IEC 62896

Edition 1.0 2024-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Hybrid insulators for AC and DC for high-voltage applications greater than 1 000 V AC and 1 500 V DC – Definitions, test methods and acceptance criteria

Isolateurs hybrides pour applications haute tension en courant alternatif et en courant continu supérieures à 1 000 V en courant alternatif et 1 500 V en courant continu – Définitions, méthodes d'essai et critères d'acceptation

IEC 62896:2024-05(en-fr)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.080.10

ISBN 978-2-8322-8755-2

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HYBRID INSULATORS FOR AC AND DC HIGH-VOLTAGE APPLICATIONS GREATER THAN 1 000 V AC AND 1 500 V DC – DEFINITIONS, TEST METHODS AND ACCEPTANCE CRITERIA

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IEC 62896 has been prepared by IEC technical committee 36: Insulators. It is an International Standard.

This first edition cancels and replaces the IEC TS 62896 published in 2015. 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);
c) harmonization of Table 1 (Tests to be carried out after design and type changes) with other product standards and IEC 62217.

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

Draft	Report on voting
36/594/FDIS	36/597/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, or
- revised.

INTRODUCTION

Hybrid insulators consist of an insulating core, bearing the mechanical load protected by a polymeric housing, the load being transmitted to the core by end fittings. Despite these common features, the materials used and the construction details employed by different manufacturers may be quite different. The core is made of ceramic or glass material.

Hybrid insulators are applied as overhead line, post or hollow core equipment insulators. In order to perform the design tests, IEC 62217 is intended to be applied for the polymeric housing and the interfaces between core and the housing. For the core, the test standards for the respective ceramic product (IEC 60168, IEC 60383-1 and −2 and IEC 62155) are intended to be applied.

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 of hybrid 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 hybrid insulators has been considered in specifying the design tests to ensure a satisfactory life-time under normally known stress conditions in service.

Polymeric housing materials that show the hydrophobicity transfer mechanism (HTM) are preferred for hybrid insulators. These housing materials are applied as a countermeasure against severely polluted service conditions.

Pollution tests according to IEC 60507 or IEC 61245 are not included in this document since they are designed for non-polymeric items. Specific pollution tests for polymeric insulators are still under consideration.

HYBRID INSULATORS FOR AC AND DC HIGH-VOLTAGE APPLICATIONS GREATER THAN 1 000 V AC AND 1 500 V DC – DEFINITIONS, TEST METHODS AND ACCEPTANCE CRITERIA

1 Scope

This document applies to hybrid insulators for AC and DC applications greater than 1 000 V AC and 1 500 V DC consisting of a load-bearing insulating solid or hollow core consisting of ceramic or glass, a housing (defined geometry, outside the insulating core) made of polymeric material and end fittings permanently attached to the insulating core.

Hybrid insulators covered by this document are intended for use as suspension/tension long rod and cap and pin type insulators, line post insulators, station post insulators and hollow core insulators for apparatus.

The object of this document is to:

- define the terms used;
- prescribe test methods;
- prescribe acceptance criteria.

Silicone or other functional coatings (CIGRE Technical Brochure No. 478), booster sheds, shed extenders and rain deflectors are not within the scope of this document. CIGRE B2.69 published two Technical Brochures, TB 837 and TB 838, in June 2021 with the scope of practical applications and collection of experiences for anti-pollution coatings for insulators.

This document does not include requirements dealing with the choice of insulators for specific operating conditions.

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 60050-471:2007, *International Electrotechnical Vocabulary (IEV) – Part 471: Insulators*

IEC 60168, *Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V*

IEC 60383-1:2023, *Insulators for overhead lines with a nominal voltage above 1000 V – Part 1: Ceramic or glass insulator units for a.c. systems – Definitions, test methods and acceptance criteria*

IEC 60383-2, *Insulators for overhead lines with a nominal voltage above 1000 V – Part 2: Insulator strings and insulator sets for a.c. systems – Definitions, test methods and acceptance criteria*

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 HV insulators for indoor and outdoor use – General definitions, test methods and acceptance criteria*

IEC 61211, *Insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1 000 V – Impulse puncture testing in air*

IEC 61325, *Insulators for overhead lines with a nominal voltage above 1000 V – Ceramic or glass insulator units for d.c. systems – Definitions, test methods and acceptance criteria*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-471:2007 and the following apply (some definitions from IEC 62217 are reproduced here for ease of reference).

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
high-voltage
HV
voltage over 1 000 V AC or over 1 500 V DC or over 1 500 V peak value

3.2
polymeric insulator
insulator whose insulating body consists of at least one organic based material

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

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

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

3.3
resin insulator
polymeric insulator whose insulating body consists of a solid insulator trunk and sheds protruding from the insulator trunk made from only one organic based housing material (e.g. cycloaliphatic epoxy)

3.4
composite insulator
polymeric insulator made of at least two polymeric insulating parts, namely a core and a housing, equipped with metal fittings

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

[SOURCE: IEC 60050-471:2007, 471-01-02, modified (addition of "polymeric", replacement of "end fittings" by "metal fittings"]

3.5
hybrid insulator
insulator that consists of a ceramic core and a polymeric housing, equipped with one or more metal fittings

See Figure 1.

Note 1 to entry: According to IEC TS 62896.

Note 2 to entry: The mechanical functions are mainly characterised by the core, the external electrical functions are mainly characterised by the polymeric housing. The housing may cover the core completely or partly. In the latter case the exposed portions of the ceramic core are usually covered by glaze.

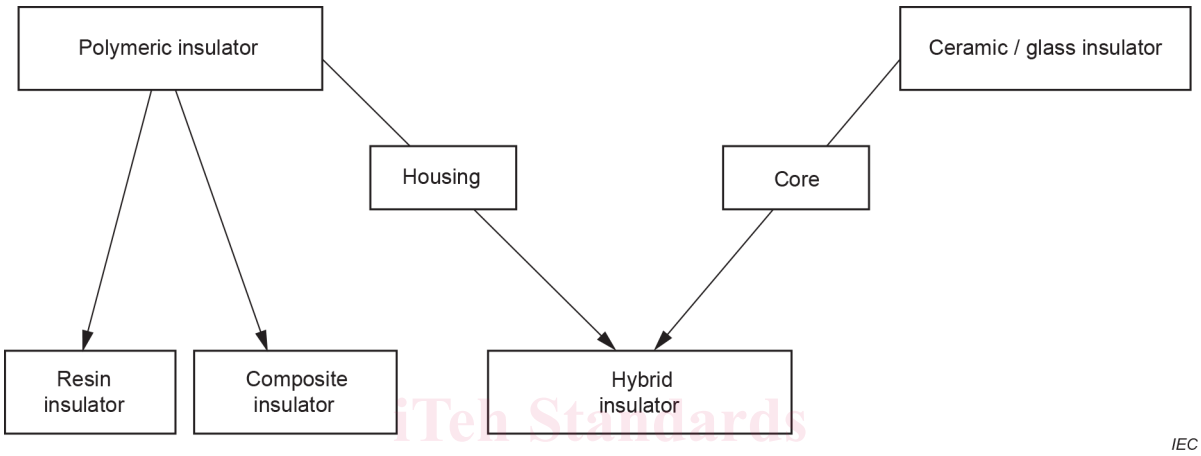

Figure 1 – Classification of insulator designs

3.6
core
central insulating part of an insulator which provides the mechanical characteristics

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

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

3.7
insulator trunk
central insulating part of an insulator from which the sheds project

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

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

3.8
housing
external insulating part of a composite insulator providing the necessary creepage distance and protecting core from environment

Note 1 to entry: An intermediate sheath made of insulating material may be part of the housing.

[SOURCE: IEC 60050-471:2007, 471-01-09]

3.9
shed (of an insulator)
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]

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

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

3.11
arcing distance
shortest distance in 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
sheath
uniform and continuous tubular covering made of insulating material

[SOURCE: IEC 60050-151, 151-12-41, modified (removal of "conductive or")]

3.13
interfaces
surface between the different materials

Note 1 to entry: Various interfaces can be found 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.

3.14
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]

3.15
connection zone
zone where the mechanical load is transmitted between the insulating body and the end fitting

3.16
coupling
part of the end fitting which transmits load to the hardware external to the insulator

3.17
tracking
progressive degradation of the surface of a solid insulating material by local discharges to form conducting or partially conducting paths

Note 1 to entry: Tracking paths are conductive even under dry conditions.

3.18
erosion
loss of material due to leakage current or electrical discharge

Note 1 to entry: Light surface traces, commonly tree-shaped, can occur on composite insulators as on ceramic insulators, after partial discharge. These traces are not considered to be objectionable as long as they are nonconductive. When they are conductive, they are classified as tracking.

3.19
crack
any internal fracture or surface fissure of depth greater than 0,1 mm

3.20
puncture
permanent loss of dielectric strength due to a disruptive discharge passing through the solid insulating material of an insulator

[SOURCE: IEC 60050-471:2007, 471-01-14, modified to define puncture as the result of a discharge, rather than the discharge itself]

3.21
lot
group of insulators or insulator bodies offered for acceptance from the same manufacturer, of the same design and manufactured under similar conditions of production

Note 1 to entry: One or more lots may be offered together for acceptance; the lot(s) offered may consist of the whole, or part, of the quantity ordered.

3.22
hydrophobicity
behaviour of the surface of a solid insulating material to repel to water or aqueous electrolyte solutions; hydrophobicity of a polymeric insulating material is, in general, a volume property by means of the chemical composition of a material at its surface

Note 1 to entry: Nonetheless, hydrophobicity is strongly affected by surface effects such as:

– surface structure (i. e. roughness);
– chemical interaction between water and the solid surface (adsorption, absorption, swelling of the solid material in contact with water);
– an accumulated pollution layer.

Note 2 to entry: Furthermore, the conditions during an evaluation of hydrophobicity (climatic (temperature, pressure, humidity), method for cleaning or electrostatic charges) may affect the measured degree of hydrophobicity.

3.23
hydrophobicity transfer
hydrophobicity transfer is the phenomenon of a transfer of hydrophobicity from the bulk of the housing material to pollution layer on its surface