भारतीय मानक
Indian Standard

IS 6873 (Part 2/Sec 2) : 2024
CISPR 14-2 : 2020

रेडियो व्यवधान लक्षणों की मापन पद्धतियाँ एवं सीमाएँ

भाग 2 विधुत चुम्बकीय संगतता (ईएमसी) — घरेलू साधित्र, विधुत संयंत्र और समान उपकरणों के लिए अपेक्षाएँ

अनुभाग 2 प्रतिरक्षा — पारिवारिक उत्पादों के उपयोग हेतु मानक

(पाँचवां पुनरीक्षण)

Limits and Methods of Measurement of Radio Disturbance Characteristics

Part 2 Electromagnetic Compatibility (EMC) — Requirements for Household Appliances, Electric Tools and Similar Apparatus

Section 2 Immunity — Product Family Standard

(Fifth Revision)

ICS 33.100.20

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Electromagnetic Compatibility Sectional Committee, LITD 09

NATIONAL FOREWORD

This Indian Standard (Part 2/Sec 2) (Fifth Revision) which is identical to CISPR 14-2 : 2020 ‘Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 2: Immunity — Product family standard’ issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Electromagnetic Compatibility Sectional Committee and approval of the Electronics and Information Technology Division Council.

This standard was first published in 1977 and was largely based on CISPR 14. It was subsequently revised in 1999, 2009, 2015 and 2019. First revision was based on CISPR 14 : 1993. Second revision of this standard was identical to CISPR 14-2 : 2007. Third revision of this standard was identical to CISPR14-2 : 2008. Forth revision of this was identical to CISPR14-2 : 2015. This fifth revision has been undertaken to align it with the latest version of CISPR 14-2 : 2020.

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

a) Extension of the frequency range for radiated immunity above 1 GHz;

b) An advanced categorisation of equipment;

c) Revision of general test conditions and addition of new specific test conditions (for example, for robotic equipment);

d) Clarification of requirements applicable to equipment incorporating radio functions;

e) Addition of requirements for wired network ports;

f) Revision of definitions and addition of new ones;

g) Delete requirements referring to statistical evaluation; and

h) Alignment with CISPR 14-1, where applicable.

The text of the IEC standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminologies and conventions are, however, not identical to those used in the Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’; and

b) Comma (,) has been used as a decimal marker, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their respective places, are listed below along with their degree of equivalence for the editions indicated. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

International Standards	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC 60050-161 International electrotechnical vocabulary (IEV) — Part 161: Electromagnetic compatibility	IS 1885 (Part 85) : 2003/IEC 60050-161 : 1990 Electrotechnical vocabulary: Part 85 Electromagnetic compatibility	Identical

International Standards	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC 61000-4-2 : 2008 Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test	IS 14700 (Part 4/Sec 2) : 2018/ IEC 61000-4-2 : 2008 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques, Section 2 Electrostatic discharge immunity test (*second revision*)	Identical
IEC 61000-4-3 : 2006 Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test AMD 1 : 2007 AMD 2 : 2010	IS 14700 (Part 4/Sec 3) : 2023/ IEC 61000-4-3 : 2020 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques, Section 3 Radiated, radio-frequency electromagnetic field immunity test (*second revision*)	Identical
IEC 61000-4-4 : 2012 Electromagnetic compatibility (EMC) — Part 4-4: Testing and measurement techniques — Electrical fast transient/burst immunity test	IS 14700 (Part 4/Sec 4) : 2018/ IEC 61000-4-4 : 2012 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques, Section 4 Electrical fast transient/ burst immunity test (*second revision*)	Identical
IEC 61000-4-5 : 2014 Electromagnetic compatibility (EMC) — Part 4-5: Testing and measurement techniques — Surge immunity test	IS 14700 (Part 4/Sec 5) : 2019/ IEC 61000-4-5 : 2017 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques, Section 5 Surge immunity test (*first revision*)	Identical
IEC 61000-4-6 : 2013 Electromagnetic compatibility (EMC) — Part 4-6: Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields	IS 14700 (Part 4/Sec 6) : 2016/ IEC 61000-4-6 : 2013 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques, Section 6 Immunity to conducted disturbances, induced by radio-frequency fields	Identical
IEC 61000-4-11 : 2020 Electromagnetic compatibility (EMC) — Part 4-11: Testing and measurement techniques — Voltage dips, short interruptions and voltage variations immunity tests	IS 14700 (Part 4/Sec 11) : 2021/ IEC 61000-4-11 : 2020 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques, Section 11 Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase (*first revision*)	Identical
CISPR 14-1 : 2020 Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 1: Emission	IS 6873 (Part 2/Sec 1) : 2023 Limits and methods of measurement of radio disturbance characteristics: Part 2 Electromagnetic compatibility (EMC) — Requirements for household appliances, electric tools and similar apparatus, Section 1 Emission (*fourth revision*)	Identical

The Committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard: For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

International Standard	*Title*
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 emissions and immunity measurements in fully anechoic rooms (FARs)

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

CONTENTS

INTRODUCTION

The intention of this document 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.

Indian Standard

LIMITS AND METHODS OF MEASUREMENT OF RADIO DISTURBANCE CHARACTERISTICS

PART 2 ELECTROMAGNETIC COMPATIBILITY (EMC) — REQUIREMENTS FOR HOUSEHOLD APPLIANCES, ELECTRIC TOOLS AND SIMILAR APPARATUS

SECTION 2 IMMUNITY — PRODUCT FAMILY STANDARD

(Fifth Revision)

1 Scope

This part of CISPR 14 specifies the electromagnetic immunity requirements in the frequency range 0 Hz to 400 GHz that apply to appliances, electric tools and similar apparatus as specified below, whether powered by AC or DC (including a battery).

This document specifies immunity requirements for continuous and transient electromagnetic disturbances, both conducted and radiated.

Unless otherwise specified, this document is applicable to all equipment in the scope of CISPR 14-1, namely:

- household appliances or similar apparatus;

  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;
  – on farms;
  – by clients in hotels and other residential type environments;
  – for induction cooking or air conditioning, 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 equipment;
  – electric/electronic toys;
  – personal care and beauty care appliances;
  – automatic goods-dispensing machines;
  – entertainment machines;
  – cine or slide projectors;
  – battery chargers and external power supplies for use with products under the scope of this document;
  – electric fence energisers.

Included in the scope of this document are also microwave ovens for domestic use or catering.

Equipment which incorporate radio transmit/receive functions are included in the scope of this document.

NOTE 4 For handling cases where equipment under the scope of this document is combined with transmit and/or receive radio functions, see Clause 8.

Excluded from the scope of this document are:

– equipment for which all electromagnetic immunity requirements are explicitly formulated in other CISPR or IEC standards;

NOTE 5 Examples are:

- luminaires, including portable luminaires for children, discharge lamps, LED lamps and other lighting devices under the scope of IEC 61547 (but see 8.7);
- multimedia equipment under the scope of CISPR 35;
- mains communication devices, as well as baby surveillance systems;
- arc welding equipment.

– equipment intended to be part of the fixed electrical installation of buildings (e.g. fuses, circuit breakers, cables and switches);

– medical electrical equipment, including those in the scope of CISPR 14-1;

– equipment used only in industrial environment;

– equipment intended to be used exclusively in locations where special electromagnetic conditions exist (e.g. high electromagnetic fields nearby broadcast transmitting stations or high energy pulses nearby power generation stations);

– equipment intended to be used exclusively on a vehicle, ship, boat or aircraft;

– the effects of electromagnetic phenomena relating to the safety of apparatus (see IEC 60335 series);

Also excluded from the scope of this document is AC single-phase equipment with a rated voltage higher than 250 V between phase and neutral and AC multi-phase equipment with rated voltage higher than 480 V.

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

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.

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic compatibility*

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 61000-4-5:2014/AMD1:2017

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 61000-4-11:2020, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

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 emissions and immunity measurements in fully anechoic rooms (FARs)*

CISPR 14-1:2020, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

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.

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

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
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.

3.2.2
equipment under test
EUT
equipment being evaluated according to the requirements of this document

3.2.3
system under test
EUT and auxiliary equipment which are tested together in accordance with the requirements of this document

Note 1 to entry: The system under test can be made by one or more EUTs, and can also include auxiliary equipment (see 3.2.7).

3.2.4
test system
combination of instruments, ancillary equipment, associated equipment and test environment used to test the system under test according to the specifications of a test method

Note 1 to entry: Examples of elements part of the test system are disturbance generators and amplifiers, coupling and decoupling networks, coupling planes, test chambers and monitoring devices.

3.2.5
ancillary equipment
transducer connected to a measuring receiver or (test) signal generator and used in the disturbance signal transfer between the EUT and the measuring or test equipment

EXAMPLE Coupling and decoupling networks, attenuators and antennas.

[SOURCE: CISPR 16-2-3:2016, 3.1.2, modified – Definition rephrased and example added.]

3.2.6
associated equipment
AE
equipment that is not part of the system under test but needed to exercise and/or monitor the EUT

EXAMPLE A control unit exchanging data and/or transferring power to the EUT through a wired interface (e.g. via Ethernet or USB), a data logger or an audio/video system.

Note 1 to entry: AE may be either local (within the test system) or remote.

[SOURCE: CISPR 16-2-3:2016, 3.1.5, modified – Definition rephrased and example and Note added.]

3.2.7
auxiliary equipment
AuxEq
peripheral equipment that is part of the system under test

EXAMPLE An accessory providing additional functions to a piece of equipment, a wired remote control, an external battery, an external power supply or a laptop providing a compatible USB power port.

Note 1 to entry: Certain auxiliary equipment is used to achieve the normal operating conditions of the EUT during testing but it is not provided or specified for use with the EUT. Accordingly, whilst part of the system under test, such auxiliary equipment is not part of the EUT.

[SOURCE: CISPR 16-2-3:2016, 3.1.6, modified – Example and note added.]

3.2.8
mains operated equipment
equipment which is not battery operated equipment

3.2.9
battery operated equipment
equipment which is operated only from batteries and cannot perform its intended function when connected to the mains supply, either directly or via an external power supply (EPS) unit

3.2.10
mains operation
condition where the equipment is powered from the 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 mains supply is mains operation.

3.2.11
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 mains supply, either directly or via an external power supply (EPS) unit

3.2.12
port
physical interface of the system under test through which electromagnetic energy propagates

Note 1 to entry: See Figure 1.

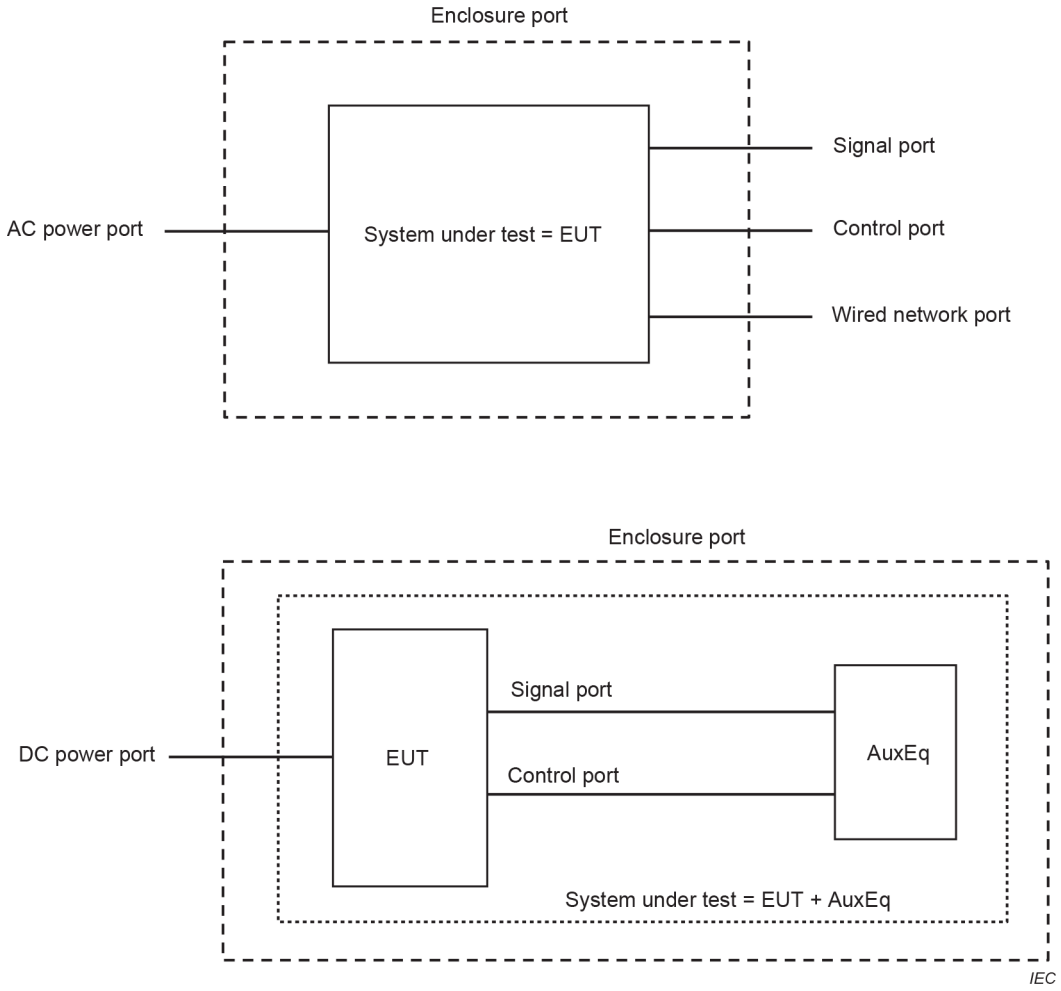


Figure 1 – Examples of ports

3.2.13
enclosure port
physical boundary of the system under test through which electromagnetic fields may radiate or impinge

3.2.14
power port
port at which a conductor or cable, carrying the electrical input/output power needed for the operation (functioning), is connected to the equipment

Note 1 to entry: A power port may supply either AC or DC current.

[SOURCE: IEC 61000-6-1:2016, 3.4, modified – Note added]

3.2.15
signal/control port
port at which a conductor or cable intended to carry signals is connected to the equipment

EXAMPLE Analog inputs, outputs and control lines; data buses; communication networks, etc.

[SOURCE: IEC 61000-6-1:2016, 3.3]

3.2.16
wired network port
port 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]

3.2.17
toy
product 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.

3.2.18
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.

3.2.19
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.

3.2.20
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.

3.2.21
representative load
load which is not provided (sold) with the equipment but it is used to exercise the EUT as specified in the relevant test conditions

Note 1 to entry: Examples are a resistive load or a battery used to load a battery charger output terminals, a resistive load connected to a secondary coil to exercise an inductive power transfer source or a real inductive power transfer client. It is common that a representative load is an apparatus commercially available or specified in the instructions for use.

3.2.22
representative source
apparatus which is not provided (sold) with the equipment but it is used to power the EUT at its rated voltage in order to obtain the relevant test conditions

Note 1 to entry: Examples are an EPS or an inductive power source.

Note 2 to entry: This is generally an apparatus commercially available or specified in the instructions for use.

3.2.23
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.

3.2.24
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.

3.2.25
radio transmitter
device producing radio-frequency energy intended to be radiated by an antenna, normally for the purpose of radio communication

[SOURCE: IEC 60050-713:1998, 713-08-01, 1, modified – "Apparatus" replaced by "device".]

3.2.26
radio receiver
device with associated antenna or including an antenna, used to select the desired radio-frequency signals from incident radio-frequency radiation, to amplify them, demodulate them and if necessary convert the recovered signals into a usable form by equipment in the scope of this document

3.2.27
extra low voltage
voltage that does not exceed 50 V between conductors and between conductors and earth, when the equipment is supplied at rated voltage

[SOURCE: IEC 60335-1:2010, 3.4.1, modified – Deletion of "supplied from a source within the appliance".]

3.2.28
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.

3.3 Abbreviated terms

AC Alternating Current
AE Associated Equipment
AuxEq Auxiliary Equipment
CDN Coupling and Decoupling Network
DC Direct Current
EPS External Power Supply
ESD ElectroStatic Discharge
EUT Equipment Under Test
FAR Fully Anechoic Room
IR Infrared (Light)
RF Radio Frequency

4 Classification of apparatus

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

4.2 Category I: equipment containing no electronic control circuitry.

EXAMPLES Appliances, tools and toys that contain no electronic control circuits and only electromechanical components such as switches, thermostats, brush motors, induction motors, heating elements, lighting toys containing only batteries and LED.

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

4.3 Category II: mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz.

4.4 Category III: battery operated equipment not included in Category I.

EXAMPLES Appliances, tools and toys powered by batteries and that include a microprocessor to provide a selection of functions.

NOTE The assignment to Category III is independent of the clock frequency.

This category also includes equipment provided with rechargeable batteries, which can be charged, directly or indirectly, from the mains. Accordingly, this equipment shall also be subjected to the test requirements for mains operated equipment but only when testing the charging function.

If the equipment can operate its intended functions when connected, directly or indirectly to the mains, then it is not battery operated. Accordingly, it shall be classified as Category II, Category IV or Category V, as applicable, and subjected to the corresponding test requirements when in mains operation.

4.5 Category IV: mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 15 MHz but lower than or equal to 200 MHz.

4.6 Category V: mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 200 MHz.

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 61000-4-2:2008, 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 61000-4-2:2008

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.

To identify points for applying the discharges the requirements of IEC 61000-4-2:2008 shall be followed.

5.2 Fast transients

Fast transient tests are carried out according to basic standard IEC 61000-4-4:2012, for 2 min with a positive polarity and for 2 min with a negative polarity, according to the following Table 2, Table 3 and Table 4.

Table 2 – Signal ports, control ports and wired network 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 61000-4-4:2012
Applicable only to ports interfacing with cables whose total length can exceed 3 m according to the instructions for use.		

Table 3 – Input and output DC 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 61000-4-4:2012
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 DC power input port intended for use with an AC – DC power adaptor shall be tested on the AC power input of the AC – DC power adaptor specified in the instructions for use or, where none is specified, using an AC – DC power adaptor that meets the apparatus specifications. For DC input and output ports intended to be connected permanently, the test is only applicable to cables longer than 3 m. Wired network ports, which also provide DC power (e.g. Power Over Ethernet) shall be treated as wired network ports only.		

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

Table 4 – Input and output AC 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 61000-4-4:2012
For extra low voltage AC ports and output AC ports, this testing is only applicable to ports interfacing with cables whose total length can exceed 3 m according to the instructions for use. The specifications of this table shall also apply to AC power ports that facilitate communications (e.g. mains signalling).		

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

5.3 Injected currents, 0,15 MHz to 230 MHz

Injected current tests are carried out according to the basic standard IEC 61000-4-6:2013, and according to the following Table 5, Table 6 and Table 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 Some refrigerators are an example of large EUT.

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

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

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

Table 5 – Signal ports, control ports and wired network ports

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 1 V (RMS) (unmodulated) 150 Ω source impedance	IEC 61000-4-6:2013
Applicable only to ports interfacing with cables whose total length may exceed 3 m according to the instructions for use.		

Table 6 – Input and output DC power ports

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 %AM	0,15 MHz to 230 MHz 1 V (RMS) (unmodulated) 150 Ω source impedance	IEC 61000-4-6:2013
Not applicable to battery operated appliances that cannot be connected to the mains while in use. Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging. Apparatus with a DC power input port intended for use with an AC – DC power adaptor shall be tested on the AC power input of the AC – DC power adaptor specified in the instructions for use or, where none is specified, using an AC – DC power adaptor that meets the apparatus specifications. For DC input and output ports intended to be connected permanently, the test is only applicable to cables longer than 3 m. Wired network ports, which also provide DC power (e.g. Power Over Ethernet) shall be treated as wired network ports only.		

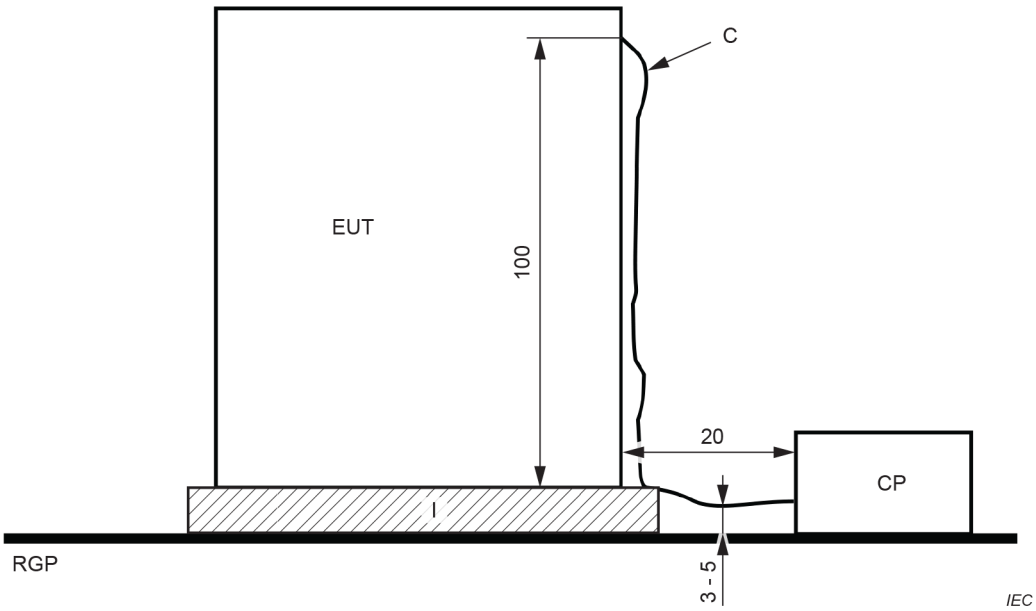
A coupling/decoupling network shall be applied for testing DC power ports.

Table 7 – Input and output AC power ports

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 3 V (RMS) (unmodulated) 150 Ω source impedance	IEC 61000-4-6:2013
For extra low voltage AC ports and output AC 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. The specifications of this table shall also apply to AC power ports that facilitate communications (e.g. mains signalling).		

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

Dimensions in centimetres



RGP = Reference ground plane I = Insulating support

CP = CDN or clamp C = Mains cable

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

5.4 Injected currents, 0,15 MHz to 80 MHz

Injected current tests are carried out according to the basic standard IEC 61000-4-6:2013, and according to the following Table 8, Table 9 and Table 10.

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

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

Table 8 – Signal ports, control ports and wired network ports

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 1 V (RMS) (unmodulated) 150 Ω source impedance	IEC 61000-4-6:2013
Applicable only to ports interfacing with cables whose total length can exceed 3 m according to the instructions for use.		

Table 9 – Input and output DC power ports

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 1 V (RMS) (unmodulated) 150 Ω source impedance	IEC 61000-4-6:2013
Not applicable to battery operated appliances that cannot be connected to the mains while in use. Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging. Apparatus with a DC power input port intended for use with an AC – DC power adaptor shall be tested on the AC power input of the AC – DC power adaptor specified in the instructions for use or, where none is specified, using an AC – DC power adaptor that meets the apparatus specifications. For DC input and output power ports intended to be connected permanently, the test is not applicable provided the instructions require external cables not to be longer than 3 m. Wired network ports, which also provide DC power (e.g. Power Over Ethernet) shall be treated as wired network ports only.		

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

Table 10 – Input and output AC power ports

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 3 V (RMS) (unmodulated) 150 Ω source impedance	IEC 61000-4-6:2013
For extra low voltage AC ports and output AC ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the instructions for use. The specifications of this table shall also apply to AC power ports that facilitate communications (e.g. mains signalling).		

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

5.5 Radio frequency electromagnetic fields, 80 MHz to 6 GHz

Radio frequency electromagnetic field tests are carried out according to the basic standard IEC 61000-4-3:2006, IEC 61000-4-3:2006/AMD1:2007, IEC 61000-4-3:2006/AMD1:2007/ AMD2:2010, or IEC 61000-4-22:2010 or IEC 61000-4-20:2010, and according to Table 11.

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

Table 11 – Enclosure ports

Environmental phenomenon	Test specifications	Test set-up
Radio-frequency electromagnetic field, 1 kHz, 80 % AM (swept test)	80 MHz to 6 GHz [a] 3 V/m (RMS) (unmodulated)	IEC 61000-4-3:2006, IEC 61000-4-3:2006/AMD1:2007 and IEC 61000-4-3:2006/AMD2:2010, or IEC 61000-4-22:2010, or IEC 61000-4-20:2010 [b]

[a] The highest frequency up to which tests need to be performed depends on the category of equipment, see 7.2.

[b] 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).

5.6 Surges

Surge immunity tests are carried out according to basic standard IEC 61000-4-5:2014 and IEC 61000-4-5:2014/AMD1:2017, and according to Table 12.

Table 12 – Input AC power ports

Environmental phenomenon	Test specifications	Test set-up
Surge	1,2/50 (8/20) μs T_r/T_d 2 kV line-to-earth with 12 Ω Impedance 1 kV line-to-line with 2 Ω Impedance	IEC 61000-4-5:2014 and IEC 61000-4-5:2014/AMD1:2017
The specifications of this table shall also apply to AC power ports that facilitate communications (e.g. mains signalling).		

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

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

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

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

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

Table 13 – Wired network ports

Environmental phenomenon	Test specifications	Test set-up
Surge	1,2/50 µs (8/20 µs) T_r/T_d 1 kV line-to-earth (unshielded) 0,5 kV shield-to-earth (shielded)	IEC 61000-4-5:2014 and IEC 61000-4-5:2014/AMD1:2017 (including coupling resistance)
Only applicable to wired network ports that can connect directly to cables leaving the building structure. NOTE Examples of ports that meet the above condition are typically those supporting xDSL, PSTN and similar communications. LAN and similar are examples of ports that do not meet the above condition.		

Wired network ports which also provide DC power (e.g. Power Over Ethernet) shall be treated as wired network ports only.

5.7 Voltage dips

Tests concerning voltage dips are carried out according to basic standard IEC 61000-4-11:2020, and according to the following Table 13. The voltage interruption tests according to IEC 61000-4-11:2020 are not performed.

Table 14 – Input AC power ports

Environmental phenomena		Test level in % U_T	Durations for voltage dips		Test set-up
			50 Hz	60 Hz	
Voltage dips in % U_T	100	0	0,5 cycle	0,5 cycle	IEC 61000-4-11:2020 The voltage changes shall occur at zero crossing.
	60	40	10 cycles	12 cycles	
	30	70	25 cycles	30 cycles	
U_T is the rated voltage of the EUT.					

6 Performance criteria

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

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

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

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

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

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

7 Applicability of immunity tests

7.1 General

7.1.1 The immunity tests for equipment covered by this document shall be applied to the relevant ports of the EUT, as applicable (see 7.2), following the specifications and requirements given in Clause 5, Table 1 to Table 14.

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

Each of the tests specified in this document shall be conducted individually. The order in which the tests are conducted is the sole responsibility of the test laboratory.

7.1.2 It may be determined from consideration of the electrical characteristics and usage of a particular equipment that some of the tests are inappropriate, and therefore unnecessary. In such cases, the decision not to test and the reasons behind that decision shall be recorded in the test report.

7.2 Application of tests for the different categories of apparatus

7.2.1 General

The EUT shall be subjected to the tests specified in 7.2.2 to 7.2.6, as applicable, and meet or exceed the corresponding performance criteria, the category of equipment being determined from Clause 4.

The performance observed during the assessment of the EUT shall be noted in the test report.

7.2.2 Category I

Category I equipment is deemed to comply with the immunity requirements of this document without testing.

7.2.3 Category II

Table 15 – Immunity tests applicable to Category II

Environmental phenomenon	**Performance criterion**	**Test specifications** (see subclause)
Electrostatic discharges	B	5.1
Electric fast transients	B	5.2
Injected currents 150 kHz to 230 MHz	A	5.3
Surges	B	5.6
Voltage dips	C	5.7

7.2.4 Category III

Table 16 – Immunity tests applicable to Category III

Environmental phenomenon	**Performance criterion**	**Test specifications** (see subclause)
Electrostatic discharges	B/C [a]	5.1
Electric fast transients	B	5.2
Injected currents 150 kHz to 80 MHz	A	5.4
Radio frequency electromagnetic fields [b, c] 80 MHz to (F) MHz	A	5.5
Surges	B	5.6

[a] Performance criterion C may be applied to toys not using score or data entered by the user (e.g. musical soft toys and sounding toys).

[b] The frequency (F), up to which this test needs to be performed, is determined from either Table 17 or Table 18, according to the principle for distinguishing between categories IV and V.

[c] For Category III toys, the radio frequency electromagnetic fields test shall be applicable only for ride on toys.

7.2.5 Category IV

Table 17 – Immunity tests applicable to Category IV

Environmental phenomenon	**Performance criterion**	**Test specifications** (see subclause)
Electrostatic discharges	B	5.1
Electric fast transients	B	5.2
Injected currents 150 kHz to 80 MHz	A	5.4
Radio frequency electromagnetic fields 80 MHz to 1 000 MHz	A	5.5
Surges	B	5.6
Voltage dips	C	5.7

7.2.6 Category V

Table 18 – Immunity tests applicable to Category V

Environmental phenomenon	Performance criterion	Test specifications (see subclause)
Electrostatic discharges	B	5.1
Electric fast transients	B	5.2
Injected currents 150 kHz to 80 MHz	A	5.4
Radio frequency electromagnetic fields 80 MHz to 6 GHz	A	5.5
Surges	B	5.6
Voltage dips	C	5.7

7.2.7 Exceptions

Performance criterion C may be applied to surge testing, if such degradation of performance does not affect the ability of the user to operate the equipment as intended.

NOTE Surges can trigger overvoltage protection circuits that shutdown the equipment. The approach to recover the operating conditions interrupted by the surge depends on the particular type of equipment (e.g. attended or not). As long as the above principle is satisfied such occurrences are acceptable because not frequent.

8 Test conditions

8.1 General

The tests shall be carried out within the specified or typical environmental range for the equipment and with the EUT operated from the intended power supply sources according to 8.2 and/or 8.3, as appropriate.

NOTE 1 Variations of the environmental conditions and power supply can influence the test results.

Testing shall be performed in the operating mode(s) expected to be the most susceptible consistent with normal use, in order to assess all relevant functions. If such operating modes are not specified at the time of testing, the EUT shall be tested in all relevant operating modes expected for intended use.

To reduce the amount of testing, it is recommended to select one or more modes of operation that exercise multiple functions during the application of each test.

NOTE 2 Operating modes can be made by the combination of different functions operated simultaneously (e.g. for a vacuum cleaner the nozzle to beat a carpet can be operated in addition to the suction function).

NOTE 3 Certain functions can be operated only simultaneously (e.g. the heating function of certain heating appliances can be active only when associated with a ventilation function that maintains the heating elements within the appropriate temperature range).

Unless otherwise specified in this document, the tests shall be made while the equipment is operated in the load and ambient conditions specified in Annex A of CISPR 14-1:2020.

NOTE 4 For example a tumble dryer is loaded with the same cotton sheets specified in A.1.12 of CISPR 14-1:2020.

Where the test conditions are not specified in CISPR 14-1, these shall be obtained from the instructions for use, which in any case take precedence. Alternatively, RF continuous disturbances (electromagnetic fields and current injection) may also be applied while, at random, the selected modes of the EUT are sequentially set into operation, ensuring that the operator does not influence the result.

NOTE 5 See 8.6 for equipment having functions within the scope of different standards.

8.2 Mains operation

8.2.1 Voltage at the AC mains port

During the tests, the EUT shall be operated at the rated voltage specified for the equipment.

For single-phase equipment with a rated voltage range in the range between:

- 100 V to 127 V, testing shall be done at one nominal voltage within this range; the recommended test voltage is 120 V;
- 200 V to 240 V, testing shall be done at one nominal voltage within this range; the recommended test voltage is 230 V;
- 100 V to 240 V, testing shall be done at one nominal voltage within the range 100 V to 127 V, or at one nominal voltage within the range 200 V to 240 V. However, the user of this document may specify that the equipment is tested twice; once at one nominal voltage within the range 100 V to 127 V and once within the range 200 V to 240 V. This decision shall be recorded in the test report.

Where applicable, the same applies to the AC mains port of EPS.

Multi-phase equipment shall be tested applying the same principles set-out above.

For three-phase equipment with a rated voltage range in the range between:

- 200 V to 240 V, testing shall be done at one nominal voltage within this range; the recommended test voltage is 220 V;
- 380 V to 450 V, testing shall be done at one nominal voltage within this range; the recommended test voltage is 400 V.

8.2.2 Frequency at the AC mains port

During the tests, the EUT shall be operated at the rated frequency specified for the equipment.

If the equipment has more than one rated frequency (e.g. 50 Hz and/or 60 Hz), then the EUT shall be tested at one of these frequencies only.

If the equipment has a rated frequency range (e.g. 50 Hz to 60 Hz), then the EUT shall be tested at one frequency within that range.

8.3 DC operation

8.3.1 Battery operation

When testing an EUT for battery operation, the type of batteries used and their connection shall be as specified in the instructions for use. If the instructions provide for different ratings of batteries to be used, the batteries with the highest capacity (e.g. in Ah) should be used.

Fully charged batteries shall be used when starting each test. During the test, the battery condition shall be adequate to maintain normal operating conditions.

If the battery is charged from the AC mains supply, the equipment shall be treated in this operation mode as mains operated equipment.

8.3.2 Operation from a DC supply other than a battery

During the tests, the EUT shall be operated at the rated voltage specified for the DC powered equipment using a representative source.

DC powered equipment which operate from a dedicated DC supply unit (e.g. EPS) shall be tested using the DC supply unit supplied, specified or recommended in the instructions for use. Where the DC supply unit is not specified nor recommended in the instructions for use, or not made available at the time of testing, a representative source providing the rated voltage and current specified for the equipment shall be used. The representative source chosen shall be adequate to meet the specifications of the EUT and shall meet the performance criteria of this document when operated in combination with the DC powered equipment.

The representative source used shall be documented in the test report.

8.4 Specific test conditions

8.4.1 Control settings

If the control of the equipment can be set at different levels (e.g speed, temperature), a setting below maximum is recommended, preferably at approximately 50 % level.

8.4.2 Auxiliary equipment

If the equipment can be connected to the auxiliary equipment, then the EUT shall be tested while connected to the minimum configuration of auxiliary equipment units necessary to exercise all existing ports. If the auxiliary equipment is not included with the equipment or not provided at the time of testing, representative samples that meet the specifications of the instructions for use of the equipment shall be used.

When the EUT and the auxiliary equipment are sold separately and are to be used with different models of equipment (e.g. video toy cartridges), the auxiliary equipment shall be tested with at least one representative hosting equipment that meets the specifications of the auxiliary equipment.

8.4.3 Specific equipment

8.4.3.1 Microwave ovens

Appliances with a microwave oven function shall be loaded with (1,0 ± 0,5) l tap water; for long lasting tests the application of the disturbance may be paused to refill the load.

8.4.3.2 Toys and experimental kits

Toys are operated under normal operation conditions taking into account the foreseeable way in which the toy would be used by children. If applicable, the EPS supplied with the toy shall be used. If the EPS is not made available with the toy or none is recommended for use, a representative source shall be used.

Experimental kits intended for education and play are not required to be tested.

8.4.3.3 Robotic equipments

8.4.3.3.1 General

Batteries for mobile parts shall be fully charged when starting each test. During the test, the battery condition shall be adequate to maintain normal operating conditions. If the battery charge is depleted down to a level for which normal operating conditions are not maintained, in order to complete the test the battery shall be recharged or replaced with one of the same type which is fully charged.

Where the mobile part is powered through a cable, the cable shall be of the necessary length to enable the movements of the mobile part within the test setup as provided in 8.4.3.3.2 and 8.4.3.3.3.

8.4.3.3.2 Mobile parts – Horizontal operation

This type of robotic equipment is intended to move according to a pattern parallel to the ground or with an inclination less than 45°.

NOTE 1 Examples are robotic cleaners that move on the floor of a house or the benchtop of a kitchen.

During testing, the mobile part of the robotic equipment shall be maintained stationary, with the electronic control (microprocessors and sensors) operating in order to fulfil its intended functions. Motors (e.g. brush motors, traction motors, suction motors) shall be operating under normal conditions. Tools and traction means (e.g. brushes, wheels or tracks) shall be operated continuously, but without mechanical load.

NOTE 2 Robotic equipment which utilise a program that gives the equipment a kind of artificial intelligence might not be able to operate the intended functions while stationary. In such case, a special software mode (e.g. “EMC testing mode”) to be included in the software by the manufacturer is generally used to achieve the above mentioned operating conditions.

The mobile part shall be placed according to the specifications of the applicable test methods.

Where robotic equipment have sensors that stop the intended functions when not in contact with the surface they operate on (e.g. in order to prevent access to hazardous moving parts), a support can be used to achieve the above mentioned conditions (e.g. an idle roller).

The roller or any support used to maintain the mobile part of the robotic equipment to the required distance (e.g. from reference or coupling planes) shall be made of a material suitable for the selected test method. If the distance cannot be as specified in the basic standard (e.g. from the ESD horizontal coupling plane) the minimum possible distance shall be kept.

NOTE 3 The idle roller has no own drive, it only supports the robotic equipment and allows the wheels to turn while the equipment stays on the spot. The roller can provide an alternative or be of complement to the EMC testing mode software.

8.4.3.3.3 Mobile parts – Operation other than horizontal

This robotic equipment is intended to move according to a pattern not parallel to the ground, with an inclination greater than 45 degrees°, but typically vertical.

NOTE 1 Examples are robotic window cleaners that move on one or both sides of a window.

During testing the mobile part of the robotic equipment shall be operated freely on a vertical test surface having a size (1,0 ± 0,2) m × (1,0 ± 0,2) m, unless otherwise specified in 8.4.3.3.4.

For the radio frequency electromagnetic field test the test surface shall fit within the UFA where the specified field test level is established.

For electrostatic discharges the test surface (not any of its supports) shall be kept at (0,1 ± 0,02) m from the vertical coupling plane, unless otherwise specified in 8.4.3.3.4. The discharges shall be applied when the mobile part approaches the side of the coupling plane being discharged on.

The electronic control (microprocessors and sensors) shall be operating in order to fulfil the intended functions. Motors (e.g. brush motors, traction motors, suction motors) shall be operating under normal conditions. Tools and traction means (e.g. brushes, wheels or tracks) shall be operated continuously.

NOTE 2 It is expected that the robotic equipment is able to operate normally on the test surface without particular arrangements. Otherwise, a special software mode (e.g. “EMC testing mode”) to be included in the software by the manufacturer is generally used to achieve the above mentioned operating conditions.

The vertical test surface shall be placed and made of a material in accordance to the specifications of the applicable test methods. The surface shall be also sufficiently even in order to keep constant the load of the parts in contact with it.

8.4.3.3.4 Specific test position for robotic equipment

Robotic vacuum cleaners and robotic floor cleaners shall be tested stationary according to 8.4.3.3.2.

Electrical robotic lawn mowers shall be tested stationary according to 8.4.3.3.2.

Robotic window cleaners shall be tested according to 8.4.3.3.3 using a rectangular vertical test surface made of glass. The size of the test surface shall be (1,0 ± 0,2) m × (1,0 ± 0,2) m and its thickness shall be (10 ± 2) mm. However, the thickness may be different if this is necessary to allow the movement of split type window cleaners.

For split type window cleaners during the electrostatic discharges test the 0,1 m distance from the vertical coupling plane shall be measured from the cleaning unit facing the coupling plane and not from the test surface.

Other robotic equipment shall be tested following the requirements of either 8.4.3.3.2 or 8.4.3.3.3, according to the inclination of the intended operating pattern of the mobile part.

8.4.3.3.5 Stationary parts

The stationary parts of robotic equipment, if any, shall be tested based on the category assigned to its combination with the mobile part and shall be placed according to the intended use.

NOTE 1 For example, the docking station and docked robotic vacuum cleaner are placed as floor standing equipment; a docking station and robotic equipment for kitchen counter use are placed as table-top equipment.

NOTE 2 When sitting with the stationary part the mobile part might power down significant parts of its circuitry and high frequency clocks might not be active.

Stationary parts of robotic equipment (e.g. a docking station) shall be tested in the following conditions:

1) Mobile part docked
   - charging the battery of the mobile part continuously; a fully discharged battery shall be used when starting the test;
   - operating any other function that may be active when the mobile part is docked;
2) Mobile part not docked
   - operating any function that may be active when the mobile part is not docked (e.g. border detection or mobile part detection).

8.5 Test procedures

For manual selection of the modes of operation, the application of the disturbance may be paused, ensuring that the operator does not influence the test results.

In cases where the EUT operates according to an automatic programme, the scan for RF continuous disturbance tests shall be started just after the programme has started. However, there is no requirement to synchronise the start of the test scan with the start of the programme. Where the programme lasts longer than the scan time, the scan shall be repeated until the programme is finished.

If it is necessary to modify the test setup of a RF continuous test, the operation of the EUT shall be paused, if possible, until the scan with the new setup starts.

NOTE For example some components of the test system might have to be changed in order to cover the entire frequency range (e.g. two antenna from 80 MHz to 6 000 MHz).

The test configuration, operating modes and test procedure shall be noted in the test report.

8.6 Multifunction equipment

Unless otherwise stated in this document, multifunction equipment may be required to comply with clauses in this document and clauses in other standards. In this case, each function subjected to clauses of this document shall be operated in isolation from the functions subjected to clauses of the other standards, if this can be achieved without modifying the EUT internally. Where it is not practical to isolate a particular function, or where doing so would result in the EUT being unable to fulfil its functions, then the EUT shall be tested with the minimum number of functions operative, consistent with the equipment's intended use.

NOTE 1 An example of a multifunction equipment required to be tested to the relevant clauses of this document and another standard is a fridge with an integrated screen for displaying TV programs or playing music. The fridge (food conservation function) would need to comply with the various requirements in this document and the multimedia function would need to comply with the provisions of CISPR 35.

Equipment tested as above shall be considered compliant when each of the functions subjected to this document has been found to be compliant with the requirements in this document.

NOTE 2 For multifunction equipment having all its functions subjected to this document see 8.1 and 8.4.

8.7 Equipment with built-in lighting function

Equipment with a lighting function shall be tested with the lighting function switched on.

If the light is user adjustable, the light shall be set at the medium setting. Where a medium setting is not available, the light shall be set at the first available setting below mid-range.

NOTE 1 For example a light with only two individual settings (max and min) is set to the minimum; a light with four settings is set to the first setting above the minimum.

If all requirements of this document are met when testing in the above conditions, 8.6 need not be applied. Otherwise, if 8.6 can be applied because the lighting function of such equipment can be tested separately, the lighting function may be tested according to the requirements in IEC 61547 with the remaining equipment being tested according to this document with the lighting function not activated.

The lighting function need not be tested, if it is not intended to be continuously switched on during normal operation.

NOTE 2 A range hood is an example of a product where the lighting function is intended to be continuously switched on during normal operation. A refrigerator is an example of a product where the lighting function is not intended to be continuously switched on during normal operation, since the light is turned off when the door is closed.

8.8 Equipment incorporating radio functions

Equipment incorporating radio functions shall be tested with these functions disabled, if possible. If it is not possible to disable these radio functions, e.g. because the radio functionality provides the only means of controlling the equipment, testing shall be performed with each radio function(s) enabled in turn or simultaneously. In this case, in order not to affect the test result, it is recommended to apply the corresponding exclusion band(s) for RF continuous disturbances, as given in the EMC standard applicable to the relevant radio function(s).

9 Compliance with this publication

Equipment shall be verified by performing the tests specified in this publication on one or more units.

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

Where this publication gives options for evaluating particular EMC characteristics with a choice of test methods and associated limits, any one of these options may be used.

The equipment complies with the requirements of this publication with respect to the addressed EMC characteristics when one of the test methods returns a test result compliant with the applicable requirements. In any situation where it is necessary to verify the original compliance assessment result, the option originally chosen shall be used to avoid excessive uncertainties induced by applying different test methods.

An EUT which fulfils the applicable requirements specified in this document is deemed to fulfil the requirements in the entire frequency range from 0 Hz to 400 GHz. No tests need be performed at frequencies or for phenomena where no requirements are specified.

10 Test uncertainty

The uncertainty related to the calibration of test instrument and facilities specified in the relevant basic standards provided in Clause 5 need not be recorded in the test report.

In particular, the test parameters and test levels specified in the tables of Clause 5 shall not be changed to take test uncertainty into account.

11 Test report

Sufficient details shall be provided to facilitate reproducibility of the tests. Accordingly, the test report shall include:

– a description of the EUT;
– information about any auxiliary equipment and associated equipment used and their coupling to the EUT;
– which modes of operation has been subject to testing during each type of test, which settings have been applied (e.g. control set to position 3) and the test procedure;
– which ports have been tested and how these ports were exercised, if applicable;
– any special measure taken to ensure compliance (e.g. the use of a shielded cable);
– photographs (or diagram) of test setups;
– information about the components of the test system and their position, where relevant (e.g. distance from the antenna, cables length).
– the performance criteria adopted for each test and the corresponding judgement for each test mode.

Annex A
(informative)

Guidance for permissible degradation

Table A.1 serves as a guide to formulate the permissible degradation of performance of the EUT caused by electromagnetic phenomena.

Table A.1 – Examples of degradations

Functions (non-exhaustive)	Criteria			
	A	B [b]	C1 [c]	C2 [c]
Motor speed	10 % [a]	–	+	–
Torque	10 % [a]	–	+	–
Movement	10 % [a]	–	+	–
Power (consumption, input)	10 % [a]	–	+	–
Switching (change of state)	–	–	+	–
Heating	10 % [a]	–	+	–
Timing (programme, delay, duty cycle)	10% [a]	–	+	–
Stand-by	–	–	[d]	–
Data storage	–	–	[e]	[e]
Sensor functions (signal transmission)	[f]	–	[g]	–
Indicators (visual and acoustic)	[f]	–	[g]	–
Audio function	[f]	–	[g]	–
Illumination	[f]	–	[g]	–

– No change allowed.

\+ Change allowed.

[a] Values are exclusive of the measurement accuracy.

[b] For criterion B, measurement or verification has been performed during the stable operations of the EUT before and after the application of the specified phenomenon.

[c] For criterion C, distinction is made between C1 (before resetting) and C2 (after resetting).

[d] Switching-off is allowed, switching-on is not allowed.

[e] Loss or change of data is allowed.

[f] Lower performance as specified by the manufacturer is allowed, but no loss of correct function.

[g] Loss of correct functions allowed.

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IEC 61000-6-1:2016, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity standard for residential, commercial and light-industrial environments*

IEC 61547, *Equipment for general lighting purposes – EMC immunity requirements*

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

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