
Uninterruptible power systems (UPS) - Part 1-2: General and safety requirements for UPS used in restricted access locations (IEC 62040-1-2:2002 + Corrigendum 2002)

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EUROPEAN STANDARD

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English version

**Uninterruptible power systems (UPS)
Part 1-2: General and safety requirements for UPS
used in restricted access locations
(IEC 62040-1-2:2002 + corrigendum 2002)**

Alimentations sans interruption (ASI)
Partie 1-2: Prescriptions générales
et règles de sécurité pour les ASI
utilisées dans des locaux d'accès restreint
(CEI 62040-1-2:2002 + corrigendum 2002)

Unterbrechungsfreie
Stromversorgungssysteme (USV)
Teil 1-2: Allgemeine Anforderungen
und Sicherheitsanforderungen an USV
in abgeschlossenen Betriebsräumen
(IEC 62040-1-2:2002 + Corrigendum 2002)

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This European Standard was approved by CENELEC on 2002-11-01. 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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 22H/23FDIS, future edition 1 of IEC 62040-1-2 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 62040-1-2 on 2002-11-01.

This European Standard supersedes EN 50091-1-2:1998 + corrigendum August 1999.

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) 2003-08-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-11-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes L, M, N, P and ZA are normative and annex H is informative.

Annex ZA has been added by CENELEC.

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**.

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Endorsement notice

The text of the International Standard IEC 62040-1-2:2002 and its corrigendum December 2002 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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 60364(mod)	Series	Electrical installations of buildings	HD 384 HD 60364	Series Series
IEC 60364-4-41	2001	Part 4-41: Protection for safety - Protection against electric shock	-	-
IEC 60364-4-482	1982	Part 4: Protection for safety Chapter 48: Choice of protective measures as a function of external influences Section 482: Protection against fire where particular risks or danger exist	-	-
IEC 60417	Series	Graphical symbols for use on equipment	EN 60417	Series
IEC 60439-1	1999	Low-voltage switchgear and controlgear assemblies Part 1: Type-tested and partially type- tested assemblies	EN 60439-1	1999
IEC 60445	1999	Basic and safety principles for man- machine interface, marking and identification - Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system	EN 60445	2000
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC 60950-1 (mod)	2001	Information technology equipment - Safety Part 1: General requirements	EN 60950-1	2001
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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61140	2001	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2002
IEC 62040-1-1 + corr. December	2002 2002	Uninterruptible power systems (UPS) Part 1-1: General and safety requirements for UPS used in operator access areas	EN 62040-1-1	2003
IEC 62040-2	1999	Part 2: Electromagnetic compatibility (EMC) requirements	-	-
IEC 62040-3 (mod)	1999	Part 3: Method of specifying the performance and test requirements	EN 62040-3	2001

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INTERNATIONAL STANDARD

IEC 62040-1-2

First edition
2002-08

Uninterruptible power systems (UPS) –

Part 1-2: General and safety requirements for UPS used in restricted access locations

iTeh STANDARD PREVIEW

Alimentations (sans interruption) (ASI) –

Partie 1-2: SIST EN 62040-1-2:2003

*Prescriptions générales et règles de sécurité pour les ASI
utilisées dans des locaux d'accès restreint*

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 1-2: General and safety requirements for UPS used in restricted access locations

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.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 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 62040-1-2 has been prepared by IEC technical committee 22H: Uninterruptible power systems (UPS), of IEC technical committee 22: Power electronic systems and equipment.

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

FDIS	Report on voting
22H/23/FDIS	22H/25/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 L, M, N and P form an integral part of this standard.

Annex H is for information only.

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**

The committee has decided that this publication remains valid until 2006. At this date, in accordance with the committee's decision, the publication will be

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

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UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 1-2: General and safety requirements for UPS used in restricted access locations

1 Scope and specific applications

1.1 Scope

This standard applies to electronic **uninterruptible power systems** with an electrical energy storage device in the d.c. link. It is to be used with IEC 60950-1 which is referred to in this standard as "RD".

When any item is referred to by the phrase "The definitions or the provisions of item/RD apply", this phrase is intended to mean that the definitions or provisions in that item of IEC 60950-1 apply, except any which are clearly inapplicable to **uninterruptible power systems**. National requirements additional to those in IEC 60950-1 apply and are found as notes under relevant clauses of the RD.

The primary function of the **UPS** covered by this standard is to ensure continuity of an alternating power source. The **UPS** may also serve to improve the quality of the power source by keeping it within specified characteristics.

This standard is applicable to **UPS** which are movable, stationary, fixed or for building-in, for use on low-voltage distribution systems and intended to be installed in **restricted access locations**. It specifies requirements to ensure safety for the **service person**.

This standard is intended to ensure the safety of installed **UPS**, both as a single **UPS** unit or as a system of interconnected **UPS** units, subject to installing, operating and maintaining the **UPS** in the manner prescribed by the manufacturer.

This standard does not cover d.c. supplied electronic ballasts (IEC 60924 and IEC 60925) and **UPS** based on rotating machines.

The relevant general and safety requirements for **UPS** intended to be installed in operator access areas are given in IEC 62040-1-1; electromagnetic compatibility (EMC) requirements and definitions are given in IEC 62040-2.

1.2 Specific applications

Even if this standard does not cover all types of **UPS**, it may be taken as a guide for such equipment. Requirements additional to those specified in this standard may be necessary for specific applications, for example:

- **UPS** intended for operation while exposed, for example, to extremes of temperature; to excessive dust, moisture, or vibration; to flammable gases; to corrosive or explosive atmospheres;
- electromedical applications with the **UPS** located within 1,5 m from the patient contact area;
- **UPS** subject to transient overvoltages exceeding those for Overvoltage Category II according to IEC 60664, additional protection might be necessary in the mains supply to the **UPS**.
- **UPS** intended for use where ingress of water and foreign objects are possible, additional requirements may be necessary; for guidance on such requirements and for relevant testing, see annex H.

- **UPS** with trapezoidal output waveforms and long run times (greater than 30 min) are subject to voltage distortion tests for the purpose of load compatibility.

NOTE For **UPS** intended to be used in vehicles, on board ships or aircraft, in tropical countries, or on elevations greater than 1 000 m, different requirements may be necessary.

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 60364 (all parts), *Electrical installations of buildings*

IEC 60364-4-41:2001, *Electrical installations of buildings – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-482:1982, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 48: Choice of protective measures as a function of external influences – Section 482: Protection against fire*

IEC 60417 (all parts), *Graphical symbols for use on equipment*

IEC 60439-1:1999, *Low-voltage switchgear and controlgear assemblies – Part 1: Type-tested and partially type-tested assemblies*

IEC 60445:1999, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60950-1:2001, *Safety of information technology equipment*

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 61140:2001, *Protection against electric shock – Common aspects for installation and equipment*

IEC 62040-1-1: *Uninterruptible Power Systems (UPS) – Part 1-1: General and safety requirements for UPS used in operator access areas*¹

IEC 62040-2:1999, *Uninterruptible Power Systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements*

IEC 62040-3: 1999, *Uninterruptible Power Systems (UPS) – Part 3: Method of specifying the performance and test requirements*

¹ To be published

3 Definitions

3.1 General

For the purpose of this standard, the following definitions apply. Where the terms "voltage" and "current" are used, they imply the r.m.s. values, unless otherwise specified.

NOTE Care should be taken that measurement instruments give a true r.m.s. reading in the presence of non-sinusoidal signals. For other terms and definitions, see also IEC 62040-3.

3.1.1

uninterruptible power system (UPS)

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

3.1.2

continuity of load power

load power with voltage and frequency within rated steady-state and transient tolerance bands and with distortion and interruptions within the limits specified for the load

3.1.3

bypass

power path alternative to the indirect a.c. converter

3.1.4

power failure

any variation in power supply which can cause unacceptable performance of the load equipment

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3.1.5

primary power

power supplied by an electrical utility company or by a user's generator

3.1.6

active power

sum of the electrical power at the fundamental frequency and the powers of each harmonic component from the output terminals, in W or kW

3.1.7

apparent power

product of the r.m.s. output voltage and r.m.s. current

3.1.8

rated voltage

input or output supply voltage (for three-phase supply, the phase-to-phase voltage) as declared by the manufacturer

3.1.9

rated voltage range

input or output supply voltage range as declared by the manufacturer, expressed by its lower and upper rated voltages

3.1.10

rated current

maximum input or output current of the UPS as declared by the manufacturer

3.1.11**backfeed**

condition in which a voltage or energy available within the **UPS** is fed back to any of the input terminals, either directly or by a leakage path while operating in the **stored energy mode** and with **primary power** not available

3.2 Operating conditions**3.2.1****reference load**

mode of operation which approximates as closely as possible to the most severe conditions of normal use in accordance with the manufacturer's operating instructions; however, when the conditions of actual use can obviously be more severe than the maximum load conditions recommended by the manufacturer, a load shall be used that is representative of the maximum that can be applied

NOTE For examples of **reference load** conditions for **UPS**, see annex M.

3.2.2**linear load**

load where the current drawn from the supply is defined by the relationship:

$$I = U/Z$$

where

I is the load current;

U is the supply voltage;

Z is the load impedance.

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3.2.3**non-linear load**

load where the parameter Z (load impedance) is no longer a constant but is a variable dependent on other parameters, such as voltage or time (see annex M)

3.2.4**stored energy mode**

operation of the **UPS** when supplied by the following conditions:

- **primary power** is disconnected or is out of a given tolerance;
- battery is being discharged;
- load is within the given range;
- output voltage is within the given tolerance

3.3 Equipment mobility

The definitions of 1.2.3/RD apply.

3.4 Insulation classes of UPS

The definitions of 1.2.4/RD apply.

3.5 Connection to the supply

The definitions of 1.2.5/RD apply.

3.6 Enclosures

The definitions of 1.2.6/RD apply.