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Bushings for DC application

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC/IEEE 65700-19-03:2018 sisaldab Euroopa standardi EN IEC/IEEE 65700:2018 ingliskeelset teksti.	This Estonian standard EVS-EN IEC/IEEE 65700-19-03:2018 consists of the English text of the European standard EN IEC/IEEE 65700:2018.
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English Version

**Bushings for DC application
(IEC/IEEE 65700-19-03:2014)**Traversées pour application en courant continu
(IEC/IEEE 65700-19-03:2014)Durchführungen für Gleichspannungsanwendungen
(IEC/IEEE 65700-19-03:2014)

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document EN IEC/IEEE 65700:2018 consists of the text of IEC/IEEE 65700-19-03:2014 prepared by IEC/SC 36A "Insulated bushings, of IEC technical committee 36: Insulators and Bushing subcommittee of the IEEE-PES transformer committee".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-02-20
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2021-02-20

This document supersedes EN 62199:2004.

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Endorsement notice

The text of the International Standard IEC/IEEE 65700-19-03:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60296	NOTE	Harmonized as EN 60296.
IEC 60376	NOTE	Harmonized as EN 60376.
IEC 60480	NOTE	Harmonized as EN 60480.
IEC 60836	NOTE	Harmonized as EN 60836.
IEC 60867	NOTE	Harmonized as EN 60867.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050	Series	International Electrotechnical Vocabulary	-	-
IEC 60060-1	2010	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	2010
IEC 60071-1	-	Insulation co-ordination - Part 1: Definitions, principles and rules	EN 60071-1	-
IEC 60071-5	-	Insulation co-ordination - Part 5: Procedures for high-voltage direct current (HVDC) converter stations	EN 60071-5	-
IEC 60076-1	-	Power transformers - Part 1: General	EN 60076-1	-
IEC 60076-2	-	Power transformers - Part 2: Temperature rise for liquid-immersed transformers	EN 60076-2	-
IEC 60076-7	-	Power transformers - Part 7: Loading guide- for oil-immersed power transformers	-	-
IEC 60137	2008	Insulated bushings for alternating voltages above 1 000 V	EN 60137	2008
IEC 60270	-	High-voltage test techniques - Partial discharge measurements	EN 60270	-
IEC 60296	-	Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear	EN 60296	-
IEC 60376	-	Specification of technical grade sulfur hexafluoride (SF ₆) for use in electrical equipment	EN 60376	-
IEC 60480	-	Guidelines for the checking and treatment of sulphur hexafluoride (SF ₆) taken from electrical equipment and specification for its re-use	EN 60480	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60836	-	Specifications for unused silicone insulating liquids for electrotechnical purposes	EN 60836	-
IEC 60867	-	Insulating liquids - Specifications for unused liquids based on synthetic aromatic hydrocarbons	EN 60867	-
IEC 61245	-	Artificial pollution tests on high-voltage insulators to be used on d.c. systems	-	-
IEC 61378-2	-	Convertor transformers - Part 2: Transformers for HVDC applications	EN 61378-2	-
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	EN 61462	-
IEC 62155	-	Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1 000 V	EN 62155	-
CISPR 16-1	Series	Specification for radio disturbance and immunity measuring apparatus and methods	EN 55016-1	Series
CISPR 18-2	-	Radio interference characteristics of overhead power lines and high-voltage equipment - Part 2: Methods of measurement and procedure for determining limits	-	-
IEEE Std C57.19.00™	2004	IEEE General Requirements and Test Procedures for Outdoor Apparatus Bushings (ANSI)	-	-

IEEE Standards Dictionary Online

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

BUSHINGS FOR DC APPLICATION

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 Publication(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.

IEEE Standards documents are developed within IEEE Societies and Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of IEEE and serve without compensation. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards. Use of IEEE Standards documents is wholly voluntary. IEEE documents are made available for use subject to important notices and legal disclaimers (see <http://standards.ieee.org/IPR/disclaimers.html> for more information).

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This International Standard has been prepared by a joint working group of sub-committee 36A: Insulated bushings, of IEC technical committee 36: Insulators and Bushing subcommittee of the IEEE-PES transformer committee¹.

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

FDIS	Report on voting
36A/173/FDIS	36A/174/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.

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 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.

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

¹ A list of IEEE participants can be found at the following URL:
<http://standards.ieee.org/downloads/65700/65700-19-03-2014/65700-19-03-2014_wg-participants.pdf>.

INTRODUCTION

In this first edition of IEC/IEEE 65700-19-03, service experiences as well as established market requirements have been harmonized with existing IEC and IEEE standards, primarily:

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

IEC 62199, *Bushings for DC application*

IEEE Std C57.19.00™, *IEEE Standard General Requirements and Test Procedures for Outdoor Power Apparatus Bushings*

IEEE Std C57.19.03™, *IEEE Standard Requirements, Terminology and Test Code for Bushings for DC Application*

This dual numbered standard replaces the previous IEC and IEEE DC bushing standards.

Where applicable, reference is also made to the following standards:

IEC 61462, *Composite insulators – Hollow insulators for use in outdoor and indoor electrical equipment*; and

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

Non-ceramic bushing insulators are widely used in DC applications and this standard applies to similar qualification procedures on all types of insulators, except for the artificial pollution test. Preparation of a bushing for an artificial pollution test destroys the surface of a composite insulator and therefore cannot be performed on such bushings.

The range of type tests and routine tests has been carefully planned, considering that high voltage direct current (HVDC) power transmission is a mature technology, but still with limited service experience compared to AC systems and voltage coordination may vary with different system HVDC design practices.

Work on IEEE Std C57.19.03 edition 1 was started in 1988 within the Working Group on Bushings for DC Applications of the Bushing Subcommittee of the IEEE Transformers Committee. The working group decided to address requirements for these bushings in a self-standing document because many problems specific to this type of bushing were being experienced within the industry and other available standards on bushings were inadequate for this purpose. The main reference for the resulting document was its counterpart for ac bushings, IEEE Std C57.19.00-1991 and IEC 60137. Requirements were also coordinated with the CIGRE Joint Working Group 12/14.10 as well as with the HVDC Converter Transformer and Smoothing Reactor Subcommittee of the IEEE Transformers Committee, which developed standards for these HVDC apparatus during the same time frame.

IEEE Std C57.19.03:1996 was approved by the IEEE-SA Standards Board on 20 June 1996 and published on 6 January 1997. During the reaffirmation process for this document in 2002, several errors in the document were reported. All known errors were corrected in a corrigendum in December 2005. This revised standard includes the corrections made in the corrigendum.

Work on IEC 62199 started in 2000 by IEC SC 36A, the insulated bushings subcommittee of IEC TC 36, the insulators technical committee, and was largely based on IEEE Std C57.19.03. Edition 1 was published in 2004.

After work on the revision of IEEE Std C57.19.03 was started by IEEE it was agreed at a meeting of IEC TC36 in Sao Paulo in 2008 to approach IEEE to establish a Joint Maintenance Team under the Dual Logo Standard procedure. This was agreed and work on the new document IEC/IEEE 65700-19-03 was started in 2009.

BUSHINGS FOR DC APPLICATION

1 Scope

This International Standard applies to outdoor and indoor bushings of any voltage used on DC systems, of capacitance graded or gas insulated types for use as components of oil-filled converter transformers and smoothing reactors, as well as air-to-air DC bushings. This standard does not apply to the following:

- cable terminations (potheads);
- bushings for instrument transformers;
- bushings for test power supplies;
- bushings applied with gaseous insulation (other than air at atmospheric pressure) external to the bushing;
- bushings for industrial application;
- bushings for traction application;
- bushings for distribution class transformers.

This standard makes reference to IEC 60137 for general terms and conditions and defines the special terms used, operating conditions, ratings, test procedures as well as general mechanical and electrical requirements for bushings for DC application.

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 60050, *International Electrotechnical Vocabulary (IEV)*. Available from: <http://www.electropedia.org/>

IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60071-1, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60071-5, *Insulation co-ordination – Part 5: Procedures for high-voltage direct current (HVDC) converter stations*

IEC 60076-1, *Power Transformers – Part 1: General*

IEC 60076-2, *Power Transformers – Part 2: Temperature rise for liquid-immersed transformers*

IEC 60076-7, *Power Transformers – Part 7: Loading guide for oil-immersed power transformers*

IEC 60137:2008, *Insulated bushings for alternating voltages above 1000 V*

IEC 60270, *High-voltage test techniques – Partial discharge measurements*

IEC 60296, *Fluids for electrotechnical applications – Unused mineral insulating oils for transformers and switchgear*

IEC 60376, *Specification of technical grade sulfur hexafluoride (SF6) for use in electrical equipment*

IEC 60480, *Guidelines for the checking and treatment of sulfur hexafluoride (SF6) taken from electrical equipment and specification for its re-use*

IEC 60836, *Specifications for unused silicone insulating liquids for electrotechnical purposes*

IEC 60867, *Insulating liquids - Specifications for unused liquids based on synthetic aromatic hydrocarbons*

IEC 61245, *Artificial pollution tests on high-voltage insulators to be used on d.c. systems*

IEC 61378-2, *Converter transformers – Part 2: Transformers for HVDC Applications*

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*

CISPR 16-1 (all parts), *Specification for radio disturbance and immunity measuring apparatus and methods*

CISPR 18-2, *Radio interference characteristics of overhead power lines and high-voltage equipment – Parts 2: Methods of measurement and procedure for determining limits*

IEEE Std C57.19.00™-2004, *IEEE General Requirements and Test Procedures for Outdoor Apparatus Bushings (ANSI)*

IEEE Standards Dictionary Online²

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60137, IEEE Std C57.19.00, IEC 60050-471 and the IEEE Standards Dictionary Online, as well as the following, apply.

3.1.1

DC bushing

bushing subject to DC voltage stress, i.e. bushings applied to the valve winding side of a converter transformer, bushings applied to a DC smoothing reactor, wall bushing or a bushing applied to a converter valve

² Subscription is available at http://www.ieee.org/portal/innovate/products/standard/standards_dictionary.html