IEC 62772

Edition 1.0 2016-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Composite hollow core station post insulators for substations with a.c. voltage greater than 1 000 V and d.c. voltage greater than 1 500 V – Definitions, test methods and acceptance criteria

Isolateurs supports composites creux pour postes présentant une tension alternative supérieure à 1 000 V et une tension continue supérieure à 1 500 V – Définitions, méthodes d'essai et critères d'acceptation

IEC 62772:2016-08(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 62772

Edition 1.0 2016-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Composite hollow core station post insulators for substations with a.c. voltage greater than 1 000 V and d.c. voltage greater than 1 500 V – Definitions, test methods and acceptance criteria

Isolateurs supports composites creux pour postes présentant une tension alternative supérieure à 1 000 V et une tension continue supérieure à 1 500 V – Définitions, méthodes d'essai et critères d'acceptation

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.080.10

ISBN 978-2-8322-3601-7

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

COMPOSITE HOLLOW CORE STATION POST INSULATORS FOR SUBSTATIONS WITH A.C. VOLTAGE GREATER THAN 1 000 V AND D.C. VOLTAGE GREATER THAN 1 500 V – 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 62772 has been prepared by IEC technical committee 36: Insulators.

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

FDIS	Report on voting
36/386/FDIS	36/389/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 website 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.

INTRODUCTION

Composite hollow core station post insulators consist of an insulating hollow core (tube), bearing the mechanical load protected by a polymeric housing, the load being transmitted to the core by end fittings. The hollow core is filled entirely with an insulating material. The core is made of resin impregnated fibres.

Composite hollow core station post insulators are typically applied as post insulators in substations. In order to perform the design tests, IEC 62217 is to be applied for materials and interfaces of the insulator. Some tests have been grouped together as "design tests", to be performed only once on insulators which satisfy the same design conditions. For all design tests on composite hollow core station post insulators, the common clauses defined in IEC 62217 are applied. As far as practical, the influence of time on the electrical and mechanical properties of the components (core material, housing, interfaces etc.) and of the complete composite hollow core station post insulator has been considered in specifying the design tests to ensure a satisfactory life-time under normally known stress conditions in service.

This standard relates to 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*, as well as IEC 62231, *Composite station post insulators for substations with a.c. voltages greater than 1 000 V up to 245 kV – Definitions, test methods and acceptance criteria*. Tests and requirements described in IEC 62231 can be used although this standard has no voltage limit.

The use of polymeric housing materials that show hydrophobicity and hydrophobicity transfer mechanism (HTM) is preferred for composite hollow core station post insulators. This is due to the fact that the influence of diameter can be significant for hydrophilic surfaces (see also IEC 60815-3). For instance silicone rubber is recognized as successful countermeasure against severe polluted service conditions. The ageing performance of the polymeric housing can be evaluated by the salt fog test standardized in IEC 62217. For the time being, no test is defined to quantify the HTM, but CIGRE SC D.1 deals with this subject intensively and Technical Brochure No. 442 is available for the evaluation of the retention of the hydrophobicity.

COMPOSITE HOLLOW CORE STATION POST INSULATORS FOR SUBSTATIONS WITH A.C. VOLTAGE GREATER THAN 1 000 V AND D.C. VOLTAGE GREATER THAN 1 500 V – DEFINITIONS, TEST METHODS AND ACCEPTANCE CRITERIA

1 Scope

This International Standard applies to composite hollow core station post insulators consisting of a load-bearing insulating tube (core) made of resin impregnated fibres an insulating filler material (e.g. solid, liquid, foam, gaseous – pressurized or unpressurized), a housing (outside the insulating tube) made of polymeric material (for example silicone or ethylene-propylene) and metal fixing devices at the ends of the insulating tube. Composite hollow core station post insulators as defined in this standard are intended for general use in substations in both, outdoor and indoor environments, operating with a rated AC voltage greater than 1 000 V and a frequency not greater than 100 Hz or for use in direct current systems with a rated voltage greater than 1 500 V.

The object of this standard is:

– to define the terms used;
– to prescribe test methods;
– to prescribe acceptance criteria.

All the tests in this standard, apart from the thermal-mechanical test, are performed at normal ambient temperature. This standard does not prescribe tests that may be characteristic of the apparatus of which the composite hollow core station post insulator ultimately may form a part. Further technical input is required in this area.

NOTE 1 "Pressurized" means a permanent gas or liquid pressure greater than 0,05 MPa (0,5 bar) gauge. The gas can be dry air or inert gases, for example sulphur hexafluoride, nitrogen, or a mixture of such gases.

NOTE 2 "Unpressurized" means a gas or liquid pressure smaller than or equal to 0,05 MPa (0,5 bar) gauge.

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

IEC 60168:2001, *Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 000 V*

IEC 61109:2008, *Insulators for overhead lines – Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria*

IEC 61462:2007, *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 62217:2012, *Polymeric HV insulators for indoor and outdoor use – General definitions, test methods and acceptance criteria*

IEC 62231:2006, *Composite station post insulators for substations with a.c. voltages greater than 1 000 V up to 245 kV – Definitions, test methods and acceptance criteria*

3 Terms and definitions

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

3.1
composite hollow core station post insulator
insulator consisting of at least three insulating parts, namely a tube, an internal filler and a housing

Note 1 to entry: The housing may consist either of individual sheds mounted on the tube, with or without an intermediate sheath, or directly applied in one or several pieces onto the tube. A composite hollow core station post insulator unit is permanently equipped with fixing devices.

3.2
tube (core)
insulating part of a composite hollow core station post insulator designed to ensure the mechanical characteristics

Note 1 to entry The tube is generally cylindrical or conical, but may have other shapes (for example barrel). The tube is made of resin impregnated fibres.

Note 2 to entry Resin impregnated fibres are structured in such a manner as to achieve sufficient mechanical strength. Layers of different fibres may be used to fulfil special requirements.

3.3
filler
insulating material filling the entire space (e.g. solid, liquid, foam, gaseous – pressurized or unpressurized) of the hollow core station post insulator which has no load bearing function

3.4
fixing device (end fitting)
integral component or formed part of an insulator intended to connect it to a supporting structure, or to a conductor, or to an item of equipment, or to another insulator

Note 1 to entry: Where the end fitting is metallic, the term “metal fitting” is normally used.

[SOURCE: IEC 60050-471:2007, 471-01-06]

3.5
coupling
part of the end fitting which transmits the load to the accessories external to the insulator

[SOURCE: IEC 62217:2012, definition 3.13]

3.6
connection zone
zone where the mechanical load is transmitted between the insulating body and the end fitting

[SOURCE: IEC 62217:2012, definition 3.12]

3.7
housing
external insulating part of composite hollow core station post insulator providing necessary creepage distance and protecting the tube from the environment

Note 1 to entry: If an intermediate sheath is used it forms a part of the housing

[SOURCE: IEC 62217:2012, definition 3.7, modified ("composite insulator" replaced by "composite hollow core station post insulator", "protecting core" replaced by "protecting the tube")]

3.8
shed
insulating part, projecting from the insulator trunk, intended to increase the creepage distance

Note 1 to entry: The shed can be with or without ribs

[SOURCE: IEC 60050-471:2007, 471-01-15]

3.9
insulator trunk
central insulating part of an insulator from which the sheds protrude

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

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

3.10
creepage distance
shortest distance or the sum of the shortest distances along the surface of an insulator between two conductive parts which normally have the operating voltage between them

Note 1 to entry: The surface of any non-insulating jointing material is not considered as forming part of the creepage distance.

Note 2 to entry: If a high resistance coating is applied to parts of the insulating part of an insulator, such parts are considered to be effective insulating surfaces and the distance over them is included in the creepage distance.

[SOURCE: IEC 60050-471:2007, 471-01-04]

3.11
arcing distance
shortest distance in the air external to the insulator between the metallic parts which normally have the operating voltage between them

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

3.12
interface
surface between the different materials

Note 1 to entry: Various interfaces occur in most composite insulators, e.g.

- between housing and end fittings,
- between various parts of the housing; e.g. between sheds, or between sheath and sheds,
- between core and housing
- between core and filler.

[SOURCE: IEC 62217:2012, definition 3.11]

3.13
damage limit of the tube under mechanical stress
limit below which mechanical loads can be applied, at normal ambient temperature, without micro damage to the composite tube

Note 1 to entry: Applying such loads means that the tube is in a reversible elastic phase. If the damage limit of the tube is exceeded, the tube is in an irreversible plastic phase, which means permanent damage to the tube which may not be visible at a macroscopic level (for a quantitative definition see Annex C of IEC 61462:1997).

3.14
specified mechanical load
SML
cantilever load specified by the manufacturer that is used in the mechanical tests in accordance with IEC 61462

Note 1 to entry The load is normally applied by bending at normal ambient temperature.

Note 2 to entry The SML forms the basis of the selection of composite hollow station post insulators with regard to external loads.

3.15
maximum mechanical load
MML
highest cantilever load which is expected to be applied to the composite hollow core station post insulators in accordance with IEC 61462

Note 1 to entry: The MML of the composite hollow core station post insulator is specified by the insulator manufacturer.

3.16
specified cantilever load
SCL
cantilever load which can be withstood by the insulator when tested under the prescribed conditions in accordance with IEC 62231

3.17
maximum design cantilever load
MDCL
load level above which damage to the insulator begins to occur and that should not be exceeded in service in accordance with IEC 62231

Note 1 to entry: In the context of this standard (IEC 62772) MDCL is considered to be equal to 1,25 times MML as determined in IEC 61462:1997, Clause 8 or 0,5 times of SML.

3.18
specified torsion load
SToL
torsion load level which can be withstood by the insulator when tested under the prescribed conditions in accordance with IEC 62231

3.19
maximum design torsion load
MDToL
load level above which damage to the insulator begins to occur and that should not be exceeded in service in accordance with IEC 62231

3.20
specified tension load
STL
tension load which can be withstood by the insulator when tested under the prescribed conditions in accordance with IEC 62231

3.21
maximum design tension load
MDTL
load level above which damage to the insulator begins to occur and that should not be exceeded in service in accordance with IEC 62231

3.22
specified compression load
SCoL
compression load which can be withstood by the insulator when tested under the prescribed conditions in accordance with IEC 62231

3.23
buckling load
compression load that induces buckling of the insulator core in accordance with IEC 62231

3.24
maximum design compression load
MDCoL
load level above which damage to the insulator begins to occur and that should not be exceeded in service in accordance with IEC 62231 and IEC 61462

3.25
failing load of a composite hollow core station post insulator
maximum load that can be reached when the insulator is tested under the prescribed conditions (valid for bending or pressure tests)

Note 1 to entry: Damage to the core and / or the connection zone is likely to occur at loads lower than the insulator failing load.

3.26
deflection under cantilever load
displacement of a point on an insulator, measured perpendicularly to its axis, under the effect of a load applied perpendicularly to this axis

Note 1 to entry: Deflection/load relationships are determined by the manufacturer.

3.27
residual deflection
difference between the initial deflection of a composite hollow core station post insulator prior to bending load application, and the final deflection after release of the load

Note 1 to entry: The measurement of residual deflection serves for qualitative comparison with strain gauge measurements.

3.28
residual angular displacement
difference between the initial angular displacement, if any, of one of the insulator end fitting with respect to the other insulator end fitting measured prior to the application of the torsion load and the final angular displacement measured after torsion load release

Note 1 to entry: The residual angular displacement may depend on the duration of application of the torsion load and on the time duration between the torsion load release and the measurement of the displacement.

3.29
specified internal pressure
SIP
internal pressure specified by the manufacturer which is verified during a type test at normal ambient temperature

Note 1 to entry: The SIP forms the basis of the selection of composite hollow station post insulators with respect to internal pressure.

3.30
maximum service pressure
MSP
difference between the maximum absolute internal pressure at maximum operational temperature and the normal outside pressure

Note 1 to entry The MSP of the composite hollow core station post insulator is specified by the insulator manufacturer.

Note 2 to entry The MSP is equivalent to "design pressure" as used for ceramic hollow insulators (see IEC 62155).

3.31
specified temperatures
highest and lowest temperature permissible for the composite hollow core station post insulator

Note 1 to entry: The specified temperatures are specified by the manufacturer.

3.32
manufacturer
individual or organization producing the composite hollow core station post insulator

3.33
equipment manufacturer
individual or organization producing the electrical equipment utilizing the composite hollow core station post insulator

4 Identification and marking

The manufacturer's drawing shall show the relevant dimensions and values necessary for identifying and testing the insulator in accordance with this standard. The drawing shall also show applicable manufacturing tolerances. In addition, the relevant IEC designation, when available, shall be stated on the drawing.

Each composite hollow core station post insulator shall be marked with the name or trade mark of the manufacturer and the year of manufacture. In addition, each hollow core station post composite insulator shall be marked with the type reference and serial numbers in order to allow identification. In addition, each insulator shall be marked with at least the maximum design mechanical load, for example: MDCL: 4 kN. This marking shall be legible and indelible.

5 Environmental conditions

See description in IEC 62217.

6 Information on transport, storage and installation

See description in IEC 62217.

7 Classification of tests

7.1 General

The tests are divided into groups as follows:

7.2 Design tests

These tests are intended to verify the suitability of the design, materials and manufacturing technology.

A composite hollow core station post insulators design is defined by:

- materials and design of the tube, housing, filler and manufacturing method,
- material of the end fittings, their design and method of attachment,
- layer thickness of the housing over the tube (including a sheath where used).

For new designs and when changes in the design occur, re-qualification shall be done according to Table 1.

7.3 Type tests

Type tests are intended to verify the main characteristics of a composite hollow core station post insulator, which depend mainly on its shape and size. Type tests in accordance with Table 1 shall be applied to composite hollow core station post insulators, the class of which has passed the design tests. They shall be repeated only when the type or material of the composite hollow core station post insulator is changed (see Table 1). The type tests shall be performed, according to the type tests defined in IEC 62231.

Electrically, a composite hollow core station post insulator type is defined by the

- arcing distance,
- creepage distance,
- housing profile,
- internal filler.

Mechanically, a composite hollow core station post insulator type is defined by the

- length (only for the compression and buckling withstand load test),
- tube‘s diameter, wall thickness, design and material,
- design and method of attachment of the end fittings.

7.4 Sample tests

These tests are for the purpose of verifying the characteristics of composite hollow core station post insulators which depend on the manufacturing quality and the material used. They shall be made on insulators taken at random from batches offered for acceptance.

7.5 Routine tests

These tests are for the purpose of eliminating composite hollow core station post insulators with manufacturing defects. They shall be made on each composite hollow core station post insulator.