IEC 61000-3-2

Edition 5.2 2024-03
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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+AMD1:2020-07+AMD2:2024-03 CSV(en-fr)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 61000-3-2

Edition 5.2 2024-03
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.100.10

ISBN 978-2-8322-8449-0

IEC 61000-3-2

Edition 5.2 2024-03
CONSOLIDATED VERSION

REDLINE VERSION

VERSION REDLINE

colour inside

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+AMD1:2020-07+AMD2:2024-03 CSV(en-fr)

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.

_____

IEC 61000-3-2:2018-01/AMD1:2020-07/ISH1:2021-08(en-fr)

ICS 33.100.10

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.

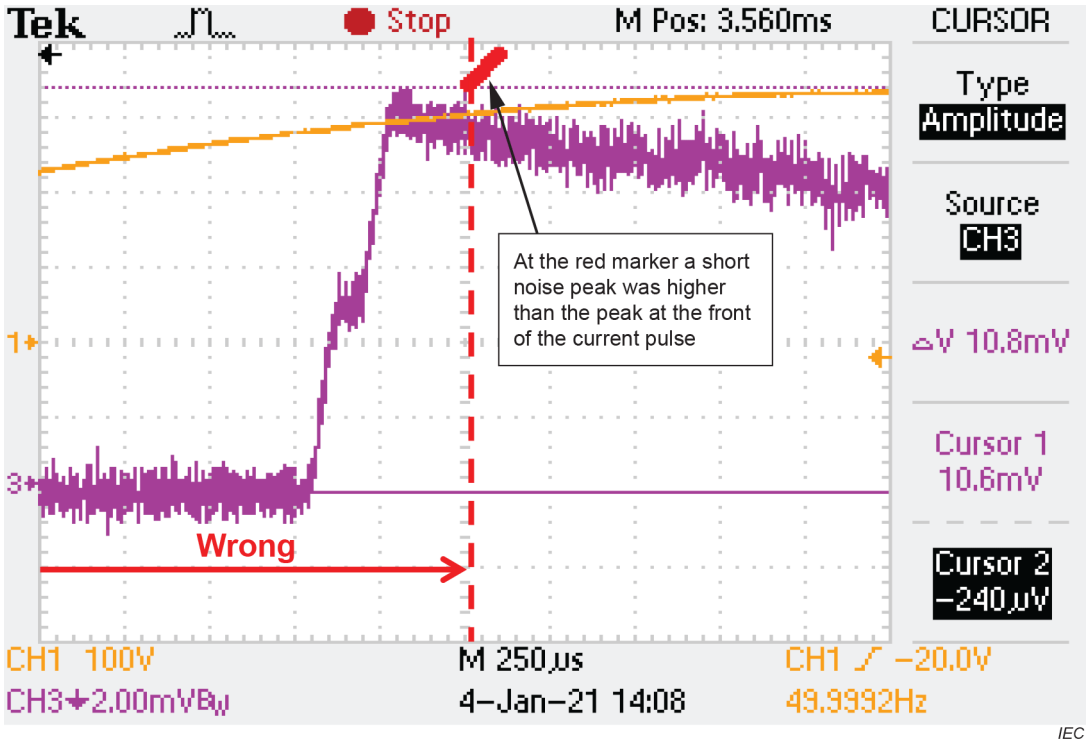

Figure 1 – Incorrect measurement

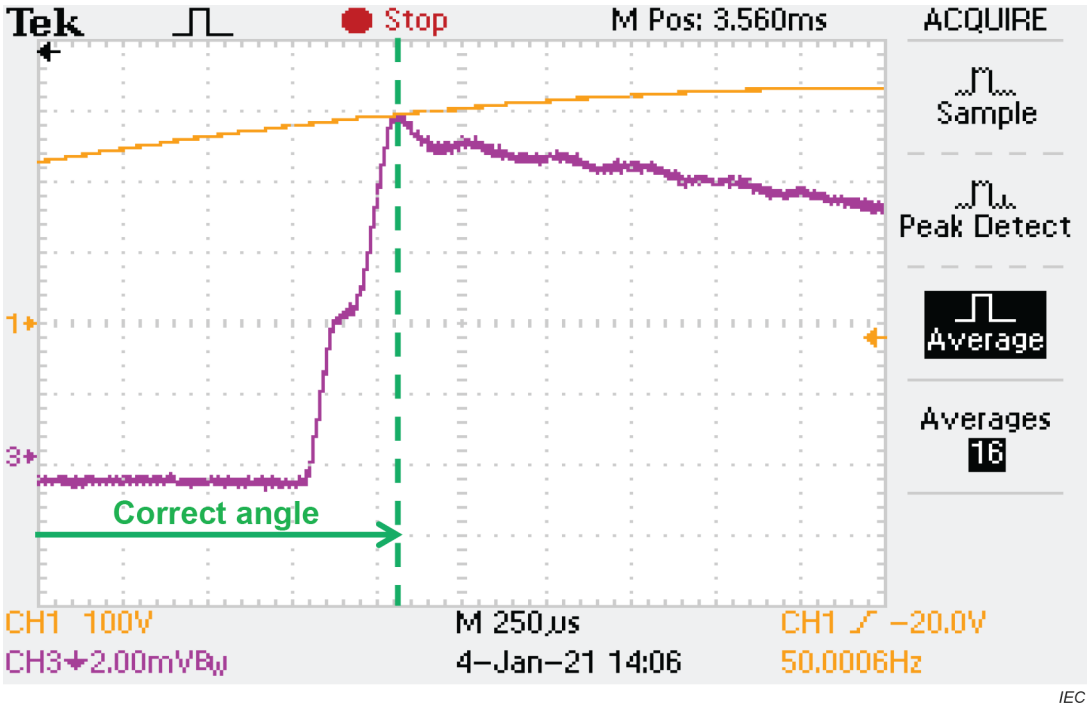

Figure 2 – Correct measurement with averaged waveform

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ELECTROMAGNETIC COMPATIBILITY (EMC) –

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

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.

This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61000-3-2 edition 5.2 contains the fifth edition (2018-01) [documents 77A/986/FDIS and 77A/990/RVD], its amendment 1 (2020-07) [documents 77A/1077/FDIS and 77A/1084/RVD] and its Interpretation Sheet (2021-08), and its amendment 2 (2024-03) [documents 77A/1161/CDV and 77A/1181/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

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 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 ≤ 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 ≤ 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 ≤ 16 A to equipment with a rated input current ≤ 16 A.

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 document and its amendments will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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 ~~levels~~ of the environment

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

Part 9: Miscellaneous

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).

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"

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 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 can be produced by equipment tested under specified conditions.

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 the scope of this document. ~~Arc welding equipment intended for professional use, as specified in IEC 60974-1, is excluded from this document and can be subject to installation restrictions as indicated in IEC 61000-3-12.~~ 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.

~~The tests according to this document are type tests.~~

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 60050-161:1990, *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