# IEC 63413

Edition 1.0 2026-03

# INTERNATIONAL STANDARD

**Nuclear power plants - Instrumentation and control systems important to safety - Platform qualification**



ICS 27.120.20

ISBN 978-2-8327-1119-4

IEC 63413:2026-03(en)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

**About the IEC**
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

**About IEC publications**
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

**IEC publications search - webstore.iec.ch/advsearchform**
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - webstore.iec.ch/justpublished**
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

**IEC Customer Service Centre - webstore.iec.ch/csc**
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

**IEC Products & Services Portal - products.iec.ch**
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

**Electropedia - www.electropedia.org**
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.



**Warning! Make sure that you obtained this publication from an authorized distributor.**

# CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

# Nuclear power plants - Instrumentation and control systems important to safety - Platform qualification

## 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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.



IEC 63413 has been prepared by subcommittee 45A: Instrumentation, control and electrical power systems of nuclear facilities, of IEC technical committee 45: Nuclear instrumentation. It is an International Standard.

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

| Draft | Report on voting |
|---|---|
| 45A/1638/FDIS | 45A/1647/RVD |

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

– reconfirmed,
– withdrawn, or
– revised.

# INTRODUCTION

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

This document provides requirements on the qualification of instrumentation and control (I&C) platforms for use in I&C systems important to safety, within the framework of the IEC SC 45A standards. It provides guidance on how IEC SC 45A standards are to be applied for I&C platforms considering all possible constituents of an I&C platform (i.e. hardware, software, programmable logic, its architecture, including internal and external interfaces, and engineering tools). This document covers both product and life cycle process aspects according to IEC 61513.

In general, I&C platforms are developed for a defined set of applications and are pre-existing with regards to their application in the I&C systems of a specific nuclear power plant (NPP). Therefore, this document is organised in two parts:

1) The first part deals with requirements for performing a generic qualification of an I&C platform for use in I&C systems important to safety of NPPs. A generic (i.e. plant independent) qualification considers known or anticipated requirements for the applications the I&C platform will be used for.
2) The second part covers the plant-specific aspects related to the I&C platform qualification, and its relation to the qualification of I&C systems important to safety in NPPs.

The approach is based on and consistent with the framework and requirements provided by IEC SC 45A standards, and refers to corresponding standards that are required in the context of an I&C qualification: according to IEC 61513:2011, 6.2.3.2, the suitability of pre-existing I&C components (forming the I&C platform) are evaluated to demonstrate that their characteristics comply with the plant-specific system requirements specification. A generic platform qualification would facilitate the verification of the feasibility of the qualification in accordance with IEC 61513:2011, 6.5.2, and the identification of additional work and constraints necessary for the plant-specific qualification.



IEC 61513:2011, 6.5, deals with requirements related to the I&C system qualification, which concerns the qualification of the I&C platform and the plant-specific I&C system. The requirements on qualification herein are given for different activities and for each I&C platform and module development life cycle phase including verification and validation. However, up to the issuance of this document it was not clear how IEC SC 45A standards can be applied consistently for generic qualification of I&C platforms and its use in I&C systems. By establishing a consistent approach, this document also aims at facilitating the qualification of I&C systems important to safety of NPPs based on a qualified I&C platform.

It is intended that this document be used by designers and operators of NPPs (utilities), licensees, systems evaluators, vendors, and by regulators.

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

The first-level IEC SC 45A standard for I&C systems important to safety in NPPs is IEC 61513. IEC 63413 is a second-level IEC SC 45A standard which addresses the generic issue of requirements on the qualification of I&C platforms for use in I&C systems important to safety.

IEC 60987 is a second-level standard which covers the hardware aspects of I&C systems used to perform functions important to safety in NPPs. This document makes direct reference to IEC 60987 for I&C platform hardware requirements.

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. This document makes direct reference to IEC 60880 and IEC 62138 for I&C platform software requirements.

IEC 62566 and IEC 62566-2 are second-level standards which together cover the development of HPDs used to perform functions important to safety in NPPs. This document makes direct reference to IEC 62566 and IEC 62566-2 for requirements on HPDs for use in I&C platforms.

IEC/IEEE 60980-344 is a second level standard which focuses on the seismic qualification of electrical equipment important to safety. IEC/IEEE 60780-323 is a second level standard for equipment qualification important to safety. This document makes direct reference to IEC/IEEE 60980-344 and IEC/IEEE 60780-323 for equipment and the seismic qualification of I&C platforms.

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

**c) Recommendations and limitations regarding the application of this document**

It is important to note that this document establishes no additional functional requirements for classified systems (see IEC 61226 for system classification requirements).

This document does not directly prescribe what is necessary for the successful licensing of I&C systems based on a qualified I&C platform. Rather, it provides assistance for licensing, and creates a framework by formulating requirements on I&C platform qualification and making specific reference to the relevant IEC SC 45A standards.

It is acknowledged that I&C technology continues to evolve, and that it is not possible for a document such as this to include references to all modern design technologies and techniques. To ensure that this document will continue to be relevant in future years, the emphasis has been placed on issues of principle rather than specific hardware, software or programmable logic design technologies. If new design techniques are developed, then it is possible to assess the suitability of such techniques by adapting and applying the design principles contained within this document.



This document refers to IEC 62645 to address how to protect I&C systems against those threats arising from malicious attacks such as cybersecurity, for programmable digital items from the perspective of an I&C platform. IEC 62645 provides requirements for security programmes for programmable digital items for all their development phases and on-site operation. Together with IEC 62859 for coordinating safety and cybersecurity and IEC 63096 for security controls, IEC 62645 provides the normative framework of IEC SC 45A regarding the specific subject of cybersecurity.

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

The IEC SC 45A standard series comprises a consistent set of documents organised in a hierarchy of four levels. The top-level documents of the IEC SC 45A standard series are IEC 61513 and IEC 63046, covering respectively general requirements for instrumentation and control (I&C) systems and general requirements for electrical power systems of NPPs. IEC 61513 and IEC 63046 adopt an overall system life-cycle framework and constitute, along with the relevant second-level standards, the nuclear implementation of the basic safety series IEC 61508. IEC 61513 and IEC 63046 refer to ISO 9001 as well as to IAEA GSR Part 2 and IAEA GS-G-3.1 and IAEA GS-G-3.5 for topics related to quality assurance (QA).

IEC 61513 and IEC 63046 refer directly to second-level IEC SC 45A standards for general requirements for specific topics, such as categorization of functions and classification of systems (IEC 61226), qualification (IEC/IEEE 60780-323), separation (IEC 60709), control room design (IEC 60964), electromagnetic compatibility (IEC 62003), human factors engineering (IEC 63351), programmable digital item and hardware aspects for programmable digital systems (in particular IEC/IEEE 60880 and IEC 62566) and management of ageing (IEC 62342). For cybersecurity, IEC 62645 builds upon the valid high-level principles and main concepts of the generic security standards, in particular ISO/IEC 27001 and ISO/IEC 27002; it adapts them and completes them to fit the nuclear context and coordinates with the IEC 62443 series.

At a third level, standards relate to specific requirements for specific equipment, technical methods, or activities. Usually, these documents refer to second-level documents for general requirements and can be used on their own.

A fourth level, extending the IEC SC 45A standard series, pertains to Technical Reports which are not normative.

The IEC SC 45A standards series consistently implement the safety and cybersecurity principles and terminology within relevant IAEA safety standards and relevant documents of the IAEA nuclear security series (NSS). In particular, this includes the IAEA requirements SSR-2/1, establishing safety requirements related to the design of nuclear power plants (NPPs), the IAEA safety guide SSG-30 dealing with the safety classification of structures, systems and components in NPPs, the IAEA safety guide SSG-39 dealing with the design of instrumentation and control systems for NPPs, the IAEA safety guide SSG-34 dealing with the design of electrical power systems for NPPs, the IAEA safety guide SSG-51 dealing with human factors engineering in the design of NPPs, the implementing guide NSS 42-G and technical guidance NSS 17-T for computer security at nuclear facilities.



NOTE IEC TR 63400 provides a more comprehensive description of the overall structure of the IEC SC 45A standards series and of its relationship with other standards bodies and standards.



This document is organized as follows:

– Clause 4 addresses the requirements for performing a qualification of an I&C platform for use in I&C systems important to safety of NPPs. This includes differentiation of requirements according to the safety category of the I&C functions which are to be implemented by the I&C platform. The given structure of the qualification is based on the system life cycle specified by IEC 61513 and all applicable standards related to the specific aspects including requirements on hardware, software and programmable logic.
– Clause 5 addresses the requirements for the use of a qualified I&C platform in I&C systems important to the safety of NPPs. This includes the suitability of the I&C platform and consideration of context and dependencies between the I&C platform and the I&C system qualification.
– Additionally, this document provides an informative Annex A giving examples of cooperation between parties involved in the process of I&C platform qualification. The informative Annex B provides an overview for allocation of requirements by qualification aspects.

## 1 Scope

This document provides guidance and establishes requirements for the qualification of I&C platforms, according to IEC nuclear standards, aimed to be used in nuclear applications important to safety. Qualification of an I&C platform (also called pre-qualification or generic qualification) is performed as a generic activity outside the framework of a plant-specific application project. Platform qualification aims to fulfil in an anticipated manner all requirements leading to an I&C platform fully suitable for the implementation of a plant-specific application project. It enables a licensing process to concentrate on two separate steps; one dedicated to the suitability of the I&C platform, considering safety features and development processes, and one dedicated to the plant-specific implementation, considering safety functions.

The platform qualification covers consequently all I&C platform specific aspects including hardware, software, HPD, engineering tools, environmental qualification, quality and the applied safety life cycle supporting these activities. Platform qualification also considers interaction of platform assemblies. This document applies to I&C platforms under development, as well as to pre-existing I&C platforms.

I&C platforms and their qualification are, in principle, mentioned within IEC 61513, but in some cases, it is not clear which requirements on I&C systems are relevant for an I&C platform, and are therefore required for their qualification. This document provides guidance on what is relevant to I&C platform qualification and what is relevant to the implementation of an I&C system design based on a qualified I&C platform.

According to IEC 61513:2011, 6.5.2, it is convenient to use evidence from the qualification of hardware and software modules, established outside the framework of a plant-specific application (i.e. pre-qualification or generic qualification of COTS products or of an equipment family). The objective of this document is to identify those requirements that relate closely to an I&C platform qualification and aims to support a two-step approach for the licensing of I&C systems based on this I&C platform. If the complete qualification of an I&C system is performed in the framework of a plant-specific application, this document does not apply.



In any case, requirements specified by IEC SC 45A standards (e.g. hardware, software and programmable logic requirements) apply for the qualification of an I&C platform. Therefore, this document refers to existing requirements within the IEC SC 45A series of standards that are necessary for qualifying an I&C platform and for its use in the NPP. Basic means of equipment and seismic qualification, as prescribed by IEC/IEEE 60780-323 and IEC/IEEE 60980-344, are through analysis, type testing and documented operational experience. Other documents applicable for qualification for nuclear use include IEC 61513, IEC 63046, IEC 60880, IEC 62138, IEC 62566, IEC 62566-2, IEC 60987, IEC 62671, and IEC 61226.

## 2 Normative references

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.

IEC 60880:2006, *Nuclear power plants - Instrumentation and control systems important to safety - Software aspects for computer-based systems performing category A functions*

IEC 60987:2021, *Nuclear power plants - Instrumentation and control important to safety - Hardware requirements*

IEC 61513:2011, *Nuclear power plants - Instrumentation and control important to safety - General requirements for systems*

IEC 62138:2018, *Nuclear power plants - Instrumentation and control systems important to safety - Software aspects for computer-based systems performing category B or C functions*

IEC 62566:2012, *Nuclear power plants - Instrumentation and control important to safety - Development of HDL-programmed integrated circuits for systems performing category A functions*

IEC 62566-2, *Nuclear power plants - Instrumentation and control systems important to safety - Development of HDL-programmed integrated circuits - Part 2: HDL-programmed integrated circuits for systems performing category B or C functions*

IEC/IEEE 60780-323:2016, *Nuclear facilities - Electrical equipment important to safety - Qualification*

IEC/IEEE 60980-344, *Nuclear facilities - Equipment important to safety - Seismic qualification*

## 3 Terms, definitions, symbols and abbreviated terms

### 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp



**3.1.1**
**application software library**
collection of software modules with typical functionality suitable to create application software

Note 1 to entry: When using pre-existing equipment (here I&C platform), such a library is considered to be part of the system software and qualified as such.

[SOURCE: IEC 61513:2011, 3.3, modified – “implementing typical application functions” has been replaced by “with typical functionality suitable to create application software”; in the Note 1 to entry, “(here I&C platform)” has been added.]

**3.1.2**
**assessment**
systematic process that is carried out throughout the design process to ensure that all the relevant safety requirements are met by the proposed (or actual) design

[SOURCE: IAEA Nuclear Safety and Security Glossary, 2022 (Interim Edition), term “safety assessment”, modified – made specific to design process activities.]

**3.1.3**
**audit**
planned and documented activity performed by qualified personnel to determine by investigation, examination, or evaluation of objective evidence, the adequacy and compliance with established procedures, or applicable documents, and the effectiveness of their implementation

Note 1 to entry: The term refers here to internal or external control of organisations on quality management, project management, and all other issues concerning safety requirements on nuclear processes.

Note 2 to entry: It is further assumed that the audited organisation provides “auditable data”, i.e. technical information which is documented and organized in a readily understandable and traceable manner that permits independent review of the inferences or conclusions based on the information (see IEC/IEEE 60780-323).

[SOURCE: IAEA Nuclear Safety and Security Glossary, 2022 (Interim Edition), explanatory note to the term “independent assessment”, modified – “independent assessment” has been replaced by “audit”; “independence of the assessing organisation or individuals” has been omitted; the phrase “on the fulfilment of safety requirements and quality management” has been replaced by “on quality management, project management, and all other issues concerning safety requirements on nuclear processes”; and the reference “IAEA Safety Standards” has been replaced by “IEC/IEEE 60780-323.]

**3.1.4**
**automated code generation**
function of automated tools allowing transformation of the application-oriented language into a form suitable for compilation or execution

[SOURCE: IEC 60880:2006, 3.5.]



**3.1.5**
**commissioning**
process by means of which systems and components of facilities and activities, having been constructed, are made operational and verified to be in accordance with the design and to have met the required performance criteria

Note 1 to entry: Commissioning may include both non-nuclear/non-radioactive and nuclear/radioactive testing.

[SOURCE: IAEA Nuclear Safety and Security Glossary, 2022 (Interim Edition), modified – “of facilities and activities” has been omitted.]

**3.1.6**
**component**
one of the parts that make up a platform or system

Note 1 to entry: A component can be hardware, computer programs and configuration data, and may be subdivided into other components

Note 2 to entry: See also “I&C system” and “I&C platform”.

Note 3 to entry: The terms “equipment”, “component”, and “module” are often used interchangeably. The relationship of these terms is not yet standardized.

Note 4 to entry: This IEC/SC 45A definition is in principle compatible with the sub-definition of “Component” given in the frame of the IAEA Nuclear Safety and Security Glossary, 2022 (interim) edition definition of “Structures Systems and Components (SSC)”. Nevertheless, as only examples of hardware components are given, this can mislead the reader and IEC/SC 45A prefer to use a definition which explicitly covers software components.

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.698, modified – expanded to include components of a platform and additional explanatory notes.]

**3.1.7**
**equipment qualification**
generation and maintenance of evidence to ensure that equipment will operate on demand, under specified service conditions, to meet system performance requirements

Note 1 to entry: The definition is wider than that in IEC/IEEE 60780-323:2016 which has been taken from the IAEA safety glossary 2007 and which refers to “specific” service conditions.

[SOURCE: IAEA Nuclear Safety and Security Glossary, 2022 (Interim Edition).]

**3.1.8**
**Hardware Description Language**
**HDL**
language used to formally describe the functions and/or the structure of an electronic component for documentation, simulation or synthesis

Note 1 to entry: The most widely used HDLs are VHDL (IEEE 1076) and Verilog (IEEE 1364).

[SOURCE: IEC 62566:2012, 3.6.]

**3.1.9**
**HPD**
HDL-Programmed Device integrated circuit configured (for NPP I&C systems), with Hardware Description Languages and related software tools

Note 1 to entry: HPDs are typically represented by ASICs, FPGAs, PLDs or similar micro-electronic technologies.

[SOURCE: IEC 62566:2012, 3.7, modified – Note 1 to Note 3 have been replaced by a new Note 1 to entry.]



**3.1.10**
**I&C system**
system, based on electrical and/or electronic and/or programmable electronic technology, performing I&C functions as well as service and monitoring functions related to the operation of the system itself

Note 1 to entry: The term is used as a general term which encompasses all elements of the system such as internal power supplies, sensors and other input devices, data highways and other communication paths, interfaces to actuators and other output devices (see note 2). The different functions within a system may use dedicated or shared resources.

Note 2 to entry: The elements included in a specific I&C system are defined in the specification of the boundaries of the system.

Note 3 to entry: An I&C system can be engineered based on an existing I&C platform or be developed directly for a specific application in a NPP.

Note 4 to entry: According to their typical functionality, IAEA distinguishes between automation / control systems, HMI systems, interlock systems and protection systems.

[SOURCE: IEC 61513:2011, 3.29, modified – the sentence beginning ‘The term is used as a general term…’ has been moved to Note 1 to entry; a new Note 3 to entry has been added.]