



SLOVENSKI STANDARD
SIST EN 50091-1-2:2001
01-junij-2001

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SIST EN 50091-1:1995

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

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

Unterbrechungsfreie Stromversorgungssysteme (USV) -- Teil 1-2: Allgemeine Anforderungen und Sicherheitsanforderungen für USV in abgeschlossenen Betriebsräumen

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Alimentations sans interruption (ASI) -- Partie 1-2: Prescriptions générales et règles de sécurité pour les ASI utilisables dans des locaux d'accès restreint

Ta slovenski standard je istoveten z: EN 50091-1-2:1998

ICS:

29.200	W{ ^} } ã ä Å ^ ç [] ã Ë Ú ç ã ä å [Á ^ \ d ä } [} ã ä å ð	Rectifiers. Convertors. Stabilized power supply
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 50091-1-2

July 1998

ICS 29.020; 29.200

Descriptors: Power electronics, uninterruptible power supply, restricted access location, general requirements, safety requirements

English version

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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

This European Standard was prepared by the Technical Committee CENELEC TC 22X, Power electronics.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50091-1-2 on 1998-01-01.

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) 1998-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1998-12-01

This European Standard is to be used in conjunction with EN 60950:1992 and its amendments A1:1993, A2:1993 and A3:1995, *Safety of information technology equipment*, which is referred to in this document by "RD".

NOTE: When reference is made to RD by phrases such as "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 for use in restricted access locations.*

Inappropriate clauses within EN 60950 which relate to operator safety are not referenced, but are replaced by additional text or reference to the relevant provisions of IEC 61140 and/or IEC 60536.

This Part 1-2 of EN 50091 deals with the general and safety requirements of uninterruptible power systems, for use in restricted access locations, i.e. secure electrical switchrooms and installed, operated and maintained by skilled electrical personnel.

The relevant general and safety requirements for operator access areas are given in EN 50091-1-1:1996; EMC requirements are given in EN 50091-2:1995; performance requirements are given in ENV 50091-3:1998.

This European Standard covers the essential requirements of LVD Directive 73/23/EEC.

NOTE: The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type

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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 uninterruptible power system (UPS) covered by this Standard is to ensure continuity of an alternating power source. The uninterruptible power system may also serve to improve the quality of the power source by keeping it within specified characteristics.

This Standard is applicable to UPS for use on distribution systems up to 1000 V a.c. which are movable, stationary, fixed and for building in.

This Standard applies to UPS intended to be installed in restricted access locations and specifies requirements to ensure safety for the service personnel.

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 or a.c. supplied electronic lamp control gears, or UPS based on rotating machines.

NOTE 1: For UPS intended to be used in vehicles, on board ships or aircraft in tropical countries, or on elevations greater than 1000 m different requirements may be necessary.

NOTE 2: For UPS subject to transient overvoltages exceeding those for Overvoltage Category II according to HD 625.1 S1, additional protection might be necessary in the mains supply to the UPS.

NOTE 3: For 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.

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 ENV 50091-3: *Performance requirements* have to be taken into account.

NOTE 5: Integral components (e.g. batteries) shall comply as far as is practicable with their component standards in intended use.

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

- 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 physical connections to the patient.

1.2 Normative references

This European Standard incorporates by dated or undated references 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.

EN 50091-1-1	1996	Uninterruptible power systems (UPS) Part 1-1: General and safety requirements for UPS used in operator access areas
EN 50091-2	1995	Part 2: EMC requirements
ENV 50091-3	1998	Part 3: Performance requirements and test methods
EN 60309-1	1992	Plugs, socket-outlets and couplers for industrial purposes Part 1: General requirements (IEC 60309-1:1988 + corrigendum March 1992, modified)
EN 60309-2	1992	Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories of harmonized configurations (IEC 60309-2:1989 + corrigendum April 1992, modified)
EN 60439-1	1994	Low voltage switchgear and controlgear assemblies Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1:1992 + corrigendum December 1993)
EN 60445	1990	Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system (IEC 60445:1988)
EN 60529	1991	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)
EN 60950	1992	Safety of information technology equipment
+ A1	1993	(IEC 60950:1991 + A1:1992 + A2:1993 + A3:1995, modified)
+ A2	1993	
+ A3	1995	
ENV 61000-2-2	1993	Electromagnetic compatibility (EMC) Part 2: Environment Section 2: Compatibility levels for low frequency conducted disturbances and signalling in public low voltage power supply systems (IEC 61000-2-2:1990, modified)
HD 243 S12	1995	Graphical symbols for use on equipment - Index, survey and compilation of the single sheets (IEC 60417:1973 + supplements A:1974 to M:1994)

HD 384.4.41 S2	1996	Electrical installations of buildings Part 4: Protection for safety - Chapter 41: Protection against electric shock (IEC 60364-4-41:1992, modified)
HD 384.4.42 S1 + A2	1985 1994	Chapter 42: Protection against thermal effects (IEC 60364-4-42:1980, modified)
HD 384.4.46 S1	1987	Chapter 46: Isolation and switching (IEC 60364-4-46:1981, modified)
HD 625.1 S1	1996	Insulation coordination for equipment within low voltage systems Part 1: Principles, requirements and tests (IEC 60664-1:1992, modified)
IEC 60083	1975	Plugs and socket-outlets for domestic and similar general use
IEC 60146-4	1986	Semi-conductor convertors Part 4: Method of specifying the performance and test requirements of Uninterruptible power systems
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 https://standards.iteh.ai/catalog/standards/sist/06ef4b97cac6/sist-en-50091-1-2-2001
IEC 60364-7-707	1984	Part 7: Requirements for special installations or locations Section 707: Earthing requirements for the installations of data processing equipment
IEC 60536-2	1992	Classification of electrical and electronic equipment with regard to protection against electric shock Part 2: Guidelines to requirements for protection against electric shock
IEC 61140	1992	Protection against electric shock - Common aspects for installation and equipment
ISO 7000	1984	Graphical symbols for use on equipment

1.3 Definitions

1.3.1 General

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

NOTE: Care should be taken that measurement instruments give a true rms reading in the presence of non-sinusoidal signals. For other terms and definitions see also IEC 60146-4.

1.3.1.1 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.

1.3.1.2 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.

1.3.1.3 functional unit

Basic unit, for example, a rectifier, an inverter or a UPS switch.

1.3.1.4 bypass

Power path alternative to the indirect a.c. convertor.

1.3.1.5 power failure (standards.iteh.ai)

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

1.3.1.6 primary power

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

1.3.1.7 bypass power

Power supplied via the bypass.

1.3.1.8 apparent output power

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

1.3.1.9 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.

1.3.1.10 load power factor

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

1.3.1.11 peak factor

Ratio of the peak value to the rms value in steady state.

1.3.1.12 rated voltage

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

1.3.1.13 rated voltage range

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

1.3.1.14 rated current

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

1.3.1.15 rated frequency

The input or output supply frequency as declared by the manufacturer.

1.3.1.16 rated frequency range

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

1.3.1.17 rated apparent output power

Apparent output power as declared by the manufacturer.

1.3.1.18 rated active output power

Active output power as declared by the manufacturer.

1.3.1.19 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.

1.3.2 Operating conditions**1.3.2.1 reference 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 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.

1.3.2.2 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.

1.3.2.3 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).

1.3.2.4 stand-by power

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

1.3.2.5 stored energy mode (standards.iteh.ai)

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.

1.3.2.6 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 1.3.2.7 and at the commencement of its service life.

1.3.2.7 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 1.3.2.6 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.

1.3.3 UPS mobility

The definitions of 1.2.3/RD apply.

1.3.4 Classes of UPS

The definitions of 1.2.4/RD apply.

1.3.5 Connections

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

1.3.5.1 power cord

A flexible cord or cable for interconnection purposes.

1.3.6 Enclosures

The definitions of 1.2.6/RD apply.

1.3.7 Accessibility

The definitions of 1.2.7.2/RD, 1.2.7.3/RD and 1.2.7.4/RD apply.

NOTE: Restricted access location within the meaning of this Standard is defined as secure electrical switchrooms or similar locations where access is excluded to all other persons other than skilled electrical personnel.

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1.3.8 Circuits and circuit characteristics

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

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NOTE: Refer to clause 2 on fundamental design requirements relating to the use of SELV circuits.

1.3.9 Insulation

The definitions of 1.2.9/RD apply.

1.3.10 Creepage distances and clearances

The definitions of 1.2.10/RD apply.

1.3.11 Components

The definitions of 1.2.11/RD apply.

1.3.12 Power distribution

The definitions of 1.2.12/RD apply.

1.3.13 Flammability

The definitions of 1.2.13/RD apply.

1.3.14 Miscellaneous

The definitions of 1.2.14.2/RD, 1.2.14.3/RD, 1.2.14.4/RD, 1.2.14.7/RD and 1.2.14.8/RD apply together with the following:

1.3.14.1 type test

The definition of 1.2.14.1/RD applies together with the following.

NOTE: Purchasers should note that for physically large UPS units and/or power ratings adequate test facilities to demonstrate some of the type tests may not exist, or not be economically viable.

This situation also applies to some electrical tests for which no commercially available test simulation equipment is available or require specialised test facilities beyond the scope of a manufacturers premises.

Where these situations exist, the manufacturer may elect to either:

1. Use a certified test house to carry out testing for compliance on his behalf. Evidence of third party certification shall be deemed sufficient to prove compliance with the relevant clauses.
2. Demonstrate that the design is compliant by calculation or by experience and/or testing of similar designs in similar conditions.

For testing of parameters other than those listed as routine, it shall be a matter of agreement between the manufacturer and the purchaser as a contract condition.

1.4 General requirements

1.4.1 UPS design and construction

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.

Where the UPS involves safety situations not specifically covered, the design should provide a level of safety not less than that generally afforded by this Standard.

Unless otherwise specified, compliance is checked by inspection and by carrying out all the relevant tests.

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

1.4.2 User information

Sufficient information shall be provided to the user concerning any condition necessary to ensure that the UPS 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.

1.4.3 Classification of UPS

UPS covered by this Standard is classified according to its protection from electric shock as Class I.

1.5 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, 1.4.11/RD and 1.4.12/RD apply together with the following.

1.5.1 Except where specific test conditions are stated elsewhere in the Standard and, where it is clear that there is a significant impact on the results of the test, the tests shall be carried out under the most unfavourable combination within the manufacturer's operating specifications of the following parameters:

- supply voltage;
- absence of supply voltage;
- supply frequency;
- charge condition of the battery;
- physical location of UPS and position of movable parts;
- operating mode.

1.5.2 In determining the most unfavourable supply voltage for a test, the following variables shall be taken into account:

- multiple rated voltages;
- extremes of rated voltage ranges;
- tolerance on rated voltage as specified by the manufacturer. If a tolerance is not specified, the requirements of 1.6.5/RD apply.

1.5.3 In determination of input current, and where other test results could be affected, the following variables shall be considered and adjusted to give the most unfavourable results:

- loads due to recharging of batteries;
- loads due to optional features, offered or provided for by the manufacturer for inclusion in or with the equipment under test;
- loads due to other units of equipment intended by the manufacturer to draw power from the UPS under test.

NOTE: Artificial loads may be used to simulate such loads during testing.