



DPC: 19/30364698 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 15 July 2019

Origin: International

Latest date for receipt of comments: 06 August 2019

Project No. 2017/02580

Responsible committee: PEL/36 Insulators for power systems

Interested committees:

Title: Draft BS EN IEC 62217 Polymeric HV insulators for indoor and outdoor use - General definitions, test methods and acceptance criteria.

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 06 August 2019

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



36/459/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 62217 ED3

DATE OF CIRCULATION:

2019-07-12

CLOSING DATE FOR COMMENTS:

2019-09-06

SUPERSEDES DOCUMENTS:

36/420A/RR

IEC TC 36 : INSULATORS

SECRETARIAT:

Australia

SECRETARY:

Ms Manjoo Lalwani

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☒ QUALITY ASSURANCE

☐ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Polymeric HV insulators for indoor and outdoor use - General definitions, test methods and acceptance criteria

NOTE FROM TC/SC OFFICERS:

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
4 Identification.....	11
5 Environmental conditions.....	11
6 Information on transport, storage and installation	11
7 Classification of tests	11
7.1 Design tests.....	12
7.2 Type tests.....	12
7.3 Sample tests.....	12
7.4 Routine tests	12
8 General requirements for insulator test specimens	12
9 Design tests	13
9.1 General.....	13
9.2 Tests on interfaces and connections of end fittings	13
9.2.1 General	13
9.2.2 Test specimens	13
9.2.3 Reference voltage and temperature for verification tests.....	13
9.2.4 Reference dry power frequency test	14
9.2.5 Product specific pre-stressing.....	14
9.2.6 Water immersion pre-stressing	14
9.2.7 Verification tests.....	14
9.3 Tests on housing material.....	15
9.3.1 Hardness test	15
9.3.2 Accelerated weathering test.....	16
9.3.3 Tracking and erosion test – 1 000 h salt fog a.c. voltage test.....	16
9.3.4 Flammability test	18
9.3.5 Hydrophobicity transfer test	19
9.4 Tests on core material	20
9.4.1 Porosity test (Dye penetration test).....	20
9.4.2 Water diffusion test.....	21
9.4.3 Stress corrosion test.....	24
Annex A (informative) Recommended Application of tests.....	25
Annex B (informative) Explanation of the concept of classes for the design tests	26
Annex C (informative) Difference between the tracking and erosion and accelerated ageing test on polymeric insulators.....	27
Annex D (informative) Electric field control	28
Bibliography.....	30
Figure 1 –Illustration of the electrodes position and axial length	15
Figure 2 –Examples of test specimen for core material	21
Figure 3 – Example of boiling container for the water diffusion test	22

47	Figure 4 – Electrodes for the voltage test.....	23
48	Figure 5 – Voltage test circuit	23
49	Figure 6 – Example for permanent load application for stress corrosion test	24
50	Figure D.1 –Example of triple point at the sealing of long rod insulator	29
51		
52	Table 1 – Normal environmental conditions.....	11
53	Table 2 – Initial NaCl content of the water as a function of the specimen dimensions	18
54	Table 3 – Flammability requirements	19
55	Table A.1 – Recommended application on housing materials	25
56	Table A.2 – Recommended application on core materials	25
57		
58		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**IEC 62217- POLYMERIC HV INSULATORS FOR INDOOR AND OUTDOOR
USE - GENERAL DEFINITIONS, TEST METHODS AND ACCEPTANCE
CRITERIA****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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
 - 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
 - 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
 - 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
 - 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
 - 6) All users should ensure that they have the latest edition of this publication.
 - 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
 - 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.
 - 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.
- International Standard IEC 62217 has been prepared by IEC technical committee 36: Insulators.
- This third edition of the standard cancels and replaces the second edition, published in 2012. It constitutes its technical revision and introduces the following important changes:
- a) The scope of the standard is specified to comprise solid core, hollow core and resin insulators used for both a.c. and d.c. systems in indoor and outdoor applications of HV overhead lines and substations; hybrid insulators with ceramic core and polymeric housing are also included, while coated insulators (e.g. with Room Temperature Vulcanized (RTV) silicone rubber coatings) are not considered in this standard;
 - b) Steep-front impulse voltage test is modified to avoid unwanted flashovers between the leads of the electrodes;
 - c) Differences between HTM and non-HTM as housing materials are specified and relevant test method and acceptance criteria for polymeric insulators with HTM housing are new introduced;
 - d) Acceptance criteria in water diffusion test of core materials is modified;
 - e) Stress corrosion test for core materials is new introduced;

f) Annex A summarizes recommended test procedures for evaluating the quality of housing materials and core materials;

g) Annex D is introduced to remind the control of electric field of polymeric insulators.

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

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The National Committees are requested to note that for this document the stability date is 20XX..

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

Polymeric insulators consist either of one insulating material (resin insulators) or two or several insulating materials (composite insulators). The insulating materials are generally cross-linked organic materials synthesised from carbon or silicon chemistry and form the insulating body. Insulating materials can be composed from organic materials containing various inorganic and organic ingredients, such as fillers and extenders. End fittings are often used at the ends of the insulating body to transmit mechanical loads. Despite these common features, the materials used and the construction details employed by different manufacturers may be widely different.

The tests given in this standard are those which are, in general, common to a great majority of insulator designs and materials, whatever their final application. Considering the increasing applications of polymeric insulators, the scope of this standard specifies a wider range and more stringent technical requirements for solid core, hollow core and resin insulators used in a.c. and d.c. systems in indoor and outdoor applications of HV overhead lines and substations to ensure proper insulator performance under normal operating conditions. The technical requirements have been regrouped in this standard to avoid repetition of the relevant product standards and drift between procedures as the various product standards are drafted or revised.

The majority of these tests have been grouped together as "Design tests", to be performed only once for insulators of the same design. The design tests are intended to eliminate insulator designs, materials or manufacturing technologies which are not suitable for high-voltage applications. The influence of time on the electrical properties of the complete polymeric insulator and its components (core material, housing, interfaces etc.) has been considered in specifying the design tests in order to ensure a satisfactory lifetime under normal operating and environmental conditions. However, according to the practical experience gathered over recent years, in order to ensure satisfactory long-term performance of insulators, there appeared a necessity to revise the acceptance criteria, to modify some test procedures as well as to introduce new tests, especially for insulating materials used in polymeric insulators.

Pollution tests, according to IEC 60507 or IEC 61245, are not included in this document. Specific pollution tests for polymeric insulators are still under consideration.

The 1000 h salt-fog tracking and erosion test is considered as a screening test intended to reject materials or designs which are inadequate. Tracking and erosion tests are not intended to evaluate long term performance of insulators in harsh environments by simulation of multiple environmental factors as ageing tests do for insulator designs under cumulative service stresses. Such tests, e.g. the 5000 h multi stress test in IEC/TR 62730 (2012) or other tests, are not considered in the present standard.

When considering the wide use of silicone rubber insulators with hydrophobicity transfer property, relevant test procedures are introduced. However, the hydrophobicity transfer test in the standard is intended to distinguish the hydrophobicity transfer material (HTM) from non-HTM, rather than to screen good HTM. For core materials, the acceptance criteria for water diffusion test is modified. Stress corrosion test for insulators subjected to tensile stress is introduced to minimize risks of brittle fractures. In Annex A, the recommended applications of the tests are classified into the procedures for separately evaluating the quality of housing materials and core materials. Annex D is introduced to remind the control of electric field of polymeric insulators.

IEC Guide 111 has been followed wherever possible during the preparation of this standard.

IEC 62217_POLYMERIC HV INSULATORS FOR INDOOR AND OUTDOOR USE -GENERAL DEFINITIONS, TEST METHODS AND ACCEPTANCE CRITERIA

1 Scope

This International Standard is applicable to polymeric insulators for a.c. systems with a nominal voltage greater than 1 000 V (frequency less than 100 Hz) and d.c. systems with a nominal voltage greater than 1 500 V whose insulating body consists of one or various organic materials. Indoor and outdoor application and used for both HV overhead lines and substations including solid-core, hollow core and resin insulators. Hybrid insulators with ceramic core and polymeric housing are included, while coated insulators (e.g. with RTV silicone rubber coatings) are not included in this standard.

The object of this standard is

- to define the common terms used for polymeric insulators;
- to prescribe common test methods for design tests on polymeric insulators;
- to prescribe acceptance or failure criteria, if applicable;

These tests, criteria and recommendations are intended to ensure a satisfactory life-time under normal operating and environmental conditions (see Clause 5). This standard shall only be applied in conjunction with the relevant product standard.

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 60050-471:2007, International Electrotechnical Vocabulary - Part 471: Insulators

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

IEC 60068-2-11, Environmental testing - Part 2: Tests. Test KA: Salt mist

IEC 60507:2013, Artificial pollution tests on high-voltage ceramic and glass insulators to be used on a.c. systems

IEC 60695-11-10, Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods

IEC 60721-1, Classification of environmental conditions - Part 1: Environmental parameters and their severities

IEC 60815-1, Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 1: Definitions, information and general principles

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 TR 62039, Selection guide for polymeric materials for outdoor use under HV stress

IEC TS 62073, Guidance on the measurement of wettability of insulator surfaces

IEC TR 62662, Guidance for production, testing and diagnostics of polymer insulators with respect to brittle fracture of core materials

225 IEC TS 62896, Hybrid insulators for a.c. and d.c. high-voltage applications – Definitions, test
226 methods and acceptance criteria

227 ISO 868, Plastics and ebonite - Determination of indentation hardness by means of a
228 durometer (Shore hardness)

229 ISO 4287, Geometrical Product Specifications (GPS) - Surface Texture; Profile method -
230 Terms, definitions and surface texture parameters

231 ISO 4892-1, Plastics - Methods of exposure to laboratory light sources - Part 1; General
232 Guidance

233 ISO 4892-2, Plastics - Methods of exposure to laboratory light sources - Part 2; Xenon-arc
234 sources

235 **3 Terms and definitions**

236 For the purposes of this document the terms and definitions given in IEC 60050-471:2007 and
237 the following apply:

238 **3.1**

239 **high voltage (HV)**

240 voltage over 1 000 V a.c. or over 1 500 V d.c. or over 1 500 V peak value

241 **3.2**

242 **polymeric insulator**

243 insulator whose insulating body consists of at least one organic based material

244 Note 1 to entry: Polymeric insulators are also known as non-ceramic insulators.

245 Note 2 to entry: Coupling devices may be attached to the ends of the insulating body.

246 [SOURCE: IEC 60050-471:2007, 471-01-13]

247 **3.3**

248 **resin insulator**

249 polymeric insulator whose insulating body consists of a solid insulator trunk and sheds
250 protruding from the insulator trunk made from only one organic based housing material (e.g.
251 cycloaliphatic epoxy)

252 **3.4**

253 **composite insulator**

254 insulator made of at least two insulating parts, namely a core and a housing equipped with
255 metal fittings

256 Note 1 to entry: Composite insulators, for example, can consist either of individual sheds mounted on the core,
257 with or without an intermediate sheath, or alternatively, of a housing directly moulded or cast in one or several
258 pieces on to the core.

259 [SOURCE: IEC 60050-471:2007, 471-01-02]

260 **3.5**

261 **core**

262 central insulating part of an insulator which provides the mechanical characteristics

263 Note 1 to entry: The housing and sheds are not part of the core.

264 [SOURCE: IEC 60050-471:2007, 471-01-03]

265 **3.6**

266 **insulator trunk**

267 central insulating part of an insulator from which the sheds project

268 Note 1 to entry: Also known as shank on smaller insulators.

269 [SOURCE: IEC 60050-471:2007, 471-01-11]