
Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase) (IEC 61000-3-2:2000, modified)

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EUROPEAN STANDARD

EN 61000-3-2

NORME EUROPÉENNE

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Supersedes EN 61000-3-2:1995 + A1:1998 + A2:1998 + A14:2000

English version

Electromagnetic compatibility (EMC)
Part 3-2: Limits - Limits for harmonic current emissions
(equipment input current up to and including 16 A per phase)
(IEC 61000-3-2:2000, modified)

Compatibilité électromagnétique (CEM)
Partie 3-2: Limites - Limites pour les
émissions de courant harmonique
(courant appelé par les appareils inférieur
ou égal à 16 A par phase)
(CEI 61000-3-2:2000, modifiée)

Elektromagnetische Verträglichkeit (EMV)
Teil 3-2: Grenzwerte - Grenzwerte für
Oberschwingungsströme (Geräte-
Eingangsstrom bis einschließlich 16 A
je Leiter)
(IEC 61000-3-2:2000, modifiziert)

This European Standard was approved by CENELEC on 2000-12-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

Document 77A/310/FDIS, future amendment to IEC 61000-3-2:1995, prepared by SC 77A, Low-frequency phenomena, of IEC TC 77, Electromagnetic compatibility, was submitted to the IEC-CENELEC parallel vote.

The text of this document was incorporated into a new edition of IEC 61000-3-2 which, together with common modifications prepared by the Technical Committee CENELEC TC 210, Electromagnetic compatibility (EMC), was approved by CENELEC as a new edition of EN 61000-3-2 on 2000-12-05.

The European common modifications provide a temporary solution for legislation in Europe, to be applied after 2001-01-01 for compliance with the EMC Directive.

This European Standard replaces EN 61000-3-2:1995 and its amendments A1:1998, A2:1998 and A14:2000.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2001-07-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2004-01-01

The reference of subclauses, figures and tables which are in addition to those in IEC 61000-3-2 is prefixed with the letter Z.

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Endorsement notice

The text of the International Standard IEC 61000-3-2:2000 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

1 Scope

Delete the last paragraph:

“Special equipment...IEC 61000-3-4”.

2 Normative references

Replace the text of clause 2 by:

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments)

EN 60065	1998	<i>Audio, video and similar electronic apparatus – Safety requirements (IEC 60065:1998, mod.)</i>
EN 60107-1	1997	<i>Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies (IEC 60107-1:1997)</i>
EN 60155	1995	<i>Glow-starters for fluorescent lamps (IEC 60155:1993)</i>
EN 60268-3	2000	<i>Sound system equipment – Part 3: Amplifiers (IEC 60268-3:2000)</i>
EN 60335-2-2	1995	<i>Safety of household and similar electrical appliances – Part 2-2: Particular requirements for vacuum cleaners and water suction cleaning appliances (IEC 60335-2-2:1993, mod.)</i>
EN 60335-2-7	1997	<i>Safety of household and similar electrical appliances – Part 2-7: Particular requirements for washing machines (IEC 60335-2-7:1993, mod.)</i>
EN 60335-2-14	1996	<i>Safety of household and similar electrical appliances – Part 2-14: Particular requirements for kitchen machines (IEC 60335-2-14:1994, mod.)</i>
EN 60974-1	1998	<i>Arc welding equipment -- Part 1: Welding power sources (IEC 60974-1:1998)</i>
EN 61000-4-7	1993	<i>Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – Section 7: General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto (IEC 61000-4-7:1991)</i>
IEC 60050-131	1978	<i>International Electrotechnical Vocabulary (IEV) – Chapter 131: Electric and magnetic circuits</i>
IEC 60050-161	1990	<i>International Electrotechnical Vocabulary (IEV) – Chapter 161: Electro-magnetic compatibility</i>
IEC 61000-2-2	1990	<i>Electromagnetic compatibility (EMC) – Part 2: Environment – Section 2: Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems</i>

IEC 61000-3-4 1998 *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*

3 Definitions

Add, after definition 3.13, the following note:

NOTE The active input power is the active power measured at the input supply terminals of the equipment under test.

Add the following new definitions:

3.Z1

total harmonic current

the total r.m.s. value of the harmonic current components of orders 2 to 40

$$\text{total harmonic current} = \sqrt{\sum_{n=2}^{40} I_n^2}$$

3.Z2

built-in dimmer

a dimmer, including the user control, which is entirely contained within the enclosure of a luminaire

3.Z3

partial odd harmonic current

the total r.m.s. value of the odd harmonic current components of orders 21 to 39

$$\text{partial odd harmonic current} = \sqrt{\sum_{n=21,23}^{39} I_n^2}$$

3.Z4

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 lighting 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 halogen lamp transformers;
- UV and IR radiation equipment;
- illuminated advertising signs;
- dimmers for lamps other than incandescent lamps.

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 purpose;
- dimmers for incandescent lamps.

3.Z5

stand-by mode

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

NOTE This mode is sometimes termed 'sleep mode'.

4 General

Add at the end of the clause:

Professional equipment, which does not comply with the requirements of this standard, may be permitted to be connected to certain types of low voltage supplies, if the instruction manual contains a requirement to ask the supply authority for permission to connect. Recommendations concerning this aspect are contained in Technical Report IEC 61000-3-4 or the standard (IEC 61000-3-12, to be published) that will replace it.

5 Classification of equipment

Replace the text of the entire clause 5 by:

For the purpose of harmonic current limitation, equipment is classified as follows:

Class A:

- Balanced three-phase equipment;
- Household appliances excluding equipment identified as Class D;
- Tools excluding portable tools;
- Dimmers for incandescent lamps;
- Audio equipment.

Equipment not specified in one of the three other classes shall be considered as Class A equipment.

NOTE 1 Equipment that can be shown to have a significant effect on the supply system may be reclassified in a future edition of the standard. Factors to be taken into account include:

- number in use;
- duration of use;
- simultaneity of use;
- power consumption;
- harmonic spectrum, including phase.

Class B:

- Portable tools;
- Arc welding equipment which is not professional equipment.

Class C:

- Lighting equipment.

Class D:

Equipment having a specified power according to 6.2.2 less than or equal to 600 W, of the following types:

- Personal computers and personal computer monitors;
- Television receivers. <https://standards.iteh.ai/catalog/standards/sist/a9f2323b-cd5b-409f-b1e4-a09f9dd31e69/sist-en-61000-3-2-2002>

NOTE 2 Class D limits are reserved for equipment that, by virtue of the factors listed in note 1, can be shown to have a pronounced effect on the public electricity supply system.

6 General requirements

6.1 Control methods

Add before the first paragraph:

The following restrictions apply even to equipment to which no harmonic current limits apply as defined in clause 7.

Replace the entire 6.2 by:

6.2 Harmonic current measurement

6.2.1 Test configuration

Specific test conditions for the measurement of harmonic currents associated with some types of equipment are given in annex C.

For equipment not mentioned in annex C, emission tests shall be conducted with the user's operation controls or automatic programs set to the mode expected to produce the maximum total harmonic current (THC) under normal operating conditions. This defines the equipment set-up during emission tests and not a requirement to measure THC or to conduct searches for worst-case emissions.

The harmonic current limits specified in clause 7 apply to line currents and not to currents in the neutral conductor.

The equipment is tested as presented by, and in accordance with information provided by, the manufacturer. Preliminary operation of motor drives by the manufacturer may be needed before the tests are undertaken to ensure that results correspond with normal use.

6.2.2 Measurement procedure

The test shall be conducted according to the general requirements given in 6.2.3. The test duration shall be as defined in 6.2.4.

The measurement of harmonic currents shall be performed as follows:

- for each harmonic order, measure the 1,5 s smoothed r.m.s. harmonic current in each DFT time window as defined in annex B ,
- calculate the arithmetic average of the measured values from the DFT time windows over the entire observation period as defined in 6.2.4.

The value of 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 power from the DFT time windows over the entire duration of the test.

NOTE The active input power supplied to the smoothing section of the measuring instrument as defined in annex B is the active input power in each DFT time window.

The harmonic currents and the active input power shall be measured under the same test conditions but need not be measured simultaneously.

The value for power, measured as defined in this clause, shall be specified by the manufacturer and documented in the test report. This value shall be used for establishing limits during emissions tests when limits are specified in terms of power. In order not to specify a power at which limits change abruptly, thus giving rise to doubt as to which limits apply, the manufacturer may specify any value which is within $\pm 10\%$ of the actual measured value.

The value for power found by measurement during emission tests other than the original manufacturer's conformity assessment test, measured according to the terms of this clause, shall not be less than 90 % nor greater than 110 % of the value for power specified by the manufacturer in the test report (see 6.2.3.4). In the event that the measured value is outside of this tolerance band about the specified value, the measured power shall be used to establish the limits.

For Class C equipment, the fundamental current and power factor, specified by the manufacturer, shall be used for the calculation of limits (see 3.12). The fundamental component of current and the power factor are measured and specified by the manufacturer in the same way as the power is measured and specified for the calculation of Class D limits. The value used for power factor shall be obtained from the same DFT measurement window as the value for the fundamental component of current.

6.2.3 General requirements

6.2.3.1 Repeatability

The repeatability of the measurements shall be better than $\pm 5\%$, when the following conditions are met:

- the same equipment under test (EUT) (not another of the same type, however similar);
- identical test conditions;
- same test system;
- identical climatic conditions, if relevant.

6.2.3.2 Starting and stopping

When a piece of equipment is brought into operation or is taken out of operation, manually or automatically, harmonic currents and power are not taken into account for the first 10 s following the switching event.

The equipment under test shall not be in stand-by mode (see 3.Z5) for more than 10 % of any observation period.

6.2.3.3 Application of limits

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

For each harmonic order, all 1,5 s smoothed r.m.s. harmonic current values, as defined in 6.2.2, shall be less than or equal to 150 % of the applicable limits.

Harmonic currents less than 0,6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

For the 21st and higher odd order harmonics, the average values obtained for each individual odd harmonic over the full observation period, calculated from the 1,5 s smoothed r.m.s. values according to 6.2.2 may exceed the applicable limits by 50 % provided that the following conditions are met:

- the measured partial odd harmonic current does not exceed the partial odd harmonic current which can be calculated from the applicable limits.
- all 1,5 s smoothed r.m.s. individual harmonic current values shall be less than or equal to 150 % of the applicable limits.

6.2.3.4 Test report

The test report may be based on information supplied by the manufacturer to a testing facility, or be a document recording details of the manufacturer's own tests. It shall include all relevant information for the test conditions, the test observation period, and, when applicable for establishing the limits, the active power or fundamental current and power factor.

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6.2.4 Test observation period

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Observation periods (T_{obs}) for four different types of equipment behaviour are considered and described in Table Z1.

Table Z1 – Test observation period

Type of equipment behaviour	Observation period
Quasi-stationary	T_{obs} of sufficient duration to meet the requirements for repeatability in 6.2.3.1
Short cyclic ($T_{cycle} \leq 2,5$ min)	$T_{obs} \geq 10$ cycles (reference method) or T_{obs} of sufficient duration or synchronisation to meet the requirements for repeatability in 6.2.3.1 (see note).
Random	T_{obs} of sufficient duration to meet the requirements for repeatability in 6.2.3.1
Long cyclic ($T_{cycle} > 2,5$ min)	Full equipment program cycle (reference method) or a representative 2,5 min period considered by the manufacturer as the operating period with the highest THC.
NOTE By 'synchronization' is meant that the total observation period is sufficiently close to including an exact integral number of equipment cycles such that the requirements for repeatability in 6.2.3.1 are met.	

7 Harmonic current limits

Replace the first sentence of clause 7 by:

The procedure for applying the limits and assessing the results is shown in Figure Z1.

For the following categories of equipment limits are not specified in this edition of the standard.

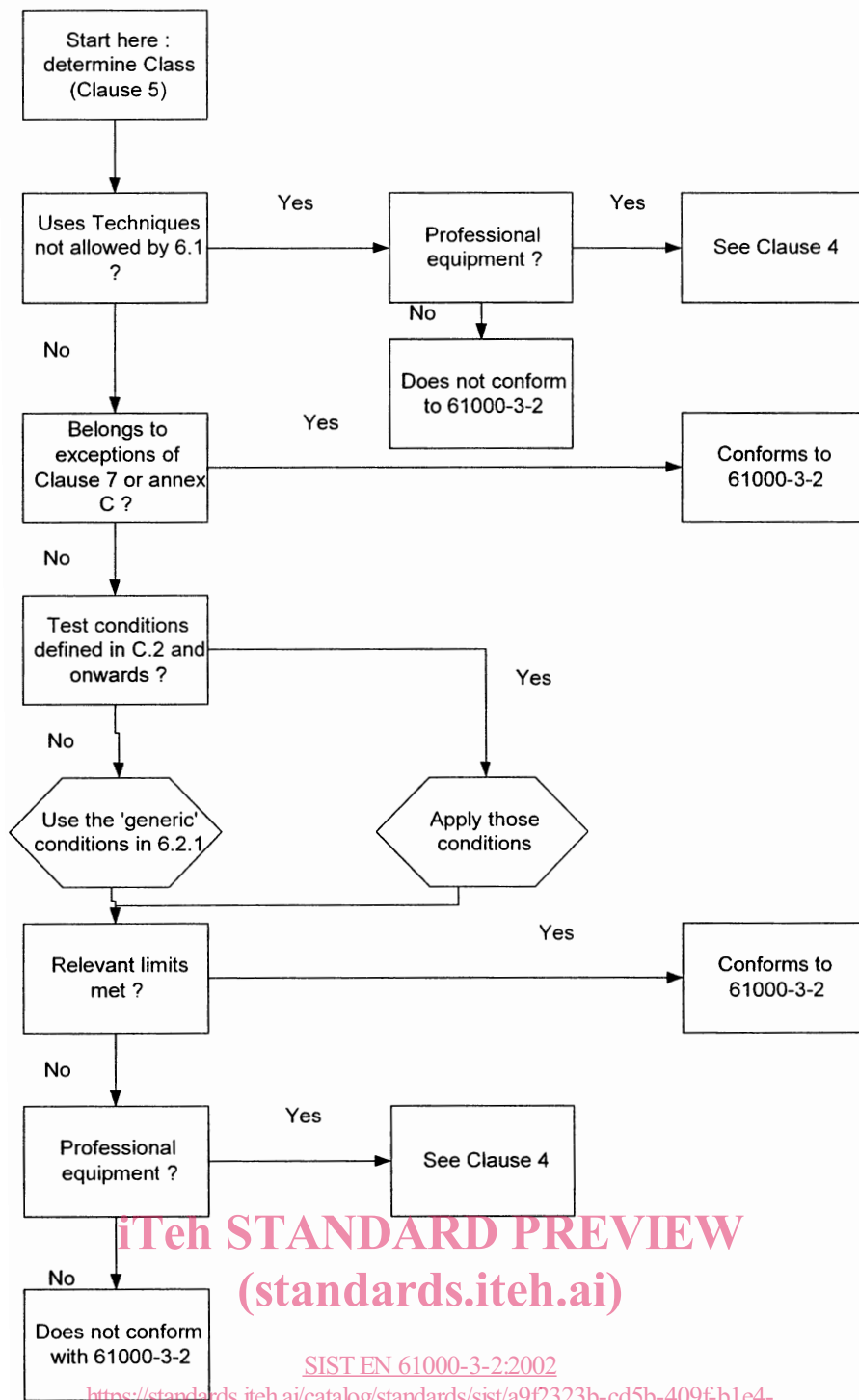
NOTE 1 Limits may be defined in a future amendment or revision of the standard:

- Equipment with a rated power of 75 W or less, other than lighting equipment,

NOTE 2 This value may be reduced from 75 W to 50 W in the future, subject to approval by National Committees at that time.

- Professional equipment with a total rated power greater than 1 kW;
- Symmetrically controlled heating elements with a rated power less than or equal to 200 W;
- Independent dimmers for incandescent lamps with a rated power less than or equal to 1 kW.

NOTE 3 See also C.5.3.



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Figure Z1 - Flowchart for determining conformity

7.1 Limits for class A equipment

Delete the word "absolute".

Add:

Audio amplifiers shall be tested according to C.3. Dimmers for incandescent lamps shall be tested according to C.6.

7.2 Limits for class B equipment

Delete the words "maximum permissible".

7.3 Limits for Class C equipment

Replace the entire subclause by:

a) Active input power > 25 W

For lighting equipment having an active input power > 25 W, the harmonic currents shall not exceed the relative limits given in Table 2.

For discharge lighting equipment that has built-in dimmers or consists of independent dimmers or dimmers built in an enclosure, the following conditions apply:

- the harmonic current values for the maximum load condition derived from the percentage limits given in Table 2 shall not be exceeded;
- in any dimming position, the harmonic current shall not exceed the value of current allowed in the maximum load condition;
- the equipment shall be tested according to the conditions given in C.5.

b) Active input power \leq 25 W

Discharge lighting equipment having an active input power \leq 25 W shall comply with one of the following two sets of requirements:

- the harmonic currents shall not exceed the power related limits of Table 3, column 2, or:
- the third harmonic current, expressed as a percentage of the fundamental current, shall not exceed 86 % and the fifth shall not exceed 61 %; moreover, the wave form of the input current shall be such that it begins to flow before or at 60 °, has its last peak (if there are several peaks per half period) before or at 65 ° and does not stop flowing before 90 ° where the zero crossing of the fundamental supply voltage is assumed to be at 0 °.

If the discharge lighting equipment has a built-in dimming device, measurement is made only in the full load condition.

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7.4 Limits for class D equipment

Replace by:

For Class D equipment, the harmonic currents and the power shall be measured as defined in 6.2.2. The input currents at harmonic frequencies shall not exceed the values that can be derived from Table 3 according to the requirements specified in 6.2.3 and 6.2.4.

Annex B

Replace the text of annex B by:

The requirements for measurement equipment are defined in EN 61000-4-7.

NOTE EN 61000-4-7:1993 does not explicitly define 1,5 s smoothed active input power. To be specific, it is smoothed by 1,5 s first order low pass filter.

Annex C

C.1 Replace the title and text by:

C.1 General

The test conditions for the measurement of harmonic currents associated with some types of equipment are given in the following clauses.

C.3 Test conditions for audio amplifiers

Correct typography errors in the second dashed item:

- normal position of user controls. In particular, any controls affecting the frequency response shall be set to give the widest flat response achievable;

C.6 Test conditions for independent and built-in incandescent lamp dimmers

Delete the last sentence.

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