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CISPR 11

Edition 7.0 2024-02  
COMMENTED VERSION

# INTERNATIONAL STANDARD



INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

PRODUCT FAMILY EMC STANDARD

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 33.100.10

ISBN 978-2-8322-8316-5

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INTERNATIONAL ELECTROTECHNICAL COMMISSION  
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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

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 commented version (CMV) of the official standard CISPR 11:2024 edition 7.0 allows the user to identify the changes made to the previous CISPR 11:2015+AMD1:2016+AMD2:2019 CSV edition 6.2. Furthermore, comments from CISPR Subcommittee B experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.**

**A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.**

**This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.**

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 seventh edition cancels and replaces the sixth edition published in 2015, Amendment 1:2016 and Amendment 2:2019. This edition constitutes a technical revision.

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

- a) introduction of limits for radiated disturbances in the frequency range above 1 GHz for group 1 equipment in line with the requirements given in the generic emission standards;
- b) introduction of limits for conducted disturbances on the wired network port in line with the requirements given in the generic emission standards;
- c) introduction of requirements for equipment which incorporates radio transmit/receive functions;
- d) introduction of definitions for various types of robots;
- e) consideration of some particular conditions when measuring robots, such as measurement setups and operating modes of robots.

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

Draft	Report on voting
CIS/B/831/FDIS	CIS/B/837/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

This document 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 committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**IMPORTANT – The "colour inside" logo on the cover page of this document 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 document 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 3.1.18 in this document. CISPR and ITU share their responsibilities 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 (2020)). 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 can~~ apply to individual ISM RF applications operated at frequencies outside designated ISM bands (see Table 1). They also ~~may can~~ 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 C of this document.

~~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~~

## Introduction to the Amendment 2

~~This AMD 2 combines the contents of two fragments which have been circulated as CIS/B/688/CDV (f2) and CIS/B/697/CDV (f3).~~

~~Fragment 2: Requirements for semiconductor power converters (SPC)~~

~~CISPR 11 Ed. 6.1 needs to be supplemented with further information for full inclusion of type test requirements for SPCs specified hereafter. These requirements apply only to the following types of equipment:~~

- ~~a) power conversion equipment intended for assembly into photovoltaic power generating systems, such as grid connected power converters (GCPCs) and d.c. to d.c. converters,~~
- ~~b) GCPCs intended for assembly into energy storage systems.~~

~~Fragment 3: Improvement of repeatability for measurements in the frequency range 1-18 GHz~~

~~Based on the comments from the National Committees on CIS/B/662/DC, CIS/B/WG1 decided on its meeting in Hangzhou 2016 to amend the test procedure for group 2 equipment in the frequency range 1 to 18 GHz for the following reasons:~~

- ~~a) CISPR 11 allows final measurements on group 2 equipment operating at frequencies above 400 MHz with two different weighting functions, the traditional "LogAV detector" with a video bandwidth of 10 Hz and the new APD method, where the Amplitude Probability Distribution is evaluated.~~

~~With the alignment of emission requirements for sources of fluctuating emissions with those generating CW type emissions (Fraction 4 of the last general maintenance of CISPR 11) for most of the frequency range 1 to 18 GHz the peak detector is used mostly for preliminary~~

~~measurements, while the number of final measurements with the LogAV detector has been increased from 2 frequencies to max. 7 frequencies.~~

~~In parallel, with fraction 3, the APD detector has been introduced, but only with the traditional 2 final frequencies (one in the range 1 GHz to 2.4 GHz and one in the range 2,5 GHz to 18 GHz).~~

~~The number of final frequencies to be measured should be aligned for both weighting functions.~~

~~b) During practical measurements cases have been observed, where the critical frequency changed between preliminary and final measurement by more than 5 MHz. The range of 10 MHz for weighted measurements ( $\pm 5$  MHz from highest peak emission) seems therefore not always to be sufficient.~~

~~An extension of this frequency range seems advisable and could increase the repeatability.~~

~~In the range 11,7 to 12,7 GHz, an EUT fails immediately if one peak exceeds the limit of 73 dB[ $\mu$ V/m]. Observations on a big number of different microwave ovens have shown that during the final measurement (at least 2 min) such peaks may occur very seldom, and with a very short duration, and an estimated overall duration of less than 1 % of the measuring time.~~

~~A state-of-the-art digital communication service should be able to tolerate such peaks. Meanwhile, in countries where broadcasting systems, which are already standardized and widely spread and is difficult to avoid disturbance by such peaks, are under operation, additional limits could be separately introduced as necessary.~~

~~c) The repeatability of the peak measurement on microwave ovens is poor. Moreover, the sheer height of the highest peak emission, without information on its duration and repetition rate, provides very limited information on the real disturbance potential.~~

~~Measurements with both of the weighting methods have a significantly better repeatability and should, by their physical nature, give a better judgement for the disturbing potential of the EUT on digital radio services.~~

~~d) The conditions for preliminary and final measurements became ambiguous in Edition 6.0 (CISPR 11:2015), particularly regarding the required test time. Furthermore, it has been found that, in some cases, a duration of 20 s for the preliminary peak measurement may not be enough. To further increase the repeatability, WG1 decided not to divide the peak measurements anymore into preliminary and final measurements, but to require a 2-minute max hold peak measurement at every azimuth.~~

~~CISPR SC/B WG1 agreed to present the following proposals to the National Committees:~~

- ~~1) Define the same 7 final frequency ranges for the APD method as already defined for the LogAV method (detector).~~
- ~~2) Extend the frequency range for the final weighted measurement to 20 MHz.~~

~~For the APD method this would mean to measure on 5 final frequencies, the critical frequency itself,  $\pm 5$  MHz and  $\pm 10$  MHz.~~

~~For the LogAV detector, the requirement remains to perform for the final measurements at least 5 consecutive sweeps in max hold mode. The test time increases accordingly, and coverage of the fluctuations is the same as before.~~

- ~~3) Change the peak limit in Table 13 to a constant value of 70 dB[ $\mu$ V/m] throughout the frequency range and replace the requirement of a final peak measurement in the range 11,7 GHz to 12,7 GHz by a requirement of an additional weighted measurement at the frequency of the highest peak emission in this range. This may lead to a maximum of 8 final weighted measurements.~~
- ~~4) Discard the distinction between preliminary and final peak measurements and make instead the peak measurements on all azimuths for 2 minutes.~~

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

## 1 Scope

This document 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 document 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 (2020) (see Definition 3.1.18), this document covers emission requirements related to radio-frequency disturbances in the frequency range of 9 kHz to 18 GHz.

ISM equipment which incorporates radio transmit/receive functions (host equipment with radio functionality) is included in the scope of this document, see Annex F. However, the emission requirements in this document are not intended to be applicable to the intentional transmissions from a radio transmitter as defined by the ITU including their spurious emissions. **1**

NOTE 1 This exclusion only applies to emissions from the intentional radio transmitter. However, combination emissions, for example emissions resulting from intermodulation between the radio and the non-radio subassemblies of the ISM equipment, are not subject to this exclusion.

NOTE 2 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 document.

Robots used for industrial, scientific and medical applications are in the scope of this document. **2**

EXAMPLE Welding robots, spraying robots, handling robots, processing robots, assembly robots, medical robots, education and experimental robots. A comprehensive list of robots in the scope of this document is given on the IEC EMC zone.

NOTE 3 Flying robots, domestic helper robots, toy robots and entertainment robots are examples of robots in the scope of other CISPR standards.

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

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CISPR 16-1-1:2010/2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus –*

<sup>1</sup> Figures in square brackets refer to the Bibliography.

*Measuring apparatus*

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~~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 16-1-2:2014/AMD1:2017

CISPR 16-1-4:~~2010~~2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*

CISPR 16-1-4:~~2010/AMD1:2012~~2019/AMD1:2020

CISPR 16-1-4:2019/AMD2:2023

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 16-2-1:2014/AMD1:2017

CISPR 16-2-3:~~2010~~2016, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 16-2-3:~~2010/AMD1:2010~~2016/AMD1:2019

CISPR 16-2-3:~~2010/AMD2:2014~~2016/AMD2:2023

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/AMD1:2014

CISPR 16-4-2:2011/AMD2:2018

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

CISPR 32:2015/AMD1:2019

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Part 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~~2017, *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 61000-4-6:2023, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61307:2011<sup>2</sup>, *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~~2020), *Radio regulations* (available at <http://www.itu.int/en/myitu/Publications/2020/09/02/14/23/Radio-Regulations-2020>)

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<sup>2</sup> This publication was withdrawn.



# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

PRODUCT FAMILY EMC STANDARD  
NORME DE FAMILLE DE PRODUITS EN CEM

**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

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
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- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

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 seventh edition cancels and replaces the sixth edition published in 2015, Amendment 1:2016 and Amendment 2:2019. This edition constitutes a technical revision.

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

- a) introduction of limits for radiated disturbances in the frequency range above 1 GHz for group 1 equipment in line with the requirements given in the generic emission standards;
- b) introduction of limits for conducted disturbances on the wired network port in line with the requirements given in the generic emission standards;



- c) introduction of requirements for equipment which incorporates radio transmit/receive functions;
- d) introduction of definitions for various types of robots;
- e) consideration of some particular conditions when measuring robots, such as measurement setups and operating modes of robots.

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

Draft	Report on voting
CIS/B/831/FDIS	CIS/B/837/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

This document 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 committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**IMPORTANT – The "colour inside" logo on the cover page of this document 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 document 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 3.1.18 in this document. CISPR and ITU share their responsibilities 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 both, equipment assessed by means of 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(2020)). 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 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 can apply to individual ISM RF applications operated at frequencies outside designated ISM bands (see Table 1). They also can apply to ISM RF applications operated at frequencies above 18 GHz.

Recommendations of CISPR for the protection of radio services in particular areas are found in Annex C of this document.

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

## 1 Scope

This document 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 document covers emission requirements related to radio-frequency (RF) disturbances in the frequency range of 9 kHz to 400 GHz.

For ISM RF applications in the meaning of the definition found in the ITU Radio Regulations (2020) (see Definition 3.1.18), this document covers emission requirements related to radio-frequency disturbances in the frequency range of 9 kHz to 18 GHz.

ISM equipment which incorporates radio transmit/receive functions (host equipment with radio functionality) is included in the scope of this document, see Annex F. However, the emission requirements in this document are not intended to be applicable to the intentional transmissions from a radio transmitter as defined by the ITU including their spurious emissions.

NOTE 1 This exclusion only applies to emissions from the intentional radio transmitter. However, combination emissions, for example emissions resulting from intermodulation between the radio and the non-radio subassemblies of the ISM equipment, are not subject to this exclusion.

NOTE 2 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 document.

Robots used for industrial, scientific and medical applications are in the scope of this document.

EXAMPLE Welding robots, spraying robots, handling robots, processing robots, assembly robots, medical robots, education and experimental robots. A comprehensive list of robots in the scope of this document is given on the IEC EMC zone.

NOTE 3 Flying robots, domestic helper robots, toy robots and entertainment robots are examples of robots in the scope of other CISPR standards.

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

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CISPR 16-1-1:2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

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<sup>1</sup> Figures in square brackets refer to the Bibliography.

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 16-1-2:2014/AMD1:2017

CISPR 16-1-4:2019, *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 16-1-4:2019/AMD1:2020  
CISPR 16-1-4:2019/AMD2:2023

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 16-2-1:2014/AMD1:2017

CISPR 16-2-3:2016, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*  
CISPR 16-2-3:2016/AMD1:2019  
CISPR 16-2-3:2016/AMD2:2023

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IEC 61000-4-6:2023, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61307:2011<sup>2</sup>, *Industrial microwave heating installations – Test methods for the determination of power output*

ITU Radio Regulations (2020), *Radio regulations* (available at <http://www.itu.int/en/myitu/Publications/2020/09/02/14/23/Radio-Regulations-2020>)

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<sup>2</sup> This publication was withdrawn.

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## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

### COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

## APPAREILS INDUSTRIELS, SCIENTIFIQUES ET MÉDICAUX – CARACTÉRISTIQUES DE PERTURBATIONS RADIOÉLECTRIQUES – LIMITES ET MÉTHODES DE MESURE

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La Norme internationale CISPR 11 a été établie par le sous-comité B du CISPR: Perturbations relatives aux appareils industriels, scientifiques et médicaux à fréquences radioélectriques, aux autres appareils de l'industrie lourde, aux lignes électriques aériennes, aux appareils à haute tension et aux appareils de traction électrique.

Cette septième édition annule et remplace la sixième édition parue en 2015, l'Amendement 1:2016 et l'Amendement 2:2019. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) introduction de limites pour les perturbations rayonnées dans la plage de fréquences supérieure à 1 GHz pour les appareils du groupe 1, conformément aux exigences données dans les normes d'émission génériques;
- b) introduction de limites pour les perturbations conduites sur l'accès de réseau câblé conformément aux exigences données dans les normes d'émission génériques;
- c) Introduction d'exigences relatives aux appareils qui intègrent des fonctions d'émission/réception radio;
- d) introduction de définitions pour les différents types de robots;
- e) prise en considération de certaines conditions particulières lors de la mesure des robots, comme les configurations de mesure et les modes de fonctionnement des robots.

Le texte de ce document est issu des documents suivants:

Projet	Rapport de vote
CIS/B/831/FDIS	CIS/B/837/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les directives ISO/IEC, Partie 2, il a été développé selon les directives ISO/IEC, Partie 1 et les directives ISO/IEC, Supplément IEC, disponibles sous [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). Les principaux types de documents développés par l'IEC sont décrits plus en détail sous [www.iec.ch/publications](http://www.iec.ch/publications).

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Le contenu principal du présent document est fondé sur la Recommandation n° 39/2 du CISPR rappelée ci-dessous:

RECOMMANDATION n° 39/2

**Limites et méthodes de mesure des caractéristiques de perturbations électromagnétiques des appareils industriels, scientifiques et médicaux (ISM) à fréquences radioélectriques**

Le CISPR

CONSIDÉRANT

- a) que les appareils ISM à fréquences radioélectriques constituent une source importante de perturbations;
- b) que les méthodes de mesure de ces perturbations ont été spécifiées par le CISPR;
- c) que certaines fréquences sont désignées par l'Union Internationale des Télécommunications (UIT) pour un rayonnement non limité provenant des appareils ISM;

RECOMMANDE

que la dernière édition de la CISPR 11 soit utilisée pour appliquer des limites et méthodes de mesure des caractéristiques des appareils ISM.

## INTRODUCTION

Parmi les exigences communes relatives au contrôle des perturbations radioélectriques dues au matériel destiné à des applications industrielles, scientifiques et électromédicales, la présente publication du CISPR contient des exigences spécifiques relatives au contrôle des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques au sens de la définition donnée par l'Union Internationale des Télécommunications (UIT). Voir également la Définition 3.1.18 du présent document. Le CISPR et l'UIT se partagent la responsabilité de la protection des services radio en matière d'utilisation des applications ISM à fréquences radioélectriques.

Le CISPR est concerné par le contrôle des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques par le moyen d'une évaluation de ces perturbations, soit sur un site d'essai normalisé, soit, dans le cas d'une application ISM à fréquences radioélectriques qui ne peut pas être soumise à l'essai sur un tel site, sur son lieu de fonctionnement. Par conséquent, la présente publication du CISPR couvre les exigences relatives à l'évaluation des deux sortes d'appareils, à savoir, les appareils évalués par des essais sur des sites d'essai normalisés ou les appareils spécifiques évalués dans des conditions *in situ*.

L'UIT est concerné par le contrôle des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques pendant le fonctionnement normal et l'utilisation de l'appareil correspondant sur son lieu de fonctionnement (voir la Définition 1.15 dans le règlement des radiocommunications de l'UIT (2020)). Là, l'utilisation de l'énergie radioélectrique découplée de l'application ISM à fréquences radioélectriques par couplage rayonnant, inductif ou capacitif est limitée à l'emplacement de cette application.

Le paragraphe 6.3 de la présente publication du CISPR contient les exigences essentielles relatives aux émissions pour une évaluation des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques sur des sites d'essai normalisés. Ces exigences permettent des essais sur les applications ISM à fréquences radioélectriques qui fonctionnent à des fréquences jusqu'à 18 GHz. Le paragraphe 6.4 contient par ailleurs les exigences essentielles relatives aux émissions pour une évaluation *in situ* des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques dans la plage de fréquences jusqu'à 1 GHz. Toutes les exigences ont été établies en étroite collaboration avec l'UIT et jouissent de l'approbation de l'UIT.

Toutefois, pour le fonctionnement et l'utilisation de plusieurs types d'applications ISM à fréquences radioélectriques, il convient que le fabricant, l'installateur et/ou le client connaissent les dispositions nationales complémentaires concernant la réglementation et les besoins particuliers de protection des services et applications radio locaux. Selon le pays concerné, ces dispositions complémentaires peuvent s'appliquer à des applications ISM à fréquences radioélectriques qui fonctionnent à des fréquences situées à l'extérieur des bandes ISM désignées (voir le Tableau 1). Elles peuvent aussi s'appliquer à des applications ISM à fréquences radioélectriques qui fonctionnent à des fréquences supérieures à 18 GHz.

L'Annexe C du présent document donne des recommandations du CISPR relatives à la protection des services radio dans des zones particulières.

# APPAREILS INDUSTRIELS, SCIENTIFIQUES ET MÉDICAUX – CARACTÉRISTIQUES DE PERTURBATIONS RADIOÉLECTRIQUES – LIMITES ET MÉTHODES DE MESURE

## 1 Domaine d'application

Le présent document s'applique aux appareils industriels, scientifiques et électromédicaux qui fonctionnent dans la plage de fréquences de 0 Hz à 400 GHz, ainsi qu'aux appareils domestiques et similaires conçus pour produire et/ou utiliser, dans un espace réduit, de l'énergie radioélectrique.

Le présent document couvre les exigences d'émission relatives aux perturbations radioélectriques dans la plage de fréquences de 9 kHz à 400 GHz.

Pour les applications industrielles, scientifiques et médicales (ISM) à fréquences radioélectriques, au sens de la définition fournie par le règlement des radiocommunications de l'UIT (2020) (voir la Définition 3.1.18), le présent document couvre les exigences d'émission relatives aux perturbations à fréquences radioélectriques dans la plage de fréquences de 9 kHz à 18 GHz.

Les appareils ISM qui intègrent des fonctions d'émission/réception radio (équipement hôte avec une fonctionnalité radio) sont inclus dans le domaine d'application du présent document, voir l'Annexe F. Toutefois, les exigences d'émission du présent document ne sont pas destinées à s'appliquer aux transmissions intentionnelles d'un émetteur radio tel que défini par l'UIT, y compris leurs émissions parasites.

NOTE 1 Cette exclusion s'applique uniquement aux émissions de l'émetteur radio intentionnel. Toutefois, les émissions combinées, par exemple les émissions qui résultent de l'intermodulation entre la radio et les sous-ensembles non radioélectriques de l'appareil ISM, ne sont pas soumises à cette exclusion.

NOTE 2 Les exigences d'émission pour les appareils de cuisson à induction sont spécifiées dans la CISPR 14-1 [1]<sup>1</sup>.

Les exigences relatives aux appareils d'éclairage ISM à fréquences radioélectriques et aux générateurs de rayonnement UV qui fonctionnent dans les bandes de fréquences ISM définies par le règlement des radiocommunications de l'UIT sont spécifiées dans le présent document.

Les robots utilisés pour les applications industrielles, scientifiques et médicales relèvent du domaine d'application du présent document.

EXEMPLE Robots de soudage, robots de pulvérisation, robots de manutention, robots de traitement, robots d'assemblage, robots médicaux, robots éducatifs et expérimentaux. Une liste exhaustive des robots qui relèvent du domaine d'application de la présente norme est donnée dans la zone CEM de l'IEC.

NOTE 3 Les robots volants, les robots d'aide domestique, les robots jouets et les robots de divertissement sont des exemples de robots qui relèvent du domaine d'application des autres normes CISPR.

Les appareils couverts par d'autres normes de produits du CISPR et d'autres normes d'émission de famille de produits n'entrent pas dans le domaine d'application du présent document.

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1 Les chiffres entre crochets renvoient à la Bibliographie.

## 2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

CISPR 16-1-1:2019, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-1: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Appareils de mesure*

CISPR 16-1-2:2014, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-2: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Dispositifs de couplage pour la mesure des perturbations conduites*  
CISPR 16-1-2:2014/AMD1:2017

CISPR 16-1-4:2019, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-4: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Antennes et emplacements d'essai pour les mesures des perturbations rayonnées*  
CISPR 16-1-4:2019/AMD1:2020  
CISPR 16-1-4:2019/AMD2:2023

CISPR 16-2-1:2014, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-1: Méthodes de mesure des perturbations et de l'immunité – Mesures des perturbations conduites*  
CISPR 16-2-1:2014/AMD1:2017

CISPR 16-2-3:2016, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-3: Méthodes de mesure des perturbations et de l'immunité – Mesurages des perturbations rayonnées*  
CISPR 16-2-3:2016/AMD1:2019  
CISPR 16-2-3:2016/AMD2:2023

CISPR 16-4-2:2011, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 4-2: Incertitudes, statistiques et modélisation des limites – Incertitudes de mesure de l'instrumentation*  
CISPR 16-4-2:2011/AMD1:2014  
CISPR 16-4-2:2011/AMD2:2018

CISPR 32:2015, *Compatibilité électromagnétique des équipements multimédia – Exigences d'émission*  
CISPR 32:2015/AMD1:2019

IEC 60050-161:1990, *Vocabulaire Electrotechnique international (IEV) – Partie 161: Compatibilité électromagnétique*

IEC 60601-2-2:2017, *Appareils électromédicaux – Partie 2-2: Exigences particulières pour la sécurité de base et les performances essentielles des appareils d'électrochirurgie à courant haute fréquence et des accessoires d'électrochirurgie à courant haute fréquence*

IEC 61000-4-6:2023, *Compatibilité électromagnétique (CEM) – Partie 4-6: Techniques d'essai et de mesure – Immunité aux perturbations conduites, induites par les champs aux fréquences radioélectriques*

IEC 61307:2011<sup>2</sup>, *Installations industrielles de chauffage à hyperfréquence – Méthodes d'essai pour la détermination de la puissance de sortie*

Règlement des radiocommunications de l'UIT (2020), *Règlement des radiocommunications, disponible à l'adresse*  
<http://www.itu.int/en/myitu/Publications/2020/09/02/14/23/Radio-Regulations-2020>)

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<sup>2</sup> Cette publication a été supprimée.