IEC 61000-3-2

Edition 5.0 2024-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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AMENDMENT 2
AMENDEMENT 2

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)

IEC 61000-3-2:2018-01/AMD2:2024-03(en-fr)

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ELECTROMAGNETIC COMPATIBILITY (EMC) –

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

AMENDMENT 2

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Amendment 2 to IEC 61000-3-2:2018 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:

Draft	Report on voting
77A/1161/CDV	77A/1181/RVC

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 Amendment 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/.

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INTRODUCTION to Amendment 2

Amendment 2 to IEC 61000-3-2 Ed. 5.1 (= IEC 61000-3-2:2018 plus IEC 61000-3-2/AMD1:2021) is based on 77A/1098/Q, 77A/1106/DISH, 77A/1123A/RQ, 77A/1149/CD, 77A/1150/CD, 77A/1151/CD, 77A/1152/CD, the observations to these CD's and discussions in SC77A / WG1 during the meetings October 2021, May 2022 and November 2022.

At CD stage the amendment has been split into 4 different fragments:

Fragment 1	Lighting equipment
Fragment 2	Test conditions
Fragment 3	Repeatability and measurement uncertainty
Fragment 4	Miscellaneous

As the number of comments on the 4 different CDs was not very high, SC77A WG1 during its meeting November 2022 in San Diego decided to combine the 4 fragments already at CDV stage.

This amendment contains the following main changes in comparison with IEC 61000-3-2:2018 and IEC 61000-3-2:2018/AMD1:2020:

- Inclusion of Interpretation Sheet IEC 61000-3-2:2018/AMD1:2020/ISH1:2021
- New terms and definitions reflecting the actual luminaires on the market
- Adapted test conditions for actual luminaires on the market
- Consolidate the test conditions for video-cassette recorders
- Revision of test conditions for washing machines
- Clarification of references in clause B.17
- Adding IEC Guide 115 to the normative references
- Better specification for repeatability
- New specification for measurement uncertainty and decision rule where in comparison with 77A/1161/CDV the notes in 8.2.1 have been updated to refer to the newest version of IEC Guide 115
- Adding IEC TR 61000-1-6 to the bibliography
- New definition for an independent function
- New definitions for symmetrical control, asymmetrical control and phase control
- Clarification that special test conditions in Annex B have precedence over the general test conditions in clause 6.3.1
- Clarification for the calculation of THC, THD or POHC (The disregarding of currents less than 0,6 % of input current or less than 5 mA applies only to individual harmonics.)
- Clarification for the application of class D limits
- Clarification for the requirements on the test voltage in A.2, bullet d)
- Addition of an informative Annex D "Symmetry of mains current waveforms"

1 Scope

Delete the fifth paragraph.

Replace the last paragraph with the following:

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

2 Normative references

Replace IEC 60335-2-14:2016*, as modified by Amendment 1,* IEC 60335-2-24:2010*, as modified by Amendment 1, and* IEC 60335-2-79:2016*, as modified by Amendment 1, with the following:*

IEC 60335-2-14:2016, *Household and similar electrical appliances – Safety – Part 2-14: Particular requirements for kitchen machines*
IEC 60335-2-14:2016/AMD1:2019

IEC 60335-2-24:2020, *Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice makers*

IEC 60335-2-79:2021, *Household and similar electrical appliances – Safety – Part 2-79: Particular requirements for high pressure cleaners and steam cleaners*

Replace IEC 60598-2-17:2012*, as modified by Amendment 1, with the following:*

IEC 60598-2-17:2017, *Luminaires – Part 2-17: Particular requirements – Luminaires for stage lighting, television and film studios (outdoor and indoor)*

Replace IEC 60974-1:2017*, as modified by Amendment 1, with the following:*

IEC 60974-1:2021, *Arc welding equipment – Part 1: Welding power sources*

Add the following new reference:

IEC GUIDE 115:2023, *Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector*

3 Terms and definitions

Replace the first paragraph with the following:

For the purposes of this document, the following terms and definitions apply.

3.26
professional luminaire for stage lighting and studios

Replace the definition, as modified by Amendment 1, with the following:

luminaire (outdoor or indoor) for stage lighting or for television, film or photographic studios within the scope of IEC 60598-2-17:2017 and which is professional equipment

Add the following new terms and definitions:

3.30
independent functions, pl.
functions which do not intentionally interact with each other

3.31
symmetrical control
<single phase> control of the mains current conduction designed to operate in an identical manner on the positive and negative half cycles of an alternating supply voltage

Note 1 to entry: The identical pattern can appear across one or more periods of the fundamental frequency (see Annex D for examples).

3.32
asymmetrical control
<single phase> control of the mains current conduction which is not symmetrical control

3.33
integrated luminaire
luminaire which cannot be dismantled, without being permanently damaged, in order to individually remove the contained mains-connected devices

3.34
non-integrated luminaire
luminaire which can be dismantled, without being permanently damaged, in order to remove the contained mains-connected devices

Note 1 to entry: Separate lighting control gear or integrated lamps are examples of mains-connected devices.

3.35
separate lighting control gear
SLCG
lighting control gear that is designed to be directly connected to mains and can be placed on the market as a separate product or as a replaceable part of a non-integrated luminaire

Note 1 to entry: Separate lighting control gear can be a built-in control gear or an independent control gear as defined in IEC 61347-1.

5.2 Description of lighting equipment

Replace, in the first paragraph, the text of the first dash, as modified by Amendment 1, with the following:

– integrated lamps, integrated luminaires, non-integrated luminaires, separate lighting control gear;

Delete the text of the third dash:

6.3.1 Test configuration

Replace the second paragraph with the following:

Specific test conditions for the measurement of harmonic currents associated with some types of equipment are given in Annex B, which take precedence over the general test conditions given below.

6.3.2 Measurement procedure

Replace the first paragraph with the following:

The tests shall be conducted in accordance with the general requirements given in 6.3.3 and Annex B, as applicable. Further recommendations are given in 6.3.3 and 6.3.4.

6.3.3 General requirements

Replace the heading with the following:

6.3.3 General requirements and recommendations

6.3.3.1 Repeatability

Replace the text of 6.3.3.1, as modified by Amendment 1, with the following:

The repeatability (see 3.15) of the average value for the individual harmonic currents of an order ≤ 11 over the entire test observation period should be better than ± (5 % of the applicable limit + 1mA), 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.

The repeatability of the average value of individual harmonic currents of an order > 11 under the same conditions should be better than ± (10 % of the applicable limit + 1 mA).

This repeatability recommendation can assist in determining the necessary test observation period when this period is not specified in Table 4 or Annex B. However, in no case does this recommendation serve as a pass/fail criterion for the assessment of compliance with the requirements of this document.

For the avoidance of doubt, in cases where all relevant limits are met, the test results shall be accepted as demonstrating compliance, even if the repeatability values exceed the recommended values in this sub-clause.

6.3.3.4 Application of limits

Replace the third paragraph with the following:

Harmonic currents less than 0,6 % of the average input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded. This exclusion applies only to the comparison of individual harmonic currents against limits.

6.5 Multifunction equipment

Delete Note 1, as modified by Amendment 1, and make NOTE 2 into NOTE.

Replace the third paragraph, as modified by Amendment 1, with the following:

For equipment for which it is not obvious of how to operate each function alone, instructions may be provided for testing purposes explaining how the function can be operated alone. These instructions may specify internal changes in the equipment, exclusively for the purpose of operating independent functions alone during the test. The equipment shall be tested accordingly. The test report shall contain a detailed description of how the separate testing of independent functions has been achieved and how the tests have been performed.

7.4.3 Rated power ≥ 5 W and ≤ 25 W

Replace, in the first paragraph, at the end of the second dash, the semi-colon with a period.

Add, in the first paragraph, at the end of the second dash, the following text and note:

If the waveform includes a noise-like component that makes it difficult to determine the phase angles with some instruments intended to comply with IEC 61000-4-7, an oscilloscope or any other time-domain measurement may be used, if it meets the same bandwidth limitation requirement. This can, for example, be achieved by filtering and/or data acquisition combined with FFT/IFFT operations;

NOTE 1 Background information can be found in IEC 61000-3-2:2018/AMD1:2020/ISH1:2021.

Renumber the note at the end of 7.4.3 as Note 2.

7.5 Limits for Class D equipment

Replace the first paragraph with the following:

The harmonics of the input current shall not exceed the values derived from the middle column of Table 3 in accordance with the power value determined in 6.3.2, or the values specified in the right column of Table 3, whichever are lower.

8 Compliance with this document

Replace Clause 8, as modified by Amendment 1, with the following:

8 Compliance with this document

8.1 Use of test methods

Unless otherwise stated, where this document gives options for evaluating harmonics with a choice of test methods and associated limits, any one of these options may be used.

The equipment is deemed to comply with this document with respect to the addressed EMC characteristics when one of the test methods returns a test result compliant with the applicable requirements.

In any situation where it is necessary to verify the original compliance assessment result, the option originally chosen shall be used to avoid excessive uncertainties induced by applying different test methods.

8.2 Decision rules and measurement uncertainty

8.2.1 Measurements with an instrument in accordance with IEC 61000-4-7, class I

The following decision rule applies: The measurement results shall be compared directly with the limits. Further calculation of a measurement uncertainty is not required. The test methods specified in this document minimize the number of major sources of uncertainty.

NOTE 1 This decision rule is an application of "simple acceptance" (formerly called "accuracy method") described in IEC Guide 115:2023, 3.1.4, 4.2.2 and 4.3 as follows:

> IEC Guide 115:2023, 4.2.2:
>
> "Test methods used under the IECEE Certification Body (CB) Scheme are in essence consensus standards. Criteria used to determine conformance with requirements are most often based on a consensus of judgment of the limits that are applicable to the test result. Exceeding the limit by a small amount does not result in an imminent hazard. Test methods used can have a statement expressing the maximum permissible measurement uncertainty expected to be achieved when the method is used. Historically, and still today, test laboratories have used state-of-the-art equipment and have not considered measurement uncertainty when comparing test results to specification limits: the observed results were compared directly to the limits stated in the standard. Safety standards have been developed in this environment and the specification limits in the standards reflect this practice. This practice provides the basis for use of the simple acceptance decision rule under the IECEE CB Scheme (see 4.3.3)."
>
> IEC Guide 115:2023, excerpt from 4.3.3:
>
> "When comparing the obtained measurement results with the applicable limits in accordance with the specification in the IEC standards, the conformance decision is made without applying the measurement uncertainty. Refer to Figure 1. This is often called “simple acceptance".

NOTE 2 References to CTL OD 5014 or IECEE OD-5014 "IEC system of conformity assessment schemes for electrotechnical equipment and components" in IEC Guide 115 or a standard for the assessment of laboratories are replaced and superseded by the reference to IEC 61000-4-7.

8.2.2 Measurements with an instrument in accordance with IEC 61000-4-7, class II

A decision rule based on IEC Guide 115:2023, 4.3.4, shall be applied and a detailed analysis of the measurement uncertainty shall be performed.

NOTE Guidance for the calculation of the measurement uncertainty can be found in IEC TR 61000-1-6.

A.1 Test circuit

Replace the text, as modified by Amendment 1, with the following:

The harmonic currents of the EUT shall be measured in accordance with the circuits given in:

– Figure A.1 for single-phase equipment;
– Figure A.2 for three-phase equipment.

Measurement equipment complying with IEC 61000-4-7:2002 and IEC 61000-4-7:2002/AMD1:2008 shall be used.

A.2 Supply source

Replace, in the first paragraph, item d), the first sentence with the following:

The peak value of the test voltage shall be between 1,40 times and 1,42 times (inclusive) its RMS value and shall be reached between 87° and 93°(inclusive) after the zero crossing of the test voltage.

Annex B (normative) – Type test conditions

Replace the title with the following:

Annex B (normative) – Special test conditions

B.4 Video-cassette recorders

Replace the title and text, as modified by Amendment 1, with the following:

B.4 Video-cassette recorders and similar equipment

Measurements on video-cassette recorders and other similar equipment using tape support shall be made in the playback mode with the standard tape speed.

B.5.3 Luminaires

Replace the existing text, as modified by Amendment 1, with the following:

B.5.3.1 General

Luminaires containing only passive devices that produce no harmonic currents comply with the requirements of this document without testing.

NOTE Examples of passive devices are lamp holders and electromechanical switches.

If the luminaire is equipped with a glow starter, a starter in accordance with IEC 60155 shall be used.

B.5.3.2 Non-integrated luminaires

Non-integrated luminaires allowing the removal and separate verification of contained mains-connected devices comply with the requirements of this document if their mains-connected devices comply with the requirements of this document.

NOTE Examples of mains-connected devices are integrated lamps and separate lighting control gear (SLCG).

B.5.3.3 Integrated luminaires

Integrated luminaires shall be tested as manufactured. If these luminaires additionally incorporate further independent functions that do not intentionally interact with the lighting

function and that belong to Class A or Class D, as specified in 5.1, they may be tested with each independent function operated alone, if this can be achieved without modifying the luminaire. For luminaires for which it is not obvious how to operate each independent function alone without modifying the luminaire, an instruction may be provided for testing purposes of how each independent function can be operated alone. This instruction may specify changes in the luminaire. The luminaire shall be tested accordingly.

The luminaire thus tested complies with the requirements of this document when each independent function complies with the requirements for the relevant class of equipment belonging to the function. If no instruction for testing purposes is provided or if it is not possible to test the luminaire with each function operated alone, or if further functions belonging to Class A or Class D intentionally interact with the lighting function, the luminaire complies with this document if it meets the limits for Class C equipment with all functions operating simultaneously.

NOTE 1 For example, a function can be operated alone by setting the others into an off or standby mode, if provided.

NOTE 2 An example of an independent function is a surveillance camera, which is also active when the light is switched off.

NOTE 3 An example of a function that intentionally interacts with the lighting function is a motion detector that controls the light output of the luminaire.

B.5.4 Lighting control gear

Replace the title and text, as modified by Amendment 1, with the following:

B.5.4 Separate lighting control gear (SLCG)

SLCG shall be tested with light sources specified in their instructions for use, or with artificial loads having electrical characteristics close to those of those light sources.

If the SLCG is designed for more than one type of light source or if the SLCG is designed to additionally power auxiliary loads (e.g. a sensor or a camera), the instructions for the use of the SLCG shall specify for which load characteristics (light sources, auxiliary loads) the SLCG fulfils the relevant harmonic requirements and the SLCG shall be tested for each corresponding load characteristic and shall comply in each case.

B.8 Washing machines

Replace the text, as modified by Amendment 1, with the following:

The washing machine shall be tested during a complete laundry program incorporating the normal wash-cycle, filled with (50 ± 5) % of the rated washing load in kg. The load shall be made of double hemmed, pre-washed cotton cloths, size approximately 70 cm × 70 cm, dry weight from 140 g/m^2 to 175 g/m^2. The cloths shall be loaded into the washing machine in such a way as to avoid an unrealistic unbalance of the weight.

NOTE Loading the cloths one-by-one is one way to achieve this.

The temperature of the fill water shall be

- (65 ± 5) °C for washing machines without heating elements and intended for connection to a hot water supply;
- from 10 °C to 25 °C for other washing machines.

For washing machines with a programmer, the 60 °C cotton program without pre-wash, if available, shall be used, otherwise the regular wash program without pre-wash shall be used. If the washing machine contains heating elements which are not controlled by the programmer, the water shall be heated to (65 ± 5) °C before starting the first wash period.