



**Industrial, scientific and medical
equipment—Radio-frequency
disturbance characteristics—Limits and
methods of measurement
(CISPR 11:2015+AMD1:2016 (ED.6.1)
MOD)**



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- Australian Communications and Media Authority
 - Australian Industry Group
 - Australian Information Industry Association
 - Consumer Electronics Suppliers Association
 - Department of Defence (Australian Government)
 - Electrical Compliance Testing Association
 - EMC Society of Australia
 - Energy Networks Australia
 - Engineers Australia
 - Free TV Australia
 - Lighting Council Australia
 - National Measurement Institute
 - Wireless Institute Australia
-

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Australian Standard[®]

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equipment—Radio-frequency
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(CISPR 11:2015+AMD1:2016 (ED.6.1)
MOD)**

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PREFACE

This Standard was prepared by the Australian members of Joint Standards Australia/Standards New Zealand Committee TE-003, Electromagnetic Interference, to supersede AS/NZS CISPR 11:2011.

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 identify limits and methods of measurement of electromagnetic disturbance characteristics in ISM radio frequency equipment.

This Standard is an adoption with national modifications and has been reproduced from CISPR 11:2015+AMD1:2016 CSV (ED.6.1), *Industrial, scientific and medical equipment—Radio-frequency disturbance characteristics—Limits and methods of measurement*, and has been varied as indicated to take account of Australian conditions. The modifications are specified in Appendix ZZ.

The variations are related to the 900 MHz ISM band. In Australia, this bandwidth is reduced to 915 MHz to 928 MHz (instead of 902 MHz to 928 MHz).

As this Standard is 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 to define the application of the annex or appendix to which they apply. A normative annex or appendix is an integral part of a standard, whereas an informative annex or appendix is only for information and guidance.

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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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This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.

This Consolidated version of CISPR 11 bears the edition number 6.1. It consists of the sixth edition (2015-06) [documents CISPR/B/628/FDIS and CISPR/B/631/RVD] and its amendment 1 (2016-06) [documents CISPR/B/627/CDV and CISPR/B/639A/RVC]. The technical content is identical to the base edition and its amendment.

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

International Standard CISPR 11 has been prepared by CISPR Subcommittee B: Interference relating to industrial, scientific and medical radio-frequency apparatus, to other (heavy) industrial equipment, to overhead power lines, to high voltage equipment and to electric traction.

This sixth edition introduces and permits type testing on components of power electronic equipment, systems and installations. Its emission limits apply now to low voltage (LV) a.c. and d.c. power ports, irrespective of the direction of power transmission. Several limits were adapted to the practical test conditions found at test sites. They are also applicable now to power electronic ISM RF equipment used for wireless power transfer (WPT), for instant power supply and charging purposes. The limits in the range 1 GHz to 18 GHz apply now to CW-type disturbances and to fluctuating disturbances in a similar, uniform and technology-neutral way. For these measurements, two alternative methods of measurement are available, the traditional log-AV method and the new APD method.

For measurements at LV d.c. power ports of power electronic equipment, a modern implementation of the 150 Ω Delta-network specified in CISPR 16-1-2 has been made available.

This International Standard CISPR 11 has the status of a Product Family EMC standard in accordance with IEC Guide 107, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications* (2014).

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of the base publication and its amendment 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

The main content of this standard is based on CISPR Recommendation No. 39/2 given below:

RECOMMENDATION No. 39/2

Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment

The CISPR

CONSIDERING

- a) that ISM RF equipment is an important source of disturbance;
- b) that methods of measuring such disturbances have been prescribed by the CISPR;
- c) that certain frequencies are designated by the International Telecommunication Union (ITU) for unrestricted radiation from ISM equipment,

RECOMMENDS

that the latest edition of CISPR 11 be used for the application of limits and methods of measurement of ISM equipment.

INTRODUCTION

This CISPR publication contains, amongst common requirements for the control of RF disturbances from equipment intended for use in industrial, scientific, and medical electrical applications, specific requirements for the control of RF disturbances caused by ISM RF applications in the meaning of the definition of the International Telecommunication Union (ITU), see also Definition 3.13 in this International Standard. CISPR and ITU share their responsibility for the protection of radio services in respect of the use of ISM RF applications.

The CISPR is concerned with the control of RF disturbances from ISM RF applications by means of an assessment of these disturbances either at a standardised test site or, for an individual ISM RF application which cannot be tested at such a site, at its place of operation. Consequently, this CISPR Publication covers requirements for conformity assessment of both, equipment assessed by means of type tests at standardised test sites or of individual equipment under in situ conditions.

The ITU is concerned with the control of RF disturbances from ISM RF applications during normal operation and use of the respective equipment at its place of operation (see Definition 1.15 in the ITU Radio Regulations). There, use of radio-frequency energy decoupled from the ISM RF application by radiation, induction or capacitive coupling is restricted to the location of that individual application.

This CISPR publication contains, in 6.3, the essential emission requirements for an assessment of RF disturbances from ISM RF applications at standardised test sites. These requirements allow for type testing of ISM RF applications operated at frequencies up to 18 GHz. It further contains, in 6.4, the essential emission requirements for an in situ assessment of RF disturbances from individual ISM RF applications in the frequency range up to 1 GHz. All requirements were established in close collaboration with the ITU and enjoy approval of the ITU.

However, for operation and use of several types of ISM RF applications the manufacturer, installer and/or customer should be aware of additional national provisions regarding possible licensing and particular protection needs of local radio services and applications. Depending on the country concerned, such additional provisions may apply to individual ISM RF applications operated at frequencies outside designated ISM bands (see Table 1). They also may apply to ISM RF applications operated at frequencies above 18 GHz. For the latter type of applications, local protection of radio services and appliances requires an accomplishment of the conformity assessment by application of the relevant national provisions in the frequency range above 18 GHz in accordance with vested interests of the ITU and national administrations. These additional national provisions may apply to spurious emissions, emissions appearing at harmonics of the operation frequency, and to wanted emissions at the operation frequency allocated outside a designated ISM band in the frequency range above 18 GHz.

Recommendations of CISPR for the protection of radio services in particular areas are found in Annex E of this International Standard.

Definition 1.15 of the ITU Radio Regulations reads as follows:

1.15 *industrial, scientific and medical (ISM) applications (of radio frequency energy):* Operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications.

[ITU Radio Regulations Volume 1: 2012 – Chapter I, Definition 1.15]

Introduction to Amendment 1

This Amendment introduces the fully-anechoic room (FAR) for measurements of the disturbance field strength in the range 30 MHz to 1 GHz on equipment in the scope of CISPR 11.

It contains the complete set of requirements for measurement of radiated disturbances from equipment fitting into the validated test volume of a given FAR. It specifies a separation distance of 3 m and restricts use of the FAR to measurements on table-top equipment.

At the moment the FAR can be used:

- for measurements on table-top equipment fitting into the validated test volume of the given FAR,
- for a separation distance of 3 m only, and
- if the FAR was validated according to CISPR 16-1-4.

The limits for class A and class B group 1 equipment in this CDV base on the limits in the generic emission standards IEC 61000-6-3:2006/AMD 1 (2010) and IEC 61000-6-4:2006/AMD 1 (2010). The limits for class A and class B group 2 equipment were derived using the same approximation formula as used when deriving the limits for the generic emission standards in mid of the years 2000 to 2010. CISPR/H/104/INF, published in 2005, gives detailed explanations how these limits for the FAR were derived.

More detailed background information is still found in CISPR/B/627/CDV.

CISPR/B WG1 in October 2015

AUSTRALIAN STANDARD

Industrial, scientific and medical equipment—Radio-frequency disturbance characteristics—Limits and methods of measurement (CISPR 11:2015+AMD1:2016 (ED.6.1) MOD)**1 Scope**

This International Standard applies to industrial, scientific and medical electrical equipment operating in the frequency range 0 Hz to 400 GHz and to domestic and similar appliances designed to generate and/or use locally radio-frequency energy.

This standard covers emission requirements related to radio-frequency (RF) disturbances in the frequency range of 9 kHz to 400 GHz. Measurements need only be performed in frequency ranges where limits are specified in Clause 6.

For ISM RF applications in the meaning of the definition found in the ITU Radio Regulations (see Definition 3.13), this standard covers emission requirements related to radio-frequency disturbances in the frequency range of 9 kHz to 18 GHz.

NOTE Emission requirements for induction cooking appliances are specified in CISPR 14-1 [1]¹.

Requirements for ISM RF lighting equipment and UV irradiators operating at frequencies within the ISM frequency bands defined by the ITU Radio Regulations are contained in this standard.

Equipment covered by other CISPR product and product family emission standards are excluded from the scope of this standard.

2 Normative references

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

CISPR 16-1-1:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-1:2010/AMD 1:2010

CISPR 16-1-1:2010/AMD 2:2014

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 16-1-4:2010, *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/AMD 1:2012

¹ Figures in square brackets refer to the Bibliography.

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 16-2-3:2010, *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/AMD 1:2010

CISPR 16-2-3:2010/AMD 2:2014

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

CISPR 16-4-2:2011/AMD 1:2014

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

IEC 60601-1-2:2014, *Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral standard: Electromagnetic disturbances – Requirements and tests*

IEC 60601-2-2:2009, *Medical electrical equipment – Part 2-2: Particular requirements for the basic safety and essential performance of high frequency surgical equipment and high frequency surgical accessories*

IEC 60974-10:2014, *Arc welding equipment – Part 10: Electromagnetic compatibility (EMC) requirements*

IEC 61307:2011, *Industrial microwave heating installations – Test methods for the determination of power output*

IEC 62135-2:2007, *Resistance welding equipment – Part 2: Electromagnetic compatibility (EMC) requirements*

ITU Radio Regulations (2012), *Radio regulations, Volume 3 – Resolutions and recommendations, Resolution no. 63* (available at <http://www.itu.int/pub/R-REG-RR-2012>)

3 Terms and definitions

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

3.1

a.c. mains power port

port used to connect to a public low voltage a.c. mains power distribution network or other low voltage a.c. mains installation

3.2

arc welding equipment

equipment for applying current and voltage and having the required characteristics suitable for arc welding and allied processes

3.3**artificial mains network****AMN**

network that provides a defined impedance to the EUT at radio frequencies, couples the disturbance voltage to the measuring receiver and decouples the test circuit from the supply mains

Note 1 to entry: There are two basic types of AMN, the V-network (V-AMN) which couples the unsymmetrical voltages, and the Delta-network which couples the symmetric and the asymmetric voltages separately.

Note 2 to entry: The terms line impedance stabilization network (LISN) and V-AMN are used interchangeably.

3.4**boundary of the equipment under test**

imaginary straight line periphery describing a simple geometric configuration encompassing the equipment under test

Note 1 to entry: All interconnecting cables are included within this boundary.

3.5**component**

product which serves a specific function or functions and which is intended for use in a higher order assembled equipment or system

3.6**d.c. artificial network****artificial d.c. network****DC-AN**

artificial network that provides defined termination to the EUT's d.c. power port under test while also providing the necessary decoupling from conducted disturbances originating from the laboratory d.c. power source or from the load

3.7**d.c. power port**

port used to connect to a low voltage d.c. power generating system or energy storage, or to another source/load

Note 1 to entry: Such a system may be for example a photovoltaic or a fuel cell power generating system, or also a battery.

3.8**electro-discharge machining (EDM) equipment****EDM equipment**

all the necessary units for the spark erosion process including the machine tool, the generator, control circuits, the working fluid container and integral devices

3.9**electromagnetic radiation**

1) phenomenon by which energy in the form of electromagnetic waves emanates from a source into space

2) energy transferred through space in the form of electromagnetic waves

Note 1 to entry: By extension, the term "electromagnetic radiation" sometimes also covers induction phenomena.

[SOURCE: IEC 60050-161:1990, 161-01-10]

3.10**equipment for resistance welding and allied processes**

all equipment associated with carrying out the processes of resistance welding or allied processes consisting of e.g. power source, electrodes, tooling and associated control equipment, which may be a separate unit or part of a complex machine

3.11**grid connected power converter****GCPC**

power converter connected to an a.c. mains power distribution network or other a.c. mains installation and used in a power generating system

3.12**high power electronic system and equipment**

one or more semiconductor power converters with a combined rated power greater than 75 kVA, or an equipment containing such converters

Note 1 to entry: Examples of such high power electronic equipment are semiconductor power converters for application in UPS (Uninterruptible Power Systems) and PDS (Power Drive Systems).

3.13**industrial, scientific and medical (ISM) applications (of radio frequency energy)****ISM applications (of radio frequency energy)**

operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications

Note 1 to entry: Typical applications are the production of physical, biological, or chemical effects such as heating, ionisation of gases, mechanical vibrations, hair removal, acceleration of charged particles. A non-exhaustive list of examples is given in Annex A.

[SOURCE: ITU Radio Regulations Volume 1: 2012 – Chapter I, Definition 1.15]

3.14**ISM RF equipment and appliances**

equipment or appliances designed to generate and/or use locally radio-frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications and information technology and other applications covered by other CISPR publications

Note 2 to entry: The abbreviation "ISM RF" is used throughout this standard for such equipment or appliances only.

3.15**low voltage****LV**

a set of voltage levels used for the distribution of electricity and whose upper limit is generally accepted to be 1 000 V a.c. or 1 500 V d.c.

[SOURCE: IEC 60050-601:1985, 601-01-26, modified – addition of the words "or 1 500 V d.c."]

3.16**photovoltaic power generating system**

electric power generating system which uses the photovoltaic effect to convert solar power into electricity

3.17**small size equipment**

equipment, either positioned on a table top or standing on the floor which, including its cables fits in an imaginary cylindrical test volume of 1,2 m in diameter and 1,5 m height (to ground plane)

3.18**spark erosion**

removal of material in a dielectric working fluid by electro-discharges, which are separated in time and randomly distributed in space, between two electrically conductive electrodes (the tool electrode and the work piece electrode), and where the energy in the discharge is controlled

3.19**type test**

test of one or more devices made to a certain design to show that the design meets certain specifications

Note 1 to entry: Recognition of a type test as type approval may depend on national or regional regulation, see H.2 in Annex H.

3.20**fully-anechoic room****FAR**

shielded enclosure, the internal surfaces of which are lined with radio-frequency-energy absorbing material (i.e. RF absorber) that absorbs electromagnetic energy in the frequency range of interest

3.21**open-area test site****OATS**

facility used for measurements of electromagnetic fields the intention for which is to simulate a semi-free-space environment over a specified frequency range that is used for radiated emission testing of products

Note 1 to entry: An OATS typically is located outdoors in an open area, and has an electrically-conducting ground plane.

3.22**semi-anechoic chamber****SAC**

shielded enclosure, in which five of the six internal surfaces are lined with radio-frequency energy absorbing material (i.e. RF absorber) that absorbs electromagnetic energy in the frequency range of interest, and the bottom horizontal surface is a conducting ground plane for use with OATS test set-ups

4 Frequencies designated for ISM use

Certain frequencies are designated by the International Telecommunication Union (ITU) for use as fundamental frequencies for ISM RF applications (see also Definition 3.13). These frequencies are listed in Table 1.

NOTE In individual countries different or additional frequencies can be designated for use by ISM RF applications.

Table 1 – Frequencies in the radio-frequency (RF) range designated by ITU for use as fundamental ISM frequencies

Centre frequency MHz	Frequency range MHz	Maximum radiation limit ^b	Number of appropriate footnote to the table of frequency allocation of the ITU Radio Regulations ^a
6,780	6,765 – 6,795	Under consideration	5.138
13,560	13,553 – 13,567	Unrestricted	5.150
27,120	26,957 – 27,283	Unrestricted	5.150
40,680	40,66 – 40,70	Unrestricted	5.150
433,920	433,05 – 434,79	Under consideration	5.138 in Region 1, except countries mentioned in 5.280
915,000	902 – 928	Unrestricted	5.150 in Region 2 only
2 450	2 400 – 2 500	Unrestricted	5.150
5 800	5 725 – 5 875	Unrestricted	5.150
24 125	24 000 – 24 250	Unrestricted	5.150
61 250	61 000 – 61 500	Under consideration	5.138
122 500	122 000 – 123 000	Under consideration	5.138
245 000	244 000 – 246 000	Under consideration	5.138
^a Resolution No. 63 of the ITU Radio Regulations applies.			
^b The term “unrestricted” applies to the fundamental and all other frequency components falling within the designated band. Outside of ITU designated ISM bands the limits for the disturbance voltage and radiation disturbance in this standard apply.			

5 Classification of equipment

5.1 Separation into groups

In order to simplify identification of the relevant limits, equipment in the scope of this standard is categorized into two groups, i.e. into group 1 and group 2.

Group 1 equipment: group 1 contains all equipment in the scope of this standard which is not classified as group 2 equipment.

Group 2 equipment: group 2 contains all ISM RF equipment in which radio-frequency energy in the frequency range 9 kHz to 400 GHz is intentionally generated and used or only used locally, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material, for inspection/analysis purposes, or for transfer of electromagnetic energy.

NOTE See Annex A for examples of the separation of equipment into group 1 or 2.

5.2 Division into classes

In accordance with the intended use of equipment in the electromagnetic environment, this standard defines two classes of equipment, namely class A and class B.

Class A equipment is equipment suitable for use in all locations other than those allocated in residential environments and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

Class A equipment shall meet class A limits.

Arc welding equipment which contains arc striking or stabilizing devices and stand-alone arc striking or stabilizing devices for arc welding shall be classified as class A equipment.

Class B equipment is equipment suitable for use in locations in residential environments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

Class B equipment shall meet class B limits.

5.3 Documentation for the user

The manufacturer and/or supplier of equipment shall ensure that the user is informed about the class and group of the equipment, either by labelling or by the accompanying documentation. In both cases the manufacturer/supplier shall explain the meaning of both the class and the group in the documentation accompanying the equipment.

The documentation accompanying the equipment shall contain details of any precautions to be observed by the purchaser or user to ensure that regular operation and use of the equipment in the field does not cause harmful radio frequency interference (RFI). In the framework of this standard, these details concern information about:

- the possibility of radio frequency interference originating from operation of class A equipment in certain environments,
- special precautions to be observed when connecting class A equipment to a low voltage power supply network, see Footnote a and b in Table 2, Footnote b in Table 3 and Footnote a in Table 6, respectively,
- measures which can be taken at installation level to reduce emissions from installed class A equipment, see Footnote b in Table 2 and Footnote a in Table 8.

For class A equipment, the instructions for use accompanying the product shall contain the following text:

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

6 Limits of electromagnetic disturbances

6.1 General

For measurements at standardized test sites, the requirements specified hereafter constitute the requirements for type tests.

Class A equipment may be measured either on a test site or in situ as preferred by the manufacturer.

NOTE 1 Due to size, complexity or operating conditions some equipment may have to be measured in situ in order to show compliance with the radiation disturbance limits specified herein.

Class B equipment shall be measured on a test site.

NOTE 2 The limits have been determined on a probabilistic basis taking into account the likelihood of interference. In cases of interference, additional provisions may have to be applied.

The lower limit shall apply at all transition frequencies.

Measuring apparatus and methods of measurement are specified in Clauses 7, 8 and 9.

Where this standard gives options for testing particular requirements with a choice of test methods, compliance can be shown against any of the test methods, using the specified limits.

with the restrictions provided in the relevant tables. In any situation where it is necessary to retest the equipment, the test method originally chosen should be used in order to ensure consistency of the results.

6.2 Group 1 equipment measured on a test site

6.2.1 Limits for conducted disturbances

6.2.1.1 General

The equipment under test shall meet either:

- a) both the average limit specified for measurements with an average detector and the quasi-peak limit specified for measurements with a quasi-peak detector (see 7.3); or
- b) the average limit when using a quasi-peak detector (see 7.3).

The limits for the LV d.c. power port specified hereafter apply only to grid connected power convertors (GCPCs) intended for assembly into photovoltaic power generating systems.

6.2.1.2 Frequency range 9 kHz to 150 kHz

In the frequency range 9 kHz to 150 kHz limits are not specified.

6.2.1.3 Frequency range 150 kHz to 30 MHz

Limits for the disturbance voltage at low voltage a.c. mains power ports in the frequency range 150 kHz to 30 MHz for equipment measured on a test site using the 50 Ω /50 μ H CISPR artificial mains network (V-AMN) or the CISPR voltage probe (see 7.3.3 and Figure 1) are given in Tables 2 and 4.

Limits for conducted disturbances at low voltage d.c. power ports in the frequency range 150 kHz to 30 MHz for equipment measured on a test site using the 150 Ω CISPR network (DC-AN) (see 7.3.2.3 and Annex I) or the current probe (see CISPR 16-1-2) are given in Table 3 and 5.

Table 2 – Disturbance voltage limits for class A group 1 equipment measured on a test site (a.c. mains power port)

Frequency range MHz	Rated power of ≤ 20 kVA ^c		Rated power of > 20 kVA and ≤ 75 kVA ^{a, c}		High power electronic systems and equipment, Rated power of > 75 kVA ^{b, c}	
	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 – 0,50	79	66	100	90	130	120
0,50 – 5	73	60	86	76	125	115
5 – 30	73	60	90 decreasing linearly with logarithm of frequency to 73	80 60	115	105
At the transition frequency, the more stringent limit shall apply. For class A equipment intended to be connected solely to isolated neutral or high impedance earthed (IT) industrial power distribution networks (see IEC 60364-1) the limits for equipment with a rated power > 75 kVA may be applied, regardless of its actual rated power. NOTE A rated input or output power of 20 kVA corresponds for example to a current of approximately 29 A per phase in case of 400 V three-phase power supply networks, and to a current of approximately 58 A per phase in case of 200 V three phase power supply networks. ^a These limits apply to equipment with a rated power > 20 kVA and intended to be connected to a dedicated power transformer or generator, and which is not connected to low voltage (LV) overhead power lines. For equipment not intended to be connected to a user specific power transformer the limits for ≤ 20 kVA apply. The manufacturer, and/or supplier shall provide information on installation measures that can be used to reduce emissions from the installed equipment. In particular it shall be indicated that this equipment is intended to be connected to a dedicated power transformer or generator and not to LV overhead power lines. ^b These limits apply only to high power electronic systems and equipment with a rated power greater than 75 kVA when intended to be installed as follows: – installation is supplied from a dedicated power transformer or generator, and which is not connected to Low Voltage (LV) overhead power lines, – installation is physically separated from residential environments by distance greater than 30 m or by a structure which acts as a barrier to radiated phenomena, – the manufacturer and/or supplier shall indicate that this equipment meets the disturbance voltage limits for high power electronic systems and equipment of rated input power > 75 kVA and provide information on installation measures to be applied by the installer. In particular, it shall be indicated that this equipment is intended to be used in an installation which is powered by a dedicated power transformer or generator and not by LV overhead power lines. ^c Selection of the appropriate set of limits shall be based on the rated a.c. power stated by the manufacturer.						

Table 3 – Limits for conducted disturbances of class A group 1 equipment measured on a test site (d.c. power port)

Frequency range MHz	Rated power of ≤ 20 kVA ^a		Rated power of > 20 kVA to ≤ 75 kVA ^{a, b}				Rated power of > 75 kVA ^{a, b}			
	Voltage limits		Voltage limits		Current limits		Voltage limits		Current limits	
	QP dB(μV)	AV dB(μV)	QP dB(μV)	AV dB(μV)	QP dB(μA)	AV dB(μA)	QP dB(μV)	AV dB(μV)	QP dB(μA)	AV dB(μA)
0,15 to 5	97 to 89	84 to 76	116 to 106	106 to 96	72 to 62	62 to 52	132 to 122	122 to 112	88 to 78	78 to 68
5 to 30	89 to 89	76 to 76	106 to 89	96 to 76	62 to 45	52 to 32	122 to 105	112 to 92	78 to 61	68 to 48
In certain frequency ranges, the limits in this table decrease linearly with logarithm of frequency.										
^a Selection of the appropriate set of limits shall be based on the rated a.c. power stated by the manufacturer.										
^b These limits apply to equipment with a rated power > 20 kVA and intended to be installed in a large photovoltaic power generating system by a professional. In the manual accompanying the product, the manufacturer, and/or supplier shall provide information on mitigation measures that can be used to reduce emissions from the installed equipment, with the goal of preventing harmful interference to radio reception in a distance of 30 m from the installation. In particular it shall be indicated that this equipment can be equipped with additional filtering and that installation is physically separated from residential environments by distance greater than 30 m. The installer is invited to check the mitigated installation against CISPR 11 in-situ measurements as indicated in clause 6.4 of this standard.										

Table 4 – Disturbance voltage limits for class B group 1 equipment measured on a test site (a.c. mains power port)

Frequency range MHz	Quasi-peak dB(μV)	Average dB(μV)
0,15 – 0,50	66 Decreasing linearly with logarithm of frequency to 56	56 Decreasing linearly with logarithm of frequency to 46
0,50 – 5	56	46
5 – 30	60	50
At the transition frequency, the more stringent limit shall apply.		

For diagnostic X-ray generators operating in intermittent mode the quasi-peak limits of Table 2 or Table 4 can be relaxed by 20 dB.

Table 5 – Disturbance voltage limits for class B group 1 equipment measured on a test site (d.c. power port)

Frequency range MHz	Quasi-peak dB(μV)	Average dB(μV)
0,15 – 0,50	84 Decreasing linearly with logarithm of frequency to 74	74 Decreasing linearly with logarithm of frequency to 64
0,50 – 30	74	64

6.2.2 Limits of electromagnetic radiation disturbance

6.2.2.1 General

The equipment under test shall meet the quasi-peak limits when using a quasi-peak detector.

6.2.2.2 Frequency range 9 kHz to 150 kHz

In the frequency range 9 kHz to 150 kHz limits are not specified.

6.2.2.3 Frequency range 150 kHz to 1 GHz

In the frequency range 150 kHz to 30 MHz limits are not specified.

In the frequency range above 30 MHz the limits refer to the electric field strength component of the electromagnetic radiation disturbance.

The electromagnetic radiation disturbance limits for the frequency range 30 MHz to 1 GHz for group 1, classes A and B equipment are specified in Table 6 and 7, respectively. Recommendations for the protection of specific safety-related radio services are given in Annex E and Table E.1.

On an open-area test site (OATS) or in a semi-anechoic chamber (SAC), class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m (see information in Table 6), and class B equipment at a nominal distance of 3 m, or 10 m (see information in Table 7). A measuring distance less than 10 m is allowed only for equipment which complies with the definition for *small size equipment* given in 3.17.

In a fully-anechoic room (FAR) class A or class B equipment can be measured at a nominal distance of 3 m (see information in Table 6 and Table 7), provided that the EUT fits into the validated test volume of the given FAR. In conjunction with measurements according to this standard, use of the FAR is restricted to table-top equipment.

Table 6 – Electromagnetic radiation disturbance limits for class A group 1 equipment measured on a test site

Frequency range MHz	OATS or SAC				FAR	
	10 m measuring distance		3 m measuring distance ^b		3 m measuring distance ^{b, c}	
	rated power of		rated power of		rated power of	
	≤ 20 kVA ^d	> 20 kVA ^{a, d}	≤ 20 kVA ^d	> 20 kVA ^{a, d}	≤ 20 kVA ^d	> 20 kVA ^{a, d}
	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)
30 – 230	40	50	50	60	52 decreasing linearly with logarithm of frequency to 45	62 decreasing linearly with logarithm of frequency to 55
230 – 1 000	47	50	57	60	52	55

On an OATS or in a SAC, class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m. In case of measurements at a separation distance of 30 m, an inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining compliance.

At the transition frequency, the more stringent limit shall apply.

In the frequency range 30 MHz to 230 MHz, the limit for measurements in the FAR decreases linearly with the logarithm of frequency.

- ^a These limits apply to equipment with a rated power of > 20 kVA and intended to be used at locations where there is a distance greater than 30 m between the equipment and third party sensitive radio communications. The manufacturer shall indicate in the technical documentation that this equipment is intended to be used at locations where the separation distance to third party sensitive radio services is > 30 m. If these conditions are not met, then the limits for ≤ 20 kVA apply.
- ^b The 3 m separation distance applies only to small size equipment meeting the size criterion defined in 3.17.
- ^c The table-top equipment shall fit into the validated test volume of the FAR.
- ^d Selection of the appropriate set of limits shall be based on the rated a.c. power stated by the manufacturer.

**Table 7 – Electromagnetic radiation disturbance limits
for class B group 1 equipment measured on a test site**

Frequency range MHz	OATS or SAC		FAR
	10 m measuring distance	3 m measuring distance ^a	3 m measuring distance ^{a,b}
	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)
30 – 230	30	40	42 Decreasing linearly with logarithm of frequency to 35
230 – 1 000	37	47	42
On an OATS or in a SAC, class B equipment can be measured at a nominal distance of 3 m or 10 m. At the transition frequency, the more stringent limit shall apply.			
^a The 3 m separation distance applies only to <i>small size equipment</i> meeting the size criterion defined in 3.17.			
^b The table-top equipment shall fit into the validated test volume of the FAR.			

For medical electrical equipment intended to be permanently installed in shielded locations, further provisions with regard to the measurement arrangement and load conditions are found in IEC 60601-1-2.

6.2.2.4 Frequency range 1 GHz to 18 GHz

In the frequency range 1 GHz to 18 GHz limits are not specified.

6.2.2.5 Frequency range 18 GHz to 400 GHz

In the frequency range 18 GHz to 400 GHz limits are not specified.

6.3 Group 2 equipment measured on a test site

6.3.1 Limits for conducted disturbances

6.3.1.1 General

The equipment under test shall meet either:

- both the average limit specified for measurements with an average detector and the quasi-peak limit specified for measurements with a quasi-peak detector (see 7.3); or
- the average limit when using a quasi-peak detector (see 7.3).

6.3.1.2 Frequency range 9 kHz to 150 kHz

In the frequency range 9 kHz to 150 kHz limits are not specified.

6.3.1.3 Frequency range 150 kHz to 30 MHz

Limits for the disturbance voltage at low voltage a.c. mains power ports in the frequency range 150 kHz to 30 MHz for equipment measured on a test site using the 50 Ω /50 μ H CISPR artificial mains network (V-AMN) or the CISPR voltage probe (see 7.3.3 and Figure 1) are given in Tables 8 and 9, except for the ITU designated frequency bands listed in Table 1 where no limits apply.

For electric welding equipment the limits of Table 8 or 9 apply in active mode of operation. In stand-by (or idle) mode, the limits of Table 2 or 4 apply.

For ISM RF lighting devices operating in dedicated ISM frequency bands (defined by the ITU in Table 1) the limits of Table 9 apply.

Table 8 – Disturbance voltage limits for class A group 2 equipment measured on a test site (a.c. mains power port)

Frequency range MHz	Rated power of ≤ 75 kVA ^b		Rated power of > 75 kVA ^{a, b}	
	Quasi-peak dB(μ V)	Average dB(μ V)	Quasi-peak dB(μ V)	Average dB(μ V)
0,15 – 0,50	100	90	130	120
0,50 – 5	86	76	125	115
5 – 30	90 decreasing linearly with logarithm of frequency to 73	80 60	115	105
At the transition frequency, the more stringent limit shall apply.				
For class A equipment with a rated power ≤ 75 kVA intended to be connected solely to isolated neutral or high impedance earthed (IT) industrial power distribution networks (see IEC 60364-1) the limits defined for group 2 equipment with a rated power > 75 kVA may be applied.				
^a The manufacturer and/or supplier shall provide information on installation measures that can be used to reduce emissions from the installed equipment.				
^b Selection of the appropriate set of limits shall be based on the rated a.c. power stated by the manufacturer.				

NOTE A rated input or output power of 75 kVA corresponds for example to a current of approximately 108 A per phase in case of 400 V three phase power supply networks and to a current of approximately 216 A per phase in case of 200 V three phase power supply networks.

High-frequency (HF) surgical equipment shall meet the limits of Table 2 or 4 specified for group 1 equipment, in stand-by mode of operation. For high-frequency (HF) surgical equipment operating at frequencies outside designated ISM bands (see Table 1), these limits also apply at the operating frequency and inside the designated frequency bands. The related measurements shall be performed in a test arrangement in accordance with IEC 60601-2-2.

Table 9 – Disturbance voltage limits for class B group 2 equipment measured on a test site (a.c. mains power port)

Frequency range MHz	Quasi-peak dB(μV)	Average dB(μV)
0,15 – 0,50	66 Decreasing linearly with logarithm of frequency to 56	56 Decreasing linearly with logarithm of frequency to 46
0,50 – 5	56	46
5 – 30	60	50
At the transition frequency, the more stringent limit shall apply.		

6.3.2 Limits of electromagnetic radiation disturbance

6.3.2.1 General

The equipment under test shall meet the limits when using a measuring instrument with a peak, quasi-peak or average detector as indicated in the appropriate table.

Up to 30 MHz the limits refer to the magnetic component of the electromagnetic radiation disturbance. Above 30 MHz the limits refer to the electric field strength component of the electromagnetic radiation disturbance.

6.3.2.2 Frequency range 9 kHz to 150 kHz

In the frequency range 9 kHz to 150 kHz limits are not specified.

6.3.2.3 Frequency range 150 kHz to 1 GHz

Except for the designated frequency range listed in Table 1, the electromagnetic radiation disturbance limits for the frequency range 150 kHz to 1 GHz for group 2 class A equipment are specified in Table 10; and for group 2 class B equipment in Table 12.

The limits in Tables 10 and 12 apply to all electromagnetic disturbances at all frequencies not exempted according to Table 1 Footnote b).

For class A resistance welding equipment the limits of Table 10 apply in the frequency range 30 MHz to 1 GHz in active mode of operation. In stand-by (or idle) mode, the limits of Table 6 apply. For class B resistance welding equipment the limits of Table 12 apply in active mode of operation. In stand-by (or idle) mode, the limits of Table 7 apply.

For class A arc welding equipment the limits of Table 11 apply in active mode of operation. In stand-by (or idle) mode, the limits of Table 6 apply. For class B arc welding equipment the limits of Table 7 apply in active mode of operation and in stand-by (or idle) mode.

For class A EDM equipment the limits of Table 11 apply.

For ISM RF lighting devices operating in dedicated ISM frequency bands (defined by the ITU in Table 1) the limits of Table 12 apply.

For high-frequency (HF) surgical equipment, the limits of Table 6 or 7 apply. High-frequency (HF) surgical equipment shall meet the respective limits when tested in stand-by mode of operation.

Recommendations for the protection of specific safety services are given in Annex E and Table E.1.

On an open-area test site (OATS) or in a semi-anechoic chamber (SAC), class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m, and class B equipment at a nominal distance of 3 m or 10 m (see Tables 10 and 12).

In the frequency range 30 MHz to 1 GHz, a measuring distance of 3 m is allowed only for equipment which complies with the definition given in 3.17.

In a fully-anechoic room (FAR) class A or class B equipment can be measured at a nominal distance of 3 m, provided that the EUT fits into the validated test volume of the given FAR. In conjunction with measurements according to this standard, use of the FAR is restricted to table-top equipment.

For group 2 class A or B equipment other than EDM or arc welding, measurements in the FAR in the range 30 MHz to 1 GHz shall be supplemented by measurement of the magnetic component of the disturbance field strength in the range 150 kHz to 30 MHz, at an OATS or in a SAC, see also footnote b in Table 10 and footnote c in Table 12.

Table 10 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured on a test site

Frequency range MHz	OATS or SAC						FAR
	Limits for a measuring distance D in m						
	$D = 30$ m		$D = 10$ m		$D = 3$ m ^a		$D = 3$ m ^{a,b}
	Electric field Quasi-peak dB(μV/m)	Magnetic field Quasi-peak dB(μA/m)	Electric field Quasi-peak dB(μV/m)	Magnetic field Quasi-peak dB(μA/m)	Electric field Quasi-peak dB(μV/m)	Magnetic field Quasi-peak dB(μA/m)	Electric field Quasi-peak dB(μV/m)
0,15 – 0,49	–	33,5	–	57,5	–	82	–
0,49 – 1,705	–	23,5	–	47,5	–	72	–
1,705 – 2,194	–	28,5	–	52,5	–	77	–
2,194 – 3,95	–	23,5	–	43,5	–	68	–
3,95 – 11	–	8,5	–	18,5	–	68 decreasing linearly with logarithm of frequency to 28,5	–
11 – 20	–	8,5	–	18,5	–	28,5	–
20 – 30	–	–1,5	–	8,5	–	18,5	–
30 – 47	58	–	68	–	78	–	80 to 78
47 – 53,91	40	–	50	–	60	–	60
53,91 – 54,56	40	–	50	–	60	–	60
54,56 – 68	40	–	50	–	60	–	60 to 59
68 – 80,872	53	–	63	–	73	–	72
80,872 – 81,848	68	–	78	–	88	–	87
81,848 – 87	53	–	63	–	73	–	72 to 71
87 – 134,786	50	–	60	–	70	–	68 to 67
134,786 – 136,414	60	–	70	–	80	–	77
136,414 – 156	50	–	60	–	70	–	67 to 66
156 – 174	64	–	74	–	84	–	80
174 – 188,7	40	–	50	–	60	–	56
188,7 – 190,979	50	–	60	–	70	–	66
190,979 – 230	40	–	50	–	60	–	56 to 55
230 – 400	50	–	60	–	70	–	65
400 – 470	53	–	63	–	73	–	68
470 – 1 000	50	–	60	–	70	–	65

On an OATS or in a SAC, class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m. A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.17.

At the transition frequency, the more stringent limit shall apply. In certain frequency ranges, the limit for measurements in the FAR decreases linearly with the logarithm of frequency.

^a In the frequency range 30 MHz to 1 GHz, the 3 m separation distance applies only to *small size equipment* meeting the size criterion defined in 3.17.

^b The table-top equipment shall fit into the validated test volume of the FAR. In the range below 30 MHz, such group 2 equipment shall be measured at an OATS or in a SAC (see limits in the respective magnetic field column in this table).