



SLOVENSKI STANDARD

SIST EN 50091-2:1997

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Uninterruptible Power Systems (UPS) - Part 2: EMC requirements

Uninterruptible power systems (UPS) -- Part 2: EMC requirements

Unterbrechungsfreie Stromversorgungssysteme(USV) -- Teil 2: EMV-Anforderungen

Alimentations sans interruption (ASI) -- Partie 2: Prescriptions pour la compatibilité électromagnétique (CEM)

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33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general

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Descriptors: Power electronics, uninterruptible power system, UPS, electromagnetic compatibility requirements, EMC, electromagnetic compatibility for uninterruptible power systems

English version

**Uninterruptible power systems (UPS)
Part 2: EMC requirements**

Alimentations sans interruption (ASI)
Partie 2: Prescriptions pour la
compatibilité électromagnétique (CEM)

Unterbrechungsfreie
Stromversorgung (USV)
Teil 2: EMV-Anforderungen

This European Standard was approved by CENELEC on 1995-03-06. 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.

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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 CENELEC BTF 60-4.

It was submitted to the CENELEC Unique Acceptance Procedure (UAP) in April 1994 and was approved by CENELEC as EN 50091-2 on 1995-03-06.

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) 1996-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-03-01

For products which have complied with the relevant national standard before 1996-03-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2001-03-01.

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

Annexes designated "informative" are given for information only. In this standard, annexes A, D and E are normative and annexes B, C and F are informative.

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1 INTRODUCTION

1.1 Scope

This EMC Standard applies to single UPS units or UPS systems comprising a number of interconnected UPS and associated control/switchgear forming a single power system, intended to be installed in any operator accessible area or in separated electrical locations, connected to either industrial or public low voltage supply networks.

This product EMC Standard will take precedence over all aspects of the Generic Standards and no additional testing is necessary.

The requirements have been selected so as to ensure an adequate level of electromagnetic compatibility (EMC) for UPS at public and industrial locations. These levels cannot however cover extreme cases which may occur in any location, but with extremely low probability.

It takes account of the differing test conditions necessary to encompass the range of physical sizes and power ratings of UPS.

A UPS unit or system shall meet the relevant requirements of this Standard as a stand-alone product. EMC phenomena produced by any customers' load connected to the output of the UPS equipment shall not be taken into account.

Special installation environments are not covered nor are fault conditions of UPS taken into account.

This Standard does not cover DC supplied electronic ballasts (IEC 924 and IEC 925) or UPS based on rotating machines.

1.2 Object

This section states:

- EMC requirements
- Test methods
- Minimum performance levels

1.3 Normative references

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.

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prEN 50091-3 (in preparation)		Uninterruptible power systems (UPS) Part 3: Performance requirements
EN 55011	1991	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment (CISPR 11:1990, modified)
EN 55022	1987	Limits and methods of measurement of radio interference characteristics of information technology equipment
EN 60555-1	1987	Disturbances in supply systems caused by household appliances and similar electrical equipment Part 1: Definitions
EN 60555-2	1987	Disturbances in supply systems caused by household appliances and similar electrical equipment Part 2: Harmonics
EN 60555-3/A1	1991	Disturbances in supply systems caused by household appliances and similar electrical equipment Part 3: Voltage fluctuations (IEC 555-3/ A1:1990 + corrigendum 1990)
EN 61000-4-1	1994	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 1: Overview of immunity tests; basic EMC publication (IEC 1000-4-1:1992)
EN 61000-4-11	1994	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 1: Voltage dips, short interruptions and voltage variations immunity tests (IEC 1000-4-11:1994)
IEC 83	1979	Plugs and socket-outlets for domestic and similar general use
IEC 801-1	1984	Electromagnetic compatibility for industrial-process measurement and control equipment Part 1: General introduction
IEC 801-2	1991	Electromagnetic compatibility for industrial-process measurement and control equipment Part 2: Electrostatic discharge requirements

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IEC 801-3	1984 Electromagnetic compatibility for industrial-process measurement and control equipment Part 3: Radiated electromagnetic field requirements
IEC 801-4	1988 Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Electrical fast transient/burst requirements
IEC 801-5 (in preparation)	Electromagnetic compatibility for industrial-process measurement and control equipment Part 5: Surge immunity requirements
IEC 1000-2-2	1990 Electromagnetic compatibility (EMC) Part 2: Environment Section 2: Compatibility levels for low frequency conducted disturbances and signalling in public low voltage supply systems
IEV 50(161)	1990 International electrotechnical vocabulary (IEV) - Chapter 161: Electromagnetic compatibility
CISPR 16	1987 CISPR Specification for radio interference measuring apparatus and measurement method

1.4 Definitions

Definitions related to EMC and to relevant phenomena may be found in Chapter 161 of the IEV and in IEC and CISPR Publications. The following particular definitions are used in this Standard:

Port: Particular interface of the specified UPS with the external electromagnetic environment (see figure 1).

Enclosure port: The physical boundary of the UPS through which electromagnetic fields may radiate or impinge.

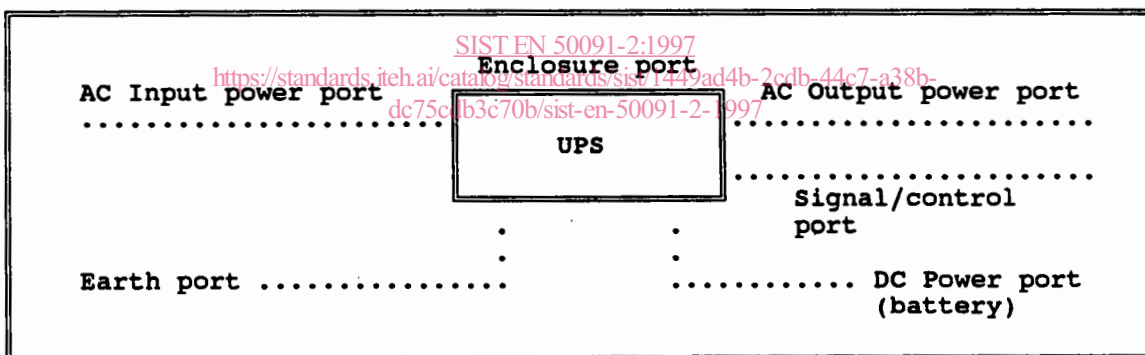


Figure 1: Examples of ports

2 EMISSION

Disturbances in the frequency range from 0 Hz to 1,0 GHz are covered.

The emission requirements have been selected so as to ensure that disturbances generated by UPS operating normally do not exceed a level which could prevent other apparatus from operating as intended.

NOTE 1: The limits in this Standard may not, however, provide fully, protection against interference to radio and television reception when the UPS is used closer than 10 m to the receiving antenna(e) for Class B-UPS and 30 m for Class A-UPS.

NOTE 2: In special cases, for instance when highly susceptible apparatus is being used in proximity, additional mitigation measures may have to be employed to reduce the electromagnetic emission further below the specified levels.

2.1 General requirements

The equipment shall comply with the emission limits of 2.3 to 2.5.

The tests shall be made with the UPS in the following conditions:

- rated input voltage
- normal and stored energy mode of operation
- linear load that results in the highest interference level

The objective of 2.4 and 2.5 is to define limits and test methods for UPS indicated in the scope in relation to electromagnetic emissions which may cause interference in other apparatus, e.g. radio receivers.

These emission limits represent essential electromagnetic compatibility requirements.

Test requirements are specified for each port considered. Refer to annex A for test methodology.

2.2 Classification of UPS

UPS products shall be classified in two ways for electromagnetic emissions:

- a) **UPS for unrestricted sales distribution**

Where the sales distribution of the UPS is unrestricted and not dependent on the technical competence of the customer or user for the further employment of the UPS, it is described with the term: "unrestricted sales distribution" and implements harder emission limits in accordance with the essential EMC protecting requirements. Products in this category are classified as Class A-UPS or Class B-UPS.

Class A-UPS

UPS suitable for use in all establishments other than domestic and those directly connected to a low voltage public supply network which supplies buildings used for domestic purposes.

(For all UPS connected by industrial plugs and sockets or permanently connected and UPS fitted with national plugs and sockets marketed solely for industrial use).

The following wording shall be included in the Instructions for Use:

WARNING: This is a Class A-UPS Product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take additional measures.

Class A-UPS shall meet Class A-UPS limits of this Standard.

NOTE: Although Class A-UPS limits have been derived for industrial and commercial establishments, administrations may allow, with whatever additional measures are necessary, the installation and use of Class A-UPS equipment in a domestic establishment or in an establishment connected directly to domestic power supplies.

Class B-UPS

UPS suitable for use in all establishments including domestic and those establishments directly connected to a public low voltage network which supplies buildings used for domestic purposes. (All UPS connected by national plugs and sockets (IEC 83), except those clearly marked and marketed only for industrial applications).

Class B-UPS shall meet Class B-UPS limits of this Standard.

b) UPS for restricted sales distribution

Where the sales distribution is restricted to only customers and users with a high technical competence, it is described as "restricted sales distribution" and implements higher emission limits, because for economic reasons both partners, the manufacturer and customer in partnership and agreement, have to ensure the essential EMC protecting requirement for the specific resulting installation by choice of emission limits or by measurements "in-situ" together with all different equipment and boundary conditions.

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The following wording shall be included in the Instructions for Use:

WARNING: This is a product for restricted sales distribution to informed partners. Installation restrictions or additional measures may be needed to prevent disturbances.

This category is limited to UPS whose rated output current is greater than 25 A intended to be installed in commercial or industrial buildings with its own electricity supply transformer and a minimum 30 m boundary to all other establishments and/or consumers.

NOTE: The emission limits for restricted sales distribution are shown in the relevant tables and implement the draft recommendation of CISPR/B (Secretariat) 62:1990 giving requirements for a practical solution in relevant environments using limits from EN 55011 and CISPR/B (Secretariat) 62:1990 (under review).

2.3 General measurement conditions

The measurements shall be made in the operating mode producing the largest emission in the frequency band being investigated consistent with normal applications. UPS operating modes, normal mode and stored energy mode shall be investigated covered.

An attempt should be made to maximise the emission by varying the test set up configuration of the test sample.

UPS with additional mains terminals (ports) for the connection of separate supplies for static bypass and/or maintenance bypass circuits, these terminals (ports) shall, wherever possible, be temporarily connected to the normal AC input port supply. Conducted emission tests in 2.4 shall include measurement of these additional circuits.

If the UPS is part of a system, or can be connected to auxiliary accessories, then the UPS shall be tested while connected to the minimum configuration of auxiliary accessories necessary to exercise the ports or terminated in an equivalent impedance.

UPS AC outputs shall be loaded with linear load capable of exercising the unit under test for any load condition within its output rating.

The configuration and mode of operation during measurement shall be precisely noted in the test report. Refer to annex A for test set-up and measurement criteria. For "in-situ" testing, see A.8.3.

The tests shall be carried out somewhere within the specific operating environment range for the UPS and at its rated supply voltage, unless otherwise indicated.

2.3.1 Documentation for the purchaser/user

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- a) Documentation for the purchaser/user. The purchaser/user shall be informed if special measures have to be taken to achieve compliance, e.g. the use of shielded or special cables. Any restriction on the length of the AC output cables shall also be indicated.
- b) Documentation which shall be available to the purchaser/user upon request. A list of auxiliary accessories together with the UPS complying with the emission requirements shall be made available.

2.3.2 Applicability

Measurements are made on the relevant ports of the UPS.

2.4 Conducted emissions**2.4.1 Limits of mains terminal interference voltage**

The test unit shall not exceed the limits of either table 1 or table 2 according to the rated output current, and the class of UPS under test.

The UPS shall meet both the average and quasi-peak limit when using, respectively, an average detector receiver and a quasi-peak detector receiver and measured in accordance with the methods described in A.5.

If the average limit is met when using a quasi-peak detector receiver, the test unit shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

If reading on the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the highest reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

a) UPS for unrestricted sales distribution

Table 1: Limits of mains terminal interference voltage frequency range 0,15 MHz to 30 MHz for class A-UPS and class B-UPS equipment

FREQUENCY RANGE (MHz)	LIMITS [dB(μ V)]			
	CLASS A-UPS		CLASS B-UPS	
	Quasi-Peak	Average	Quasi-Peak	Average
0,15 to 0,50	79	66	* 66 to 56	*56 to 46
0,50 to 5	73	60	56	46
5 to 30	73	60	60	50

* The limit decreases linearly with the logarithm of the frequency

b) UPS for restricted sales distribution

UPS which have a rated output current exceeding 25 A.

Table 2: Limits of mains terminal interference voltage frequency range 0,15 MHz to 30 MHz

UPS RATING	FREQUENCY RANGE (MHz)	LIMITS [dB(μ V)]	
		Quasi-Peak	Average
25-100 A	0,15 to 0,50	100	90
	0,50 to 5,0	86	76
	5,0 to 30,0	*90 to 70	*80 to 60
101-400 A	0,15 to 0,50	130	120
	0,50 to 5,0	125	115
	5,0 to 30,0	115	105
> 400 A	0,15 to 0,50	Under	Under
	0,5 to 5,0	Consideration	Consideration
	5,0 to 30,0	Consideration	Consideration

* The limits decrease linearly with the logarithm of the frequency

2.4.2 Limits of AC output interference voltage

Conducted disturbances at the output of the UPS shall be less than the amplitude in table 1 or table 2 plus 14 dB according to the rated output current.

These limits only apply to UPS where the output cable, as declared by the manufacturer in his user instructions, can exceed 10 m in length.

The values shall be measured using a voltage probe in accordance with A.1.3.

2.4.3 Limits of signal ports (informative)

See annex C (informative).

2.4.4 Limits of DC ports

Where a UPS is provided with terminals for the connection of an external battery source, this port shall be included in the test set-up.

For table-top units, the battery and its enclosure shall be installed in a position permitted by the manufacturer instructions. Measurement of its emission shall be part of the radiated emission test.