INTERNATIONAL STANDARD

ISO 18080-3

First edition
2015-12-15

Textiles — Test methods for evaluating the electrostatic propensity of fabrics —

Part 3: Test method using manual friction

Textiles — Méthodes d'essai pour l'évaluation de la propension des étoffes électrostatique —
Partie 3: Méthode d'essai de friction manuelle

Reference number
ISO 18080-3:2015(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) are worldwide federations of national standards bodies (ISO member bodies and IEC national committees). The work of preparing International Standards is normally carried out through ISO and IEC 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 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).

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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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committees responsible for this document are Technical Committee ISO/TC 38, *Textiles* and IEC/TC 101 *Electrostatics* as JWG 26, *Antistatic*, in the lead of ISO/TC 38.

ISO 18080 consists of the following parts, under the general title of *Textiles — Test methods for evaluating the electrostatic propensity of fabrics*:

— *Part 1: Test method using corona charging*

— *Part 2: Test method using rotary mechanical friction*

— *Part 3: Test method using manual friction*

— *Part 4: Test method using horizontal mechanical friction*

Introduction

In addition to safety hazards and damage or disruption of sensitive electronic devices and systems which are covered by other International Standards, electrostatic charging of clothing can also cause problems of clinging, uncomfortable shocks and the attraction of airborne dust and other contaminants.

Clothing designed to avoid airborne dust contamination is required in a number of expanding industries relating to precision technology, biotechnology, food, hygiene, etc. It is also generally desirable to have clothing that does not cling or cause uncomfortable shocks.

Test methods are required to evaluate the propensity of fabrics used to make clothing designed to avoid problems associated with electrostatic charging. Test methods are specified in a number of National and International Standards, including those published by ISO and IEC. However, the relationship between measurable electrostatic properties and end use performance is rather complex and may require a combination of different test methods depending on application.

The test method described in this International Standard for measuring charge density on the surface of a textile generated by friction is one of a number of test methods that can be used to evaluate the electrostatic propensity of textile materials. As the charge density generated depends on the textile material, its surface condition, and the nature of the friction, the gentle friction action described can be considered to simulate practical wearing conditions.

As with any manual test procedure, there is a certain operator dependence that cannot be eliminated. Test results from different laboratories may differ by more than a factor of five.

Textiles — Test methods for evaluating the electrostatic propensity of fabrics —

Part 3: Test method using manual friction

1 Scope

This part of ISO 18080 specifies a test method using manual friction with measurement of frictional charge density on specimens of fabric. The test method is suitable for fabrics of all types of composition and construction that are capable of withstanding frictional charging.

Some fabrics, e.g. fabrics of low strength or loose construction, may not be physically capable of withstanding the manual friction used in this test method or may give false results. In such cases, the test method described in ISO 18080-1 can be used to evaluate electrostatic propensity.

The test method described may not be suitable for evaluating garments and garment materials in relation to safety of personnel and protection of electrostatic discharge sensitive devices.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3175-2, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene*

ISO 3175-3, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 3: Procedure for testing performance when cleaning and finishing using hydrocarbon solvents*

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

IEC 61340-5-1, *Electrostatics — Part 5-1: Protection of electronic devices from electrostatic phenomena — General requirements*

3 Terms and definitions

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

3.1
antistatic
property of a material that reduces its propensity to acquire electrostatic charges or allows electrostatic charges to dissipate quickly

3.2
conductive
providing a sufficiently high conductivity so that potential differences over any parts of a material or object are not sufficiently large to be of practical significance

Note 1 to entry: In general, a conductive material has a resistance below about 10^5 Ω, but different standards may define different resistance ranges for this term.

3.3
frictional charge density
quantity of charge per unit area on a fabric specimen generated by friction between the specimen and other fabrics

4 Principle

A fabric specimen is charged by rubbing it by hand with another fabric. The quantity of charge generated is measured using a Faraday pail test apparatus.

5 Conditioning and testing atmosphere

Unless otherwise agreed or specified, the atmosphere for conditioning and testing shall be a temperature of (20 ± 2) °C and a relative humidity of (40 ± 4) %. If a different temperature or humidity is used for conditioning or testing, record it in the test report.

NOTE For measurements, refer to ISO 139.

6 Apparatus

6.1 Testing apparatus, an example of the testing apparatus is composed of the following parts.

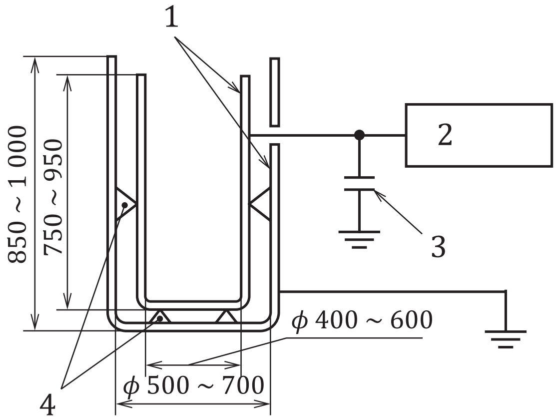
— **Voltmeter**, with a DC measurement range of ±(10 mV to 10 V) or larger, 5 % measuring accuracy, and input resistance greater than 10^{14} Ω.

— **Faraday pail**, the basic form of a Faraday pail system for measurement of charge is shown in Figure 1. It consists of two concentric metal containers, the inner container being electrically insulated from the outer which is connected to the ground. The latter is necessary to provide electrical shielding from external fields and protection for the sensitive charge measuring system.

— **Capacitor**, added to the measuring circuit to limit the pail voltage to within the range of the voltmeter used. A capacitor of 0,1 μF with a relative tolerance of ±2 % and insulation resistance greater than 10^{13} Ω is suitable for the voltage measuring range shown above.

— **Insulating spacer**, made of fluoro-resin, acrylic resin or poly-carbonate resin, or other material with insulation resistance of at least 1×10^{14} Ω.

Dimensions in millimetres



Key

1 Faraday pail

2 voltmeter

3 capacitor

4 insulating spacer

Figure 1 — Example of a charge quantity measuring apparatus

6.2 Rubbing fabric

Rubbing fabrics for this test are selected as follows:

— acrylic filaments, interlock knit using 3 stage bat: 200 g/m² ± 15 g/m²;

— nylon filaments, interlock knit using 3 stage bat: 230 g/m² ± 15 g/m²;

— if other rubbing fabrics are used, they shall be described in full detail in the test report.

6.3 Rubbing bar preparation

6.3.1 Prepare a hard polyvinyl chloride pipe with an outside diameter of 32 mm ± 0,2 mm, a nominal thickness of 3,1 mm, and a nominal length of 400 mm.

A hard polyvinyl chloride pipe with the nearest dimension may be used for this test.

6.3.2 Prepare the nylon or acrylic rubbing fabric with a length of 500 mm ± 10 mm in the wale direction and 450 mm ± 10 mm in the course direction.

6.3.3 Wind the rubbing fabric around the pipe (6.3.1) so that the entire 500 mm length of the rubbing fabric is taken up around the pipe.

6.3.4 Stretch both ends and insert the extra length of rubbing fabric inside of the pipe to fix it inplace.

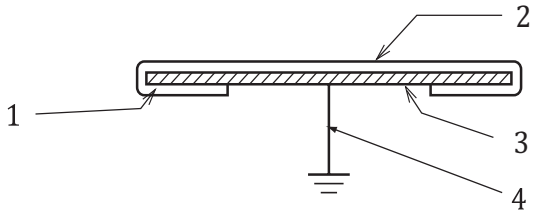
6.4 Base plate preparation

6.4.1 Prepare an aluminium plate with nominal dimensions of 320 mm × 300 mm and a thickness 3 mm.

6.4.2 Prepare the rubbing fabric as specified in 6.3.2 with nominal dimensions of 450 mm in the wale direction and 400 mm in the course direction.

6.4.3 Place the double-sided adhesive tape (thickness 50 µm to 100 µm and nominal width 20 mm) along all four sides of the reverse surface of the base plate.

6.4.4 Wrap the rubbing fabric so as to cover the plate from all ends and fix it using the adhesive tape as shown in Figure 2.



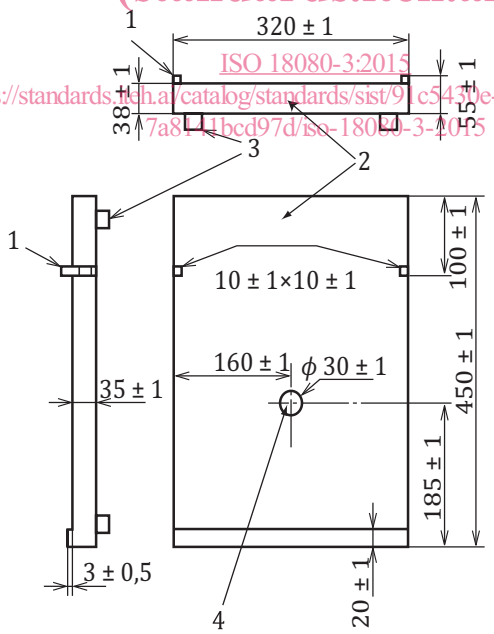
Key

1 folded rubbing fabric, fixed by double-sided adhesive tape
2 rubbing fabric
3 aluminium plate, 320 mm × 300 mm, thickness 3 mm
4 ground wire

Figure 2 — Base plate configuration

6.5 Base stand, made of wooden plate, acrylic bar for stopper, and rubber legs.

Dimensions in millimetres



Key

1 acrylic bar
2 wooden plate
3 rubber legs
4 ground wire hole

Figure 3 — Base stand configuration

6.6 Insulation bar, made of acrylic, with a nominal diameter of 20 mm and a nominal length of 500 mm.

6.7 Static electricity elimination equipment, self-discharge type or superimposed voltage type.

6.8 Oven, used to dry samples at (70 ± 3) °C.

6.9 Other test apparatus. Test apparatus other than that described above may be used after appropriate validation and provided a full description of all deviations from the above specifications are included in the test report.

7 Preparation of specimen

7.1 Sampling

Prepare a sample for the test from a fabric roll or clothing.

Careful handling and the use of clean, lint free gloves is recommended to avoid contaminating the samples.

7.2 Cleansing

7.2.1 General

In case that the samples are required to cleanse, use one of the following procedures.

If the procedure used for cleansing differs from those detailed below, either in the method, number of cycles, or any other condition, details of such deviations shall be included in the test report.

7.2.2 Wash by water

Wash the samples three cycles according to ISO 6330 Procedure 4 N or 4 M at 40 °C water temperature using a reference detergent according to ISO 6330. Dry them by one of the natural drying procedures according to ISO 6330.

Residual detergent from previous use of the washing machine may affect the test results. Careful cleaning of the washing machine before using is recommended.

7.2.3 Dry cleaning

Dry clean samples according to ISO 3175-2 or ISO 3175-3.

7.3 Conditioning of sample

Condition samples as follows:

— dry two samples for one hour at 70 °C;

— place the samples in the conditioning atmosphere specified in Clause 5 for at least 24 h.

8 Testing method

8.1 After conditioning as specified in 7.3, cut three test specimens from the sample of dimensions 350 mm ± 1 mm by 250 mm ± 1 mm with the longer dimension in the direction of the warp in woven fabrics, the wale in knitted fabrics, or machine direction in nonwoven fabrics. Cut a further three