



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

**Part 1: Emission (CISPR 14-1:2016
(ED 6.0), MOD)**



AS CISPR 14.1:2018

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- Australian Industry Group
- Australian Information Industry Association
- Consumer Electronics Suppliers Association
- Department of Defence (Australian Government)
- EMC Society of Australia
- Energy Networks Australia
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Electromagnetic compatibility— Requirements for household appliances, electric tools and similar apparatus

Part 1: Emission (CISPR 14-1:2016 (ED 6.0), MOD)

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Preface

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee TE-003, Electromagnetic Compatibility, to supersede AS/NZS CISPR 14.1:2013.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to specify the requirements that apply to the emission of radio-frequency disturbances in the frequency range 9 kHz to 400 GHz from appliances, electric tools and similar apparatus, whether powered by AC or DC (including a battery). Also included in the scope of this Standard are separate parts of the above-mentioned equipment such as motors and switching devices (e.g. power or protective relays); however, no emission requirements apply to such separate parts, unless otherwise stated in this Standard.

The Interpretation Sheets CISPR 14-1:2016/ISH1:2017 and CISPR 14-1:2016/ISH2:2017 are attached to this Standard.

This Standard is an adoption with national modifications, and has been reproduced from, CISPR 14-1:2016 (ED 6.0), *Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 1: Emission*. Appendix ZZ lists the variations for the application of this Standard in Australia and New Zealand.

As this document has been reproduced from an International Standard, the following applies:

- (a) In the source text “this International Standard” should read “this Australian Standard”.
- (b) A full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

NOTES

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CISPR 14-1
Edition 6.0 2016-08**ELECTROMAGNETIC COMPATIBILITY –
REQUIREMENTS FOR HOUSEHOLD APPLIANCES,
ELECTRIC TOOLS AND SIMILAR APPARATUS –****Part 1: Emission****INTERPRETATION SHEET 1**

This interpretation sheet has been prepared by subcommittee CISPR F: Interference relating to household appliances tools, lighting equipment and similar apparatus, of IEC technical committee CISPR: International special committee on radio interference.

The text of this interpretation sheet is based on the following documents:

FDIS	Report on voting
CIS/F/703/FDIS	CIS/F/707/RVD

Full information on the voting for the approval of this interpretation sheet can be found in the report on voting indicated in the above table.

Interpretation Sheet 1 to CISPR 14-1: Interpretation of subclause 5.4.2.4 of CISPR 14-1:2016 on the upper quartile method for the evaluation of clicks**Introduction**

The evaluation of clicks has to be performed at four frequencies while the determination of the click rate N is made only at two frequencies. The application of the upper quartile method at the frequencies 150 kHz and 500 kHz is clear, while the situation is unclear for the frequencies 1,4 MHz and 30 MHz. This interpretation sheet is intended to clarify this matter.

The click measurement procedure is under revision in CISPR/F WG1 and will be updated in the next amendment to CISPR 14-1:2016.

Question

How should the upper quartile method be applied at the frequencies 1,4 MHz and 30 MHz?

Interpretation

Each of the following two interpretations is valid.

ICS 33.100.10

Interpretation 1:

The number of clicks at 1,4 MHz and the number of clicks at 30 MHz which exceed the limit, L , for continuous disturbances during the observation time, T , are measured. The number of clicks at 1,4 MHz and the number of clicks at 30 MHz exceeding L_q are allowed to be one quarter of the number of clicks counted at each respective frequency.

Interpretation 2:

The number of clicks at 1,4 MHz and the number of clicks at 30 MHz which exceed the limit, L , for continuous disturbances during the observation time, T , are not measured but are assumed to be equal to the number of clicks counted at 500 kHz during the observation time T . The number of clicks at 1,4 MHz and the number of clicks at 30 MHz exceeding L_q are allowed to be one quarter of the number of clicks counted at 500 kHz.

In any situation where it is necessary to verify the original measurement, the assessment method (interpretation 1 or 2) originally chosen shall be used in order to ensure consistency of the results.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CISPR 14-1
Edition 6.0 2016-08**ELECTROMAGNETIC COMPATIBILITY –
REQUIREMENTS FOR HOUSEHOLD APPLIANCES,
ELECTRIC TOOLS AND SIMILAR APPARATUS –****Part 1: Emission****INTERPRETATION SHEET 2**

This interpretation sheet has been prepared by subcommittee CISPR F: Interference relating to household appliances tools, lighting equipment and similar apparatus, of IEC technical committee CISPR: International special committee on radio interference.

The text of this interpretation sheet is based on the following documents:

FDIS	Report on voting
CIS/F/702/FDIS	CIS/F/706/RVD

Full information on the voting for the approval of this interpretation sheet can be found in the report on voting indicated in the above table.

Interpretation Sheet 2 to CISPR 14-1: Interpretation of subclause A.4.11 of CISPR 14-1:2016 on the assessment of irons with steam generator**Introduction**

Subclause A.4.11 of CISPR 14-1:2016 defines the testing conditions for irons (dry or steam), but there are no instructions regarding the steam production.

Question

How to set the steam function of irons during CISPR 14-1 emission tests?

Interpretation

When measuring disturbances from irons, if the iron has a continuous steam function, it shall be operated in this mode only and use a sufficient amount of water to facilitate continuous steaming for the duration of the test.

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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.
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- 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.

The International Standard CISPR 14-1 has been prepared by subcommittee CISPR/F: Interference related to household appliances, tools, lighting equipment and similar appliances, of IEC technical committee CISPR.

This sixth edition cancels and replaces the fifth edition published in 2005, Amendment 1:2008 and Amendment 2:2011. This edition constitutes a technical revision.

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

- full editorial review of the standard, rearranging the structure of several clauses;
- improvements to the operating conditions for testing induction cooking appliances and incorporation of the limits for these appliances in the body of the standard;

- moving all specific operating conditions to Annex A;
- improvement of definitions;
- addition of general and specific test setups (e.g. vacuum cleaners and robotic cleaners) for radiated emission;
- provision for the current probe test method for conducted disturbance measurements on ports other than the AC mains port in alternative to the voltage probe method;
- clarifications about click analysis (e.g. measurements under the presence of continuous disturbances). Further clarification is being developed for future inclusion;
- clarification about the use of the artificial hand;
- introduction of testing on wired network ports of household equipment (equivalent to CISPR 32 requirements);
- clarification in the scope regarding emissions from radio transmitters (copied verbatim from CISPR 32);
- clarification about the measurement of equipment with built-in luminaries.

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

FDIS	Report on voting
CISPR/F/681/FDIS	CISPR/F/684/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 can be found on the IEC website under the general title *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus*.

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

The contents of the corrigendum of October 2016 and the interpretation sheet 1 of May 2017 and 2 of May 2017 have been included in this copy.

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

Part 1: Emission

1 Scope

This part of CISPR 14 specifies the requirements that apply to the emission of radio-frequency disturbances in the frequency range 9 kHz to 400 GHz from appliances, electric tools and similar apparatus as defined below, whether powered by AC or DC (including a battery).

Within this standard wherever the term “equipment” is used it includes the more specific terms “appliance”, “household or similar appliances”, “electric tool”, “toys” and “apparatus”.

This International Standard is applicable to the following equipment:

- household appliances or similar equipment;

NOTE 1 Examples are equipment used:

- for typical housekeeping functions in the household environment, which includes the dwelling and its associated buildings, the garden, etc.;
- for typical housekeeping functions in shops, offices, commercial and other similar working environments;
- in farms;
- by clients in hotels and other residential type environments;
- for induction cooking, either in residential or commercial environments.

- electric tools;

NOTE 2 Examples of electric tools include electric motor-operated or electromagnetically driven hand-held tools, transportable tools, lawn and garden machinery.

- similar apparatus.

NOTE 3 Examples are external power controllers using semiconductor devices, motor-driven electro-medical apparatus, electric/electronic toys, automatic goods-dispensing machines, entertainment machines, cine or slide projectors, as well as battery chargers and external power supplies for use with products under the scope of this standard.

Also included in the scope of this standard are separate parts of the above mentioned equipment such as motors and switching devices (e.g. power or protective relays); however, no emission requirements apply to such separate parts, unless otherwise stated in this standard.

Excluded from the scope of this standard are:

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

NOTE 4 Examples are:

- luminaires, including portable luminaires for children, discharge lamps and other lighting devices under the scope of CISPR 15;
- information technology equipment, e.g. home computers, personal computers, electronic copying machines under the scope of CISPR 32;
- audio/video equipment and electronic music instruments other than toys under the scope of CISPR 32;

- mains communication devices, as well as baby surveillance systems;
 - equipment which is under the scope of CISPR 11 because of the use of radio frequency energy for heating (other than induction cooking) and therapeutic purposes, microwave ovens (but be aware of 6.5 on multifunction equipment e.g. for click measurements)
 - radio controls, walkie-talkies and other types of radio-transmitters;
 - arc welding equipment.
- equipment intended to be used only on a vehicle, ship or aircraft;
 - the effects of electromagnetic phenomena relating to the safety of the equipment.

Multifunction equipment may be required to comply with clauses in this and other standards. The details are given in 6.5.

The radiated emission requirements in this standard are not intended to be applicable to the intentional transmissions from a radio transmitter as defined by the ITU, nor to any spurious emissions related to these intentional transmissions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

CISPR 16-1-1:2015, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements*

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 16-1-3:2004/AMD1:2016

CISPR 16-1-4:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*
CISPR 16-1-4:2010/AMD1:2012

CISPR 16-2-1:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-2-2:2010, *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 16-2-3:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*
CISPR 16-2-3:2010/AMD1:2010
CISPR 16-2-3:2010/AMD2:2014

CISPR 16-4-2:2011, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling*

instrumentation uncertainty
CISPR 16-4-2:2011/AMD1:2014

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*
IEC 60050-161:1990/AMD1:1997
IEC 60050-161:1990/AMD2:1998
IEC 60050-161:1990/AMD3:2014
IEC 60050-161:1990/AMD4:2014
IEC 60050-161:1990/AMD5:2015

IEC 60335-2-76:2002, *Household and similar electrical appliances – Safety – Part 2-76: Particular requirements for electric fence energizers*
IEC 60335-2-76:2002/AMD1:2006
IEC 60335-2-76:2002/AMD2:2013

IEC 61000-4-20:2010, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

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

3 Terms, definitions and abbreviated terms

3.1 General

For the purposes of this document, the terms and definitions given in IEC 60050-161, as well as the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.2 General terms and definitions

3.2.1

equipment under test

EUT

equipment (devices, appliances and systems) subjected to EMC (emission) compliance tests

[SOURCE: CISPR 16-2-1:2014, 3.1.18]

3.2.2

reference ground

reference potential connecting point

Note 1 to entry: There can only be one reference ground in a conducted disturbance measurement system.

[SOURCE: CISPR 16-2-1:2014, 3.1.24]

3.2.3**reference ground plane****RGP**

flat conductive surface that is used as a common reference and allows a defined parasitic capacitance to the surroundings of an EUT

Note 1 to entry: A reference ground plane is needed for conducted disturbance measurements, and serves as reference ground for the measurement of unsymmetric and asymmetric disturbance voltage.

[SOURCE: CISPR 16-2-1:2014, 3.1.25]

3.2.4**common mode absorption device****CMAD**

device applied on cables leaving the test volume in radiated emission measurements to reduce the compliance uncertainty

[SOURCE: CISPR 16-1-4:2010, 3.1.4]

3.2.5**radio frequency****RF**

frequency of the electromagnetic spectrum that is between the audio-frequency portion and the infrared portion

Note 1 to entry: The RF spectrum is generally accepted to be from 9 kHz to 3 000 GHz.

3.2.6**weighting** (of e.g. impulsive disturbance)

pulse-repetition-frequency (PRF) dependent conversion (mostly reduction) of a peak-detected impulse voltage level to an indication that corresponds to the interference effect on radio reception

[SOURCE: CISPR 16-2-1:2014, 3.1.29]

3.3 Terms and definitions related to click analysis**3.3.1****switching operation**

operation of opening or closing a switch or contact

Note 1 to entry: Switches can be mechanical (including electro-mechanical relays) or electronic (thyristors, transistors).

Note 2 to entry: Switching operations are used to control/enable the operation of a device/load (e.g. a motor or a heating element) and have the potential of generating discontinuous disturbances.

Note 3 to entry: Switching operations occur at a random rate (e.g. for the purpose of temperature control) or pre-determined rate (e.g. as part of automatic program controls).

Note 4 to entry: The occurrence of switching operations is not necessarily associated with the generation of disturbances classified as clicks (see 3.3.3 definition)

3.3.2**discontinuous disturbance**

impulsive disturbance that appears as an abrupt and transitory increase of the disturbance level caused by switching operations

Note 1 to entry: The spectral density of discontinuous disturbances is broadband. Their subjective effect varies with repetition rate, duration and amplitude. These parameters are captured with suitable time domain instrumentation (e.g. disturbance analyser).

Note 2 to entry: Other impulsive disturbances appear as broadband (e.g. those generated by commutation in brush motors) but the repetition rate is higher than that typical of switching operations.

3.3.3

click

discontinuous disturbance, the amplitude of which exceeds the quasi-peak limit for 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, where the durations are determined from the signal which exceeds the i.f. reference level of the measuring receiver and for a click containing a number of impulses, the duration time is that from the beginning of the first to the end of the last impulse

Note 1 to entry: Examples of discontinuous disturbances which can be classified as clicks are shown in Figure 2. Examples of discontinuous disturbances which cannot be classified as clicks, are shown in Figure 3.

Note 2 to entry: Under certain conditions, some kinds of disturbances are considered as clicks even if they do not meet this definition (see 5.4.3).

3.3.4

i.f. reference level

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

3.3.5

minimum observation time

T

minimum time necessary to permit the statistical interpretation of the disturbance caused by clicks or switching operations

3.3.6

click rate

N

in general the number of clicks or switching operations per minute

3.3.7

click limit

L_q

variable limit for discontinuous disturbances, which depends on the click rate *N*

Note 1 to entry: The click limit can be seen as a relaxation of the relevant quasi-peak limit for continuous disturbances and it is used for the assessment of discontinuous disturbances classified as clicks.

3.3.8

upper quartile method

statistical evaluation method for clicks

3.4 Terms and definitions related to types of ports

3.4.1

port

physical interface through which electromagnetic energy enters or leaves the EUT

Note 1 to entry: This standard does not define requirements for optical and wireless ports.

[SOURCE: CISPR 32:2015, 3.1.27, modified – Note 1 to entry modified]

3.4.2

mains port

port used for connection to the AC mains supply network

3.4.3**associated port**

port used for connection of the EUT to an associated device

Note 1 to entry: Examples include ports for connection to loads, batteries, remote controls, EPS and other specific interfaces as RS-232, Universal Serial Bus (USB) and High-Definition Multimedia Interface (HDMI).

Note 2 to entry: These ports are used to transfer control signals, information, energy supply or a combination thereof.

Note 3 to entry: Wired network ports are not included in this definition.

3.4.4**wired network port**

point of connection for voice, data and signalling transfers intended to interconnect widely dispersed systems by direct connection to a single-user or multi-user communication network

Note 1 to entry: Examples of these include CATV, PSTN, ISDN, xDSL, LAN and similar networks.

Note 2 to entry: These ports are connected to screened or unscreened cables and may carry AC or DC power where this is an integral part of the telecommunication specification

[SOURCE: CISPR 32:2015, 3.1.32, modified – Note 2 to entry modified]

3.4.5**fence port**

output port of an electric fence energizer (high voltage)

3.4.6**enclosure port**

physical boundary of the EUT through which electromagnetic fields may radiate

[SOURCE: CISPR 32:2015, 3.1.13]

3.5 Terms and definitions related to parts and devices connected to the EUT**3.5.1****terminal**

conductive part that allows electrical connection at a port

Note 1 to entry: Terminals are fitted at the end of a cable (e.g. a plug, a connector) or directly at the enclosure of the EUT (a connector).

3.5.2**non-extendable wiring**

arrangement whereby the length of electrical wire connected to a port cannot be easily increased by the user

EXAMPLE Non-extendable wiring are cables and leads that are:

- permanently attached to equipment or devices at both ends,
- attached using special tools,
- connected using couplers that are not generally available to members of the public,
- fitted with connectors specifically designed for use only with a particular model of equipment/apparatus,
- wiring whose length is established only after installation, e.g. air conditioning units.

3.5.3**associated device**

apparatus part of the equipment (system) under test that is conductively connected to the EUT in order to exercise the operating functions covered by the EMC assessment

EXAMPLE Loads, controls, batteries, external power supplies and battery chargers.

Note 1 to entry: These devices can be essential or not for the operation of the EUT.

Note 2 to entry: Devices not part of the system under test are those that interface with the EUT for the purpose of transferring data and/or power (e.g. Ethernet, USB and similar devices).

3.5.4

external power controller

device or equipment which allows the user to directly control the power delivered to a load external to the EUT

EXAMPLE Controllers used to regulate the speed of motors or the movement of mechanical parts. The required settings are generally achieved by rotating knobs and/or pressing buttons. Regulation can be provided by a number of fixed or continuously adjustable settings.

3.5.5

external power supply

EPS

device having its own physical enclosure that converts power supplied by the AC mains into power at a different voltage

Note 1 to entry: The output voltage of the EPS can be either AC or DC.

3.6 Terms and definitions related to operating conditions

3.6.1

mains operated equipment

equipment which is not battery operated equipment

3.6.2

battery operated equipment

equipment which is operated only from batteries and cannot perform its intended function when connected to the AC mains supply, either directly or via an external power supply (EPS) unit

3.6.3

mains operation

condition where the equipment is powered from the AC mains supply either directly or via a dedicated external power supply to perform its intended function(s)

Note 1 to entry: Charging batteries from the AC mains supply is mains operation.

3.6.4

battery operation

condition where the equipment is powered only from batteries and there is no provision for the equipment to perform its intended function(s) when connected to the AC mains supply, either directly or via an external power supply (EPS) unit

3.6.5

operating mode

condition in which the equipment performs one or more of its intended function(s), as specified by the manufacturer

Note 1 to entry: The number of operating modes could be increased if an associated device can be used to expand the functionality of the equipment.

Note 2 to entry: A number of user selectable settings could be available within an operating mode (e.g. control of power or speed).

3.6.6**table-top EUT**

equipment intended to be located on the top of a table or on a surface other than the floor

EXAMPLE Wall and ceilings are examples of surfaces other than the floor.

3.6.7**floor standing EUT**

equipment that, according to its design and/or weight, usually stands on the floor while in use

3.7 Terms and definitions related to toys**3.7.1****toy**

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

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

Note 2 to entry: The supply voltage of a toy can be provided by a battery or by means of an adapter or a transformer connected to the AC mains supply.

Note 3 to entry: External power supplies and external chargers for toys are considered not to be part of the toy (see IEC 61558-2-7).

3.7.2**battery toy**

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

3.7.3**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

3.7.4**dual supply toy**

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

3.7.5**battery box**

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

3.7.6**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, keyboard, monitor and connections, are considered to be part of the toy.

3.7.7**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

3.7.8**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.

3.8 Other terms and definitions

3.8.1

clock frequency

fundamental frequency of any signal used in the EUT excluding those which are solely used inside integrated circuits (IC) and those used in radio transmitters or radio receivers

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

3.8.2

active electronic circuit

electronic circuit containing electronic components switching at a variable or fixed rate (switching/clock frequency)

Note 1 to entry: Active electronic circuits comprise components such as transistors, thyristors, digital ICs, microprocessors, and oscillators. An LED display circuit connected to a battery is not an active electronic circuit if the current is limited only by a resistor or by a transistor operating linearly, but it is an active electronic circuit if the current is pulsed.

Note 2 to entry: According to the switching rate and to the measurement bandwidth, the spectral distribution of the disturbance generated by active electronic circuits appears as either broadband or narrowband.

Note 3 to entry: Active electronic circuits are used to control switching operations as defined in 3.3.1 (e.g. by a microcontroller) but the two switching rates are fundamentally different.

3.8.3

robotic equipment

equipment capable of performing its intended use by changing its position or the position of its parts without human intervention

Note 1 to entry: The movements can be within a limited space, a pre-programmed space, or a space self-controlled by the equipment.

3.8.4

robotic cleaner

robotic equipment capable of performing the functions of a cleaner

EXAMPLE Robotic cleaners used to vacuum dust and dirt or to wash floors and windows.

Note 1 to entry: Robotic cleaners typically consist of two parts:

- a battery powered mobile part that performs the cleaning function (cleaning unit), and
- a stationary docking station which could, for example, provide battery charging, data processing and dust removal from the mobile cleaner.

3.9 Abbreviations

AC :	Alternating current
AMN :	Artificial Mains Network
DC :	Direct current
EPS :	External Power Supply
FAR :	Fully Anechoic Room
OATS :	Open Area Test Site
SAC :	Semi Anechoic Chamber
RGP :	Reference Ground Plane

RF : Radio Frequency
i.f.: intermediate frequency

4 Limits of disturbances

4.1 General

Radio disturbance limits are given in the frequency range 150 kHz to 1 000 MHz, with an extension down to 9 kHz for particular types of equipment.

If it is evident from the construction of the equipment that a certain measurement is not necessary, e.g. because the equipment has no source of disturbance, the equipment is deemed to comply with the requirements without testing.

4.2 Application of limits

The following Table 1 gives a reference to the limits applicable to the different types of equipment under the scope of this standard.

The table provides only a quick reference. The requirements detailed in the referenced clauses and other relevant clauses shall be applied.

Table 1 – Application of limits

	Disturbance voltage/current		Disturbance voltage	Disturbance Power ^c	Radiated dist.	Magnetic field			
	Continuous ^{a, f}		Clicks ^b						
Subclause	(4.3.2)	(4.3.3)		(4.4.2)	(4.3.4)		(4.3.4)	(4.3.2)	
Limits	Table 2	Table 5	Table 6	Text	Table 7	Table 8	Table 9	Table 3	Table 4
All equipment not listed below		•		•	•	•	•		
Tools			•	•	•	•	•		
Induction cooking appliances	•			•	•	•	•	•	•
Electric fence energisers ^d		•		•	•	•	•		
Toys Cat. A ^e									
Toys Cat. B							•		
Toys Cat. C							•		
Toys Cat. D		•		•	•	•	•		
Toys Cat. E		•		•	•	•	•		
a Limits of Table 5 and Table 6 can also be applicable to discontinuous disturbances (see 4.4.2.2). b For exemption and exceptions see 5.4.3. c For mains operated equipment, if certain conditions are met, the disturbance power test may be applied in alternative to the radiated disturbance test (see 4.3.4.2 and Figure 4). d For electric fence energisers the disturbance voltage test is applied according to 4.3.3.5. e Toys of category A shall be deemed to comply with the requirements of this standard without testing. f For wired network ports, see 4.3.3.7.									

4.3 Continuous disturbances

4.3.1 General

Continuous disturbances shall be assessed in accordance with the methods and limits of this subclause using the test equipment specified in 5.1.

NOTE Continuous disturbances can be either: broadband, caused by switching devices such as mechanical switches, commutators and semiconductor regulators; or narrowband, caused by electronic control devices such as microprocessors.

4.3.2 Frequency range 9 kHz to 30 MHz

The requirements and the tables contained in this subclause only apply to induction cooking appliances.

The measurement of disturbance voltage on the mains port of induction cooking appliances shall be made in accordance with Clause 5 and the corresponding limits are specified in Table 2.

The assessment of the radiated disturbances from induction cooking appliances in the frequency range 9 kHz to 30 MHz shall be made according to the test method and limits specified in Table 3.

In alternative the method and limits specified in Table 4 may be used for appliances having diagonal dimension up to 1.6 m.

Table 2 – Disturbance voltage limits for induction cooking appliances

Frequency range	Appliances which are 100 V rated and without an earth connection		All other appliances	
MHz	dB μ V Quasi-peak	dB μ V Average	dB μ V Quasi-peak	dB μ V Average
0,009 to 0,050	122	–	110	–
0,050 to 0,150	Decreasing linearly with logarithm of frequency from 102 to 92	–	Decreasing linearly with logarithm of frequency from 90 to 80	–
0,150 to 0,5	Decreasing linearly with logarithm of frequency from 72 to 62		66 to 56	56 to 46
0,5 to 5	56	46	56	46
5 to 30	60	50	60	50
The lower limit applies at the transition frequencies.				

Table 3 – Magnetic field strength limits

Frequency range MHz	Limits at 3 m distance ^{a, b} Quasi-peak dB μ A/m
0,009 to 0,070	69
0,070 to 0,150	Decreasing linearly with logarithm of frequency from 69 to 39
0,150 to 4,0	Decreasing linearly with logarithm of frequency from 39 to 3
4,0 to 30	3
^a The measurements are performed at 3 m distance with a 0,6 m loop antenna as described in 4.3.2 of CISPR 16-1-4:2010. ^b The antenna shall be installed vertically, with the lower edge of the loop at 1 m height above the floor.	

Table 4 – Limits of the magnetic field induced current

Frequency range MHz	Horizontal component ^{a,b}	Vertical component ^{a,c}
	Quasi-peak dB μ A	Quasi-peak dB μ A
0,009 to 0,070	88	106
0,070 to 0,150	Decreasing linearly with logarithm of frequency from 88 to 58	106 to 76
0,150 to 30	Decreasing linearly with logarithm of frequency from 58 to 22	76 to 40
^a The measurement is performed using the 2 m loop antenna system (LAS) as described in 7.2 of CISPR 16-2-3:2010. ^b Current induced by the horizontal component of the magnetic field. ^c Current induced by the vertical component of the magnetic field.		

In any situation where it is necessary to verify the original measurement the measuring method originally chosen shall be used in order to ensure consistency of the results.

The test report shall state which method was used and which limits were applied.

4.3.3 Frequency range 150 kHz to 30 MHz

4.3.3.1 General

Disturbance voltages shall be measured in accordance with Clause 5 at each applicable port with respect to the reference ground. Disturbance currents shall be measured in accordance with Clause 5 on the relevant leads.

4.3.3.2 Mains port

The limits in columns 2 and 3 of Table 5 shall be met on the phase(s) and the neutral of the mains port of all equipment except for electric tools. For electric tools, see 4.3.3.4.

4.3.3.3 Associated port

On associated ports, either the disturbance voltage or the disturbance current measurement method may be selected, the limits given in columns 4 to 7 of Table 5.

However, these limits do not apply to:

- a) ports of equipment or associated devices that do not contain active electronic circuits or brush motors
- b) ports which connect to non-extendable wiring shorter than 2 m;
- c) ports connected to leads integrated in the suction hose of vacuum cleaners, even if the length exceeds 2 m;
- d) ports internal to the EUT (e.g. built-in batteries);
- e) ports which are not necessary for the intended functions of the EUT and which are not in operation during normal use (e.g. programming ports).

NOTE See also 5.2.3.1.

If a port can be configured to be either a mains port or another type of port, then the limits of Table 5 applicable to the type of port being tested shall be met.

4.3.3.4 Tools

For motor operated electric tools the limits for the mains port are given in Table 6.

The power ratings given in columns 2 to 7 of Table 6 relate only to the rated power P of the motor. The power taken by resistive loads of the EUT (for instance the power used by the heating elements in an electric blower for plastic welding) is disregarded for the purpose of selecting the limits.

For ports other than the mains port 4.3.3.3 shall apply.

4.3.3.5 Electric fences

For electric fence energizers the disturbance voltage limits apply to:

- a) the mains port on energizers designed for connection to the mains (columns 2 and 3 of Table 5);
- b) the battery port of battery operated energizers (columns 4 and 5 of Table 5), except that no disturbance voltage limits apply to this port if the external batteries are connected by non-extendable wiring shorter than 2 m;
- c) the fence port on all energizers (columns 4 and 5, or alternatively, columns 6 and 7 of Table 5)

Type D energizers, as defined in Clause 3 according to IEC 60335-2-76:2002/AMD1:2006/AMD2:2013, are measured as battery-operated energizers with connecting leads of at least 2 m in length between the energizer and the battery.

NOTE In practice, the fence wire can also act as an active source of disturbances, due to the high-voltage discharges, in particular to radio and telecommunication networks.

Manufacturers of electric fence energizers should instruct the users to avoid discharge points such as touching vegetation or broken fence wires.

4.3.3.6 Limits

The limits of Table 5 and Table 6 for the frequency range 150 kHz to 30 MHz apply to the conducted emissions from equipment other than induction cooking appliances.

Table 5 – General limits

Frequency range	Mains ports		Associated ports			
	Disturbance voltage		Disturbance voltage		Disturbance current	
1	2	3	4	5	6	7
MHz	Quasi-peak dBμV	Average dBμV	Quasi-peak dBμV	Average dBμV	Quasi-peak dBμA	Average dBμA
0,15 to 0,50	Decreasing linearly with the logarithm of the frequency from: 66 to 56		80	70	Decreasing linearly with the logarithm of the frequency from: 40 to 30	
	59 to 46				30 to 20	
0,50 to 5	56	46	74	64	30	20
5 to 30	60	50	74	64		
The lower limit applies at the transition frequencies.						
The test report shall state which test method was used and which limits were applied.						

Table 6 – Limits for mains port of tools

Frequency range	$P \leq 700 \text{ W}$		$700 \text{ W} < P \leq 1\,000 \text{ W}$		$P > 1\,000 \text{ W}$	
	2	3	4	5	6	7
MHz	Quasi-peak dB μ V	Average dB μ V	Quasi-peak dB μ V	Average dB μ V	Quasi-peak dB μ V	Average dB μ V
0,15 to 0,35	Decreasing linearly with the logarithm of the frequency from: 66 to 59					
0,35 to 5	59	49	63	53	69	59
5 to 30	64	54	68	58	74	64
The lower limit applies at the transition frequencies.						
Key						
P = rated power of the motor only.						

If the quasi-peak measurements meet the average limit, the EUT shall be deemed to meet both limits and the measurements using the average detector need not be carried out.

4.3.3.7 Wired network ports

Wired network ports shall meet the requirements of CISPR 32 and the applicable disturbance limits for class B equipment in the frequency range 150 kHz to 30 MHz.

4.3.4 Frequency range 30 MHz to 1 000 MHz

4.3.4.1 General

Products and associated devices that do not contain active electronic circuits or brush motors are deemed to comply with the requirements of this standard in the frequency range 30 MHz to 1 000 MHz without testing. See also 4.1.

For mains operation, the assessment procedure of 4.3.4.2 shall be applied.

For battery operation, the assessment procedure of 4.3.4.3 shall be applied.

Equipment which is capable of both mains and battery operation shall be assessed in the mains operation mode only if all intended functions can be performed in this mode.

4.3.4.2 Mains operation

The EUT shall be assessed for emissions in the frequency range from 30 MHz to 1 000 MHz by testing in accordance with either method a) or b), see also Figure 4.

- a) The disturbance power limits in columns 2 and 3 of Table 7 for the frequency range from 30 MHz to 300 MHz shall be met by all equipment except for electric tools.

For electric tools the limits given in columns 4 to 9 of Table 7 apply. The power ratings given in columns 4 to 9 of Table 7 relate only to the rated power P of the motor. The power taken by resistive loads of the EUT (for instance the power used by the heating elements in an electric blower for plastic welding) is disregarded for the purpose of selecting the limits.

The EUT shall be also deemed to comply with the requirement of this standard in the frequency range from 300 MHz to 1 000 MHz without further testing if both conditions 1) and 2) below are fulfilled:

- 1) the disturbance power emission from the EUT is lower than the limits of Table 7 reduced by the values of Table 8;
- 2) the maximum clock frequency is less than 30 MHz

If either of the conditions 1) or 2) is not fulfilled, radiated measurements in the frequency range from 300 MHz to 1 000 MHz shall be performed and the limits of Table 9 for that range applied. In any case, the limits of Table 7 in the frequency range 30 MHz to 300 MHz shall be met.

- b) The limits for radiated disturbances in Table 9 for the selected test method shall be met.

NOTE The advantage of method b) is that the assessment in the frequency range 30 MHz to 1 000 MHz of equipment having leads in addition to the mains lead is done in one measurement only, whilst with method a) the leads, where applicable, have to be tested separately.

4.3.4.3 Battery operation

The EUT shall comply with the limits in Table 9 for the frequency range from 30 MHz to 1 000 MHz (see also Figure 5).

Battery operated remote controls used for equipment within the scope of this standard that do not use connecting cables need not be tested.

NOTE An example of the above would be a device that transmits infrared or ultrasonic signals to an air conditioning system. Such devices can be hand-held or mounted at a fixed position.

4.3.4.4 Disturbance power limits

The disturbance power limits in Table 7, and where relevant, in Table 8 shall be applied.

Table 7 – Disturbance power limits – 30 MHz to 300 MHz

Frequency range	General		Tools					
			$P \leq 700 \text{ W}$		$700 \text{ W} < P \leq 1\,000 \text{ W}$		$P > 1\,000 \text{ W}$	
1	2	3	4	5	6	7	8	9
MHz	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW
30 to 300	Increasing linearly with the frequency from:							
	45 to 55	35 to 45	45 to 55	35 to 45	49 to 59	39 to 49	55 to 65	45 to 55
Key P = rated power of the motor only.								

If the quasi-peak measurements meet the average limit, the EUT shall be deemed to meet both limits and the measurements using the average detector need not be carried out.

Table 8 – Reduction applicable to Table 7 limits

Frequency range	General		Tools					
			$P \leq 700 \text{ W}$		$700 \text{ W} < P \leq 1\,000 \text{ W}$		$P > 1\,000 \text{ W}$	
1	2	3	4	5	6	7	8	9
MHz	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW	Quasi-peak dBpW	Average dBpW
200 to 300	Increasing linearly with the frequency from:							
	0 to 10	0	0 to 10	0	0 to 10	0	0 to 10	0
NOTE This table only applies if method a) specified in 4.3.4.2 is followed.								

4.3.4.5 Radiated disturbance limits – 30 MHz to 1 000 MHz

The radiated disturbances limits, as specified in Table 9, shall be applied according to the selected test method.

Table 9 – Radiated disturbance limits and testing methods – 30 MHz to 1 000 MHz

Testing method	Basic standard	Frequency range MHz	Limit ^a Quasi-peak dB μ V/m	Remarks
OATS or SAC ^b	CISPR 16-2-3	30 to 230 230 to 1 000	30 37	Measurement distance 10 m
FAR ^c	CISPR 16-2-3	30 to 230 230 to 1 000	42 to 35 ^d 42	Measurement distance 3 m
FAR ^c	IEC 61000-4-22	30 to 230 230 to 1 000	42 to 35 ^d 42	Measurement distance 3 m
TEM-Waveguide ^e	IEC 61000-4-20	30 – 230 230 – 1 000	30 37	–
^a The lower limit is applies at the transition frequency. ^b Measurements may be made at closer distance, down to 3 m. An inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining the limit. in this case the recommendations of the CISPR basic standards shall be considered when testing large EUT at frequency approaching 30 MHz, due to near field effects. ^c All equipment shall be measured within the test volume as described in 5.3.4.3 and shown in Figures 12 to 19. ^d Decreasing linearly with the logarithm of the frequency. ^e The TEM waveguide method shall be limited to battery operated EUT without cables attached and with a maximum size according to 6.2 of IEC 61000-4-20:2010 (the largest dimension of the enclosure is equal to the wavelength at the maximum measurement frequency, 300 mm at 1 GHz). The test report shall state which test method was used and which limits were applied.				

Any of the measurement methods mentioned in Table 9 may be selected by the manufacturer to assess the EUT (see Figure 4 and Figure 5).