

INTERNATIONAL STANDARD



BASIC EMC PUBLICATION

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

IEC 61000-4-6:2008

<https://standards.iteh.ai/Catalogue/standards/iec/1230453a-a27e-42d2-bbe7-f19d1c670b8d/iec-61000-4-6-2008>



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IEC 61000-4-6

Edition 3.0 2008-10
REDLINE VERSION

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.100.20

ISBN 978-2-8891-0376-8

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**Electromagnetic compatibility (EMC) –
Part 4-6: Testing and measurement techniques – Immunity to conducted
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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International Standard IEC 61000-4-6 has been prepared by subcommittee 77B: High-frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

This standard forms part 4-6 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications*.

This third edition of IEC 61000-4-6 cancels and replaces the second edition published in 2003, Amendment 1 (2004) and Amendment 2 (2006). This edition constitutes a technical revision.

The document 77B/571/FDIS, circulated to the National Committees as Amendment 3, led to the publication of the new edition.

The text of this standard is based on the second edition, its Amendment 1, Amendment 2 and on the following documents:

FDIS	Report on voting
77B/571/FDIS	77B/577/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.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

IEC 61000 is published in separate parts according to the following structure:

Part 1: General

General considerations (introduction, fundamental principles)
Definitions, terminology

Part 2: Environment

Description of the environment
Classification of the environment
Compatibility levels

Part 3: Limits

Emission limits
Immunity limits (in so far as they do not fall under the responsibility of the product committees)

Part 4: Testing and measurement techniques

Measurement techniques
Testing techniques

Part 5: Installation and mitigation guidelines

Installation guidelines
Mitigation methods and devices

Part 6: Generic standards

Part 9: Miscellaneous

Each part is further subdivided into several parts, published either as international standards or as technical specifications or technical reports, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number identifying the subdivision (example : 61000-6-1).

This part is an international standard which gives immunity requirements and test procedure related to conducted disturbances induced by radio-frequency fields.

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields

1 Scope and object

This part of IEC 61000 relates to the conducted immunity requirements of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 9 kHz up to 80 MHz. Equipment not having at least one conducting cable (such as mains supply, signal line or earth connection) which can couple the equipment to the disturbing RF fields is excluded.

NOTE 1 Test methods are defined in this part for measuring the effect that conducted disturbing signals, induced by electromagnetic radiation, have on the equipment concerned. The simulation and measurement of these conducted disturbances are not adequately exact for the quantitative determination of effects. The test methods defined are structured for the primary objective of establishing adequate repeatability of results at various facilities for quantitative analysis of effects.

The object of this standard is to establish a common reference for evaluating the functional immunity of electrical and electronic equipment when subjected to conducted disturbances induced by radio-frequency fields. The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of an equipment or system against a defined phenomenon.

NOTE 2 As described in IEC Guide 107, this standard is a basic EMC publication for use by product committees of the IEC. As also stated in Guide 107, the IEC product committees are responsible for determining whether this immunity test standard should be applied or not, and if applied, they are responsible for determining the appropriate test levels and performance criteria. TC 77 and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular immunity tests for their products.

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.

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

3 Terms and definitions

For the purposes of this part of IEC 61000, the terms and definitions given in IEC 60050-161 as well as the following definitions apply.

3.1

artificial hand

electrical network simulating the impedance of the human body under average operational conditions between a hand-held electrical appliance and earth

[IEV 161-04-27]

NOTE The construction should be in accordance with CISPR 16-1-2.

3.2 auxiliary equipment AE

equipment necessary to provide the equipment under test (EUT) with the signals required for normal operation and equipment to verify the performance of the EUT

3.3 clamp injection

clamp injection is obtained by means of a clamp-on “current” injecting device on the cable:

- **current clamp**: a transformer, the secondary winding of which consists of the cable into which the injection is made;
- **electromagnetic clamp** (EM clamp): injection device with combined capacitive and inductive coupling

3.4 common-mode impedance

ratio of the common mode voltage and the common-mode current at a certain port

NOTE This common mode impedance can be determined by applying a unity common mode voltage between the terminal(s) or screen of that port and a reference plane (point). The resulting common mode current is then measured as the vectorial sum of all currents flowing through these terminal(s) or screen (see also Figures 8a and 8b).

3.5 coupling factor

ratio given by the open-circuit voltage (e.m.f.) obtained at the EUT port of the coupling (and decoupling) device divided by the open-circuit voltage obtained at the output of the test generator

3.6 coupling network

electrical circuit for transferring energy from one circuit to another with a defined impedance

NOTE Coupling and decoupling devices can be integrated into one box (coupling and decoupling network (CDN)) or they can be in separate networks.

3.7 coupling/decoupling network CDN

electrical circuit incorporating the functions of both the coupling and decoupling networks

3.8 decoupling network

electrical circuit for preventing test signals applied to the EUT from affecting other devices, equipment or systems that are not under test

3.9 test generator

generator (RF generator, modulation source, attenuators, broadband power amplifier and filters) capable of generating the required test signal (see Figure 3)

3.10 electromotive force e.m.f.

voltage at the terminals of the ideal voltage source in the representation of an active element

[IEV 131-01-38:1978]

3.11 measurement result

U_{mr}
voltage reading of the measurement equipment

3.12 voltage standing wave ratio VSWR

ratio of a maximum to an adjacent minimum voltage magnitude along the line

4 General

The source of disturbance covered by this part of IEC 61000 is basically an electromagnetic field, coming from intended RF transmitters, that may act on the whole length of cables connected to installed equipment. The dimensions of the disturbed equipment, mostly a sub-part of a larger system, are assumed to be small compared with the wavelengths involved. The in-going and outgoing leads (e.g. mains, communication lines, interface cables) behave as passive receiving antenna networks because of their length, which can be several wavelengths.

Between those cable networks, the susceptible equipment is exposed to currents flowing "through" the equipment. Cable systems connected to an equipment are assumed to be in resonant mode ($\lambda/4$, $\lambda/2$ open or folded dipoles) and as such are represented by coupling and decoupling devices having a common-mode impedance of 150Ω with respect to a ground reference plane. Where possible the EUT is tested by connecting it between two 150Ω common-mode impedance connections: one providing an RF source and the other providing a return path for the current.

This test method subjects the EUT to a source of disturbance comprising electric and magnetic fields, simulating those coming from intentional RF transmitters. These disturbing fields (E and H) are approximated by the electric and magnetic near-fields resulting from the voltages and currents caused by the test set-up as shown in Figure 2a.

The use of coupling and decoupling devices to apply the disturbing signal to one cable at the time, while keeping all other cables non-excited, see Figure 2b, can only approximate the real situation where disturbing sources act on all cables simultaneously, with a range of different amplitudes and phases.

Coupling and decoupling devices are defined by their characteristics given in 6.2. Any coupling and decoupling device fulfilling these characteristics can be used. The coupling and decoupling networks in Annex D are only examples of commercially available networks.

5 Test levels

No tests are required for induced disturbances caused by electromagnetic fields coming from intentional RF transmitters in the frequency range 9 kHz to 150 kHz.