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Surface active agents — Fabric conditioners — Determination of antistatic performance

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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.

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This document was prepared by Technical Committee ISO/TC 91 *Surface active agents.*

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Surface active agents — Fabric conditioners — Determination of antistatic performance

1 Scope

This document specifies a method for the determination of static electricity elimination (antistatic) performance.

This document is applicable to fabric conditioners and antistatic agents.

NOTE The differences between this document and some International Standards related to static electricity on textiles are listed in Annex B.

2 Normative references

There are no normative references in this document.

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:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
fabric surface resistance
R_s
resistance measured when electric current flows through the surface of fabric

3.2
fabric surface resistance coefficient
ρ_s
surface resistance measured by two electrodes of unit length placed on the fabric surface with the distance of unit length between them

Note 1 to entry: Unit length is expressed in centimetres.

3.3
antistatic agent
product used to treat fabric for eliminating static electricity

3.4
fabric conditioner
product with both antistatic and softening function, which generally contains cationic surface active agents

4 Principle

The electrostatic effect of fabric is subject to not only the amount of static electricity generated, but also the dissipation capacity of electrostatic charge. The fabric surface resistance is a physical quantity characterizing the electrostatic charge attenuation velocity of fabric. Soak the test fabric material in

fabric conditioner solution under specified conditions. Measure the surface resistance of the test fabric material with ultra-high resistance meter before and after soaking. Assess the antistatic performance for fabric conditioner with the decrease of the surface resistance coefficient ($\Delta\rho_s$) or the decrease of the logarithm of the surface resistance coefficient ($\Delta\lg\rho_s$).

5 Test fabric material

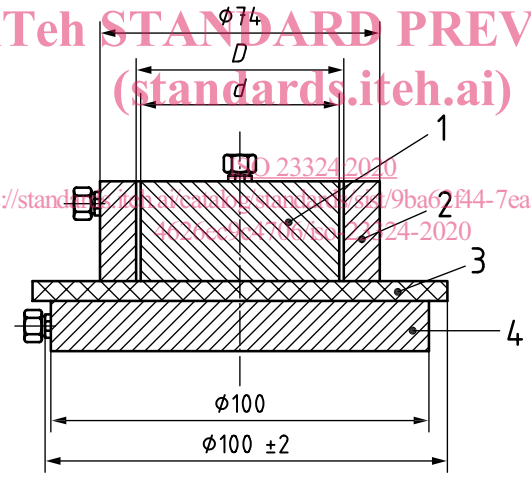
5.1 Polyester, white or milky woven twill, with warp 428 threads per decimetre and weft 242 threads per decimetre.

Polyester of other specifications or cloth of other textures can be used. However, only the comparative test result of antistatic performance for different fabric conditioners can be provided, which shall be included in the test report.

6 Apparatus and materials

6.1 Digital ultra-high resistance meter, with three coaxial electrodes and measuring range from 1×10^3 Ω to 1×10^{16} Ω. The intrinsic error within limits shall not exceed 10 % of the indicated value. The pressure that the electrodes press on sample shall be 100 g/cm^2. Structure size of coaxial-electrode system is shown in Figure 1.

Dimensions in millimetres



Key

1 measuring electrode
2 shield electrode
3 test sample
4 high-voltage electrode
D inner diameter of the circular shield electrode
d diameter of the measuring electrode

Figure 1 — Coaxial-electrode system

6.2 Oven, regulated at a temperature of (45 ± 2) °C.

6.3 Humidistat. A glass desiccator containing potassium carbonate-saturated solution can be used. The relative humidity (RH) of air at equilibrium shall be 43 % for a temperature between 10 °C and 30 °C.

6.4 Vegetable dehydrator (see Figure 2). Diameter of the upper rim of outer basket shall be (26 ± 3) cm, and the height shall be (17 ± 2) cm.

a) Overall photo **b) Top cover** **c) Bottom basket**

Figure 2 — Vegetable dehydrator

6.5 Speed controller (optional), for use with the vegetable dehydrator (6.4). See Annex A.

6.6 Soap flakes, neat soaps, soap powder or soap base, with dried sodium soap content ≥ 54 %.

6.7 Miscellaneous tools, scissors, ruler, filter paper, plastic tweezers, plastic clip and thermometer.

7 Procedure

7.1 Preparation of test clothes

7.1.1 Washing of test clothes

Cut 10 cm selvage off the polyester fabric, then cut it into 100 mm × 100 mm test clothes.

Dissolve soap flakes (6.6) in distilled water or deionized water to obtain a soap solution with a concentration of 1g/l of dried sodium soap. Keep the temperature between 40 °C and 45 °C.

Transfer 2 l of the soap solution to the vegetable dehydrator (6.4). Put 20 pieces of the 100 mm × 100 mm test clothes into it, cover and spin for 15 min. During the spinning, turn clockwise five times then anticlockwise five times for 3 min at a speed of 18 r/min to 22 r/min under control or monitoring (6.5), then stop for 2 min. Repeat 2 times. Discard the water and spin fast for 30 s.

Transfer 2 l of distilled water or deionized water at a temperature of 40 °C to 45 °C to the vegetable dehydrator (6.4). Cover and spin for 3 min. During the spinning, turn clockwise five times then anticlockwise five times. Discard the water and spin fast for 30 s. Then, repeat the rinse 2 times.

7.1.2 Drying of test clothes

Pick the washed test clothes with plastic tweezers. Clip both sides of the test clothes hanging to dry at room temperature for 2 h to 3 h. Lay the dried test clothes on filter paper in an enamel tray and cover with another filter paper. Dry in the oven (6.2) at 45 °C for 4 h. Put it in the humidistat (6.3) and keep in reserve.

7.2 Preparation of conditioner solution

Weigh 8,5 g test sample, dilute the test sample with distilled water or deionized water to 850 ml in a 1 000 ml beaker to obtain a concentration of 10,0 g/l. Transfer 200 ml of the solution to four 400 ml beakers, respectively, for parallel test.

Soak four pieces of 100 mm × 100 mm test clothes (see 7.1) in each 200 ml conditioner solution for 10 min at room temperature and stir with a glass rod. Take out and clip both sides of the test clothes hanging to dry for 3 h. Dry in the oven (6.2) at 45 °C for 4 h as specified in 7.1.2.

Another four pieces of 100 mm × 100 mm test clothes (see 7.1) shall be used for blank test (without soaking in conditioner solution). Separate the dried test clothes of different samples and those of the blank with filter paper. Place in the humidistat (6.3) for 15 h or more hours at room temperature.

7.3 Measurement of surface resistance

7.3.1 Measurement conditions

Measurement shall be carried out at controlled humidity (43 ± 5) % and temperature (20 ± 2) °C.

7.3.2 Measurement of surface resistance

Start the ultra-high resistance meter according to the operation manual. Measure the test clothes one by one.

8 Expression of results

8.1 Method of calculation

8.1.1 Fabric surface resistance (R_s)

The resistance directly read on the screen of the ultra-high resistance meter is the fabric surface resistance (R_s), in Ω.

8.1.2 Fabric surface resistance coefficient (ρ_s)

The fabric surface resistance coefficient (ρ_s), in Ω, is given by Formula (1). It can be used to compare the results obtained from ultra-high resistance meters with different parameters.

$$\rho_s = R_s \times \frac{2\pi}{\ln \frac{D}{d}} \tag{1}$$

where

R_s is the fabric surface resistance, in Ω, specified in 8.1.1;

D is the inner diameter, in centimetres, of the circular shield electrode;

d is the diameter, in centimetres, of the measuring electrode;

π is 3,1416.

When D = 5,4 cm and d = 5,0 cm, $\rho_s = R_s \times 81{,}6$.

8.1.3 Decrease of fabric surface resistance coefficient ($\Delta\rho_s$)

The decrease ($\Delta\rho_s$) of the fabric surface resistance coefficient, is given by Formula (2).

$$\Delta\rho_s = \rho_{sB} - \rho_{sC} \tag{2}$$

where

ρ_{sB} is the average value, of the surface resistance coefficients from four pieces of blank test clothes;

ρ_{sC} is the average value, of the surface resistance coefficients from four pieces of test clothes treated with conditioner solution.

8.1.4 Decrease of the logarithm of fabric surface resistance coefficient ($\Delta\lg\rho_s$)

The decrease of the logarithm of fabric surface resistance coefficient ($\Delta\lg\rho_s$) is given by Formula (3).

$$\Delta\lg\rho_s = \lg\rho_{sB} - \lg\rho_{sC} = \lg R_{sB} - \lg R_{sC} \tag{3}$$

where

$\lg\rho_{sB}$ is the logarithm, of the average value of surface resistance coefficients from four pieces of blank test clothes;

$\lg\rho_{sC}$ is the logarithm, of the average value of surface resistance coefficients from four pieces of test clothes treated with conditioner solution;

$\lg R_{sB}$ is the logarithm, of the average value of surface resistance from four pieces of blank test clothes;

$\lg R_{sC}$ is the logarithm, of the average value of surface resistance from four pieces of test clothes treated with conditioner solution.

8.2 Expression of results

Express the antistatic performance for fabric conditioner as the decrease of surface resistance coefficient ($\Delta\rho_s$) or decrease of the logarithm of surface resistance coefficient ($\Delta\lg\rho_s$) of fabric treated with fabric conditioner. The bigger $\Delta\rho_s$ or $\Delta\lg\rho_s$ implies the better antistatic performance.

9 Test report

The test report shall include the following particulars:

a) a reference to this document, i.e. ISO 23324;

b) sample name;

c) test date;

d) specification of polyester;

e) type, specification and parameters of the ultra-high resistance meter;

f) concentration of conditioner solution;

g) relative humidity and temperature in the humidistat and of the test environment;

h) test results: $\Delta\rho_s$ or $\Delta\lg\rho_s$;

i) operator name;

