

---

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

Electrostatics -- Part 2-3: Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation

Elektrostatik -- Teil 2-3: Prüfverfahren zur Bestimmung des Widerstandes und des spezifischen Widerstandes von festen planen Werkstoffen, die zur Vermeidung elektrostatischer Aufladung verwendet werden

Electrostatique -- Partie 2-3: Méthodes d'essais pour la détermination de la résistance et de la résistivité des matériaux planaires solides destinés à éviter les charges électrostatiques

**Ta slovenski standard je istoveten z: EN 61340-2-3:2000**

---

**ICS:**

17.220.99	Drugi standardi v zvezi z električno in magnetizmom	Other standards related to electricity and magnetism
-----------	---	--

**SIST EN 61340-2-3:2001****en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 61340-2-3:2001](https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001)

<https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001>

EUROPEAN STANDARD

EN 61340-2-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2000

ICS 17.220.99;29.020

English version

**Electrostatics****Part 2-3: Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation  
(IEC 61340-2-3:2000)**

Electrostatique

Partie 2-3: Méthodes d'essais pour la détermination de la résistance et de la résistivité des matériaux planaires solides destinés à éviter les charges électrostatiques  
(CEI 61340-2-3:2000)

Elektrostatik

Teil 2-3: Prüfverfahren zur Bestimmung des Widerstandes und des spezifischen Widerstandes von festen planen Werkstoffen, die zur Vermeidung elektrostatischer Aufladung verwendet werden  
(IEC 61340-2-3:2000)

iteh STANDARD PREVIEW  
(standards.iteh.ai)

[SIST EN 61340-2-3:2001](https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001)

<https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001>

This European Standard was approved by CENELEC on 2000-04-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**CENELEC**

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

## Foreword

The text of document 101/71/FDIS, future edition 1 of IEC 61340-2-3, prepared by IEC TC 101, Electrostatics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61340-2-3 on 2000-04-01.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2001-01-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2003-04-01

Annexes designated "normative" are part of the body of the standard.  
In this standard, annex ZA is normative.  
Annex ZA has been added by CENELEC.

---

## Endorsement notice

The text of the International Standard IEC 61340-2-3:2000 was approved by CENELEC as a European Standard without any modification.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 61340-2-3:2001](https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001)

<https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001>

**Annex ZA (normative)****Normative references to international publications  
with their corresponding European publications**

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 (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60093	1980	Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials	HD 429 S1	1983
IEC 60167	1964	Methods of test for the determination of the insulation resistance of solid insulating materials	HD 568 S1	1990
IEC 60212	1971	Standard conditions for use prior to and during the testing of solid electrical insulating materials	HD 437 S1	1984
IEC 60260	1968	Test enclosures of non-injection type for constant relative humidity	HD 98 S1	1977
ISO 1853	1998	Conducting and dissipative rubbers, vulcanized or thermoplastic Measurement of resistivity	-	-
ISO 2951	1974	Vulcanized rubber Determination of insulation resistance	-	-
ISO 3915	1981	Plastics Measurement of resistivity of conductive plastics	EN ISO 3915	1999

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 61340-2-3:2001](https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001)

<https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001>

**NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD**

**CEI  
IEC**

**61340-2-3**

Première édition  
First edition  
2000-03

**Electrostatique –**

**Partie 2-3:**

**Méthodes d'essais pour la détermination de  
la résistance et de la résistivité des matériaux  
planaires solides destinés à éviter les charges  
électrostatiques**

ITEH STANDARD PREVIEW  
(standards.iteh.ai)

**Electrostatics –**

SIST EN 61340-2-3:2001  
<https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001>

**Part 2-3:**

**Methods of test for determining the resistance  
and resistivity of solid planar materials used  
to avoid electrostatic charge accumulation**

© IEC 2000 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'éditeur.

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission  
Telefax: +41 22 919 0300

3, rue de Varembé Geneva, Switzerland  
e-mail: [inmail@iec.ch](mailto:inmail@iec.ch) IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

CODE PRIX  
PRICE CODE

**S**

Pour prix, voir catalogue en vigueur  
For price, see current catalogue

## CONTENTS

	Page
FOREWORD .....	5
INTRODUCTION .....	7
Clause	
1 Scope .....	9
2 Normative references .....	9
3 Definitions .....	11
4 Conditioning and test environment .....	11
5 Selection of test method .....	13
6 Resistance measurements of solid conductive materials .....	13
7 Resistance measurements of solid insulating materials .....	13
8 Resistance measurements of electrostatic dissipative materials (used to avoid electrostatic charge accumulation) .....	13
8.1 Instrumentation .....	15
8.2 Electrode assemblies .....	15
8.3 Sample preparation and handling .....	17
8.4 System verification fixtures for surface resistance .....	19
8.5 System verification for volume resistance measurements .....	19
8.6 Test procedures .....	21
9 Conversion to resistivity values <small>SIST EN 61340-2-3:2001</small> .....	23
9.1 Surface resistivity $\rho_s$ <small>https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001</small> .....	25
9.2 Volume resistivity $\rho_v$ .....	25
10 Repeatability and reproducibility .....	25
11 Report .....	27
Figure 1 – Assembly for the measurement of surface and volume resistance .....	29
Figure 2 – Basic connections of the electrodes for surface resistance measurements .....	29
Figure 3 – Basic connections of the electrodes for volume resistance measurements .....	31
Figure 4 – Assembly for the measurement of resistance-to-ground/groundable point and point-to-point resistance .....	31
Figure 5 – Lower resistance range verification fixture for surface resistance measurements .....	33
Figure 6 – Upper resistance range verification fixture for surface resistance measurements .....	35
Figure 7 – Principle of resistance to groundable point measurements .....	37
Figure 8 – Principle of point-to-point measurements .....	37
Figure 9 – Configuration for the conversion to surface or volume resistivity .....	39
Bibliography .....	41



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ELECTROSTATICS –

**Part 2-3: Methods of test for determining the resistance  
and resistivity of solid planar materials used  
to avoid electrostatic charge accumulation**

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61340-2-3 has been prepared by IEC technical committee 101: Electrostatics.

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

FDIS	Report on voting
101/71/FDIS	101/79/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 3.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

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

## INTRODUCTION

Measurements of resistances and related calculations of resistivities belong to the fundamental objectives of electrical measuring techniques along with measurements of voltage and current.

Resistivity is the electrical characteristic having the widest range, extending over some thirty orders of magnitude from the most conductive metal to almost perfect insulators.

The basis is Ohm's law and is valid for d.c. current and instantaneous values of a.c. current in electron conductors (metals, carbon, etc.). Values of resistance measurements using a.c. current can be influenced by capacitive/inductive reactance, depending on the frequency. Thus, existing national and international standards dealing with resistance measurements of solid materials normally require the application of d.c. current.

Most non-metal materials such as plastics are classified as polymers and ion conductors. The transport of charges can be dependent upon the applied electrical field strength during the measurement. Beside the measuring current, there exists a charging current that polarizes and/or electrostatically charges the material, indicated by an asymptotic decay of the measuring current with time and causing an apparent change in resistance. If this effect is observed, it will be advisable to repeat the measurement immediately after a definite electrification time has elapsed using the reverse polarity for the measuring current and averaging both obtained values.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 61340-2-3:2001](https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001)

<https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac10a85adc3/sist-en-61340-2-3-2001>

## ELECTROSTATICS –

### Part 2-3: Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation

#### 1 Scope

This International Standard describes test methods for the determination of the electrical resistance and resistivity of solid materials in the range from  $10^4 \Omega$  to  $10^{12} \Omega$  used to avoid electrostatic charge accumulation.

It takes account of existing IEC/ISO standards and other published information, and gives recommendations and guidelines on the appropriate method.

#### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61340. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61340 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

<https://standards.iteh.ai/catalog/standards/sist/78511107-f77e-4733-a9b7-4ac19a85ad3/sist-en-61340-2-3-2001>

IEC 60093:1980, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials*

IEC 60167:1964, *Methods of test for the determination of the insulation resistance of solid insulating materials*

IEC 60212:1971, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60260:1968, *Test enclosures of non-injection type for constant relative humidity*

ISO 1853:1998, *Conducting and antistatic rubbers – Measurement of resistivity*

ISO 2951:1974, *Vulcanized rubber – Determination of insulation resistance*

ISO 3915:1981, *Plastics – Measurement of resistivity of conductive plastics*