

# 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 1: Emission**

**Compatibilité électromagnétique – Exigences pour les appareils électrodomestiques, outillages électriques et appareils analogues –  
Partie 1: Emission**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: [www.iec.ch/webstore/custserv](http://www.iec.ch/webstore/custserv)

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00

### A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: [www.iec.ch/searchpub/cur\\_fut-f.htm](http://www.iec.ch/searchpub/cur_fut-f.htm)

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: [www.iec.ch/webstore/custserv/custserv\\_entry-f.htm](http://www.iec.ch/webstore/custserv/custserv_entry-f.htm)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tél.: +41 22 919 02 11  
Fax: +41 22 919 03 00

# 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 1: Emission**

**Compatibilité électromagnétique – Exigences pour les appareils  
électrodomestiques, outillages électriques et appareils analogues –  
Partie 1: Emission**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE **CR**  
CODE PRIX

ICS 33.100.10

ISBN 978-2-88910-007-1

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	8
3 Definitions .....	9
4 Limits of disturbance .....	12
4.1 Continuous disturbance.....	12
4.2 Discontinuous disturbance.....	17
5 Methods of measurement of terminal disturbance voltages (148,5 kHz to 30 MHz).....	19
5.1 Measuring devices .....	19
5.2 Measuring procedures and arrangements.....	20
5.3 Reduction of disturbance not produced by the equipment under test .....	24
6 Methods of measurement of disturbance power (30 MHz to 300 MHz).....	25
6.1 Measuring devices .....	25
6.2 Measurement procedure on the mains lead .....	25
6.3 Special requirements for appliances having auxiliary apparatus connected at the end of a lead other than the mains lead.....	26
6.4 Assessment of measuring results .....	27
7 Operating conditions and interpretation of results.....	27
7.1 General.....	27
7.2 Operating conditions for particular equipment and integrated parts.....	28
7.3 Standard operating conditions and normal loads .....	31
7.4 Interpretation of results .....	46
8 Interpretation of CISPR radio disturbance limit .....	49
8.1 Significance of a CISPR limit.....	49
8.2 Type tests.....	49
8.3 Compliance with limits for appliances in large-scale production.....	50
8.4 Non-compliance .....	52
9 Methods of measurement of radiated emission (30 MHz to 1 000 MHz) .....	52
9.1 Measuring devices .....	52
9.2 Measuring arrangement.....	52
10 Measurement uncertainty .....	53
Annex A (normative) Limits of disturbance caused by the switching operations of specific appliances when the formula $20 \lg 30/N$ is applicable.....	67
Annex B (informative) Example of the use of the upper quartile method to determine compliance with disturbance limits (see 7.4.2.6) .....	70
Annex C (informative) Guidance notes for the measurement of discontinuous disturbance (clicks).....	72
Bibliography.....	77
Figure 1 – Graphical representation of the limits, household appliances and electric tools (see 4.1.1).....	54
Figure 2 – Graphical representation of the limits, regulating controls (see 4.1.1).....	55

Figure 3 – Examples of discontinuous disturbances classified as clicks (see 3.2) .....	56
Figure 4 – Examples of discontinuous disturbance for which the limits of continuous disturbance apply (see 4.2.2.1). For some exceptions from this rule see 4.2.3.2 and 4.2.3.4. ....	57
Figure 5 – Measuring arrangement for regulating controls (see 5.2.4).....	59
Figure 6 – Arrangement for measurement of disturbance voltage produced at the fence terminal of electric fence energizers (see 7.3.7.2) .....	60
Figure 7 – Measuring arrangement for toys running on tracks .....	61
Figure 8 – Application of the artificial hand (5.1.4 and 5.2.2.2).....	63
Figure 9 – Flow diagram for measurements of discontinuous disturbance (see Annex C) .....	64
Figure 10 – Flow chart for emission testing of mains operated appliances in the frequency range from 30 MHz to 1 000 MHz.....	65
Figure 11 – Flow chart for emission testing of battery-operated appliances in the frequency range from 30 MHz to 1 000 MHz.....	66
Table 1 – Terminal voltage limits for the frequency range 148,5 kHz to 30 MHz (see Figures 1 and 2).....	13
Table 2a – Disturbance power limits for the frequency range 30 MHz to 300 MHz.....	14
Table 2b – Margin when performing disturbance power measurement in the frequency range 30 MHz to 300 MHz .....	15
Table 3 – Radiated disturbance limits and testing methods for the frequency range 30 MHz to 1 000 MHz .....	15
Table 4 – General margin to the limit for statistical evaluation.....	50
Table 5 – Factor $k$ for the application of the non-central $t$ -distribution .....	51
Table 6 – Application of the binomial distribution .....	52
Table A.1 – Examples of appliances and application of limits according to 4.2.2 and 4.2.3 for which the click rate $N$ is derived from the number of clicks .....	68
Table A.2 – Examples of appliances and application of limits for which the click rate $N$ is derived from the number of switching operations and the factor $f$ as mentioned in the relevant operating conditions .....	69

**INTERNATIONAL ELECTROTECHNICAL COMMISSION****INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE****ELECTROMAGNETIC COMPATIBILITY –  
REQUIREMENTS FOR HOUSEHOLD APPLIANCES,  
ELECTRIC TOOLS AND SIMILAR APPARATUS –****Part 1: Emission****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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard CISPR 14-1 has been prepared by CISPR subcommittee F: Interference relating to household appliances, tools, lighting equipment and similar apparatus.

This consolidated version of CISPR 14-1 consists of the fifth edition (2005) [documents CISPR/F/404/FDIS and CISPR/F/411/RVD], its amendment 1 (2008) [documents CISPR/F/491/FDIS and CISPR/F/502/RVD] and its corrigendum 1 of January 2009..

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 5.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

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

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

Withdawn

iTech Standards  
(<https://standards.iteh.ai>)  
Document Preview

CISPR 14-1:2005  
<https://standards.iteh.ai/catalog/standards/iec/501695f4-44c1-4121-b31c-274931978b28/cispr-14-1-2005>

## INTRODUCTION

The intention of this standard is to establish uniform requirements for the radio disturbance level of the equipment contained in the scope, to fix limits of disturbance, to describe methods of measurement and to standardize operating conditions and interpretation of results.



iTech Standards  
(<https://standards.iteh.ai>)  
Document Preview

CISPR 14-1:2005

<https://standards.iteh.ai/catalog/standards/iec/301695f4-44c1-4121-b31c-274931978b28/cispr-14-1-2005>



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

## Part 1: Emission

### 1 Scope

**1.1** This standard applies to the conduction and the radiation of radio-frequency disturbances from appliances whose main functions are performed by motors and switching or regulating devices, unless the r.f. energy is intentionally generated or intended for illumination.

It includes such equipment as: household electrical appliances, electric tools, regulating controls using semiconductor devices, motor-driven electro-medical apparatus, electric/electronic toys, automatic dispensing machines as well as cine or slide projectors. Both mains powered appliances and battery powered appliances are included.

Also included in the scope of this standard are:

- separate parts of the above mentioned equipment such as motors, switching devices e.g. (power or protective) relays, however no emission requirements apply unless formulated in this standard.

Excluded from the scope of this standard are:

- apparatus for which all emission requirements in the radio frequency range are explicitly formulated in other IEC or CISPR standards;

NOTE 1 Examples are:

- luminaires, including portable luminaires for children, discharge lamps and other lighting devices: CISPR 15;
- audio and video equipment and electronic music instruments, other than toys: CISPR 13 and CISPR 20 (see also 7.3.5.4.2);
- mains communication devices, as well as baby surveillance systems: IEC 61000-3-8;
- equipment for generation and use of radio frequency energy for heating and therapeutic purposes: CISPR 11;
- microwave ovens: CISPR 11 (but be aware of 1.3 on multifunction equipment);
- information technology equipment, e.g. home computers, personal computers, electronic copying machines: CISPR 22;
- electronic equipment to be used on motor vehicles: CISPR 12;
- radio controls, walkie-talkies and other types of radio-transmitters, also when used with toys;
- arc welding equipment: CISPR 11.
- regulating controls and equipment with regulating controls incorporating semiconductor devices with a rated input current of more than 25 A per phase;
- stand-alone power supplies.

NOTE 2 Toys powered by the supply system of a motor-powered vehicle, ship or aircraft are not covered by this standard.

**1.2** The frequency range covered is 9 kHz to 400 GHz.

**1.3** Multifunction equipment which is subjected simultaneously to different clauses of this standard and/or other standards shall meet the provisions of each clause/standard with the relevant functions in operation; details are given in 7.2.1.

**1.4** The limits in this standard have been determined on a probabilistic basis, to keep the suppression of disturbances economically feasible while still achieving an adequate radio protection. In exceptional cases radio frequency interference may occur, in spite of compliance with the limits. In such a case, additional provisions may be required.

**1.5** The effects of electromagnetic phenomena relating to the safety of apparatus are excluded from the scope of this standard.

## 2 Normative references

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

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

Amendment 1: 1997

Amendment 2: 1998

IEC 60335-2-76:2002, *Household and similar electrical appliances – Safety – Part 2-76: Particular requirements for electric fence energizers*

IEC 60598-2-4:1997, *Luminaires – Part 2-4: Particular requirements – Section 4: Portable general purpose luminaires*

IEC 60598-2-10:2003, *Luminaires – Part 2-10: Particular requirements – Portable luminaires for children*

IEC 61000-4-20:2003, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

CISPR 15:2000, *Limits and methods of measurement of radio disturbance characteristics electrical lighting and similar equipment*.

CISPR 16-1-1:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

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

CISPR 16-1-3:2004, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-3: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Disturbance power*

CISPR 16-1-4:2007, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Radiated disturbances*

Amendment 1 (2007)

CISPR 16-2-1:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-2-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-2: Methods of measurement of disturbances and immunity – Measurement of disturbance power*

CISPR 16-2-3:2006, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 16-4-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements*

CISPR 22:2005, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

### 3 Definitions

For the purpose of this standard, the definitions contained in IEC 60050-161 apply extended with the specific definitions as follows:

**3.1** Definitions of the following terms are specified in CISPR 16-2-1 or CISPR 16-2-2:

Reference ground

Equipment under test (EUT)

Level

Weighting

#### **3.2** **click**

a disturbance, the amplitude of which exceeds the quasi-peak limit of continuous disturbance, the duration of which is not longer than 200 ms and which is separated from a subsequent disturbance by at least 200 ms. The durations are determined from the signal which exceeds the i.f. reference level of the measuring receiver

A click may contain a number of impulses, in which case the relevant time is that from the beginning of the first to the end of the last impulse.

NOTE Under certain conditions, some kinds of disturbances are exempted from this definition (see 4.2.3)

#### **3.3**

##### **i.f. reference level**

the corresponding value on the intermediate frequency output of the measuring receiver of an unmodulated sinusoidal signal which produces a quasi-peak indication equal to the limit for continuous disturbance

#### **3.4**

##### **switching operation**

one opening or one closing of a switch or contact

NOTE Independent of whether clicks are observed or not.

#### **3.5**

##### **minimum observation time**

***T***

the minimum time necessary when counting clicks (or where relevant counting switching operations) to provide sufficiently firm evidence for the statistical interpretation of the number of clicks (or switching operations) per time unit (see also 7.4.2.1)

#### **3.6**

##### **click rate**

***N***

in general the number of clicks or switching operations within one minute; this Figure is being used to determine the click limit (see also 7.4.2.3)

### 3.7

#### click limit

##### $L_q$

the relevant limit  $L$  for continuous disturbance, as given in 4.1.1 for the measurement with the quasi-peak detector, increased by a certain value determined from the click rate  $N$  (see also 4.2.2.2)

The click limit applies to the disturbance assessed according to the upper quartile method.

### 3.8

#### upper quartile method

a quarter of the number of the clicks registered during the observation time  $T$  is allowed to exceed the click limit  $L_q$

In the case of switching operations a quarter of the number of the switching operations registered during the observation time is allowed to produce clicks exceeding the click limit  $L_q$  (see also 7.4.2.6).

### 3.9

#### 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 IEC 61558-2-7).

### 3.10

#### battery toy

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

### 3.11

#### 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

### 3.12

#### dual supply toy

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

### 3.13

#### battery box

compartment which is separate from the toy or appliance and in which the batteries are placed

### 3.14

#### 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

### 3.15

#### 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.

**3.16****constructional kit**

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

**3.17****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.

**3.18****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.

**3.19****portable luminaire for children**

luminaire that in normal use can be moved from one place to another while connected to the supply and which is designed to provide a level of safety in excess of that provided by a portable general purpose luminaire conforming with IEC 60598-2-4

NOTE A portable luminaire for children is intended for use by children who may not be under the supervision of more competent persons at the time of use.

[IEC 60598-2-10: 10.3.1]

**3.20****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.

**3.21****electronic circuit**

circuit incorporating at least one electronic component

**3.22****electronic component**

part in which conduction is achieved principally by electrons moving through a vacuum, gas or semiconductor

NOTE Electronic components do not include resistors, capacitors and inductors.

**3.23****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

**3.24****clock frequency**

the 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 (IC) by phase-locked-loop (PLL) circuits from lower clock oscillator frequencies outside the IC.

### 3.25

#### **battery-operated appliance**

appliance which is operated only from batteries and has no provision for performing its intended function when connected to the mains, either directly or via a power supply.

NOTE 1 Toys are not considered to be appliances.

NOTE 2 An appliance which has provision for charging but cannot perform its intended function during charging is considered to be a battery-operated appliance.

### 3.26

#### **mains-operated appliance**

all appliances which are not battery-operated appliances

NOTE Toys are not considered to be appliances.

## 4 Limits of disturbance

Radio disturbance measurements below 148,5 kHz and above 1 000 MHz do not need to be carried out.

### 4.1 Continuous disturbance

Commutator motors, as well as other devices incorporated in household appliances, electric tools and similar electrical apparatus may cause continuous disturbance.

Continuous disturbance may be either broadband, caused by switching devices such as mechanical switches, commutators and semiconductor regulators, or may be narrowband, caused by electronic control devices such as microprocessors.

NOTE Instead of the concept of "broadband" and "narrowband" disturbances, in this standard a distinction is made between two related kinds of disturbance, defined by the type of the applied detector. For this purpose limits have been defined with respect to the measurement with the quasi-peak detector and with the average detector (see 5.1.1 and 6.1.1).

#### 4.1.1 Frequency range 148,5 kHz to 30 MHz (terminal voltages)

NOTE The World Administrative Radiocommunications Conference (WARC) has in 1979 reduced the lower frequency limit in Region 1 to 148,5 kHz; for applications falling in the scope of this standard, tests at 150 kHz are considered adequate, since 148,5 kHz falls within the receiver bandwidth.

The limits of the terminal disturbance voltages are given in Table 1. Terminal voltages are measured, in accordance with Clause 5, on each terminal with respect to ground.

Terminals are defined as conductive parts, suitable for re-usable electrical connection to external circuits.

**4.1.1.1** The limits in columns 2 and 3 shall be met on the phase(s) and the neutral of the mains terminals of all appliances except those of electric tools.

**4.1.1.2** On additional terminals of appliances as well as on load and additional terminals of regulating controls incorporating semiconductor devices the relaxed limits given for "additional terminals" in columns 4 and 5 apply.

Terminals which may be used as either mains terminals or load/additional terminals are subject to the limits for mains terminals.

No terminal voltage limits apply for leads, which are not easily extensible by the user (permanently connected, or provided with a specific connector), which are shorter than 2 m, and which connect the equipment with an auxiliary apparatus or device, (e.g. semiconductor speed controls, power plugs with AC-DC converters).