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**Textiles — Industrial washing and  
finishing procedures for testing of  
workwear**

*Textiles — Méthodes de blanchissage et de finition industriels pour les  
essais des vêtements de travail*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). (standards.iteh.ai)

This document was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 2, *Cleansing, finishing and water resistance tests*.  
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This second edition cancels and replaces the first edition (ISO 15797:2002), which has been technically revised. It also incorporates the Technical Corrigendum ISO 15797:2002/Cor. 1:2004.

The main changes compared to the previous edition are as follows:

- in the Scope, the restriction of workwear to cotton, polyester and their blends has been removed, thereby including other fibres, and the accommodation of some PPE garments for which the referenced processes are appropriate has been added;
- [6.5](#) has been added to give examples of antichlor chemicals;
- in [9.2](#), in light of experience, changes have been made to Drying procedure B tunnel and cabinet finishing;
- throughout [Tables 1](#) to [4](#), the headings Cotton and Polyester/cotton have been replaced by Full load and Reduced load, respectively, to facilitate the change in the Scope;
- [Annex A](#) has been revised to include alternative temperature measuring systems.

## Introduction

This document enables manufacturers of textiles to test their fabrics and garments for resistance to exacting washing and drying processes used in industrial laundries for care and maintenance purposes.

It is not practical to carry out rigorous testing in an industrial laundry environment and this document, using intermediate stage equipment, allows testing to be done in a more exacting laboratory setting under standardized conditions.

This document is a test method and is not intended as instructions or recommendations on how to wash and dry in an industrial laundry. Nor does it provide specifications on equipment to be used by industrial launderers.

A laundering cycle consists of a washing and a drying/finishing procedure.

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# Textiles — Industrial washing and finishing procedures for testing of workwear

## 1 Scope

This document specifies test procedures and equipment which can be used in the evaluation of workwear (including, where appropriate, for some PPE garments) intended to be industrially laundered. They serve as a basis for testing relevant properties such as dimensional stability, colour characteristics, creasing, seam puckering, pilling and visual aspects in general.

This document does not provide instructions and specifications for the procedures and equipment to be used by industrial launderers.

As it is often not practical to reproduce industrial laundry processes (washing and drying/finishing) in a laboratory setting, this document provides an approach using defined intermediate scale equipment and exacting test procedures which can be used for the evaluation of workwear intended to be laundered industrially.

As this document reflects a simulation of real-life industrial laundry conditions, in some cases, testing of the workwear in the actual industrial laundering equipment and processes intended to be used is advisable when finally determining product and process compatibility.

It is not necessary to test using all eight washing procedures nor both drying procedures. A selection is made of the washing and drying procedure(s) that are best suited to the characteristics of the fabric or fabric composition and the intended use.

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## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Textiles — Standard atmospheres for conditioning and testing*

ISO 3071, *Textiles — Determination of pH of aqueous extract*

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

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp/>

### 3.1

#### **cage**

rotating container within which the load is held during the laundering process

Note 1 to entry: The cage is generally fabricated from perforated stainless steel.

**3.2  
dead volume**

volume of water left in the *drum* (3.4), such that the water surface lies at a tangent with the inside of the *cage* (3.1) in the stationary position

**3.3  
domestic laundering**

washing/finishing of textiles according to size and volume needed by a single household

Note 1 to entry: The usual size of the *cage* (3.1) for domestic laundering is approximately 60 l.

**3.4  
drum**

non-rotating container within which the *cage* (3.1) rotates

**3.5  
load ratio**

ratio of the dry load to the net *cage* (3.1) volume

Note 1 to entry: The load ratio is expressed in kilogrammes per litre.

Note 2 to entry: Net cage volume is given by net volume of lifters, back wall and door.

**3.6  
g-factor**

factor defined by the formula

$$0,56 \times \left( \frac{n}{1000} \right)^2 \times d$$

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where

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*n* is the number of revolutions per minute (r/min);

*d* is the cage diameter in millimetres

**3.7  
industrial laundering**

professional laundering of *workwear* (3.9) in greater quantities than *domestic laundering* (3.3)

**3.8  
liquor ratio**

ratio of the dry load to the total amount of water

Note 1 to entry: The liquor ratio is expressed in kilogrammes per litre.

**3.9  
workwear**

garment specifically designed to be worn in the workplace

Note 1 to entry: Its attributes are determined by the reason for its use, the activity in the workplace and the requirement to restore it for reuse.

**4 Principle**

The specimen (or relevant number of specimens) is washed in a washer/extractor and dried/finished according to one of the specified procedures. If multiple laundering cycles are required, each wash process shall be followed by drying/finishing.



## 5 Apparatus

### 5.1 Washer/extractor, with the following characteristics:

- a) front- or side-loading open pocket horizontal rotating drum type;
- b) cage volume: 220 l to 250 l;
- c) diameter of cage: 750 mm to 850 mm;
- d) depth of cage: 400 mm to 600 mm;
- e) ratio (diameter of cage to depth of cage):  $1,5 \pm 15 \%$ ;
- f) dead volume: 10 l to 20 l;
- g) lifting vanes (ribs): three; each having a height 10 % to 12 % of the diameter of cage; base width <100 mm;
- h) heating: direct steam or electric, thermostatically controlled;
- i) g-factors: wash  $0,75 \pm 10 \%$ ; drain  $0,75 \pm 10 \%$ ; interspin 50 to 100; final extraction 250 to 350;
- j) programmable extract speeds;
- k) reversible action, (5 to 10) revolutions in one direction, then reverse;
- l) time rotating at full washing speed to total washing time: 80 %.

### 5.2 Tumble dryer, with the following characteristics:

- a) air vented batch drying tumbler with a system for detecting the moisture content of the exhaust air to a tolerance of  $\pm 5 \%$ ;
- b) thermostatically controlled heating;
- c) diameter of cage: 900 mm to 1 100 mm;
- d) depth of cage: 630 mm to 1 000 mm;
- e) cage volume: 600 l to 720 l;
- f) g-factor: 0,7 to 1,0;
- g) reversing action: yes;
- h) nominal evaporation rate: 45 l/h  $\pm 20 \%$ ;
- i) radial airstream: yes;
- j) perforated drum: yes.

### 5.3 Finisher, with the following characteristics:

- a) batch-loaded steam cabinet;
- b) capacity: (8 to 18) pieces/garment;
- c) spray steam pressure: 2 bar to 5 bar (200 kPa to 500 kPa);
- d) specific volume flow (within cabinet): 6 900 m<sup>3</sup>/m<sup>2</sup> h to 8 900 m<sup>3</sup>/m<sup>2</sup> h;
- e) direction of air flow: top to bottom;

- f) temperature setting: adjustable;
- g) inlet temperature: 160 °C option required;
- h) distance from hanger to hanger: 75 mm ± 10 mm.

**5.4 Loading ballast**, consisting of clean workwear garments (lab coats, bib and brace, overalls, jackets, trousers and boiler suits) not previously washed more than 100 times and similar to the type of garment and fabric of the specimen (e.g. polyester/cotton or cotton) and the colour (e.g. white, coloured or fluorescent coloured). In cases where the ballast material may have a significant influence on the test result, the entire loading ballast shall consist of the specimen material, e.g. when testing contrasting colours or multicoloured material in textiles.

## 6 Reagents

### 6.1 Reference detergents.

The nominal composition of the reference detergents is given in 6.1.1 and 6.1.2. The reference detergent (with optical brightener) (6.1.1) can be used except when colour characteristics are being assessed. The reference detergent shall be stored in closed containers in a cool and dry place.

#### 6.1.1 Reference detergent (with optical brightener).

Values in % are based on 100 % raw material (pure).

##### Nominal percentage composition by weight

	Percentage
ABS-Na (C-12 chain)	0,425
Nonionic surfactant (C13/15 ZEO or C12/14 ZEO)	6,0
Sodium citrate dehydrate	5,0
Hydroxyethane diphosphonic acid Na-salt (HEDP)	1,0
Metasilicate anhydrous	42,3
Polymer (polymaleic acid)	2,0
Foam inhibitor (phosphoric acid ester)	3,0
Sodium carbonate	39,5
Optical brightener	0,3
Remaining water from raw material	0,475
	100,00

Due to the variability which may result from the manufacturing procedure of the detergent or of its ageing, the use is recommended, for comparative measurements, of a reference detergent supplied by one definite manufacturer from a definite production batch and of recent supply. It is recommended to keep the detergent and any bleaching agent separate. It is also recommended to keep small quantities and to use it within a limited time.

#### 6.1.2 Reference detergent (without optical brightener).

Values in % are based on 100 % raw material (pure).

Nominal percentage composition by weight	Percentage
ABS-Na (C-12 chain)	0,425
Nonionic surfactant (C13/15 7EO or C12/14 7EO)	6,0
Sodium citrate dehydrate	5,0
Hydroxyethane diphosphonic acid Na salt (HEDP)	1,0
Metasilicate anhydrous	42,6
Polymer (polymaleic acid)	2,0
Foam inhibitor (phosphoric acid ester)	3,0
Sodium carbonate	39,5
Remaining water from raw material	0,475
	100,00

Due to the variability which may result from the manufacturing procedure of the detergent or of its ageing, the use is recommended, for comparative measurements, of a reference detergent supplied by one definite manufacturer from a definite production batch and of recent supply. It is recommended to keep the detergent and any bleaching agent separate. It is also recommended to keep small quantities and to use it within a limited time.

## 6.2 Peracetic acid bleach. [standards.iteh.ai](https://standards.iteh.ai/catalog/standards/sist/34715cfe-5473-41cb-850c-826ffa0521ae/iso-15797-2017)

The nominal composition of the standard peracetic acid bleach is as follows:

- peracetic acid: 4 % to 5 %;
- hydrogen peroxide: 20 % to 30 %.

Use the agent within 30 days of receipt.

## 6.3 Chlorine bleach.

The nominal composition of the standard chlorine bleach is as follows:

- 150 g/l active chlorine (NaOCl).

Check the concentration prior to testing.

Use the agent within 30 days of receipt.

## 6.4 Hydrogen peroxide bleach.

Use one of the following commonly available hydrogen peroxide solutions.

	Solution A	Solution B
Strength expressed as volume/volume	100	130
Strength expressed as mass/volume %	30	40
Strength expressed as mass/mass %	27,5	35

Check the concentration prior to testing.