INTERNATIONAL STANDARD

IEC 61264

Second edition
1998-10

Ceramic pressurized hollow insulators for high-voltage switchgear and controlgear

Enveloppes isolantes sous pression en matière céramique pour l'appareillage haute tension

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For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary* (IEV).

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CERAMIC PRESSURIZED HOLLOW INSULATORS FOR HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61264 has been prepared by subcommittee 36C: Insulators for substations, of IEC technical committee 36: Insulators. It is based on CENELEC publication EN 50062.

This second edition cancels and replaces the first edition published in 1994 and constitutes a technical revision.

This standard supplements and modifies, if necessary, IEC 60233, which applies to unpressurized hollow insulators.

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

FDIS	Report on voting
36C/94/FDIS	36C/101/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.

Annexes A, B and C are for information only.

A bilingual version of this standard will be issued at a later date.

INTRODUCTION

Technical improvements to this International Standard have been made in the following areas:

– guidance for load combinations: it is made clear that other combinations might exist and that operating loads, if existent, should be considered;

– information on mechanical strength: this should be collected during testing for a possibility of statistical evaluation;

– geometrical tolerances.

CERAMIC PRESSURIZED HOLLOW INSULATORS FOR HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR

1 Scope and object

This International Standard applies to hollow insulators made of ceramic material, with their fixing devices, intended for use with a **permanent gas pressure** greater than 50 kPa gauge having an internal volume equal to or greater than 1 l (1 000 cm^3). They are intended for use in electrical equipment operating on alternating current with a rated voltage greater than 1 000 V and a frequency not greater than 100 Hz or for use in direct current equipment with a rated voltage greater than 1 500 V.

NOTE 1 – The gas can be: dry air, inert gases, e.g. sulphur hexafluoride or nitrogen or a mixture of such gases.

NOTE 2 – Hollow insulators are intended for use in electrical equipment with a permanent gas pressure, for example

– circuit-breakers,
– switch-disconnectors,
– disconnectors,
– earthing switches,
– instrument transformers,
– surge arresters,
– bushings,
– cable sealing ends.

The object of this standard is

– to define terms used;
– to prescribe design rules;
– to prescribe test procedures and test values

regarding pressure and bending stresses for hollow insulators.

It is not the object of this standard to prescribe dielectric tests, because the withstand voltages are not characteristics of the hollow insulator itself, but of the apparatus of which it ultimately forms a part.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEV 60050(471):1984, *International Electrotechnical Vocabulary (IEV) – Chapter 471: Insulators*

IEC 60056:1987, *High-voltage alternating-current circuit-breakers*

IEC 60168:1994, *Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 000 V*

IEC 60233:1974, *Tests on hollow insulators for use in electrical equipment*

IEC 60672-3:1997, *Ceramic and glass insulating materials – Part 3: Specifications for individual materials*

IEC 60694:1996, *Common specifications for high-voltage switchgear and controlgear standards*

IEC 60865-1:1993, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*

IEC 61166:1993, *High-voltage alternating current circuit-breakers – Guide for seismic qualification of high-voltage alternating current circuit-breakers*

ISO 4287:1997, *Geometrical Product Specification (GPS) – Surface texture: Profile method – Terms, definitions and surface texture parameters*

ISO 4287-2:1984, *Surface roughness – Terminology – Part 2: Measurement of surface roughness parameters*

CENELEC EN 50062:1991, *Ceramic pressurized hollow insulators for high-voltage switchgear and controlgear*

3 Definitions

For the purpose of this International Standard, the following definitions apply. The definitions given below are those which either do not appear or differ from those given in IEC 60050(471)

3.1
hollow insulator body
a hollow insulating part body, which is open from end to end, with or without sheds, not including the fixing devices or end fittings

3.2
hollow insulator
a hollow insulating part, which is open from end to end, with or without sheds, including the fixing devices or end fittings [IEV 471-01-17, modified]

NOTE – This is a general term which also covers the definitions 3.4, 3.5 and 3.6.

3.3
fixing device or end fitting
a device forming part of a hollow insulator, intended to connect it to a supporting structure or to an item of equipment, or to another insulator

NOTE – Where the fixing device is metallic, the term "metal fitting" is also used. [IEV 471-01-02, modified]

3.4
hollow post insulator
a hollow post insulator consists of one hollow post insulator unit or an assembly of more units and is intended to give support to a live part, which is to be insulated from earth or from another live part

3.5
hollow post insulator unit
a hollow post insulator unit consists of a permanent assembly of a hollow insulating body with fixing devices and is intended to give support

3.6
chamber insulator
a chamber insulator is a hollow insulator, which is used as a housing for example the arc extinction chamber of a circuit-breaker

3.7
bushing
a device that enables one or several conductors to pass through a partition such as a wall or tank and insulates the conductors from it. The means of attachment (flange or other fixing device) to the partition forms part of the bushing. [IEV 471-02-01, modified]

3.8
design pressure
it is at least the upper limit of differential pressure reached between the interior and exterior of the hollow insulator during operation at the design temperature

3.9
design temperature
the highest temperature reached inside the hollow insulator which can occur under service conditions. This is generally the upper limit of ambient air temperature increased by the temperature rise due to the flow of rated normal current, and to dielectric losses, if any

3.10
type test withstand bending moment
it is the withstand bending moment verified in a type test according to 6.3. The withstand bending moment is based on load conditions specified in 4.2.3 of a pressurized hollow insulator to be used in an electrical equipment

3.11
mechanical failing load
the maximum load reached when a hollow insulator is tested under the prescribed conditions of test

3.12
manufacturer
the organization that produces the hollow insulators or hollow insulator bodies

3.13
equipment manufacturer
individual or organization which produces the electrical equipment utilizing the hollow insulators or hollow insulator bodies

3.14
parallelism of the end faces
the maximum difference in the height of a hollow insulator measured across the surfaces of the end fittings or the end surfaces of the hollow insulator body

3.15
eccentricity
the displacement, perpendicular to the axis of the hollow insulator, between the centres of the pitch circles of the fixing holes of the turned fit in the top and bottom end fittings

3.16
angular deviation of the fixing holes
the rotational displacement, expressed as an angle, between corresponding fixing holes in the end fittings at the top and bottom of a hollow insulator

3.17
lot
a group of insulators offered for acceptance from the same manufacturer, of the same design and manufactured under similar conditions of production. 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

4 General recommendations for design and construction

4.1 Purpose

The rules for the design of gas-pressurized hollow insulators for high-voltage equipment prescribed in this clause take into account that these hollow insulators are subjected to particular operating conditions which distinguish them from compressed air receivers and other similar storage vessels.

4.2 Rules for design

When designing hollow insulators, the following points shall be taken into consideration.

– Deviations and tolerances of profile: circularity, run out, camber, parallelism, coaxiality, eveness, differences in wall thickness, and angular and radial position of fixing holes shall all take account of the parts to be fitted inside.

– It shall be considered that electrical strength, mechanical strength and technological problems may influence the real construction but, due to the complexity of this subject, no definitive guide can be given.

– A critical selection of materials for cementing and fittings is also necessary. The ceramic material shall comply in its characteristics with IEC 60672-3, groups C100 and C200.

– An insulating pressurized enclosure may be considered as appropriate for its intended use only after the electrical equipment of which it is a part has satisfactorily passed the type tests provided for by the particular standards with which this equipment must comply.

4.2.1 Determination of the design pressure

The design pressure shall be the difference between the maximum absolute pressure, when the equipment (of which the hollow insulator is a part) is carrying its rated normal current at maximum ambient temperature, and the outside pressure.

The maximum absolute pressure of the gas inside the hollow insulator shall be determined by the equipment manufacturer.

NOTE – In some special cases (e.g. circuit-breakers) the pressure rise occurring after a breaking operation should be taken into account.

4.2.2 Determination of the design temperature

The equipment manufacturer shall determine this value taking account of 3.9.

Solar radiation shall be taken into account.

4.2.3 Determination of the type test withstand bending moment

The following factors may all contribute to the bending stress that may occur in electrical equipment: mass, internal pressure, terminal loads, short-circuit loads, ice loads, operating loads, wind loads, seismic loads (see table 1).