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Uninterruptible power systems (UPS) –
Part 2: Electromagnetic compatibility (EMC) requirements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Edition 3.0 2016-11

UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 2: Electromagnetic compatibility (EMC) requirements

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by subcommittee 22H: Uninterruptible power systems (UPS), of IEC technical committee 22: Power electronic systems and equipment.

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

FDIS	Report on voting
22H/232/FDIS	22H/236/RVD

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.

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Interpretation of 5.3.2.4, Limits at the network ports

Introduction

Sub-clause 5.3.2.4 states that the **network port** limits applicable to **UPS** of **category C1, C2** and **C3** are located in Table 1, Table 2 and Annex C.

It was not clear whether 5.3.2.4 applies to **network ports** that originate and terminate within the **enclosure port** of the **UPS** (i.e. to **network ports** connected exclusively to circuits or devices forming an integral part of the **UPS**).

Interpretation

The **network port** limits in Table 1, Table 2 and Annex C apply only to **network ports** for which connection to circuits or devices external to the **enclosure port** of the **UPS** is allowed. This includes, without limitation, connection to PSTN, ISDN, xDSL and Ethernet networks. The limits in Table 1, Table 2 and Annex C do not apply to **network ports** that originate and terminate within the **enclosure port** of the **UPS** (i.e. to **network ports** connected exclusively to circuits or devices forming an integral part of the **UPS**).

IEC 62040-2:2016-11/ISH1:2018-06(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 2: Electromagnetic compatibility (EMC) requirements

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.
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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 redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 62040-2 has been prepared by subcommittee 22H: Uninterruptible power systems (UPS), of IEC technical committee 22: Power electronic systems and equipment.

This third edition cancels and replaces the second edition published in 2005. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) the inclusion of **network port** limits in Table 1, Table 2 and Annex C for the sake of consistency with other standards;
b) a change of quasi-peak limit for **category C3 UPS** in Table 2 for the sake of consistency with other standards;
c) a clarification in Table 4 about the performance criteria for immunity tests;
d) a revision of some test configurations in Annex A.

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

FDIS	Report on voting
22H/210/FDIS	22H/212/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

In this document, the following print types are used:

– requirements proper and normative annexes: in roman type;
– compliance statements and test specifications: *in italic type*;
– notes and other informative matter: in smaller roman type;
– normative conditions within tables: in smaller roman type;
– terms that are defined in Clause 3: **bold**.

A list of all parts in the IEC 62040 series, published under the general title *Uninterruptible power systems (UPS)*, can be found on the IEC website.

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

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

The contents of the Interpretation sheet of June 2018 have been included in this copy.

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.

UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 2: Electromagnetic compatibility (EMC) requirements

1 Scope

~~This part of IEC 62040 applies to UPS units intended to be installed~~

~~– as a unit or in UPS systems comprising a number of interconnected UPS and associated control/switchgear forming a single power system; and~~

~~– in any operator accessible area or in separated electrical locations, connected to low-voltage supply networks for either industrial or residential, commercial and light industrial environments.~~

~~This part of IEC 62040 is intended as a product standard allowing the EMC conformity assessment of products of categories C1, C2 and C3 as defined in this part of IEC 62040, before placing them on the market.~~

~~Equipment of category 4 is treated as a fixed installation. Checking is generally done after installation in its final place of use. Sometimes partial checking may be done before. See Annex E~~

~~The requirements have been selected so as to ensure an adequate level of electromagnetic compatibility (EMC) for UPS at public and industrial locations. These levels cannot, however, cover extreme cases, which may occur in any location but with extremely low probability of occurrence.~~

~~This part of IEC 62040 takes into account the differing test conditions necessary to encompass the range of physical sizes and power ratings of UPS.~~

~~A UPS unit or system shall meet the relevant requirements of this part of IEC 62040 as a stand-alone product. EMC phenomena produced by any customers' load connected to the output of the UPS equipment shall not be taken into account.~~

~~Special installation environments are not covered, nor are fault conditions of UPS taken into account.~~

~~This part of IEC 62040 does not cover d.c. supplied electronic ballast or UPS based on rotating machines.~~

~~This part of IEC 62040 states:~~

~~– EMC requirements;~~

~~– test methods;~~

~~– minimum performance levels.~~

This part of IEC 62040 is a type test product standard for electromagnetic compatibility (EMC) and applies to movable, stationary, fixed or built-in, pluggable and permanently connected UPS for use in low-voltage distribution systems with an environment being either residential, commercial, light industrial or industrial, which deliver output voltage with **port** voltages not exceeding 1 500 V DC or 1 000 V AC and which include an energy storage device.

Subject to installing, operating and maintaining the UPS in the manner prescribed by the manufacturer, this standard defines emission limits, immunity levels, test methods and performance criteria for a complete UPS to comply with the essential EMC requirements

necessary to avoid the UPS interfering with other apparatus, e.g. radio receivers, and to avoid the UPS being affected by external phenomena.

This standard does not address EMC phenomena produced by loads connected to the UPS or situations created by any apparatus external to the UPS other than as described in the immunity requirements.

This standard is harmonized with applicable IEC standards for electromagnetic emission limits and immunity levels. It contains additional requirements applicable to UPS.

This standard does not cover:

a) low-voltage DC power supply devices covered by IEC 61204 standards;

b) systems wherein the output voltage is derived from a rotating machine.

NOTE 1 UPS generally connect to their energy storage device through a DC link. A chemical battery is an example of an energy storage device. Alternative devices can be suitable, and as such, where “battery” appears in the text of this standard, this can be understood as “energy storage device”.

NOTE 2 This type test-based product standard allows EMC conformity assessment of UPS included in one of categories C1, C2 and C3 before placing them on the market. It also provides guidance for conformity assessment of UPS included in category C4 (see Clause 4).

NOTE 3 The differing test conditions necessary to encompass the range of physical sizes and power ratings of a complete UPS are taken into account. A complete UPS can consist of one or more interconnected units. For UPS configuration details refer to IEC 62040-3:2011, Annex A.

NOTE 4 The requirements have been selected so as to permit an adequate level of EMC for UPS installed in residential, commercial, light industrial and industrial locations. The requirements are not always sufficient to cover situations with low probability of occurrence including UPS faults.

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) – Chapter 161: Electromagnetic compatibility*~~

IEC 61000-2-2:2002, *Electromagnetic compatibility (EMC) – Part 2-2: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems*

IEC 61000-3-2:~~2000~~ 2014, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤16 A per phase)*

IEC 61000-3-12:2011, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase*

~~IEC 61000-4-1:2000, *Electromagnetic compatibility (EMC) – Part 4-1: Testing and measurement techniques – Overview of IEC 61000-4 series*~~

IEC 61000-4-2:~~1995~~ 2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:~~2002~~ 2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:~~2004~~ 2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:~~1995~~ 2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:~~2003~~ 2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances induced by radio-frequency fields*

IEC 61000-4-8:~~1993~~ 2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 62040-3:~~1999~~ 2011, *Uninterruptible power systems (UPS) – Part 3: Method of specifying the performance and test requirements*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

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CISPR 16-1-4:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*
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CISPR 16-2-3:2010/AMD2:2014

CISPR 22:~~2005~~ 2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

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Uninterruptible power systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements

Alimentations sans interruption (ASI) – Partie 2: Exigences pour la compatibilité électromagnétique (CEM)

IEC 62040-2:2016-11(en-fr)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Part 2: Electromagnetic compatibility (EMC) requirements

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Part 2: Electromagnetic compatibility (EMC) requirements

1 Scope

This part of IEC 62040 is a type test product standard for electromagnetic compatibility (EMC) and applies to movable, stationary, fixed or built-in, pluggable and permanently connected UPS for use in low-voltage distribution systems with an environment being either residential, commercial, light industrial or industrial, which deliver output voltage with **port** voltages not exceeding 1 500 V DC or 1 000 V AC and which include an energy storage device.

Subject to installing, operating and maintaining the UPS in the manner prescribed by the manufacturer, this standard defines emission limits, immunity levels, test methods and performance criteria for a complete UPS to comply with the essential EMC requirements necessary to avoid the UPS interfering with other apparatus, e.g. radio receivers, and to avoid the UPS being affected by external phenomena.

This standard does not address EMC phenomena produced by loads connected to the UPS or situations created by any apparatus external to the UPS other than as described in the immunity requirements.

This standard is harmonized with applicable IEC standards for electromagnetic emission limits and immunity levels. It contains additional requirements applicable to UPS.

This standard does not cover:

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CISPR 16-2-3:2010/AMD1:2010
CISPR 16-2-3:2010/AMD2:2014

CISPR 22:2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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ALIMENTATIONS SANS INTERRUPTION (ASI) –

Partie 2: Exigences pour la compatibilité électromagnétique (CEM)

AVANT-PROPOS

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La Norme internationale IEC 62040-2 a été établie par le sous-comité 22H: Alimentations sans interruption (ASI), du comité d'études 22 de l'IEC: Systèmes et équipements électroniques de puissance.

Cette troisième édition annule et remplace la deuxième édition parue en 2005. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) l'intégration des limites pour les **accès réseau de télécommunication** dans le Tableau 1, le Tableau 2 et l'Annexe C, à des fins de cohérence avec d'autres normes;
b) une modification des limites quasi-crête pour les **ASI de catégorie C3** dans le Tableau 2, à des fins de cohérence avec d'autres normes;

c) une clarification des critères de performance destinés aux essais d'immunité dans le Tableau 4;

d) une révision de certaines configurations d'essai dans l'Annexe A.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
22H/210/FDIS	22H/212/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Dans le présent document, les caractères d'imprimerie suivants sont employés:

– exigences proprement dites et annexes normatives: caractères romains;

– déclarations de conformité et modalités d'essai: *caractères italiques*;

– notes et commentaires: petits caractères romains;

– conditions normatives au sein des tableaux: petits caractères romains;

– termes définis à l'Article 3: **gras**.

Une liste de toutes les parties de la série IEC 62040, publiées sous le titre général *Alimentations sans interruption (ASI)*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives à la publication recherchée. A cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

Le contenu de la feuille d'interprétation de juin 2018 a été pris en considération dans cet exemplaire.

IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.

ALIMENTATIONS SANS INTERRUPTION (ASI) –

Partie 2: Exigences pour la compatibilité électromagnétique (CEM)

1 Domaine d'application

La présente partie de l'IEC 62040 est une norme de produit pour les essais de type en matière de compatibilité électromagnétique (CEM). Elle s'applique aux ASI mobiles, stationnaires, installées à poste fixe ou intégrées, enfichables et connectées en permanence, destinées à une utilisation dans les réseaux de distribution basse tension d'un environnement résidentiel, commercial, d'industrie légère ou industriel, qui fournissent une tension de sortie ne dépassant pas 1 000 V en courant alternatif ou 1 500 V en courant continu au niveau de l'**accès**, et qui incluent un dispositif de stockage d'énergie.

Sous réserve que l'installation, l'exploitation et la maintenance de l'ASI soient réalisées de la manière prescrite par le fabricant, la présente norme définit les limites d'émission, les niveaux d'immunité, les méthodes d'essai et les critères de performances permettant à une ASI complète de respecter les exigences de CEM essentielles nécessaires pour éviter les interférences entre l'ASI et d'autres appareils, par exemple des récepteurs radio, et pour empêcher que l'ASI soit affectée par des phénomènes extérieurs.

La présente norme ne traite pas des phénomènes de CEM produits par des charges connectées à l'ASI ni des situations créées par tout appareil externe à l'ASI autre que ceux décrits dans les exigences d'immunité.

La présente norme est harmonisée avec les normes IEC applicables relatives aux limites d'émissions électromagnétiques et aux niveaux d'immunité. Elle contient des exigences supplémentaires applicables aux ASI.

La présente norme ne couvre pas:

a) les dispositifs d'alimentation à basse tension en courant continu couverts par les normes IEC 61204;

b) les systèmes dont la tension de sortie est dérivée d'une machine tournante.

NOTE 1 Les ASI sont généralement raccordées à leur dispositif de stockage d'énergie via une liaison continue. Une batterie chimique est un exemple de dispositif de stockage d'énergie. D'autres dispositifs peuvent être appropriés; par conséquent, lorsque le mot "batterie" apparaît dans le texte de la présente norme, il peut être compris dans le sens de "dispositif de stockage d'énergie".

NOTE 2 La présente norme de produit pour les essais de type permet d'évaluer la conformité CEM des ASI comprises dans l'une des catégories C1, C2 et C3 avant leur mise sur le marché. Elle propose également des préconisations destinées à évaluer la conformité des ASI comprises dans la catégorie C4 (voir Article 4).

NOTE 3 Les différentes conditions d'essai nécessaires à couvrir toute la plage de tailles et de caractéristiques assignées de puissance d'une ASI complète sont prises en considération. Une ASI complète peut consister en une ou plusieurs unités interconnectées. Pour plus d'informations sur la configuration d'une ASI, voir l'IEC 62040-3:2011, Annexe A.

NOTE 4 Les exigences ont été choisies de manière à permettre un niveau adéquat de CEM pour les ASI installées dans un environnement résidentiel, commercial, d'industrie légère ou industriel. Les exigences ne suffisent pas systématiquement à couvrir les situations peu susceptibles de se produire, y compris les défaillances de l'ASI.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée

s’applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61000-2-2:2002, *Compatibilité électromagnétique (CEM) – Partie 2-2: Environnement – Niveaux de compatibilité pour les perturbations conduites à basse fréquence et la transmission des signaux sur les réseaux publics d'alimentation basse tension*

IEC 61000-3-2:2014, *Compatibilité électromagnétique (CEM) – Partie 3-2: Limites – Limites pour les émissions de courant harmonique (courant appelé par les appareils ≤ 16 A par phase)*

IEC 61000-3-12:2011, *Compatibilité électromagnétique (CEM) – Partie 3-12: Limites – Limites pour les courants harmoniques produits par les appareils connectés aux réseaux publics basse tension ayant un courant appelé > 16 A et ≤ 75 A par phase*

IEC 61000-4-2:2008, *Compatibilité électromagnétique (CEM) – Partie 4-2: Techniques d'essai et de mesure – Essai d'immunité aux décharges électrostatiques*

IEC 61000-4-3:2006, *Compatibilité électromagnétique (CEM) – Partie 4-3: Techniques d'essai et de mesure – Essai d'immunité aux champs électromagnétiques rayonnés aux fréquences radioélectriques*

IEC 61000-4-4:2012, *Compatibilité électromagnétique (CEM) – Partie 4-4: Techniques d'essai et de mesure – Essai d'immunité aux transitoires électriques rapides en salves*

IEC 61000-4-5:2014, *Compatibilité électromagnétique (CEM) – Partie 4-5: Techniques d'essai et de mesure – Essai d'immunité aux ondes de choc*

IEC 61000-4-6:2013, *Compatibilité électromagnétique (CEM) – Partie 4-6: Techniques d'essai et de mesure – Immunité aux perturbations conduites, induites par les champs radioélectriques*

IEC 61000-4-8:2009, *Compatibilité électromagnétique (CEM) – Partie 4-8: Techniques d'essai et de mesure – Essai d'immunité au champ magnétique à la fréquence du réseau*

IEC 62040-3:2011, *Alimentations sans interruption (ASI) – Partie 3: Méthode de spécification des performances et exigences d'essais*

CISPR 11:2015, *Appareils industriels, scientifiques et médicaux – Caractéristiques de perturbations radioélectriques – Limites et méthodes de mesure*

CISPR 16-1-1:2015, *Spécification des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-1: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Appareils de mesure*

CISPR 16-1-2:2014, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-2: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Dispositifs de couplage pour la mesure des perturbations conduites*

CISPR 16-1-4:2010, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-4: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Antennes et emplacements d'essai pour les mesures des perturbations rayonnées*
CISPR 16-1-4:2010/AMD1:2012

CISPR 16-2-1:2014, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-1: Méthodes de mesure des perturbations et de l'immunité – Mesures des perturbations conduites*

CISPR 16-2-3:2010, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-3: Méthodes de mesure des perturbations et de l'immunité – Mesures des perturbations rayonnées*
CISPR 16-2-3:2010/AMD1:2010
CISPR 16-2-3:2010/AMD2:2014

CISPR 22:2008, *Appareils de traitement de l'information – Caractéristiques des perturbations radioélectriques – Limites et méthodes de mesure*