



SLOVENSKI STANDARD SIST EN IEC 61225:2020

01-junij-2020

**Nuklearne elektrarne - Merilni, nadzorni in elektroenergetski sistemi - Zahteve za
statične neprekinjene enosmerne in izmenične napajalne sisteme (IEC 61225:2019)**

Nuclear power plants - Instrumentation, control and electrical power systems -
Requirements for static uninterruptible DC and AC power supply systems (IEC
61225:2019)

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Centrales nucléaire de puissance - Systèmes d'instrumentation, de contrôle-commande
et d'alimentation électrique - Exigences pour les systèmes d'alimentation en courant
alternatif et en courant continu statiques sans interruption (IEC 61225:2019)

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Ta slovenski standard je istoveten z: EN IEC 61225:2020

ICS:

27.120.20 Jedrske elektrarne. Varnost Nuclear power plants. Safety

SIST EN IEC 61225:2020

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EUROPEAN STANDARD

EN IEC 61225

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2020

ICS 27.120.20

English Version

**Nuclear power plants - Instrumentation, control and electrical power systems - Requirements for static uninterruptible DC and AC power supply systems
(IEC 61225:2019)**

Centrales nucléaire de puissance - Systèmes d'instrumentation, de contrôle-commande et d'alimentation électrique - Exigences pour les systèmes d'alimentation en courant alternatif et en courant continu statiques sans interruption
(IEC 61225:2019)

To be completed
(IEC 61225:2019)

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 61225:2020 (E)**European foreword**

This document (EN IEC 61225:2020) consists of the text of IEC 61225:2019 prepared by IEC/TC 45 "Nuclear instrumentation".

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-09-17
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2020-09-17

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As stated in the nuclear safety directive 2009/71/EURATOM, Chapter 1, Article 2, item 2, Member States are not prevented from taking more stringent safety measures in the subject-matter covered by the Directive, in compliance with Community law. In a similar manner, this European standard does not prevent Member States from taking more stringent nuclear safety and security measures in the subject-matter covered by this standard.

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The text of the International Standard IEC 61225:2019 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60964	NOTE	Harmonized as EN IEC 60964
IEC 61000-6-2	NOTE	Harmonized as EN IEC 61000-6-2
IEC 61000-6-4	NOTE	Harmonized as EN IEC 61000-6-4
IEC 61226	NOTE	Harmonized as EN 61226
IEC 62040-3	NOTE	Harmonized as EN 62040-3
IEC 62340	NOTE	Harmonized as EN 62340

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60038 (mod)	-	IEC standard voltages	EN 60038	-
IEC 60146-1-1	-	Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements	EN 60146-1-1	-
IEC 60146-2	-	Semiconductor converters - Part 2: Self-commutated semiconductor converters including direct d.c. converters	EN 60146-2	-
IEC 60364-4-41 (mod)	-	Low-voltage electrical installations - Part 4-41: Protection for safety against electric shock	EN 60364-4-41	-
			+A11	2017
			+A12	2019
IEC 60709	-		EN IEC 60709	-
IEC 60880	-	Nuclear power plants - Instrumentation and control systems important to safety - Software aspects for computer-based systems performing category A functions	EN 60880	-
IEC 60980	-	Recommended practices for seismic-qualification of electrical equipment of the safety system for nuclear generating stations		-
IEC 61000-1	series	Electromagnetic compatibility (EMC) - Part 1-2: General - Methodology for the achievement of functional safety of electrical and electronic systems including equipment with regard to electromagnetic phenomena	EN 61000-1	series
IEC 61508	series	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 1: General requirements (see http://www.iec.ch/functionalsafety)	EN 61508	series
IEC 61513	-	Nuclear power plants - Instrumentation and control important to safety - General requirements for systems	EN 61513	-
IEC 62003	-	Nuclear power plants - Instrumentation and-		-

EN IEC 61225:2020 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62040	series	control important to safety - Requirements for electromagnetic compatibility testing Uninterruptible power systems (UPS) - Part 1: Safety requirements	EN IEC 62040	series
IEC 62138	-	Nuclear power plants - Instrumentation and control systems important to safety - Software aspects for computer-based systems performing category B or C functions	+prAA EN IEC 62138	-
IEC 62566	-	Nuclear power plants - Instrumentation and control important to safety - Development of HDL-programmed integrated circuits for systems performing category A functions	EN 62566	-
IEC/IEEE 323	60780--		EN 60780-323	-

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IEC 61225

Edition 3.0 2019-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Nuclear power plants – Instrumentation, control and electrical power systems – Requirements for static uninterruptible DC and AC power supply systems

Centrales nucléaires de puissance – Systèmes d'instrumentation, de contrôle-commande et d'alimentation électrique – Exigences pour les systèmes d'alimentation en courant alternatif et en courant continu statiques sans interruption

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 27.120.20

ISBN 978-2-8322-6382-2

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**NUCLEAR POWER PLANTS – INSTRUMENTATION, CONTROL AND
ELECTRICAL POWER SYSTEMS – REQUIREMENTS FOR STATIC
UNINTERRUPTIBLE DC AND AC POWER SUPPLY SYSTEMS**

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 61225 has been prepared by subcommittee 45A: Instrumentation, control and electrical power systems of nuclear facilities, of IEC technical committee 45: Nuclear instrumentation.

This third edition cancels and replaces the second edition published in 2005. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the principal objective of this edition is to address the requirements on the static uninterruptible power supplies in nuclear power plants;
- b) in addition to Instrumentation and Control (I&C) power supplies include all static uninterruptible power supplies;

- c) emphasize that the static uninterruptible power supplies shall protect the connected equipment (loads) from transients on the on-site AC distribution system (the immunity concept);
- d) in accordance with the defence-in-depth concept, this standard applies to static uninterruptible power supplies for all equipment, not only for equipment important to safety, with a graded approach to verification and validation;
- e) addition of the requirement that, when batteries are connected in parallel under abnormal operating conditions, they shall be properly protected with isolation devices to avoid any failure that may impair more than one division of the uninterruptible power supply.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
45A/1235/FDIS	45A/1250/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or [SIST EN IEC 61225:2020](#)
- amended. <https://standards.iteh.ai/catalog/standards/sist/10195a0b-1f2d-43c4-8ebf-8d7fd169d3de/sist-en-iec-61225-2020>

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INTRODUCTION

a) Technical background, main issues and organization of the standard

The 1993 issue of IEC 61225 was developed for specifying the requirements relevant to the design of electrical supplies for I&C systems in nuclear power plants. Considering the experience gathered worldwide on this subject, in 2003 working group A2 recommended a revision to this standard so that a new revision, IEC 61225 Ed. 2 (2005), could be consistently integrated into the SC 45A standard series. In 2015, working group A11 recommended a revision to this standard following the publication of the revision of IAEA SSG-34 and that the scope of the standard should cover static uninterruptible power supplies for all types of connected equipment.

International operating experience with electrical supply systems in nuclear power plants has highlighted a number of supply voltage variations and malfunctions, such as:

- voltage perturbations due to disturbances on the internal AC distribution system (with origin off-site or on-site);
- voltage overshoot on loss of grid;
- open phase conditions (one or two phases);
- asymmetrical faults.

These types of perturbations can degrade the performance of static uninterruptible power supplies and ultimately result in failure of connected equipment.

One of the objectives of the uninterruptible power supplies is to protect the connected equipment from voltage variations on the on-site AC distribution system (the immunity concept). The power supplies shall also guarantee an output voltage with specified magnitude and waveform (in case of AC) to connected loads. The power supplies shall have the capacity to supply the relevant loads during a specified time regardless of any voltage variations on the on-site AC distribution system.

Examples of voltage and frequency variations in the incoming feeder to the supplies can be found in informative Annex A. Examples of specifications for static uninterruptible power supplies can be found in informative Annex B.

This standard is applicable to the design of static uninterruptible electrical power supplies in new nuclear power plants, when design work is initiated after the publication of this standard. It also serves as a reference for upgrading and modernizing existing nuclear power plants.

b) Situation of the current standard in the structure of the SC 45A standard series

IEC 61225 is a second level document specifically addressing the particular topic of requirements for electrical supplies.

For more details on the structure of the SC 45A standard series, see item d) of this introduction.

c) Recommendations and limitations regarding the application of this standard

This standard is to be applied in conjunction with IEC 61513, IEC 60709, IEC 60880, IEC 62138, IEC 62855 and IEC 63046 (to be published).

d) Description of the structure of the IEC SC 45A standard series and relationships with other IEC documents and other bodies documents (IAEA, ISO)

The top-level documents of the IEC SC 45A standard series are IEC 61513 and IEC 63046. IEC 61513 provides general requirements for I&C systems and equipment that are used to perform functions important to safety in NPPs. IEC 63046 provides general requirements for electrical power systems of NPPs; it covers power supply systems including the supply systems of the I&C systems. IEC 61513 and IEC 63046 are to be considered in conjunction and at the same level. IEC 61513 and IEC 63046 structure the IEC SC 45A standard series and shape a complete framework establishing general requirements for instrumentation, control and electrical systems for nuclear power plants.

IEC 61513 and IEC 63046 refer directly to other IEC SC 45A standards for general topics related to categorization of functions and classification of systems, qualification, separation, defence against common cause failure, control room design, electromagnetic