



DPC: 25/30511202 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 07 October 2025

Origin: International

Latest date for receipt of comments: 29 October 2025

Project No. 2025/00785

Responsible committee: NCE/8 Instrumentation, Control & Electrical Systems of Nuclear Facilities

Interested committees:

Title: Draft BS EN 61227 Ed.3.0 BS EN IEC 61227 Nuclear power plants - Control rooms - Operator controls.

Please notify admin.start@bsigroup.com if you are aware of any keywords that might assist in clarifying or identifying the standard or of the content of this standard:

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 29 October 2025

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

E-mail: admin.start@bsigroup.com

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



45A/1631/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 61227 ED3	
DATE OF CIRCULATION: 2025-10-03	CLOSING DATE FOR COMMENTS: 2025-11-28
SUPERSEDES DOCUMENTS: 45A/1506/RR	

IEC SC 45A : INSTRUMENTATION, CONTROL AND ELECTRICAL POWER SYSTEMS OF NUCLEAR FACILITIES	
SECRETARIAT: France	SECRETARY: Mr Alexander WIGG
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Safety	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Nuclear power plants - Control rooms - Operator controls

NOTE FROM TC/SC OFFICERS:

Circulation of CD in accordance with the working group recommendations as per meetings held in Knoxville, USA, in June 2025.

Copyright © 2025 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

CONTENTS

1	FOREWORD.....	3
2		
3	1 Scope.....	7
4	2 Normative references	7
5	3 Terms and definitions	7
6	4 Abbreviated terms	8
7	5 Design principles	8
8	5.1 Basic concepts.....	8
9	5.2 Types of HMI of operator controls	9
10	5.2.1 General	9
11	5.2.2 Dedicated controls	9
12	5.2.3 Soft controls	9
13	5.3 Selection of control system	10
14	6 Design requirements.....	11
15	6.1 Dedicated controls	11
16	6.1.1 Control board layout	11
17	6.1.2 Positioning of groups	12
18	6.1.3 Device layout.....	12
19	6.1.4 Uniformity of orientation.....	12
20	6.1.5 Mimic diagrams	13
21	6.1.6 Coding.....	14
22	6.1.7 Protection against mal-operation of control devices	14
23	6.1.8 Compatibility with VDU formats.....	15
24	6.2 Soft controls	16
25	6.2.1 Display devices	16
26	6.2.2 Selection displays.....	16
27	6.2.3 Input fields.....	16
28	6.2.4 Input formats	16
29	6.2.5 User-system interaction	17
30	6.2.6 Touch panels.....	18
31	Annex A (informative) Examples for the arrangement of dedicated controls	20
32	Annex B (informative) Design requirements for the voice user interface	22
33	B.1 Application Environment and Advantages	22
34	B.2 Limitations and Constraints.....	22
35	B.1 Introduction.....	22
36	B.2 Design Requirements.....	22
37	B.2.1 Voice Commands.....	22
38	B.2.2 Voice Characteristics	22
39	B.2.3 Command Clarity and Execution	22
40	B.2.4 System Feedback and Prompting.....	22
41	B.2.5 Voice Feedback.....	23
42	B.2.6 Cognitive Workload Management.....	23
43	B.2.7 Emergency Command Handling	23
44	B.2.8 Multi-Speaker Environments	23
45	B.2.9 Error Handling and Recovery	23
46		

47 Bibliography 24

48

49 Figure 1 – IEC SC45A standards addressing control rooms, HMI and HFE 5

50

INTERNATIONAL ELECTROTECHNICAL COMMISSION

NUCLEAR POWER PLANTS - CONTROL ROOMS - OPERATOR CONTROLS

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 61227 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.
- This third edition cancels and replaces the second edition published in 2008. This edition constitutes a technical revision.
- This edition includes the following significant technical changes with respect to the previous edition:
- a) The term "discrete control" has been replaced by "dedicated control", consistent with the operator control type defined in IEC 60964 (Edition 3.0).
 - b) Provisions have been updated to reflect recent experience with touch interfaces.
 - c) Requirements have been introduced for a new category of soft control, i.e., voice user interfaces.
 - d) The structure of subsections and the wording have been streamlined to improve readability and applicability.

e) review of the existing requirements and updating of the terminology and definitions.

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

Draft	Report on voting
XX/XX/FDIS	XX/XX/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 organisation of this standard

This IEC standard specifically focuses on operator controls.

It is intended that this standard be used by operators of NPPs (utilities), systems evaluators and by licensors.

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

IEC 61227 is the third level IEC SC 45A document tackling the generic issue of operator controls.

IEC 61227 is to be read in association with IEC 60964 and IEC 61772. IEC 60964 is the appropriate IEC SC 45A chapeau document for control rooms which provides guidance on control room design and which references IEC 61227. IEC 61772 establishes requirements for the application of VDU (Visual Display Units).

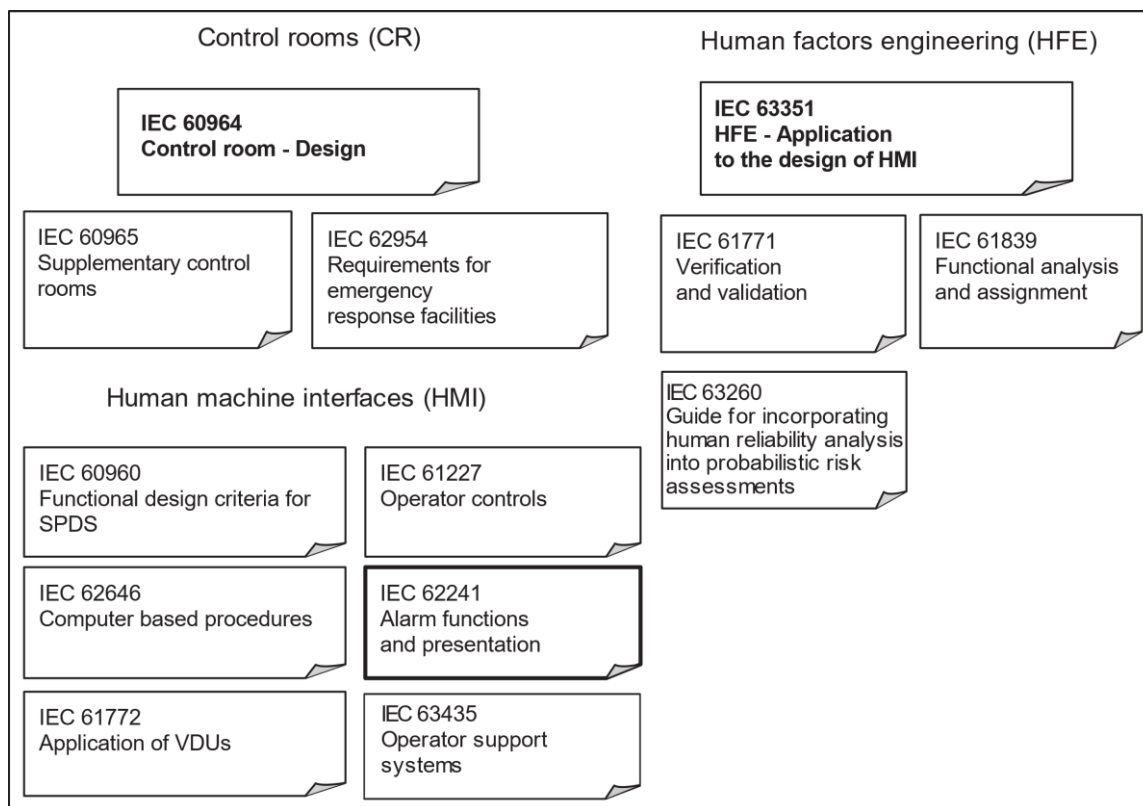


Figure 1 – IEC SC45A standards addressing control rooms, HMI and HFE

The documents shown on the left of the figure below the “IEC 60964” box constitute the existing set of control room (CR) and human-machine interface (HMI) design related standards and those on the right of the figure below the “IEC 63351” box constitute the HFE related standards.

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

c) Recommendations and limitations regarding the application of this standard

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

To ensure that this standard will continue to be relevant in future years, the emphasis has been placed on issues of principle, rather than specific technologies.

d) 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 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, corresponds to the 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.