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BSI Standards Publication

Bushings — Seismic qualification

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National foreword

This Published Document is the UK implementation of IEC/TS 61463:2016.

The UK participation in its preparation was entrusted to Technical Committee PEL/36, Insulators for power systems.

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

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Bushings – Seismic qualification

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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BUSHINGS – SEISMIC QUALIFICATION

FOREWORD

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- The subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 61463, which is a Technical Specification, has been prepared by subcommittee 36A: Insulated bushings, of IEC technical committee 36: Insulators.

This second edition cancels and replaces the first edition published in 1996 and Amendment 1:2000. This edition constitutes a technical revision.

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

a) the seismic spectrum profile has been substituted with the one of IEEE Std 693-2005, worldwide used as a reference;
b) the acceptance criteria have been reviewed and the maximum permissible stress for each main material has been harmonized with the relevant IEC Standard for that material;
c) a load on the head has been prescribed when the bushing is subject to the vibration test;
d) the sine sweep test has been added as a method of search of resonance frequency, worldwide used.

The text of this document is based on the following documents:

Enquiry draft	Report on voting
36A/178/DTS	36A/179/RVC

Full information on the voting for the approval of this document 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 website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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

As it is not always possible to define accurately the seismic severity at the bushing flange level, IEC TS 61463, which is a Technical Specification, presents three alternative methods of qualification. The three methods are equally acceptable. If the required response spectrum (RRS) at the bushing flange is not known, a severity (in terms of acceleration values) based on standard response spectra at the ground level may be used to carry out qualification through one of the three methods described in this document.

When the environmental characteristics are not sufficiently known, qualification by static calculation is acceptable. Where high safety reliability of equipment is required for a specific environment, precise data are used, therefore qualification by dynamic analysis or vibration test is recommended. The choice between vibration testing and dynamic analysis depends mainly on the capacity of the test facility for the mass and volume of the specimen, and, also if non-linearities are expected.

When qualification by dynamic analysis is foreseen, it is recommended that the numerical model be adjusted by using vibration data (see Clause 5).

This document was prepared with the intention of being applicable to bushings whatever their construction material and their internal configuration.The information contained, originally directed to porcelain bushings, has been partially updated to include also composite bushings.

BUSHINGS – SEISMIC QUALIFICATION

1 Scope

IEC TS 61463, which is a Technical Specification, is applicable to alternating current and direct current bushings for highest voltages above 52 kV (or with resonance frequencies placed inside the seismic response spectrum), mounted on transformers, other apparatus or buildings. For bushings with highest voltages less than or equal to 52 kV (or with resonance frequencies placed outside from the seismic response spectrum), due to their characteristics, seismic qualification is not used as far as construction practice and seismic construction practice comply with the state of the art.

This document presents acceptable seismic qualification methods and requirements to demonstrate that a bushing can maintain its mechanical properties, insulate and carry current during and after an earthquake.

The seismic qualification of a bushing is only performed upon request.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-47, *Environmental testing – Part 2-47: Test – Mounting of specimens for vibration, impact and similar dynamic tests*

IEC 60068-2-57, *Environmental testing – Part 2-57: Tests – Test Ff: Vibration – Time-history and sine-beat method*

IEC 60068-3-3:1991, *Environmental testing – Part 3-3: Guidance – Seismic test methods for equipments*

IEC 60137, *Insulated bushings for alternating voltages above 1 000 V*

IEC 61462, *Composite hollow insulators – Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1 000 V – Definitions, test methods, acceptance criteria and design recommendations*

IEC 62155*, Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1 000 V*

IEC 62217*, Polymeric insulators for indoor and outdoor use – General definitions, test methods and acceptance criteria*

ISO 2041, *Mechanical vibration, shock and condition monitoring – Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60068-3-3, IEC 60137, IEC 61462, ISO 2041 and the following apply.