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# INTERNATIONAL STANDARD ISO 2267

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## Surface active agents — Verification of certain effects of laundering — Preparation and use of unsoiled cotton control cloth

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## FOREWORD

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International Standard ISO 2267 was drawn up by Technical Committee ISO/TC 91, *Surface active agents*.

It was approved in August 1971 by the Member Bodies of the following countries :

| | | |
|---|---|---|
| Austria | Poland | Thailand |
| Belgium | Portugal | Turkey |
| Egypt, Arab Rep. of | Romania | United Kingdom |
| France | South Africa, Rep. of | U.S.A. |
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No Member Body expressed disapproval of the document.



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# Surface active agents — Verification of certain effects of laundering — Preparation and use of unsoiled cotton control cloth

## 0 INTRODUCTION

The quality of laundering treatments for household textile articles may be assessed in two different ways, depending on whether the cleaning effect, or the conservation of the initial characteristics of cloth subjected to repeated laundering, is under consideration.

In the first case, some tests may be carried out on the cloth itself, which may be re-used. However, for the measurement of greying and yellowing, it is essential to use unsoiled control cloths. Furthermore, as the measurement of certain characteristics of the household textile articles, particularly their mechanical properties, entails the destruction of samples, it is quite impossible to perform these tests on household textile articles which are in use.

It has therefore been proposed to define the harmlessness of a laundering process on household textile articles by reference to the behaviour of control material treated in the same way at the same time as the cloth washed in the normal manner.

Since the behaviour of household textile articles in use is influenced by many and complex factors, and depends to a large extent on the actual texture and weave of the material, it is necessary, in order to obtain satisfactory reproducibility of the results, to standardize all matters relating to the preparation of the control cloth, and to its use.

In this International Standard, the characteristics of the control cloth are defined with the greatest possible precision, and its use is standardized.

The test methods to be applied to the control cloth before and after use are to be the subject of a separate International Standard.

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the characteristics of a cotton material and the preliminary treatments which are to be applied to it in order to make it an *unsoiled cotton control cloth* for the testing of certain effects of laundering.

It also defines the conditions of use of this control cloth (in the form of control strips) during the laundering processes which are being tested from the point of view of the conservation of the original characteristics of the cloth.

The unsoiled cotton control cloth is primarily intended to enable the laundering of white cloth to be tested. It may be used with all detergents and all types of domestic or industrial machines designed to wash, hydroextract and dry household textile articles.

The unsoiled cotton control cloth may also be used for testing the laundering of other categories of textile articles (coloured, for example).

## 2 REFERENCE

ISO/R 862, *Surface active agents — Glossary.*

## 3 DEFINITIONS

**3.1 laundering process :** All the operations carried out during laundering. These may comprise

- soaking
- one or more washes
- bleaching
- one or more rinses
- hydroextraction
- drying
- calendering, pressing or ironing.

**3.2 detergent :** A product of which the composition is specially designed to assist the development of the phenomena of detergent action.[1)]

NOTE — A detergent comprises essential components (surface active agents) and, usually, complementary components (builders, etc.).

**3.3 normally soiled household textile articles :** An average sample of the cloth which is washed in the usual way and presents an average degree of soiling resulting from normal use.

NOTE — The qualitative and quantitative variability of soiling in household textile articles which have been washed in the normal way, depending on the circumstances of place and time, makes it impossible to define a standard soiled cloth which would be suitable in all cases.

This variability, which cannot be avoided, does not, nevertheless, prevent the obtaining of meaningful results if appropriate statistical methods are used.

1) See ISO/R 862.

Although the nature of the dirt affects the behaviour of the cloth during laundering, the control cloth will be affected in the same way because part of the dirt is redeposited on it during washing. As a result, the conclusions arrived at after the application of this International Standard will depend, to some extent, on what constitutes normally soiled cloth in the specific circumstances which are of interest to the user of this International Standard.

If it is necessary, for certain well-defined tests, to use soiled cloth which does not conform to this definition, this shall be specifically mentioned in the test report relating to the methods of test.

**3.4 unprepared control cloth** : The undyed cloth provided by the textile industry for the preparation of the control cloth and having certain well-defined characteristics, so that it can provide a control conforming to the requirements.

**3.5 control cloth** : Unprepared control cloth which has been subjected to a given number of preparatory treatments under well-defined conditions in order to bring its essential characteristics to specified initial values.

## 4 PRINCIPLE

A given number of strips of control cloth and machine loads of normally soiled cloth are together subjected to a given number of consecutive laundering processes.

After these processes, characteristic properties of the strips of control cloth are measured and compared with their initial values.

The evolution of these properties during washing should enable the causes of wear in household textile articles in the laundering process to be detected.

## 5 COTTON CONTROL CLOTH

### 5.1 Characteristics and requirements

#### 5.1.1 *Unprepared control cloth*

The cloth provided by the textile industry shall be selected in such a way that, after having been subjected to the preparatory treatments (see 5.2), it has the characteristics defined in 5.1.2.

The unbleached yarn to be used for both warp and weft shall comply with the following requirements :

- nature : pure cotton, minimum commercial length 27 mm (see Note 1);
- linear density : single yarn 30 ± 2 tex;
- twist : Z 700 ± 25 ~~tr/m~~

The width, mass, and warp strength shall be such that it is possible to obtain the values laid down for the control cloth, allowing for dimensional variations. The latter occur either during any treatment aimed at giving dimensional stability or during preparatory treatment. They are usually of the order of 3 to 8 % in the warp and 1 to 5 % in the weft for stabilized cloth "direct from the loom".

The unprepared control cloth shall also comply with the following requirements :

- it shall have a plain weave;
- it shall have been completely desized and shall not contain any "fluorescent brightening agent (FBA)"[1];.
- it shall have been boiled and laundered in such a way that, on the one hand, the reflectance of the material is greater than 86 and, on the other, the fluidity value of the cotton is less than 5 reciprocal poises or its degree of polimerization greater than 1 600 (after boiling for 1 h in a 1 % sodium hydroxide solution without being allowed to come into contact with the oxygen in the air).

NOTES

1 It is important to verify that the control cloth consists of cotton only, and contains no other fibre whatsoever. A microscopic examination of the constituent fibres is recommended.

2 It is desirable, but not essential, for the cloth to have a certain number of coloured warp, and possibly also weft, threads, dyed with a fast dye, or white threads of a larger linear mass, or double threads, which indicate :

- the surface area of each strip (see Figure 1);
- within this area, the area of the test pieces to be used for the measurement of tensile strength (see Figure 2).

This will facilitate the cutting of both strips and test pieces. Allowance should be made, when determining the dimensions of these, for the dimensional variations envisaged during the preliminary treatments.

It is also desirable for the two selvedges to be different, so that the two sides of the material can be identified.

#### 5.1.2 *Control cloth*

The unprepared control cloth becomes a control cloth after it has undergone the preparatory treatments (see 5.2), provided that after these treatments it satisfies the following requirements :

- number of threads in warp : 25 ± 2 threads per centimetre;
- number of threads in weft : 25 ± 2 threads per centimetre;
- mass per square metre : 170 ± 10 g after conditioning at 20 °C and 65 % relative humidity;
- width : at least 800 mm;
- tensile strength in warp : at least 500 N, the measurement being made on a test piece of the type shown in Figure 2;
- fluidity value between 4 and 5 reciprocal poises, or degree of polymerization between 1 700 and 1 550;
- reflectance (measured immediately after the last preparatory treatment) : greater than 86.

1) This term has been chosen by TC 38, *Textiles*.

NOTE — The maximum reflectance that can be obtained on the control cloth depends to some extent on the measuring apparatus used. If the measuring conditions are such that the specular component is excluded (which is the case when the measurement is made perpendicular to the surface, with illumination at an angle of 45°), the maximum reflectance is about 92. If the measuring conditions are such that the specular component is not excluded, or is only partly excluded (measurement in a photometric sphere), the maximum reflectance may exceed 92 (values related to $BaSO_4 = 100$).

It is understood, of course, that this applies only under measuring conditions such that any possible contribution from a fluorescent emission is excluded.

### 5.2 Preparatory treatments

#### 5.2.1 *Reagents*

**5.2.1.1** Water, of zero hardness.

**5.2.1.2** Pure soap flakes

Verify (for example, by examination in ultraviolet light of a sample of the same cloth washed with a solution of the soap) that the soap does not contain any "fluorescent brightening agent (FBA)".

**5.2.1.3** Sodium metasilicate ($Na_2SiO_3 \cdot 5H_2O$).

#### 5.2.2 *Apparatus*

**5.2.2.1** Washing machine, rotating-drum type, diameter of drum greater than 500 mm, made entirely of stainless steel and of a size suitable for the size of the pieces of control cloth to be washed in it.

**5.2.2.2** Conventional hydroextraction, pressing or calendering equipment.

#### 5.2.3 *Preparation of cloth*

Cut the unprepared control cloth into pieces corresponding to one strip of the specified dimensions (see 6.2), or into several strips if the pressing or ironing equipment can allow this, and hem them.

Number the pieces of cloth with indelible ink, so that their original position in the large piece of cloth can be identified (see 6.3). It is advisable to put all the numbers on the same side of the cloth (see 5.2.4.6).

#### 5.2.4 *Procedure*

Apply to the unprepared control cloth, which cannot be used as it is, five preparatory treatments, under the following conditions :

**5.2.4.1** Loading of washing machine

Load the machine only with pieces of unprepared control cloth.

The loading factor (mass, in kilograms, of cloth divided by volume, in cubic decimetres, of inner drum) shall be between $^1/_{13}$ and $^1/_{18}$.

**5.2.4.2** Soaking

For each kilogram of dry cloth add 5.5 l of cold water (5.2.1.1) and 1.25 g of pure soap flakes (5.2.1.2). Set the drum in motion. At the same time heat in such a way that the soaking water is between 35 and 40 °C at the end of the soaking.

The total time of soaking shall be 5 min and, in the case of domestic machines, it is recommended that the water added shall be preheated to 35 to 40 °C.

Empty the machine (see Note 1, page 4).

**5.2.4.3** Washing

For each kilogram of dry cloth add 2 l of water (5.2.1.1) and 12 g of sodium metasilicate (5.2.1.3).

Heat as quickly as possible to 80 °C (see Note 2, page 4).

If necessary, add a sufficient quantity of soap flakes to maintain a good, but not excessive, lather.

Continue washing for 15 min at between 80 and 90 °C.

Empty the machine (see Note 1, page 4).

**5.2.4.4** Rinsing

For each rinse, add 5 l of cold water (5.2.1.1) per kilogram of cloth.

Allow the drum to rotate for 3 min.

Empty the machine (see Note 1, page 4).

Repeat this sequence of operations until the alkalinity of the last rinsing water is less than one-fiftieth of that of the washing water, after subtraction of the alkalinity of the softened water used (see Note 3, page 4).

**5.2.4.5** Hydroextraction

Hydroextract the pieces of cloth after the final rinse until they contain not more than 50 g of water for every 100 g of cloth conditioned.

**5.2.4.6** Pressing

Immediately after hydroextraction, press or iron the pieces of cloth so as to avoid the formation of creases in the material.

Depending on the size of the pieces of cloth which have been washed, either a flat press or a calender may be used. In both cases the temperature of the heated part of the machine shall not exceed 170 °C. It is preferable to avoid any pulling of the cloth.

During the final preparatory treatment it is recommended that the pieces of cloth be pressed or ironed with the marked side against the polished part of the equipment.

Under no circumstances is air drying permitted (see Note 4, page 4).

NOTES

1 Each emptying operation shall be completed in under 1 min.

2 In industrial steam-heated washing machines, it should not take longer than 5 to 10 min to reach 80 °C. For machines heated by electricity or gas this time may be considerably longer and, in this case, it is advisable to add preheated water in order to reduce the heating time.

3 If the soft water used has an alkalinity of more than 2.5 meq/l (number of millilitres of 0.1 N hydrochloric acid needed to neutralize 100 ml of water in the presence of methyl orange indicator), the final rinsing water shall be acidified with acetic acid, formic acid, sodium metabisulphite or ammonium or sodium bifluoride.

4 As air drying is usually carried out by hanging the pieces of cloth vertically, because of lack of space for spreading them out flat, the mass of the damp cloth exerts a pull which stretches the material. It has also been proved that air drying produces an additional, irregular, deterioration.

### 5.3 Verification of characteristics, necessary corrections

Determine, within 24 h after the last preparatory treatment, the reflectance and the degree of yellowing of the pieces of cloth which have been washed. The other characteristics may be determined at a suitable time.

If, after the last preparatory treatment, the fluidity is less than 4 reciprocal poises or if the degree of polymerization is greater than 1 700, one or more additional preparatory treatments, including bleaching with sodium hypochlorite (see Note below), shall be performed, in order to bring the fluidity to between 4 and 5 reciprocal poises or the degree of polymerization to a value between 1 700 and 1 550.

This operation shall be carried out during the final rinse, under the following conditions :

– temperature : 25 ± 5 °C;

– hypochlorite concentration and duration : determined experimentally in such a way as to give the required result.

Each bleaching operation shall be followed by a cold dechlorinating rinse to which has been added a sufficient quantity of sodium metabisulphite ($Na_2S_2O_5$) to neutralize the remaining hypochlorite, and by hydroextraction and pressing or ironing as described in 5.2.4.5 and 5.2.4.6.

NOTE – Even if bleaching is not needed to raise the fluidity above 4 reciprocal poises or to reduce the degree of polymerization below 1 700, it is useful to include in each preparatory treatment a mild bleaching with hypochlorite, while at the same time keeping the fluidity of the control cloth below 5 reciprocal poises or the degree of polymerization above 1 550. Without this treatment, it is difficult to achieve the maximum reflectance.

### 5.4 Storage of control cloth

Store the pieces of control cloth under conditions of the strictest cleanliness, away from light, heat, moisture and acid or alkaline fumes.

## 6 CONTROL STRIPS

### 6.1 Number of strips

For each series of laundering operations forming a test, treat a minimum of three strips simultaneously; then compare these strips with at least three further strips of control cloth which have not undergone the operations of which the test consists.

In cases where control strips from the same piece of unprepared control cloth are used for several tests carried out simultaneously, it is permissible to use a smaller number of strips in determining the initial values, provided that this is mentioned in the test report, and that the choice of the initial number of strips is justified by sufficiently detailed statistical calculations to permit the objective evaluation of the accuracy obtained for each characteristic, particularly the tensile strength.

NOTE – By the term "piece of industrial control cloth" is meant a piece of cloth which is generally between 50 and 100 m long, woven in one operation on one loom.

The determination of the characteristics of the control cloth and the statistical evaluation of the accuracy of each characteristic is valid only for the piece of cloth from which the strips of control cloth are taken; in other words, averages may not be determined from measurements made on strips of control cloth taken from different pieces of industrial control cloth.

### 6.2 Selection of strips

Cut strips 400 mm long from the width (see Figure 1) of the control cloth (see 5.1.2).

All the strips used during a test shall be taken from the same piece of cloth and shall have undergone the preparatory treatments together, in the same machine.

The six (or more) strips necessary for the test shall be cut from the piece of control cloth one after the other. The odd-numbered strips (marked I, III, V) shall be included in the washing tests, the others (marked II, IV, VI) shall be used for the determination of the initial values of the characteristics.

### 6.3 Marking of strips

In order to avoid any confusion between strips which have been used, mark each of them according to a predetermined code, using indelible ink or coloured thread, in a position which will not interfere with the measurement of characteristics.

This marking shall always be on the same side of the cloth (see 5.2.3 and 5.2.4.6).

Similarly, in order to avoid any error as to the number of laundering operations performed on any one strip, it is advisable to apply an indelible ink mark after each operation. To make this check still more effective, two differently coloured inks may be used alternately.