

Specification for

Uninterruptable power systems (UPS) —

Part 1: General and safety requirements

The European Standard EN 50091-1:1993 has the status of a British Standard

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National foreword

This British Standard has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee, and is the English language version of EN 50091-1:1993 *Uninterruptable power systems (UPS)* —

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 28, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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English version

Uninterruptable power systems (UPS) Part 1: General and safety requirements

Alimentations sans interruption (ASI)
Première partie: Prescriptions générales et
règles de sécurité

Unterbrechungsfreie Stromversorgung (USV)
Teil 1: Allgemeine Anforderungen und
Sicherheitsbestimmungen

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

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Foreword

This European Standard has been prepared by CENELEC BTTF 60-4 according to the relevant decisions of the CENELEC Technical Board.

It is to be used in conjunction with EN 60950:1992 *Safety of information technology equipment including electrical business equipment*, which is referred to in this document by “RD”.

NOTE When any item is referred to RD 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 EN 60950 apply, except any which are clearly inapplicable to uninterruptible power systems.

This Part 1 of EN 50091 deals with the general and safety requirements of uninterruptible power systems. The relevant performance requirements will be given in EN 50091-2 (in preparation).

The text of this European Standard was submitted to formal vote in July 1992 and approved by CENELEC as EN 50091-1 on 1992-12-09.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-01-01
- latest date of withdrawal of conflicting national standards (dow) 1994-03-15

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1 General

1.1 Scope

1.1.1 This standard applies to electronic indirect a.c. convertor systems with an electrical energy storage device in the d.c. link. The primary function of the uninterruptable power system (UPS) covered by this standard is to ensure continuity of an alternating power source. The uninterruptable power system may also serve to improve the quality of the power source by keeping it within specified characteristics.

This standard is applicable to movable, stationary, fixed and built in UPS for distribution systems up to 1 000 V a.c.

This standard applies to UPS intended to be installed in any operator accessible area and specifies requirements to ensure safety for the operator and layman who may come into contact with the equipment and, where specifically stated, for service personnel.

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

This standard does not cover d.c. supplied electronic ballasts (IEC 924 and 925), UPS intended to be installed in separated electrical locations and UPS based on rotating machines.

NOTE 1 For equipment 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.

NOTE 2 For equipment subject to transient overvoltages exceeding those for Installation Category II according to IEC 664, additional protection might be necessary in the mains supply to the equipment.

NOTE 3 For equipment 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.

NOTE 4 Manufacturers are reminded that some appliances are sensitive to a distorted waveform of the voltage or current and can be consequently overloaded; while the unsymmetrical or d.c. content can bring malfunction of earth leakage circuit breakers; therefore also the requirements of EN 50091-2 *Performance requirements* have to be taken into account.

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

- equipment 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 physical connections to the patient.

1.2 Definitions

1.2.1 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 measuring instruments give a true r.m.s. reading in the presence of non-sinusoidal signals. For other terms and definitions see also IEC 146-4.

1.2.1.1 uninterruptable 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

1.2.1.2 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

1.2.1.3 UPS functional unit

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

1.2.1.4 bypass

power path alternative to the indirect a.c. convertor

1.2.1.5 power failure

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

1.2.1.6 primary power

power normally continuously available which is usually supplied by an electrical utility company but sometimes by the user's own generator

1.2.1.7 bypass power

power supplied via the bypass

1.2.1.8 apparent output power

permanent apparent power, the product of the r.m.s. output voltage and r.m.s. current. It is given for a load in VA or kVA, with a specified power factor

1.2.1.9**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

1.2.1.10**load power factor**

characteristic of an a.c. load expressed as the ratio of active power to apparent power

1.2.1.11**peak factor**

ratio of the peak value to the r.m.s. value in steady state

1.2.1.12**rated voltage**

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

1.2.1.13**rated voltage range**

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

1.2.1.14**rated current**

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

1.2.1.15**rated frequency**

the input or output supply frequency as declared by the manufacturer

1.2.1.16**rated frequency range**

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

1.2.1.17**rated apparent output power**

apparent output power as declared by the manufacturer

1.2.1.18**rated active output power**

active output power as declared by the manufacturer

1.2.1.19**backfeed**

the condition where a proportion of the voltage or energy available within the UPS is fed back to any of the input terminals, either directly or by a leakage path

1.2.2 Operating conditions**1.2.2.1****normal load**

the mode of operation which approximates as close 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 is used that is representative of the maximum that can be applied

NOTE For examples of normal load conditions for UPS equipment, see Annex M.

1.2.2.2**linear load**

a 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.

1.2.2.3**non-linear load**

a 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)

1.2.2.4**stand-by power**

the power intended to replace primary power in the event of primary power failure

1.2.2.5**stored energy mode**

the 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.

1.2.2.6**stored energy time**

minimum time during which the UPS will ensure continuity of load power, under specified service conditions when the primary power fails, starting with the energy storage means being charged according to **1.2.2.7**

NOTE Fully charged is intended as restored energy after a restored energy time recharge.

1.2.2.7**restored energy time**

maximum time required to recharge sufficiently the energy storage means of the UPS with the charging capacity installed (after a discharge as specified in 1.2.2.6 with the UPS operating under specified service conditions) to ensure another such a discharge

NOTE This period is the time taken after a stored energy time discharge to restore sufficient energy to repeat the stored energy time discharge.

1.2.3**equipment mobility**

the definitions of 1.2.3/RD apply

1.2.4**classes of equipment**

the definitions of 1.2.4/RD apply

1.2.5 Connections

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

1.2.5.1**power cord**

a flexible cord or cable for interconnection purposes

1.2.6**enclosures**

the definitions of 1.2.6/RD apply

1.2.7**accessibility**

the definitions of 1.2.7/RD apply

1.2.8 Circuit characteristics

The definitions of 1.2.8/RD apply together with the following.

1.2.8.1**hazardous voltage**

a voltage exceeding 42,4 V peak, or 60 V d.c., existing in a circuit which does not meet the requirements for a limited current circuit

1.2.9**insulation**

the definitions of 1.2.9/RD apply

1.2.10**creepage distances and clearances**

the definitions of 1.2.10/RD apply

1.2.11**components**

the definitions of 1.2.11/RD apply

1.2.12**power distribution**

the definitions of 1.2.12/RD apply

1.2.13**flammability**

the definitions of 1.2.13/RD apply

1.2.14 Miscellaneous

The definitions of 1.2.14/RD apply together with following.

1.2.14.1**touch current**

the current which flows into a network representing the impedance of the human body

1.2.14.2**protective conductor current**

the current in the protective conductor as measured by an ammeter of negligible impedance (see Annex G)

NOTE In the present standard the term "earth leakage current" is used as equivalent.

1.3 General requirements

1.3.1 A UPS shall be so designed and constructed that, under conditions of normal use and likely fault conditions, it protects against risks of personal injury from electric shock and other hazards, and against serious fire originating in the UPS or connected loads, within the meaning of this standard.

In general, compliance is checked by inspection and by the relevant tests.

NOTE 1 Where the equipment involves safety situations not specifically covered, the design should provide a level of safety not less than that generally afforded by this standard.

NOTE 2 The need for additional detailed requirements to cope with a new situation should be brought promptly to the attention of the appropriate committee.

1.3.2 Sufficient information shall be provided to the user concerning any condition necessary to ensure that the equipment will not present a hazard within the meaning of this standard when used as prescribed by the manufacturer (see 1.7).

Compliance is checked by inspection.

1.3.3 Equipment is classified according to its protection from electric shock as:

Class I, or

Class II

NOTE Equipment containing ELV circuits or parts at hazardous voltage is Class I or Class II.

1.4 General conditions for tests

The provisions of 1.4.1/RD, 1.4.2/RD, 1.4.3/RD, 1.4.6/RD, 1.4.7/RD, 1.4.8/RD, 1.4.10/RD and 1.4.11/RD apply together with the following.