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COMMENTED VERSION

Utrustning för industriellt, vetenskapligt och medicinskt bruk (ISM-utrustning) – Radiostörningar – Gränsvärden och mätmetoder

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

En så kallad "Commented Version" (CMV) innehåller både den fastställda IEC-standarden och en kommenterad och ändringsmarkerad standard. Alla tillägg och borttagningar sedan den tidigare utgåvan är markerade med färg. Med en CMV sparar du mycket tid när du ska identifiera och förklara aktuella ändringar i standarden. SEK Svensk Elstandard kan bara ge ut CMV i de fall den finns tillgänglig från IEC.



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

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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. The main document types developed by IEC are described in greater detail at 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 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:~~

- ~~power conversion equipment intended for assembly into photovoltaic power generating systems, such as grid connected power converters (GCPs) and d.c. to d.c. converters,~~
- ~~GCPs 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:~~

- ~~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 (± 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, ± 5 MHz and ± 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]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 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 –*

¹ Figures in square brackets refer to the Bibliography.

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 16-1-2:2014/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*

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Utrustning för industriellt, vetenskapligt och medicinskt bruk (ISM-utrustning) – Radiostörningar – Gränsvärden och mätmetoder

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

Som svensk standard gäller europastandarden EN 55011:2025. Den svenska standarden innehåller den officiella engelska språkversionen av EN 55011:2025.

Nationellt förord

Europastandarden EN 55011:2025

består av:

- europastandardens ikraftsättningsdokument, utarbetat inom CENELEC
- CISPR 11, Seventh edition, 2024 - Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 55011, utg 5:2016 med eventuella tillägg, ändringar och rättelser gäller ej fr o m 2028-07-31.

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English Version

Industrial, scientific and medical equipment - Radio-frequency
disturbance characteristics - Limits and methods of
measurement
(CISPR 11:2024)

Appareils industriels, scientifiques et médicaux -
Caractéristiques de perturbations radioélectriques - Limites
et méthodes de mesure
(CISPR 11:2024)

Industrielle, wissenschaftliche und medizinische Geräte -
Funkstörungen - Grenzwerte und Messverfahren
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European foreword

The text of document CIS/B/831/FDIS, future edition 7 of CISPR 11, prepared by SC CISPR/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 IEC/TC CISPR "International special committee on radio interference" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 55011:2025.

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

CISPR 14-1	NOTE	Approved as EN IEC 55014-1
IEC 62920:2017	NOTE	Approved as EN 62920:2017 (not modified) +A11:2020
IEC 62920:2017/A1:2021	NOTE	Approved as EN 62920:2017/A1:2021 (not modified)
IEC 61000-6-3:2020	NOTE	Approved as EN IEC 61000-6-3:2021 (not modified)
IEC 60364-1	NOTE	Approved as HD 60364-1
IEC 60601-1-2:2014	NOTE	Approved as EN 60601-1-2:2015 (not modified)
IEC 60601-1-2:2014/A1:2020	NOTE	Approved as EN 60601-1-2:2015/A1:2021 (not modified)
IEC 61922:2002	NOTE	Approved as EN 61922:2002 (not modified)
IEC 61308:2005	NOTE	Approved as EN 61308:2006 (not modified)
IEC 60705:2010	NOTE	Approved as EN 60705:2015 (not modified)
IEC 60974-10:2020	NOTE	Approved as EN IEC 60974-10:2021 (not modified)
CISPR 12	NOTE	Approved as EN 55012

CISPR 15:2018	NOTE	Approved as EN IEC 55015:2019 (not modified) +A11:2020
IEC 60364-5-51:2005	NOTE	Approved as HD 60364-5-51:2009 +A11:2013
IEC 61158-1:2023	NOTE	Approved as EN IEC 61158-1:2023 (not modified)
IEC 61689:2022	NOTE	Approved as EN IEC 61689:2022 (not modified)
IEC 62135-2:2020	NOTE	Approved as EN IEC 62135-2:2021 (not modified)

Annex ZA

(normative)

Normative references to international publications with their corresponding European publications

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NOTE 1 Where 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.cencenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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	EN IEC 55016-1-1	2019
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
+ A1	2017		+ A1	2018
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	EN IEC 55016-1-4	2019
+ A1	2020		+ A1	2020
+ A2	2023		+ A2	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	EN 55016-2-1	2014
+ A1	2017		+ A1	2017

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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	EN 55016-2-3	2017
+ A1	2019		+ A1	2019
+ A2	2023		+ A2	2023
CISPR 16-4-2	2011	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	2011
+ A1	2014		+ A1	2014
+ A2	2018		+ A2	2018
CISPR 32	2015	Electromagnetic compatibility of multimedia equipment - Emission requirements	EN 55032	2015
+ A1	2019		+ A1	2020
IEC 60050-161	1990	International Electrotechnical Vocabulary. Chapter 161: Electromagnetic compatibility	-	-
IEC 60601-2-2	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	EN IEC 60601-2-2	2018
IEC 61000-4-6	2023	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN IEC 61000-4-6	2023
IEC 61307	2011	Industrial microwave heating installations - Test methods for the determination of power output	EN 61307	2011
ITU Radio Regulations	2020	Radio Regulations	-	-

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**

INTERNATIONAL
ELECTROTECHNICAL
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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

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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 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. The main document types developed by IEC are described in greater detail at 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 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]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 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*

¹ 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

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 60601-2-2:2017, *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 61000-4-6:2023, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61307:2011², *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>)

² This publication was withdrawn.