SLOVENSKI STANDARD
SIST EN 1149-2:1998

01-april-1998

Varovalna obleka - Elektrostatiļ ne lastnosti - 2. del: Preskusna metoda za merjenje elektriļ ne upornosti skozi material (vertikalna upornost)

Protective clothing - Electrostatic properties - Part 2: Test method for measurement of the electrical resistance through a material (vertical resistance)

Schutzkleidung - Elektrostatische Eigenschaften - Teil 2: Prüfverfahren für die Messung des elektrischen Widerstandes durch ein Material (Durchgangswiderstand)

Vetements de protection - Propriétés électrostatiques - Partie 2: Méthode d'essai pour le mesurage de la résistance électrique a travers un matériau (résistance verticale)

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English version

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 162 "Protective clothing including hand and arm protection and lifejackets" the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 1998, and conflicting national standards shall be withdrawn at the latest by February 1998.

The annex A is informative.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

0 Introduction

This European Standard is part of a series of test methods and requirements for electrostatic properties of protective clothing. The European Standard has been divided into a number of parts due to the differing fields of application and materials.

1 Scope

This European Standard specifies a test method for measuring the electrical vertical resistance of protective clothing materials. This European Standard is not applicable for specifying protection against mains voltages.

NOTE: Further information is given in the informative annex A.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1149-1 : 1995
Protective clothing - Electrostatic properties - Part 1: Surface resistivity (Test methods and requirements)

3 Definition

For the purposes of this European Standard the following definition applies:

3.1 Vertical Resistance R_V

The electrical resistance through a material in ohms as determined by using specified electrodes.

4 Test principle

Electrodes are placed on opposite surfaces of the material to be tested. A DC potential is applied to the electrodes and the vertical resistance of the test material is determined.

5 Test apparatus

5.1 Electrode assembly

5.1.1 General

Electrical contact with the test material shall be established by means of an electrode assembly identical to electrode type A of EN 1149-1. This electrode assembly also determines the measuring geometry, see figure 1.

5.1.2 Test electrode

The test electrode consists of a metal disc (1) approximately 3 mm thick and with a diameter d_1 = 50,4 mm which is secured, under a separating disc of high-insulating material (2), concentrically to a metal guard plate (3). A coaxial plug-in connection (4) provides a means of electrical contact to the metal disc and the guard plate.

5.1.3 Annular electrode

The annular electrode consists of a metal guard ring (5) of approximately 3 mm thickness with an inside diameter d_2 = 69,2 mm and an outside diameter d_3 = 89 mm, which under a separating ring of high-insulating material (6) is placed concentrically to a screening ring (7) with an outside diameter d_4 = 100 mm. Insertion of a connector (8) insulated from the screening ring (7) provides a means of electrical contact to the metal guard ring (5).

5.1.4 Base plate electrode

The base plate electrode consists of a metal disc (9) (110 ± 0,2) mm diameter and approximately 12 mm thickness, equipped on the lower side with an insulating layer (10) of a maximum thickness of 1 mm and insulation not less than 10^{14} Ω. A socket (11) provides electrical contact.

5.1.5 Construction of the assembly

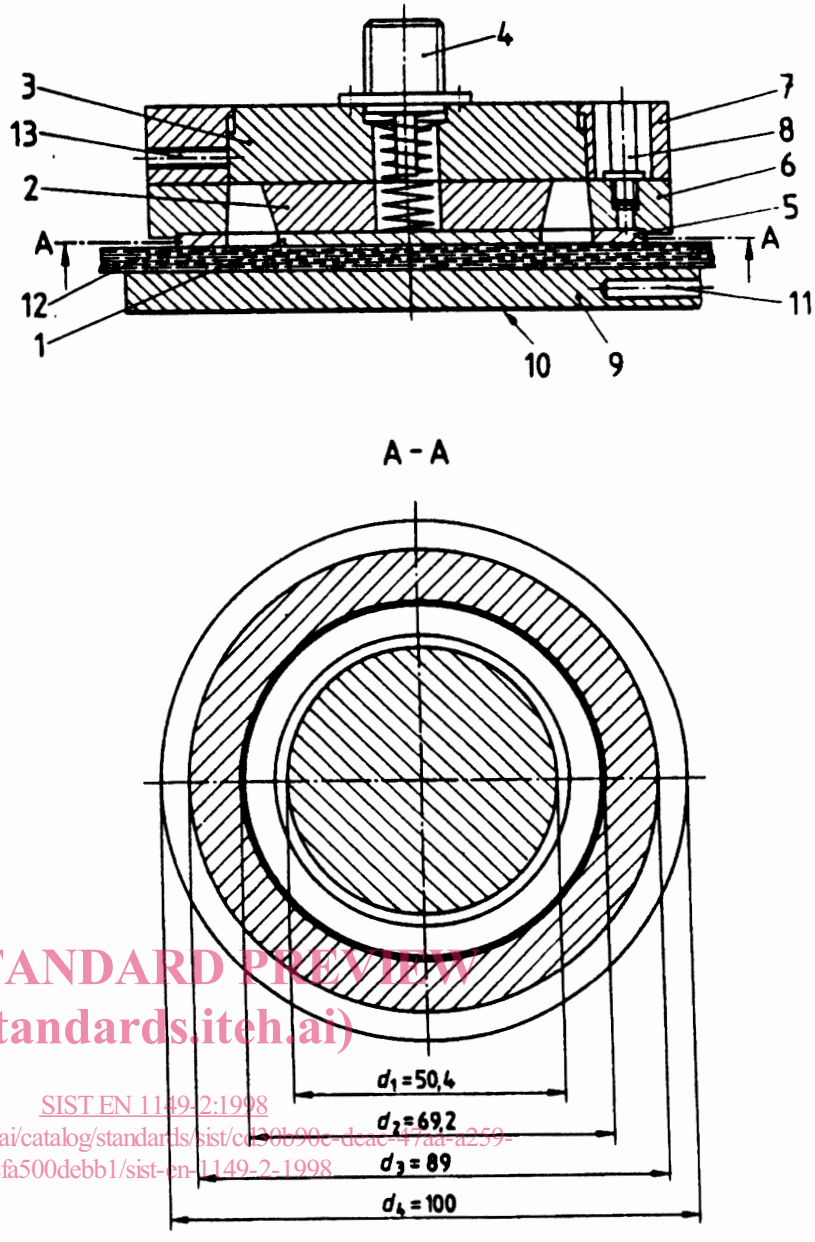
The test electrode is placed concentrically to the annular electrode and shall be easily movable within it. For completion of electrical contact, sprung balls shall be inserted into three holes (13) distributed at equal distances along a circumference of the contact area between the metal guard plate (3) and the screening ring (7) of the test and annular electrodes. The spring pressure thus asserted shall be weak enough for any extra friction to be negligible.

The surfaces of electrodes (1), (5) and (9) which come into contact with the specimen shall be made from the same material, so that in the case of samples containing electrolyte, no electrolysis junctions can occur.

The overall mass of test and annular electrodes shall be (1020 ± 20) g, exerting a contact pressure on the test material of approximately 10 N. In order to ensure that the test and annular electrodes each have an equal pressure (approximately 0,225 N cm^{-2} = 2,25 kPa) the mass of the test electrode shall be (460 ± 10) g and the mass of the annular electrode shall be (560 ± 10) g.

Figure 1 is a construction diagram showing suitable dimensions assuming that the metal parts are made of steel with a density of 7,8 g cm^{-3} and the insulating parts are of Polymethylmethacrylate (PMMA), Polystyrene (PS) or Polycarbonate (PC) with a density of approximately 1,19 g cm^{-3}.

Dimensions in Millimetres



1 Metal disc of the test electrode
2 Insulating disc of the test electrode
3 Guard plate of the test electrode
4 Coaxial plug-in connection
5 Metal guard ring of the annular electrode
6 Insulating ring
7 Screening ring
8 Connector
9 Metal disc of the base plate electrode
10 Insulating layer
11 Socket
12 Test material
13 Bore for ball

Figure 1: Electrode assembly

5.2 Ohmmeter or electrometer

Ohmmeter with a range of	10^5 Ω to 10^{14} Ω;
and a limit of errors of	± 5 % for ≤ 10^{12} Ω, ± 20 % for > 10^{12} Ω.

Alternatively an electrometer can be used with an input impedance of not less than 10^{14} Ω and a separate DC source with an inbuilt safety resistor.

5.3 Cleaning agent applicable to the electrodes

Use an appropriate cleaning agent, e.g. propan-2-ol or ethanol.

NOTE: Certain cleaning agents thought appropriate, such propan-2-ol or ethanol, are highly flammable and toxic. It is recommended to resort to appropriate collective or personal measures of protection in order to avoid ignition, breathing of vapours and contact of such products with skin, eyes and clothing.

6 Specimens or sample/garment and conditioning

6.1 Specimens or sample/garment

From a sample or garment, five test specimens shall be cut each of a size between the overall dimensions of the annular electrode and base plate electrode. If a sample/garment is to be tested, then measurements shall be made at five different suitable places. Handle the specimens only at the edges to avoid contamination.

NOTE: The specimens can be from the same production lots as the materials that have been used for the manufacture of the delivery sample of the protective clothing.

6.2 Conditioning and testing atmosphere

The specimens or sample/garment shall be conditioned prior to testing for at least 24 h and tested in the following atmosphere:

Air temperature: (23 ± 1) °C
Relative humidity: (25 ± 5) %

NOTE: For specific purposes other atmospheres may be required (see Annex A).

7 Test procedure

7.1 Cleaning

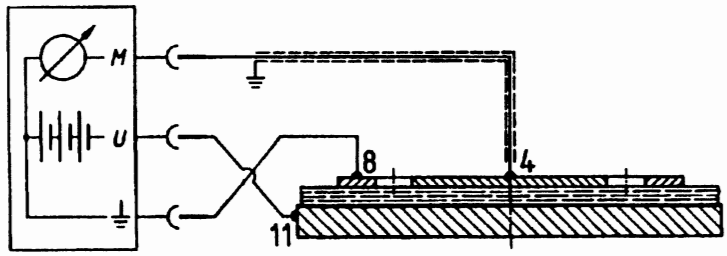
Clean the lower surfaces of the test and annular electrode, and the upper surface of the base plate electrode by wiping with a paper tissue which has been moistened with one of the cleaning agents (see 5.3).

7.2 Isolation test of the base plate electrode

Testing shall be done according to 5.4.2 of EN 1149-1 : 1995.

7.3 Testing

The base plate electrode shall be placed with the non-isolated side upwards. The test material shall be placed on the base plate and the test electrode and the annular electrode shall be placed concentrically on top of it. The circuit is formed as shown in figure 2.



4 Coaxial plug-in connection
8 Connector
11 Socket

Figure 2: Circuit for measurement of vertical resistance R_v

If the surface resistivity measured according to EN 1149-1 of the test sample is less than 10^8 Ω the metal guard ring (5) shall not be connected to earth during determination of R_v, as otherwise an excessively high fault current may cause an undue reduction of the test voltage. If this is the case only specimens, and not samples/-garments, shall be tested.

Apply a potential of (100 ± 5) V and after (15 ± 1) s determine the vertical resistance using the ohmmeter or electrometer. If the vertical resistance is less than 10^5 Ω an appropriate low voltage may be applied and shall be stated in the test report.

If necessary, vertical resistances of below 10^5 Ω may be determined by measuring the current through a suitable ammeter connected in series with the specimen and calculating the ratio of the applied potential to the current.

Repeat this procedure on the four other test specimens or on four different places on the garment.

8 Calculation and expression of results

Calculate the arithmetical mean of the five measured values of the vertical resistance.

9 Test report

In the test report reference shall be made to this European Standard and the following shall be reported:

a) description of the material tested;
b) test atmosphere;
c) testing potential, in volts;
d) all five single measurements;
e) mean vertical resistance R_v, in ohms;
f) any variations from this European Standard;
g) date of test.