

Nuclear power plants - Instrumentation and control
systems important to safety – Data communication in
systems performing category A functions

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 61500:2019 sisaldab Euroopa standardi EN IEC 61500:2019 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 61500:2019 consists of the English text of the European standard EN IEC 61500:2019.
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English Version

**Nuclear power plants - Instrumentation and control systems
important to safety - Data communication in systems performing
category A functions
(IEC 61500:2018)**

Centrales nucléaires de puissance - Systèmes
d'instrumentation et de contrôle-commande importants pour
la sûreté - Communications de données dans les systèmes
réalisant des fonctions de catégorie A
(IEC 61500:2018)

Kernkraftwerke - Leittechnische Systeme mit
sicherheitstechnischer Bedeutung - Datenkommunikation in
Systemen, die Funktionen der Kategorie A ausführen
(IEC 61500:2018)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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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

European foreword

This document (EN IEC 61500:2019) consists of the text of IEC 61500:2018 prepared by IEC/SC 45A: "Instrumentation, control and electrical power systems of nuclear facilities", of IEC/TC 45: "Nuclear instrumentation".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-06-17
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2022-06-17

This document supersedes EN 61500:2011.

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/or security measures in the subject-matter covered by this standard.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

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 When 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 60671	2007	Nuclear power plants - Instrumentation and control systems important to safety - Surveillance testing	EN 60671	2011
IEC 60709	-	Nuclear power plants - Instrumentation and control systems important to safety - Separation	EN 60709	-
IEC/IEEE 60780-323	2016	Nuclear facilities - Electrical equipment important to safety - Qualification	EN 60780-323	2017
IEC 60880	2006	Nuclear power plants - Instrumentation and control systems important to safety - Software aspects for computer-based systems performing category A functions	EN 60880	2009
IEC 60980	-	Recommended practices for seismic qualification of electrical equipment of the safety system for nuclear generating stations	-	-
IEC 60987	2007	Nuclear power plants - Instrumentation and control important to safety - Hardware design requirements for computer-based systems	EN 60987	2015
+ A1	2013		-	-
IEC 61000	series	Electromagnetic compatibility (EMC)	EN 61000	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 control important to safety - Requirements for electromagnetic compatibility testing	-	-
IEC 62340	2007	Nuclear power plants - Instrumentation and control systems important to safety - Requirements for coping with common cause failure (CCF)	EN 62340	2010
IEC 62566	2012	Nuclear power plants - Instrumentation and control important to safety - Development of HDL-programmed integrated circuits for systems performing category A functions	EN 62566	2014
IEC 62645	2014	Nuclear power plants - Instrumentation and control systems – Requirements for security programmes for computer-based systems	-	-

IEC 62859	-	Nuclear power plants - Instrumentation and control systems - Requirements for coordinating safety and cybersecurity	-	-
IAEA safety guide No. SSG-39	2016	Design of instrumentation and control systems for nuclear power plants		

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**NUCLEAR POWER PLANTS –
INSTRUMENTATION AND CONTROL SYSTEMS IMPORTANT TO SAFETY –
DATA COMMUNICATION IN SYSTEMS PERFORMING
CATEGORY A FUNCTIONS****FOREWORD**

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International Standard IEC 61500 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 2009. This edition constitutes a technical revision.

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

- a) the changes introduced to previously referenced standards have been confirmed to apply;
- b) relevant newly published standards have been referenced;
- c) lessons learned from several industrial applications have been incorporated.

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

FDIS	Report on voting
45A/1183/FDIS	45A/1194/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 stability 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.

INTRODUCTION

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

The equipment for data communication of on-line plant data can simplify the hardwired cables connecting distributed systems for instrumentation, control, protection and monitoring needed for the safe operation of Nuclear Power Plants (NPP). Such communication systems can have advantages over direct cables, for electrical isolation, for reduction of cable fire loads or other reasons. In a distributed computer based system, communication equipment is an essential part of the system. Data communication is usually essential for implementing I&C systems important to safety in nuclear power plants.

It is intended that the document be used by operators of NPPs (utilities), manufacturers of data communication equipment, systems evaluators and by licensors.

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

IEC 61500 is the third level IEC SC 45A document tackling the generic issue of data communication for equipment performing category A functions.

IEC 61500 is to be read in association with IEC 61513, which is the appropriate IEC SC 45A document providing guidance on general requirements for instrumentation and control systems important to safety, IEC 60880, which is the appropriate IEC SC 45A document providing guidance on software aspects for computer based systems performing category A functions, and IEC 60987 which is the appropriate IEC SC 45A document providing guidance on hardware aspects for computer based systems.

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 the standard

It is important to note that this standard establishes no additional functional requirements for safety systems.

Aspects for which special recommendations have been provided in this standard are:

- Requirements for data communication within systems performing category A functions.
- Requirements for data communication between divisions of a system performing category A functions.
- Requirements for data communication of systems performing category A functions with systems of lower safety importance.
- Reliability requirements for data communication.

To ensure that the standard will continue to be relevant in future years, emphasis is placed on principles, rather than on specific technologies.

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 NPP. IEC 63046 provides general requirements for electrical power systems of NPP; 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 compatibility, cybersecurity, software and hardware aspects for programmable digital systems, coordination of safety and security requirements and management of ageing. The standards referenced directly at this second level should be considered together with IEC 61513 and IEC 63046 as a consistent document set.

At a third level, IEC SC 45A standards not directly referenced by IEC 61513 or by IEC 63046 are standards related to specific equipment, technical methods, or specific activities. Usually these documents, which make reference to second-level documents for general topics, can be used on their own.

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

The IEC SC 45A standard series consistently implements and details the safety and security principles and basic aspects provided in the relevant IAEA safety standards and in the 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, the IAEA safety guide SSG-30 dealing with the safety classification of structures, systems and components in NPP, 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 and the implementing guide NSS17 for computer security at nuclear facilities. The safety and security terminology and definitions used by the IEC SC 45A standards are consistent with those used by the IAEA.

IEC 61513 and IEC 63046 have adopted a presentation format similar to the basic safety publication IEC 61508 with an overall life-cycle framework and a system life-cycle framework. Regarding nuclear safety, IEC 61513 and IEC 63046 provide the interpretation of the general requirements of IEC 61508-1, IEC 61508-2 and IEC 61508-4, for the nuclear application sector. In this framework IEC 60880, IEC 62138 and IEC 62566 correspond to IEC 61508-3 for the nuclear application sector. IEC 61513 and IEC 63046 refer to ISO as well as to IAEA GS-R-3 and IAEA GS-G-3.1 and IAEA GS-G-3.5 for topics related to quality assurance (QA). At level 2, regarding nuclear security, IEC 62645 is the entry document for the IEC SC 45A security standards. It 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. Also at level 2, IEC 60964 is the entry document for the IEC SC 45A control rooms standards and IEC 62342 is the entry document for the IEC SC 45A ageing management standards.

NOTE 1 It is assumed that for the design of I&C systems in NPPs that implement conventional safety functions (e.g. to address worker safety, asset protection, chemical hazards, process energy hazards) international or national standards would be applied.

NOTE 2 IEC SC 45A domain was extended in 2013 to cover electrical systems. In 2014 and 2015 discussions were held in IEC SC 45A to decide how and where general requirements for the design of electrical systems were to be considered. IEC SC 45A experts recommended that an independent standard be developed at the same level as IEC 61513 to establish general requirements for electrical systems. Project IEC 63046 is now launched to cover this objective. When IEC 63046 will be published this NOTE 2 of the introduction of IEC SC 45A standards will be suppressed.