of revolutions per minute;

d is the diameter, in millimetres, of the rotating cage.

12.2 When using commercial dry-cleaning equipment, official regulations and normal safety precautions should be observed. Details on these can be obtained from national dry-cleaning research institutes.

12.3 Descriptions of normal finishing apparatus and treatments are given in national documents, for example :

Guild of Cleaners and Launderers Garment Pressing Manual, Specialist Journals Limited, 6 Great Bounds Drive, Southborough, Tunbridge Wells, Kent (England);

C. R. RIGGOTT and J. R. BAUMAN, *Finishing Quality and Methods*, 1970, National Institute of Drycleaning, USA;

Die Praxis des Bügelns in der Chemischreinigung, published by Bundesfachverband, Chemischreinigung-Färberei e.V., Hannover, Germany, 1971.

12.4 Examples of sensitive materials are many woollen knitwears, fur fabrics, crêpes, open-set, loose-spun wool fabrics, loom-finished fabrics, bouclés, Bedford cords, cavalry twills, Raschel fabrics, chenille, cloqué fabrics, pure silk fabrics, etc. Sub-committee ISO/TC 38/SC 11, *Care labelling of textiles and apparel*, was invited to prepare definitions of the three terms "normal materials", sensitive materials", and "very sensitive materials", and has provided the following information.

Normal materials are those that can be dry cleaned satisfactorily by a recognized efficient dry cleaning process such as the machine method for normal materials specified in ISO 3175.

Sensitive materials are those that will not satisfactorily withstand dry cleaning according to the method for normal materials, but that can be dry cleaned satisfactorily by a modified process such as the machine method for sensitive articles specified in ISO 3175.

Very sensitive materials are outside the scope of ISO 3175. They will not withstand dry cleaning even according to the machine method for sensitive materials specified in ISO 3175. If they are appreciably soiled, it may not be possible to clean them adequately without impairing their properties. In some circumstances, if they are only lightly soiled, it may be possible to achieve some degree of cleaning whilst preserving their properties by means of a severely restricted process. The type of restrictions needed may vary with different materials. Owing to the impact of environmental legislation, the scope for carrying out such restricted processes is being diminished.