



BSI Standards Publication

Uninterruptible power systems (UPS)

Part 1: Safety requirements

This is a preview of "BS EN IEC 62040-1:20...". Click here to purchase the full version from the ANSI store.

National foreword

This British Standard is the UK implementation of EN IEC 62040-1:2019+A11:2021. It is derived from IEC 62040-1:2017, incorporating corrigendum October 2019. It supersedes BS EN IEC 62040-1:2019, which is withdrawn.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum October 2019 is indicated in the text by AC1 AC1.

The UK participation in its preparation was entrusted to Technical Committee PEL/22, Power electronics.

A list of organizations represented on this committee can be obtained on request to its committee manager.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

This publication has been prepared under a mandate given to the European Standards Organizations by the European Commission and the European Free Trade Association and is intended to support essential requirements of the EU legislation detailed in the European foreword. Annex ZA/ZZ describes how the publication relates to the legislation.

For the Great Britain market (England, Scotland and Wales), if the UK Government has designated this publication for conformity with UKCA marking legislation and has not amended the essential requirements of that legislation, Annex ZA/ZZ and any references to EU law in the publication should be read in accordance with the designation as applying to UK legislation in the same way as to EU law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

For the Northern Ireland market, UK law will continue to implement relevant EU law subject to periodic confirmation. References to EU legislation are therefore still valid.

More information on legislation can be found at www.gov.uk.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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Amendments/corrigenda issued since publication

Date	Text affected
30 November 2019	Implementation of IEC corrigendum October 2019
31 August 2020	Correction to supersession information in national foreword

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Date	Text affected
28 February 2021	Implementation of CENELEC amendment A11:2021: addition of Annex ZZ

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EUROPÄISCHE NORM

February 2021

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English Version

Uninterruptible power systems (UPS) - Part 1: Safety requirements (IEC 62040-1:2017)

Alimentations sans interruption (ASI) - Partie 1: Exigences de sécurité
(IEC 62040-1:2017)

Unterbrechungsfreie Stromversorgungssysteme (USV) - Teil 1: Sicherheitsanforderungen
(IEC 62040-1:2017)

This European Standard was approved by CENELEC on 2017-08-16. 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.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

The text of document 22H/217/FDIS, future edition 2 of IEC 62040-1, prepared by SC 22H "Uninterruptible power systems (UPS)" of IEC/TC 22 "Power electronic systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62040-1:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-01-19
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-07-19

This document supersedes EN 62040-1:2008 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 62040-1:2017 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60076-11:2004	NOTE	Harmonized as EN 60076-11:2004 (not modified)
IEC 60364-5-52	NOTE	Harmonized as HD 60364-5-52
IEC 60947-1:2007	NOTE	Harmonized as EN 60947-1:2007 (not modified)
IEC 60947-3:2008	NOTE	Harmonized as EN 60947-3:2009 (not modified)
IEC 60947-6-1:2005	NOTE	Harmonized as EN 60947-6-1:2005 (not modified)
IEC 60947-6-1:2005/A1:2013	NOTE	Harmonized as EN 60947-6-1:2005/A1:2014 (not modified)
IEC 61347 (series)	NOTE	Harmonized as EN 61347 (series)
IEC 61439-1:2011	NOTE	Harmonized as EN 61439-1:2011 (not modified)
IEC 61508 (series)	NOTE	Harmonized as EN 61508 (series)
IEC 62040-3:2011	NOTE	Harmonized as EN 62040-3:2011 (not modified)
IEC 62310-1	NOTE	Harmonized as EN 62310-1
IEC 62368-1:2014	NOTE	Harmonized as EN 62368-1:2014/AC:2015 (not modified)

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Foreword to amendment A11

This document (EN IEC 62040-1:2019/A11:2021) has been prepared by CLC/TC 22X "Power electronics".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-08-05
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2023-11-17

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60364-4-42- (mod)		Low-voltage electrical installations - Part 4-42: Protection for safety - Protection against thermal effects	EN 60364-4-42	-
IEC 60384-14	-	Fixed capacitors for use in electronic equipment - Part 14: Sectional specification - Fixed capacitors for electromagnetic interference suppression and connection to the supply mains	EN 60384-14	-
IEC/TR 60755	-	General requirements for residual current-operated protective devices		-
IEC 60947-2	2006	Low-voltage switchgear and controlgear - Part 2: Circuit-breakers	EN 60947-2	2006
IEC 60950-1 (mod)	2005	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1 + A11 + A12	2006 2009 2011
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	EN 61000-2-2	2002
IEC 61008-1 (mod)	-	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) - Part 1: General rules	EN 61008-1	-
IEC 61009-1 (mod)	-	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) - Part 1: General rules	EN 61009-1	-
IEC 62040-2	2005	Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements	EN 62040-2	2006

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<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62477-1	2012	Safety requirements for power electronic converter systems and equipment - Part 1: General	EN 62477-1	2012

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(informative)

Relationship between this European Standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European Standard has been prepared under a Commission's standardization request relating to harmonized standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.

Table ZZ.1 — Correspondence between this European Standard and Annex I of Directive 2014/35/EU [2014 OJ L96]

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
1. General		
1 a) the essential characteristics, the recognition and observance of which will ensure that electrical equipment will be used safely and in applications for which it was made, shall be marked on the electrical equipment, or, if this is not possible, on an accompanying document	6	
1 b) the electrical equipment, together with its component parts, shall be made in such a way as to ensure that it can be safely and properly assembled and connected;	4.3 4.8 4.11, 4.102, 4.103 6.3 Annex CC	
1 c) the electrical equipment shall be so designed and manufactured as to ensure that protection against the hazards set out in points 2 and 3 is assured, providing that the equipment is used in applications for which it was made and is adequately maintained.	1, 2, 3 6.2, 6.4, 6.5	refer to 2a to 2d and 3a to 3c in this table
2. Protection against hazards arising from the electrical equipment		

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Directive 2014/35/EU	of this EN	
2 a) persons and domestic animals are adequately protected against the danger of physical injury or other harm which might be caused by direct or indirect contact;	4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.8, 4.9, 4.101. 4.103 Annex A, Annex D, Annex F 5.1, 5.2.1, 5.2.2, 5.2.3, 5.2.4	
2 b) temperatures, arcs or radiation which would cause a danger, are not produced	4.1, 4.2, 4.3, 4.5, 4.6, 4.9, 4.11, 4.12 5.1, 5.2.6 5.2.3.9, 5.2.4, 5.2.3.10, 5.2.5	Hazards arising from electric, magnetic and electromagnetic fields, other ionizing and non-ionizing radiation are covered by separate standards.
2 c) persons, domestic animals and property are adequately protected against non-electrical dangers caused by the electrical equipment which are revealed by experience;	4.1, 4.2, 4.7, 4.12 5.1 5.2.1, 5.2.2, 5.2.4	
2 d) the insulation is suitable for foreseeable conditions.	4.1, 4.2, 4.4.7, 4.6.4, 4.101 5.1 5.2.1, 5.2.3, 5.2.4, 5.2.3.10, 5.2.5	
3. Protection against hazards which may be caused by external influences on the electrical equipment		
3 a) meets the expected mechanical requirements in such a way that persons, domestic animals and property are not endangered;	4.1, 4.2, 4.7, 4.9, 4.12 5.1 5.2.1, 5.2.2, 5.2.4, 5.2.6 Annex GG	
3 b) is resistant to non-mechanical influences in expected environmental conditions, in such a way that persons, domestic animals and property are not endangered;	4.2, 4.9, 5.1 5.2.1, 5.2.6, 5.2.7	EMC is not covered.
3 c) does not endanger persons, domestic animals and property in foreseeable conditions of overload.	4.1, 4.2, 4.3 5.1 5.2.1, 5.2.4 Annex CC	

WARNING 1: Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2: Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 1: Safety 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.
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International Standard IEC 62040-1 has been prepared by subcommittee 22H: Uninterruptible power systems (UPS), of IEC technical committee 22: Power electronic systems and equipment.

This second edition cancels and replaces the first edition published in 2008 and its Amendment 1:2013. This edition constitutes a technical revision.

This edition includes the following significant technical change with respect to the previous edition: the reference document has been changed from IEC 60950-1:2005 (safety for IT equipment) to IEC 62477-1 (group safety standard for power electronic converters).

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The text of this International Standard is based on the following documents:

FDIS	Report on voting
22H/217/FDIS	22H/218/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.

This International Standard is to be read in conjunction with IEC 62477-1:2012.

The provisions of the general rules dealt within IEC 62477-1:2012 are only applicable to this document insofar as they are specifically cited. Clauses and subclauses of IEC 62477-1:2012 that are applicable in this document are identified by reference to IEC 62477-1:2012, for example, "Clause 4 of IEC 62477-1:2012 applies, except as follows".

The exceptions are then listed. The exceptions can take the form of a deletion, a replacement or an addition of subclauses, tables, figures or annexes.

Subclauses, tables and figures that are additional to those in IEC 62477-1:2012 are, in this document, identified by a suffix in the format of X.10x, for example 4.3.101.

Annexes that are additional to those in IEC 62477-1:2012 are, in this document, lettered AA, BB, etc.

In this document, the following print types are used:

- requirements and normative annexes: roman type
- compliance statements and test specifications: *italic type*
- notes and other informative matter: smaller roman type
- normative conditions within tables: 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 corrigendum of October 2019 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.

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INTRODUCTION

IEC technical sub-committee 22H: Uninterruptible power systems (UPS) carefully considered the relevance of each paragraph of IEC 62477-1:2012 in UPS applications. This part of IEC 62040 utilizes IEC 62477-1:2012 as a reference document and references, adds, replaces or modifies requirements as relevant. This is because product-specific topics not covered by the reference document are the responsibility of the technical committee using the reference document.

IEC 62477-1:2012 relates to products that include power electronic converters, with a rated system voltage not exceeding 1 000 V AC or 1 500 V DC. It specifies requirements to reduce risks of fire, electric shock, thermal, energy and mechanical hazards, except functional safety as defined in IEC 61508 (all parts). The objectives of this document are to establish a common terminology and basis for the safety requirements of products that contain power electronic converters across several IEC technical committees.

IEC 62477-1:2012 was developed with the intention:

- to be used as a reference document for product committees inside IEC technical committee 22: Power electronic systems and equipment in the development of product standards for power electronic converter systems and equipment;
- to replace IEC 62103 as a product family standard providing minimum requirements for safety aspects of power electronic converter systems and equipment in apparatus for which no product standard exists; and

NOTE The scope of IEC 62103 contains reliability aspects, which are not covered by this document.

- to be used as a reference document for product committees outside TC 22 in the development of product standards of power electronic converter systems and equipment intended for renewable energy sources. TC 82, TC 88, TC 105 and TC 114, in particular, have been identified as relevant technical committees at the time of publication.

The reference document, being a group safety standard, will not take precedence over this product-specific standard according to IEC Guide 104. IEC Guide 104 provides information about the responsibility of product committees to use group safety standards for the development of their own product standards.

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UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 1: Safety requirements

1 Scope

This part of IEC 62040 applies to movable, stationary, fixed or built-in **UPS** for use in low-voltage distribution systems and that are intended to be installed in an area accessible by an **ordinary person** or in a restricted access area as applicable, that deliver fixed frequency AC output voltage with port voltages not exceeding 1 000 V AC or 1 500 V DC and that include an energy storage device. It applies to pluggable and to permanently connected **UPS**, whether consisting of a system of interconnected units or of independent units, subject to installing, operating and maintaining the **UPS** in the manner prescribed by the manufacturer.

NOTE 1 Typical **UPS** configurations, including voltage and/or frequency converters and other topologies, are described in IEC 62040-3, the test and performance product standard for **UPS**.

NOTE 2 **UPS** generally connect to their energy storage device through a DC link. A chemical battery is used throughout the standard as an example of an energy storage device. Alternative devices exist, and as such, where "battery" appears in the text of this document, this is to be understood as "energy storage device".

This document specifies requirements to ensure safety for the **ordinary person** who comes into contact with the **UPS** and, where specifically stated, for the **skilled person**. The objective is to reduce risks of fire, electric shock, thermal, energy and mechanical hazards during use and operation and, where specifically stated, during service and maintenance.

This product standard is harmonized with the applicable parts of group safety publication IEC 62477-1:2012 for power electronic converter systems and contains additional requirements relevant to **UPS**.

This document does not cover:

- UPS that have a DC output;
- systems for operation on moving platforms including, but not limited to, aircrafts, ships and motor vehicles;
- external AC or DC input and output distribution boards covered by their specific product standard;
- stand-alone static transfer systems (STS) covered by IEC 62310-1;
- systems wherein the output voltage is directly derived from a rotating machine;
- telecommunications apparatus other than **UPS** for such apparatus;
- functional safety aspects covered by IEC 61508 (all parts).

NOTE 3 Even if this document does not cover the applications listed above, it is commonly taken as a guide for such applications.

NOTE 4 Specialized **UPS** applications are generally governed by additional requirements covered elsewhere, for example **UPS** for medical applications.

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.