



SLOVENSKI STANDARD
SIST EN 1149-1:1998

01-april-1998

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

Schutzkleidung - Elektrostatische Eigenschaften - Teil 1: Oberflächenwiderstand (Prüfverfahren und Anforderungen)

Vêtements de protection - Propriétés électrostatiques - Partie 1: Résistivité de surface (méthodes d'essai et exigences)

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Ta slovenski standard je istoveten z: EN 1149-1:1995

ICS:

13.340.10 Varovalna obleka Protective clothing

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EUROPEAN STANDARD

EN 1149-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 1995

ICS 13.340.10

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English version

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

Vêtements de protection électrostatiques - Partie 1: Résistivité de surface (méthodes d'essai et exigences) **STANDARD PREVIEW** Schutzkleidung - Elektrostatische Eigenschaften - Teil 1: Oberflächenwiderstand (Prüfverfahren und Anforderungen) (standards.iteh.ai)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

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

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Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 162 "Protective clothing including hand and arm protection and lifejackets" of which the secretariat 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of an identical text or by endorsement, at the latest by June 1996, and conflicting national standards shall be withdrawn at the latest by June 1996.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s).

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 following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



0 Introduction

This standard is part of a series of test methods and requirements for electrostatic properties of protective clothing. Different parts are necessary, because of the various fields of application and materials.

1 Scope

This European Standard specifies electrostatic requirements and test methods for electrostatic dissipative protective clothing to avoid incendiary discharges. The requirements may not be sufficient in oxygen enriched flammable atmospheres and the test method is not applicable for fabrics with core conducting fibres. This standard is not applicable for protection against main 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 340 : 1993

Protective clothing - General requirements

EN 344

Requirements and test methods for safety, protective and occupational footwear for professional use

ISO 7000 : 1989

Graphical symbols for use on equipment - Index and synopsis

3 Definitions

For the purposes of this standard the following definitions apply.

3.1 Homogeneous material

Material, where the electrical properties of the components (threads, layers) do not differ substantially from each other, or a material which contains an intimate blend of conductive fibres.

NOTE: This leads to electrostatic properties independent of the direction of the measurement.

3.2 Inhomogeneous material

Material that contains small quantities of conducting threads, which are distributed discretely in a grid pattern throughout the material; or material that is coated or laminated with polymeric or metallic materials where the electrical properties of the material components differ substantially (e.g. more than a factor of 10) from each other.

3.3 Surface resistance

The resistance in ohms as determined by using specified electrodes placed on the surface of the material.

3.4 Surface resistivity

The resistance in ohms between opposite edges of a square of the material along the surface of the material.

NOTE: The surface resistivity is independent of the electrode dimensions and is calculated by multiplying the measured surface resistance with the appropriate factor.

3.5 Protective clothing

Clothing which covers or replaces personal clothing and which is designed to provide protection against one or more hazards (see EN 340).

4 Requirements

4.1 Performance requirements

For homogeneous materials the surface resistivity shall be less than $5 \times 10^{10} \Omega$ after testing according to clause 5.

For inhomogeneous materials which are coated or laminated at least one surface shall comply with the requirement for homogeneous materials.

Inhomogeneous materials containing conducting threads shall have:

- a) resistances none of which exceeds $10^9 \Omega$ on at least one surface when measured according to 5.1 to 5.4.3;
- b) a grid pattern of conducting threads;
- c) a maximum spacing of 10 mm between the conducting threads.

NOTE: For materials containing conducting core fibres, present test methods are inappropriate (see annex A).

4.2 Design requirements

Electrostatic dissipative protective clothing consisting of a two-piece or a one-piece suit shall be able to always cover the body, arms and legs. The clothing shall be designed to allow a charge dissipation throughout the garment and to allow direct contact of the conducting component of the clothing material with the skin, e.g. at the neck and wrists. Folds at the end of garments e.g. sleeves, trouser-ends and collar shall improve the ability of the electrostatic material to contact the skin. The width of the exposed surfaces of any closure accessories, e.g. zips, shall be less than 10 mm.

NOTE: Hazardous discharge from sublayers of clothing is avoided by ensuring that they are completely covered by the outer garment. Therefore jackets of a two-piece garment should be long enough to cover the top of the trousers even when the wearer is bending over.

NOTE: Example of folds - Fold a conductive garment surface on the outside to the inside at the sleeves.

NOTE: If the conducting component of the garment cannot contact the skin, it should be earthed directly.

5 Test method

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5.1 Principle

The specimen is placed on an insulating base plate and an electrode assembly is rested on the specimen. A DC potential is applied to the electrode assembly and the resistance of the fabric is measured.

5.2 Apparatus

5.2.1 Electrodes

The electrodes shall consist of a cylindrical and an annular electrode which are arranged concentrically with each other. Suitable electrodes, Type A made of stainless steel and Type B made of solid brass are shown in figure 1 and figure 2. The insulation resistance between the inner and the outer electrode shall be not less than $10^{14} \Omega$ when determined in accordance with the method described in 5.4.2. If a solid insulator is used with a metal guard ring in the middle of it the insulating and the metal rings are recessed so that they do not contact the fabric surface.

5.2.2 Flat base plate

A flat base plate shall consist of insulating material of surface resistivity not less than $10^{14} \Omega$ (see 5.4.2), of a thickness between 1 mm and 10 mm and it shall be larger than the overall dimensions of the electrode. This plate is used as a support for the specimen during the measurement, and is rested in turn on an earthed conducting surface, e.g. metal plate.

5.2.3 Ohmmeter or electrometer

Ohmmeter with a range of	$10^5 \Omega$ to $10^{14} \Omega$;
and an accuracy of	$\pm 5 \%$ for $\leq 10^{12} \Omega$ and $\pm 20 \%$ for $> 10^{12} \Omega$.

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

5.2.4 Cleaning agent

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

WARNING: Propan-2-ol and ethanol are highly flammable and toxic. Avoid breathing the vapour and contact with skin, eyes and clothing.

5.3 Specimen and conditioning

5.3.1 Pretreatment

The specimen shall be pretreated according to the specific protective clothing standard for which this is an additional test or otherwise undergo five cycles of cleaning according to 5.3 of EN 340:1993.

NOTE: This pretreatment is superfluous for garments not intended for cleaning (e.g. for single use garments).

5.3.2 Specimen or garment

Five test specimens shall be cut each of size between the overall dimensions of the electrodes and of the base plate. If an uncut garment shall be tested, then measurements shall be made at five different suitable places on the garment. Handle the specimens only at the edges to avoid contamination.

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

5.3.3 Conditioning and testing atmosphere

The specimen shall be conditioned prior to testing for at least 24 hours and tested in the following atmosphere:

Air temperature: $(23 \pm 1) ^\circ\text{C}$;
Relative humidity: $(25 \pm 5) \%$.

NOTE: The surface resistance of homogeneous materials depends to a large degree on the relative humidity. The lower the relative humidity the higher the surface resistance and the better materials can be distinguished. As a low relative humidity of 25 % can occur in practice, this value is used.

5.4 Procedure

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5.4.1 Cleaning

Clean the lower surfaces of the electrodes and the upper surface of the base plate by wiping with a paper tissue which has been moistened with one of the cleaning agents (see 5.2.4).

5.4.2 Insulation test of the flat base plate

Carry out a blank test using the procedure given in 5.4.3 but with no specimen in position. Calculate the resistivity of the insulating material and check that it meets the requirements of 5.2.2.

5.4.3 Testing

Place the test specimen on the base plate with the surface to be tested uppermost and rest the electrode assembly on top of the specimen. Connect the electrodes as shown in figure 1 and figure 2.

Apply a potential of $(100 \pm 5) \text{ V}$ and after $(15 \pm 1) \text{ s}$ determine the resistance using the ohmmeter or electrometer. If the resistance is less than $10^5 \Omega$ an appropriate low voltage may be applied and shall be mentioned in the test report.

If necessary, resistances of below $10^5 \Omega$ 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.

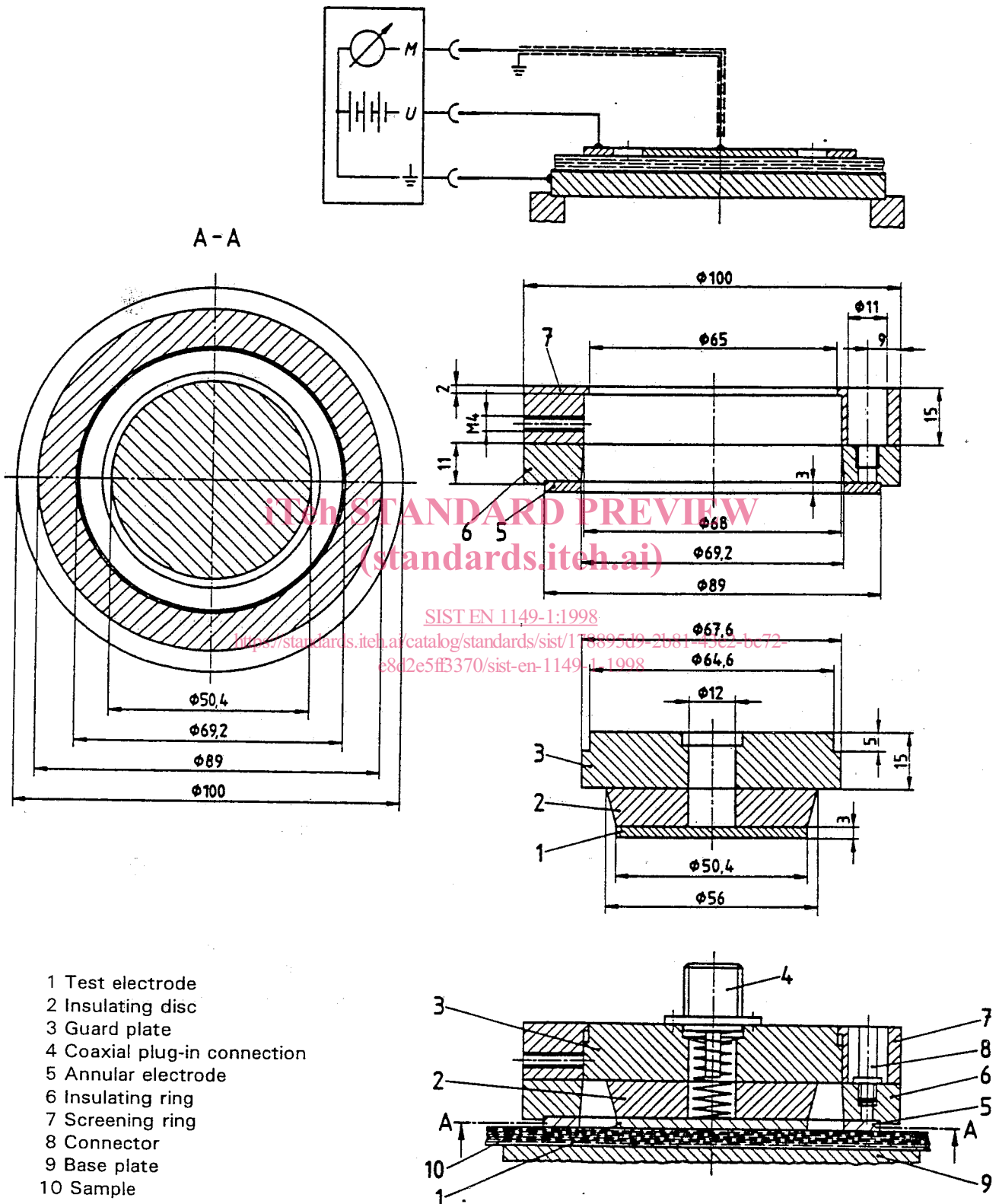
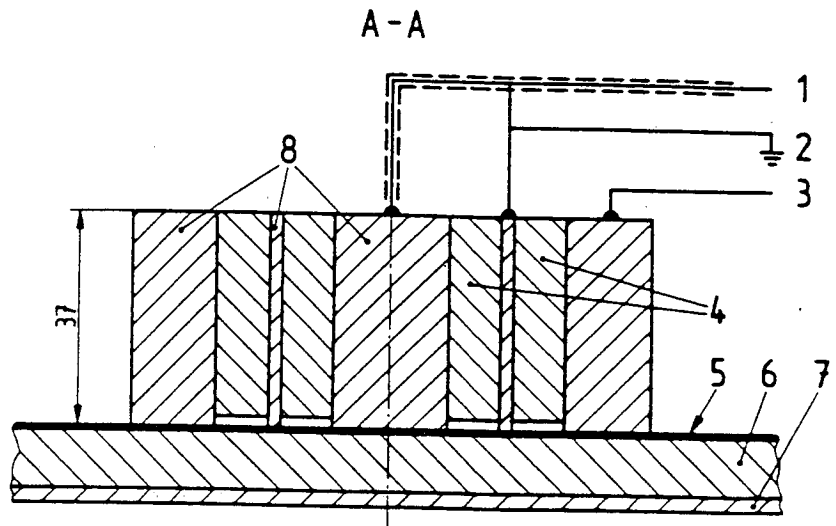


Figure 1: Assembly, dimensions and measuring circuit of electrodes Type A

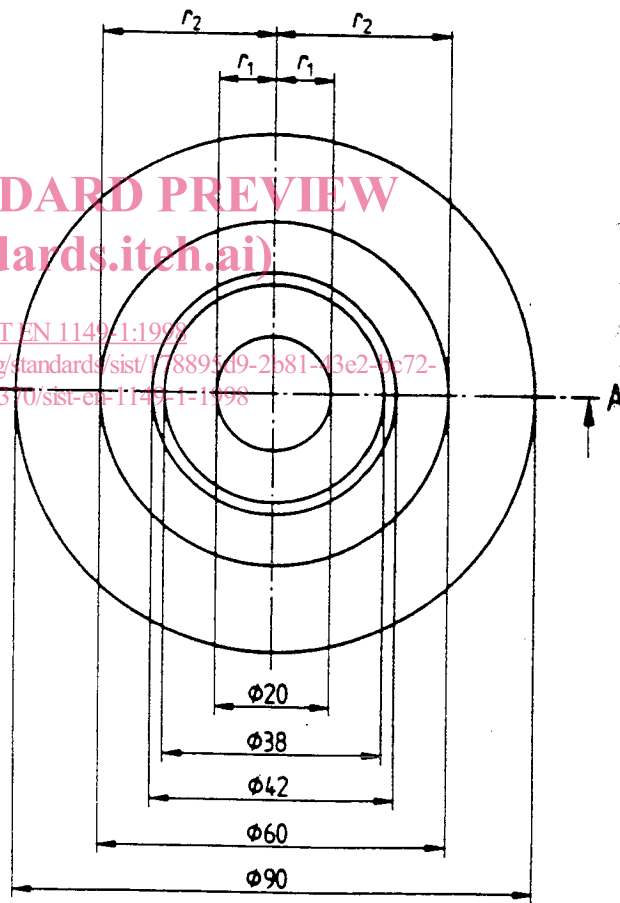
Dimensions in Millimetres



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- 1 to High of Ohmmeter or to Electrometer
- 2 Guard to earth
- 3 to low of Ohmmeter or to D.C. supply
- 4 High resistivity insulating material
- 5 Fabric under test
- 6 High resistivity insulating material
- 7 Earthed metal plate
- 8 Brass

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Section A-A

Figure 2: Assembly and dimensions of electrodes Type B