SLOVENSKI STANDARD
SIST EN 62241:2015

01-september-2015

Jedrske elektrarne - Glavni komandni prostor - Funkcije alarma in predstavitev (IEC 62241:2004)

Nuclear power plants - Main control room - Alarm functions and presentation (IEC 62241:2004)

Kernkraftwerke - Warte - Alarmfunktionen und ihre Darstellung (IEC 62241:2004)

Centrales nucléaires de puissance - Salle de commande principale - Fonctions et présentation des alarmes (IEC 62241:2004)

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ICS:

27.120.20 Jedrske elektrarne. Varnost Nuclear power plants. Safety

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EUROPEAN STANDARD
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English Version

Nuclear power plants - Main control room - Alarm functions and presentation (IEC 62241:2004)

Centrales nucléaires de puissance - Salle de commande principale - Fonctions et présentation des alarmes (IEC 62241:2004)

Kernkraftwerke - Warte - Alarmfunktionen und ihre Darstellung (IEC 62241:2004)

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CENELEC

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 62241:2015) consists of the text of IEC 62241:2004 prepared by SC 45A “Instrumentation, control and electrical systems of nuclear facilities” of 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)	2016-02-16
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2018-02-16

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 measures in the subject-matter covered by this standard.

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Endorsement notice

The text of the International Standard IEC 62241:2004 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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

Publication	Year	Title	EN/HD	Year
IEC 60964	1989 [1)]	Design for control rooms of nuclear power plants	-	-
IEC 61226	-	Nuclear power plants - Instrumentation and control important to safety - Classification of instrumentation and control functions	EN 61226	-
IEC 61771	-	Nuclear power plants - Main control room - Verification and validation of design		-
IEC 61772	-	Nuclear power plants - Control rooms - Application of visual display units (VDUs)	EN 61772	-
IEC 61839	-	Nuclear power plants - Design of control rooms - Functional analysis and assignment	EN 61839	-

[1)] Superseded by IEC 60964:2009.

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Nuclear power plants – Main control room – Alarm functions and presentation

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

NUCLEAR POWER PLANTS – MAIN CONTROL ROOM – ALARM FUNCTIONS AND PRESENTATION

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 62241 has been prepared by subcommittee 45A: Instrumentation and control of nuclear facilities, of IEC technical committee 45: Nuclear instrumentation.

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

FDIS	Report on voting
45A/540/FDIS	45A/546/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.

This International Standard supplements 4.6.4 of IEC 60964:1989 and therefore supersedes the guidance given in A.4.6.4 of Annex A of IEC 60964.

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.

INTRODUCTION

Technical background, main issues and organisation of the standard

IEC 60964:1989 was developed to supply requirements relevant for the design of Control Rooms (CR) of nuclear power plants. In this first edition of IEC 60964 which has been used extensively within the nuclear industry, the subject of alarm systems was tackled in a one page clause. Considering the return of experience gathered worldwide on the subject, it appeared that a comprehensive standard on alarm systems was needed.

This standard is for application to the design of new main control rooms of nuclear power plants conforming to IEC 60964, where work is initiated after the publication of this standard. It serves as a reference for upgrading and modernizing existing control rooms. If it is desired to apply it to supplementary and local control rooms, special attention should be given to identifying the areas affected.

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

IEC 62241 will be directly referenced by the second edition of IEC 60964 (under consideration) and is the third level document specifically tackling the topic of alarm systems.

For more details on the structure of the IEC SC 45A series of standards, see below the "Description of the structure of the IEC SC 45A series of standards".

Recommendations and limitations regarding the application of this standard

This Standard supplements Subclause 4.6.4 of IEC 60964:1989 and therefore supersedes the guidance given in A.4.6.4 of Annex A of IEC 60964 Ed.1.0.

For the categorization of alarm systems, the safety classification of IEC 61226 should be taken into account.

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

The top level document of the IEC SC 45A series of standards is IEC 61513. It provides general requirements for instrumentation and control systems and equipment (I&C systems) that are used to perform functions important to safety in nuclear power plants (NPPs). IEC 61513 structures the IEC SC 45A series of standards.

IEC 61513 refers directly to other IEC SC 45A standards for general topics related to categorization of functions and classification of systems, qualification, separation of systems, defence against common cause failure, software aspects of computer based systems, hardware aspects of computer based systems, and control room design. The standards referenced directly at this second level should be considered together with IEC 61513 as a consistent document set.

At a third level, IEC SC 45A standards not directly referenced by IEC 61513 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 series of standards corresponds to the Technical Reports which are not normative.

IEC 61513 has adopted a presentation format similar to the basic safety series IEC 61508 with an overall safety life-cycle framework and a system life-cycle framework and provides an interpretation of the general requirements of IEC 61508, parts 1, 2 and 4, for the nuclear application sector. Compliance with this standard will facilitate consistency with the requirements of IEC 61508 as they have been interpreted for the nuclear industry. In this framework, IEC 60880 and IEC 62138 correspond to IEC 61508-3 for the nuclear application sector.

IEC 61513 refers to ISO as well as to IAEA 50-C-QA for topics related to quality assurance.

The IEC SC 45A series of standards consistently implements and details the principles and basic safety aspects provided in the IAEA code on the safety of nuclear power plants and in the IAEA safety series, in particular the Requirements NS-R-1 and the Safety Guide NS-G-1.3[1]. The terminology and definitions used by IEC SC 45A standards are consistent with those used by the IAEA.

1 Requirements NS-R-1: *Safety of Nuclear Power Plants: Design*
Safety Guide NS-G-1.3: *Instrumentation and Control Systems Important to Safety in Nuclear Power Plants*

NUCLEAR POWER PLANTS – MAIN CONTROL ROOM – ALARM FUNCTIONS AND PRESENTATION

1 Scope and object

This International Standard provides the functional requirements for the alarm systems in the main control room of nuclear power plants. It gives definitions of the terms used for alarm functions. It also establishes the human factors requirements and the design guidelines for alarm presentation for the main control room of nuclear power plants.

NOTE The alarm functions can be implemented in a dedicated system (alarm system) or preferably be an integrated part of the main control room HMI (Human-Machine Interface) system.

It specifies the alarm functions including those for the selection and definition of original alarm signals, alarm signal processing (e.g., event sequence processing, static and dynamic prioritisation), alarm display processing (e.g., alarm suppression) and the use of associated display devices (e.g., Visual Display Unit (VDU), conventional alarm fascia, mural display), with acknowledge and reset sequences, and other related matters.

Under abnormal conditions or plant transient conditions in the nuclear power plant, many alarms occur simultaneously. For this reason, the alarm functions of the main control room of nuclear power plants require special considerations for human factors engineering and system configuration, to avoid operator misunderstandings and to provide the operator with adequate information. Therefore, the scope includes special alarm functions based on human factors for monitoring and operation of nuclear power plants. It does not cover specific alarm systems, such as the fire alarm and security alarm systems.

The object of this Standard is to establish a common international understanding of the underlying functional design basis of alarm systems for control rooms, covering the corresponding functional requirements, the human factors requirements and design guidelines for the alarm functions and alarm presentation for the main control room of nuclear power plants.

This Standard therefore aims to give guidance to reduce problems which have been experienced in the past: omission of important alarms, delay in detecting important alarms, increased workload that may affect the performance of other operational activities, inattention to frequently activated alarms known as ‘nuisance alarms,’ and confusion associated with the misunderstanding of the relationships among alarms and of the importance of alarms.

2 Normative references

The following referenced documents are necessary 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.

IEC 60964:1989, *Design for control rooms of nuclear power plants*

IEC 61226, *Nuclear power plants – Instrumentation and control systems important for safety – Classification*

IEC 61771, *Nuclear power plants – Main control room – Verification and validation of design*

IEC 61772, *Nuclear power plants – Main control room – Application of visual display units (VDU)*

IEC 61839, *Nuclear power plants – Design of control rooms – Functional analysis and assignments*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60964, as well as the following definitions, apply.

NOTE When the same term is defined in IEC 60964 and in this standard, the definition given in this standard applies.

3.1
alarm
item of diagnostic, prognostic, or guidance information, which is used to alert the operator and to draw his or her attention to a process or system deviation

NOTE Specific information provided by alarms includes the existence of an anomaly for which corrective action might be needed, the cause and potential consequences of the anomaly, the overall plant status, corrective action to the anomaly, and feedback of corrective actions.

Two types of deviation may be recognised:

– unplanned – undesirable process deviations and equipment faults;

– planned – deviations in process conditions or equipment status that are the expected response to but could be indicative of undesirable plant conditions.

3.2
alarm acknowledgement
action, which operators are required to carry out to show that they have recognized an alarm presented to them

3.3
alarm avalanche
condition where a large number of alarms appear within a short time at a rate exceeding the operator's capacity to take them into account

3.4
alarm coding
method of highlighting an object of concern visually or audibly, with the intention of drawing the operator's attention to the object

3.5
alarm control
set of alarm presentation control functions, which support the operators in recognizing alarm status correctly and in a timely manner

NOTE Alarm acknowledgement, silence, and reset are typical examples of alarm control.