

# REDLINE VERSION



BASIC EMC PUBLICATION

---

**Electromagnetic compatibility (EMC) –  
Part 6-4: Generic standards – Emission standard for industrial environments**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 33.100.10

ISBN 978-2-8322-5388-5

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	2
1 Scope <del>and object</del> .....	7
2 Normative references .....	8
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms and definitions.....	9
3.2 Abbreviated terms.....	10
4 Conditions during testing .....	12
5 Product documentation .....	13
6 Applicability .....	13
7 Measurement uncertainty .....	13
8 Compliance with this document .....	15
9 Emission requirements .....	15
<del>Application of limits in tests for conformity of equipment in series production.....</del>	<del>.....</del>
Annex A (informative) Testing of DC powered systems .....	20
Annex B (informative) Further information on measurements using a FAR .....	22
B.1 General.....	22
B.2 Analysis .....	22
B.2.1 Theoretical analysis of simple radiators .....	22
B.2.2 Limitations with the basic model .....	23
B.2.3 Measurements on an EUT .....	26
B.2.4 Derivation of limits .....	27
B.3 Requirements .....	28
Bibliography.....	29
Figure 1 – Examples of ports .....	9
Figure B.1 – Geometrical optics model for OATS measurements .....	22
Figure B.2 – Field attenuation between two half-wave dipoles above ground plane with fixed transmit antenna height and variable receive antenna height.....	23
Figure B.3 – Equivalent circuit diagram of a typical EUT .....	24
Figure B.4 – 10 m distance, horizontal polarization, calculated differences for an electrically short straight wire above the ground plane on an OATS compared with a FAR ( $E_{OATS} - E_{FAR}$ ).....	24
Figure B.5 – 10 m distance, vertical polarization, calculated differences for an electrically short straight wire above the ground plane on an OATS compared with a FAR ( $E_{OATS} - E_{FAR}$ ).....	25
Figure B.6 – 3 m distance, horizontal polarization, calculated differences for an electrically short straight wire above the ground plane on an OATS compared with a FAR ( $E_{OATS} - E_{FAR}$ ).....	25
Figure B.7 – 3 m distance, vertical polarization, calculated differences for an electrically short straight wire above the ground plane on an OATS compared with a FAR ( $E_{OATS} - E_{FAR}$ ).....	26
Figure B.8 – Differences of the horizontal polarised emission of the small EUT with mains lead in the 3 m FARs and on 10 m OATS.....	27

~~Table 1 – Emission~~ .....

Table 1 – Test arrangements of EUT .....	12
Table 2 – Required highest frequency for radiated measurement .....	16
Table 3 – Requirements for radiated emissions – enclosure port.....	17
Table 4 – Requirements for conducted emissions – low voltage AC mains port.....	18
Table 5 – Requirements for conducted emissions – wired network port.....	18
Table A.1 – Proposed requirements for conducted emissions – DC power port .....	20
Table A.2 – Conducted testing of DC powered equipment.....	21
Table B.1 – Proposed requirements for radiated emissions, FAR .....	28

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMAGNETIC COMPATIBILITY (EMC) –****Part 6-4: Generic standards –  
Emission standard for industrial environments**

## 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.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

**DISCLAIMER**

**This Redline version is not an official IEC Standard and is intended only to provide the user with an indication of what changes have been made to the previous version. Only the current version of the standard is to be considered the official document.**

**This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

International Standard IEC 61000-6-4 has been prepared by CISPR subcommittee H: Limits for the protection of radio services.

This third edition cancels and replaces the second edition published in 2006 and Amendment 1:2010 This edition constitutes a technical revision.

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

- a) possible future requirements on DC ports;
- b) possible future radiated polarity specific emission limits within a FAR;
- c) the definition of which average detector is used for emission measurements at frequencies above 1GHz and that results using a peak detector are acceptable for all measurements;
- d) the definition of different EUT test arrangements.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
CIS/H/339A/FDIS	CIS/H/350/RVD

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

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

It forms Part 6-4 of the IEC 61000 series of standards. It has the status of a basic EMC publication in accordance with IEC Guide 107.

A list of all parts in the CISPR 61000 series, published under the general title *Electromagnetic compatibility*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document 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.**

## INTRODUCTION

IEC 61000 is published in separate parts according to the following structure:

### **Part 1: General**

General considerations (introduction, fundamental principles)

Definitions, terminology

### **Part 2: Environment**

Description of the environment

Classification of the environment

Compatibility levels

### **Part 3: Limits**

Emission limits

Immunity limits (insofar as they do not fall under the responsibility of the product committees)

### **Part 4: Testing and measurement techniques**

Measurement techniques

Testing techniques

### **Part 5: Installation and mitigation guidelines**

Installation guidelines

Mitigation methods and devices

### **Part 6: Generic standards**

### **Part 9: Miscellaneous**

Each part is further subdivided into several parts published either as International Standards or technical reports/specifications, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number identifying the subdivision (example: IEC 61000-6-1).

# ELECTROMAGNETIC COMPATIBILITY (EMC) –

## Part 6-4: Generic standards –

### Emission standard for industrial environments

#### 1 ~~Scope and object~~

~~This part of IEC 61000 for EMC emission requirements applies to electrical and electronic apparatus intended for use in industrial environments as described below.~~

~~Emission requirements in the frequency range 0 Hz to 400 GHz are covered. No measurement needs to be performed at frequencies where no requirement is specified.~~

~~This generic EMC emission standard is applicable if no relevant dedicated product or product-family EMC emission standard exists.~~

~~This standard applies to a apparatus intended to be connected to a power network supplied from a high or medium voltage transformer dedicated to the supply of an installation feeding manufacturing or similar plant, and intended to operate in or in proximity to industrial locations, as described below. This standard applies also to apparatus, which is battery operated and intended to be used in industrial locations.~~

~~The environments encompassed by this standard are industrial, both indoor and outdoor.~~

~~Industrial locations are in addition characterised by the existence of one or more of the following examples:~~

- ~~— industrial, scientific and medical (ISM)<sup>1)</sup> apparatus;~~
- ~~— heavy inductive or capacitive loads that are frequently switched;~~
- ~~— high currents and associated magnetic fields.~~

~~The object of this standard is to define the emission test requirements for apparatus defined in the scope in relation to continuous and transient, conducted and radiated disturbances.~~

~~The emission requirements have been selected so as to ensure that disturbances generated by apparatus operating normally in industrial locations do not exceed a level that could prevent other apparatus from operating as intended. Fault conditions of apparatus are not taken into account. Not all disturbance phenomena have been included for testing purposes in this standard but only those considered as relevant for the equipment covered by this standard. These requirements represent essential electromagnetic compatibility emission requirements.~~

This part of IEC 61000 for emission requirements applies to electrical and electronic equipment intended for use within the environment existing at industrial (see 3.1.12) locations.

This document does not apply to equipment that fall within the scope of IEC 61000-6-3.

The environments encompassed by this document cover both indoor and outdoor locations.

---

<sup>1)</sup> As defined in CISPR 11.

Emission requirements in the frequency range 9 kHz to 400 GHz are covered in this document and have been selected to provide an adequate level of protection of radio reception in the defined electromagnetic environment. No measurement needs to be performed at frequencies where no requirement is specified. These requirements are considered essential to provide an adequate level of protection to radio services.

Not all disturbance phenomena have been included for testing purposes but only those considered relevant for the equipment intended to operate within the environments included within this document.

Requirements are specified for each port considered.

This generic EMC emission standard is to be used where no applicable product or product-family EMC emission standard is available.

NOTE 1 Safety considerations are not covered by this document.

NOTE 2 In special cases, situations will arise where the levels specified in this document will not offer adequate protection; for example where a sensitive receiver is used in close proximity to an ~~apparatus~~ equipment. In these instances, special mitigation measures may have to be employed.

NOTE 3 Disturbances generated in fault conditions of equipment are not covered by 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.

IEC 60050-161, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility*

IEC 61000-4-20:2010, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguide*

CISPR 11:2015, *Industrial, scientific and medical ~~(ISM) radio-frequency~~ equipment – ~~Electromagnetic~~ Radio-frequency disturbance characteristics – Limits and methods of measurement*  
CISPR 11:2015/AMD1:2016

CISPR 14-1:2016, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1-1:2015, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:~~2003~~ 2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – ~~Ancillary equipment~~ Coupling devices for conducted disturbances ~~s~~ 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/AMD1:2012

CISPR 16-1-4:2010/AMD2:2017



CISPR 16-1-6:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-6: Radio disturbance and immunity measuring apparatus – EMC antenna calibration*

CISPR 16-1-6:2014/AMD1:2017

CISPR 16-2-1:~~2003~~ 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 16-4-2:2011, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – ~~Uncertainty in EMC measurements~~ Measurement instrumentation uncertainty*

CISPR 16-4-2:2011/AMD1:2014

~~CISPR 22, Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement~~

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

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



BASIC EMC PUBLICATION  
PUBLICATION FONDAMENTALE EN CEM

**Electromagnetic compatibility (EMC) –  
Part 6-4: Generic standards – Emission standard for industrial environments**

**Compatibilité électromagnétique (CEM) –  
Partie 6-4: Normes génériques – Norme sur l'émission pour les environnements  
industriels**

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms, definitions and abbreviated terms .....	8
3.1 Terms and definitions.....	8
3.2 Abbreviated terms.....	10
4 Conditions during testing .....	11
5 Product documentation .....	12
6 Applicability .....	12
7 Measurement uncertainty .....	12
8 Compliance with this document .....	12
9 Emission requirements .....	13
Annex A (informative) Testing of DC powered systems .....	17
Annex B (informative) Further information on measurements using a FAR .....	19
B.1 General.....	19
B.2 Analysis .....	19
B.2.1 Theoretical analysis of simple radiators .....	19
B.2.2 Limitations with the basic model .....	20
B.2.3 Measurements on an EUT .....	23
B.2.4 Derivation of limits .....	24
B.3 Requirements .....	24
Bibliography.....	26
Figure 1 – Example of ports .....	9
Figure B.1 – Geometrical optics model for OATS measurements .....	19
Figure B.2 – Field attenuation between two half-wave dipoles above ground plane with fixed transmit antenna height and variable receive antenna height.....	20
Figure B.3 – Equivalent circuit diagram of a typical EUT .....	21
Figure B.4 – 10 m distance, horizontal polarization, calculated differences for an electrically short straight wire above the ground plane on an OATS compared with a FAR ( $E_{OATS} - E_{FAR}$ ).....	21
Figure B.5 – 10 m distance, vertical polarization, calculated differences for an electrically short straight wire above the ground plane on an OATS compared with a FAR ( $E_{OATS} - E_{FAR}$ ).....	22
Figure B.6 – 3 m distance, horizontal polarization, calculated differences for an electrically short straight wire above the ground plane on an OATS compared with a FAR ( $E_{OATS} - E_{FAR}$ ).....	22
Figure B.7 – 3 m distance, vertical polarization, calculated differences for an electrically short straight wire above the ground plane on an OATS compared with a FAR ( $E_{OATS} - E_{FAR}$ ).....	23
Figure B.8 – Differences of the horizontal polarised emission of the small EUT with mains lead in the 3 m FARs and on 10 m OATS.....	24
Table 1 – Test arrangements of EUT .....	11

Table 2 – Required highest frequency for radiated measurement ..... 14

Table 3 – Requirements for radiated emissions – enclosure port..... 15

Table 4 – Requirements for conducted emissions – low voltage AC mains port ..... 16

Table 5 – Requirements for conducted emissions – wired network port..... 16

Table A.1 – Proposed requirements for conducted emissions – DC power port ..... 17

Table A.2 – Conducted testing of DC powered equipment..... 18

Table B.1 – Proposed requirements for radiated emissions, FAR .....25

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMAGNETIC COMPATIBILITY (EMC) –****Part 6-4: Generic standards –  
Emission standard for industrial environments**

## 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.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61000-6-4 has been prepared by CISPR subcommittee H: Limits for the protection of radio services.

This third edition cancels and replaces the second edition published in 2006 and Amendment 1:2010 This edition constitutes a technical revision.

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

- a) possible future requirements on DC ports;
- b) possible future radiated polarity specific emission limits within a FAR;
- c) the definition of which average detector is used for emission measurements at frequencies above 1GHz and that results using a peak detector are acceptable for all measurements;
- d) the definition of different EUT test arrangements.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
CIS/H/339A/FDIS	CIS/H/350/RVD

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

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

It forms Part 6-4 of the IEC 61000 series of standards. It has the status of a basic EMC publication in accordance with IEC Guide 107.

A list of all parts in the CISPR 61000 series, published under the general title *Electromagnetic compatibility*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document 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.**

## INTRODUCTION

IEC 61000 is published in separate parts according to the following structure:

### **Part 1: General**

General considerations (introduction, fundamental principles)

Definitions, terminology

### **Part 2: Environment**

Description of the environment

Classification of the environment

Compatibility levels

### **Part 3: Limits**

Emission limits

Immunity limits (insofar as they do not fall under the responsibility of the product committees)

### **Part 4: Testing and measurement techniques**

Measurement techniques

Testing techniques

### **Part 5: Installation and mitigation guidelines**

Installation guidelines

Mitigation methods and devices

### **Part 6: Generic standards**

### **Part 9: Miscellaneous**

Each part is further subdivided into several parts published either as International Standards or technical reports/specifications, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number identifying the subdivision (example: IEC 61000-6-1).

# **ELECTROMAGNETIC COMPATIBILITY (EMC) –**

## **Part 6-4: Generic standards –**

### **Emission standard for industrial environments**

## **1 Scope**

This part of IEC 61000 for emission requirements applies to electrical and electronic equipment intended for use within the environment existing at industrial (see 3.1.12) locations.

This document does not apply to equipment that fall within the scope of IEC 61000-6-3.

The environments encompassed by this document cover both indoor and outdoor locations.

Emission requirements in the frequency range 9 kHz to 400 GHz are covered in this document and have been selected to provide an adequate level of protection of radio reception in the defined electromagnetic environment. No measurement needs to be performed at frequencies where no requirement is specified. These requirements are considered essential to provide an adequate level of protection to radio services.

Not all disturbance phenomena have been included for testing purposes but only those considered relevant for the equipment intended to operate within the environments included within this document.

Requirements are specified for each port considered.

This generic EMC emission standard is to be used where no applicable product or product-family EMC emission standard is available.

NOTE 1 Safety considerations are not covered by this document.

NOTE 2 In special cases, situations will arise where the levels specified in this document will not offer adequate protection; for example where a sensitive receiver is used in close proximity to an equipment. In these instances, special mitigation measures may have to be employed.

NOTE 3 Disturbances generated in fault conditions of equipment are not covered by 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.

IEC 60050-161, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility*

IEC 61000-4-20:2010, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguide*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*  
CISPR 11:2015/AMD1:2016



CISPR 14-1:2016, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1-1:2015, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

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/AMD1:2012

CISPR 16-1-4:2010/AMD2:2017

CISPR 16-1-6:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-6: Radio disturbance and immunity measuring apparatus – EMC antenna calibration*

CISPR 16-1-6:2014/AMD1:2017

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

CISPR 16-4-2:2011/AMD1:2014

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

## SOMMAIRE

AVANT-PROPOS.....	30
INTRODUCTION.....	32
1 Domaine d'application .....	33
2 Références normatives .....	33
3 Termes, définitions et termes abrégés .....	34
3.1 Termes et définitions .....	34
3.2 Termes abrégés.....	37
4 Conditions pendant les essais .....	37
5 Documentation du produit.....	38
6 Applicabilité.....	38
7 Incertitude de mesure .....	39
8 Conformité au présent document .....	39
9 Exigences d'émissions.....	39
Annexe A (informative) Essai des systèmes alimentés an courant continu .....	43
Annexe B (informative) Informations complémentaires relatives aux mesures à l'aide d'une salle complètement anéchoïque .....	45
B.1 Généralités .....	45
B.2 Analyse.....	45
B.2.1 Analyse théorique d'éléments rayonnants simples .....	45
B.2.2 Limites avec le modèle de base .....	46
B.2.3 Mesures sur un EUT .....	49
B.2.4 Écart de limites.....	50
B.3 Exigences .....	51
Bibliographie.....	52
Figure 1 – Exemple d'accès .....	35
Figure B.1 – Modèle optique géométrique pour les mesures d'OATS .....	45
Figure B.2 – Affaiblissement du champ entre deux doublets demi-onde au-dessus du plan de masse, avec hauteur d'antenne d'émission fixe et hauteur d'antenne de réception variable .....	46
Figure B.3 – Schéma d'équivalence des circuits d'un EUT classique.....	47
Figure B.4 – Différences calculées à une distance de 10 m en polarisation horizontale pour un fil rectiligne court d'un point de vue électrique au-dessus du plan de masse d'un OATS comparées à une FAR ( $E_{OATS} - E_{FAR}$ ).....	47
Figure B.5 – Différences calculées à une distance de 10 m en polarisation verticale pour un fil rectiligne court d'un point de vue électrique au-dessus du plan de masse d'un OATS comparées à une FAR ( $E_{OATS} - E_{FAR}$ ).....	48
Figure B.6 – Différences calculées à une distance de 3 m en polarisation horizontale pour un fil rectiligne court d'un point de vue électrique au-dessus du plan de masse d'un OATS comparées à une FAR ( $E_{OATS} - E_{FAR}$ ).....	48
Figure B.7 – Différences calculées à une distance de 3 m en polarisation verticale pour un fil rectiligne court d'un point de vue électrique au-dessus du plan de masse d'un OATS comparées à une FAR ( $E_{OATS} - E_{FAR}$ ).....	49
Figure B.8 – Différences d'émission à polarisation horizontale du petit EUT doté d'un cordon secteur à 3 m dans une salle entièrement anéchoïque et à 10 m dans un site d'essai ouvert en champ libre .....	50

Tableau 1 – Dispositions d'essai de l'EUT .....	38
Tableau 2 – Fréquence la plus élevée exigée pour la mesure rayonnée .....	40
Tableau 3 – Exigences en matière d'émissions rayonnées, accès par l'enveloppe .....	41
Tableau 4 – Exigences en matière d'émissions conduites, accès au réseau d'alimentation en courant alternatif à basse tension .....	42
Tableau 5 – Exigences en matière d'émissions conduites, accès par le réseau câblé .....	42
Tableau A.1 – Exigences proposées pour les émissions conduites – accès en courant continu.....	43
Tableau A.2 – Essai d'émissions conduites des appareils alimentés en courant continu .....	44
Tableau B.1 – Exigences proposées en matière d'émissions rayonnées, salle entièrement anéchoïque .....	51

## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

### COMPATIBILITÉ ÉLECTROMAGNÉTIQUE (CEM) –

#### Partie 6-4: Normes génériques – Norme sur l'émission pour les environnements industriels

##### AVANT-PROPOS

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 61000-6-4 a été établie par le sous-comité H du CISPR: Limites pour la protection des services radioélectriques.

Cette troisième édition annule et remplace la seconde édition parue en 2016 et son Amendement 1:2010. Cette édition constitue une révision technique.

La présente édition inclut les modifications techniques suivantes par rapport à l'édition précédente:

- a) les exigences ultérieures possibles sur les accès en courant continu;
- b) les limites futures possibles d'émissions rayonnées spécifiques à la polarité dans une FAR;

- c) la définition du type de détecteur de valeur moyenne est utilisée pour les mesures des émissions à des fréquences supérieures à 1GHz et les résultats obtenus à l'aide d'un détecteur de crête sont acceptables pour tous les mesurages;
- d) la définition des différentes dispositions d'essais de l'EUT.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
CIS/H/339A/FDIS	CIS/H/350/RVD

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

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Il forme la Partie 6-4 de la série des normes IEC 61000. Il a le statut de publication fondamentale en CEM conformément au Guide 107 de l'IEC.

Une liste de toutes les parties de la série des normes CISPR IEC 61000 est publiée sous le titre général *Compatibilité électromagnétique*, est visible sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

**IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.**

## INTRODUCTION

L'IEC 61000 est publiée en plusieurs parties, conformément à la structure suivante:

### **Partie 1: Généralités**

Considérations générales (introduction, principes fondamentaux)

Définitions, terminologie

### **Partie 2: Environnement**

Description de l'environnement

Classification de l'environnement

Niveaux de compatibilité

### **Partie 3: Limites**

Limites d'émission

Limites d'immunité (dans la mesure où elles ne relèvent pas de la responsabilité des comités de produits)

### **Partie 4: Techniques d'essai et de mesure**

Techniques de mesure

Techniques d'essai

### **Partie 5: Guide d'installation et d'atténuation**

Guide d'installation

Méthodes et dispositifs d'atténuation

### **Partie 6: Normes génériques**

### **Partie 9: Divers**

Chaque partie est à son tour subdivisée en parties qui sont publiées soit comme Normes internationales, soit comme rapports techniques/spécifications techniques, certaines d'entre elles ayant déjà été publiées comme sections. D'autres seront publiées avec le numéro de la partie suivi d'un tiret et d'un second chiffre identifiant la subdivision (exemple: IEC 61000-6-1).

## COMPATIBILITÉ ÉLECTROMAGNÉTIQUE (CEM) –

### Partie 6-4: Normes génériques – Norme sur l'émission pour les environnements industriels

#### 1 Domaine d'application

La présente partie de l'IEC 61000 concernant les exigences d'émissions s'applique aux appareils électriques et électroniques destinés à être utilisés dans des environnements existants (voir 3.1.12) sur des sites industriels.

Le présent document ne s'applique pas aux appareils entrant dans le domaine d'application de l'IEC 61000-6-3.

Les environnements couverts par le présent document sont les sites intérieurs et extérieurs.

Les exigences en matière d'émission dans la plage de fréquences comprises entre 9 kHz et 400 GHz sont couvertes dans le présent document et ont été choisies de manière à assurer un niveau adéquat de protection de la réception radioélectrique dans l'environnement électromagnétique défini. Il n'est pas nécessaire de réaliser des mesures aux fréquences pour lesquelles aucune exigence n'a été spécifiée. Ces exigences sont considérées comme étant essentielles à l'obtention d'un niveau adéquat de protection des services radioélectriques.

Tous les phénomènes perturbateurs n'ont pas été inclus pour les besoins de l'essai. Seuls l'ont été ceux considérés comme pertinents pour l'équipement destiné à fonctionner dans l'environnement couvert par le présent document.

Les exigences sont spécifiées pour chacun des accès considérés.

La présente Norme d'émission CEM générique doit être utilisée lorsqu'aucune norme d'émission CEM spécifique à un produit ou à une famille de produits n'est disponible.

NOTE 1 Le présent document ne traite pas des aspects de sécurité.

NOTE 2 Dans des cas particuliers, des situations apparaissent dans lesquelles les niveaux spécifiés dans le présent document ne peuvent offrir le niveau de protection adéquat (lorsqu'un récepteur sensible est utilisé à très grande proximité d'un appareil, par exemple). Dans de tels cas, des mesures particulières d'atténuation peuvent devoir être employées.

NOTE 3 Les perturbations générées dans les conditions de défaut de l'équipement ne sont pas couvertes par le présent document.

#### 2 Références normatives

Les documents suivants cités dans le texte 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).

IEC 60050-161, *Vocabulaire Electrotechnique International – Chapitre 161 – Compatibilité électromagnétique*

IEC 61000-4-20:2010, *Compatibilité électromagnétique (CEM) – Partie 4-20: Techniques d'essai et de mesure – Essais d'émission et d'immunité dans les guides d'onde TEM*

CISPR 11:2015, *Appareils industriels, scientifiques et médicaux – Caractéristiques de perturbations radioélectriques – Limites et méthodes de mesure*  
CISPR 11:2015/AMD 1:2016

CISPR 14-1:2016, *Compatibilité électromagnétique – Exigences pour les appareils électrodomestiques, outillages électriques et appareils analogues – Partie 1: Émission*

CISPR 16-1-1:2015, *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 16-1-4:2010, *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 16-1-4:2010/AMD1:2012

CISPR 16-1-4:2010/AMD2:2017

CISPR 16-1-6:2014, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-6: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Étalonnage des antennes CEM*

CISPR 16-1-6:2014/AMD1:2017

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 16-4-2:2011, *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/AMD 1:2014

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