

Electrical insulating materials — A.C. voltage endurance evaluation — Introduction

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National foreword

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This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for its conversion to an international standard. A review of this publication will be initiated not later than three years after its publication by the international organization so that a decision can be taken on its status. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

The UK participation in its preparation was entrusted to Technical Committee GEL/112, Evaluation and qualification of electrical insulating materials and systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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TECHNICAL SPECIFICATION

**Electrical insulating materials – A.C. voltage endurance evaluation –
Introduction**

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ELECTRICAL INSULATING MATERIALS – A.C. VOLTAGE ENDURANCE EVALUATION – INTRODUCTION

1 Scope

This technical specification explains many of the factors involved in voltage endurance tests on electrical insulating materials and systems. It describes the voltage endurance graph, lists test methods illustrating their limitations and gives guidance for evaluating the a.c. voltage endurance of insulating materials and systems from the results of the tests.

The terminology to be used in voltage endurance is defined and explained. It should be emphasized that where this technical specification is concerned with materials, the results may not be directly applicable to the performance of insulating systems.

Voltage endurance tests are used to compare and evaluate insulating materials with regard to their various applications in electrical systems. Determining the ability of electrical insulating materials and systems to endure a.c. voltage stress is complex. The results of voltage endurance tests are influenced by many factors so this technical specification should only be considered as an attempt to present a unified view of voltage endurance for simplified planning and analysis. Some documents for the various practical cases exist and others are being developed.

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.

IEC 60243 (all parts), *Electric strength of insulating materials – Test methods*

IEC 62539, *Guide for the statistical analysis of electrical insulation dielectric breakdown data (IEEE Standard 930:2004)*

3 Terms, definitions and symbols

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

3.1 Terms and definitions

3.1.1

voltage endurance

VE

measure of the ability of solid insulating materials to endure voltage

NOTE In this technical specification, only a.c. voltage is considered.

3.1.2

life

time of any technical system until its failure or loss of serviceability

3.1.3**voltage life**

time for solid insulating materials to dielectric dielectric breakdown under constant voltage stress

3.1.4**voltage endurance coefficient**

VEC

numerical value of the reciprocal of the slope of a straight line log/log VE plot

3.1.5**specimen**

representative test object for assessing the value of one or more physical properties

3.1.6**sample**

group of nominally identical specimens from the same manufacturing batch

3.2 Symbols

c, c' constants in the inverse-power model

E electric stress

E_0 short-time electric strength

E_s short-time electric strength of prestressed specimens

E_t electric threshold stress

f frequency

h, k constants in the exponential model

L time to dielectric dielectric breakdown

m scale parameter in the simple Weibull distribution (one variable)

M scale parameter in the generalized Weibull distribution (two variables)

n exponent of stress in the inverse-power model coinciding with the VEC

n_d differential VEC

n_i initial VEC

R dimensional ratio

t time

t_c time to dielectric breakdown at constant stress

t_0 time to dielectric breakdown at constant stress E_0

t_p time to dielectric breakdown with progressive stress

t_{p0} time to dielectric breakdown with progressive stress producing dielectric breakdown at stress E_0

$\tan \delta$ dissipation factor

β shape parameter in the Weibull distribution of times to dielectric breakdown at constant stress

γ shape parameter of the Weibull distribution of the dielectric breakdown stresses from a progressive stress test

ν number of dielectric breakdown stress values

ν' number of dielectric breakdown times