Electrical insulating materials - Determination of the effects of ionizing radiation - Part 5: Procedures for assessment of ageing in service

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NATIONAL FOREWORD

See Eesti standard EVS-EN 60544-5:2012 sisaldab Euroopa standardi EN 60544-5:2012 ingliskeelset teksti.	This Estonian standard EVS-EN 60544-5:2012 consists of the English text of the European standard EN 60544-5:2012.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 13.04.2012.	Date of Availability of the European standard is 13.04.2012.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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English version

Electrical insulating materials - Determination of the effects of ionizing radiation - Part 5: Procedures for assessment of ageing in service

(IEC 60544-5:2011)

Matériaux isolants - Détermination des effets des rayonnements ionisants - Partie 5: Procédures pour l'estimation du vieillissement en service (CEI 60544-5:2011)

Elektroisolierstoffe - Bestimmung der Wirkung ionisierender Strahlung - Teil 5: Bewertungsverfahren für die Alterung während des Einsatzes (IEC 60544-5:2011)

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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CENELEC

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

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Foreword

The text of document 112/171/CDV, future edition 2 of IEC 60544-5, prepared by IEC TC 112, "Evaluation and qualification of electrical insulating materials and systems", was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60544-5:2012.

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)	2012-10-18
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2015-01-18

This document supersedes EN 60544-5:2003.

EN 60544-5:2012 constitutes an editorial revision to align it with standards recently developed by SC 45A as well as with other parts in the EN 60544 series.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60544-5:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60544-4 NOTE Harmonized as EN 60544-4.

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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60544-1	-	Electrical insulating materials - Determination of the effects of ionizing radiation - Part 1: Radiation interaction and dosimetry	EN 60544-1	-
IEC 60544-2	-	Guide for determining the effects of ionizing radiation on insulating materials - Part 2: Procedures for irradiation and test	-	-
IEC 60780	-	Nuclear power plants - Electrical equipment of the safety system - Qualification	-	-
IEC/TR 61244-1	-	Determination of long-term radiation ageing in polymers - Part 1: Techniques for monitoring diffusion-limited oxidation	-	-
IEC/TR 61244-2	-	Determination of long-term radiation ageing in polymers - Part 2: Procedures for predicting ageing at low dose rates	-	-

CONTENTS

INTRODUCTION

Organic and polymeric materials provide a significant proportion of the insulation used in electrical systems. These materials are sensitive to the effects of irradiation and the response varies widely between different types. It is therefore important to be able to assess the degree of degradation of these insulating materials during their service lifetimes. This part of IEC 60544 provides recommended procedures for assessing ageing of insulating materials in service.

There are a number of approaches to the assessment of ageing of polymer-based components exposed to radiation environments [1–4][1]. These are based on the better understanding of the factors affecting ageing degradation which has been developed over several decades. In nuclear power plants, qualification programmes are normally used for selection of components, including those based on polymeric materials. These initial qualification procedures, such as IEEE-323 [5] and IEEE-383 [6], were originally written before there was sufficient understanding of ageing mechanisms. Most of the methods discussed in this part of IEC 60544 are therefore used to supplement the initial qualification process.

This part is the fifth in a series dealing with the effect of ionizing radiation on insulating materials.

Part 1 (Radiation interaction and dosimetry) constitutes an introduction dealing very broadly with the problems involved in evaluating radiation effects. It also provides guidance to dosimetry terminology, several methods of determining exposure and absorbed dose, and methods of calculating absorbed dose in any specific material from the dosimetry method applied.

Part 2 (Procedures for irradiation and test) describes procedures for maintaining seven different types of exposure conditions during irradiation. It also specifies the controls that should be maintained over these conditions so that when test results are reported, reliable comparisons of material performance can be made. In addition, it defines certain important irradiation conditions and test procedures to be used for property change determinations and corresponding end-point criteria.

Part 3 has been incorporated into the second edition of IEC 60544-2.

Part 4 (Classification system for service in radiation environments) provides a recommended classification system for categorizing the radiation endurance of insulation materials.

[1] Figures in square brackets refer to the bibliography.

ELECTRICAL INSULATING MATERIALS – DETERMINATION OF THE EFFECTS OF IONIZING RADIATION –

Part 5: Procedures for assessment of ageing in service

1 Scope and object

This part of IEC 60544 covers ageing assessment methods which can be applied to components based on polymeric materials (e.g. cable insulation and jackets, elastomeric seals, polymeric coatings, gaiters) which are used in environments where they are exposed to radiation.

The object of this standard is aimed at providing methods for the assessment of ageing in service. The approaches discussed in the following clauses cover ageing assessment programmes based on condition monitoring (CM), the use of sample deposits in severe environments and sampling of real-time aged components.

2 Normative references

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.

IEC 60544-1, *Electrical insulating materials – Determination of the effects of ionizing radiation – Part 1: Radiation interaction and dosimetry*

IEC 60544-2, *Guide for determining the effects of ionizing radiation on insulating materials – Part 2: Procedures for irradiation and test*

IEC 61244-1, *Determination of long-term radiation ageing in polymers – Part 1: Techniques for monitoring diffusion-limited oxidation*

IEC 61244-2, *Determination of long-term radiation ageing in polymers – Part 2: Procedures for predicting ageing at low dose rates*

IEC 60780, *Nuclear power plants – Electrical equipment of the safety system – Qualification*