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Nuclear power plants – Instrumentation and control important to safety – Electrical equipment condition monitoring methods – Part 3: Elongation at break

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 3: Elongation at break

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 document(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.

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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.

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC/IEEE 62582-3:2012. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC/IEEE 62582-3 was 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. It is an International Standard.

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

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

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

a) Updated best practices relating to condition monitoring using the tensile elongation method.

b) Updated bibliography, references and context.

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

Draft	Report on voting
45A/1524/FDIS	45A/1538/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 the rules given in the ISO/IEC Directives, Part 2, 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/.

A list of all parts of the 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.

[1] A list of IEEE participants can be found at the following URL: http://standards.ieee.org/downloads/62582-3/62582-3-2012/62582-3-2012_wg-participants.pdf.

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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

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

This part of this IEC/IEEE standard specifically focuses on elongation at break methods for condition monitoring for the management of ageing of electrical equipment installed in nuclear power plants. The method is primarily suited to samples taken from equipment that are based on ~~thermoplastic or elastomeric polymers~~ polymeric materials.

This part of IEC/IEEE 62582 is the third part of the IEC/IEEE 62582 series. It contains detailed descriptions of condition monitoring based on elongation at break measurements.

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

~~Historically, IEEE Std 323-2003 introduced the concept and role that conditionbased 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.~~

IEC/IEEE 60780-323 defined term condition-based qualification which is an adjunct to type testing. The qualified condition is established by condition indicator(s) prior to the start of accident conditions for which the equipment was demonstrated to meet the design requirements for the specified service conditions. IEC/IEEE 60780-323 defined condition indicator.

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), JNES-SS-0903, 2009 and IAEA-TECDOC-1825:2017.

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

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

Part 3 of IEC/IEEE 62582 is the third level IEC SC 45A document tackling the specific issue of application and performance of elongation at break measurements in management of ageing of electrical instrument and control equipment in nuclear power plants.

Part 3 of IEC/IEEE 62582 is to be read in association with Part 1 of IEC/IEEE 62582, which provides requirements for application of methods for condition monitoring of electrical equipment important to safety of nuclear power plants.

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 document establishes no additional functional requirements for safety systems.

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.~~

The IEC SC 45A standard series comprises a hierarchy of four levels. The top-level documents of the IEC SC 45A standard series are IEC 61513 and IEC 63046.

IEC 61513 provides general requirements for instrumentation and control (I&C) systems and equipment that are used to perform functions important to safety in nuclear power plants (NPPs). IEC 63046 provides general requirements for electrical power systems of NPPs; 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 power systems for nuclear power plants.

IEC 61513 and IEC 63046 refer directly to other IEC SC 45A standards for general requirements for specific topics, such as categorization of functions and classification of systems, qualification, separation, defence against common cause failure, control room design, electromagnetic compatibility, human factors engineering, 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 requirements for specific equipment, technical methods, or ~~specific~~ activities. Usually these documents, which make reference to second-level documents for general ~~topics~~ requirements, can be used on their own.

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

The IEC SC 45A standards 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 (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 and the implementing guide NSS42-G for computer security at nuclear facilities. The safety and security terminology and definitions used by the 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 ~~safety~~ 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~~, regarding nuclear safety~~. In this framework, IEC 60880, IEC 62138 and IEC 62566 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.~~

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).

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. At level 2, IEC 60964 is the entry document for the IEC/SC 45A control rooms standards, IEC 63351 is the entry document for the human factors engineering standards and IEC 62342 is the entry document for the 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~~, that are based on the requirements of a standard such as IEC 61508~~.

NOTE 2 IEC TR 64000 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.

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

Part 3: Elongation at break

1 Scope ~~and object~~

This part of IEC/IEEE 62582 contains methods for condition monitoring of organic and polymeric materials in instrumentation and control systems using tensile elongation techniques in the detail necessary to produce accurate and reproducible measurements. This document includes the requirements for selection of samples, the measurement system and conditions, and the reporting of the measurement results.

The different parts of IEC/IEEE 62582 are measurement standards, primarily for use in the management of ageing in initial qualification and after installation. IEC/IEEE 62582-1 includes requirements for the application of the other parts of IEC/IEEE 62582 and some elements which are common to all methods. Information on the role of condition monitoring in qualification of equipment important to safety is found in ~~IEEE Std 323~~ IEC/IEEE 60780-323.

This document is ~~intended for application~~ applicable to non-energised equipment.

2 Normative references

There are no normative references in this document.

IEC/IEEE 62582-3

Edition 2.0 2024-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Nuclear power plants – Instrumentation and control important to safety – Electrical equipment condition monitoring methods – Part 3: Elongation at break

Centrales nucléaires – Instrumentation et contrôle-commande importants pour la sûreté – Méthodes de surveillance de l'état des matériels électriques – Partie 3: Allongement à la rupture



IEC/IEEE 62582-3:2024-07(en-fr)

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FOREWORD

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INTRODUCTION

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

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

Part 3 of IEC/IEEE 62582 is the third level IEC SC 45A document tackling the specific issue of application and performance of elongation at break measurements in management of ageing of electrical instrument and control equipment in nuclear power plants.

Part 3 of IEC/IEEE 62582 is to be read in association with Part 1 of IEC/IEEE 62582, which provides requirements for application of methods for condition monitoring of electrical equipment important to safety of nuclear power plants.

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 document establishes no additional functional requirements for safety systems.

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 IEC SC 45A standard series comprises a hierarchy of four levels. The top-level documents of the IEC SC 45A standard series are IEC 61513 and IEC 63046.

IEC 61513 provides general requirements for instrumentation and control (I&C) systems and equipment that are used to perform functions important to safety in nuclear power plants (NPPs). IEC 63046 provides general requirements for electrical power systems of NPPs; 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 power systems for nuclear power plants.

IEC 61513 and IEC 63046 refer directly to other IEC SC 45A standards for general requirements for specific topics, such as categorization of functions and classification of systems, qualification, separation, defence against common cause failure, control room design, electromagnetic compatibility, human factors engineering, 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.

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The IEC SC 45A standards 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 (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 and the implementing guide NSS42-G for computer security at nuclear facilities. The safety and security terminology and definitions used by the 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 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).

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. At level 2, IEC 60964 is the entry document for the IEC/SC 45A control rooms standards, IEC 63351 is the entry document for the human factors engineering standards and IEC 62342 is the entry document for the 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 TR 64000 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.

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

Part 3: Elongation at break

1 Scope

This part of IEC/IEEE 62582 contains methods for condition monitoring of organic and polymeric materials in instrumentation and control systems using tensile elongation techniques in the detail necessary to produce accurate and reproducible measurements. This document includes the requirements for selection of samples, the measurement system and conditions, and the reporting of the measurement results.

The different parts of IEC/IEEE 62582 are measurement standards, primarily for use in the management of ageing in initial qualification and after installation. IEC/IEEE 62582-1 includes requirements for the application of the other parts of IEC/IEEE 62582 and some elements which are common to all methods. Information on the role of condition monitoring in qualification of equipment important to safety is found in IEC/IEEE 60780-323.

This document is applicable to non-energised equipment.

2 Normative references

There are no normative references in this document.

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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CENTRALES NUCLÉAIRES – INSTRUMENTATION ET CONTRÔLE-COMMANDE IMPORTANTS POUR LA SÛRETÉ – MÉTHODES DE SURVEILLANCE DE L'ÉTAT DES MATÉRIELS ÉLECTRIQUES –

Partie 3: Allongement à la rupture

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "document (s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux.

   Les normes de l'IEEE sont élaborées par les Sociétés de l'IEEE, ainsi que par les Comités de coordination des normes du Conseil de normalisation de l'IEEE Standards Association (IEEE-SA). Ces normes sont l'aboutissement d'un consensus, approuvé par l'American National Standards Institute (ANSI), qui rassemble des bénévoles représentant différents points de vue et intérêts. Les participants bénévoles ne sont pas nécessairement membres de l'IEEE et leur intervention n'est pas rétribuée. Si l'IEEE administre le déroulement de cette procédure et définit les règles destinées à favoriser l'équité du consensus, l'IEEE lui-même n'évalue pas, ne teste pas et ne vérifie pas l'exactitude de toute information contenue dans ses normes. L'utilisation de normes de l'IEEE est entièrement volontaire. *Les documents de l'IEEE sont disponibles à des fins d'utilisation, à condition d'être assortis d'avis importants et de clauses de non-responsabilité (voir* http://standards.ieee.org/IPR/disclaimers.html *pour plus d'informations).*

   L'IEC travaille en étroite collaboration avec l'IEEE, selon des conditions fixées par accord entre les deux organisations. Cette Norme internationale double logo a été élaborée conjointement par l'IEC et l'IEEE en vertu de cet accord.

2) Les décisions officielles de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études. Une fois le consensus établi entre les Sociétés de l'IEEE et les Comités de coordination des normes, les décisions officielles de l'IEEE relatives aux questions techniques sont déterminées en fonction du vote exprimé par un groupe à la composition équilibrée, composé de parties intéressées qui manifestent leur intérêt pour la révision des normes proposées. L'approbation finale de la norme de l'IEEE est soumise au Conseil de normalisation de l'IEEE Standards Association (IEEE SA).

3) Les Publications IEC/IEEE se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC/Sociétés de l'IEEE. Tous les efforts raisonnables sont entrepris afin de s'assurer de l'exactitude du contenu technique des Publications IEC/IEEE; l'IEC ou l'IEEE ne peuvent pas être tenus responsables de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.

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L'IEC/IEEE 62582-3 a été établie par le sous-comité 45A: Systèmes d'instrumentation, de contrôle-commande et d'alimentation électrique des installations nucléaires, du comité d'études 45 de l'IEC: Instrumentation nucléaire, en coopération avec le "Nuclear Power Engineering Committee" de l'IEEE[1] Power and Energy Society, selon l'accord double logo IEC/IEEE passé entre l'IEC et l'IEEE. Il s'agit d'une Norme internationale.

Le présent document est une norme double logo IEC/IEEE.

Cette deuxième édition annule et remplace la première édition parue en 2012. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques suivantes par rapport à l'édition précédente:

a) mise à jour des meilleures pratiques relatives à la surveillance de l'état par la méthode d'allongement en traction;

b) mise à jour de la bibliographie, des références et du contexte.

Le texte de cette Norme internationale est issu des documents suivants de l'IEC:

Projet	Rapport de vote
45A/1524/FDIS	45A/1538/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

Une liste de toutes les parties de la série IEC/IEEE 62582, publiées sous le titre général *Centrales nucléaires – Instrumentation et contrôle-commande importants pour la sûreté – Méthodes de surveillance de l'état des matériels électriques*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

_____

[1] Une liste des participants IEEE est disponible à l'adresse: http://standards.ieee.org/downloads/62582-3/62582-3-2012/62582-3-2012_wg-participants.pdf.

INTRODUCTION

a) Contexte technique, questions principales et structure de la norme

La présente partie de la norme IEC/IEEE traite en particulier des méthodes de mesurage de l'allongement à la rupture, utilisées pour la surveillance de l'état dans le cadre de la gestion du vieillissement des matériels électriques installés dans les centrales nucléaires. La méthode convient plus particulièrement aux échantillons prélevés sur des matériels réalisés à partir de matériaux polymères.

La présente partie de l'IEC/IEEE 62582 est la troisième partie de la série IEC/IEEE 62582. Elle contient des descriptions complètes de la surveillance de l'état, qui repose sur des mesurages de l'allongement à la rupture.

La série IEC/IEEE 62582 est publiée en double logo, ce qui la rend applicable pour la gestion du vieillissement des matériels électriques qualifiés tant dans le cadre des normes IEEE que dans celui des normes IEC.

L'IEC/IEEE 60780-323 définit le terme "qualification par surveillance d'état" qui est un complément aux essais de type. L'état qualifié est établi par un ou plusieurs indicateurs d'état avant le début des conditions accidentelles pour lesquelles le matériel a été évalué en satisfaisant aux exigences de conception dans le cadre des conditions de service spécifiées. L'IEC/IEEE 60780-323 définit le terme "indicateur d'état".

Des recherches importantes ont été réalisées sur les techniques de surveillance d'état et sur l'utilisation de ces techniques dans le cadre de la qualification des matériels, comme cela est indiqué dans les documents NUREG/CR-6704, Vol. 2 (BNL-NUREG-52610), JNES-SS-0903:2009 et IAEA-TECDOC-1825:2017.

La présente norme IEC/IEEE est destinée à être utilisée par les laboratoires d'essai, les exploitants de centrales nucléaires, les évaluateurs de systèmes et les concédants de licence.

b) Positionnement de la présente norme dans la structure de la collection de normes du SC 45A de l'IEC

La Partie 3 de l'IEC/IEEE 62582 est le document de troisième niveau du SC 45A de l'IEC qui traite de la question particulière de l'application et des performances des mesurages de l'allongement à la rupture dans le cadre de la gestion du vieillissement des matériels électriques de mesure et des équipements de contrôle-commande dans les centrales nucléaires.

La Partie 3 de l'IEC/IEEE 62582 doit être lue conjointement avec la Partie 1 de l'IEC/IEEE 62582 qui fournit les exigences pour l'application des méthodes de surveillance de l'état des matériels électriques importants pour la sûreté utilisés dans les centrales nucléaires.

Pour plus d'informations sur la structure de la collection de normes du SC 45A de l'IEC, voir le point d) de la présente introduction.

c) Recommandations et limites relatives à l'application de la présente norme

Il est important de noter que le présent document n'établit pas d'exigences fonctionnelles supplémentaires pour les systèmes de sûreté.

d) Description de la structure de la collection des normes du SC 45A de l'IEC et relations avec d'autres documents de l'IEC, et avec les documents d'autres organisations (AIEA, ISO)

La collection de normes établies par le SC 45A de l'IEC est structurée en quatre niveaux. Les documents de niveau supérieur dans la collection des normes établies par le SC 45A de l'IEC sont l'IEC 61513 et l'IEC 63046.

L'IEC 61513 établit les exigences générales relatives aux systèmes et équipements d'instrumentation et de contrôle-commande (systèmes d'I&C) utilisés pour réaliser des fonctions importantes pour la sûreté des centrales nucléaires. L'IEC 63046 établit les exigences générales relatives aux systèmes d'alimentation électrique des centrales nucléaires; elle couvre les systèmes d'alimentation électrique y compris les alimentations des systèmes d'I&C.

L'IEC 61513 et l'IEC 63046 doivent être prises en compte ensemble et au même niveau. L'IEC 61513 et l'IEC 63046 structurent la collection de normes du SC 45A de l'IEC et constituent un cadre complet qui établit les exigences générales relatives aux systèmes d'instrumentation, de contrôle-commande et d'alimentation électrique des centrales nucléaires.

L'IEC 61513 et l'IEC 63046 font directement référence à d'autres normes du SC 45A de l'IEC quant aux exigences générales relatives à des sujets spécifiques, tels que la catégorisation des fonctions et le classement des systèmes, la qualification, la séparation des systèmes, la défense contre les défaillances de cause commune, la conception des salles de commande, la compatibilité électromagnétique, l'ingénierie des facteurs humains, la cybersécurité, les aspects logiciels et matériels relatifs aux systèmes numériques programmables, la coordination des exigences de sûreté et de sécurité, et la gestion du vieillissement. Il convient de considérer que ces normes, auxquelles il est fait directement référence à ce deuxième niveau, forment, avec l'IEC 61513 et l'IEC 63046, un ensemble documentaire cohérent.

Au troisième niveau, les normes du SC 45A de l'IEC, qui ne sont pas citées en référence directement par l'IEC 61513 ou l'IEC 63046, traitent d'exigences particulières relatives à des matériels particuliers, des méthodes techniques ou des activités spécifiques. Généralement, ces documents, qui font référence aux documents de deuxième niveau pour les exigences générales, peuvent être utilisés de façon isolée.

Un quatrième niveau qui est une extension de la collection de normes du SC 45 de l'IEC correspond aux rapports techniques qui ne sont pas des documents normatifs.

Les normes de la collection du SC 45A de l'IEC mettent en œuvre de manière systématique et décrivent les principes de sûreté et de sécurité et les aspects fondamentaux donnés dans les normes de sûreté de l'AIEA pertinentes pour les centrales nucléaires, ainsi que dans les documents pertinents de la collection de l'AIEA pour la sécurité nucléaire (NSS). Cela concerne en particulier le document d'exigences SSR-2/1 qui établit les exigences de sûreté relatives à la conception des centrales nucléaires, le guide de sûreté SSG-30 qui traite du classement de sûreté des structures, systèmes et composants des centrales nucléaires, le guide de sûreté SSG-39 qui traite de la conception des systèmes d'instrumentation et de contrôle-commande des centrales nucléaires, le guide de sûreté SSG-34 qui traite de la conception des systèmes d'alimentation électrique des centrales nucléaires, le guide de sûreté SSG-51 qui traite de l'ingénierie des facteurs humains lors de la conception des centrales nucléaires et le guide de mise en œuvre NSS42-G qui traite de la sécurité informatique pour les installations nucléaires. La terminologie et les définitions utilisées pour la sûreté et la sécurité dans les normes établies par le SC 45A sont conformes à celles utilisées par l'AIEA.

L'IEC 61513 et l'IEC 63046 ont adopté une présentation similaire à celle de la publication fondamentale de sécurité IEC 61508, avec un cycle de vie d'ensemble et un cycle de vie des systèmes. En ce qui concerne la sûreté nucléaire, l'IEC 61513 et l'IEC 63046 donnent l'interprétation des exigences générales des parties 1, 2 et 4 de l'IEC 61508 pour le secteur nucléaire. Dans ce cadre, l'IEC 60880, l'IEC 62138 et l'IEC 62566 correspondent à l'IEC 61508-3 pour le secteur nucléaire.

L'IEC 61513 et l'IEC 63046 font référence à l'ISO 9001, ainsi qu'aux documents AIEA GSR partie 2, AIEA GS-G-3.1 et AIEA GS-G-3.5 pour les aspects qui concernent l'assurance qualité (QA).

Au deuxième niveau, en ce qui concerne la sûreté nucléaire, l'IEC 62645 est le document chapeau des normes de sécurité du SC 45A de l'IEC. Elle se fonde sur les principes pertinents de haut niveau et sur les concepts principaux des normes génériques de sécurité, en particulier l'ISO/IEC 27001 et l'ISO/IEC 27002; elle les adapte et les complète pour les rendre pertinents pour le secteur nucléaire; elle est en coordination étroite avec la série de normes IEC 62443. Au deuxième niveau, l'IEC 60964 est le document chapeau des normes du SC 45A de l'IEC applicables aux salles de commande, l'IEC 63351 est le document chapeau des normes applicables à l'ingénierie des facteurs humains et l'IEC 62342 est le document chapeau des normes applicables à la gestion du vieillissement.

NOTE 1 On considère que pour la conception des systèmes d'I&C qui mettent en œuvre des fonctions de sûreté conventionnelle dans les centrales nucléaires (par exemple, pour assurer la sécurité des travailleurs, la protection des biens, la prévention contre les risques chimiques, la prévention contre les risques liés au procédé énergétique), des normes nationales ou internationales sont appliquées.

NOTE 2 Le Rapport technique IEC TR 64000 donne une description plus complète de la structure globale de la collection de normes du SC 45A de l'IEC, ainsi que ses relations avec les autres organismes de normalisation et les autres normes.

CENTRALES NUCLÉAIRES – INSTRUMENTATION ET CONTRÔLE-COMMANDE IMPORTANTS POUR LA SÛRETÉ – MÉTHODES DE SURVEILLANCE DE L'ÉTAT DES MATÉRIELS ÉLECTRIQUES –

Partie 3: Allongement à la rupture

1 Domaine d’application

La présente partie de l'IEC/IEEE 62582 fournit des méthodes de surveillance d'état pour les matériaux organiques et polymères des systèmes d'instrumentation et de contrôle-commande. Ces méthodes reposent sur des techniques d'allongement en traction et sont suffisamment détaillées pour obtenir des mesures exactes et reproductibles. Le présent document comprend des exigences concernant le choix des échantillons, le système et les conditions de mesurage, ainsi que l'établissement du rapport des résultats des mesures.

Les différentes parties de l'IEC/IEEE 62582 sont des normes de mesurage, qui sont principalement destinées à être utilisées pour la gestion du vieillissement dans le cadre de la qualification initiale et après installation. L’IEC/IEEE 62582-1 fournit des exigences concernant l’application des autres parties de l'IEC/IEEE 62582 et certains éléments communs à l'ensemble des méthodes. L'IEC/IEEE 60780-323 fournit des informations concernant le rôle de la surveillance de l'état dans la qualification des matériels importants pour la sûreté.

Le présent document s'applique aux matériels qui ne sont pas sous tension.

2 Références normatives

Le présent document ne contient aucune référence normative.