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Withdrawn

Electrostatics –
Part 4-6: Standard test methods for specific applications – Wrist straps

Electrostatique –
Partie 4-6: Méthodes d'essai normalisées pour des applications spécifiques – Bracelets de conduction dissipative

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ELECTROSTATICS –

Part 4-6: Standard test methods for specific applications – Wrist straps

FOREWORD

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International Standard IEC 61340-4-6 has been prepared by IEC technical committee 101: Electrostatics.

The text of this standard is based on ANSI/ESD S1.1-2006. It was submitted to the National Committees for voting under the Fast Track Procedure.

This bilingual version (2011-04) replaces the English version.

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

FDIS	Report on voting
101/291/FDIS	101/296/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.

The French version of this standard has not been voted upon.

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

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

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de la CEI sous "http://webstore.iec.ch" dans les données relatives à la publication recherchée. A cette date, la publication sera

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INTRODUCTION

This part of IEC 61340 has been developed to establish test methods for evaluating the electrical and mechanical attributes of wrist straps used in an electrostatic control program. Wrist straps are intended to connect the user to electrical ground, thus preventing electrostatic charge on a user's body from attaining a level that may damage ESD susceptible devices or assemblies.

Test methods and performance limits for evaluation, acceptance, and functional testing are provided. Application and construction guidance is included in the annexes.

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ELECTROSTATICS –

Part 4-6: Standard test methods for specific applications – Wrist straps

1 Scope

This part of IEC 61340 provides electrical and mechanical test methods and performance limits for evaluation, acceptance and functional testing of wrist straps.

This standard is intended for testing wrist straps and wrist strap systems used for the grounding of personnel engaged in working with ESD sensitive assemblies and devices.

It does not address constant monitoring systems.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ESD ADV1.0, *Glossary of terms*[1]

3 Terms and definitions

For the purposes of this document, the following terms and definitions, in addition to those specified in the ESD association glossary of terms, shall apply.

3.1
wrist strap
assembled device consisting of a wrist cuff and ground cord that provides electrical connection of a person's skin to ground

3.2
wrist strap system
wrist strap when properly worn by a person, where the electrical path includes the person, the cuff and the ground cord

3.3
cuff
portion of the wrist strap worn on the wrist

NOTE The cuff maintains electrical contact with a person's skin.

3.4
ground cord
portion of the wrist strap that provides flexibility of movement while completing the electrical circuit between the cuff and ground

[1] ESD Association, 7900 Turin Rd, Bldg. 3, Ste. 2, Rome, NY 13440-2069, 315-339-6937, www.esda.org

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3.5
evaluation testing
stringent testing of a wrist strap to determine its electrical and mechanical performance abilities

NOTE Data are in the form of values from laboratory testing.

3.6
acceptance testing
incoming tests to confirm proper marking and electrical functionality

NOTE Data are in the form of visual inspection records, and values or pass/fail notation.

3.7
functional testing
end-use testing to confirm electrical functionality

NOTE Data are in the form of pass/fail notation or values.

3.8
current-limiting resistance
resistance value incorporated in series with the wrist strap's electrical path to ground

NOTE This resistance limits electrical current that could pass through the ground cord in the event of inadvertent user contact with electrical potential.

3.9
resistance range
user-specified upper and lower resistance values which define the user-acceptable resistance values of a wrist strap or wrist strap system

3.10
strain relief
construction feature designed to protect the connections and cord from premature failure

3.11
breakaway force
force required to disconnect the ground cord from the cuff

4 Testing levels and performance limits

This part of IEC 61340 specifies different types of testing for wrist straps. Tables 1, 2 and 3 detail the three types of testing with the associated limits and paragraph references to test methods. The methods provide appropriate tests for the different levels of wrist strap examination. The "evaluation tests" are laboratory tests for measuring the performance of a wrist strap or for the comparison of wrist straps. "Acceptance tests" provide methods for incoming goods inspection. Finally, the "functional test" is a simple check of electrical continuity. This test shall be used on a regular, user-defined basis, to ensure that the wrist strap is electrically functional.

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Table 1 – Evaluation testing

Electrical	**Limit**	**Test ref.**
Wrist strap continuity and resistance	1 mΩ ± 20 %, or user defined value	5.1
Cuff resistance Interior: Exterior:	≤100 kΩ or user defined value ≥10 mΩ	5.2
Mechanical	**Limit**	**Test ref.**
Cuff size	Defined	5.3
Breakaway force	> 0,45 kg (1 lb), < 2,3 kg (5 lb)	5.4
Connector and cord integrity	> 2,3 kg (5 lb) and > 66 % of cord strength	5.5
Ground cord extendibility	Extension to manufacturer’s specified length with no continuity loss	5.6
Bending life	≥ 16 000 cycles	5.7
Marking	**Limit**	**Test ref.**
Manufacturer’s identification	Logo and/or name	5.8
Identification of non-standard Resistance value	Red feature. Value marked	5.9

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Table 2 – Acceptance testing

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Electrical	**Limit**	**Test ref.**
Wrist strap resistance	1 mΩ ± 20 %, or user defined value	5.10
Marking	**Limit**	**Test ref.**
Manufacturer’s identification	Logo and/or name	5.8
Identification of non-standard Resistance value	Red feature. Value marked	5.9

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Table 3 – Functional testing

Electrical	**Limit**	**Test ref.**
Wrist strap system continuity	“Pass” or ≤ 10 mΩ, or user defined value	5.11

5 Test methods

Refer to Tables 1, 2 and 3 for test method applications.

5.1 Wrist strap continuity and resistance test

This test measures the value of the current-limiting resistance and assures continuity between the discrete parts of the wrist strap.

5.1.1 Equipment

The equipment shall consist of the following:

- A test fixture (see Figure 1) comprising an insulative stand and two 2,54 cm (1 “) diameter stainless steel cylinders, with one cylinder fixed to the stand directly above the second. The second cylinder will weigh 0,11 kg (0,25 lb) and is mounted in a slot in the stand that allows free vertical movement;
- an ohmmeter or other instrument(s) capable of reading from at least 50 kΩ to at least 100 m mΩ with a test voltage of 7 V to 30 V DC open circuit;
- six samples of wrist straps.

5.1.2 Procedure

Using the fixture shown in Figure 1, place the cuff around the cylinders with the cuff interior toward the cylinders and the ground cord connector on the right side and parallel to the cylinders, evenly spaced between the cylinders. Allow the 0,11 kg (0,25 lb) cylinder to move freely and stress the cuff.

Connect the ground cord to the cuff.

Connect the ohmmeter to the top cylinder and to the ground connector of the ground cord. Measure and record the resistance.

Repeat the test for a total of six wrist straps.

5.1.3 Reporting

Report the resistance for each wrist strap.

5.2 Cuff resistance test

Resistance of the cuff interior and exterior is determined.

5.2.1 Equipment

See 5.1.1.

5.2.2 Procedure (interior resistance)

Using the test fixture from 5.1.1, Figure 1, place a cuff around the cylinders with the cuff interior toward the cylinders and the ground cord connector on the right side and parallel to the cylinders, evenly spaced between the cylinders. Allow the 0,11 kg (0,25 lb) cylinder to move freely and stress the cuff.

Connect the ohmmeter to the top cylinder and the ground cord connector on the cuff. Measure and record the resistance value.

Repeat procedure for a total of six cuffs.

5.2.3 Procedure (exterior resistance)

Place a cuff around the cylinders (Figure 1) with the cuff exterior toward the cylinders and the ground cord connector on the right side and parallel to the cylinders, evenly spaced between the cylinders. Allow the 0,11 kg (0,25 lb) cylinder to move freely and stress the cuff.

Connect the ohmmeter to the top cylinder and the ground cord connector on the cuff. Measure and record the resistance value.

Repeat procedure for a total of six cuffs.

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5.2.4 Reporting

Report the interior resistance and exterior resistance of each cuff.

5.3 Cuff size requirements

Cuff sizes are determined by the cuff's ability to fit over a specifically sized cylinder. A cuff's ability to expand to fit over a hand, yet contract to fit snugly around a wrist is determined by fitting the cuff over specifically sized large and small cylinders.

5.3.1 Equipment

The equipment shall consist of the following:

- 1 cylinder having an outside diameter of 4,3 cm (1,70 “)
- 1 cylinder having an outside diameter of 5,3 cm (2,10")
- 1 cylinder having an outside diameter of 8,25 cm (3,25")
- 1 cylinder having an outside diameter of 8,9 cm (3,50")

5.3.2 Self-adjusting cuffs

“Large”-sized self-adjustable expanding metal or fabric cuffs shall fit snugly onto a 5,3 cm (2,10") diameter cylinder, and be capable of easily fitting over a 8,9 cm (3,50") diameter cylinder.

“Small”-sized self-adjustable expanding metal or fabric cuffs shall fit snugly onto a 4,3 cm (170") diameter cylinder, and be capable of easily fitting over a 8,25 cm (3,25") diameter cylinder.

5.3.3 “One-size-fits-all” cuffs

“One-size-fits-all” cuffs shall fit snugly on a 4,3 cm (1,70") diameter cylinder and be capable of sufficient expansion to fit over a 8,9 cm (3,5") cylinder.

5.4 Breakaway force

With the ground cord connected to the cuff in a normal manner, a force of ≥ 0,45 kg (1 lb) but ≤ 2,3 kg (5 lb) applied to the ground cord, in the normal disconnect direction, shall be required to separate the ground cord from the cuff.

5.5 Connection integrity

The strengths of the ground cord, the ground cord's attachment to the ground, and cuff connectors are determined.

5.5.1 Equipment

The equipment shall consist of the following:

- tensile tester capable of 6,35 cm (2,5") per minute travel;
- grippers for tensile tester;
- chart recorder.

5.5.2 Procedure

Using the tensile tester and chart recorder, test and record the tensile strength (breaking point) of the ground cord, the ground connector to the ground cord, and the cuff connector to the cord. Repeat the test for a total of six ground cords.

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