
Elektrostatika - 4-9. del: Standardne preskusne metode za posebno uporabo -
Oblačila - Uporovne značilnosti

Electrostatics - Part 4-9: Standard test methods for specific applications - Garments -
Resistive Characterization

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PREVIEW

Électrostatique - Partie 4-9: Méthodes d'essai normalisées pour des applications
spécifiques - Vêtements - Caractéristiques résistives

Ta slovenski standard je istoveten z: prEN IEC 61340-4-9:2021

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IEC TC 101 : ELECTROSTATICS	
SECRETARIAT: Germany	SECRETARY: Mr Hartmut Berndt
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☒ QUALITY ASSURANCE ☐ SAFETY	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. https://standards.iteh.ai/catalog/standards/sist/33486bfb-e609-4dfc-832d-47b53afa351a/osist-pren-iec-61340-4-9-2022 The CENELEC members are invited to vote through the CENELEC online voting system.	

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TITLE:

Electrostatics - Part 4-9: Standard test methods for specific applications - Garments - Resistive Characterization

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

The text "Resistive Characterization" has been added to the project title (see 101/636A/CC).

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROSTATICS –

**Part 4-9: Standard test methods for
specific applications – Garments – Resistive Characterization**

FOREWORD

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International Standard IEC 61340-4-9 has been prepared by IEC technical committee 101: Electrostatics.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) IEC 61010-1 and IEC 61010-2-030 were added as requirements for measurement equipment
- b) Testing voltage for personal ground path changed from 7 V DC to 30 V DC to 7 V DC to 100 V DC
- c) Cleaning requirements changed from a minimum of 5 cycles of cleaning to a minimum of 3 cycles of cleaning.

- d) Moderate humidity requirements deleted
- e) Figures were replaced with generic drawings

The text of this standard is based on the following documents:

FDIS	Report on voting
101/500/FDIS	101/502/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61340 series, published under the general title *Electrostatics*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

143 This part of IEC 61340 provides test methods for evaluating the electrical resistance of
144 garments that contain surface conductive or dissipative components or materials used in the
145 electronics industry for the control of electrostatic discharge. This standard defines
146 procedures for measuring electrical resistance, including a system resistance test for
147 garments that provide a ground path for personnel.

148 Clothing made from synthetic fibres is a common source of electrostatic charge. Wearing an
149 appropriate static control garment over personal clothing can minimize the effect of this
150 charge. To effectively control electrostatic charges, the static control garment should be
151 grounded.

152 Three categories of garments are considered in this standard.

- 153 a) A static control garment might suppress or otherwise affect an electric field from clothing
154 worn underneath the garment without being attached to ground. However, without
155 grounding, a charge might accumulate on conductive or dissipative elements of a
156 garment, if present, resulting in a charged source.
- 157 b) A groundable static control garment can provide a higher level of suppression when the
158 lower resistance fabric is connected to ground.
- 159 c) A groundable static control garment system provides a ground path for a person that
160 suppresses the electrical field from clothing worn underneath the garment and also bonds
161 the skin of the wearer to an identified ground path. Groundable static control garment
162 systems can also be used in conjunction with a continuous or constant monitoring system
163 in a manner similar to those used in continuous monitoring of wrist straps in an ESD
164 protected area (EPA).

165 Resistive characterization is only one aspect to consider in evaluating garments for any
166 specific application. To fully characterize a garment, electrical field attenuation, static decay,
167 peak voltage, residual voltage and triboelectric charging might need to be considered. Other
168 attributes related to applications and environments, such as cleanroom compatibility, chemical
169 and fire resistance, should be evaluated in the garment selection process but are beyond the
170 scope of this standard.

171 Garments constructed from fabrics made with fibres that are not surface conductive but might
172 have other related properties that impart some level of electrostatic charge dissipation or
173 suppression when connected to ground, are not specifically measured by the methods
174 provided in this standard. This being the case, some garment fabrics and construction might
175 allow for surface voltage accumulation and charge transfer to occur which can be detrimental
176 to electronic items.

177 Alternate methods for evaluating the electrostatic properties of garments are described in IEC
178 TS 61340-4-2.

179

ELECTROSTATICS –

Part 4-9: Standard test methods for specific applications – Garments – Resistive Characterization

1 Scope

This part of IEC 61340 provides test methods for measuring the electrical resistance of garments used for static control applications. These test methods can be used for evaluating outer garments that are homogeneously conductive or homogeneously dissipative, or that utilize surface conductive or surface dissipative components or elements.

NOTE The test methods defined in this standard might not be able to measure materials with buried conductive layers.

The resistance point-to-point test method tests the electrical resistance between the two sleeves, any two panels or any two or more electrically interconnected components of the static control garment, including the electrical resistance across the seams and cuffs of the garment as applicable.

An alternate sleeve-to-sleeve test method is allowed, using clamps to hang a garment.

Static control garments that electrically bond to the wearer and provide a path to ground from the wearer are evaluated using the resistance point-to-point test method, the resistance point to groundable point test method, as well as a system test to determine the resistance from the person through the garment to the groundable point of the garment system.

A band resistance measurement test is provided in IEC 61340-4-6 which can be used for garments so equipped with cuffs that are intended to perform the same function as a wrist strap band.

The system test with a person wearing a groundable static control garment system includes the ground cord that connects to the groundable point of the garment.

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.

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1 General requirements*

IEC 61010-2-030, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030 Particular requirements for equipment having testing or measuring circuits*

IEC 61340-2-3, *Electrostatics – Part 2-3: Methods of test for determining the resistance and resistivity of solid materials used to avoid electrostatic charge accumulation*

IEC 61340-4-6, *Electrostatics – Part 4-6: Standard test methods for specific applications – Wrist straps*

3 Terms and definitions

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

3.1

acceptance testing

testing used to confirm to users that products delivered are substantially the same as the samples used to qualify products

3.2

garment system

any electrically interconnected components of static control apparel

3.3

point-to-point resistance

resistance measured from one point to another on the surface of the same panel or two different panels of a garment

Note 1 to entry: Point-to-point resistance is expressed in Ω .

3.4

static control garments

personnel garments that are designed for electrostatic charge control

3.5

product qualification

testing used to confirm that products comply with requirements of an ESD control program or other specification

3.6

groundable static control garment

garment that exhibits an electrical resistance from point-to-point and from any point or panel on the garment to the groundable point on the garment

Note 1 to entry: The groundable point can be a cuff contact to the wearer's skin or separate dedicated grounding point connector.

3.7

groundable static control garment system

garments that are used to establish the primary ground path for a person to the groundable point of the garment and the connection of the garment to ground, typically through a grounding cord

Note 1 to entry: The garment is a groundable static control garment as defined in 3.6, with additional features to enable grounding of the wearer.

4 Atmosphere for conditioning and testing

The following requirements supersede any other specification for the atmosphere for conditioning and testing that might be given in one or more of the documents referred to in this standard.

Unless otherwise agreed, the atmosphere for conditioning and testing for laboratory evaluations at low humidity shall be at a temperature of $23\text{ °C} \pm 2\text{ °C}$ and $12\% \pm 3\%$ relative humidity. The conditioning time prior to testing shall be at least 48 h.

5 Equipment and materials

5.1 Resistance measurement apparatus

5.1.1 General

Electrical equipment for measurement shall comply with the safety requirements of IEC 61010-1 and IEC 61010-2-030. The measurement apparatus, called the meter, whether it is a single meter or collection of instruments, shall be capable of the following.

5.1.2 Product qualification

The meter shall have a circuit voltage while under load of 100 V ($\pm 5\%$) for measurements of $1,0 \times 10^6 \Omega$ and above, and 10 V ($\pm 5\%$) for measurements less than $1,0 \times 10^6 \Omega$.

The meter shall be capable of making measurements from $1,0 \times 10^3 \Omega$ to $1,0 \times 10^{12} \Omega$.

5.1.3 Acceptance testing

The product qualification meter can be used for acceptance testing or the following:

The meter shall have an open circuit voltage of 100 V ($\pm 5\%$) for measurements of $1,0 \times 10^6 \Omega$ and above, and 10 V ($\pm 5\%$) for measurements less than $1,0 \times 10^6 \Omega$.

The meter shall be capable of making measurements from $1,0 \times 10^3 \Omega$ to $1,0 \times 10^{12} \Omega$.

In case of disagreement the meter used for product qualification shall be used to resolve any disputes.

5.1.4 Ohmmeter for testing personal ground path

Integrated tester or meter, whether it is a single meter (ohmmeter) or a collection of instruments that are capable of measuring from $5,0 \times 10^4 \Omega$ to at least $1,0 \times 10^8 \Omega$ with a test voltage from 7 V to 100 V DC open circuit. If the test voltage exceeds 60 V DC, or 35 V DC in wet locations, the additional safety limits for current and capacitive charge specified in IEC 61010-1 shall be applied.

Both test leads should be capable of being isolated from ground. AC line-powered resistance measuring devices might give erroneous results due to undefined ground paths. Battery powered equipment is recommended.

5.2 Resistance measurement electrodes

5.2.1 Cylindrical electrodes

A cylindrical $2,5 \text{ kg} \pm 0,25 \text{ kg}$ electrode with a diameter of $63,5 \text{ mm} \pm 1 \text{ mm}$, having a contact of electrically conductive material with a Shore-A (IRHD) durometer hardness between 50 and 70. The resistance between two electrodes should be less than $1,0 \times 10^3 \Omega$ when measured at 10 V on a metallic surface.

5.2.2 Clamps/electrodes

The clamps/electrodes shall consist of two flat electrically conductive plates (e.g. stainless steel) with a dimension of approximately $50 \text{ mm} \times 25 \text{ mm}$ each. The clamp/electrodes shall be electrically conductive with sufficient compression force to retain and suspend the garment. See Figure 7.