

INTERNATIONAL STANDARD

NORME INTERNATIONALE



AMENDMENT 1
AMENDEMENT 1

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

Compatibilité électromagnétique (CEM) –
Partie 3-2: Limites – Limites pour les émissions de courant harmonique (courant
appelé par les appareils ≤16 A par phase)



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 61000-3-2
Edition 5.0 2018-01
Amendment 1 2020-07

ELECTROMAGNETIC COMPATIBILITY (EMC) –

**Part 3-2: Limits – Limits for harmonic current emissions
(equipment input current ≤ 16 A per phase)**

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by subcommittee 77A: EMC – Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
77A/1106/DISH	77A/1114/RVDISH

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

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.

Interpretation of the second set of requirements applicable to Class C equipment with a rated power ≥ 5 W and ≤ 25 W according to 7.4.3 of IEC 61000-3-2:2018 and IEC 61000-3-2:2018/AMD1:2020.

Introduction

The second set of requirements of 7.4.3 of IEC 61000-3-2:2018 and IEC 61000-3-2:2018/AMD1:2020 requires that “*the waveform of the input current shall be such that it reaches the 5 % current threshold before or at 60°, has its peak value before or at 65° and does not fall below the 5 % current threshold before 90°, referenced to any zero crossing of the fundamental supply voltage*” and that “*Components of current with frequencies above 9 kHz shall not influence this evaluation (a filter similar to the one described in 5.3 of IEC 61000-4-7:2002 and IEC 61000-4-7:2002/AMD1:2008 may be used),*”

Testing laboratories and Class C equipment manufacturers concluded that several harmonics test systems with IEC 61000-4-7 compliant measurement equipment do not completely filter out the components of current with frequencies above 9 kHz, thus resulting in a non-accurate evaluation of the phase angles (see Figure 1). One of the reasons why filters are not used is that they can alter the phase angle itself by introducing a phase delay.

Question

When applying the second set of requirements in 7.4.3, what method shall be used to measure the phase angle in order to avoid the influence of components of current with frequencies above 9 kHz?

Interpretation

Given the issues reported by test laboratories, if the phase angle is measured with an IEC 61000-4-7 test system that doesn't remove the components above 9 kHz correctly, the measurements with a digital oscilloscope shall prevail, where the components above 9 kHz have been removed without affecting the phase angle at which the peak current occurs.

NOTE This can be achieved for example by using a synchronous averaging mode of the oscilloscope (see Figure 2).

Annex

Figure 1 and Figure 2 show an incorrect and the correct evaluation of the phase angle.

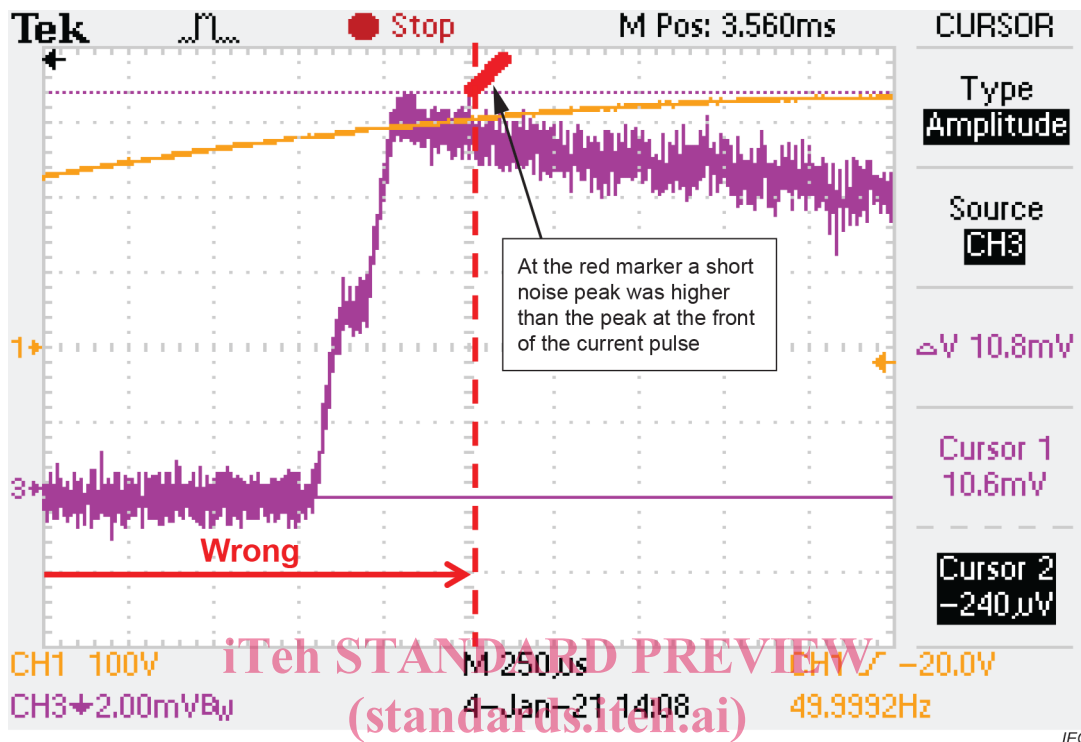


Figure 1 – Incorrect measurement
<https://standards.iteh.ai/catalog/standards/sist/4688049f-4d25-4d7d-b05d-9d9f6ad3854e/iec-61000-3-2-2018-amd1-2020>

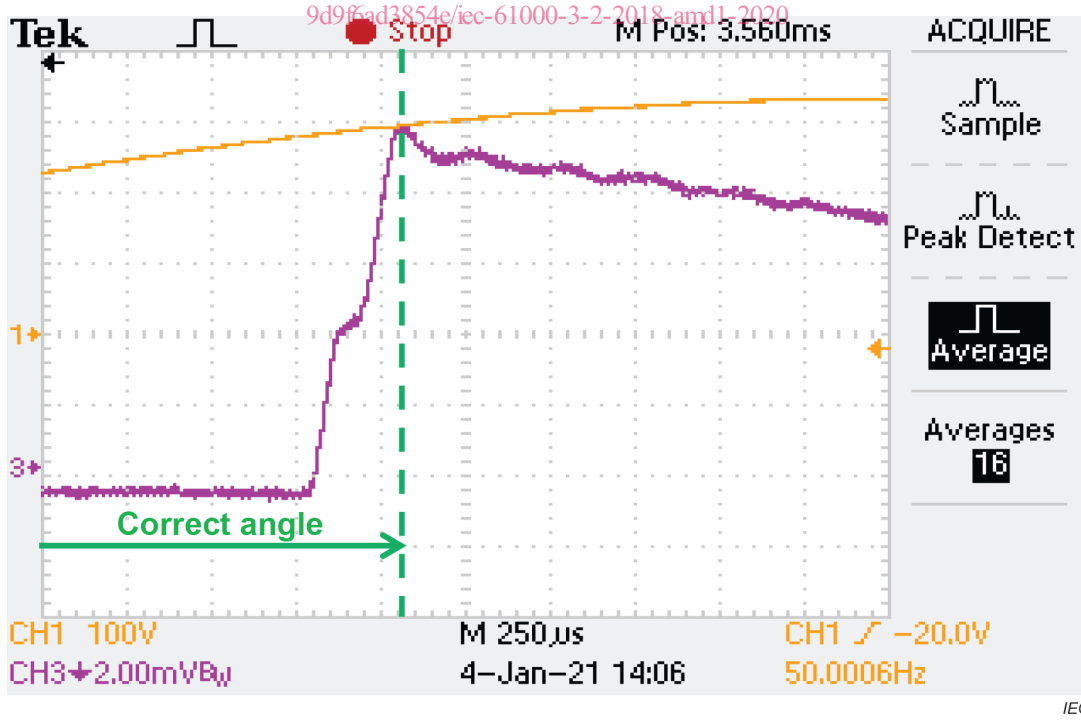


Figure 2 – Correct measurement with averaged waveform

FOREWORD

This amendment has been prepared by subcommittee 77A: EMC – Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

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

FDIS	Report on voting
77A/1077/FDIS	77A/1084/RVD

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

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

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The contents of the Interpretation sheet of August 2021 have been included in this copy. Apply to the English version only.

[IEC 61000-3-2:2018/AMD1:2020](http://standards.iteh.ai/catalog/standards/sist/46889496442544714b05d1405e42854654/iec-61000-3-2-2018-amd1-2020)

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INTRODUCTION

Replace, under "Part 2: Environment", the first line "Description levels" with the following:

Description of the environment

1 Scope

Replace the fourth paragraph with the following:

Arc welding equipment, which is not professional equipment, with a rated input current up to and including 16 A per phase, is included in the scope of this document. All other arc welding equipment is excluded from the scope of this document; however, the harmonics emission can be evaluated using IEC 61000-3-12 and relevant installation restrictions.

2 Normative references

Replace the references with the following:

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic compatibility* (available at www.electropedia.org)

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

IEC 60155:1993, *Glow-starters for fluorescent lamps*

IEC 60268-1:1985, *Sound system equipment – Part 1: General*
IEC 60268-1:1985/AMD1:1988
IEC 60268-1:1985/AMD2:1988

IEC 60268-3:2018, *Sound system equipment – Part 3: Amplifiers*

IEC 60335-2-2:2019, *Household and similar electrical appliances – Safety – Part 2-2: Particular requirements for vacuum cleaners and water-suction cleaning appliances*

IEC 60335-2-14:2016, *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 60335-2-24:2010/AMD1:2012
IEC 60335-2-24:2010/AMD2:2017

IEC 60335-2-79:2016, *Household and similar electrical appliances – Safety – Part 2-79: Particular requirements for high pressure cleaners and steam cleaners*

IEC 60598-2-17:2012, *Luminaires – Part 2-17: Particular requirements – Luminaires for stage lighting, television and film studios (outdoor and indoor)*
IEC 60598-2-17:2012/AMD1:2015

IEC 60974-1:2017, *Arc welding equipment – Part 1: Welding power sources*

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

IEC 62756-1:2015, *Digital load side transmission lighting control (DLT) – Part 1: Basic requirements*

3 Terms and definitions

Replace definition 3.2 including Note 1 to entry with the following:

3.2

lamp

light source provided with at least one cap

Note 1 to entry: For products that have the same physical characteristics as lamps for general lighting but that are built to emit optical radiation mainly in the IR or UV spectrum, the term IR lamp or UV lamp is often used.

[SOURCE: IEC 60050-845:2020, 845-27-008, modified – existing notes 2 and 3 have been removed, the term “electric” has been removed from the term and the definition]

Replace definition 3.3 with the following:

3.3

integrated lamp

electric lamp which cannot be dismantled without being permanently damaged, incorporating lighting control gear, and all additional elements necessary for starting and stable operation of the light source, designed for direct connection to the supply voltage

[SOURCE: IEC 60050-845:2020, 845-27-009]

Replace definition 3.4 with the following:

3.4

luminaire

apparatus which distributes, filters or transforms the light transmitted from at least one source of optical radiation and which includes, except the sources themselves, all the parts necessary for fixing and protecting the sources (IEV 845-21-032) and, where necessary, circuit auxiliaries together with the means for connecting them to the power supply

[SOURCE: IEC 60050-845: 845-30-001:2020, modified – existing note has been removed]

Replace definition 3.6 with the following:

3.6

void

Replace definition 3.7 with the following and delete Note 1 to entry:

3.7

active input power

mean value of the instantaneous power, taken over 10 (50 Hz systems) or 12 (60 Hz systems) fundamental periods and measured in accordance with IEC 61000-4-7:2002 and IEC 61000-4-7:2002/AMD1:2008 at the input supply terminals of the equipment under test

3.12

partial odd harmonic current

Add the following new note to entry: <https://standards.iteh.ai/catalog/standards/sist/4688049f-4d25-4d7d-b05d-9d9f6ad3854e/iec-61000-3-2-2018-amd1-2020>

Note 1 to entry: Details for the calculation of the *POHC* are given in Annex C.

Renumber the existing Note 1 to entry as Note 2 to entry.

Replace definition 3.13 including note 1 to entry with the following:

3.13

lighting equipment

equipment with a primary function of generating and/or regulating and/or distributing the radiation emitted by a light source

Note 1 to entry: See also 5.2.

Replace definition 3.19 including all notes to entry with the following:

3.19

lighting control gear

unit inserted between the power supply and at least one light source, which serves to supply the light source(s) with the voltage and/or-current required for its (their) intended operation, and which can consist of one or more separate components.

Note 1 to entry: The lighting control gear can include means for igniting, dimming, correcting the power factor and suppressing radio interference, and further control functions.

Note 2 to entry: The lighting control gear can be partly or totally integrated in the light source.

Note 3 to entry: For the purposes of this document, independent phase control dimmers as defined in 3.23 and 3.24 are not considered to be lighting control gear.

Replace definition 3.20 with the following.

3.20
digital load side transmission lighting control device
DLT control device

device to control lighting parameters of electronic lighting equipment, such as light level and light colour, using data transmission over its load side mains wiring in accordance with IEC 62756-1:2015

Note 1 to entry: A DLT control device is wired like a phase control dimmer, but does not directly make the supply power delivered to the connected dedicated lighting equipment vary. It transmits digital signals over the power cable on the load side to the dedicated lighting equipment, which contains means for receiving and interpreting control signals as well as built-in means for dimming, colour variation and other operating features.

Note 2 to entry: This note applies to the French language only.

Replace definition 3.21 with the following:

3.21
dimmer

device for varying the luminous flux from light sources

[SOURCE: IEC 60050-845: 845-28-063:2020, modified – the existing note has been removed]

Replace definition 3.26 with the following:

3.26
professional luminaire for stage lighting and studios

luminaire (outdoor or indoor) for stage lighting or for television, film or photographic studios within the scope of IEC 60598-2-17:2012 and IEC 60598-2-17:2012/AMD1:2015 and which is professional equipment

<https://standards.iteh.ai/catalog/standards/sist/4688049f-4d25-4d7d-b05d-9d9f6ad3854e/iec-61000-3-2-2018-amd1-2020>

Add the following new terms.

3.27
light source

surface or object emitting light

[SOURCE: IEC 60050-845:2020, 845-27-001, modified – the existing notes have been removed]

3.28
instructions for use

information that is provided by manufacturers or distributors for users of the product

3.29
external power supply
EPS

equipment which converts power supplied by the mains into power at a different voltage, which has its own physical enclosure, and which is intended for use with separate equipment that constitutes the load

Note 1 to entry: The output voltage of the EPS can be either AC or DC.

Note 2 to entry: The output of the EPS can be either detachable from, or permanently connected to, the separate equipment being powered.

Note 3 to entry: See also 5.3.

5 Classification of equipment

5.1 General

Replace the first sentence under Class D with the following:

Equipment having a specified power less than or equal to 600 W according to 6.3.2, of the following types:

5.2 Description of lighting equipment

Replace the existing text with the following:

In this document, lighting equipment as defined in 3.13 includes:

- light sources, lamps, integrated lamps and luminaires;
- the lighting part of multi-function equipment where one of the primary functions of this is illumination;
- independent lighting control gear;
- ultraviolet (UV) and infrared (IR) radiation equipment;
- illuminated advertising signs;
- independent dimmers, other than phase control types, for lighting equipment;
- DLT control devices.

In this document, lighting equipment as defined in 3.13 excludes:

- lighting devices built in equipment with another primary purpose, such as photocopiers, overhead projectors and slide projectors, or employed for scale illumination 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 light sources with or without a separate switch (e.g. a range hood with a built-in light source);
- independent phase control dimmers;
- professional luminaires for stage lighting and studios;
- emergency luminaires that emit light only during emergency mode;
- professional appliances whose primary function is to present lighting devices for exhibition purposes;
- mechanical switches and relays, and other simple devices providing on/off control only, that do not produce distorted currents.

Add, after 5.2, the following new subclause:

5.3 External power supplies

EPS shall be classified according to the types of equipment they are designated for, as specified in the instructions for use.

NOTE See also Clause B.17.

6.2 Control methods

Replace the existing text with the following:

Asymmetrical controls according to IEC 60050-161:1990, 161-07-12, and half-wave rectification directly on the mains supply may only be used where:

- a) they are the only practical solution permitting the detection of unsafe conditions, or
- b) they control an active input power less than or equal to 100 W, or
- c) they are operated in a portable equipment fitted with a two-core flexible cord which is intended for use for a short period of time, i.e. for a few minutes only.

If at least one of these three conditions is fulfilled, half-wave rectification may be used for any purpose, whereas asymmetrical controls may only be used for the control of motors.

NOTE 1 Equipment which can fulfil condition c) includes, but is not limited to, hair dryers, electrical kitchen appliances and portable tools.

NOTE 2 When using asymmetrical controls or half-wave rectification under the above circumstances, the input current has a DC component that can disturb certain types of protection devices in case of an earth fault. See IEC TR 60755.

Even though asymmetrical controls and half-wave rectification are permitted under the conditions given above, equipment shall still comply with the harmonic requirements of this document.

In general, symmetrical controls may be used for any application and without particular restrictions. However, symmetrical control methods which can produce integer harmonics of the mains frequency up to the 40th order in the mains input current may be used to control the power supplied to heating elements only if at least one of the following restrictions is met:

- the full sine-wave active input power of these heating elements is lower than or equal to 200 W, or
- the limits of Table 3 are not exceeded when testing with these heating elements active.

Such symmetrical control methods are also allowed for professional equipment provided that either one of the above conditions is fulfilled, or the relevant emission limits according to Clause 7 are not exceeded when tested at the supply input terminals and in addition both the following conditions are fulfilled:

- it is necessary to control precisely the temperature of a heater whose thermal time constant is less than 2 s, and
- there is no other technique economically available.

Professional equipment whose primary purpose, considered as a whole, is not for heating, shall be tested against the relevant emission limits according to Clause 7.

NOTE 3 An example of a product whose primary purpose, considered as a whole, is not for heating is a photocopier, whereas a cooker is considered to have heating as its primary purpose.

For domestic equipment used for a short time (e.g. hair dryers) the above restrictions for symmetrical control of heating elements shall not apply and the limits for Class A shall apply instead.

For the application of this document diode rectification is not considered to be a form of control.

6.3.2 Measurement procedure

In the second paragraph replace the first dash with the following:

- for each harmonic order, measure the 1,5 s smoothed RMS harmonic current in each discrete Fourier transform (DFT) time window as defined in IEC 61000-4-7:2002 and IEC 61000-4-7:2002 /AMD1:2008;

Replace the third paragraph with the following and delete the Note:

The value of the active input power to be used for the calculation of limits shall be determined as follows:

- measure the 1,5 s smoothed active input power in each DFT time window;
- determine the maximum of the measured values of active input power from the DFT time windows over the entire duration of the test.

Replace the last paragraph with the following:

For Class C equipment, the fundamental current specified by the manufacturer shall be used for the calculation of limits. The fundamental component of the current is measured and specified by the manufacturer in the same way as the power is measured and specified for the calculation of Class D limits.

6.3.3.1 Repeatability

Replace the text with the following:

The repeatability (see 3.15) of the average value for the individual harmonic currents over the entire test observation period should be better than $\pm 5\%$ of the applicable limit, when the following conditions are met:

- the same equipment under test (EUT) (not another of the same type, but the exact same specimen);
- the same test system;
- the same location;
- identical test conditions;
- identical climatic conditions, if relevant.

This repeatability recommendation serves the purpose of defining the necessary observation period (see 6.3.4), but not as a pass/fail criterion for the assessment of compliance with the requirements of this document.

6.3.3.4 Application of limits

Replace the first paragraph with the following:

The average values for the individual harmonic currents, taken over the entire test observation period, shall be less than or equal to the applicable limits.

Replace all occurrences of the term “partial odd harmonic current” with “POHC”.

Add at the end of 6.3.3.4 the following sentence:

Details for the calculation of the POHC are defined in Annex C.

6.3.3.5 Test report

Delete, at the end of the existing text, the words “and power factor”.

Add, after 6.4, the following new subclause: