IEC/IEEE 62582-1

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Nuclear power plants – Instrumentation and control important to safety – Electrical equipment condition monitoring methods – Part 1: General

Centrales nucléaires de puissance – Instrumentation et contrôle-commande importants pour la sûreté – Méthodes de surveillance de l'état des matériels électriques – Partie 1: Généralités

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NUCLEAR POWER PLANTS – INSTRUMENTATION AND CONTROL IMPORTANT TO SAFETY – ELECTRICAL EQUIPMENT CONDITION MONITORING METHODS –

Part 1: General

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International Standard IEC/IEEE 62582-1 has been prepared by subcommittee 45A: Instrumentation and control of nuclear facilities, of IEC technical committee 45: Nuclear instrumentation, in cooperation with the Nuclear Power Engineering Committee of the Power & Energy Society of the IEEE[1], under the IEC/IEEE Dual Logo Agreement between IEC and IEEE.

This publication is published as an IEC/IEEE Dual Logo standard.

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

FDIS	Report on voting
45A/840/FDIS	45A/849/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.

International standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

A list of all parts of IEC/IEEE 62582 series, under the general title *Nuclear power plants – Instrumentation and control important to safety – Electrical equipment condition monitoring methods*, can be found on the IEC website.

The IEC Technical Committee and IEEE Technical Committee have 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- withdrawn,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.

[1] A list of IEEE participants can be found at the following URL: http://standards.ieee.org/downloads/62582-1/62582-1-2011/62582-1-2011_wg-participants.pdf.

INTRODUCTION

a) Technical background, main issues and organisation of this standard

This part of this IEC/IEEE standard specifically focuses on methods for condition monitoring for management of ageing of electrical equipment installed in nuclear power plants and for application of the concept of qualified condition.

This part of IEC/IEEE 62582 is the first part of the IEC/IEEE 62582 series of standards, containing background and guidelines for the application of methods for condition monitoring of electrical equipment important to safety of nuclear power plants. The detailed descriptions of the methods are given in the other parts, one part for each method. This part also includes some elements which are common to all methods.

IEC/IEEE 62582 is issued with a joint logo which makes it applicable to the management of ageing of electrical equipment qualified to IEEE as well as IEC Standards.

Condition monitoring is a developing field and more methods will be added to the IEC/IEEE 62582 when they are considered widely applied and a good reproducibility of the condition monitoring method can be demonstrated.

Historically, IEEE Std 323-2003 introduced the concept and role that condition based qualification could be used in equipment qualification as an adjunct to qualified life. In equipment qualification, the condition of the equipment for which acceptable performance was demonstrated is the qualified condition. The qualified condition is the condition of equipment, prior to the start of a design basis event, for which the equipment was demonstrated to meet the design requirements for the specified service conditions.

Significant research has been performed on condition monitoring techniques and the use of these techniques in equipment qualification as noted in NUREG/CR-6704, Vol. 2 (BNL - NUREG-52610) and JNES-SS-0903, 2009.

It is intended that this IEC/IEEE Standard be used by operators of nuclear power plants, systems evaluators and by licensors.

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

Part 1 of IEC/IEEE 62582 is the third level IEC SC 45A document tackling the issue of application of condition monitoring in equipment qualification and management of ageing of electrical I&C equipments in nuclear power plants.

Part 1 of IEC/IEEE 62582 is to be read in association with IEC 60780 and IEEE 323, which provide general requirements for qualification of I&C systems and equipment that are used to perform functions important to safety in NPPs and nuclear facilities.

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 standard

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

The Standard discusses the general measurement technique for current condition monitoring methods and is not meant to cover any 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 and provides an interpretation of the general requirements of IEC 61508-1, IEC 61508-2 and IEC 61508-4, for the nuclear application sector. Compliance with IEC 61513 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 (now replaced by IAEA GS-R-3) 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.

NUCLEAR POWER PLANTS – INSTRUMENTATION AND CONTROL IMPORTANT TO SAFETY – ELECTRICAL EQUIPMENT CONDITION MONITORING METHODS –

Part 1: General

1 Scope and object

This part of IEC/IEEE 62582 contains requirements for application of the other parts of IEC/IEEE 62582 related to specific methods for condition monitoring in electrical equipment important to safety of nuclear power plants. It also includes requirements which are common to all methods.

IEC/IEEE 62582 specifies condition monitoring methods in sufficient detail to enhance the accuracy and repeatability, and provide standard formats for reporting the results. The methods specified are applicable to electrical equipment containing organic or polymeric materials. Some methods are especially designed for the measurement of condition of a limited range of equipment whilst others can be applied to all types of equipment for which the organic parts are accessible.

Although the scope of IEC/IEEE 62582 is limited to the application of instrumentation and control systems important to safety, the condition monitoring methods may be applicable also to other components which include organic or polymeric materials.

The different parts of IEC/IEEE 62582 are measurement standards, primarily for use in the management of ageing in initial qualification and after installation. For technical background of condition monitoring methods, reference is made to other IEC standards, e.g. IEC 60544-5. Information on the role of condition monitoring in qualification of equipment important to safety is found in IEEE Std 323. General information on management of ageing can be found in IEC 62342 and IEEE 1205.

NOTE The procedures defined in the IEC/IEEE 62582 are intended for detailed condition monitoring. A simplified version of the procedures may be appropriate for preliminary assessment of the need for detailed measurements.

2 Normative references

The following referenced documents are indispensable 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.

IEEE Std 323.2003, IEEE *Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations*

3 Terms and definitions

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

3.1
condition indicator
characteristic of a structure, system or component that can be observed, measured or trended to infer or directly indicate the current and future ability of the structure, system or component to function within acceptance criteria

[IAEA Safety Glossary, 2007 Edition]