

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Nuclear power plants – Control rooms – Computer based procedures

Centrales nucléaires de puissance – Salles de commande – Procédures informatisées



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**NUCLEAR POWER PLANTS –
CONTROL ROOMS –
COMPUTER BASED PROCEDURES**

FOREWORD

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International Standard IEC 62646 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/886/FDIS	45A/888/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,
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Withdrawn

INTRODUCTION

a) Technical background, main issues and organisation of the Standard

This IEC standard focuses on computerisation of procedures used by the operating staff. Procedures have always contributed to a large extent to NPP safety and availability and, now, the use of computer technology to provide enhanced guidance to the plant operators is increasing and becoming current practice. This standard also provides guidance for the decision on the extent the procedures should be computerised.

It is intended that the Standard be used by nuclear power plant designers, utilities operating staff, systems evaluators and by regulatory engineers.

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

IEC 62646 is the third level IEC SC 45A document tackling the generic issue of computerised procedures.

IEC 62646 is to be read in association with IEC 60964 and with IEC 61839. IEC 60964 is the appropriate IEC SC 45A document providing guidance on operator controls, verification and validation of design, application of visual display units in the control room, whereas IEC 61839 establishes functional analysis and assignment guidance for allocating functions between operators and systems.

For more details on the structure of the IEC SC 45A standard series, see the 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.

This standard deals with technical requirements and Human Factor Engineering related to Computer Based Procedures (CBP). However it does not provide detailed guidance on ergonomic design of control centres as it is treated in the ISO 11064 series of standards, nor on task allocation between human and systems dealt with in IEC 61839 and on cyber security, which is developed in IEC 62645. It also excludes the organisation for maintenance of procedures.

Aspects for which requirements and recommendations have been provided in this Standard are:

- the establishment of a policy for computerisation of procedures, especially which types of procedure should be computerised and to what extent. The different families of CBP (Computer Based Procedures) to be aimed at, with their associated features, are then defined. Finally, the safety aspects of CBP are considered;
- the use of CBP inside and outside of the MCR (Main Control Room), in possible conjunction with paper based procedures, as well as the assistance provided to operator activities, including user coordination;
- safety and non safety design requirements for the digital system processing CBP, and considerations about what to do in case of failure of this system;
- detailed requirements and recommendations related to the functional features of CBP, from the basic ones to the most sophisticated ones, i.e. information, navigation, guidance and plant control;
- the CBP life cycle, from the set-up of the project to the CBP maintenance and the operator training via design and implementation.

To ensure that the standard will continue to be relevant in future years, the emphasis has been placed on issues of principle, 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 document of the IEC SC 45A standard series is IEC 61513. It provides general requirements for I&C systems and equipment that are used to perform functions important to safety in NPPs. IEC 61513 structures the IEC SC 45A standard series.

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 standard series, corresponds to the Technical Reports which are not normative.

IEC 61513 has adopted a presentation format similar to the basic safety publication IEC 61508 with an overall safety life-cycle framework and a system life-cycle framework. Regarding nuclear safety, it provides the interpretation of the general requirements of IEC 61508-1, IEC 61508-2 and IEC 61508-4, for the nuclear application sector, regarding nuclear safety. 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 GS-R-3 and IAEA GS-G-3.1 for topics related to quality assurance (QA).

The IEC SC 45A standards series consistently implements and details the principles and basic safety aspects provided in the IAEA code on the safety of NPPs and in the IAEA safety series, in particular the Requirements NS-R-1, establishing safety requirements related to the design of Nuclear Power Plants, and the Safety Guide NS-G-1.3 dealing with instrumentation and control systems important to safety in Nuclear Power Plants. The terminology and definitions used by SC 45A standards are consistent with those used by the IAEA.

NOTE 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, that are based on the requirements of a standard such as IEC 61508.