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Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

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**EN 55011**

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Supersedes EN 55011:2009

English Version

Industrial, scientific and medical equipment -  
Radio-frequency disturbance characteristics -  
Limits and methods of measurement  
(CISPR 11:2015 , modified)

Appareils industriels, scientifiques et médicaux -  
Caractéristiques de perturbations radioélectriques -  
Limites et méthodes de mesure  
(CISPR 11:2015 , modifiée)

Industrielle, wissenschaftliche und medizinische Geräte -  
Funkstörungen - Grenzwerte und Messverfahren  
(CISPR 11:2015 , modifiziert)

This European Standard was approved by CENELEC on 2016-02-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## European foreword

The text of document CISPR/B/628/FDIS, future edition 6 of CISPR 11, prepared by CISPR SC 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" of CISPR "International special committee on radio interference" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 55011:2016.

A draft amendment, which covers common modifications to CISPR 11:2015 (CISPR/B/628/FDIS), was prepared by CLC/TC 210, "Electromagnetic Compatibility (EMC)" and approved by CENELEC.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-02-15
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2019-02-15

This document supersedes EN 55011:2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in CISPR 11:2015 are prefixed "Z".

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s), see informative Annex ZZ, which is an integral part of this document.

## Endorsement notice

The text of the International Standard CISPR 11:2015 was approved by CENELEC as a European Standard with agreed common modifications.

### COMMON MODIFICATIONS

#### 4 Frequencies designated for ISM use

Replace Clause 4 by the following:

#### 4 National measures and 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.

**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 <sup>b</sup>	Number of appropriate footnote to the table of frequency allocation of the ITU Radio Regulations <sup>a</sup>
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

<sup>a</sup> Resolution No. 63 of the ITU Radio Regulations applies.

<sup>b</sup> 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.

In some CENELEC countries, different or additional frequencies may be designated for use with ISM RF applications in the meaning of the definition found in the ITU Radio Regulations, see definition 3.13. These frequencies are listed in Table ZB.1 (see Annex ZB).

The limits for the disturbance voltage and radiation disturbance defined in this standard do also not apply to the fundamental ISM frequencies listed in Table ZB.1. If ISM RF applications use fundamental frequencies other than the ITU or nationally designated frequencies, then the limits for the disturbance voltage and radiation disturbance of this standard apply also to these fundamental frequencies.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
CISPR 16-1-1	2010	Specification for radio disturbance and immunity measuring apparatus and methods -	EN 55016-1-1	2010
+ A1	2010		+ A1	2010
+ A2	2014	Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus	+ A2	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	EN 55016-1-2	2014
CISPR 16-1-4	2010	Specification for radio disturbance and immunity measuring apparatus and methods -	EN 55016-1-4	2010
+ A1	2012	Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements	+ A1	2012
CISPR 16-2-1	2014	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements	EN 55016-2-1	2014
CISPR 16-2-3	2010	Specification for radio disturbance and immunity measuring apparatus and methods -	EN 55016-2-3	2010
-	-		+ AC	2013
+ A1	2010	Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements	+ A1	2010
+ A2	2014		+ A2	2014

**EN 55011:2016 (E)**

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
CISPR 16-4-2 + A1	2011 2014	Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, statistics and limit modelling - Measurement instrumentation uncertainty	EN 55016-4-2 + A1	2011 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	EN 60601-1-2	2015
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	EN 60601-2-2 + A11	2009 2011
IEC 60974-10	2014	Arc welding equipment - Part 10: Electromagnetic compatibility (EMC) requirements	EN 60974-10	2014
IEC 61307	2011	Industrial microwave heating installations - Test methods for the determination of power output	EN 61307	2011
IEC 62135-2	2007	Resistance welding equipment - Part 2: Electromagnetic compatibility (EMC) requirements	EN 62135-2	2008
ITU Radio regulations, Vol 3	2012	Radio Regulations - Volume 3: Resolutions and Recommendations	-	-

**Annex ZB**  
(normative)

**Frequencies designated on a national basis in CENELEC countries  
for use as fundamental ISM frequencies**

**Table ZB.1 — Frequencies designated on a national basis in CENELEC countries  
for use as fundamental ISM frequencies**

Frequency MHz	Maximum radiation limit	Notes
0,009 - 0,010	not limited	Germany only
83,996 - 84,004	not limited	United Kingdom only <sup>a</sup>
167,992 - 168,008	not limited	United Kingdom only <sup>a</sup>
886,000 - 906,000	not limited	United Kingdom only <sup>a</sup>

<sup>a</sup> Radio communication services must accept harmful interference from ISM apparatus operating in accordance with the WT (Control of Interference from RF Heating Apparatus) Regulations 1971. The WT (Control of Interference from RF Heating Apparatus) Regulations 1971 specify the limits of levels of radiation permitted outside the ISM bands.



## Annex ZZ

(informative)

### Coverage of Essential Requirements of EU Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and within its scope the Standard covers only the following essential requirements out of those given in Annex 1 of EC Directive 2004/108/EC.

**Table ZZ.1 — Correspondence between this European Standard and Directive 2004/108/EC**

Essential Requirements of Directive 2004/108/EC, Annex 1	Clauses and subclauses of this EN
1(a)	Clause 6 (Limits for electromagnetic disturbances), 8.2 (Conducted disturbances (at power ports)), 8.3 (Requirement for radiated disturbances (9 kHz to 1 GHz)), Clause 9 (Requirement for radiated disturbances (1 GHz to 18 GHz))

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned.

**WARNING:** Other requirements and other EU Directives can be applied to the products falling within the scope of this standard.

## Bibliography

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

CISPR 14-1	NOTE	Harmonized as EN 55014-1.
CISPR 15:2013	NOTE	Harmonized as EN 55015:2013 (not modified).
IEC 60364-1	NOTE	Harmonized as HD 60364-1.
IEC 60364-5-51:2005	NOTE	Harmonized as HD 60364-5-51:2009 (modified) and HD 60364-5-51:2009/A11:2013.
IEC 60705:2010	NOTE	Harmonized as EN 60705:2012 (modified).
IEC 61308:2005	NOTE	Harmonized as EN 61308:2006 (not modified).
IEC 61689:2013	NOTE	Harmonized as EN 61689:2013 (not modified).
IEC 61922:2002	NOTE	Harmonized as EN 61922:2002 (not modified).



# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE  
COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

**Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement**

**Appareils industriels, scientifiques et médicaux – Caractéristiques de perturbations radioélectriques – Limites et méthodes de mesure**





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INTERNATIONAL ELECTROTECHNICAL COMMISSION  
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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**INDUSTRIAL, SCIENTIFIC AND MEDICAL EQUIPMENT –  
RADIO-FREQUENCY DISTURBANCE CHARACTERISTICS –  
LIMITS AND METHODS OF MEASUREMENT**

FOREWORD

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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 cancels and replaces the fifth edition published in 2009 and its Amendment 1 published in 2010. It constitutes a technical revision.

It 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  $\Omega$  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)*.

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

FDIS	Report on voting
CISPR/B/628/FDIS	CISPR/B/631/RVD

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

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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]

# INDUSTRIAL, SCIENTIFIC AND MEDICAL EQUIPMENT – RADIO-FREQUENCY DISTURBANCE CHARACTERISTICS – LIMITS AND METHODS OF MEASUREMENT

## 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]<sup>1</sup>.

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

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<sup>1</sup> 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>)

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