



**SLOVENSKI STANDARD**  
**SIST EN 60987:2010**  
**01-januar-2010**

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NU hYj YnUbU flcj Ub^j gfc^bYcdfYa YfU i bUb]y\_]\`g]ghYa cj`f97`\* \$- , +.&\$ \$+ž  
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Nuclear power plants - Instrumentation and control important to safety - Hardware design requirements for computer-based systems

Kernkraftwerke - Leittechnische Systeme mit sicherheitstechnischer Bedeutung - Anforderungen an die Hardware-Auslegung rechnerbasierter Systeme  
(standards.iteh.ai)

Centrales nucléaires de puissance - Instrumentation et contrôle-commande importants pour la sûreté - Exigences applicables à la conception du matériel des systèmes informatisés  
SIST EN 60987:2010  
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**Ta slovenski standard je istoveten z: EN 60987:2009**

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**ICS:**

27.120.20 Jedrske elektrarne. Varnost Nuclear power plants. Safety

**SIST EN 60987:2010**

**en,fr**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 60987**

June 2009

ICS 27.120.20

English version

**Nuclear power plants -  
Instrumentation and control important to safety -  
Hardware design requirements for computer-based systems  
(IEC 60987:2007, modified)**

Centrales nucléaires de puissance -  
Instrumentation et contrôle-commande  
importants pour la sûreté -  
Exigences applicables à la conception  
du matériel des systèmes informatisés  
(CEI 60987:2007, modifiée)

Kernkraftwerke -  
Leittechnische Systeme mit  
sicherheitstechnischer Bedeutung -  
Anforderungen an die  
Hardware-Auslegung  
rechnerbasierter Systeme  
(IEC 60987:2007, modifiziert)

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This European Standard was approved by CENELEC on 2009-06-01. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**CENELEC**

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

**Central Secretariat: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of the International Standard IEC 60987:2007, prepared by SC 45A, Instrumentation and control of nuclear facilities, of IEC TC 45, Nuclear instrumentation, together with the common modifications prepared by the Technical Committee CENELEC TC 45AX, Instrumentation and control of nuclear facilities, was submitted to the formal vote and was approved by CENELEC as EN 60987 on 2009-06-01.

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) 2010-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2012-06-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 60987:2007 was approved by CENELEC as a European Standard with agreed common modifications as given below.

### COMMON MODIFICATIONS

#### 1 Scope

##### 1.1 General

**Replace** NOTE 2 by the following text:

The more complex hardware components are out of the scope of EN 60987. IEC/SC 45 A accepted new works items to cover the cases of those more complex hardware components (e.g. IEC 62566 under development when EN 60987 was published).

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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

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 60780	- <sup>1)</sup>	Nuclear power plants - Electrical equipment of the safety system - Qualification	-	-
IEC 60812	- <sup>1)</sup>	Analysis techniques for system reliability - Procedure for failure mode and effects analysis (FMEA)	EN 60812	2006 <sup>2)</sup>
IEC 60880	- <sup>1)</sup>	Nuclear power plants - Instrumentation and control systems important to safety - Software aspects for computer-based systems performing category A functions	-	-
IEC 61000	Series	Electromagnetic compatibility (EMC)	EN 61000	Series
IEC 61025	- <sup>1)</sup>	Fault tree analysis (FTA)	EN 61025	2007 <sup>2)</sup>
IEC 61513	2001	Nuclear power plants - Instrumentation and control for systems important to safety - General requirements for systems	-	-
IEC 62138	- <sup>1)</sup>	Nuclear power plants - Instrumentation and control important for safety - Software aspects for computer-based systems performing category B or C functions	-	-
ISO 9001	- <sup>1)</sup>	Quality management systems - Requirements	EN ISO 9001	2008 <sup>2)</sup>
IAEA NS-G 1.3	- <sup>1)</sup>	Instrumentation and control systems important to safety in nuclear power plants	-	-
IAEA 50-C/SG-Q	1996	Quality assurance for safety in nuclear power plants and other nuclear installations	-	-

1) Undated reference.

2) Valid edition at date of issue.



IEC 60987

Edition 2.0 2007-08

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Nuclear power plants – Instrumentation and control important to safety –  
Hardware design requirements for computer-based systems**

**Centrales nucléaires de puissance – Instrumentation et contrôle-commande  
importants pour la sûreté – Exigences applicables à la conception du matériel  
des systèmes informatisés**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**NUCLEAR POWER PLANTS –  
INSTRUMENTATION AND CONTROL  
IMPORTANT TO SAFETY –  
HARDWARE DESIGN REQUIREMENTS  
FOR COMPUTER-BASED 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 60987 has been prepared by subcommittee 45A: Instrumentation and control of nuclear facilities, of IEC technical committee 45: Nuclear instrumentation.

This second edition cancels and replaces the first edition published in 1989. This edition includes the following significant technical changes with respect to the previous edition:

- account has been taken of the fact that computer design engineering techniques have advanced significantly in the intervening years;
- update of the format to align with the current IEC/ISO directives on the style of standards;
- alignment of the standard with the new revisions of IAEA documents NS-R-1 and NS-G-1.3, which includes as far as possible an adaptation of the definitions;

- replacement, as far as possible, of the requirements associated with standards published since the first edition, especially IEC 61513, IEC 60880, edition 2, and IEC 62138;
- review of the existing requirements and updating of the terminology and definitions.

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

FDIS	Report on voting
45A/662/FDIS	45A/666/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.

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

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

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

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## INTRODUCTION

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

The basic principles for the design of nuclear instrumentation, as specifically applied to the safety systems of nuclear power plants, were first interpreted in nuclear standards with reference to hardwired systems in IAEA Safety Guide 50-SG-D3 which has been superseded by IAEA Guide NS-G-1.3.

IEC 60987 was first issued in 1989 to cover the hardware aspects of digital systems design for systems important to safety, i.e. safety systems and safety-related systems.

Although many of the requirements within the original issue continue to be relevant, there were significant factors which justified the development of this revised edition of IEC 60987, in particular:

- a new standard has been produced which addresses in detail the general requirements for nuclear systems important to safety (IEC 61513);
- the use of pre-developed system platforms, rather than bespoke developments, has increased significantly.

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

The first-level IEC SC 45A standard for computer-based systems important to safety in nuclear power plants (NPPs) is IEC 61513. IEC 60987 is a second-level IEC SC 45A standard which addresses the generic issue of hardware design of computerized systems.

IEC 60880 and IEC 62138 are second-level standards which together cover the software aspects of computer-based systems used to perform functions important to safety in NPPs. IEC 60880 and IEC 62138 make direct reference to IEC 60987 for hardware design.

The requirements of IEC 60780 for equipment qualification are referenced within IEC 60987. For modules to be used in the design of a specific system important to safety, relevant and auditable operating experience from nuclear or other applications as described in IEC 60780, in combination with the application of rigorous quality assurance programmes, may be an acceptable method of qualification.

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 the standard

It is important to note that this standard establishes no additional functional requirements for Class 1 or Class 2 systems (see IEC 61513 for system classification requirements).

Aspects for which special recommendations have been produced (so as to assure the production of highly reliable systems), are:

- a general approach to computing hardware development;
- a general approach to hardware verification and to the hardware aspects of computer system validation.