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TECHNICAL REPORT

colour inside

Electrostatics – Part 5-4: Protection of electronic devices from electrostatic phenomena – Compliance verification

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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IEC TR 61340-5-4, which is a Technical Report, has been prepared by IEC technical committee 101: Electrostatics.

The text of this Technical Report is based on the following documents:

Draft TR	Report on voting
101/581/DTR	101/586/RVDTR

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

This document 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 document will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Compliance verification is the process of monitoring and measuring all elements of an ESD control program. Regular compliance checks and tests are an essential part of this process, ensure that area precautions and equipment remain effective, and that an ESD control program is correctly implemented in compliance with an ESD control program plan.

Qualification testing is typically carried out under controlled conditions, often in a laboratory environment, and using industry recognized standards. Verification testing is carried out under operational conditions using test methods that are appropriate to an organization's requirements. Although qualification test methods can be used, compliance verification testing often uses simple equipment and procedures. Accuracy is still important, but of equal importance is the ability to carry out non-destructive testing without interrupting the normal business of the organization.

This document describes equipment and test methods that can be used for verification testing of ESD control items and systems, and provides users with some guidance on how to carry out the tests and take appropriate action to ensure continuous compliance.

The compliance verification test frequency is not described in this document. See Annex A for test frequency considerations.

ELECTROSTATICS –

Part 5-4: Protection of electronic devices from electrostatic phenomena – Compliance verification

1 Scope

This part of IEC 61340 describes compliance verification testing for technical items that are included in ESD control programs, such as those specified in IEC 61340-5-1.

Test methods, in the main body of this document, are based on those specified in IEC 61340-5-1 and other parts of IEC 61340, and are simplified where necessary for the purposes of compliance verification, to be performed by competent personnel.

Additional compliance verification tests and procedures within the scope of this document are described in Annexes B to G.

Users can, by reference to this document in their compliance verification plan, adopt the necessary test methods described herein without change or addition. Alternatively, tests methods described in this document can be adapted to match the requirements of their own ESD control program, provided deviations in equipment or procedure are documented in their compliance verification plan.

Product qualification is excluded from the scope of this document.

2 Normative references

There are no normative references in this document

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the documents cited in the bibliography apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Personnel safety

The procedures and equipment described in this document can expose personnel to hazardous electrical conditions. Users of this document are responsible for selecting equipment that complies with applicable laws, regulatory codes and both external and internal policy. This document cannot replace or supersede any requirements for personnel safety.

Electrical hazard reduction practices should be exercised and proper grounding instructions for equipment should be followed.

5 Test equipment

5.1 Selection of test equipment

If the specifications for test equipment described in Clause 5 do not match the range of measurements required to be made in the ESD control program, other test equipment that does match the range should be used and documented in the ESD control program plan.

Test equipment should be used and calibrated according to the manufacturer's recommendations.

5.2 AC outlet analyzer (or mains socket tester)

This is a device that plugs into an AC outlet and gives an indication, typically using lights, that the outlet is correctly wired, or if a fault condition exists. For compliance verification testing, an AC outlet analyzer can be used to indicate the correct wiring of the equipment grounding conductor.

Please note that some AC outlet analyzers might not be able to differentiate ground (or earth) and neutral wire reversals, line and neutral wire reversals, and line and ground wire reversals, or determine if the impedance to ground of the equipment grounding conductor is within the organization's specification.

5.3 AC circuit tester (impedance meter)

The meter should be capable of measuring the impedance of the equipment grounding conductor from a receptacle (power outlet used for establishing the AC equipment ground) to the neutral bond at the main service equipment panel. The meter should also verify wiring orientation.

5.4 Charged plate monitor (CPM)

5.4.1 CPM requirements

A CPM has a plate that measures (150 ± 1) mm x (150 ± 1) mm with a minimum capacitance of 15 pF when it is mounted in the test fixture without electrical connections. The total capacitance of the test circuit, with plate, is (20 ± 2) pF. A CPM as described in IEC 61340-4-7 meets these requirements.

The electrostatic field meter or voltmeter should be capable of measuring voltage in such a way that, in the absence of ionization, the CPM plate voltage does not decay more than 10 % of the initial test voltage within five minutes. The response time should be less than 10 % of the shortest discharge time expected to be measured.

5.4.2 Portable verification kit

Portable verification kits for compliance verification of ionizers are commercially available and typically consist of four components: 1) electrostatic field meter or voltmeter, 2) CPM plate separated from a ground plate on insulating standoffs, 3) plate charger, and 4) ground plate. These four components may be integrated into a single instrument. A stopwatch or other timer is used to measure discharge times.

For convenient use in a portable kit, the CPM plate is typically smaller than that specified for a CPM.

A verification kit that has a capacitance or plate size that differs from the defined CPM plate may be used if the user develops a correlation factor for decay and offset voltage.

The plate charger should be capable of charging the CPM plate to a voltage of each polarity in excess of the initial test voltage.

5.5 Concentric ring electrode assembly

The electrode assembly contains a central disc surrounded by a concentric ring made of conductive materials that make contact with the material under test.

The electrode assembly described in IEC 61340-2-3 meets the requirements for compliance verification testing.

NOTE See also ANSI/ESD STM11.11.

5.6 DC ohmmeter

The instrumentation specified in IEC 61340-2-3 for laboratory evaluations and acceptance testing have output voltages of (10,0 ± 0,5) V or (100,0 ± 5) V depending on the range of resistance being measured. Instrumentation meeting the requirements for laboratory evaluations or acceptance testing as specified in IEC 61340-2-3, or instrumentation meeting the following requirements should be used for compliance verification testing.

Compliance verification instrumentation should be capable of making measurements one order of magnitude above and one order of magnitude below the intended measurement range. The output voltage of compliance verification instrumentation may vary from laboratory evaluation or acceptance testing instrumentation, and may be rated under load or open circuit. Compliance verification instrumentation should be checked against laboratory evaluation or acceptance testing instrumentation to ensure there is correlation between measurement results.

A DC ohmmeter may be a single, self-contained instrument, or a combination of instruments (e.g. DC power supply, voltmeter and ammeter). If the DC ohmmeter has a self-switching test voltage, it should be ensured that the changeover meets the requirements specified in IEC 61340-2-3 or specified by the user.

5.7 Electrostatic field meter

The electrostatic field meter is an instrument used to measure the electric field that results from electrostatic charge on a material.

There are different types of electrostatic field meter in common use including induction probes and field mills. The relative merits of these types are discussed in IEC TR 61340-1.

5.8 Electrostatic voltmeter

The electrostatic voltmeter is an instrument used to measure the voltage that results from the static charge on a material. Electrostatic voltmeters may be non-contacting, based on field meters or induction probes, or contacting. IEC TR 61340-1 gives guidance on the use of different types of electrostatic voltmeters.

5.9 Foot electrode

The foot electrode is a conductive metal plate that is at least large enough to accommodate a person's foot, without the foot extending beyond any edge of the plate (typically 305 mm x 305 mm).

5.10 Hand-held electrode

The hand-held electrode is a stainless steel, brass or copper round or tubular stock, approximately 2,5 cm in diameter and 7,5 cm or greater in length, with a connector at one end. All dimensions are nominal.