

INTERNATIONAL STANDARD

**Transformers, power supplies, reactors and similar products – EMC
requirements**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TRANSFORMERS, POWER SUPPLIES, REACTORS AND SIMILAR PRODUCTS –

EMC requirements

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International standard IEC 62041 has been prepared by Technical Committee 96: Transformers, reactors, power supply units and combinations thereof.

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

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

- the inclusion of a clause on tests in series production;
- the inclusion of a new clause on measurement uncertainty, and
- the status of a harmonized standard for this third edition.

It has the status of a product family EMC standard in accordance with IEC Guide 107:2009,

Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
96/465/FDIS	96/467/RVD

Full information on the voting for the approval of this International Standard 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.

This standard is to be used in conjunction with the IEC 61558 series.

In this standard, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type;*
- explanatory matter: in smaller roman type.

In the text of this publication, the words in **bold** are defined in Clause 3 of this document and in the IEC 61558 series.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website 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.

NOTE The attention of the National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or not later than 3 years from the date of publication.

The transitional period is no longer than 3 years after the publication of this standard.

TRANSFORMERS, POWER SUPPLIES, REACTORS AND SIMILAR PRODUCTS –

EMC requirements

1 Scope

This document is applicable to transformers, reactors and power supply units covered by the IEC 61558 series of standards. This document deals with the electromagnetic compatibility requirements for emission and immunity within the frequency range 0 Hz to 400 GHz. No tests need to be performed at frequencies where no requirements are specified.

For associated transformers, associated reactors and associated power supply units either supplied with or incorporated into an appliance or equipment the relevant EMC standard for that appliance or equipment applies.

This document covers normal operating conditions only. Other operations of the transformers, reactors and power supply units (e.g. simulated faults in the electric circuitry for testing purposes or functional safety due to the effects of the electromagnetic phenomena, or evaluation of human being for exposure to electromagnetic fields (EMF)) have not been taken into consideration in this document.

Requirements are specified for each port considered. If requirements are different the most severe takes precedence.

This document may also be used as a guide to test transformers, reactors and power supply units separately before these are incorporated into an appliance or equipment.

NOTE When **EUT (Equipment under test)** is used, it covers **transformers, reactors and power supply units** where applicable.

This document does not apply to:

- uninterruptible power supplies (UPS) covered by IEC 62040 (all parts);
- power supply units covered by IEC 61204,
(i.e. DC-DC converters, DC power and distribution equipment and power supply units for use in applications covered by IEC 60950-1, IEC 61010-1, IEC 60601-1 and IEC 60065);
- power supplies and converters for use with or in products covered by IEC 61347 (all parts).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60050-161, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility*

IEC 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-3-3, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq A$ per phase and not subject to conditional connection*

IEC 61000-3-11, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75 A and subject to conditional connection*

IEC 61000-3-12, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3 : Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-34, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase*

IEC 61000-6-1, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity standard for residential, commercial and light-industrial environments*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-3, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61558 (all parts), *Safety of power transformers, power supplies, reactors and similar products*

CISPR 14-1:2016, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1-1:2015, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements*

CISPR 16-1-4:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*
CISPR 16-1-4:2010/AMD1:2012

CISPR 16-2-1:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-2-3:2016, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 16-4-2, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty*

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161 and the following 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>

3.1.1 equipment under test

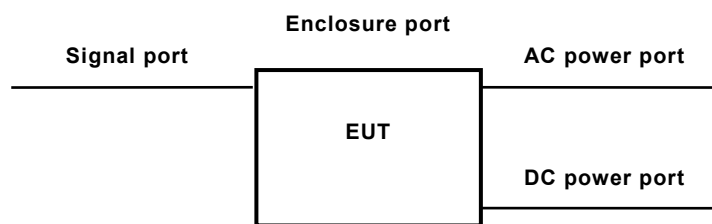
transformers, reactors and power supply units where applicable

3.1.2 port

particular interface of the specified **EUT** with the external electromagnetic environment.

Note 1 to entry: Examples of ports of interest are shown in Figure 1. The enclosure port is the physical boundary of the equipment (e.g. enclosure). The enclosure port provides for radiated and electrostatic discharge (ESD) energy transfer, whereas the other ports provide for conducted energy transfer, either by direct injection or by induction.

Note 2 to entry: In some cases, different **ports** may be combined.



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Figure 1 – Ports covered by Table A.1 to Table A.16

3.1.3

enclosure port

physical boundary of the **EUT** which electromagnetic fields may radiate through or impinge on

3.1.4

cable port

port at which a conductor or a cable is connected to the **EUT**

Note 1 to entry: Examples are signal, control and **power ports**.

3.1.5

signal port

port at which a conductor or cable intended to carry signals is connected to the **EUT**

Note 1 to entry: Examples are analogue inputs, outputs and control lines, data busses, communication networks, etc.

3.1.6

power port

port at which a conductor or cable carrying the primary electrical power needed for the operation (functioning) of an **EUT** is connected

3.1.7

public mains network

electricity lines to which all categories of consumers have access and which are operated by a supply or distribution undertaking for the purpose of supplying electrical energy

3.1.8

low voltage

voltage having a value below a conventionally adopted limit

Note 1 to entry: For the distribution of AC electric power, the upper limit is generally accepted to be 1 000 V.

[SOURCE: IEC 60050-151:2001, 151-15-03]

3.2 Abbreviations

AC	Alternating Current
AM	Amplitude Modulation
DC	Direct Current
EUT	Equipment Under Test
FAR	Fully Anechoic Room
ISN	Impedance Stabilization Network
LV	Low Voltage
OATS	Open Area Test Site