

# INTERNATIONAL STANDARD



**Electromagnetic compatibility (EMC) –  
Part 3-2: Limits – Limits for harmonic current emissions (equipment input  
current  $\leq 16$  A per phase)**

Document Preview

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REDLINE VERSION

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Electromagnetic compatibility (EMC) –  
Part 3-2: Limits – Limits for harmonic current emissions (equipment input  
current  $\leq 16$  A per phase)

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMAGNETIC COMPATIBILITY (EMC) –****Part 3-2: Limits – Limits for harmonic current emissions  
(equipment input current  $\leq 16$  A per phase)**

## FOREWORD

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International Standard IEC 61000-3-2 has been prepared by sub-committee 77A: EMC – Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It forms part 3-2 of the IEC 61000 series. It has the status of a product family standard.

This fifth edition cancels and replaces the fourth edition published in 2014. This edition constitutes a technical revision.

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

- a) an update of the emission limits for lighting equipment with a rated power  $\leq 25$  W to take into account new types of lighting equipment;
- b) the addition of a threshold of 5 W under which no emission limits apply to all lighting equipment;
- c) the modification of the requirements applying to the dimmers when operating non-incandescent lamps;
- d) the addition of test conditions for digital load side transmission control devices;
- e) the removal of the use of reference lamps and reference ballasts for the tests of lighting equipment;
- f) the simplification and clarification of the terminology used for lighting equipment;
- g) the classification of professional luminaires for stage lighting and studios under Class A;
- h) a clarification about the classification of emergency lighting equipment;
- i) a clarification for lighting equipment including one control module with an active input power  $\leq 2$  W;
- j) an update of the test conditions for television receivers;
- k) an update of the test conditions for induction hobs, taking also into account the other types of cooking appliances;
- l) for consistency with IEC 61000-3-12, a change of the scope of IEC 61000-3-2 from equipment with an input current  $\leq 16$  A to equipment with a rated input current  $\leq 16$  A.

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

FDIS	Report on voting
77A/986/FDIS	77A/990/RVD

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

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

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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## 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 levels

Classification of the environment

Compatibility levels

### Part 3: Limits

Emission limits

Immunity limits (in so far 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

[IEC 61000-3-2:2018](https://standards.iteh.ai/catalog/standards/iec/3b48ae97-3d70-455f-8ab5-40510a42744f/iec-61000-3-2-2018)

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### Part 9: Miscellaneous

~~Each part is further subdivided into sections which are to be published either as international standards, technical specifications, or as technical reports.~~

~~These standards and reports will be published in chronological order and numbered accordingly (for example, 61000-6-1).~~

~~This part is an international standard which gives emission limits for harmonic currents from equipment having an input current up to and including 16 A per phase.~~

~~This part is a Product Family Standard.~~

Each part is further subdivided into several parts, published either as international standards or as technical specifications or technical reports, 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 3-2: Limits – Limits for harmonic current emissions (equipment input current $\leq 16$ A per phase)

#### 1 Scope

This part of IEC 61000 deals with the limitation of harmonic currents injected into the public supply system.

It specifies limits of harmonic components of the input current which ~~may~~ can be produced by equipment tested under specified conditions.

~~Harmonic components are measured according to Annexes A and B.~~

This part of IEC 61000 is applicable to electrical and electronic equipment having a ~~rated~~ input current up to and including 16 A per phase, and intended to be connected to public low-voltage distribution systems.

Arc welding equipment which is not professional equipment, with a ~~rated~~ input current up to and including 16 A per phase, is included in this document. Arc welding equipment intended for professional use, as specified in IEC 60974-1, is excluded from this document and ~~may~~ can be subject to installation restrictions as indicated in ~~IEC/TR 61000-3-4 or~~ IEC 61000-3-12.

The tests according to this document are type tests. ~~Test conditions for particular equipment are given in Annex C.~~

For systems with nominal voltages less than ~~but not equal to~~ 220 V (line-to-neutral), the limits have not yet been considered.

NOTE The words apparatus, appliance, device and equipment are used throughout this document. They have the same meaning for the purposes 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.

~~IEC 60050-131, International Electrotechnical Vocabulary (IEV) – Part 131: Electric and magnetic circuits~~

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic compatibility* (available at [www.electropedia.org](http://www.electropedia.org))

~~IEC 60107-1, Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies~~

IEC 60155, *Glow-starters for fluorescent lamps*

~~IEC 60268-1:1985, Sound system equipment – Part 1: General~~

IEC 60268-3, *Sound system equipment – Part 3: Amplifiers*

~~IEC 60335-2-2, Household and similar electrical appliances – Safety – Part 2-2: Particular requirements for vacuum cleaners and water suction cleaning appliances~~

~~IEC 60335-2-14, Household and similar electrical appliances – Safety – Part 2-14: Particular requirements for kitchen machines~~

IEC 60335-2-24:2010, *Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice makers*

~~IEC 60335-2-79, Household and similar electrical appliances – Safety – Part 2-79: Particular requirements for high pressure cleaners and steam cleaners~~

~~IEC 60974-1, Arc welding equipment – Part 1: Welding power sources~~

~~IEC 61000-2-2, Electromagnetic compatibility (EMC) – Part 2-2: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems~~

~~IEC/TR 61000-3-4, Electromagnetic compatibility (EMC) – Part 3-4: Limits – Limitation of emission of harmonic currents in low-voltage power supply systems for equipment with rated current greater than 16 A~~

~~IEC 61000-3-12, Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current  $> 16$  A and  $\leq 75$  A per phase~~

IEC 61000-4-7:2002, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*  
[IEC 61000-4-7:2002/AMD1:2008](https://standards.iteh.org/standards/iec/3b48ae97-3d70-455f-8ab5-40510a42744f/iec-61000-3-2-2018)

~~Recommendation ITU-R BT.471-1, Nomenclature and description of colour bar signals~~

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1

##### portable tool

electrical tool which is hand-held during normal operation and used for a short time (a few minutes) only

Note 1 to entry: Hand-held means that no part of the tool, except the power cord, rests on the floor during normal operation.

#### 3.2

##### lamp

source ~~for producing light~~ intended to produce an optical radiation, usually visible

Note 1 to entry: For the purposes of this document, a lamp can also be a solid state lighting module which can contain further components, for example optical, electrical, mechanical and/or electronic components.

### 3.3

#### self-ballasted lamp

unit which cannot be dismantled without being permanently damaged, is provided with a lamp cap and ~~incorporating~~ incorporates a light source and ~~any additional element~~ the lighting control gear necessary for ~~starting and stable~~ the operation of the light source

### 3.4

#### luminaire

apparatus (~~other than a lamp~~) which distributes, filters or transforms the light transmitted from one or more lamps and which includes, ~~except the lamps themselves~~, all the parts necessary for ~~supporting~~, fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply

[SOURCE: IEC 60050-845:1987, 845-10-01, modified – the existing notes have been removed]

### 3.5

#### ballast

~~device connected between the supply and one or more discharge lamps which serves mainly to limit the current of the lamp(s) to the required value. It may include means for transforming the supply voltage and/or frequency, correcting the power factor and, either alone or in combination with a starting device, provide the necessary conditions for starting the lamp(s)~~

### 3.6

#### step-down converter for lighting equipment

~~unit inserted between the supply and one or more tungsten halogen or other filament lamps which serves to supply the lamp(s) with its (their) rated voltage, generally at high frequency. The unit may consist of one or more separate components. It may include means for dimming, correcting the power factor and suppressing radio interference~~

### 3.7

#### reference lamp

~~lamp selected for testing ballasts which, when associated with a reference ballast, has electrical characteristics that are close to the objective values given in the relevant lamp specification~~

### 3.8

#### reference ballast

~~special inductive type ballast designed for the purpose of providing comparison standards for use in testing ballasts and for the selection of reference lamps. It is essentially characterized by a stable voltage-to-current ratio, which is relatively uninfluenced by variations in current, temperature, and the magnetic surroundings~~

### 3.5

#### input current

current directly supplied to an equipment or a part of equipment by the AC distribution system

### 3.6

#### circuit power factor

~~the circuit power factor is the~~ ratio of the measured active input power to the product of the RMS supply voltage and the RMS supply current

### 3.7

#### active power

mean value, ~~taken over one period~~, of the instantaneous power, taken over 10 (50 Hz systems) or 12 (60 Hz systems) fundamental periods and measured in accordance with IEC 61000-4-7

Note 1 to entry: The active input power is the active power measured at the input supply terminals of the equipment under test.

~~[SOURCE: IEC 60050-131:2013, 131-11-42]~~

### 3.8 balanced three-phase equipment

equipment having rated line current modules which differ by no more than 20 %

### 3.9 professional equipment

equipment for use in trades, professions or industries and which is not intended for sale to the general public. ~~The designation shall be specified~~, as designated by the manufacturer

[SOURCE: IEC 60050-161:1990, 161-05-05, modified – the existing Note has been replaced by the text added at the end of the definition]

### 3.14 total harmonic

#### 3.10 total harmonic current *THC*

total RMS value of the harmonic current components of orders 2 to 40, expressed as:

$$THC = \sqrt{\sum_{h=2}^{40} I_h^2}$$

Note 1 to entry: This note applies to the French language only.

#### 3.11 total harmonic distortion

*THD* <https://standards.iteh.ai/catalog/standards/iec/3b48ae97-3d70-455f-8ab5-40510a42744f/iec-61000-3-2-2018>

ratio of the RMS value of the sum of the harmonic components (in this context, harmonic current components  $I_h$  of orders 2 to 40) to the RMS value of the fundamental component, expressed as:

$$THD = \sqrt{\sum_{h=2}^{40} \left( \frac{I_h}{I_1} \right)^2}$$

Note 1 to entry: This note applies to the French language only.

#### 3.12 partial odd harmonic current *POHC*

total RMS value of the odd harmonic current components of orders 21 to 39, expressed as:

$$POHC = \sqrt{\sum_{h=21,23}^{39} I_h^2}$$

Note 1 to entry: This note applies to the French language only.

**3.13****lighting equipment**

equipment with a primary function of generating and/or regulating and/or distributing optical radiation ~~by means of incandescent lamps, discharge lamps or LED's~~

~~Included are:~~

- ~~— lamps and luminaires;~~
- ~~— the lighting part of multi-function equipment where one of the primary functions of this is illumination;~~
- ~~— independent ballasts for discharge lamps and independent incandescent lamp transformers;~~
- ~~— ultraviolet (UV) and infrared (IR) radiation equipment;~~
- ~~— illuminated advertising signs;~~
- ~~— dimmers for lamps other than incandescent.~~

~~Excluded are:~~

- ~~— lighting devices built in equipment with another primary purpose such as photocopiers, overhead projectors and slide projectors or employed for scale illuminating or indication purposes;~~
- ~~— household appliances whose primary function is not for generating and/or regulating and/or distributing optical radiation but which contain one or more lamps with or without separate switch (e.g. a range hood with a built-in lamp);~~
- ~~— dimmers for incandescent lamps.~~

Note 1 to entry: See also 5.2.

**3.14****stand-by mode****sleep-mode**

non-operational, low power consumption mode (usually indicated in some way on the equipment) that can persist for an indefinite time

**3.15****repeatability**

<results of measurements> closeness of the agreement between the results of measurements of harmonic currents on the same equipment under test, carried out with the same test system, at the same location, under identical test conditions

~~[SOURCE: IEC 60050-394:2007, 394-40-38, modified<sup>4)</sup>]~~

**3.16****reproducibility**

<results of measurements> closeness of the agreement between the results of measurements of harmonic currents on the same equipment under test, carried out with different test systems under conditions of measurement intended to be the same in each case

Note 1 to entry: The test system and test conditions are assumed to fulfil all normative requirements in the applicable standards.

~~[SOURCE: IEC 60050-394:2007, 394-40-39, modified]~~

<sup>4)</sup> ~~IEC 60050-394:2007, International Electrotechnical Vocabulary — Part 394: Nuclear instrumentation — Instruments, systems, equipment and detectors~~