INTERNATIONAL STANDARD

ISO 10528

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Textiles — Commercial laundering procedure for textile fabrics prior to flammability testing

Textiles — Blanchissage commercial des étoffes textiles en vue des essais d'inflammabilité

Reference number
ISO 10528:1995(E)

Foreword

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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 10528 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 2, *Cleansing, finishing and water resistance tests*.

Annex A of this International Standard is for information only.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

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Introduction

The methods specified in this International Standard simulate the effect of commercial laundry procedures using soft water. The washing machines specified are all horizontal rotating drum types with reversing action which are already in laboratory use but which differ considerably in cage volume, frequency of rotation and the methods of controlling liquor level and temperature.

Alternative procedures for assessing the effect of domestic washing using hard water on the flammability of textile fabrics are given in ISO 12138:—, *Textiles — Domestic laundering procedure for textile fabrics prior to flammability testing* (to be published).

The methods specify the use of liquor/load ratios of 5:1 for washing and 9:1 for rinsing, which are at the low end of the ranges used in normal laundry practice. For practical reasons they are determined with no fabric present. Extra water is added during the washing procedure but the amounts will vary according to the type of machine used and cannot be controlled.

The specified wash temperature of (75 ± 3) °C has been shown to be adequate to ensure sterilization of hospital items, while the use of higher temperatures does not produce any significant improvement in the cleansing effect. Some items may not be suitable for washing at this temperature, because of shrinkage or other factors, and an alternative procedure with a wash temperature of (40 ± 3) °C is provided for such fabrics.

Different washing machines vary in their mechanical action and in the time taken to heat to the washing temperature. It is also difficult to control the water inlet temperature. A total period of 30 min agitation during heating and washing is specified for the standard wash. This is longer than would be used in practice but it helps to eliminate the uncontrollable variations between different types of installation and ensures that the test is more severe than actual use. In order to eliminate variations in the period taken to heat to temperature, agitation is not started until a temperature of (40 ± 3) °C is reached. This allows the water input temperature to vary without affecting the period of agitation.

In interlaboratory trials carried out by ISO/TC 38/SC 2/WG 6 in 1989, this procedure was found capable of distinguishing between flame retardant finishes with good and poor stability to washing. However, it was noted that the flammability test used to assess the performance of the fabrics (specified in ISO 6941:1984, *Textile fabrics — Burning behaviour — Measurement of flame spread properties of vertically oriented specimens*) gave more variability than this washing procedure when the two methods were used in sequence.

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Textiles — Commercial laundering procedure for textile fabrics prior to flammability testing

1 Scope

This International Standard specifies methods for assessing the possible effect of repeated commercial laundering on the flammability of textile fabrics. The effect of laundering is simulated using an automatic horizontal drum washing machine or small-scale laundry drum (wash wheel).

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 675:1979, *Textiles — Woven fabrics — Determination of dimensional change on commercial laundering near the boiling point.*

ISO 6330:1984, *Textiles — Domestic washing and drying procedures for textile testing.*

3 Apparatus and reagents

3.1 Washing machine.

3.1.1 Automatic washing machine (Type A), equipped with a horizontal rotating drum with reversing action.

The drum shall have a diameter of 480 mm to 610 mm and shall be fitted with three or four lifters. It shall rotate at 30 r/min to 52 r/min and reverse its direction every 10 r to 20 r. The liquor level shall be capable of being controlled to both low and high levels, giving liquor volumes of $0{,}3V_1$ and $0{,}54V_1$, where V_1 is the volume of the rotating drum (see 5.1). Means shall be provided for heating and controlling the water temperature.

This automatic washing machine shall be used in accordance with the procedures specified in clause 6 or 7.

NOTE 1 This definition allows the use of a wider range of machines than ISO 6330. Machines of Type A1 or A2 as specified in ISO 6330 may be used if they satisfy the liquor level control requirements.

3.1.2 Wash wheel (Type W), as specified in ISO 675, to be used with the procedures specified in clause 8 or 9.

This machine has a different reversing action, reversing every 5 r to 10 r and is steam-heated.

3.2 Soft water, with a maximum hardness, expressed as calcium carbonate, of 20 mg/l.

3.3 Ballast, consisting of rectangular pieces in single layers of woven 100 % bleached cotton or 100 % polyester. Each piece shall measure at least 350 mm by 500 mm and shall be hemmed along the cut edges to prevent unravelling.

3.4 Low-foaming detergent, with perborate.

For example, the IEC reference detergent or ECE reference detergent, as specified in ISO 6330, may be used. Sodium perborate is added to the detergent immediately before use in the ratio of one part perborate to four parts of detergent. All detergent quantities quoted below are for the detergent plus perborate.

3.5 Iron, or **press**, capable of being used at a temperature appropriate for the material being tested.

4 Composition of the load

The test specimens shall be of sufficient size for the subsequent flammability testing. The total dry mass of the load shall be as calculated in 5.2 and at least half the load shall consist of material under test or material of similar fibre type, the remainder consisting of polyester ballast (see 3.3).

5 Preliminary calculations

5.1 Drum volume

If it is not specified, calculate the volume V_1, expressed in litres, of the rotating drum to the nearest litre, ignoring any space occupied by lifters, using the equation

$$V_1 = lr^2\pi \times 10^{-6}$$

where

l is the length of drum, in millimetres;

r is the radius of drum, in millimetres.

5.2 Test load

Calculate the total dry mass m_1, expressed in kilograms, of the test load to the nearest 0,1 kg using the equation

$$m_1 = (0{,}060 \pm 0{,}004)V_1$$

5.3 Detergent quantity

Calculate the mass m_2, expressed in grams, of detergent to be added, to the nearest 0,5 g using the equation

$$m_2 = (0{,}30 \pm 0{,}02)V_1$$

5.4 Low dip level

Determine the volume of water V_2, expressed in litres, required to fill the machine to the low dip level (L) to the nearest 0,5 litre with no load present and with a stationary drum, using the equation

$$V_2 = (0{,}30 \pm 0{,}02)V_1$$

5.5 High dip level

Determine the volume of water V_3, expressed in litres, required to fill the machine to the high dip level (H) to the nearest 0,5 litre with no load present and with a stationary drum, using the equation

$$V_3 = (0{,}54 \pm 0{,}04)V_1$$

NOTE 2 For some machines the dip levels are preset. Other machines require the dip levels to be adjusted to give the specified volumes (see annex A).

6 Standard washing procedure: automatic machines (Type A)

6.1 Load the machine (3.1.1) with a load of m_1, as calculated in 5.2 and of the specified composition (see clause 4). Start the machine with reduced agitation and fill with soft water (3.2) at a temperature of 15 °C to 40 °C to the low dip level (L), at the same time adding the mass m_2 of detergent (3.4) as calculated in 5.3.

6.2 If the inlet water temperature is below 37 °C, heat to (40 ± 3) °C with no agitation. Heat to (75 ± 3) °C in (15 ± 3) min with reduced agitation. Switch to normal agitation and run at (75 ± 3) °C for (15 ± 0,5) min. Drain.

6.3 Fill with cold soft water to the high dip level (H). Run for 3 min then drain. Repeat three times to give a total of four rinses in all. Centrifuge for 6 min.

6.4 Repeat the washing, rinsing and centrifuging cyle 11 times, giving a total of 12 cycles.

NOTE 3 If the number of wash cycles specified cannot be completed without interruption, the load may be left wet after centrifuging for a maximum of 18 h.

6.5 Dry the specimens in accordance with one of the drying procedures specified in ISO 6330 depending on the washing instructions for the material. Press them (see 3.5) at an appropriate temperature to remove creases (if the material is suitable for pressing).

7 Reduced washing procedure: automatic machines (Type A)

7.1 Load the machine (3.1.1) with a load of mass m_1 as calculated in 5.2 and of the specified composition (see clause 4). Start the machine with reduced agitation and fill with soft water (3.2) at a temperature of 15 °C to 40 °C to the low dip level (L), at the same time adding the mass m_2 of detergent (3.4) as calculated in 5.3.

7.2 If the inlet water temperature is below 37 °C, heat to (40 ± 3) °C with no agitation. Run at (40 ± 3) °C with reduced agitation for (15 ± 0,5) min. Drain.

7.3 Fill with cold soft water to the high dip level (H). Run for 3 min then drain. Repeat three times to give a total of four rinses in all. Centrifuge for 3 min.

7.4 Repeat the washing, rinsing and centrifuging cycle 11 times, giving a total of 12 cycles.

NOTE 4 If the number of wash cycles specified cannot be completed without interruption, the load may be left wet after centrifuging for a maximum of 18 h.

7.5 Dry the specimens in accordance with one of the drying procedures specified in ISO 6330 depending on the washing instructions for the material. Press them (see 3.5) at an appropriate temperature to remove creases (if the material is suitable for pressing).

8 Standard washing procedure: wash wheel (Type W)

8.1 Load the machine (3.1.2) with a load of mass m_1 as calculated in 5.3 and of the specified composition (see clause 4). Fill with cold soft water (3.2) to the low dip level (L), at the same time adding the mass m_2 of detergent (3.4) as calculated in 5.3.

8.2 Start the machine and inject steam to raise the temperature to (75 ± 3) °C (see note 5). Maintain at (75 ± 3) °C for at least 15 min. The total washing time, including the heating period, shall be (30 ± 3) min. Drain.

NOTE 5 The water level will increase as a result of the condensation of steam during the heating period. The final liquor/load ratio will be higher than the initial 5:1 ratio.

8.3 Fill with cold soft water to the high dip level (H). Run for 3 min then drain. Repeat three times to give a total of four rinses in all.

8.4 Repeat the washing and rinsing cycle 11 times, giving a total of 12 cycles.

8.5 Dry the specimens in accordance with one of the drying procedures specified in ISO 6330 depending on the washing instructions for the material. Press them at an appropriate temperature to remove creases (if the material is suitable for pressing).

9 Reduced washing procedure: wash wheel (Type W)

9.1 Load the machine (3.1.2) with a load of mass m_1 as calculated in 5.2 and of the specified composition (see clause 4). Fill with cold soft water (3.2) to the low dip level (L), at the same time adding the mass m_2 of detergent (3.4) as calculated in 5.3.

9.2 Start the machine and inject steam to raise the temperature to (40 ± 3) °C (see note 6). Maintain at (40 ± 3) °C for (15 ± 0,5) min. Drain.

NOTE 6 The water level will increase as a result of the condensation of steam during the heating period. The final liquor/load ratio will be higher than the initial 5:1 ratio.

9.3 Fill with cold soft water to the high dip level (H). Run for 3 min then drain. Repeat three times to give a total of four rinses in all.

9.4 Repeat the washing and rinsing cycle 11 times, giving a total of 12 cycles.

9.5 Dry the specimens in accordance with one of the drying procedures specified in ISO 6330, depending on the washing instructions for the material. Press them (see 3.5) at an appropriate temperature to remove creases (if the material is suitable for pressing).

10 Report

The test report on the flammability of materials tested after washing by these procedures shall contain the following statement:

"Tested after washing in accordance with ISO 10528"

with

a) the type of washing machine used and its drum volume;

b) the type of detergent used;

c) the washing procedure employed (standard or reduced);

d) the drying procedure used;

e) any deviation from the procedure specified.

Annex A
(informative)

Parameters for typical washing machines

Type	A1	A2	W
Model	Wascator[1)]	Miele[1)]	Wash wheel
Volume, V_1 (litres)	70	45	148
Load, m_1 (kg)	4,2 ± 0,3	2,7 ± 0,2	8,9 ± 0,6
Low dip volume, V_2 (litres)	21,0 ± 1,5	13,5 ± 1,0	44,5 ± 3,0
High dip volume, V_3 (litres)	38,0 ± 3,0	24,5 ± 2,0	80,8 ± 6,0
Detergent, m_2 (g)	21,0 ± 1,5	13,5 ± 1,0	44,5 ± 3,0

NOTE — The fixed levels I and II on the Miele machine and settings of 10 cm and 20 cm on the Wascator type 71M should give the required volumes.

1) Wascator and Miele are examples of commercially available washing machines. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

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