

BRITISH STANDARD

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+A2:2008
CISPR 14-2:
1997

*Incorporating
corrigenda December 1997
and July 2007*

Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus —

Part 2: Immunity —
Product family standard

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BSi
British Standards

National foreword

This British Standard is the UK implementation of EN 55014-2:1997+A2:2008, incorporating corrigendum December 1997. It supersedes BS EN 55014-2:1997 +A1:2001 which is withdrawn. It is identical with CISPR 14-2:1997, incorporating amendments 1:2001 and 2:2008.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\text{\textcircled{A}_1}$ $\text{\textcircled{A}_2}$. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by $\text{\textcircled{A}_1}$ $\text{\textcircled{A}_1}$.

The UK participation in its preparation was entrusted by Technical Committee GEL/210, Electromagnetic compatibility, to Subcommittee GEL/210/6, Equipment, lighting fittings and domestic appliances.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

The text of CENELEC Interpretation Sheet 1 (April 2007) in relation to Clause 8, Conditions during testing, is included in National Annex NA.

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

Compliance with a British Standard cannot confer immunity from legal obligations.

Amendments issued since publication

Amd. No.	Date	Comments
9962	December 1998	Implementation of CENELEC corrigendum December 1997
13662	18 September 2002	See national foreword
17197	31 July 2007	Addition of National Annex NA to include CENELEC Interpretation Sheet 1, April 2007
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English version

**Electromagnetic compatibility -
Requirements for household appliances,
electric tools and similar apparatus -
Part 2: Immunity -
Product family standard
(CISPR 14-2:1997)**

Compatibilité électromagnétique -
Exigences pour les appareils
électrodomestiques, outillages électriques
et appareils analogues -
Partie 2: Immunité -
Norme de famille de produits
(CISPR 14-2:1997)

Elektromagnetische Verträglichkeit -
Anforderungen an Haushaltgeräte,
Elektrowerkzeuge und ähnliche
Elektrogeräte -
Teil 2: Störfestigkeit -
Produktfamilienorm
(CISPR 14-2:1997)

This European Standard was approved by CENELEC on 1996-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document CISPR/F/201/FDIS, future edition 1 of CISPR 14-2, prepared by CISPR SC F, Interference relating to household appliances, tools, lighting equipment and similar apparatus, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 55014-2 on 1996-10-01.

This European Standard supersedes EN 55104:1995.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-08-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-01-01

Annexes designated “normative” are part of the body of the standard.

In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard CISPR 14-2:1997 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document CISPR/F/333/FDIS, future amendment 1 to CISPR 14-2:1997, prepared by CISPR SC F, Interference relating to household appliances, tools, lighting equipment and similar apparatus, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 55014-2:1997 on 2001-12-01.

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- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-09-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2004-12-01

Annexes designated “normative” are part of the body of the standard.

In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 1:2001 to the International Standard CISPR 14-2:1997 was approved by CENELEC as an amendment to the European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61558-2-7 NOTE Harmonized as EN 61558-2-7:1997 (modified).

Foreword to amendment A2

The text of document CISPR/F/454/CDV, future amendment 2 to CISPR 14-2:1997, prepared by CISPR SC F, Interference relating to household appliances, tools, lighting equipment and similar apparatus, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 55014-2:1997 on 2008 09 01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2009 06 01
- latest date by which the national standards conflicting with the amendment have to be withdrawn or by endorsement (dow) 2011 09 01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 2:2008 to the International Standard CISPR 14-2:1997 was approved by CENELEC as an amendment to the European Standard without any modification.

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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.

1 Scope

1.1 This standard 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, $\overline{A_1}$ by transformer $\overline{A_1}$, 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 $\overline{A_2}$ CISPR 14-1 $\overline{A_2}$, and in addition:

- 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;

$\overline{A_1}$ — appliances for personal care equipped with radiators in the range from UV to IR, inclusive (this includes visible light). $\overline{A_1}$

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 e.m. 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 $\overline{A_1}$ other than toys $\overline{A_1}$;
- medical electrical appliances;
- personal computers and similar equipment $\overline{A_1}$ other than toys $\overline{A_1}$;
- radio transmitters;
- apparatus designed to be used exclusively in vehicles.

$\overline{A_1}$ — babies surveillance systems. $\overline{A_1}$

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 IEC 335.

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

NOTE Attention is drawn to the fact that additional requirements may 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 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 measure may have to be employed.

2 Normative references

A2 The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For updated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test*

Amendment 1:1998

Amendment 2:2000¹

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test*

Amendment 1:2007²

IEC 61000-4-4:2004, *Electromagnetic compatibility (EMC) — Part 4-4: Testing and measurement techniques — Electrical fast transient/burst immunity test*

IEC 61000-4-5:2005, *Electromagnetic compatibility (EMC) — Part 4-5: Testing and measurement techniques — Surge immunity test*

IEC 61000-4-6:2003, *Electromagnetic compatibility (EMC) — Part 4-6: Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields*

Amendment 1:2004

Amendment 2:2006³

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

A2 CISPR 14-1:2005, *Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 1: Emission* **A1** **A2**

A2 3 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. **A2**

3.1

electromagnetic compatibility

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

A2

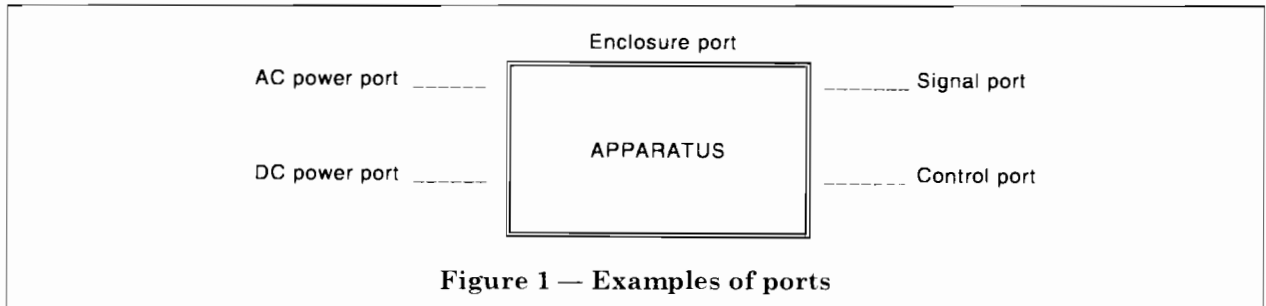
¹ There exists a consolidated edition 1.2 (2001) that includes edition 1 and its Amendments 1 and 2.

² There exists a consolidated edition 3.1 (2008) that includes edition 3 and its Amendment 1.

³ There exists a consolidated edition 2.2 (2006) that includes edition 2 and its Amendments 1 and 2. **A2**

3.2**port**

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

**3.3****enclosure port**

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

3.4**series production**

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

3.5**safety extra-low voltage**

a 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

3.6**toy**

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

Toys may incorporate motors, heating elements, electronic circuits and their combination.

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 Transformers, converters and chargers for toys are considered not to be part of the toy (see EN 60598-2-7).

3.7**electric toy**

toy having at least one function dependent on electricity

3.8**battery toy**

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

3.9**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

3.10**dual supply toy**

toy which can be operated simultaneously or alternatively as a battery toy and a transformer toy **(A1)**

A1 3.11

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

3.12

safety transformer for toys

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

NOTE Either a.c. or d.c. or both may be delivered from the transformer unit.

3.13

constructional kit

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

3.14

experimental kit

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

NOTE 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.

3.15

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 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.

3.16

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 All parts necessary for the operation of the video toy, such as control box, joy stick, keyboard, monitor and connections, are considered to be part of the toy.

3.17

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 **A1**

A2 3.18

clock frequency

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

NOTE High frequencies are often generated inside of integrated circuits, (e.g. by phase-locked-loop (PLL) circuits from lower clock oscillator frequencies outside the IC. **A2**

4 Classification of apparatus

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

4.1 Category I: apparatus containing no electronic control circuitry **A1 Text deleted **A1**.**

A1 Examples: motor operated appliances, lighting toys, track sets without electronic control units, tools, heating appliances, UV and IR radiators and apparatus containing components such as electromechanical switches and thermostats. **A1**

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

A1 Text deleted. **A1**

4.2 Category II: A_1 transformer toys, dual supply toys, A_1 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.

A_2

A_1 NOTE For toys, examples include educational computers, organs, track sets with electronic control units, A_1 A_2

4.3 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.

This category includes apparatus provided with rechargeable batteries which can be charged 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.

A_1 NOTE For toys, examples include musical soft toys, cord-controlled toys and motor-operated electronic toys, A_1

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

5 Tests

5.1 Electrostatic discharge

Electrostatic discharge tests are carried out according to basic standard A_2 IEC 61000-4-2, with test signals A_2 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	A_2 IEC 61000-4-2 A_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. 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 A_2 IEC 61000-4-4 A_2 for 2 minutes with a positive polarity and for 2 minutes with a negative polarity, according to the following Table 2, Table 3 and Table 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	A_2 IEC 61000-4-4 A_2
NOTE Applicable only to ports interfacing with cables whose total length may 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	A_2 IEC 61000-4-4 A_2
NOTE Not applicable to battery operated appliances that cannot be connected to the mains while in use.		

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	A_2 IEC 61000-4-4 A_3
A_1 For extra low voltage 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_1		

A coupling/decoupling network shall be applied 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 A_2 IEC 61000-4-6 A_3 , and according to the following Table 5, Table 6 and Table 7.

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

NOTE 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	A_2 IEC 61000-4-6 A_3
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	A_2 IEC 61000-4-6 A_3
NOTE 1 Not applicable to battery operated appliances that cannot be connected to the mains while in use.		
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.		

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	A_2 IEC 61000-4-6 A_3
A_1 For extra low voltage 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_1		

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

5.4 Injected currents, 0,15 MHz to 80 MHz

Injected current tests are carried out according to the basic standard A_2 IEC 61000-4-6 A_3 , and according to the following Table 8, Table 9 and Table 10.

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	A_2 IEC 61000-4-6 A_2
NOTE Applicable only to ports interfacing with cables whose total length may 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	A_2 IEC 61000-4-6 A_2
NOTE Not applicable to battery operated appliances that cannot be connected to the mains while in use.		

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	A_2 IEC 61000-4-6 A_2
A_2 For extra low voltage 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_1		

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 A_2 IEC 61000-4-3 A_2 , 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)	A_2 IEC 61000-4-3 A_2

5.6 Surges

Surge immunity tests are carried out according to basic standard A_2 IEC 61000-4-5 A_3 , 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) T_r/T_d μs A_2 2 kV Line-to-Earth with 12 Ω Impedance 1 kV Line-to-Earth with 2 Ω Impedance	IEC 61000-4-5 A_3

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.

Tests with other (lower) voltages than those given in Table 12 are not required.

A_2 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. A_3

5.7 Voltage dips and interruptions

Tests concerning voltage dips and interruptions are carried out according to basic standard A_2 IEC 61000-4-11 A_3 , and according to the following Table 13.

A_2 **Table 13 — Input a.c. power ports**

Environmental phenomena		Test level in % U_T			
			50 Hz	60 Hz	
Voltage dips in % U_T	100	0	0,5 cycle	0,5 cycle	IEC 61000-4-11 Voltage change shall occur at zero crossing
	60	40	10 cycles	12 cycles	
	30	70	25 cycles	30 cycles	

U_T is the rated voltage of the equipment under test. A_3

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. 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.

Table 14 — Examples of degradations

Functions (non-exhaustive)	Criteria			
	A	B ²⁾	C1 ³⁾	C2 ³⁾
Motor speed	10 % ¹⁾	—	+	—
Torque	10 % ¹⁾	—	+	—
Movement	10 % ¹⁾	—	+	—
Power (consumption, input)	10 % ¹⁾	—	+	—
Switching (change of state)	—	—	+	—
Heating	10 % ¹⁾	—	+	—
Timing (programme, delay, duty cycle)	10 % ¹⁾	—	+	—
Stand-by	—	—	4)	—
Data storage	—	—	5)	5)
Sensor functions (signal transmission)	6)	—	7)	—
Indicators (visual and acoustic)	6)	—	7)	—
Audio function	6)	—	7)	—
Illumination	6)	—	7)	—

— No change allowed.
+ Change allowed.

¹⁾Values are exclusive of the measurement accuracy.
²⁾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.
³⁾For criterion C, distinction is made between
C1: before resetting and
C2: after resetting.
⁴⁾Switching-off is allowed, switching-on is not allowed.
⁵⁾Loss or change of data is allowed.
⁶⁾Lower performance as specified by the manufacturer is allowed, but no loss of correct function.
⁷⁾Loss of correct functions allowed.

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 Table 1 to Table 13.

Tests shall be carried out on those ports which are accessible during normal operation of the equipment.

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

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 A_1 Text deleted A_1 kits intended for education and play are deemed to fulfil 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 fulfil the relevant immunity requirements without testing.

7.2.2 Category II

Category II apparatus shall fulfil 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 fulfil the following requirements:

- electrostatic discharge with performance criterion B (5.1). A_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.

This test is only applicable to the ride on toys operating with electronic devices. A_1

7.2.4 Category IV

Category IV apparatus shall fulfil the following requirements:

- 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 EM 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

A_2 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. A_2

Tests shall be carried out under the conditions specified in CISPR 14 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 shall be tested, loaded with $1 \text{ l} \pm 0,5 \text{ l}$ tapwater; long lasting tests may be interrupted to refill the load.

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

A_1 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. A_1

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 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 e.m. fields and current injection are carried out during the scan time while, at random, the selected modes of the EUT are set into operation. A_2 text deleted A_2

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 programme, 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.

A_2 text deleted

8.7 A_2 The configuration and mode of operation during the tests shall be precisely noted in the test report.

NOTE Care should be 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.

A_2 NOTE For general information, on the statistical consideration in the determination EMC compliance, see CISPR/TR 16-4-3. A_2

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.

A_2 Clause 10, Product documentation, deleted A_2

Annex ZA
(normative)

**Normative references to international publications
with their corresponding European publications**

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050-161	- ¹⁾	International Electrotechnical Vocabulary (IEV) - Chapter 161: Electromagnetic compatibility	-	-
IEC 61000-4-2	1995	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	1995
A1	1998		A1	1998
A2	2000		A2	2001
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
A1	2007		A1	2008
IEC 61000-4-4	2004	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2004
IEC 61000-4-5	2005	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2006
IEC 61000-4-6	2003	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	2007
+ A1	2004		+ corr. August	2007
+ A2	2006			2007
IEC 61000-4-11	2004	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	2004
CISPR 14-1	2005	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission	EN 55014-1	2006 ¹⁾

¹⁾ Undated reference.

Ⓐ₁ Bibliography

IEC 61558-2-7, *Safety of power transformers, power supply units and similar — Part 2-7: Particular requirements for transformers for toys.*

Ⓐ₂ 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)* Ⓐ₁ Ⓐ₂

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National Annex NA (informative) to EN 55014-2:1997 Interpretation Sheet 1

Foreword

This Interpretation Sheet to the European Standard EN 55014-2:1997 was prepared by the Interpretation Panel of the Technical Committee CENELEC TC 210, Electromagnetic compatibility (EMC). The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC on 2005-07-16.

Clause 8 Conditions during testing

Subclause 8.4: "The tests concerning e.m. 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."

Question:

What are the five selected spot frequencies and what is a reasonable minimum amount of testing required to ensure that a sufficient level of immunity can be assured ?

Interpretation:

The suggested spot frequencies for current injection are 0.15 MHz, 20 MHz, 40 MHz, 60 MHz and 80 MHz. and for e.m. fields are 80 MHz, 230 MHz, 460 MHz, 690 MHz and 1 000 MHz.

The operating modes of an EUT need to be identified and then the modes, which are likely to achieve maximum susceptibility, should be fully subjected to the interference phenomena.

EXAMPLE For a washing machine one full cycle might be all that is required. The motor, the heating element and the solenoids are of themselves largely immune to EMI but the microprocessor or other control circuitry is not. By subjecting a washing machine, while it is running a full cycle, to both e.m. fields and current injection the immunity of the microprocessor or other control circuitry is tested and only one mode is required.

Other EUTs might require more than one mode of operation, but as long as the modes of operation are properly considered and selected then a sufficient level of immunity can be assured.

Validity:

This interpretation remains valid until an amendment or updated standard dealing with this issue is published by CENELEC.

April 2007

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