
**Textiles — Professional care, drycleaning
and wetcleaning of fabrics and
garments —**

Part 3:

**Procedure for testing performance when
cleaning and finishing using hydrocarbon
solvents**

*Textiles — Entretien professionnel, nettoyage à sec et nettoyage à l'eau
des étoffes et des vêtements —*

*Partie 3: Mode opératoire pour évaluer la résistance au nettoyage et à
la finition avec des solvants hydrocarbonés*



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Foreword

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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 3175-3 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 2, *Cleansing, finishing and water resistance tests*.

ISO 3175 consists of the following parts, under the general title *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments*:

- *Part 1: Assessment of performance after cleaning and finishing*
- *Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene*
- *Part 3: Procedure for testing performance when cleaning and finishing using hydrocarbon solvents*
- *Part 4: Procedure for testing performance when cleaning and finishing using simulated wetcleaning*

Introduction

Drycleaning is a process used by professionals 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 wetcleaning. Small quantities of water may be incorporated in the solvent with the aid of a detergent for the purpose of obtaining better soil and stain removal. Some moisture-sensitive articles are preferably drycleaned without the addition of water to the solvent. A detergent is often used to assist with soil removal and reduce the risk of greying, but it must be borne in mind that detergents contain varying amounts of water in their formulations.

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

Properties of the textile or garment may change progressively on drycleaning and steaming and/or pressing and in some cases a single treatment may give little indication of the extent of dimensional and other changes that may arise after repeated treatments and which may affect the useful life of the article. Generally, most of the potential change will become apparent after three to five of the drycleaning and finishing treatments specified in this part of ISO 3175.

The properties which should be considered in an assessment for drycleanability with the methods for their assessment are given in ISO 3175-1.

Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments —

Part 3: Procedure for testing performance when cleaning and finishing using hydrocarbon solvents

1 Scope

This part of ISO 3175 specifies drycleaning procedures for hydrocarbon solvents, using commercial drycleaning machines, for fabrics and garments. It comprises procedures for normal and sensitive materials (see 3.3 and 3.4). When using commercial drycleaning equipment, national regulations and normal safety precautions should be observed.

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 139:1973, *Textiles — Standard atmospheres for conditioning and testing*

ISO 3175-1:1998, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 1: Assessment of performance after cleaning and finishing*

3 Terms and definitions

For the purposes of this part of ISO 3175, the following terms and definitions apply.

3.1

materials

garments, composites or fabrics

3.2

composite test specimen

test specimen consisting of all component parts used in the finished item, and combined in a representative assembly

3.3

normal materials

materials that are able to withstand the normal drycleaning process as specified in this part of ISO 3175, without modification

3.4 sensitive materials
materials that may require restrictions as to mechanical action and/or drying temperatures and/or water additions

EXAMPLE Acrylics, silk, crepe, chlorofibre, modacrylic, novelty tweeds, angora.

NOTE Giving careful consideration to the comments on progressive change made in the Introduction, textile items that perform satisfactorily for purpose in the procedures intended for normal and sensitive materials, listed in Table 1, may be labelled with the \textcircled{F} and \textcircled{F} symbols respectively, as described in ISO 3758.

4 Principle

The specimen, or specimens, are drycleaned in a commercial machine and finished according to one of the specified procedures. This process is a precursor to the assessment of the cleaned specimen in accordance with ISO 3175-1.

5 Reagents

5.1 Hydrocarbon solvents

HCS used for drycleaning are aliphatics (C_nH_{2n+2} ; $n = 10 - 12$) or iso- and cyclo-aliphatics, flashpoint ≥ 38 °C, boiling range 150 °C to 210 °C.

5.2 Detergent

Cocofattyaciddiethanolamide

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

6 Apparatus and materials

6.1 Drycleaning machine, consisting of a commercial reversible rotating cage and safety system intended for use with hydrocarbon solvents.

The diameter of the rotating cage shall be 600 mm minimum and 1 080 mm maximum. Its depth shall be 300 mm minimum. It shall be fitted with three or four lifters. The speed shall be such as to give a g -factor of between 0,5 and 0,8 for cleaning and between 100 and 300 for extraction.

The g -factor is calculated according to the following formula:

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

where

n is the rotational frequency, in rotations per minute;

d is the rotating cage diameter, in millimetres.

The machine shall be fitted with a means of controlling solvent and air temperature as required (see Table 1).

The machine shall have suitable facilities (e.g. dosing apparatus) to allow the emulsion (see 9.1.3) to be introduced gradually into the solvent whilst avoiding direct contact with the textiles.

The machine shall be equipped with a means of measuring the temperature of the solvent during washing as well as that of either the incoming or the outgoing air during drying, to within ± 2 °C.

6.2 Apparatus for applying the appropriate finishing treatment, consisting of the following:

6.2.1 Iron, with an approximate mass of 1,5 kg and a sole surface area of 150 cm² to 200 cm².

6.2.2 Steam press, consisting of two bucks, one fixed and the other movable, each buck having a surface area of approximately 0,35 m². Steam 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.

6.2.3 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.

6.2.4 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.

6.2.5 Steam cabinet, which needs to be specific for garments. The steam shall be released at a pressure of approximately 500 kPa.

6.3 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 (230 ± 10) g/m² and 20 % cotton pieces (180 ± 10) g/m² by mass. Each piece shall comprise two layers of fabric sewn together at the edges and, at the time of make-up, shall be (300 ± 30) mm square.

NOTE If it is agreed that an alternative ballast (composition or fibre) is to be used this should be included in the test report.

7 Conditioning

The specimens and the ballast shall be conditioned for at least 16 h in one of the standard atmospheres for conditioning and testing textiles specified in ISO 139. Specimens shall be tested immediately after removal from the conditioning atmosphere, otherwise they shall be placed in sealed plastic bags and tested within 30 min.

8 Test specimen

8.1 Garments shall be tested in the as-received condition.

8.2 Composite test specimens (see 3.2).

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

8.4 If **assessments/comparisons** are required in accordance with ISO 3175-1, at least two identical test specimens shall be required (one for comparison, one for testing).

NOTE Testing may be an iterative procedure since alternative processes of varying severity may be used, and it is advisable to obtain sufficient specimens for all the testing which may be required.

9 Procedure

NOTE Selection of the procedure to be used (normal or sensitive) depends on the textile item (see examples in 9.3). It should also take into consideration the end use to which the item will be put since this will have a bearing on the likely

type and degree of soiling. Cleaning will be generally less effective the less severe the process. Localized staining and stain removal currently falls outside the scope of this part of ISO 3175.

9.1 Procedure for normal materials

9.1.1 The mass of the complete load, measured to $\pm 0,1$ %, shall be calculated from the cage volume; for normal materials in the proportion of (50 ± 2) kg/m³ and for sensitive materials in the proportion of (33 ± 2) kg/m³. Unless the mass of a single specimen (fabric, composite or garment) exceeds 10 % of the mass of the load, the mass of the test specimen(s) shall not exceed 10 % of the mass of the load. The remainder of the load shall consist of ballast.

9.1.2 Place the conditioned load in the machine and load the machine with distilled hydrocarbon solvent, (charged with 1g/l detergent as shown in Table 1), so that the liquor ratio, calculated from the volume of solvent in the drum, is $(5,0 \pm 0,5)$ l/kg of the 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 detergent (to bring the detergent concentration to 3 g/l for the normal process) with 30 ml of hydrocarbon solvent and then, whilst stirring, adding 20 ml of water. This corresponds to 2 % of water calculated on the mass of the load.

Start the machine with the filter circuit shut off and, 2 min after the cage inlet has closed, slowly add the emulsion to the machine over a period of (30 ± 5) s using a suitable facility (e.g. dosing apparatus).

9.1.4 Switch the machine on and allow it to run for 15 min in the pump circuit. 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 (including at least 1 min at full extraction speed).

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

9.1.7 Dry the load in the drying circuit of the machine for an appropriate time, preferably using an automatic solvent dryness control. The cage inlet temperature shall not exceed 80 °C and the outlet temperature shall not exceed 60 °C. In case of vacuum drying an inlet temperature of 90 °C is allowed. After the end of the drying process switch off the heating and reduce ventilation speed whilst the load is rotated with reverse rhythm in the cage for at least 5 min (cool down).

9.1.8 Immediately remove the test specimen from the machine. Place garments individually on hangers and place fabric specimens on a flat surface, for at least 30 min before finishing.

9.1.9 Carry out finishing treatments appropriate to the test specimen from the following methods, and record the processing conditions used:

- method A: no finishing required;
- method B: finishing with an iron;
- method C: finishing with steam press;
- method D: steaming on a press or table;
- method E: steaming on a mannequin or in a cabinet;
- method F: no suitable finishing method could be found. Report methods and conditions attempted and reasons for unsuitability.

Record actual steaming times to allow for the reaction times of steam pedal switches, and timer mechanisms.

NOTE The purpose of finishing after drycleaning is to restore an article to its original condition before use. The amount and type of finishing should be consistent with the fabric/garment properties and the restorative requirements. Steaming/vacuuming times for methods C and D will vary, e.g. from (2 ± 1) s actual steam, (5 ± 1) s vacuum for a light weight garment to (4 ± 1) s/ (8 ± 1) s for heavy garments. Steaming in method C should be top steam only to equate to good pressing practice. It is likely that method E will be used with methods B or C to achieve a good standard of finish.

9.2 Procedures for sensitive materials

Proceed as in 9.1, but with the appropriate parameters at the reduced levels given in Table 1. In case of vacuum drying, an inlet temperature of 90 °C is permitted. The outlet temperature shall not exceed 50 °C.

9.3 Examples

- An acrylic item may be temperature-sensitive and so the load ratio and the drying temperature may be reduced to 60 °C air inlet, 50 °C air outlet, and the remaining parameters maintained in accordance with the "normal" procedure.
- An angora item will be very sensitive to mechanical action and water addition. Thus the machine loading shall be reduced to 66 %, no water addition, wash time reduced to 10 min and rinse time reduced to 3 min. It may also be processed in a net bag. Other parameters may be in accordance with the "normal" procedure.
- Modacrylic and chlorofibre fabrics will be sensitive to time in solvent and very sensitive to the drying temperature. The procedure may be 66 % loading, wash time reduced to 10 min, rinse time reduced to 3 min, drying air inlet temperature reduced to 60 °C, outlet to 50 °C. All other parameters will be in accordance with the "normal" procedure.

10 Test report

The test report shall include the following information:

- a) name of testing authority and report identification;
- b) date of testing;
- c) details of item evaluated (description and reference);
- d) cross-reference to any test report relating to the specimen(s) issued under ISO 3175-1;
- e) reference to this part of ISO 3175, i.e. ISO 3175-3;
- f) the type of drycleaning and finishing equipment used;
- g) procedures used taken from Table 1;
- h) variations in procedures and parameters specified in Clause 9;
- i) total number of cleaning and finishing procedures;
- j) details of any deviation from the specified procedure.

Table 1 — Drycleaning procedures

Proce- dures	Load ratio ^a kg/m ³	Solvent temperature °C	Deter- gent charge g/l ^{b,c}	Addi- tion of water ^c % kg load	Cleaning cycle time				Drying temperature ^d °C		Cool down min
					min				In ^h	Out	
					Wash ^e	Inter extract ^f	Rinse ^g	Final extract ^g			
Normal	50 ± 2	30 ± 3	1 (+2) ^c	2	15	2	5	5	80 ± 3	60 ± 3	5
Sensitive	33 ± 2	30 ± 3	1	0	10	2	3	5	60 ± 3	50 ± 3	5

a See 9.1.1.

b See 9.1.2.

c See 9.1.3.

d Machine settings to control drying temperature on cage inlet (IN) or outlet (OUT).

e See 9.1.4.

f See 9.1.5.

g See 9.1.6.

h In case of vacuum drying, 90 °C is allowed.

Bibliography

- [1] ISO 3758, *Textiles — Care labelling code using symbols*
- [2] E.C. DG XII project AQUACARB:2000, Final report

