

# INTERNATIONAL STANDARD



INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

**Electromagnetic compatibility – Requirements for household appliances,  
electric tools and similar apparatus –  
Part 2: Immunity – Product family standard**



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IEC 60385-2:2015 REV

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INTERNATIONAL  
ELECTROTECHNICAL  
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**ELECTROMAGNETIC COMPATIBILITY –  
REQUIREMENTS FOR HOUSEHOLD APPLIANCES,  
ELECTRIC TOOLS AND SIMILAR APPARATUS –**

**Part 2: Immunity – Product family standard**

FOREWORD

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**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

International Standard CISPR 14-2 has been prepared by CISPR subcommittee F: Interference relating to household appliances tools, lighting equipment and similar apparatus.

This second edition cancels and replaces the first edition published in 1997, Amendment 1:2001 and Amendment 2:2008. This edition constitutes a technical revision.

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

- a) 5.1: For ESD tests on contacts of plugs and sockets the note (“The 4 kV contact discharge shall be applied to conductive accessible parts. Metallic contacts, such as in battery compartments or in socket outlets, are excluded from this requirement.”) saying that no test on contacts is necessary has been removed. The IEC 61000-4-2 includes a detailed description how to deal with ESD on contacts and other surfaces. Also discharge on HCP and VCP is required by the basic standard IEC 61000-4-2.
- b) 5.3 and 5.4: The tables for tests at d.c. power ports according IEC 61000-4-6 are aligned with the generic standards and are the same for 5.3 and 5.4.
- c) 5.3 and 5.4: For EUT with single mains cable and no other cable, the test set-up as shown in Figure 2 shall be used. The set-up as described in Annex F of IEC 61000-4-6:2013 shall not be used.
- d) 5.5: The IEC 61000-4-22 has been introduced as alternative method for testing radiated immunity.
- e) 5.6: No line-to-earth surges are applied to products which do not have provision for connection to earth.

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

FDIS	Report on voting
CISPR/F/652/FDIS	CISPR/F/657/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.

A list of all parts in the CISPR 14 series, published under the general title *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus*, can be found on the IEC website.

The committee has decided that the contents of this publication 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 publication. At this date, the publication will be

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

## INTRODUCTION

The intention of this standard is to establish uniform requirements for the electromagnetic immunity of the equipment mentioned in the scope, to fix test specifications of immunity, to refer to basic standards for methods of testing, and to standardize operating conditions, performance criteria and interpretation of results.

*Keywords:* Immunity, household appliances, electric apparatus, electromagnetic compatibility.

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# ELECTROMAGNETIC COMPATIBILITY – REQUIREMENTS FOR HOUSEHOLD APPLIANCES, ELECTRIC TOOLS AND SIMILAR APPARATUS –

## Part 2: Immunity – Product family standard

### 1 Scope ~~and object~~

1.1 This part of CISPR 14 deals with the electromagnetic immunity of appliances and similar apparatus for household and similar purposes that use electricity, as well as electric toys and electric tools, the rated voltage of the apparatus being not more than 250 V for single-phase apparatus to be connected to phase and neutral, and 480 V for other apparatus.

Apparatus may incorporate motors, heating elements or their combination, may contain electric or electronic circuitry, and may be powered by the mains, ~~by transformer~~, by batteries, or by any other electrical power source.

Apparatus not intended for household use, but which nevertheless may require the immunity level, such as apparatus intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard as far as they are included in CISPR 14-1. In addition, the following are also included in the scope of this standard:

- microwave ovens for domestic use and catering;
- cooking hobs and cooking ovens, heated by means of r.f. energy;
- (single- and multiple-zone) induction cooking appliances;
- ~~UV and IR radiators appliances~~ for personal care equipped with radiators in the range from UV to IR, inclusive (this includes visible light);
- ~~power supplies and battery chargers provided with or intended for apparatus within the scope of this standard.~~

1.2 This standard does not apply to:

- equipment for lighting purposes;
- apparatus designed exclusively for heavy industrial purposes;
- apparatus intended to be part of the fixed electrical installation of buildings (such as fuses, circuit breakers, cables and switches);
- apparatus intended to be used in locations where special electromagnetic conditions prevail, such as the presence of high electromagnetic fields (for example in the vicinity of a broadcast transmitting station), or where high pulses occur on the power network (such as in a power generator station);
- radio and television receivers, audio and video equipment, and electronic music instruments ~~other than toys~~;
- medical electrical appliances;
- personal computers and similar equipment ~~other than toys~~;
- radio transmitters;
- apparatus designed to be used exclusively in vehicles;
- ~~babies surveillance systems.~~

**1.3** Immunity requirements in the frequency range 0 Hz to 400 GHz are covered.

**1.4** The effects of electromagnetic phenomena relating to the safety of apparatus are excluded from this standard and are covered by other standards, for example in the IEC 60335 series.

Abnormal operation of the apparatus (such as simulated faults in the electric circuitry for testing purposes) is not taken into consideration.

NOTE 1 Attention is drawn to the fact that additional requirements ~~may~~ can be necessary for apparatus intended to be used on board ships or aircraft.

**1.5** The object of this standard is to specify the immunity requirements for apparatus defined in the scope in relation to continuous and transient, conducted and radiated electromagnetic disturbances, including electrostatic discharges.

These requirements represent essential electromagnetic compatibility immunity requirements.

NOTE 2 In special cases, situations will arise where the level of disturbances may exceed the test values specified in this standard. In these instances special mitigation measures may have to be employed.

## 2 Normative references

~~The following normative documents contain provisions which through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid international standards.~~

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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):1990 International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility~~

IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at [www.electropedia.org](http://www.electropedia.org))

~~IEC 61000-4-2:1995 2008, Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test – Basic EMC publication~~

IEC 61000-4-3:1995 2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*  
IEC 61000-4-3:2006/AMD1:2007  
IEC 61000-4-3:2006/AMD2:2010

~~IEC 61000-4-4:1995 2012, Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test – Basic EMC publication~~

IEC 61000-4-5:1995 2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:1996 2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11:1994 2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests* — ~~Basic EMC publication~~

IEC 61000-4-22:2010, *Electromagnetic compatibility (EMC) – Part 4-22: Testing and measurement techniques – Radiated emissions and immunity measurements in fully anechoic rooms (FARs)*

~~CISPR 11:1990, Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment~~

~~CISPR 14:1993, Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus~~

CISPR 14-1:2005, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*  
 CISPR 14-1:2005/AMD1:2008  
 CISPR 14-1:2005/AMD2:2011

~~CISPR 16 1:1993, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus~~

### 3 Terms, definitions and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions related to EMC and related phenomena found in IEC 60050-161, as well as the following terms and definitions apply.

##### 3.1.1

##### **electromagnetic compatibility**

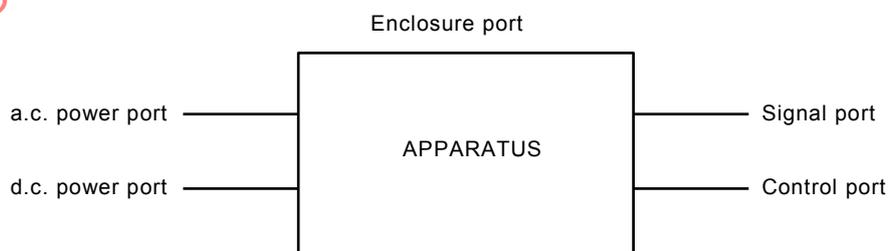
ability of a device, unit of equipment or system to function satisfactorily in its electro-magnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

##### 3.1.2

##### **port**

particular interface of the specified apparatus with the external electromagnetic environment

Note 1 to entry: See Figure 1.



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Figure 1 – Examples of ports

##### 3.1.3

##### **enclosure port**

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

#### **3.1.4 series production**

production process in which **identical** apparatus are manufactured continuously or in batches (consisting of identical products)

#### **3.1.5 safety extra-low voltage**

voltage which does not exceed 50 V a.c. or 120 V ripple free d.c. between conductors, or between any conductor and earth, in a circuit which is isolated from the supply mains by such means as a safety isolating transformer

#### **3.1.6 toy**

product designed for, or clearly intended for use in play by children under 14 years old

Note 1 to entry: Toys may incorporate motors, heating elements, electronic circuits and their combination

Note 2 to entry: The supply voltage of a toy shall not exceed 24 V a.c. (R.m.s.) or ripple-free d.c. and may be provided by a battery or by means of an adapter or a safety transformer connected to the mains supply.

Note 3 to entry: Transformers, converters and chargers for toys are considered not to be part of the toy (see IEC 61558-2-7).

#### **3.1.7 electric toy**

toy having at least one function dependent on electricity

#### **3.1.8 battery toy**

toy which contains or uses one or more batteries as the only source of electrical energy

#### **3.1.9 transformer toy**

toy which is connected to the supply mains through a transformer for toys and using the supply mains as the only source of electrical energy

#### **3.1.10 dual supply toy**

toy which can be operated simultaneously or alternatively as a battery toy and a transformer toy

#### **3.1.11 safety isolating transformer**

transformer the input winding of which is electrically separated from the output winding by an insulation at least equivalent to double insulation or reinforced insulation, and which is designed to supply an appliance or circuit at safety extra-low voltage

#### **3.1.12 safety transformer for toys**

safety isolating transformer specially designed to supply toys operating at safety extra-low voltage not exceeding 24 V

Note 1 to entry: Either a.c. or d.c. or both may be delivered from the transformer unit.

#### **3.1.13 constructional kit**

collection of electric, electronic or mechanical parts intended to be assembled as various toys

**3.1.14****experimental kit**

collection of electric or electronic components intended to be assembled in various combinations

Note 1 to entry: The main aim of an experimental set is to facilitate the acquiring of knowledge by experiment and research. It is not intended to create a toy or equipment for practical use.

**3.1.15****functional toy**

toy with a rated voltage not exceeding 24 V and which is a model of an appliance or installation used by adults

Note 1 to entry: A product with a rated voltage exceeding 24 V, intended to be used by children under the direct supervision of an adult and which is a model of an appliance or installation and used in the same way, is known as a functional product.

**3.1.16****video toy**

toy consisting of a screen and activating means by which the child can play and interact with the picture shown on the screen

Note 1 to entry: All parts necessary for the operation of the video toy, such as control box, joy stick, key board, monitor and connections, are considered to be part of the toy.

**3.1.17****normal operation of toys**

condition under which the toy, connected to the recommended power supply, is played with as intended or in a foreseeable way, bearing in mind the normal behaviour of children

**3.1.18****clock frequency**

fundamental frequency of any signal used in the device, excluding those which are solely used inside integrated circuits (IC)

Note 1 to entry: High frequencies are often generated inside of integrated circuits (IC) by phase-locked-loop (PLL) circuits from lower clock oscillator frequencies outside the IC.

**3.2 Abbreviations**

ESD	Electrostatic Discharge
CDN	Coupling and Decoupling Network
EUT	Equipment Under Test
UV	Ultraviolet (Light)
IR	Infrared (Light)
RF	Radio Frequency

**4 Classification of apparatus**

**4.1** The apparatus covered by this standard is subdivided into categories. For each category, specific requirements are formulated.

**4.2** Category I: apparatus containing no electronic control circuitry, ~~for example motor operated appliances, toys, tools, heating appliances and similar electric apparatus (such as UV and IR radiators).~~

All appliances having no electronic control circuitry are considered to be category I.

Electric circuits consisting of passive components (such as radio interference suppression capacitors or inductors, mains transformers, mains frequency rectifiers and heating elements) are not considered to be electronic control circuitry.

~~EXAMPLES apparatus containing components such as electromotors, electromechanical switches, thermostats, (rechargeable) batteries. Appliances operated with a motor and mechanical switch only; lighting toys with a battery and a LED or incandescent lamp without additional electronic control circuitry; track sets without electronic control circuitry; heating or cooling appliances without electronic control circuitry; tools without electronic controls and all other apparatus containing only electromechanical components (e. g. switches or thermostats).~~

**4.3** Category II: ~~transformer toys, dual supply toys,~~ mains powered motor operated appliances, tools, heating appliances and similar electric apparatus (for example – UV radiators, IR radiators and microwave ovens) containing electronic control circuitry with no ~~internal~~ clock frequency ~~or oscillator frequency~~ higher than 15 MHz.

~~NOTE The value 15 MHz is tentative and may be modified after a period of experience. For toys, examples include educational computers, organs, track sets with electronic control units.~~

**4.4** Category III: ~~battery powered apparatus (with built in batteries or external batteries) which in normal use is not connected to the mains, containing an electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15 MHz. equipment which in normal use, is not connected to a power network and has no cables attached.~~

This category includes apparatus provided with rechargeable batteries, solar or other similar d.c. power sources which can be charged or operated by connecting the apparatus to the mains power. However, this apparatus shall also be tested as an apparatus in category II while it is connected to the mains network.

~~NOTE For toys, examples include musical soft toys, cord-controlled toys and motor-operated electronic toys.~~

**4.5** Category IV: all other apparatus covered by the scope of this standard.

## 5 Tests

### 5.1 Electrostatic discharge

Electrostatic discharge tests (air discharges, contact discharges direct and indirect, as appropriate) are carried out according to basic standard IEC 61000-4-2, with test signals and conditions as given in Table 1.

**Table 1 – Enclosure port**

Environmental phenomenon	Test specification	Test set-up
Electrostatic discharge	8 kV air discharge 4 kV contact discharge	IEC 61000-4-2

~~NOTE The 4 kV contact discharge shall be applied to conductive accessible parts. Metallic contacts, such as in battery compartments or in socket outlets, are excluded from this requirement.~~

~~Contact discharge is the preferred test method. 20 discharges (10 with positive and 10 with negative polarity) shall be applied on each accessible metal part of the enclosure. In case of a non-conductive enclosure, discharges shall be applied on the horizontal or vertical coupling planes as specified in IEC 61000-4-2. Air discharges shall be used where contact discharges cannot be applied. Apply 20 discharges (10 with positive and 10 with negative polarity) to each selected discharging point. Tests with other (lower) voltages than those given in Table 1 are not required.~~

## 5.2 Fast transients

Fast transient tests are carried out according to basic standard IEC 61000-4-4, for 2 min with a positive polarity and for 2 min with a negative polarity, according to the following Tables 2, 3 and 4.

**Table 2 – Ports for signal lines and control lines**

Environmental phenomenon	Test specifications	Test set-up
Fast transients common mode	0,5 kV (peak) 5/50 ns $T_r/T_d$ 5 kHz repetition frequency	IEC 61000-4-4
<b>NOTE</b> Applicable only to ports interfacing with cables whose total length may can exceed 3 m according to the manufacturer's functional specification		

**Table 3 – Input and output d.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
Fast transients common mode	0,5 kV (peak) 5/50 ns $T_r/T_d$ 5 kHz repetition frequency	IEC 61000-4-4
<b>NOTE</b> Not applicable to battery operated appliances that cannot be connected to the mains while in use. Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging. Apparatus with a d.c. power input port intended for use with an a.c. – d.c. power adaptor shall be tested on the a.c. power input of the a.c.- d.c. power adaptor specified by the manufacturer or, where none is so specified, using a typical a.c. – d.c. power adaptor. For d.c. input and output ports intended to be connected permanently, the test is only applicable to cables longer than 3 m.		

A coupling/decoupling network shall be applied for testing d.c. power ports.

**Table 4 – Input and output a.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
Fast transients common mode	1 kV (peak) 5/50 ns $T_r/T_d$ 5 kHz repetition frequency	IEC 61000-4-4
For extra low voltage a.c. ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.		

A coupling/decoupling network shall be used for testing a.c. power ports.

## 5.3 Injected currents, 0,15 MHz to 230 MHz

Injected current tests are carried out according to the basic standard IEC 61000-4-6, and according to the following Tables 5, 6 and 7.

For large EUT having only one mains cable and no other cable leaving the EUT and where the mains cable leaves the EUT at a height of more than 1 m from the floor the following test set-up shall be used:

- the mains cable is routed along the enclosure of the EUT straight down to 3,0 cm to 5,0 cm above the ground plane and then horizontally to the CDN or clamp;

- the CDN or clamp shall be placed at a distance not more than 30 cm from the boundary of the EUT. A distance of 20 cm is recommended;
- see Figure 2 for an example.

NOTE 1 Typical household appliance for application of this paragraph on large EUT is a refrigerator.

Test conditions and testing arrangements, especially for measurements from 80 MHz to 230 MHz, shall be clearly specified in the test report.

NOTE 2 Current injection up to 230 MHz is applied, independent of the dimensions of the equipment under test (EUT).

The unmodulated carrier of the test signal is adjusted to the indicated test value. To perform the test, the carrier is in addition modulated as specified.

**Table 5 – Ports for signal lines and control lines**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 1 V (r.m.s.) (unmodulated) 150 Ω source impedance	IEC 61000-4-6
NOTE Applicable only to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.		

**Table 6 – Input and output d.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 1 V (r.m.s.) (unmodulated) 150 Ω source impedance	IEC 61000-4-6
NOTE 1 Not applicable to battery operated appliances that cannot be connected to the mains while in use.		
<del>NOTE 2 Applicable to battery operated appliances that can be connected to the mains while in use, or to appliances for which the length of d.c. cables may exceed 3 m according to the manufacturer's functional specification.</del>		
Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging. Apparatus with a d.c. power input port intended for use with an a.c. - d.c. power adaptor shall be tested on the a.c. power input of the a.c.- d.c. power adaptor specified by the manufacturer or, where none is so specified, using a typical a.c. - d.c. power adaptor. For d.c. input and output ports intended to be connected permanently, the test is only applicable to cables longer than 3 m.		

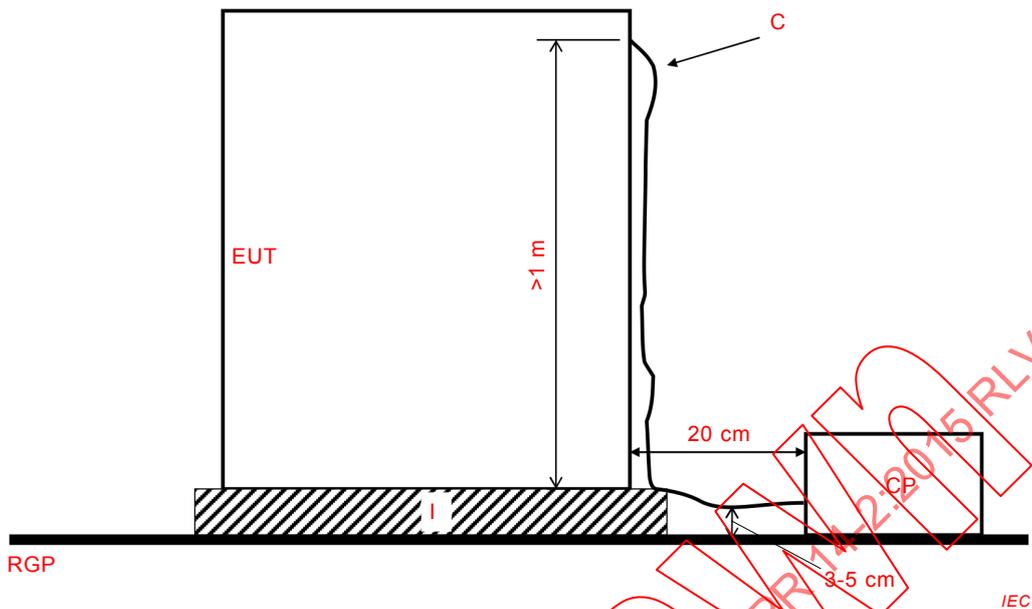
A coupling/decoupling network shall be applied for testing d.c. power ports

**Table 7 – Input and output a.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 3 V (r.m.s.) (unmodulated) 150 Ω source impedance	IEC 61000-4-6

For extra low voltage a.c ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.

A coupling/decoupling network shall be applied for testing a.c. power ports.



RGP = Reference ground plane

I = Insulating support as required by IEC 61000-4-6

CP = CDN or clamp

EUT = Equipment under test

C = Cable (mains cable)

**Figure 2 – Example for a test set-up for large EUTs (e. g. refrigerators) where the cable leaves the EUT on a height of more than 1 m above the floor**

**5.4 Injected currents, 0,15 MHz to 80 MHz**

Injected current tests are carried out according to the basic standard IEC 61000-4-6, and according to the following Tables 8, 9 and 10.

Large EUT shall be measured in the same way as described in 5.3.

The unmodulated carrier of the test signal is adjusted to the indicated test value. To perform the test, the carrier is in addition modulated as specified.

**Table 8 – Ports for signal lines and control lines**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 1 V (r.m.s.) (unmodulated) 150 Ω source impedance	IEC 61000-4-6

**NOTE** Applicable only to ports interfacing with cables whose total length ~~may~~ can exceed 3 m according to the manufacturer's functional specification.

**Table 9 – Input and output d.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 1 V (r.m.s.) (unmodulated)  150 Ω source impedance	IEC 61000-4-6

**NOTE** Not applicable to battery operated appliances that cannot be connected to the mains while in use.

Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging. Apparatus with a d.c. power input port intended for use with an a.c. – d.c. power adaptor shall be tested on the a.c. power input of the a.c.- d.c. power adaptor specified by the manufacturer or, where none is so specified, using a typical a.c. – d.c. power adaptor. For d.c. input and output power ports intended to be connected permanently, the test is not applicable provided the instructions require external cables not to be longer than 3 m.

A coupling/decoupling network shall be applied for testing d.c. power ports.

**Table 10 – Input and output a.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 3 V (r.m.s.) (unmodulated)  150 Ω source impedance	IEC 61000-4-6

For extra low voltage a.c ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.

A coupling/decoupling network shall be applied for testing a.c. power ports.

### 5.5 Radio frequency electromagnetic fields, 80 MHz to 1 000 MHz

Radio frequency electromagnetic field tests are carried out according to basic standard IEC 61000-4-3 or IEC 61000-4-22, and according to Table 11.

The unmodulated carrier of the test signal is adjusted to the indicated test value. To perform the test, the carrier is in addition modulated as specified.

**Table 11 – Enclosure port**

Environmental phenomenon	Test specifications	Test set-up
Radio-frequency electromagnetic field, 1 kHz, 80% AM	80 MHz to 1 000 MHz 3 V/m (r.m.s.) (unmodulated)	IEC 61000-4-3 or IEC 61000-4-22

### 5.6 Surges

Surge immunity tests are carried out according to basic standard IEC 61000-4-5, and according to Table 12.

**Table 12 – Input a.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
Surge	1,2/50 (8/20) $\mu$ s $T_r/T_d$ 2 kV line-to-earth with 12 $\Omega$ Impedance 1 kV line-to-line with 2 $\Omega$ Impedance	IEC 61000-4-5

Five positive and five negative pulses shall be applied as far as applicable, successively:

- between phase and phase: 1 kV;
- between phase and neutral: 1 kV;
- between phase and ~~protective~~ earth: 2 kV;
- and between neutral and ~~protective~~ earth: 2 kV.

The positive pulses are applied 90° relative to the phase angle of the a.c. line voltage to the equipment under test, and the negative pulses are applied 270° relative to the phase angle of the a.c. line voltage to the equipment under test. Tests with other (lower) voltages than those given in Table 12 are not required.

No line-to-earth surges are applied to products which do not have provision for connection to earth.

NOTE The shield of a cable does not provide a dedicated connection to earth.

### 5.7 Voltage dips ~~and interruptions~~

Tests concerning voltage dips ~~and interruptions~~ are carried out according to basic standard IEC 61000-4-11, and according to the following Table 13. The voltage interruption tests according to IEC 61000-4-11 are not performed.

**Table 13 – Input a.c. power ports**

Environmental phenomena	Test level in % $U_T$	Durations (in periods of the rated frequency) for voltage dips		Test set-up
Interruptions	0	50 Hz	60 Hz	IEC 61000-4-11 Voltage <del>shift change</del> shall occur at zero crossing
Voltage dips in % $U_T$	0	0,5 cycle	0,5 cycle	
	40	10 cycles	12 cycles	
	70	25 cycles	30 cycles	
$U_T$ is the rated voltage of the equipment under test.				

## 6 Performance criteria

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on the following criteria.

Performance criterion A: The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product

description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however no change of actual operating state or stored data is allowed **to persist after the test**. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

~~The following table 14 serves as a guide to formulate the permissible degradation of the equipment under test (EUT) caused by electromagnetic stress. Not all functions of the apparatus need to be tested.~~

The selection, the specification of functions, and the permissible degradation is left to the responsibility of the manufacturer.

~~Annex A serves as a guide to formulate the permissible degradation of the equipment under test (EUT) caused by electromagnetic phenomena.~~

## 7 Applicability of immunity tests

### 7.1 General

**7.1.1** The immunity tests for apparatus covered by this standard are given in Clause 5 on a port by port basis. The tests are specified for each port concerned.

Tests are applied to the relevant ports of the apparatus according to Tables 1 to 13 (if applicable).

Tests shall be carried out on those ports ~~which are accessible that can be subjected to disturbances~~ during normal operation of the equipment.

The tests shall be carried out as single tests in sequence. ~~The sequence of testing is optional. Any testing sequence is acceptable.~~

The description of the test, the test generator, the test methods, and the test set-up are given in basic standards which are referred to in the tables. The content of these basic standards are not repeated here; however, modifications or additional information needed for the practical application of the tests are given in this standard.

**7.1.2** It may be determined from consideration of the electrical characteristics and usage of a particular apparatus that some of the tests are inappropriate, and therefore unnecessary. In such cases it is required that the decision not to test be recorded in the test report.

**7.1.3** Regardless of their category, experimental ~~and construction~~ kits intended for education and play are deemed to fulfill the immunity requirements, and are not tested.

## **7.2 Application of tests for the different categories of apparatus**

### **7.2.1 Category I**

Category I apparatus is deemed to fulfill the relevant immunity requirements without testing.

### **7.2.2 Category II**

Category II apparatus shall fulfill the following requirements:

- electrostatic discharge with performance criterion B (5.1);
- fast transients with performance criterion B (5.2);
- injected currents up to 230 MHz with performance criterion A (5.3);
- surges with performance criterion B (5.6);
- voltage dips ~~and interruptions~~ with performance criterion C (5.7).

### **7.2.3 Category III**

Category III apparatus shall fulfill the following requirements:

- electrostatic discharge with performance criterion B (5.1);
- ~~– fast transients with performance criterion B (5.2);~~  
A performance criterion C could be applied to toys not using score or data entered by the user. Examples are musical soft toys, sounding toys, etc.
- ~~injected currents up to 230 MHz~~ radio frequency electromagnetic fields with performance criterion A (5.5).  
For toys, the radio frequency electromagnetic fields test is only applicable for ride on toys.

### **7.2.4 Category IV**

Category IV apparatus shall fulfill the following requirements (if applicable):

- electrostatic discharge with performance criterion B (5.1);
- fast transients with performance criterion B (5.2);
- injected currents up to 80 MHz with performance criterion A (5.4);
- radiofrequency electromagnetic fields with performance criterion A (5.5);
- surges with performance criterion B (5.6);
- voltage dips ~~and interruptions~~ with performance criterion C (5.7).

## **8 Conditions during testing**

**8.1** ~~Unless otherwise specified,~~ the tests shall be made ~~in the specified frequency band,~~ while the apparatus is operated as intended by the manufacturer, in the most susceptible operating mode consistent with normal use.

Tests shall be carried out under the conditions specified in CISPR 14-1 where applicable. The tests shall be carried out within the specified or typical environmental range for the apparatus, and at its rated supply voltage and frequency. If the apparatus can be set at

different levels (for example speed, temperature), a setting below maximum shall be used, preferably at approximately 50 % level.

~~Microwave ovens, cooking ovens, hobs and induction cooking appliances~~ Appliances with a microwave oven function shall be tested, loaded with  $1 \text{ l} \pm 0,5 \text{ l}$  tapwater; long lasting tests may be interrupted to refill the load.

During the tests, toys are operated under normal operation. Transformer toys are tested with the transformer supplied with the toy. If the toy is supplied without a transformer, it shall be tested with an appropriate transformer.

In case of associated devices (for example, video toy cartridges) sold separately to be used with different appliances, the associated device shall be tested with at least one appropriate representative hosting appliance, selected by the manufacturer of the associated device, in order to check conformity of the associated device for all appliances with which it is intended to operate. The hosting appliance shall be representative of series produced appliances and shall be typical.

However, the manufacturer's specification of test configuration, conditions and performances takes precedence.

**8.2** Where applicable, the configuration of the EUT shall be varied to achieve maximum susceptibility. If the apparatus can be connected to auxiliary apparatus, then the apparatus shall be tested while connected to the minimum configuration of auxiliary apparatus necessary to exercise all existing ports.

**8.3** The tests concerning ESD, transients, surges and voltage ~~interruptions~~ dips are carried out during each mode of operation of the EUT (or phase as part of the mode of operation) selected for the test.

**8.4** The tests concerning electromagnetic fields and current injection are carried out during the scan time while, at random, the selected modes of the EUT are set into operation. ~~In addition, tests are performed at five selected spot frequencies, each for up to 3 min at the selected modes of operation.~~

**8.5** For manual selection of the mode of operation, the test may be interrupted, or care should be taken that the operator does not influence the test results.

**8.6** In case of an EUT with an automatic cycling program, the scan time shall be started at random. Where a single cycle lasts longer than the scan time, the test shall be repeated until the cycle is finished.

~~8.7 Service programmes shall be tested if they are user accessible.~~

**8.7** The configuration and mode of operation during the tests shall be precisely noted in the test report.

NOTE Care ~~should be~~ is taken that changes in the environment, such as power supply, do not influence the test results.

## 9 Assessment of conformity

### 9.1 Single product evaluation

Apparatus manufactured in series production shall be verified by performing a type-test on one representative model, or on one series-produced apparatus.

The manufacturer's or supplier's quality system shall ensure that the tested model or apparatus is representative of the series-produced apparatus concerned.

For apparatus not produced in series, the test procedures shall ensure that each individual apparatus meets the requirements when tested by the methods specified.

Results obtained for an apparatus tested when installed in its place of use (and not on a test site) relates to that installation only, and shall not be considered representative for any other installation.

## 9.2 Statistical evaluation

The significance of the requirements for compliance of the apparatus with the standard shall be that, on a statistical basis, at least 80 % of the series produced apparatus complies with the requirements with at least 80 % confidence.

When type-testing is carried out on a single piece of apparatus, compliance with the requirements on the 80 %/80 % basis is not guaranteed.

Compliance is judged from the condition that the number of apparatus which do not fulfil the requirements may not exceed  $c$  in a sample of size  $n$ .

$n$	7	14	20	26	32
$c$	0	1	2	3	4

If the tests on the sample result in non-compliance with the requirements, then a second sample may be tested, and the results combined with those from the first sample. Compliance is then checked for the combined sample.

NOTE For general information, see Section Nine of CISPR 16, on the statistical consideration in the determination of limits of radio interference EMC compliance, see CISPR TR 16-4-3.

## 9.3 In case of dispute

In case of dispute, assessment of conformity with this standard shall be based on the statistical method of evaluation.

## ~~10 Product documentation~~

~~The specification prepared by the manufacturer, for the acceptable level of EMC performance, or degradation of EMC performance during or after the testing required by this standard, shall be made available upon request.~~

**Annex A**  
(informative)

**Guidance for permissible degradation**

Table A.1 serves as a guide to formulate the permissible degradation of the equipment under test (EUT) caused by electromagnetic phenomena.

Not all functions of the apparatus need to be tested. The selection of functions to be monitored during the tests and the permissible degradation is the responsibility of the manufacturer.

**Table A.1 – Examples of degradations**

Functions (non-exhaustive)	Criteria			
	A	B <sup>b</sup>	C1 <sup>c</sup>	C2 <sup>c</sup>
Motor speed	10 % <sup>a</sup>	–	+	–
Torque	10 % <sup>a</sup>	–	+	–
Movement	10 % <sup>a</sup>	–	+	–
Power (consumption, input)	10 % <sup>a</sup>	–	+	–
Switching (change of state)	–	–	+	–
Heating	10 % <sup>a</sup>	–	+	–
Timing (programme, delay, duty cycle)	10 % <sup>a</sup>	–	+	–
Stand-by	–	–	d	–
Data storage	–	–	e	e
Sensor functions (signal transmission)	f	–	g	–
Indicators (visual and acoustic)	f	–	g	–
Audio function	f	–	g	–
Illumination	f	–	g	–
– No change allowed. + Change allowed. <sup>a</sup> Values are exclusive of the measurement accuracy. <sup>b</sup> For criterion B, measurement or verification is performed during the stable operations of the Equipment Under Test before and after the application of the specified phenomenon. <sup>c</sup> For criterion C, distinction is made between C1: before resetting and C2: after resetting. <sup>d</sup> Switching-off is allowed, switching-on is not allowed. <sup>e</sup> Loss or change of data is allowed. <sup>f</sup> Lower performance as specified by the manufacturer is allowed, but no loss of correct function. <sup>g</sup> Loss of correct functions allowed.				

## Bibliography

IEC 60335 (all parts), *Household and similar electrical appliances – Safety*

IEC 61558-2-7, *Safety of power transformers, power supplies, reactors and similar products – Part 2-7: Particular requirements and tests for transformers and power supplies for toys*

CISPR TR 16-4-3, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-3: Uncertainties, statistics and limit modelling – Statistical considerations in the determination of EMC compliance of mass-produced products (only available in English)*

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# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE  
COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

**Electromagnetic compatibility – Requirements for household appliances,  
electric tools and similar apparatus –  
Part 2: Immunity – Product family standard**

**Compatibilité électromagnétique – Exigences relatives aux appareils  
électrodomestiques, outillages électriques et appareils analogues –  
Partie 2: Immunité – Norme de famille de produits**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION  
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**ELECTROMAGNETIC COMPATIBILITY –  
REQUIREMENTS FOR HOUSEHOLD APPLIANCES,  
ELECTRIC TOOLS AND SIMILAR APPARATUS –**

**Part 2: Immunity – Product family standard**

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 CISPR 14-2 has been prepared by CISPR subcommittee F: Interference relating to household appliances tools, lighting equipment and similar apparatus.

This second edition cancels and replaces the first edition published in 1997, Amendment 1:2001 and Amendment 2:2008. This edition constitutes a technical revision.

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

- a) 5.1: For ESD tests on contacts of plugs and sockets the note ("The 4 kV contact discharge shall be applied to conductive accessible parts. Metallic contacts, such as in battery compartments or in socket outlets, are excluded from this requirement.") saying that no test on contacts is necessary has been removed. The IEC 61000-4-2 includes a detailed

description how to deal with ESD on contacts and other surfaces. Also discharge on HCP and VCP is required by the basic standard IEC 61000-4-2.

- b) 5.3 and 5.4: The tables for tests at d.c. power ports according IEC 61000-4-6 are aligned with the generic standards and are the same for 5.3 and 5.4.
- c) 5.3 and 5.4: For EUT with single mains cable and no other cable, the test set-up as shown in Figure 2 shall be used. The set-up as described in Annex F of IEC 61000-4-6:2013 shall not be used.
- d) 5.5: The IEC 61000-4-22 has been introduced as alternative method for testing radiated immunity.
- e) 5.6: No line-to-earth surges are applied to products which do not have provision for connection to earth.

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

FDIS	Report on voting
CISPR/F/652/FDIS	CISPR/F/657/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.

A list of all parts in the CISPR 14 series, published under the general title *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus*, can be found on the IEC website.

The committee has decided that the contents of this publication 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 publication. At this date, the publication will be

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

## INTRODUCTION

The intention of this standard is to establish uniform requirements for the electromagnetic immunity of the equipment mentioned in the scope, to fix test specifications of immunity, to refer to basic standards for methods of testing, and to standardize operating conditions, performance criteria and interpretation of results.

*Keywords:* Immunity, household appliances, electric apparatus, electromagnetic compatibility.

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# ELECTROMAGNETIC COMPATIBILITY – REQUIREMENTS FOR HOUSEHOLD APPLIANCES, ELECTRIC TOOLS AND SIMILAR APPARATUS –

## Part 2: Immunity – Product family standard

### 1 Scope

**1.1** This part of CISPR 14 deals with the electromagnetic immunity of appliances and similar apparatus for household and similar purposes that use electricity, as well as electric toys and electric tools, the rated voltage of the apparatus being not more than 250 V for single-phase apparatus to be connected to phase and neutral, and 480 V for other apparatus.

Apparatus may incorporate motors, heating elements or their combination, may contain electric or electronic circuitry, and may be powered by the mains, by transformer, by batteries, or by any other electrical power source.

Apparatus not intended for household use, but which nevertheless may require the immunity level, such as apparatus intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard as far as they are included in CISPR 14-1. In addition, the following are also included in the scope of this standard:

- microwave ovens for domestic use and catering;
- cooking hobs and cooking ovens, heated by means of r.f. energy;
- (single- and multiple-zone) induction cooking appliances;
- appliances for personal care equipped with radiators in the range from UV to IR, inclusive (this includes visible light);
- power supplies and battery chargers provided with or intended for apparatus within the scope of this standard.

**1.2** This standard does not apply to:

- equipment for lighting purposes;
- apparatus designed exclusively for heavy industrial purposes;
- apparatus intended to be part of the fixed electrical installation of buildings (such as fuses, circuit breakers, cables and switches);
- apparatus intended to be used in locations where special electromagnetic conditions prevail, such as the presence of high electromagnetic fields (for example in the vicinity of a broadcast transmitting station), or where high pulses occur on the power network (such as in a power generator station);
- radio and television receivers, audio and video equipment, and electronic music instruments other than toys;
- medical electrical appliances;
- personal computers and similar equipment other than toys;
- radio transmitters;
- apparatus designed to be used exclusively in vehicles;
- babies surveillance systems.

**1.3** Immunity requirements in the frequency range 0 Hz to 400 GHz are covered.

**1.4** The effects of electromagnetic phenomena relating to the safety of apparatus are excluded from this standard and are covered by other standards, for example in the IEC 60335 series.

Abnormal operation of the apparatus (such as simulated faults in the electric circuitry for testing purposes) is not taken into consideration.

NOTE 1 Attention is drawn to the fact that additional requirements can be necessary for apparatus intended to be used on board ships or aircraft.

**1.5** The object of this standard is to specify the immunity requirements for apparatus defined in the scope in relation to continuous and transient, conducted and radiated electromagnetic disturbances, including electrostatic discharges.

These requirements represent essential electromagnetic compatibility immunity requirements.

NOTE 2 In special cases, situations will arise where the level of disturbances may exceed the test values specified in this standard. In these instances special mitigation measures may have to be employed.

## 2 Normative references

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

IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at [www.electropedia.org](http://www.electropedia.org))

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*  
IEC 61000-4-3:2006/AMD1:2007  
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-22:2010, *Electromagnetic compatibility (EMC) – Part 4-22: Testing and measurement techniques – Radiated emissions and immunity measurements in fully anechoic rooms (FARs)*

CISPR 14-1:2005, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*  
 CISPR 14-1:2005/AMD1:2008  
 CISPR 14-1:2005/AMD2:2011

### 3 Terms, definitions and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions related to EMC and related phenomena found in IEC 60050-161, as well as the following terms and definitions apply.

##### 3.1.1

##### **electromagnetic compatibility**

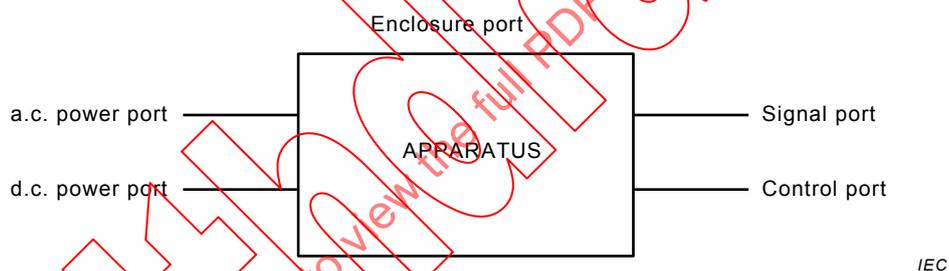
ability of a device, unit of equipment or system to function satisfactorily in its electro-magnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

##### 3.1.2

##### **port**

particular interface of the specified apparatus with the external electromagnetic environment

Note 1 to entry: See Figure 1.



**Figure 1 – Examples of ports**

##### 3.1.3

##### **enclosure port**

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

##### 3.1.4

##### **series production**

production process in which identical apparatus are manufactured continuously or in batches (consisting of identical products)

##### 3.1.5

##### **safety extra-low voltage**

voltage which does not exceed 50 V a.c. or 120 V ripple free d.c. between conductors, or between any conductor and earth, in a circuit which is isolated from the supply mains by such means as a safety isolating transformer

##### 3.1.6

##### **toy**

product designed for, or clearly intended for use in play by children under 14 years old

Note 1 to entry: Toys may incorporate motors, heating elements, electronic circuits and their combination.

Note 2 to entry: The supply voltage of a toy shall not exceed 24 V a.c. (r.m.s.) or ripple-free d.c. and may be provided by a battery or by means of an adapter or a safety transformer connected to the mains supply.

Note 3 to entry: Transformers, converters and chargers for toys are considered not to be part of the toy (see IEC 61558-2-7).

### 3.1.7

#### **electric toy**

toy having at least one function dependent on electricity

### 3.1.8

#### **battery toy**

toy which contains or uses one or more batteries as the only source of electrical energy

### 3.1.9

#### **transformer toy**

toy which is connected to the supply mains through a transformer for toys and using the supply mains as the only source of electrical energy

### 3.1.10

#### **dual supply toy**

toy which can be operated simultaneously or alternatively as a battery toy and a transformer toy

### 3.1.11

#### **safety isolating transformer**

transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to double insulation or reinforced insulation, and which is designed to supply an appliance or circuit at safety extra-low voltage

### 3.1.12

#### **safety transformer for toys**

safety isolating transformer specially designed to supply toys operating at safety extra-low voltage not exceeding 24 V

Note 1 to entry: Either a.c. or d.c. or both may be delivered from the transformer unit.

### 3.1.13

#### **constructional kit**

collection of electric, electronic or mechanical parts intended to be assembled as various toys

### 3.1.14

#### **experimental kit**

collection of electric or electronic components intended to be assembled in various combinations

Note 1 to entry: The main aim of an experimental set is to facilitate the acquiring of knowledge by experiment and research. It is not intended to create a toy or equipment for practical use.

### 3.1.15

#### **functional toy**

toy with a rated voltage not exceeding 24 V and which is a model of an appliance or installation used by adults

Note 1 to entry: A product with a rated voltage exceeding 24 V, intended to be used by children under the direct supervision of an adult and which is a model of an appliance or installation and used in the same way, is known as a functional product.

### 3.1.16

#### **video toy**

toy consisting of a screen and activating means by which the child can play and interact with the picture shown on the screen

Note 1 to entry: All parts necessary for the operation of the video toy, such as control box, joy stick, key board, monitor and connections, are considered to be part of the toy.

### 3.1.17

#### **normal operation of toys**

condition under which the toy, connected to the recommended power supply, is played with as intended or in a foreseeable way, bearing in mind the normal behaviour of children

### 3.1.18

#### **clock frequency**

fundamental frequency of any signal used in the device, excluding those which are solely used inside integrated circuits (IC)

Note 1 to entry: High frequencies are often generated inside of integrated circuits (IC) by phase-locked-loop (PLL) circuits from lower clock oscillator frequencies outside the IC.

## 3.2 Abbreviations

ESD Electrostatic Discharge

CDN Coupling and Decoupling Network

EUT Equipment Under Test

UV Ultraviolet (Light)

IR Infrared (Light)

RF Radio Frequency

## 4 Classification of apparatus

4.1 The apparatus covered by this standard is subdivided into categories. For each category, specific requirements are formulated.

4.2 Category I: apparatus containing no electronic control circuitry.

All appliances having no electronic control circuitry are considered to be category I.

Electric circuits consisting of passive components (such as radio interference suppression capacitors or inductors, mains transformers, mains frequency rectifiers and heating elements) are not considered to be electronic control circuitry.

EXAMPLES Appliances operated with a motor and mechanical switch only; lighting toys with a battery and a LED or incandescent lamp without additional electronic control circuitry; track sets without electronic control circuitry; heating or cooling appliances without electronic control circuitry; tools without electronic controls and all other apparatus containing only electromechanical components (e. g. switches or thermostats).

4.3 Category II: transformer toys, dual supply toys, mains powered motor operated appliances, tools, heating appliances and similar electric apparatus (for example – UV radiators, IR radiators and microwave ovens) containing electronic control circuitry with no clock frequency higher than 15 MHz.

NOTE For toys, examples include educational computers, organs, track sets with electronic control units.

**4.4** Category III: equipment which in normal use, is not connected to a power network and has no cables attached.

This category includes apparatus provided with rechargeable batteries, solar or other similar d.c. power sources which can be charged or operated by connecting the apparatus to the mains power. However, this apparatus shall also be tested as an apparatus in category II while it is connected to the mains network.

NOTE For toys, examples include musical soft toys, cord-controlled toys and motor-operated electronic toys.

**4.5** Category IV: all other apparatus covered by the scope of this standard.

**5 Tests**

**5.1 Electrostatic discharge**

Electrostatic discharge tests (air discharges, contact discharges direct and indirect, as appropriate) are carried out according to basic standard IEC 61000-4-2, with test signals and conditions as given in Table 1.

**Table 1 – Enclosure port**

Environmental phenomenon	Test specification	Test set-up
Electrostatic discharge	8 kV air discharge 4 kV contact discharge	IEC 61000-4-2

Apply 20 discharges (10 with positive and 10 with negative polarity) to each selected discharging point. Tests with other (lower) voltages than those given in Table 1 are not required.

**5.2 Fast transients**

Fast transient tests are carried out according to basic standard IEC 61000-4-4, for 2 min with a positive polarity and for 2 min with a negative polarity, according to the following Tables 2, 3 and 4.

**Table 2 – Ports for signal lines and control lines**

Environmental phenomenon	Test specifications	Test set-up
Fast transients common mode	0,5 kV (peak) 5/50 ns $T_r/T_d$ 5 kHz repetition frequency	IEC 61000-4-4
Applicable only to ports interfacing with cables whose total length can exceed 3 m according to the manufacturer's functional specification		

**Table 3 – Input and output d.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
Fast transients common mode	0,5 kV (peak) 5/50 ns $T_r/T_d$ 5 kHz repetition frequency	IEC 61000-4-4
Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging. Apparatus with a d.c. power input port intended for use with an a.c. – d.c. power adaptor shall be tested on the a.c. power input of the a.c.- d.c. power adaptor specified by the manufacturer or, where none is so specified, using a typical a.c. – d.c. power adaptor. For d.c. input and output ports intended to be connected permanently, the test is only applicable to cables longer than 3 m.		

A coupling/decoupling network shall be applied for testing d.c. power ports.

**Table 4 – Input and output a.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
Fast transients common mode	1 kV (peak) 5/50 ns $T_r/T_d$ 5 kHz repetition frequency	IEC 61000-4-4
For extra low voltage a.c. ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.		

A coupling/decoupling network shall be used for testing a.c. power ports.

### 5.3 Injected currents, 0,15 MHz to 230 MHz

Injected current tests are carried out according to the basic standard IEC 61000-4-6, and according to the following Tables 5, 6 and 7.

For large EUT having only one mains cable and no other cable leaving the EUT and where the mains cable leaves the EUT at a height of more than 1 m from the floor the following test set-up shall be used:

- the mains cable is routed along the enclosure of the EUT straight down to 3,0 cm to 5,0 cm above the ground plane and then horizontally to the CDN or clamp;
- the CDN or clamp shall be placed at a distance not more than 30 cm from the boundary of the EUT. A distance of 20 cm is recommended;
- see Figure 2 for an example.

NOTE 1 Typical household appliance for application of this paragraph on large EUT is a refrigerator.

Test conditions and testing arrangements, especially for measurements from 80 MHz to 230 MHz, shall be clearly specified in the test report.

NOTE 2 Current injection up to 230 MHz is applied, independent of the dimensions of the equipment under test (EUT).

The unmodulated carrier of the test signal is adjusted to the indicated test value. To perform the test, the carrier is in addition modulated as specified.

**Table 5 – Ports for signal lines and control lines**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 1 V (r.m.s.) (unmodulated)  150 Ω source impedance	IEC 61000-4-6
Applicable only to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.		

**Table 6 – Input and output d.c. power ports**

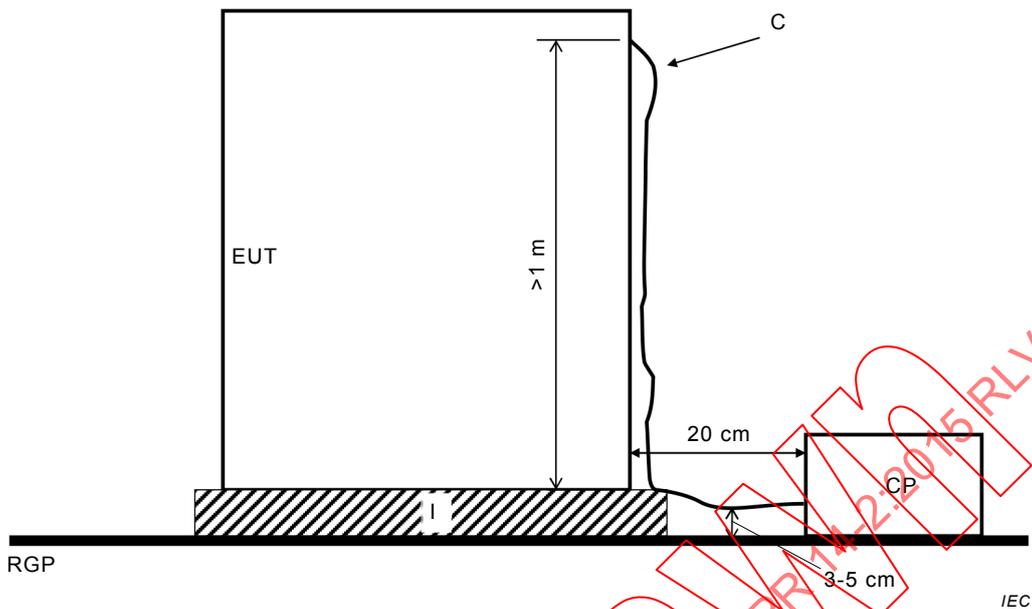
Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 %AM	0,15 MHz to 230 MHz 1 V (r.m.s.) (unmodulated)  150 Ω source impedance	IEC 61000-4-6
Not applicable to battery operated appliances that cannot be connected to the mains while in use.		
Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging. Apparatus with a d.c. power input port intended for use with an a.c. – d.c. power adaptor shall be tested on the a.c. power input of the a.c.- d.c. power adaptor specified by the manufacturer or, where none is so specified, using a typical a.c. – d.c. power adaptor. For d.c. input and output ports intended to be connected permanently, the test is only applicable to cables longer than 3 m.		

A coupling/decoupling network shall be applied for testing d.c. power ports

**Table 7 – Input and output a.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 3 V (r.m.s.) (unmodulated)  150 Ω source impedance	IEC 61000-4-6
For extra low voltage a.c ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.		

A coupling/decoupling network shall be applied for testing a.c. power ports.



RGP = Reference ground plane

I = Insulating support as required by IEC 61000-4-6

CP = CDN or clamp

EUT = Equipment under test

C = Cable (mains cable)

**Figure 2 – Example for a test set-up for large EUTs (e. g. refrigerators) where the cable leaves the EUT on a height of more than 1 m above the floor**

**5.4 Injected currents, 0,15 MHz to 80 MHz**

Injected current tests are carried out according to the basic standard IEC 61000-4-6, and according to the following Tables 8, 9 and 10.

Large EUT shall be measured in the same way as described in 5.3.

The unmodulated carrier of the test signal is adjusted to the indicated test value. To perform the test, the carrier is in addition modulated as specified.

**Table 8 – Ports for signal lines and control lines**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 1 V (r.m.s.) (unmodulated) 150 Ω source impedance	IEC 61000-4-6

Applicable only to ports interfacing with cables whose total length can exceed 3 m according to the manufacturer's functional specification.

**Table 9 – Input and output d.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 1 V (r.m.s.) (unmodulated)  150 Ω source impedance	IEC 61000-4-6
<p>Not applicable to battery operated appliances that cannot be connected to the mains while in use.</p> <p>Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging. Apparatus with a d.c. power input port intended for use with an a.c. – d.c. power adaptor shall be tested on the a.c. power input of the a.c.- d.c. power adaptor specified by the manufacturer or, where none is so specified, using a typical a.c. – d.c. power adaptor. For d.c. input and output power ports intended to be connected permanently, the test is not applicable provided the instructions require external cables not to be longer than 3 m.</p>		

A coupling/decoupling network shall be applied for testing d.c. power ports.

**Table 10 – Input and output a.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 3 V (r.m.s.) (unmodulated)  150 Ω source impedance	IEC 61000-4-6
<p>For extra low voltage a.c ports and output a.c. ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.</p>		

A coupling/decoupling network shall be applied for testing a.c. power ports.

### 5.5 Radio frequency electromagnetic fields, 80 MHz to 1 000 MHz

Radio frequency electromagnetic field tests are carried out according to basic standard IEC 61000-4-3 or IEC 61000-4-22, and according to Table 11.

The unmodulated carrier of the test signal is adjusted to the indicated test value. To perform the test, the carrier is in addition modulated as specified.

**Table 11 – Enclosure port**

Environmental phenomenon	Test specifications	Test set-up
Radio-frequency electromagnetic field, 1 kHz, 80% AM	80 MHz to 1 000 MHz 3 V/m (r.m.s.) (unmodulated)	IEC 61000-4-3 or IEC 61000-4-22

### 5.6 Surges

Surge immunity tests are carried out according to basic standard IEC 61000-4-5, and according to Table 12.

**Table 12 – Input a.c. power ports**

Environmental phenomenon	Test specifications	Test set-up
Surge	1,2/50 (8/20) $\mu$ s $T_r/T_d$ 2 kV line-to-earth with 12 $\Omega$ Impedance 1 kV line-to-line with 2 $\Omega$ Impedance	IEC 61000-4-5

Five positive and five negative pulses shall be applied as far as applicable, successively:

- between phase and phase: 1 kV;
- between phase and neutral: 1 kV;
- between phase and earth: 2 kV;
- and between neutral and earth: 2 kV.

The positive pulses are applied 90° relative to the phase angle of the a.c. line voltage to the equipment under test, and the negative pulses are applied 270° relative to the phase angle of the a.c. line voltage to the equipment under test. Tests with other (lower) voltages than those given in Table 12 are not required.

No line-to-earth surges are applied to products which do not have provision for connection to earth.

NOTE The shield of a cable does not provide a dedicated connection to earth.

## 5.7 Voltage dips

Tests concerning voltage dips are carried out according to basic standard IEC 61000-4-11, and according to the following Table 13. The voltage interruption tests according to IEC 61000-4-11 are not performed.

**Table 13 – Input a.c. power ports**

Environmental phenomena	Test level in % $U_T$	Durations for voltage dips		Test set-up
		50 Hz	60 Hz	
Voltage dips in % $U_T$	100	0	0,5 cycle	IEC 61000-4-11 Voltage change shall occur at zero crossing
	60	40	10 cycles	
	30	70	25 cycles	

$U_T$  is the rated voltage of the equipment under test.

## 6 Performance criteria

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on the following criteria.

Performance criterion A: The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product

description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however no change of actual operating state or stored data is allowed to persist after the test. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

The selection, the specification of functions, and the permissible degradation is left to the responsibility of the manufacturer.

Annex A serves as a guide to formulate the permissible degradation of the equipment under test (EUT) caused by electromagnetic phenomena.

## **7 Applicability of immunity tests**

### **7.1 General**

**7.1.1** The immunity tests for apparatus covered by this standard are given in Clause 5 on a port by port basis. The tests are specified for each port concerned.

Tests are applied to the relevant ports of the apparatus according to Tables 1 to 13 (if applicable).

Tests shall be carried out on those ports that can be subjected to disturbances during normal operation of the equipment.

The tests shall be carried out as single tests in sequence. Any testing sequence is acceptable.

The description of the test, the test generator, the test methods, and the test set-up are given in basic standards which are referred to in the tables. The content of these basic standards are not repeated here; however, modifications or additional information needed for the practical application of the tests are given in this standard.

**7.1.2** It may be determined from consideration of the electrical characteristics and usage of a particular apparatus that some of the tests are inappropriate, and therefore unnecessary. In such cases it is required that the decision not to test be recorded in the test report.

**7.1.3** Regardless of their category, experimental kits intended for education and play are deemed to fulfill the immunity requirements, and are not tested.

### **7.2 Application of tests for the different categories of apparatus**

#### **7.2.1 Category I**

Category I apparatus is deemed to fulfill the relevant immunity requirements without testing.

### 7.2.2 Category II

Category II apparatus shall fulfill the following requirements:

- electrostatic discharge with performance criterion B (5.1);
- fast transients with performance criterion B (5.2);
- injected currents up to 230 MHz with performance criterion A (5.3);
- surges with performance criterion B (5.6);
- voltage dips with performance criterion C (5.7).

### 7.2.3 Category III

Category III apparatus shall fulfill the following requirements:

- electrostatic discharge with performance criterion B (5.1);  
A performance criterion C could be applied to toys not using score or data entered by the user. Examples are musical soft toys, sounding toys, etc.
- radio frequency electromagnetic fields with performance criterion A (5.5).  
For toys, the radio frequency electromagnetic fields test is only applicable for ride on toys.

### 7.2.4 Category IV

Category IV apparatus shall fulfill the following requirements (if applicable):

- electrostatic discharge with performance criterion B (5.1);
- fast transients with performance criterion B (5.2);
- injected currents up to 80 MHz with performance criterion A (5.4);
- radiofrequency electromagnetic fields with performance criterion A (5.5);
- surges with performance criterion B (5.6);
- voltage dips with performance criterion C (5.7).

## 8 Conditions during testing

8.1 Unless otherwise specified, the tests shall be made while the apparatus is operated as intended by the manufacturer, in the most susceptible operating mode consistent with normal use.

Tests shall be carried out under the conditions specified in CISPR 14-1 where applicable. The tests shall be carried out within the specified or typical environmental range for the apparatus, and at its rated supply voltage and frequency. If the apparatus can be set at different levels (for example speed, temperature), a setting below maximum shall be used, preferably at approximately 50 % level.

Appliances with a microwave oven function shall be tested, loaded with  $1 \text{ l} \pm 0,5 \text{ l}$  tapwater; long lasting tests may be interrupted to refill the load.

During the tests, toys are operated under normal operation. Transformer toys are tested with the transformer supplied with the toy. If the toy is supplied without a transformer, it shall be tested with an appropriate transformer.

In case of associated devices (for example, video toy cartridges) sold separately to be used with different appliances, the associated device shall be tested with at least one appropriate representative hosting appliance, selected by the manufacturer of the associated device, in order to check conformity of the associated device for all appliances with which it is intended

to operate. The hosting appliance shall be representative of series produced appliances and shall be typical.

However, the manufacturer's specification of test configuration, conditions and performances takes precedence.

**8.2** Where applicable, the configuration of the EUT shall be varied to achieve maximum susceptibility. If the apparatus can be connected to auxiliary apparatus, then the apparatus shall be tested while connected to the minimum configuration of auxiliary apparatus necessary to exercise all existing ports.

**8.3** The tests concerning ESD, transients, surges and voltage dips are carried out during each mode of operation of the EUT (or phase as part of the mode of operation) selected for the test.

**8.4** The tests concerning electromagnetic fields and current injection are carried out during the scan time while, at random, the selected modes of the EUT are set into operation.

**8.5** For manual selection of the mode of operation, the test may be interrupted, or care should be taken that the operator does not influence the test results.

**8.6** In case of an EUT with an automatic cycling program, the scan time shall be started at random. Where a single cycle lasts longer than the scan time, the test shall be repeated until the cycle is finished.

**8.7** The configuration and mode of operation during the tests shall be precisely noted in the test report.

NOTE Care is taken that changes in the environment, such as power supply, do not influence the test results.

## **9 Assessment of conformity**

### **9.1 Single product evaluation**

Apparatus manufactured in series production shall be verified by performing a type-test on one representative model, or on one series-produced apparatus.

The manufacturer's or supplier's quality system shall ensure that the tested model or apparatus is representative of the series-produced apparatus concerned.

For apparatus not produced in series, the test procedures shall ensure that each individual apparatus meets the requirements when tested by the methods specified.

Results obtained for an apparatus tested when installed in its place of use (and not on a test site) relates to that installation only, and shall not be considered representative for any other installation.

### **9.2 Statistical evaluation**

The significance of the requirements for compliance of the apparatus with the standard shall be that, on a statistical basis, at least 80 % of the series produced apparatus complies with the requirements with at least 80 % confidence.

When type-testing is carried out on a single piece of apparatus, compliance with the requirements on the 80 %/80 % basis is not guaranteed.

Compliance is judged from the condition that the number of apparatus which do not fulfil the requirements may not exceed  $c$  in a sample of size  $n$ .

$n$	7	14	20	26	32
$c$	0	1	2	3	4

If the tests on the sample result in non-compliance with the requirements, then a second sample may be tested, and the results combined with those from the first sample. Compliance is then checked for the combined sample.

NOTE For general information on the statistical consideration in the determination of EMC compliance, see CISPR TR 16-4-3.

### 9.3 In case of dispute

In case of dispute, assessment of conformity with this standard shall be based on the statistical method of evaluation.

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**Annex A**  
(informative)

**Guidance for permissible degradation**

Table A.1 serves as a guide to formulate the permissible degradation of the equipment under test (EUT) caused by electromagnetic phenomena.

Not all functions of the apparatus need to be tested. The selection of functions to be monitored during the tests and the permissible degradation is the responsibility of the manufacturer.

**Table A.1 – Examples of degradations**

Functions (non-exhaustive)	Criteria			
	A	B <sup>b</sup>	C1 <sup>c</sup>	C2 <sup>c</sup>
Motor speed	10 % <sup>a</sup>	–	+	–
Torque	10 % <sup>a</sup>	–	+	–
Movement	10 % <sup>a</sup>	–	+	–
Power (consumption, input)	10 % <sup>a</sup>	–	+	–
Switching (change of state)	–	–	+	–
Heating	10 % <sup>a</sup>	–	+	–
Timing (programme, delay, duty cycle)	10 % <sup>a</sup>	–	+	–
Stand-by	–	–	d	–
Data storage	–	–	e	e
Sensor functions (signal transmission)	f	–	g	–
Indicators (visual and acoustic)	f	–	g	–
Audio function	f	–	g	–
Illumination	f	–	g	–
– No change allowed. + Change allowed. <sup>a</sup> Values are exclusive of the measurement accuracy. <sup>b</sup> For criterion B, measurement or verification is performed during the stable operations of the Equipment Under Test before and after the application of the specified phenomenon. <sup>c</sup> For criterion C, distinction is made between C1: before resetting and C2: after resetting. <sup>d</sup> Switching-off is allowed, switching-on is not allowed. <sup>e</sup> Loss or change of data is allowed. <sup>f</sup> Lower performance as specified by the manufacturer is allowed, but no loss of correct function. <sup>g</sup> Loss of correct functions allowed.				

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IEC 61558-2-7, *Safety of power transformers, power supplies, reactors and similar products – Part 2-7: Particular requirements and tests for transformers and power supplies for toys*

CISPR TR 16-4-3, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-3: Uncertainties, statistics and limit modelling – Statistical considerations in the determination of EMC compliance of mass-produced products (only available in English)*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE  
COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

**COMPATIBILITÉ ÉLECTROMAGNÉTIQUE –  
EXIGENCES RELATIVES AUX APPAREILS ÉLECTRODOMESTIQUES,  
OUTILLAGES ÉLECTRIQUES ET APPAREILS ANALOGUES –**

**Partie 2: Immunité – Norme de famille de produits**

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La Norme internationale CISPR 14-2 a été établie par le sous-comité F du CISPR: Perturbations relatives aux appareils domestiques, aux outils, aux appareils d'éclairage et aux appareils analogues.

Cette deuxième édition annule et remplace la première édition parue en 1997, Amendement 1 (2001) et Amendement 2 (2008). Cette édition constitue une révision technique.

La présente édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) 5.1: Pour les essais électrostatiques réalisés sur les contacts des prises, la note ("La décharge au contact, de 4 kV, doit être appliquée aux parties conductrices accessibles.

Les contacts métalliques, par exemple dans les compartiments de piles ou batteries ou dans les socles de prises de courant ne sont pas concernés par cette exigence.") indiquant qu'aucun essai n'est nécessaire a été retirée. L'IEC 61000-4-2 contient une description détaillée de la manière de traiter les décharges électrostatiques sur les contacts et les autres surfaces. De même, les décharges sur le PCH et le PVC sont exigées par la norme de base IEC 61000-4-2.

- b) 5.3 et 5.4: Les tableaux relatifs aux essais réalisés au niveau des accès d'alimentation continue selon l'IEC 61000-4-6 sont alignés sur les normes génériques et sont identiques pour 5.3 et 5.4.
- c) 5.3 et 5.4: Pour l'EUT ne contenant qu'un câble de réseau, le montage d'essai présenté à la Figure 2 doit être utilisé. Le montage décrit à l'Annexe F de l'IEC 61000-4-6:2013 ne doit pas être utilisé.
- d) 5.5: L'IEC 61000-4-22 a été introduite comme une autre méthode d'essai d'immunité aux rayonnements.
- e) 5.6: Aucune onde de choc entre ligne et terre n'est appliquée aux produits qui n'ont pas de disposition pour le raccordement à la terre.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
CISPR/F/652/FDIS	CISPR/F/657/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série CISPR 14, publiées sous le titre général *Compatibilité électromagnétique – Exigences pour les appareils électrodomestiques, outillages électriques et appareils analogues*, peut être consultée sur le site web de l'IEC.

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 l'IEC sous "<http://webstore.iec.ch>" dans les données relatives à la publication recherchée. A cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

## INTRODUCTION

La présente norme est destinée à établir des exigences uniformes concernant l'immunité aux perturbations électromagnétiques des appareils mentionnés dans le domaine d'application, à définir des spécifications d'essais pour cette immunité, à faire référence aux normes de base pour les méthodes d'essais et à normaliser les conditions de fonctionnement, les critères d'aptitude à la fonction et l'interprétation des résultats.

*Mots clés:* Immunité, appareils électrodomestiques, appareils électriques, compatibilité électromagnétique.

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# COMPATIBILITÉ ÉLECTROMAGNÉTIQUE – EXIGENCES RELATIVES AUX APPAREILS ÉLECTRODOMESTIQUES, OUTILLAGES ÉLECTRIQUES ET APPAREILS ANALOGUES –

## Partie 2: Immunité – Norme de famille de produits

### 1 Domaine d'application

1.1 La présente partie de la CISPR 14 traite de l'immunité aux perturbations électromagnétiques des appareils électrodomestiques et analogues qui utilisent de l'électricité, ainsi que des jouets électriques et des outils électriques dont la tension assignée ne dépasse pas 250 V pour les appareils monophasés raccordés entre phase et neutre, et 480 V pour les autres appareils.

Ces appareils peuvent comporter des moteurs et/ou des éléments chauffants. Ils peuvent comporter des circuits électriques ou électroniques et être alimentés par le réseau, par transformateur, par des piles ou batteries ou par toute autre source électrique.

Les appareils qui ne sont pas destinés à un usage domestique, mais peuvent néanmoins exiger un certain niveau d'immunité, tels que ceux destinés à être utilisés par des usagers non avertis dans les magasins, l'industrie légère et les fermes, entrent dans le domaine d'application de la présente norme dans la mesure où ils sont couverts par la CISPR 14-1. Entrent également dans le domaine d'application de la présente Norme:

- les fours à micro-ondes à usage domestique ou à usage des collectivités;
- les foyers de cuisson et fours chauffés par des fréquences radioélectriques;
- les appareils de cuisson à induction (comportant un ou plusieurs foyers);
- les appareils à usage individuel avec dispositif à rayonnement dont la gamme s'étend des ultraviolets aux infrarouges (cela comprend la lumière visible);
- les alimentations et chargeurs de batterie dotés d'un appareil ou prévus pour un appareil appartenant au domaine d'application de la présente Norme.

1.2 La présente norme ne s'applique pas:

- aux appareils d'éclairage;
- aux appareils conçus exclusivement pour l'industrie lourde;
- aux appareils destinés à faire partie d'une installation électrique fixe de bâtiments (par exemple fusibles, disjoncteurs, câbles et interrupteurs);
- aux appareils destinés à être utilisés dans des emplacements présentant des conditions électromagnétiques particulières, telles que la présence de champs électromagnétiques élevés (par exemple, à proximité d'une station de radiodiffusion) ou à des endroits où des pointes se produisent sur le réseau de puissance (par exemple, dans une station de générateur d'énergie électrique);
- aux récepteurs de radio et de télévision, aux appareils audio et vidéo et aux instruments de musique électroniques autres que les jouets;
- aux appareils médicaux électriques;
- aux ordinateurs personnels et matériels analogues autres que les jouets;
- aux émetteurs radioélectriques;
- aux appareils destinés à être utilisés exclusivement à bord de véhicules;
- aux systèmes de surveillance de nourrissons.

**1.3** La présente norme couvre les exigences d'immunité dans la bande de fréquences de 0 Hz à 400 GHz.

**1.4** Les effets des phénomènes électromagnétiques liés à la sécurité des appareils sont exclus de la présente norme et sont couverts par d'autres normes (la série IEC 60335, par exemple).

Le fonctionnement anormal des appareils (dû, par exemple, à des défauts simulés dans les circuits électriques à des fins d'essais) n'est pas pris en compte.

NOTE 1 L'attention est attirée sur le fait que des exigences supplémentaires peuvent être nécessaires pour les appareils destinés à être utilisés à bord de navires ou d'aéronefs.

**1.5** L'objet de cette norme est de définir les exigences pour les essais d'immunité aux perturbations continues et transitoires, conduites et rayonnées y compris aux décharges électrostatiques, pour les appareils définis dans le domaine d'application.

Ces exigences représentent les exigences essentielles de compatibilité électromagnétique concernant l'immunité.

NOTE 2 Dans certaines circonstances particulières, les niveaux de perturbation peuvent dépasser les niveaux d'essai spécifiés dans la présente Norme. Dans ce cas, des moyens spéciaux d'atténuation peuvent devoir être utilisés.

## 2 Références normatives

Les documents suivants sont cités en référence de manière normative, en intégralité ou en partie, dans le présent document et sont indispensables pour son application. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60050 (toutes les parties), *Vocabulaire Électrotechnique International (VEI)* (disponible à l'adresse [www.electropedia.org](http://www.electropedia.org))

IEC 61000-4-2:2008, *Compatibilité électromagnétique (CEM) – Partie 4-2: Techniques d'essai et de mesure – Essais d'immunité aux décharges électrostatiques*

IEC 61000-4-3:2006, *Compatibilité électromagnétique (CEM) – Partie 4-3: Techniques d'essai et de mesure – Essai d'immunité aux champs électromagnétiques rayonnés aux fréquences radioélectriques*

IEC 61000-4-3:2006/AMD1:2007

IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Compatibilité électromagnétique (CEM) – Partie 4-4: Techniques d'essai et de mesure – Essais d'immunité aux transitoires électriques rapides en salves*

IEC 61000-4-5:2014, *Compatibilité électromagnétique (CEM) – Partie 4-5: Techniques d'essai et de mesure – Essai d'immunité aux ondes de choc*

IEC 61000-4-6:2013, *Compatibilité électromagnétique (CEM) – Partie 4-6: Techniques d'essai et de mesure – Immunité aux perturbations conduites, induites par les champs radioélectriques*

IEC 61000-4-11:2004, *Compatibilité électromagnétique (CEM) – Partie 4-11: Techniques d'essai et de mesure – Essais d'immunité aux creux de tension, coupures brèves et variations de tension*

IEC 61000-4-22:2010, *Compatibilité électromagnétique (CEM) – Partie 4-22: Techniques d'essai et de mesure – Mesures de l'immunité et des émissions rayonnées dans des enceintes complètement anéchoïques (FAR)*

CISPR 14-1:2005, *Compatibilité électromagnétique – Exigences pour les appareils électrodomestiques, outillages électriques et appareils analogues – Partie 1: Émission*

CISPR 14-1:2005/AMD1:2008

CISPR 14-1:2005/AMD2:2011

### 3 Termes, définitions et abréviations

#### 3.1 Termes et définitions

Pour les besoins du présent document, les termes et définitions de l'IEC 60050-161 concernant la compatibilité électromagnétique (CEM) et les phénomènes correspondants, ainsi que les termes et définitions suivants s'appliquent.

##### 3.1.1

##### **compatibilité électromagnétique**

aptitude d'un dispositif, d'un appareil ou d'un système à fonctionner dans son environnement électromagnétique, de façon satisfaisante et sans produire lui-même des perturbations électromagnétiques intolérables pour ce qui se trouve dans cet environnement

##### 3.1.2

##### **accès**

interface particulière de l'appareil spécifiée avec l'environnement électromagnétique extérieur

Note 1 à l'article: Voir la Figure 1.

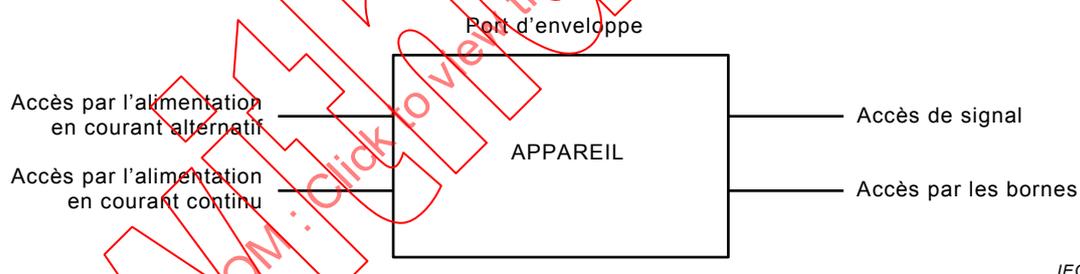


Figure 1 – Exemples d'accès

##### 3.1.3

##### **port d'enveloppe**

frontière physique de l'appareil à travers laquelle les champs électromagnétiques peuvent rayonner ou que ceux-ci peuvent frapper

##### 3.1.4

##### **production en série**

processus par lequel les appareils identiques sont fabriqués en continu ou en lots (constitués de produits identiques)

##### 3.1.5

##### **très basse tension de sécurité**

tension qui ne dépasse pas 50 V en courant alternatif ou 120 V courant continu lissé entre conducteurs, ou entre la terre et un conducteur quelconque, dans un circuit isolé du réseau d'alimentation par des moyens tels qu'un transformateur de sécurité

### 3.1.6

#### **jouet**

produit conçu ou manifestement destiné à être utilisé pour jouer par des enfants de moins de 14 ans

Note 1 à l'article: Les jouets électriques peuvent comporter des moteurs, des éléments thermiques, des circuits électroniques ou des combinaisons de ces éléments.

Note 2 à l'article: La tension d'alimentation des jouets, qui ne doit pas dépasser 24 V en courant alternatif (efficace) ou courant continu lissé, peut être obtenue par des piles, des accumulateurs, un adaptateur ou un transformateur de sécurité relié à un réseau d'alimentation.

Note 3 à l'article: Les transformateurs, les convertisseurs et les chargeurs de batteries sont considérés comme ne faisant pas partie des jouets (voir l'IEC 61558-2-7).

### 3.1.7

#### **jouet électrique**

jouet ayant au moins une fonction qui dépend de l'électricité

### 3.1.8

#### **jouet à pile ou accumulateur**

jouet qui contient ou utilise une ou plusieurs piles ou un ou plusieurs accumulateurs comme seule source d'énergie électrique

### 3.1.9

#### **jouet à transformateur**

jouet raccordé au réseau d'alimentation par l'intermédiaire d'un transformateur pour jouet et dont le réseau d'alimentation est la seule source d'énergie électrique

### 3.1.10

#### **jouet à double alimentation**

jouet qui peut être mis en fonctionnement, simultanément ou alternativement, comme un jouet à pile ou accumulateur ou comme un jouet à transformateur

### 3.1.11

#### **transformateur de sécurité**

transformateur dont l'enroulement primaire est séparé électriquement des enroulements secondaires par une isolation au moins équivalente à une double isolation ou à une isolation renforcée, et qui est destiné à alimenter un appareil ou un circuit électrique à une très basse tension de sécurité

### 3.1.12

#### **transformateur de sécurité pour jouet**

transformateur de sécurité spécialement destiné à alimenter des jouets fonctionnant à très basse tension de sécurité ne dépassant pas 24 V

Note 1 à l'article: Le transformateur peut délivrer du courant alternatif et/ou du courant continu.

### 3.1.13

#### **coffret de construction**

ensemble d'éléments électriques, électroniques ou mécaniques, destinés à être assemblés pour la construction de jouets différents

### 3.1.14

#### **coffret d'expérience électrique**

ensemble de composants électriques ou électroniques destinés à être assemblés de diverses façons

Note 1 à l'article: Le but principal d'un coffret d'expérience électrique est de faciliter l'acquisition de connaissances par l'expérimentation et la recherche. Il n'est pas destiné à la création d'un jouet ou d'un équipement pour une utilisation courante.

**3.1.15****jouet fonctionnel**

jouet dont la tension assignée n'excède pas 24 V et qui est la reproduction d'un appareil ou d'une installation utilisée par les adultes

Note 1 à l'article: Un produit dont la tension assignée excède 24 V, destiné à être utilisé par des enfants sous la surveillance directe d'un adulte, qui est la reproduction d'un appareil ou d'une installation et qui est utilisé de la même façon est appelé produit fonctionnel.

**3.1.16****jouet vidéo**

jouet constitué d'un écran et de moyens d'action avec lesquels l'enfant peut jouer et agir sur l'image présente à l'écran

Note 1 à l'article: Tous les éléments nécessaires à l'utilisation d'un jouet vidéo (le boîtier de commande, la poignée, le clavier, le moniteur et les connexions, par exemple) sont considérés comme faisant partie du jouet.

**3.1.17****conditions de fonctionnement normales des jouets**

conditions dans lesquelles le jouet, alimenté avec l'alimentation recommandée, est utilisé pour jouer comme prévu ou d'une façon prévisible, en gardant à l'esprit le comportement normal des enfants

**3.1.18****fréquence d'horloge**

fréquence fondamentale de tout signal utilisé dans le dispositif, à l'exclusion de ceux utilisés uniquement à l'intérieur des circuits intégrés (CI)

Note 1 à l'article: Des hautes fréquences sont souvent générées à l'intérieur des circuits intégrés (CI) par des circuits comportant une boucle à verrouillage de phase (PLL, phase-locked-loop) à partir de fréquences d'oscillateur d'horloge plus basses hors du CI.

**3.2 Abréviations**

DES	Décharge Electrostatique
RCD	Réseau de Couplage et Découplage
EUT	Equipment Under Test (Équipement en essai)
UV	Ultraviolet (lumière)
IR	Infrarouge (lumière)
RF	Radiofréquence

**4 Classification des appareils**

**4.1** Les appareils couverts par la présente norme sont classés en différentes catégories. Chaque catégorie fait l'objet d'exigences spécifiques.

**4.2** Catégorie I: appareils ne comportant aucun circuit électronique de commande.

Les appareils dépourvus de circuits électroniques de commande sont considérés comme faisant partie de la catégorie I.

Les circuits électriques comportant des composants passifs (des condensateurs ou des inductances de suppression de perturbations radioélectriques, des transformateurs raccordés