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Interested committees:

Title: Draft BS EN IEC 61000-2-4 Electromagnetic compatibility (EMC). Part 2-4: Environment - Compatibility levels in industrial plants for low-frequency conducted disturbances.

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



77A/1081/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 61000-2-4 ED3

DATE OF CIRCULATION:

2020-06-19

CLOSING DATE FOR COMMENTS:

2020-08-14

SUPERSEDES DOCUMENTS:

77A/1048/RR

IEC SC 77A : EMC - LOW FREQUENCY PHENOMENA

SECRETARIAT:

France

SECRETARY:

Mr Cédric LAVENU

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☒ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☐ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Electromagnetic compatibility (EMC) - Part 2-4: Environment - Compatibility levels in industrial plants for low-frequency conducted disturbances

NOTE FROM TC/SC OFFICERS:

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59 **EXPLANATORY NOTE (For information only, not to be part of the standard)**

60 Maintenance of IEC 61000-2-4:2002 is assigned to SC77A/WG8. The maintenance work
 61 carried is based on related proposals from WG8 Members and information from National
 62 Committees.

63 An overview of main modifications under discussion comparing with IEC 61000-2-4 has been
 64 provided with document 77A/1062/DC.

65 Based on the responses received to this DC (77A/1070/INF), a working draft for a future
 66 edition has been further developed, the result of this development being presented with this
 67 CD for comments. With regard to some different positions within WG8 concerning proposed
 68 modifications, together with this CD a 2nd DC is circulated to National Committees.

- 69 • providing background information about the recent status of discussions
- 70 • requesting National Committees to provide information about recognized EMI caused
 71 by harmonics to electrical equipment used in public LV supply networks as well as
 72 information about measurement results on the impact of (increased) individual
 73 harmonics in the supply voltage to the performance of equipment used in public supply
 74 networks.

75 With regard to the main issue under discussion within WG8 being the appropriate choice of
 76 compatibility levels for harmonics up to 2 kHz, in case of considering an increase of the
 77 values for the even and triplen harmonics together with a modified classification 2a und 2b for
 78 environments instead of the recently defined Class 2, the **related values for compatibility**
 79 **levels in Table 2 are provisional ones**, which will be further discussed based on the
 80 feedback as now requested from National Committees.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –**Part 2-4: Environment –
Compatibility levels in industrial plants for
low-frequency conducted disturbances****FOREWORD**

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.

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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61000-2-4 has been prepared by subcommittee 77A: Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

This standard forms part 2-4 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This third edition cancels and replaces the second edition, published in 2002, and constitutes a technical revision.

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

FDIS	Report on voting
77A/378/FDIS	77A/383/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 3.

Annexes A, B and C are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2010. At this date, the publication will be

- reconfirmed;
- withdrawn;

- 133 • replaced by a revised edition, or
134 • amended.

135

136 The contents of the corrigendum of July 2014 have been included in this copy.

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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 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, 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: 61000-3-11).

Detailed information on the various types of disturbances that can be expected on public power supply systems can be found in IEC 61000-2-1 and IEC 61000-2-12.

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 2-4: Environment –

Compatibility levels in industrial and other non-public power distribution systems for low-frequency conducted disturbances

1 Scope

This part of IEC 61000 is concerned with conducted disturbances in the frequency range from 0 kHz to 150 kHz. It gives numerical compatibility levels for industrial and non-public power distribution systems at nominal voltages up to 35 kV and a nominal frequency of 50 Hz or 60 Hz.

Power supply systems on ships, aircraft, offshore platforms and railways are not included.

The compatibility levels specified in this standard apply at the in-plant point of coupling. At the power input terminals of equipment receiving its supply from the above systems, the severity levels of the disturbances can, for the most part, be taken to be the same as the levels at the in-plant point of coupling. In some situations this is not so, particularly in the case of a long feeder dedicated to the supply of a particular load, or in the case of a disturbance generated or amplified within the installation of which the equipment forms a part.

Compatibility levels are specified for electromagnetic disturbances of the types which can be expected at any in-plant point of coupling (IPC) within industrial plants or other non-public networks, for guidance in

- a) limits to be set for disturbance emission into industrial power supply systems (including the planning levels defined in 3.1.5);

NOTE 1 A very wide range of conditions is possible in the electromagnetic environments of industrial and other non-public networks. These are approximated in this standard by the three classes described in Clause 4. However, it is the responsibility of the operator of such a network to take account of the particular electromagnetic and economic conditions, including equipment characteristics, in setting the above-mentioned limits.

- b) the choice of immunity levels for the equipment within these systems.

The disturbance phenomena considered are:

- voltage deviations;
- voltage dips and short interruptions;
- voltage unbalance;
- power-frequency variations;
- harmonics up to order 40;
- interharmonics up to the 40th harmonic;
- voltage components at higher frequencies (above 40th harmonic) up to 150kHz;
- d.c. component;– transient overvoltages.

The compatibility levels are given for different classes of the electromagnetic environment determined by the characteristics of the supply network.

NOTE 2 Compatibility levels at the point of common coupling (PCC) on public networks are specified in IEC 61000-2-2 for low-voltage networks and IEC 61000-2-12 for medium-voltage networks. Technical reports IEC 61000-3-6 and IEC 61000-3-7 describe the approach of supply authorities to the limitation of emissions from installations and large loads.

2 Normative references

The following referenced documents are indispensable for the application 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 60050-101, *International Electrotechnical Vocabulary (IEV) – Part 101: Mathematics*

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60050-551, *International Electrotechnical Vocabulary (IEV) – Part 551: Power electronics*

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 61000-2-12, *Electromagnetic compatibility (EMC) – Part 2-12: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public medium-voltage power supply systems*¹

3 Definitions

For the purposes of this part of IEC 61000, the definitions given in chapter 161 and parts 101 and 551 of IEC 60050 (IEV) as well as the following apply.

3.1 General definitions

3.1.1 (electromagnetic) disturbance

any electromagnetic phenomenon which, by being present in the electromagnetic environment, can cause electrical equipment to depart from its intended performance

[IEV 161-01-05, modified]

3.1.2 disturbance level

amount or magnitude of an electromagnetic disturbance, measured and evaluated in a specified way

[IEV 161-03-01, modified]

3.1.3 electromagnetic compatibility EMC

ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

[IEV 161-01-07]

NOTE 1 Electromagnetic compatibility is a condition of the electromagnetic environment such that, for every phenomenon, the disturbance emission level is sufficiently low and immunity levels are sufficiently high so that all devices, equipment and systems operate as intended.

NOTE 2 Electromagnetic compatibility is achieved only if emission and immunity levels are controlled such that the immunity level of devices, equipment and systems, at any location, are not exceeded by the disturbance level at that location, resulting from the cumulative emission of all sources and other factors such as circuit impedances. Conventionally, compatibility is said to exist if the probability of the departure from intended performance or of the adverse effect is sufficiently low. See Clause 4 of IEC 61000-2-1.

NOTE 3 Where the context requires it, compatibility may be understood to refer to a single disturbance or class of disturbances.

NOTE 4 Electromagnetic compatibility is a term used also to describe the field of study of the adverse electromagnetic effect which devices, equipment and systems undergo from each other or from electromagnetic phenomena.

¹ To be published.

3.1.4**(electromagnetic) compatibility level**

specified electromagnetic disturbance level used as a reference level in a specified environment for coordination in the setting of emission and immunity limits

[IEV 161-03-10, modified]

NOTE By convention, the compatibility level is chosen so that there is only a small probability that it will be exceeded by the actual disturbance level.

3.1.5**planning level**

level of a particular disturbance in a particular environment, adopted as a reference value for the limits to be set for the emission of large loads and installations, in order to coordinate those limits with all the limits adopted for equipment intended to be connected to the power supply system

NOTE The planning level is locally specific and is adopted by those responsible for planning and operating the power supply network in the relevant area. (For further explanation, see Annex A of IEC 61000-2-2 and IEC TS 61000-1-2.)

3.1.6**Industrial and private power distribution system**

Distribution network which is separated by at least one separation transformer from the public power supply system at which other customer installations are connected

3.1.6**point of common coupling****PCC**

point on a public power supply network, electrically nearest to a particular load, at which other loads are, or could be, connected

NOTE The PCC is usually the point for which electromagnetic compatibility in public networks is to be considered.

[IEV 161-07-15, modified]

3.1.7**in-plant point of coupling****IPC**

point on a network inside a system or an installation, electrically nearest to a particular load, at which other loads are, or could be, connected

NOTE The IPC is usually the point for which electromagnetic compatibility in industrial networks is to be considered.

3.2 Phenomena-related definitions

The definitions below that relate to harmonics are based on the analysis of system voltages or currents by the Discrete Fourier Transform method (DFT). This is the practical application of the Fourier Transform as defined in IEC 101-13-09. See Annex A.

NOTE The Fourier Transform of a function of time, whether periodic or non-periodic, is a function in the frequency domain and is referred to as the frequency spectrum of the time function, or simply spectrum. If the time function is periodic the spectrum is constituted of discrete lines (or components). If the time function is not periodic, the spectrum is a continuous function indicating components at all frequencies.

Other definitions related to harmonics or interharmonics are given in IEC and other standards. Some of those other definitions, although not used in this standard, are discussed in Annex A.

3.2.1**fundamental frequency**

frequency, in the spectrum obtained from a Fourier transform of a time function, to which all the frequencies of the spectrum are referred. For the purposes of this standard, the fundamental frequency is the same as the power supply frequency

[IEV 101-14-50, modified]

NOTE 1 In the case of a periodic function, the fundamental frequency is generally equal to the frequency of the function itself. (See A.1.)

NOTE 2 In case of any remaining risk of ambiguity, the power supply frequency should be referred to the polarity and speed of rotation of the synchronous generator(s) feeding the system.

NOTE 3 This definition may be applied to any industrial power supply network, without regard to the load it supplies (a single load or a combination of loads, rotating machines or other loads), and even if the generator feeding the network is a semiconductor converter.

3.2.2
fundamental component (or fundamental)
component whose frequency is the fundamental frequency

3.2.3
harmonic frequency
frequency which is an integer multiple of the fundamental frequency. The ratio of the harmonic frequency to the fundamental frequency is named harmonic order. (Recommended notation "*h*")

3.2.4
harmonic component
any of the components having a harmonic frequency. Its value is normally expressed as an r.m.s. value

For brevity, such a component may be referred to simply as a harmonic

3.2.5
interharmonic frequency
any frequency which is not an integer multiple of the fundamental frequency

NOTE 1 By extension from harmonic order, the interharmonic order is the ratio of interharmonic frequency to the fundamental frequency. This ratio is not an integer. (Recommended notation "*m*")

NOTE 2 In the case where $m < 1$, the term sub-harmonic frequency may also be used.

3.2.6
interharmonic component
component having an interharmonic frequency. Its value is normally expressed as an r.m.s. value.

For brevity, such a component may be referred to simply as an interharmonic

NOTE For the purpose of this standard, and as stated in IEC 61000-4-7, the time window has a width of 10 fundamental periods (for 50 Hz systems) or 12 fundamental periods (for 60 Hz systems), i.e. approximately 200 ms. The difference in frequency between two consecutive interharmonic components is, therefore, approximately 5 Hz.

3.2.7
total harmonic distortion
THD
ratio of the r.m.s. value of the sum of all the harmonic components up to a specified order (recommended notation "*H*") to the r.m.s. value of the fundamental component

$$THD = \sqrt{\sum_{h=2}^{h=H} \left(\frac{Q_h}{Q_1} \right)^2}$$

where:

Q represents either current or voltage;

*Q*₁ is the r.m.s. value of the fundamental component;

h is the harmonic order;

*Q*_{*h*} is the r.m.s. value of the harmonic component of order *h*;

H is 40 for the purpose of the compatibility levels in this standard.

NOTE *THD* takes account of harmonics only. For consideration of interharmonics, see A.3.1.

3.2.8
voltage unbalance (imbalance)
condition in a polyphase system in which the r.m.s. values of the line-to line voltages (fundamental component), or the phase angle between consecutive line-to line voltages, are