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CISPR 14-2

Edition 2.0 2015-02

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**

CISPR 14-2:2015-02(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 33.100
ISBN 978-2-8322-2218-8

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Part 2: Immunity – Product family standard

FOREWORD

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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.

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)

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.