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INTERNATIONAL STANDARD

colour inside

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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COMPOSITE HOLLOW CORE STATION POST INSULATORS ~~FOR SUBSTATIONS~~ WITH AC VOLTAGE GREATER THAN 1 000 V AND DC 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.
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IEC 62772 has been prepared by IEC technical committee 36: Insulators. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

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

a) modifications of terms and definitions;
b) modifications of tests procedures included in IEC TR 62039 and IEC 62217 (Hydrophobicity transfer test; Water diffusion test on the core with housing);
c) harmonization of Table 1 (Required design and type tests) with other product standards;
d) update of Annex A (Qualification of fillers);
e) addition of a new informative Annex B (Load definitions, relationship of loads).

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

Draft	Report on voting
36/569/FDIS	36/587/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

IMPORTANT – The "colour inside" logo on the cover page of this document 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

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 document 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 AC 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~~ despite the intended operating voltage limit for substations.

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.~~ For the time being, the 1 000 h AC tracking and erosion test of IEC 62217 is used to establish a minimum requirement for the tracking and erosion resistance, for both AC and DC.

Composite hollow core station post insulators are used in both AC and DC applications. Before the appropriate standard for DC applications will be issued, the majority of tests listed in this standard can also be applied to DC insulators. In spite of this, a specific tracking and erosion test procedure for DC applications as a design test is still being considered to be developed. Some information about the difference of AC and DC material erosion test can be found in the CIGRE Technical Brochure 611 [8][1]. For the time being, the 1 000 h AC tracking and erosion test of IEC 62217 is used to establish a minimum requirement for the tracking and erosion resistance.

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1 Numbers in square brackets refer to the Bibliography.

COMPOSITE HOLLOW CORE STATION POST INSULATORS ~~FOR SUBSTATIONS~~ WITH AC VOLTAGE GREATER THAN 1 000 V AND DC VOLTAGE GREATER THAN 1 500 V – DEFINITIONS, TEST METHODS AND ACCEPTANCE CRITERIA

1 Scope

This document, which is an International Standard, applies to composite hollow core station post insulators consisting of a load-bearing insulating tube (core) made of resin impregnated fibres, 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 DC.

The object of this document is:

– to define the terms used;

– to ~~prescribe~~ specify test methods;

– to ~~prescribe~~ specify acceptance criteria.

All the tests in this document, apart from the thermal-mechanical test, are performed at normal ambient temperature. This document does not ~~prescribe~~ specify tests that ~~may be~~ are characteristic of the apparatus of which the composite hollow core station post insulator ultimately may form a part (e.g. disconnector switch, reactor support, HVDC valves). ~~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 1000 V*

IEC 61109~~:2008~~, *Insulators for overhead lines – Composite suspension and tension insulators for AC 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 AC voltages greater than 1 000 V up to 245 kV – Definitions, test methods and acceptance criteria*

IEC TR 62039, *Selection guidelines for polymeric materials for outdoor use under HV stress*

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INTERNATIONAL STANDARD

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Composite hollow core station post insulators 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 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 62772:2023-11(en-fr)

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The object of this document is:

– to define the terms used;

– to specify test methods;

– to specify acceptance criteria.

All the tests in this document, apart from the thermal-mechanical test, are performed at normal ambient temperature. This document does not specify tests that are characteristic of the apparatus of which the composite hollow core station post insulator ultimately may form a part (e.g. disconnector switch, reactor support, HVDC valves).

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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 62217, *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 AC voltages greater than 1 000 V up to 245 kV – Definitions, test methods and acceptance criteria*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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ISOLATEURS SUPPORTS COMPOSITES CREUX 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

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L'IEC 62772 a été établie par le comité d'études 36 de l'IEC: Isolateurs. Il s'agit d'une Norme internationale.

Cette deuxième édition annule et remplace la première édition parue en 2016. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) modification des termes et définitions;
b) modifications des procédures d'essai incluses dans l'IEC TR 62039 et l'IEC 62217 (Essai de transfert d'hydrophobicité; Essai de pénétration d'eau sur noyau avec revêtement);
c) harmonisation du Tableau 1 (Essais de conception et essais de type exigés) avec d'autres normes de produits;
d) mise à jour de l'Annexe A (Qualification des charges internes);
e) ajout d'une nouvelle Annexe B informative (Définition des charges et relations entre elles).

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
36/569/FDIS	36/587/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

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INTRODUCTION

Les isolateurs supports composites creux sont constitués d'un noyau creux isolant (tube), supportant la charge mécanique et protégé par un revêtement polymère; la charge mécanique est transmise au noyau par l'intermédiaire des armatures d'extrémité. Le noyau creux est entièrement rempli de matériau isolant. Le noyau est composé de fibres de verre imprégnées de résine.

Les isolateurs supports composites creux sont en général utilisés comme supports isolants dans les postes. Pour procéder aux essais de conception, l'IEC 62217 est à appliquer aux matériaux et interfaces de l'isolateur. Des essais regroupés sous la dénomination "Essais de conception" sont réalisés une fois seulement pour les isolateurs satisfaisant aux mêmes conditions de conception. Pour tous les essais de conception réalisés sur des isolateurs supports composites creux, les articles communs définis dans l'IEC 62217 s'appliquent. Pour autant que cela soit applicable, l'influence du temps sur les propriétés électriques et mécaniques des composants (matériau du noyau, revêtement, interfaces, etc.) et de l'isolateur support composite creux complet a été prise en compte dans la spécification des essais de conception, afin d'assurer une durée de vie satisfaisante dans des conditions de contrainte normalement connues en service.

Le présent document fait référence à l'IEC 61462, *Isolateurs composites creux – Isolateurs avec ou sans pression interne pour utilisation dans des appareillages électriques de tensions nominales supérieures à 1 000 V – Définitions, méthodes d'essais, critères d'acceptation et recommandations de conception*, ainsi qu'à l'IEC 62231, *Isolateurs supports composites rigides à socle destinés aux postes à courant alternatif de tensions supérieures à 1 000 V jusqu'à 245 kV – Définitions, méthodes d'essai et critères d'acceptation*. Les essais et exigences décrits dans l'IEC 62231 peuvent être utilisés malgré la limitation de tension de service prévue pour les postes.

Il est préférable d'utiliser un revêtement en polymère présentant un caractère hydrophobe et un mécanisme de transfert d'hydrophobicité (HTM, Hydrophobicity Transfer Mechanism) pour les isolateurs supports composites creux. Cela est dû au fait que le diamètre peut avoir une influence significative pour les surfaces hydrophiles (voir également l'IEC 60815-3). Par exemple, le caoutchouc de silicone est reconnu comme étant un moyen efficace de lutter contre les conditions de service sous pollution sévère. Pour l'heure, l'essai de cheminement et d'érosion en courant alternatif de 1 000 h de l'IEC 62217 est utilisé pour établir une exigence minimale pour la résistance au cheminement et à l'érosion, à la fois en courant alternatif et en courant continu.

Les isolateurs supports composites creux sont utilisés dans les applications en courant alternatif et les applications en courant continu. Avant que la norme appropriée pour les applications en courant continu soit publiée, la majorité des essais énumérés dans la présente norme peuvent également s'appliquer aux isolateurs en courant continu. Malgré cela, le développement d'une procédure d'essai de résistance au cheminement et à l'érosion pour les applications en courant continu, en qualité d'essai de conception, est toujours à l'étude. Des informations sur la différence entre un essai d'érosion en courant alternatif et en courant continu pour un matériau peuvent être consultées dans la brochure technique 611 du Conseil International des Grands Réseaux Electriques (CIGRE) [8][1]. Pour l'heure, l'essai de cheminement et d'érosion en courant alternatif de 1 000 h de l'IEC 62217 est utilisé pour établir une exigence minimale pour la résistance au cheminement et à l'érosion.

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1 Les chiffres entre crochets renvoient à la Bibliographie.

ISOLATEURS SUPPORTS COMPOSITES CREUX 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

1 Domaine d'application

Le présent document, qui est une Norme internationale, s'applique aux isolateurs supports composites creux qui sont constitués d'un tube (noyau) isolant en fibres imprégnées de résine supportant la charge mécanique, d'un matériau de charge interne (solide, liquide, gaz, sous pression ou pas), d'un revêtement en polymère à l'extérieur du tube isolant (par exemple silicone ou éthylène-propylène) et de dispositifs de fixation à ses extrémités. Les isolateurs supports composites creux, tels que définis dans la présente norme, sont destinés à l'utilisation générale dans les postes, tant en extérieur qu'en intérieur. Ils fonctionnent avec une tension alternative assignée de plus de 1 000 V en courant alternatif et à une fréquence maximale de 100 Hz, ou sont utilisés dans les systèmes à courant continu avec une tension assignée supérieure à 1 500 V en courant continu.

Le présent document a pour objet:

– de définir les termes utilisés;

– de spécifier des méthodes d'essai;

– de spécifier les critères d'acceptation.

À l'exception de l'essai thermomécanique, tous les essais du présent document sont réalisés à température ambiante normale. Le présent document ne spécifie pas d'essais qui sont caractéristiques de l'appareillage dont l'isolateur support composite creux peut former un élément constitutif (par exemple interrupteur-sectionneur, support de réactance, valves de courant continu haute tension (CCHT)).

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60168, *Essais des supports isolants d'intérieur et d'extérieur, en matière céramique ou en verre, destinés à des installations de tension nominale supérieure à 1 000 V*

IEC 61109, *Isolateurs pour lignes aériennes – Isolateurs composites de suspension et d'ancrage destinés aux systèmes à courant alternatif de tension nominale supérieure à 1 000 V – Définitions, méthodes d'essai et critères d'acceptation*

IEC 61462, *Isolateurs composites creux – Isolateurs avec ou sans pression interne pour utilisation dans des appareillages électriques de tensions nominales supérieures à 1 000 V – Définitions, méthodes d'essais, critères d'acceptation et recommandations de conception*

IEC 62217, *Isolateurs polymériques à haute tension pour utilisation à l'intérieur ou à l'extérieur – Définitions générales, méthodes d'essai et critères d'acceptation*

IEC 62231:2006, *Isolateurs supports composites rigides à socle destinés aux postes à courant alternatif de tensions supérieures à 1 000 V jusqu'à 245 kV – Définitions, méthodes d'essai et critères d'acceptation*

IEC TR 62039, *Selection guidelines for polymeric materials for outdoor use under HV stress* (disponible en anglais seulement)