

Characteristics of hollow pressurised and unpressurised ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V

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National foreword

This Draft for Development is the UK implementation of IEC/TS 62371:2008.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for its conversion to an international standard. A review of this publication will be initiated not later than three years after its publication by the international organization so that a decision can be taken on its status. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

The UK participation in its preparation was entrusted to Technical Committee PEL/36, Insulators for power systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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TECHNICAL SPECIFICATION

Characteristics of hollow pressurised and unpressurised ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V

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INTRODUCTION

The IEC standards concerning insulators for overhead lines and substations are classified into two categories. One is the standard for test methods and acceptance criteria and the other is the product standard in which characteristics of the insulators are specified. Product standards of most insulators, for example cap and pin type, long rod type insulators for overhead lines and station post insulators for substations, are available.

In the case of hollow insulators, test methods and acceptance criteria are standardized in IEC 62155: *Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1 000 V*, but there has been no product standard. This seems due to the difference in application among hollow insulators and other insulators. The hollow insulators are usually applied as a component of electrical equipment and other insulators such as cap and pin type or station post insulators are directly applied to the power system as equipment.

There are benefits for standardization of the hollow insulators, even if they are used as components, for insulator manufacturers, equipment manufacturers and final users for the equipment. That is, benefits of cost saving in respect of manufacturing and inventory control, short delivery, interchangeability, etc.

Taking account of every aspect on standardization of the hollow insulators, such as the fact that there are so many designs of electrical equipment, this Technical Specification covers only basic hollow insulators for normal application as a first step towards standardization work. Accordingly, special types of hollow insulators such as barrel type for some circuit-breakers, insulators for pollution and/or seismic areas, etc. are not within the scope of this specification.

Therefore, different hollow insulators not included in this specification can also be applied to the electrical equipment in the case where special characteristics are required, depending on environmental and/or system conditions. There may be the possibility to standardize those hollow insulators as a next step after gathering sufficient information on experiences.

In addition, it should be noted that the characteristics specified here are determined, considering the data collected through the survey on the presently available hollow insulators. There may be the possibility that the survey is not complete and then the hollow insulators not covered by this technical specification can also be applied. Such insulators as widely applied but not covered by this technical specification will be added in the next revision through ascertained experiences.

CHARACTERISTICS OF HOLLOW PRESSURISED AND UNPRESSURISED CERAMIC AND GLASS INSULATORS FOR USE IN ELECTRICAL EQUIPMENT WITH RATED VOLTAGES GREATER THAN 1000 V

1 Scope

This Technical Specification applies to

- ceramic and glass hollow insulators intended for general use in electrical equipment;
- ceramic hollow insulators intended for use with a permanent gas pressure in switchgear and controlgear.

They are intended for indoor and outdoor 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.

This specification specifies the dimensional and mechanical characteristics of the hollow insulator, which are essential for interchangeability of the hollow insulator of the same type. It is not the object of this specification to prescribe electrical characteristics because they are dependent on the apparatus of which the hollow insulator ultimately forms a part. However, standard lightning impulse withstand voltage which is provided in IEC 60071-1 is described only for reference for classification purpose.

This specification applies to hollow insulators for use in electrical equipment in clean areas or lightly polluted areas, where seismic qualification is not required. For use in areas characterised by heavy pollution levels and for other particular or extreme environmental conditions such as seismic force, it may be necessary for certain dimensions to be changed.

The hollow insulators covered by this specification are:

- a) straight type hollow insulators with metal fittings on both ends;
- b) taper type hollow insulators with metal fittings on both ends;
- c) straight type hollow insulators without metal fittings;
- d) taper type hollow insulators without metal fittings.

The hollow insulators are intended for use in electrical equipment, for example:

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

There may be some cases that hollow insulators whose design can strongly be influenced by other components of specific equipment, for example, active parts of circuit-breakers. For such cases, the hollow insulators can be separately designed, depending on respective requirements of such equipment and not be covered by this specification.

NOTE 1 Hollow insulators not prescribed in this specification can also be applied to electrical equipment, depending on specific requirements of the equipment. However, if similar insulators are available in this specification, it is preferable to apply them.

NOTE 2 For general recommendations for design and tests of the hollow insulators, see IEC 62155.

NOTE 3 For characteristics of hollow insulators for use in polluted areas, reference can be made to IEC 60815-1 and IEC 60815-2.

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 62155, *Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V*

3 Terms and definitions

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

3.1

arcing distance

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

[IEV 471-01-01]

3.2

creepage distance

shortest distance along the external surface on an insulator between two conductive parts which normally have the operating voltage between them

[IEV 471-01-04, modified]

NOTE 1 The surface of cement or of other non-insulating jointing material is not considered as forming part of the creepage distance.

NOTE 2 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.

NOTE 3 In case of hollow insulators without metal fitting, creepage distance is the shortest distance along the external surface on an insulator between the presumed position of two conductive parts as shown in Figures 3 and 4, unless otherwise agreed between the purchaser and the manufacturer.

3.3

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

[IEV 471-01-06]

NOTE Where the end fitting is metallic, the term “metal fitting” is normally used.

3.4

hollow insulator

insulator which is open from end to end, with or without sheds, including end fittings

[IEV 471-01-08]

NOTE 1 A hollow insulator can be made from one or more permanently assembled insulating elements

NOTE 2 Hollow insulators without end fittings are embraced.

3.5

manufacturer

organisation that produces the hollow insulators or hollow insulator bodies

3.6

straight type hollow insulator

hollow insulator which has the same inner and outer diameters from the top to the bottom

3.7

taper type hollow insulator

hollow insulator which has increasing inner and outer diameters from the top to the bottom

3.8

withstand bending moment

bending moment verified in a type test, which is based on load conditions specified for the hollow insulator

3.9

withstand inner pressure load

inner pressure load verified in a type test, which is based on load conditions specified for the hollow insulator

4 Dimensional and mechanical characteristics

Hollow insulators are characterized by the following:

- height of hollow insulator;
- arcing distance;
- creepage distance;
- diameter of insulating part;
- inner diameter of hollow insulator;
- withstand bending moment (when required);
- withstand inner pressure load (when required);
- pitch circle diameter of end fittings (only for flange type);
- diameter of clamping part (only for clamping type);
- number of bolt holes (only for flange type).

Where applicable, fixing holes shall be equally spaced on the appropriate pitch circle, which shall be concentric with the axis of the insulator. Holes in top and bottom fittings shall be in line, unless otherwise specified, and they shall be so arranged as to permit the use of normal hexagon bolt heads and nuts.

The corresponding values are specified in Tables 1 to 4. Each table corresponds to each hollow insulator type as follows:

- Table 1: straight type hollow insulators with metal fittings on both ends;
- Table 2: taper type hollow insulators with metal fittings on both ends;
- Table 3: straight type hollow insulators without metal fittings;
- Table 4: taper type hollow insulators without metal fittings.

Figures 1 to 4 illustrate typical examples of each type of the insulator.