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Textiles — Evaluation of stability to machine dry-cleaning

Textiles — Évaluation de la stabilité au nettoyage à sec en machine

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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. 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 3175 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 2, *Cleansing, finishing and water resistance tests*.

This third edition cancels and replaces the second edition (ISO 3175:1979), which has been technically revised.

Annex A of this International Standard is for information only.

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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.

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.

Other characteristics, for which no machine test methods are currently available, are also important in determining dry-cleanability. A comprehensive list is included in annex A, and it is recommended that if fabrics or garments exhibit poor performance in respect to any of these characteristics, then appropriate comments should be included in the test report (see clause 10).

Textiles — Evaluation of stability to machine dry-cleaning

1 Scope

This International Standard specifies dry-cleaning procedures in perchloroethylene, using commercial dry-cleaning machines, for fabrics and garments. It comprises a process for normal materials and processes for sensitive and very sensitive materials (see clause 3).

NOTES

1 Various solvents can be used for dry-cleaning, of which perchloroethylene (tetrachloroethene) is the most common in many countries. For this reason, the present method specifies the use of perchloroethylene. Other solvents may be used provided comparable results are obtained.

2 In the case of the assessment of dimensional changes, the method provides for only a single dry-cleaning and a 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.

The procedures are intended to be used for the determination of dimensional change of fabrics and garments when subjected to the dry-cleaning process but may also be used for assessing the change in other characteristics.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 139:1973, *Textiles — Standard atmospheres for conditioning and testing.*

ISO 3759:1994, *Textiles — Preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change.*

ISO 5077:1984, *Textiles — Determination of dimensional change in washing and drying.*

ISO 8229:1991, *Operations and baths relating to dry-cleaning machines — Vocabulary.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 normal materials: Materials which are able to withstand the normal dry-cleaning process as specified in this International Standard without modification.

3.2 sensitive materials: Materials which may require restrictions as to mechanical action and/or drying temperatures and/or water additions, e.g. acrylics, silk, crepe.

3.3 very sensitive materials: Materials which may require greatly reduced mechanical action and/or greatly reduced drying temperatures and/or no addition of water, e.g. chlorofibre fabrics, modacrylic, novelty tweeds, angora.

4 Reagents

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

4.2 Sorbitan monooleate.

NOTE 3 In order to prevent foaming, it is important to use a clean solvent solution and not overfill the still.

5 Apparatus

5.1 Dry-cleaning machine, consisting of a commercial reversibly-rotating cage-type, totally enclosed machine intended for use with perchloroethylene.

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

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 between 0,5 and 0,8 for cleaning and between 60 and 120 for extraction.

NOTE 4 The g-factor is calculated according to the equation

$$g = 5{,}6\ n^2 d \times 10^{-7}$$

where

n is the rotational frequency, in revolutions per minute;

d is the rotating cage diameter, in millimetres.

The machine shall have suitable facilities to allow the emulsion (see 9.1.3) to be introduced gradually into the solvent between the cage and drum below the level of the solvent.

The machine shall be equipped with a means of measuring the temperature of either the incoming or the outgoing air during the drying cycle to within ± 2 °C.

5.2 Apparatus for applying the appropriate finishing treatment to the test pieces.

5.2.1 Iron, with an approximate mass of 1,5 kg and a sole surface area of 150 cm^2 to 200 cm^2.

5.2.2 Steam press, consisting of two bucks, one fixed and the other movable, each buck having a surface area of approximately 0,35 m^2.

Steam being conducted to the bucks shall be released under a pressure of approximately 500 kPa. The pressure exerted by the bucks shall be approximately 350 kPa.

5.2.3 Steam table, having a shape and dimensions suitable to the dimensions of the specimens.

The steam shall be released at a pressure of approximately 500 kPa.

5.2.4 Steam former (mannequin), which may or may not be specific in shape for garments.

The steam shall be released at a pressure of approximately 500 kPa.

5.2.5 Steam cabinet, specific for the shape of the garments.

The steam shall be released at a pressure of approximately 500 kPa.

5.3 Ballast, consisting of clean textile pieces which shall be either white or of a light colour and which shall consist of approximately 80 % wool pieces and 20 % cotton pieces by mass. Each piece shall comprise two layers of fabric sewn together at the edges and shall be (300 ± 30) mm × (300 ± 30) mm.

6 Conditioning and testing

The specimens and ballast shall be conditioned for at least 16 h and all measurements made in one of the standard atmospheres for conditioning and testing textiles specified in ISO 139.

7 Test pieces

7.1 Garments shall be tested as such.

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

8 Marking and measuring for dimensional changes

8.1 Follow the procedures for preparation of fabrics and garments given in ISO 3759, except as noted in 8.2.

8.2 When testing fabric specimens, lay out the test piece 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 similar pairs of marks in the width direction of the fabric.

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

9 Procedure

9.1 Process for normal materials

9.1.1 The mass of the complete load shall be (50 ± 2) kg per cubic metre of cage volume. Ensure that the mass of the textile part of the test piece(s) is not more than 10 % of the total load, unless the mass of the test piece or garment itself exceeds 10 % of the total load. The remainder of the load shall consist of ballast (5.3).

9.1.2 Turn power to the machine on and ensure that the filter circuit is on. Machine cage shall not be rotating. Place the conditioned load in the machine (5.1) and charge the machine with distilled perchloroethylene (4.1), containing 1 g of sorbitan monooleate detergent (4.2) per litre, so that the liquor ratio, calculated on the volume of solvent in the drum, is (5,5 ± 0,5) litres per kilogram of load.

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

9.1.3 Prepare a fresh emulsion by mixing, per kilogram of load, 10 ml of sorbitan monooleate with 30 ml of perchloroethylene and then while stirring adding 20 ml of water. This corresponds to 2 % of water calculated on the mass of the load.

If the mixing of the detergent with perchloroethylene outside the machine is not permitted, the perchloroethylene and a mixture of the detergent and water may be added directly but separately into the machine. Precautions shall be taken to avoid uneven distribution of the individual components in the load. Any deviation from this procedure shall be mentioned in the test report.

Shut off the filter circuit to the machine. Start the machine rotating, and 2 min after the cage inlet has closed, add the emulsion slowly over a period of (30 ± 5) s to the machine between the cage and the drum, below the level of the solvent.

9.1.4 Allow the machine to run for an additional 15 min. Do not use the filter circuit.

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

9.1.6 Introduce pure dry solvent at the same liquor ratio as given in 9.1.2 and rinse for 5 min. Drain and extract again for 3 min (at least 2 min of which is at full extraction speed).

9.1.7 Dry the load in the machine for an appropriate time, preferably using an automatic solvent-dryness sensor. The outlet air temperature shall not exceed 60 °C, and the inlet temperature shall not exceed 80 °C.

After drying, blow ambient air through the rotating load for at least 5 min.

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

If information on stability to dry-cleaning only is required, condition and remeasure the test piece at this stage before continuing with any further treatment. Include in the test report details of this procedure.

9.1.9 Either carry out a finishing treatment by one of the following methods which shall be recorded in the test report or, if appropriate, give no finishing treatment:

Method A: Finishing with an iron (5.2.1).

Method B: Finishing with a steam press (5.2.2)

(5 ± 1) s of steam, bucks closed, letting steam diffuse by the bucks, opening of the bucks and (5 ± 1) s rest on the lower buck and (5 ± 1) s vacuum on.

Method C: Steaming on a press (5.2.2) or on a table (5.2.3)

(5 ± 1) s of steam, the steam being diffused by the lower buck, the two bucks being open in the case of the press; (5 ± 1) s rest on the lower plate, (5 ± 1) s with vacuum on.

Method D: Steaming on a mannequin (5.2.4) or in a cabinet (5.2.5)

(10 ± 1) s steaming followed by (20 ± 2) s air-blowing.

9.1.10 Condition the test piece and remeasure, in accordance with clause 8, the distances previously marked and measured.

9.2 Processes for sensitive and very sensitive materials

Proceed as in 9.1 but with the appropriate parameters at the reduced levels given in table 1.

EXAMPLES OF SUCH PROCEDURES

1 An acrylic item may be temperature-sensitive; thus the drying temperature may be reduced to 60 °C air inlet, 50 °C air outlet, and the remaining parameters maintained as for the "normal" process.

2 An angora item will be very sensitive to mechanical action and water addition. Thus the machine load will be reduced to 66 %, no water added, wash time reduced to 5 min, rinse time reduced to 3 min and final extraction time to 2 min. The load may also be processed in a net bag. Other parameters including drying temperature will be as for the "normal" process.

3 Chlorofibre fabric will be very sensitive to time in solvent and drying temperatures. The machine load may be 66 %, wash time reduced to 5 min, rinse time reduced to 3 min, final extraction time reduced to 2 min, drying air inlet temperature reduced to 50 °C, outlet temperature to 40 °C. All other parameters will be as for the "normal" process.

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) number and year of publication of this International Standard, i.e. ISO 3175:1995, as well as the date of the test;

b) all information necessary for identification of the test sample and, if required, the sampling procedure;

c) type of dry-cleaning and finishing equipment used;

d) procedures, from table 1, and finishing treatment used;

e) any deviation from the procedures and parameters specified in 9.1;

f) total number of cleaning and finishing procedures;

g) results obtained (see clause 10), including comments on characteristics which appear in annex A, as appropriate.

Table 1 — Summary of dry-cleaning processes

Process	Total load (see 9.1.1)	Solvent temperature	Detergent charge (see 9.1.2)	Addition of water (see 9.1.3)	Cleaning cycle (min)				Drying temperature (see 9.1.7)		Deodorization time (see 9.1.7)
					Wash (see 9.1.4)	Intermediate extraction (see 9.1.5)	Rinse (see 9.1.6)	Final extraction (see 9.1.6)	Inlet	Outlet	
	%	°C	g/l	%					°C	°C	min
Normal	100	30 ± 3	1	2	15	2	5	3	80	60	5
Sensitive	66	30 ± 3	1	0	10	2	3	2	60	50	5
Very sensitive	66	30 ± 3	1	0	5	2	3	2	50	40	5