SLOVENSKI STANDARD
oSIST prEN IEC 61462:2022

01-junij-2022

Votli kompozitni izolatorji - Tlačni in breztlačni izolatorji za električno opremo z naznačeno izmenično napetostjo, višjo od 1000 V, in enosmerno napetostjo, višjo od 1500 V - Definicije, preskusne metode, merila sprejemljivosti in priporočila za načrtovanje

Composite hollow insulators - Pressurized and unpressurized insulators for use in electrical equipment with AC rated voltage greater than 1 000 V AC and D.C. voltage greater than 1500V - Definitions, test methods, acceptance criteria and design recommendations

Verbundhohlisolatoren - Druckbeanspruchte und drucklose Isolatoren für den Einsatz in elektrischen Betriebsmitteln mit Bemessungsspannungen über 1 000 V - Begriffe, Prüfverfahren, Annahmekriterien und Konstruktionsempfehlungen

Isolateurs composites creux - Isolateurs avec ou sans pression interne pour utilisation dans des appareillages électriques de tensions alternatives assignées supérieures à 1 000 V et de tensions continues supérieures à 1 500 V - Définitions, méthodes d’essai, critères d’acceptation et recommandations de conception

Ta slovenski standard je istoveten z: **prEN IEC 61462:2022**

ICS:

29.080.10	Izolatorji	Insulators

oSIST prEN IEC 61462:2022 **en,fr,de**

36/540/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 61462 ED2	
DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
2022-03-18	**2022-06-10**
SUPERSEDES DOCUMENTS:	
36/509/CD, 36/531A/CC	

IEC TC 36 : INSULATORS	
SECRETARIAT: Sweden	SECRETARY: Mr Dan Windmar
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 17,SC 17A,SC 17C	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☒ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

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

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TITLE:

Composite hollow insulators - Pressurized and unpressurized insulators for use in electrical equipment with AC rated voltage greater than 1 000 V AC and D.C. voltage greater than 1500V - Definitions, test methods, acceptance criteria and design recommendations

PROPOSED STABILITY DATE: 2026

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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COMPOSITE HOLLOW INSULATORS –

PRESSURIZED AND UNPRESSURIZED INSULATORS FOR USE IN ELECTRICAL EQUIPMENT WITH AC RATED VOLTAGE GREATER THAN 1 000 V AC AND D.C. VOLTAGE GREATER THAN 1 500 V –

DEFINITIONS, TEST METHODS, ACCEPTANCE CRITERIA AND DESIGN RECOMMENDATIONS

FOREWORD

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This new edition cancels and replaces the previous edition. It constitutes a technical revision and has the status of an International Standard since 2007.

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

FDIS	Report on voting
To be completed/FDIS	To be completed/RVD

140
141 Full information on the voting for the approval of this standard can be found in the report on
142 voting indicated in the above table.

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

144 The committee has decided that the contents of this publication will remain unchanged until
145 the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the
146 data related to the specific publication. At this date, the publication will be

147 • reconfirmed,
148 • withdrawn,
149 • replaced by a revised edition, or
150 • amended.

151

152

INTRODUCTION

Composite hollow insulators consist of an insulating tube bearing the mechanical load protected by an elastomeric housing, the loads being transmitted to the tube by metal fittings. Despite these common features, the materials used and the construction details employed by different manufacturers may vary.

Some tests have been grouped together as "Design tests" to be performed only once for insulators of the same design and material. The design tests are performed in order to eliminate designs and materials not suitable for high-voltage applications.

The relevant design tests defined in IEC 62217 are applied for composite hollow insulators; additional specific mechanical tests are given in this standard. The influence of time on the electrical and mechanical properties of the complete composite hollow insulator and its components (tube material, housing material, interfaces, etc.) has been considered in specifying the design tests in order to ensure a satisfactory lifetime under normal service conditions. These conditions may also depend on the equipment inside or outside the composite hollow insulators; however, this matter has not been covered in this standard. Test methods not specified in this standard may be considered for specific combinations of materials and specific applications, and are a matter of agreement between manufacturers and users. In this standard, the term “user” in general means the equipment manufacturer using composite hollow insulators.

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

This standard distinguishes between design tests and type tests because several general characteristics of a specific design and specific combinations of materials do not vary for different insulator types. In these cases results from design tests can be adopted for different insulator types.

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

The mechanical characteristics of composite hollow insulators are quite different compared to those of hollow insulators made of ceramics. In order to determine the onset of mechanical deterioration of composite hollow insulators under the influence of mechanical stress, strain gauge measurements are used.

This standard refers to different characteristic pressures which are used for design and testing of composite hollow insulators. The term "maximum service pressure" (MSP) is equivalent to the term "design pressure" which is used in other standards for ceramic hollow insulators; however, this latter term is not used in this standard in order to avoid confusion with "design" as used in "design tests".

General recommendations for the design and construction of composite hollow insulators are presented in Annex B.

COMPOSITE HOLLOW INSULATORS –

PRESSURIZED AND UNPRESSURIZED INSULATORS FOR USE IN ELECTRICAL EQUIPMENT WITH A.C. RATED VOLTAGE GREATER THAN 1 000 V AND D.C. VOLTAGE GREATER THAN 1 500 V – DEFINITIONS, TEST METHODS, ACCEPTANCE CRITERIA AND DESIGN RECOMMENDATIONS

1 Scope

This International Standard applies to composite hollow insulators consisting of a load-bearing insulating tube made of resin impregnated fibres, a housing (outside the insulating tube) made of elastomeric material (for example silicone or ethylene-propylene) and metal fixing devices at the ends of the insulating tube. Composite hollow insulators as defined in this standard are intended for general use (unpressurized) or for use with a permanent gas pressure (pressurized). They are intended for use in both outdoor and indoor electrical equipment operating on alternating current with a rated voltage greater than 1 000 V a.c. and a frequency not greater than 100 Hz or for use in direct current equipment with a rated voltage greater than 1 500 V d.c.

The object of this standard is:

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

Hollow insulators are integrated into electrical equipment which is electrically type tested as required by the applicable equipment standard. So, it is not the object of this standard to prescribe dielectric type tests because the withstand voltages and flashover behaviour are not characteristics of the hollow insulator itself but of the apparatus of which it ultimately forms a part.

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 hollow insulator ultimately forms a part.

Composite hollow insulators are intended for use in electrical equipment, such as, but not limited to:

- HV circuit-breakers,
- switch-disconnectors,
- disconnectors,
- station posts,
- disconnecting circuit breakers,
- earthing switches,
- instrument- and power transformers,
- bushings,
- cable terminations.

Additional testing defined by the relevant IEC equipment standard may be required.

2 Normative references

The following referenced documents are indispensable for the application 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: *High-voltage test techniques – Part 1: General definitions and test requirements*

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 insulators for indoor and outdoor use with a nominal voltage >1 000 V- General 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 insulator
insulator consisting of at least two insulating parts, namely a tube 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 insulator unit is permanently equipped with fixing devices or end fittings

[IEV 471-01-08, modified]

3.2
tube (core)
central internal insulating part of a composite hollow insulator which provides the mechanical characteristics

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

Note 2 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 3 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.

[IEV 471-01-03, modified by the addition of a synonym]

3.3
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.

[IEV 471-01-06, modified by the addition of a synonym]

3.4
coupling
part of the fixing device which transmits load to the hardware external to the insulator

[IEC 62217, section 3]

3.5
connection zone
zone where the mechanical load is transmitted between the insulating body and the end fitting

[IEC 62217, section 3]

3.6
housing
external insulating part of composite hollow insulator providing necessary creepage distance and protecting tube from environment

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

[IEC 62217, section 3]

[SOURCE: IEV 471-01-09, modified]

3.7
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.

[IEV 471-01-15]

3.8
insulator trunk
central insulating part of an insulator from which the sheds project

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

[IEV 471-01-11]

3.9
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

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

[IEV 471-01-04, modified]

3.10
arcing distance
shortest distance in the air external to the insulator between the metallic parts which normally have the operating voltage between them

Note 1 to entry – The term “dry arcing distance” is also used.

[IEV 471-01-01]

3.11
tracking
process which forms irreversible degradation by formation of conductive paths (tracks) starting and developing on the surface of an insulating material

Note 1 to entry – These paths are conductive even under dry conditions.

[IEC 62217, section 3]

3.12
erosion
irreversible and non-conducting degradation of the surface of the insulator that occurs by loss of material which can be uniform, localised or tree-shaped

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

[IEC 62217, section 3]

3.13
crack
any fracture or surface fissure of depth greater than 0,1 mm

[IEC 62217, section 3]

3.14
interface
contact 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.

[IEC 62217, section 3]

3.15
damage limit of the tube under mechanical stress
limit below which mechanical loads (pressure, bending load) 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).

3.16
maximum mechanical load (MML)
highest cantilever bending load which is expected to be applied to the hollow insulator in service and in the equipment in which it is used

Note 1 to entry – This load is specified by the equipment manufacturer.

3.17
specified mechanical load (SML)
cantilever bending load specified by the manufacturer that is used in the mechanical tests and which is verified during a type test at normal ambient temperature

Note 1 to entry – The SML forms the basis of the selection of composite hollow insulators with regard to external loads.

3.18
deflection under bending load
displacement of a point on an insulator, measured perpendicularly to its axis, under the effect of a load applied perpendicularly to this axis
[IEV 471-01-05]

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

3.19
failing load
load at ultimate failure of the 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 of the tube may occur at loads lower than the insulator failing load.

3.20
residual deflection
difference between the initial deflection of a hollow insulator prior to bending load application, and the final deflection after release of the load

3.21
overpressure
pressure above ambient pressure within a pressurized enclosure

[IEV 426-09-16]

3.22

maximum service pressure (MSP)
maximum internal overpressure in service which is specified by the equipment manufacturer

3.23
specified internal pressure (SIP)
internal overpressure specified by the equipment manufacturer which is verified during a type test at normal ambient temperature

Note 1 to entry – The SIP is specified as the short-time withstand design limit, under which the insulator structure stays intact, but damages may already occur. It can be higher than 4 x MSP.

3.24
Pressurized insulator
A pressurized insulator is an insulator permanently filled with gas or liquid whose maximum service pressure is greater than 0,05 MPa overpressure.

3.25
Unpressurized insulator
An unpressurized insulator is an insulator permanently filled with gas or liquid whose maximum service pressure is smaller than or equal to 0,05 MPa overpressure.

3.26
specified temperature
highest and/or lowest temperature permissible for the composite hollow insulator

Note 1 to entry – The specified temperature is specified by the manufacturer.

3.27
manufacturer
individual or organization producing the composite hollow insulators

3.28
equipment manufacturer
individual or organization producing the electrical equipment utilizing the composite hollow insulators

3.29
lot
group of insulators offered for acceptance from the same manufacturer, of the same design and manufactured under similar conditions of production.