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

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EUROPEAN STANDARD

EN 62040-1-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2003

ICS 29.200

Supersedes EN 50091-1-1:1996

English version

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

Alimentations sans interruption (ASI)
Partie 1-1: Prescriptions générales
et règles de sécurité pour les ASI
utilisées dans des locaux
accessibles aux opérateurs
(CEI 62040-1-1:2002 + corrigendum 2002)

Unterbrechungsfreie
Stromversorgungssysteme (USV)
Teil 1-1: Allgemeine Anforderungen
und Sicherheitsanforderungen
an USV außerhalb abgeschlossener
Betriebsräume
(IEC 62040-1-1:2002 + Corrigendum 2002)

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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

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

Foreword

The text of document 22H/22/FDIS, future edition 1 of IEC 62040-1-1, 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 was approved by CENELEC as EN 62040-1-1 on 2002-11-01.

This European Standard supersedes EN 50091-1-1:1996.

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- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-11-01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 and ZA are normative and annexes H and X are 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 62040-1-1:2002 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 60417	Series	Graphical symbols for use on equipment	EN 60417	Series
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC/TR 60755 A1 A2	1983 1988 1992	General requirements for residual current operated protective devices	-	-
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
IEC 61008-1	1996 ¹⁾	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) Part 1: General rules	-	-
IEC 61009-1	1996 ²⁾	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBO's) Part 1: General rules	-	-

¹⁾ The European Standard EN 61008-1:1994 (IEC 61008-1:1990 + A1:1992, mod.) + corrigendum December 1997 + A2:1995 (IEC/A2:1995) + A11:1995 + A12:1998 + corrigendum April 1998 + A13:1998 + A14:1998 applies.

²⁾ The European Standard EN 61009-1:1994 (IEC 61009-1:1991, mod.) + corrigendum December 1997 + A1:1995 (IEC/A1:1995) + A11:1995 + A2:1998 + A13:1998 + corrigendum April 1998 + A14:1998 + A15:1998 + A17:1998 applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62040-1-2 + corr. December	2002 2002	Uninterruptible power systems (UPS) Part 1-2: General and safety requirements for UPS used in restricted access locations	EN 62040-1-2	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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NORME
INTERNATIONALE
INTERNATIONAL
STANDARD

CEI
IEC

62040-1-1

Première édition
First edition
2002-08

Alimentations sans interruption (ASI) –

Partie 1-1:

**Exigences générales et règles de sécurité
pour les ASI utilisées dans des locaux
accessibles aux opérateurs**

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Part 1-1:

**General and safety requirements
for UPS used in operator access areas**

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International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE

X

Pour prix, voir catalogue en vigueur
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UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 1-1: General and safety requirements for UPS used in operator access areas

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

This bilingual version (2004-02) replaces the English version and its corrigenda 1 (2002-12) and 2 (2004-02).

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

FDIS	Report on voting
22H/22/FDIS	22H/24/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.

The French version of this standard has not been voted upon.

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

It is to be used with IEC 60950-1 which is referred to in this standard as "RD".

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 the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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

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UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

Part 1-1: General and safety requirements for UPS used in operator access areas

1 Scope and specific applications

1.1 Scope

This part of IEC 62040 applies to electronic **uninterruptible power systems (UPS)** 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 any **operator** accessible area. It specifies requirements to ensure safety for the **operator** and layman who may come into contact with the equipment and, where specifically stated, 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 61347 and IEC 60925), **UPS** intended to be installed in separated electrical locations and **UPS** based on rotating machines.

The relevant general and safety requirements for **UPS** installed in restricted access locations are given in IEC 62040-1-2; 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;
- for **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) in addition to complying with 5.3.1.2 of IEC 62040-3 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 60417-DB:2002¹, *Graphical symbols for use on equipment*

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

IEC 60664 (all parts), *Insulation coordination for equipment within low-voltage systems*

IEC 60755:1983, *General requirements for residual current operated protective devices*
Amendment 1 (1988)
Amendment 2 (1992)

IEC 60617-DB:2001², *Graphical symbols for diagrams*

IEC 60950-1:2001, *Information technology equipment – Safety – Part 1: General requirements*

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 61008-1:1996, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules*

IEC 61009-1:1996, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*

¹ “DB” refers to the IEC on-line database.

² “DB” refers to the IEC on-line database.

IEC 62040-1-2:2004, *Uninterruptible power systems (UPS) – Part 1-2: General and safety requirements for UPS used in restricted access locations*

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*

3 Definitions

3.1 General

For the purposes of this standard, the following definitions apply as well as some of the definitions of IEC 60950-1. 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.

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

bypass

power path alternative, either internal or external to the UPS

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3.1.3

primary power

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

3.1.4

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

3.1.5

backfeed protection

control scheme that reduces the risk of electric shock due to **backfeed**

3.1.6

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

3.2 UPS electrical ratings

3.2.1

rated voltage

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

3.2.2

rated voltage range

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

3.2.3

rated current

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

3.3 Load types

3.3.1

normal load

mode of operation which approximates as closely as possible 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 **normal load** conditions for **UPS**, see Annex M.

3.3.2

linear load

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

$$I = UIZ$$

where

I is the load current;

U is the supply voltage;

Z is the load impedance

3.3.3

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)

3.4 Connection to the supply

The definitions of 1.2.5/RD apply together with the following.

3.4.1

power cord

flexible cord or cable for interconnection purposes

3.5 Circuits and circuit characteristics

The definitions of 1.2.8/RD apply.