

Electromagnetic compatibility (EMC) —

**Part 6-3: Generic standards — Emission
standard for residential, commercial
and light-industrial environments**

The European Standard EN 61000-6-3:2007 has the status of a
British Standard

ICS 33.100.10

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 61000-6-3:2007. It is identical with IEC 61000-6-3:2006. It supersedes BS EN 61000-6-3:2001, which will be withdrawn on 1 December 2009.

The UK participation in its preparation was entrusted by Technical Committee GEL/210, EMC — Policy committee, to Subcommittee GEL/210/12, EMC — Basic and generic standards.

A list of organizations represented on GEL/210/12 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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**Electromagnetic compatibility (EMC) -
Part 6-3: Generic standards -
Emission standard for residential, commercial
and light-industrial environments
(IEC 61000-6-3:2006)**

Compatibilité électromagnétique (CEM) -
Partie 6-3: Normes génériques -
Norme sur l'émission
pour les environnements résidentiels,
commerciaux et de l'industrie légère
(CEI 61000-6-3:2006)

Elektromagnetische Verträglichkeit
(EMV) -
Teil 6-3: Fachgrundnormen -
Störaussendung für Wohnbereich,
Geschäfts- und Gewerbebereiche
sowie Kleinbetriebe
(IEC 61000-6-3:2006)

This European Standard was approved by CENELEC on 2006-12-01. 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.

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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 CISPR/H/121/FDIS, future edition 2 of IEC 61000-6-3, prepared by CISPR SC H, Limits for the protection of radio services, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61000-6-3 on 2006-12-01.

This European Standard supersedes EN 61000-6-3:2001 + A11:2004.

The major changes in EN 61000-6-3:2007 are the inclusion of a clause on tests for equipment in series production, a new clause on measurement uncertainty and the inclusion of requirements on dc power ports and telecommunications ports. The informative annex has been deleted.

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) 2007-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-12-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directives EMC (89/336/EEC), EMC (2004/108/EC) and RTTED (1999/5/EC). See Annex ZZ.

Annexes ZA and ZZ have been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61000-6-3:2006 was approved by CENELEC as a European Standard without any modification.

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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 (insofar 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 technical reports/specifications, 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).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments

1 Scope and object

This part of IEC 61000 for EMC emission requirements applies to electrical and electronic apparatus intended for use in residential, commercial and light-industrial environments.

Emission requirements in the frequency range 0 Hz to 400 GHz are covered. No measurement needs to be performed at frequencies where no requirement is specified.

This generic EMC emission standard is applicable if no relevant dedicated product or product-family EMC emission standard exists.

This standard applies to apparatus intended to be directly connected to a low-voltage public mains network or connected to a dedicated DC source, which is intended to interface between the apparatus and the low-voltage public mains network. This standard applies also to apparatus which is battery operated or is powered by a non-public, but non-industrial, low-voltage power distribution system if this apparatus is intended to be used in the locations described below.

The environments encompassed by this standard are residential, commercial and light-industrial locations, both indoor and outdoor. The following list, although not comprehensive, gives an indication of locations that are included:

- residential properties, for example houses, apartments;
- retail outlets, for example shops, supermarkets;
- business premises, for example offices, banks;
- areas of public entertainment, for example cinemas, public bars, dance halls;
- outdoor locations, for example petrol stations, car parks, amusement and sports centres;
- light-industrial locations, for example workshops, laboratories, service centres.

Locations that are characterised by being supplied directly at low voltage from the public mains network are considered to be residential, commercial or light-industrial.

The object of this standard is to define the emission test requirements for apparatus defined in the scope in relation to continuous and transient, conducted and radiated disturbances.

The emission requirements have been selected so as to ensure that disturbances generated by apparatus operating normally in residential, commercial and light-industrial locations do not exceed a level which could prevent other apparatus from operating as intended. Fault conditions of apparatus are not taken into account. Not all disturbance phenomena have been included for testing purposes in this standard but only those considered as relevant for the equipment covered by this standard. These requirements represent essential electromagnetic compatibility emission requirements.

Requirements are specified for each port considered.

NOTE 1 Safety considerations are not covered by this standard.

NOTE 2 In special cases, situations will arise where the levels specified in this standard will not offer adequate protection; for example where a sensitive receiver is used in close proximity to an apparatus. In these instances, special mitigation measures may have to be employed.

NOTE 3 As the requirements in this standard are more stringent than the requirements in IEC 61000-6-4, equipment fulfilling the requirements of this standard will also comply with the requirements of IEC 61000-6-4.

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 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 fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A*

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*

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

CISPR 16-1-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*

CISPR 16-2-1:2003, *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, *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 – Uncertainty in EMC measurements*

CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

3 Terms and definitions

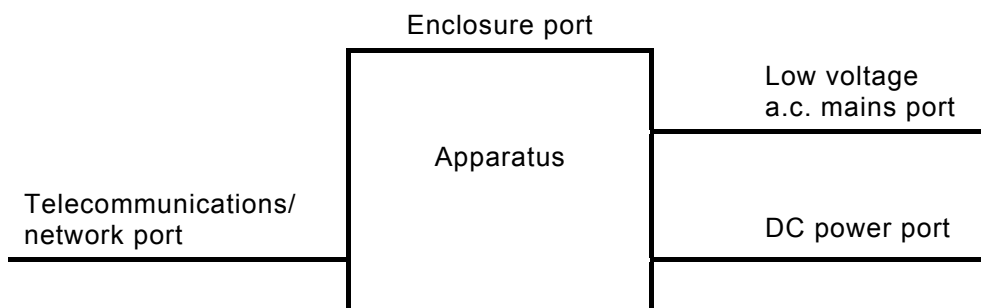
For the purposes of this document, the following terms and definitions apply.

NOTE Definitions related to EMC and to relevant phenomena are given in IEC 60050-161 and in other IEC and CISPR publications.

3.1

port

particular interface of the specified apparatus with the external electromagnetic environment (see Figure 1)



IEC 1091/06

Figure 1 – Examples of ports

3.2

enclosure port

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

3.3

cable port

port at which a conductor or a cable is connected to the apparatus

NOTE Examples are signal, control and power ports.

3.4

telecommunications/network port

point of connection for voice, data and signalling transfers intended to interconnect widely dispersed systems via such means as direct connection to multi-user telecommunications networks (e.g. public switched telecommunications networks (PSTN) integrated services digital networks (ISDN), x-type digital subscriber lines (xDSL), etc.), local area networks (e.g. Ethernet, Token Ring, etc.) and similar networks)

NOTE A port generally intended for interconnection of components of an ITE system under test (e.g. RS-232, RS-485, field buses in the scope of IEC 61158, IEEE Standard 1284 (parallel printer), Universal Serial Bus (USB), IEEE Standard 1394 ("Fire Wire"), etc.) and used in accordance with its functional specifications (e.g. for the maximum length of cable connected to it), is not considered to be a telecommunications port.

3.5

power port

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

3.6**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

3.7**low voltage****LV**

low tension

voltage having a value below a conventionally adopted limit

[IEV 601-01-26, modified]

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

3.8**d.c. power network**

local electricity supply network in the infrastructure of a certain site or building intended for flexible use by one or more different types of equipment and guaranteeing continuous power supply independently from the conditions of the public mains network

NOTE Connection to a remote local battery is not regarded as a DC power network, if such a link comprises only power supply for a single piece of equipment.

4 Conditions during testing

The equipment under test (EUT) shall be tested in the operating mode producing the largest emission in the frequency band being investigated, e.g. based on limited pre-tests and consistent with normal applications. The configuration of the test sample shall be varied to achieve maximum emission consistent with typical applications and installation practice.

If the apparatus is part of a system, or can be connected to auxiliary apparatus, the apparatus shall be tested while connected to the minimum representative configuration of auxiliary apparatus necessary to exercise the ports in a similar manner to that described in CISPR 22.

In cases where a manufacturer's specification requires external filtering and/or shielding devices or measures that are clearly specified in the user's manual, the measurement requirements of this standard shall be applied with the specified devices or measures in place.

The configuration and mode of operation during the measurements shall be precisely noted in the test report. If the apparatus has a large number of similar ports or ports with many similar connections, a sufficient number shall be selected to simulate actual operating conditions and to ensure that all the different types of termination are covered.

The measurements shall be carried out at one single set of parameters within the operating ranges of temperature, humidity and atmospheric pressure specified for the product and at the rated supply voltage, unless otherwise indicated in the basic standard.

5 Product documentation

The purchaser/user shall be informed if special measures have to be taken to achieve compliance, e.g. the use of shielded or special cables.

6 Applicability

The application of measurements for emission(s) depends on the particular apparatus, its configuration, its ports, its technology and its operating conditions.

Measurements shall be applied to the relevant ports of the apparatus according to Table 1. Measurements shall only be carried out where the relevant ports exist.

It may be determined from consideration of the electrical characteristics and usage of a particular apparatus that some of the measurements are inappropriate and therefore unnecessary. In such a case it is required that the decision and justification not to measure shall be recorded in the test report.

7 Emission requirements

The emission requirements for apparatus covered by this standard are given on a port by port basis.

Measurements shall be conducted in a well-defined and reproducible manner.

The measurements may be performed in any order.

The description of the measurement, the measurement instrumentation, the measurement methods and the measurement set-up to be used are given in the standards, which are referred to in the Table 1.

The contents of the standards referenced in the tables are not repeated here, however modifications or additional information needed for the practical application of the measurements are given in this standard.

8 Application of limits in tests for conformity of equipment in series production

8.1 Tests shall be made:

- either on a sample of equipment of the type using the statistical method of evaluation set out in 8.2,
- or, for simplicity's sake, on one equipment only.

8.2 Statistically assessed compliance with limits shall be made as follows.

This test shall be performed on a sample of not less than five and not more than 12 items of the type. If, in exceptional circumstances, five items are not available, a sample of four or three shall be used. Compliance is judged from the following relationship:

$$\bar{x} + kS_n \leq L$$

where

\bar{x} is the arithmetic mean of the measured value of n items in the sample

$$S_n^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$$

x_n is the value of the individual item

L is the appropriate limit

k is the factor derived from tables of the non-central t -distribution which assures with 80 % confidence that 80 % of the type is below the limit; the value of k depends on the sample size n and is stated below.

The quantities x_n , \bar{x} , S_n and L are expressed logarithmically: dB(μ V), dB(μ V/m) or dB(pW).

n	3	4	5	6	7	8	9	10	11	12
k	2,04	1,69	1,52	1,42	1,35	1,30	1,27	1,24	1,21	1,20

9 Measurement uncertainty

The results of measurements of emissions from ITE shall reference the measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

Determining compliance with the limits in this standard shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

However measurement uncertainty of the measurement instrumentation and its associated connections between the various instruments in the measurement chain shall be calculated and both the measurement results and the calculated uncertainty shall appear in the test report.

Table 1 – Emission

Port	Frequency range	Limits	Basic standard	Applicability note	Remarks
1) Enclosure port – Open area test site or semi-anechoic method	30 MHz – 230 MHz 230 MHz – 1 000 MHz	30 dB(µV/m) Quasi-peak at 10 m 37 dB(µV/m) Quasi-peak at 10 m	CISPR 16-2-3	See Notes 1 and 4.	May be measured at 3 m distance using the limits increased by 10 dB.
	0 kHz – 2 kHz		IEC 61000-3-2 IEC 61000-3-3 IEC 61000-3-11 IEC 61000-3-12		
2) Low voltage AC mains port	0,15 MHz – 0,5 MHz	66 dB(µV) – 56 dB(µV) quasi-peak 56 dB(µV) – 46 dB(µV) average	CISPR 16-2-1, 7.4.1 CISPR 16-1-2, 4.3	See Notes 4 and 5.	
	0,5 MHz – 5 MHz	56 dB(µV) quasi-peak 46 dB(µV) average			
	5 MHz – 30 MHz	60 dB(µV) quasi-peak 50 dB(µV) average			
	0,15 MHz – 30 MHz	See basic standard, clause: discontinuous disturbance.	CISPR 14-1		

NOTE 1 If the internal emission source(s) is operating at a frequency below 9 kHz then measurements need only to be performed up to 230 MHz.

NOTE 2 Applicable to apparatus covered within the scope of IEC 61000-3-2, IEC 61000-3-3 or IEC 61000-3-12.

NOTE 3 If the apparatus is covered by the scope of IEC 61000-3-11, this may be used instead of IEC 61000-3-3.

NOTE 4 At transitional frequencies the lower limit applies.

NOTE 5 The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.

NOTE 6 The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is 20 log₁₀ 150 / I = 44 dB).

Table 1 (continued)

Port	Frequency range	Limits	Basic standard	Applicability note	Remarks
3) DC power port	0,15 MHz – 0,50 MHz	79 dB(μ V) quasi-peak 66 dB(μ V) average	CISPR 16-2-1, 7.4.1 CISPR 16-1-2, 4.3	Applicable only to ports intended for connection to: - a local DC power network, or - a remote local battery by a connecting cable exceeding a length of 30 m. See note 4	
	0,50 MHz – 30 MHz	73 dB(μ V) quasi-peak 60 dB(μ V) average			
4) Telecommunications/ network port	0,15 MHz – 0,5 MHz	84 dB(μ V) – 74 dB(μ V) quasi-peak 74 dB(μ V) – 64 dB(μ V) average 40 dB(μ A) – 30 dB(μ A) quasi-peak 30 dB(μ A) – 20 dB(μ A) average	CISPR 22	See notes 4, 5 and 6.	
	0,5 MHz – 30 MHz	74 dB(μ V) quasi-peak 64 dB(μ V) average 30 dB(μ A) quasi-peak 20 dB(μ A) average			
NOTE 1 If the internal emission source(s) is operating at a frequency below 9 kHz then measurements need only to be performed up to 230 MHz.					
NOTE 2 Applicable to apparatus covered within the scope of IEC 61000-3-2, IEC 61000-3-3 or IEC 61000-3-12.					
NOTE 3 If the apparatus is covered by the scope of IEC 61000-3-11 this may be used instead of IEC 61000-3-3.					
NOTE 4 At transitional frequencies the lower limit applies.					
NOTE 5 The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.					
NOTE 6 The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is $20 \log_{10} 150 / I = 44$ dB).					

Bibliography

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60050-601:1985, *International Electrotechnical Vocabulary (IEV) – Chapter 601: Generation, transmission and distribution of electricity – General*

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

NOTE Harmonized as EN 61000-6-1:2007 (not modified).

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

NOTE Harmonized as EN 61000-6-4:2007 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

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 61000-3-2	- ¹⁾	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)	EN 61000-3-2	2006 ²⁾
IEC 61000-3-3	- ¹⁾	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 ≤ 16 A per phase and not subject to conditional connection	EN 61000-3-3 + corr. July	1995 ²⁾ 1997
IEC 61000-3-11	- ¹⁾	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	EN 61000-3-11	2000 ²⁾
IEC 61000-3-12	- ¹⁾	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	EN 61000-3-12	2005 ²⁾
CISPR 14-1	- ¹⁾	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission	EN 55014-1	2006 ²⁾
CISPR 16-1-2	2003	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances	EN 55016-1-2	2004
CISPR 16-2-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements	EN 55016-2-1	2004

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
CISPR 16-2-3	- ¹⁾	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements	EN 55016-2-3	2006 ²⁾
CISPR 16-4-2	- ¹⁾	Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, statistics and limit modelling - Uncertainty in EMC measurements	EN 55016-4-2	2004 ²⁾
CISPR 22	- ¹⁾	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EN 55022	2006 ²⁾

Annex ZZ
(informative)

Coverage of Essential Requirements of EC Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers the essential requirements as given in Article 4(a) of the EC Directive 89/336/EEC and Annex I Article 1(a) of the EC Directive 2004/108/EC, and the essential requirements of Article 3.1(b) (emission only) of the EC Directive 1999/5/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directives concerned.

WARNING: Other requirements and other EC Directives may be applicable to the products falling within the scope of this standard.

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