

Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 62040-3:2011 sisaldab Euroopa standardi EN 62040-3:2011 ingliskeelset teksti.

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This Estonian standard EVS-EN 62040-3:2011 consists of the English text of the European standard EN 62040-3:2011.

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Inglisekeelsed võtmesõnad: electric converters, electrically-operated electronic equipment, rating, redundancy, safety, semiconductor devices, semiconductor power converters, specification (approval), specifications, test requirements, testing, testing requirements, uninterruptible power supply devices, valve devices,

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

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

Unterbrechungsfreie
Stromversorgungssysteme (USV) -
Teil 3: Methoden zum Festlegen der
Leistungs- und Prüfungsanforderungen
(IEC 62040-3:2011)

This European Standard was approved by CENELEC on 2011-04-18. 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.

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CENELEC

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

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Foreword

The text of document 22H/129/FDIS, future edition 2 of IEC 62040-3, 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 was approved by CENELEC as EN 62040-3 on 2011-04-18.

This European Standard supersedes EN 62040-3:2001 + A11:2009.

The significant technical changes are:

- reference test load – definition and application revised (3.3.5 and 6.1.1.3);
- test schedule – presented as a single table grouped by revised type and routine tests (see 6.1.6, Table 3);
- dynamic output voltage performance characteristics – guidance to measure – addition (Annex H);
- UPS efficiency – requirements and methods of measure – addition (Annexes I and J);
- functional availability – guidance for UPS reliability integrity level classification – addition (Annex K).

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

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) | 2012-01-18 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2014-04-18 |

In this standard, 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**.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62040-3:2011 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 60034-22 | NOTE Harmonized as EN 60034-22. |
| IEC 60068-1:1988 | NOTE Harmonized as EN 60068-1:1994 (not modified). |

IEC 60068-2 series	NOTE Harmonized in EN 60068-2 series (not modified).
IEC 60068-3-3:1991	NOTE Harmonized as EN 60068-3-3:1993 (not modified).
IEC 60146-1-3:1991	NOTE Harmonized as EN 60146-1-3:1993 (not modified).
IEC 60664-1:2007	NOTE Harmonized as EN 60664-1:2007 (not modified).
IEC/TR 61508 series	NOTE Harmonized in EN 61508 series (not modified).

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60038	-	IEC standard voltages	EN 60038 ¹	-
IEC 60068-2-1	-	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	-
IEC 60068-2-2	-	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	-
IEC 60068-2-27	-	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	-
IEC 60068-2-31	2008	Environmental testing - Part 2-31: Tests - Test Ec: Rough handling shocks, primarily for equipment-type specimens	EN 60068-2-31	2008
IEC 60068-2-78	-	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	EN 60068-2-78	-
IEC 60146-1-1	2009	Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements	EN 60146-1-1	2010
IEC 60146-2	1999	Semiconductor converters - Part 2: Self-commutated semiconductor converters including direct d.c. converters	EN 60146-2	2000
IEC 60196	-	IEC standard frequencies	EN 60196	-
IEC 60364-1	-	Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions	HD 60364-1	-
IEC 60364-5-52	-	Low-voltage electrical installations - Part 5-52: Selection and erection of electrical equipment - Wiring systems	HD 60364-5-52	-
IEC 60947-3	-	Low-voltage switchgear and controlgear - Part 3: Switches, disconnectors, switch- disconnectors and fuse-combination units	EN 60947-3	-
IEC 60947-6-1	-	Low-voltage switchgear and controlgear - Part 6-1: Multiple function equipment - Transfer switching equipment	EN 60947-6-1	-

¹ At draft stage.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60950-1	-	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1	-
IEC 60990	-	Methods of measurement of touch current and protective conductor current	EN 60990	-
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 61000-3-2	-	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)	EN 61000-3-2	-
IEC/TS 61000-3-4	-	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	-	-
IEC 61000-3-12	-	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	EN 61000-3-12	-
IEC 61000-4-30	-	Electromagnetic compatibility (EMC) - Part 4-30 : Testing and measurement techniques - Power quality measurement methods	EN 61000-4-30	-
IEC 61672-1	-	Electroacoustics - Sound level meters - Part 1: Specifications	EN 61672-1	-
IEC 62040-1 + corr. September	2008 2008	Uninterruptible Power Systems (UPS) - Part 1: General and safety requirements for UPS	EN 62040-1 + corr. February	2008 2009
IEC 62040-2	-	Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements	EN 62040-2	-
IEC 62310-3	2008	Static transfer systems (STS) - Part 3: Method for specifying performance and test requirements	EN 62310-3	2008
ISO 7779	2010	Acoustics - Measurement of airborne noise emitted by information technology and telecommunications equipment	EN ISO 7779	2010

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UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 3: Method of specifying the performance and test requirements

1 Scope

This International Standard applies to movable, stationary and fixed electronic **uninterruptible power systems** (UPS) that deliver single or three-phase fixed frequency a.c. output voltage not exceeding 1 000 V a.c. and that incorporate an **energy storage system**, generally connected through a d.c. link.

This standard is intended to specify performance and test requirements of a complete UPS and not of individual **UPS functional units**. The individual UPS functional units are dealt with in IEC publications referred to in the bibliography that apply so far that they are not in contradiction with this standard.

The primary function of the UPS covered by this standard is to ensure continuity of an a.c. power source. The UPS may also serve to improve the quality of the power source by keeping it within specified characteristics. UPS have been developed over a wide range of power, from less than hundred watts to several megawatts, to meet requirements for availability and quality of power to a variety of loads. Refer to Annexes A and B for information on typical UPS configurations and topologies.

This standard also covers UPS test and performance when power switches form integral part of a UPS and are associated with its output. Included are interrupters, bypass switches, isolating switches, and tie switches. These switches interact with other functional units of the UPS to maintain **continuity of load power**.

This standard does not cover

- conventional a.c. input and output distribution boards or d.c. boards and their associated switches (e.g. switches for batteries, rectifier output or inverter input);
- stand-alone static transfer systems covered by IEC 62310-3;
- systems wherein the output voltage is derived from a rotating machine.

NOTE 1 This standard recognises that power availability to information technology (IT) equipment represents a major UPS application. The UPS output characteristics specified in this standard are therefore also aimed at ensuring compatibility with the requirements of IT equipment. This, subject to any limitation stated in the manufacturer's declaration, includes requirements for steady state and transient voltage variation as well as for the supply of both linear and non-linear load characteristics of IT equipment.

NOTE 2 Test loads specified in this standard simulate both linear and non-linear load characteristics. Their use is prescribed with the objective of verifying design and performance, as declared by the manufacturer, and also of minimising any complexity and energy consumption during the tests.

NOTE 3 This standard is aimed at 50 Hz and 60 Hz applications but does not exclude other frequency applications within the domain of IEC 60196. This is subject to an agreement between manufacturer and purchase in respect to any particular requirements arising.

NOTE 4 Single phase and three-phase voltage UPS covered by this standard include without limitation UPS supplying single-phase, two-wire; single-phase, three-wire; two-phase, three-wire, three-phase, three-wire and three-phase, four-wire 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 60038, *IEC standard voltages*

IEC 60068-2-1, *Environmental testing - Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-31:2008, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60146-1-1:2009, *Semiconductor converters – General requirements and line commutated converters – Part 1-1: Specification of basic requirements*

IEC 60146-2:1999, *Semiconductor converters – Part 2: Self-commutated semiconductor converters including direct d.c. converters*

IEC 60196, *IEC standard frequencies*

IEC 60364-1, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60364-5-52, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 60947-6-1, *Low-voltage switchgear and controlgear – Part 6-1: Multiple function equipment – Transfer switching equipment*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 60990, *Methods of measurement of touch current and protective conductor current*

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

IEC/TS 61000-3-4, *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*

IEC 61000-3-12, *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 61000-4-30, *Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods*

IEC 61672-1, *Electroacoustics – Sound level meters – Part 2: Pattern evaluation tests*

IEC 62040-1:2008, *Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS*

IEC 62040-2, *Uninterruptible power systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements*

IEC 62310-3:2008, *Static transfer systems (STS) – Part 3: Method for specifying performance and test requirements*

ISO 7779:2010, *Acoustics – Measurement of airborne noise emitted by information technology and telecommunications equipment*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE In this standard, IEC 60050 definitions are referenced wherever possible, particularly those of IEC 60050(551).

When an existing IEC 60050 definition needs amplification or additional information, this is indicated by adding the word “modified” after the IEC 60050 reference.

3.1 Systems and components

3.1.1

uninterruptible power system

UPS

combination of convertors, switches and energy storage devices (such as batteries), constituting a power system for maintaining **continuity of load power** in case of input power failure

NOTE Input power failure occurs when voltage and frequency are outside rated steady-state and transient tolerance bands or when distortion or interruptions are outside the limits specified for the UPS.

3.1.2

(electronic) (power) converter or convertor

an operative unit for electronic power conversion, comprising one or more electronic valve devices, transformers and filters if necessary and auxiliaries if any

NOTE In English, the two spellings “converter” and “convertor” are in use, and both are correct.

[IEC 60050-551:1998, 551-12-01]

3.1.3

UPS functional unit

functional unit, for example, a UPS rectifier, a UPS inverter or a UPS switch