SLOVENSKI STANDARD
SIST EN 50062:1995

01-december-1995

Ceramic pressurized hollow insulators for high-voltage switchgear and controlgear

Ceramic pressurized hollow insulators for high-voltage switchgear and controlgear

Druckbeanspruchte Hohlisolatoren aus keramischen Material für Hochspannungs-Schaltgeräte und Schaltanlagen

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

Ta slovenski standard je istoveten z: EN 50062:1991

ICS:

29.080.10 Izolatorji Insulators

SIST EN 50062:1995 **en**

EUROPEAN STANDARD EN 50062

NORME EUROPEENNE

EUROPÄISCHE NORM October 1991

UDC 621.315.623.7-033.65:621.316.54.027.3

Descriptors: Enclosure, high-voltage switching device, H.V. insulation-enclosed switchgear and controlgear, pressurized enclosure, ceramic, metalic fitting, ground part, roughness

ENGLISH VERSION

CERAMIC PRESSURIZED HOLLOW INSULATORS FOR HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR

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

Druckbeanspruchte Hohlisolatoren aus keramischen Material für Hochspannungs-Schaltgeräte und Schaltanlagen

This European Standard was approved by CENELEC on 1990-06-11. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date list and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

FOREWORD

This European standard has been prepared by CENELEC Technical Committee 17A : High-voltage switchgear and controlgear.

Drafts were discussed in meetings held in PARIS (September 1987) and in BRUSSELS (June 1989).

The text of this standard was approved by CENELEC on 11 june 1990.

The following dates were fixed :

- latest date of publication of an identical national standard : 1992-04-15

- latest date of withdrawal of conflicting national standards : 1992-04-15

For products wich have complied with the relevant national standard before 1992-04-15, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1997-04-15.

The present EN has been established to specify the design, construction, testing, inspection and certification of pressurized hollow insulators intended for use in electrical equipment when they are fitted with their fixing devices and subject, in operation, to an internal gas pressure.

Thus, this standard supplements IEC 233 : Tests on hollow insulators for use in electrical equipment.

It complies too, from this point of view, with EEC Directive 76/767 Clause 2 "Pressure vessels and methods for inspecting them. "General Directive".

This EN contains three informative annexes :

Annex A : Tolerances of form and position

Annex B : Bending moment equivalent to the design pressure.

Annex C : A - deviations

Normative references :

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendmant or revision. For undated references the lastest edition of the publication referred to applies.

When the international publication has been modified by CENELEC common modifications, indicated by (mod), the relevant EN/HD applies.

IEC 56 (mod) - 1987 :	High-voltage alternating-current circuit-breakers	HD 348 S3	1989
IEC 168 - 1988 :	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V.		
IEC 233 - 1974 :	Tests on hollow insulators for use in electrical equipment.	HD 329 S1	1978
IEC 273 - 1979 :	Dimensions of indoor and outdoor post insulators and post insulator units for systems with nominal voltages greater than 1000 V.		
IEC 672 - 1984 : Part 3	Specification for ceramics and glass insulating materials - Part 3 : Individual materials.	HD 426.3 S1	1987
IEC 694(mod) - 1980 :	Common clauses for high-voltage switchgear and controlgear standards.	HD 448 S2	1989
ISO 1101 - 1983 :	Technical drawings - Geometrical tolerancing. Tolerancing of form, orientation, location and run-out. Generalities, definitions, symbols. Examples of indication and interpretation.		
ISO 4287/1 - 1984 :	Surface roughness - Terminology - Part 1 : Surface and its parameters.		
ISO 4287/2 - 1984 :	Surface roughness - Terminology - Part 2 : Measurement of surface roughness parameters		

1. GENERAL

1.1 Scope

This standard applies to hollow insulators made of ceramic material, with their fixing devices, intended for use with a permanent gas pressure greater than 0,5 bar having an internal volume equal to or greater than 1 litre (1000cm3). They are intended for use in electrical equipment operating on alternating current with a rated voltage greater than 1000 V and a frequency not greater than 100 Hz or for use in direct current equipment with a rated voltage greater than 1500 V.

The hollow insulators covered by this standard consist of hollow insulator bodies, open from end to end, with or without sheds.

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

Note 2 : The hollow insulators are intended for use in electrical equipment, for example :

- Circuit-breakers,
- Switch-disconnectors,
- Disconnectors,
- Earthing switches,
- Instrument transformers,
- Surge arresters,
- Bushings,
- Cable sealing ends.

This standard supplements, and modifies if necessary, HD 329 (IEC 233) which applies to the body of hollow insulators.

1.2 Object

The object of this standard is :

- to prescribe design rules,
- to prescribe test procedures and test values.

regarding pressure and bending stresses for hollow insulators covered by scope 1.1.

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

1.3 Definitions

For the purposes of this standard, the following definitions apply :

1.3.1 Hollow insulator body

A hollow insulating part body, which is open from end to end, with or without sheds, but does not include the fixing devices or end fittings.

1.3.2 Hollow insulator

A hollow insulating part, which is open from end to end, with or without sheds, but including the fixing devices or end fittings (IEC 233 - HD 329).

Note : This is a general term which also covers the definitions under the subclauses 1.3.4 , 1.3.5 and 1.3.6.

1.3.3 Fixing device or metal 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.

1.3.4 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 a rigid support to a live part, which is to be insulated from earth or from another live part.

1.3.5 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 a rigid support.

1.3.6 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.

1.3.7 Bushing

A device that enables one or several conductors to pass through a partition such as a tank and insulates the conductor from it. The means of attachment (flange or other fixing device) to the partition forms parts of the bushing (IEV 471-02-01).

1.3.8 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.

1.3.9 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.

1.3.10 Type test withstand bending moment

It is the withstand bending moment verified in a type test according to subclause 4.3 of a pressurized hollow insulator to be used in an electrical equipment. The withstand bending moment is based on load conditions specified in subclause 2.2.3.

1.3.11 Manufacturer

Individual or organisation, who produces the hollow insulators.

1.4 Marking

Each hollow insulator body shall be marked, on an external glazed surface, with the name or trade mark of the manufacturer, the year of manufacture, the type reference mark and the serial number. This mark shall be legible and indelible.

2. GENERAL RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

2.1 Purpose

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

2.2 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 672 part 3 group C-100.

- A type of 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.

2.2.1 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 transient pressure rise occurring during breaking operation must be taken into account.

2.2.2 Determination of the design temperature

The equipment manufacturer shall determine this value taking account of subclause 1.3.9.

Solar radiations should be taken into account when they have a significant effect on the pressure of the gas.

2.2.3 Determination of the type test withstand bending moment

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

The following sources shall be used for determining the values necessary for calculating the relevant loads :

- Terminals loads : IEC 56 § 6.101.6.1
- Wind loads : IEC 56 § .6.101.6.1 and IEC 694 § .2.1.2
- Ice loads : IEC 56 § .6.101.6.1 and IEC 694 § .2.1.2
- Short-circuit loads shall be determined from the rated short-circuit level of the equipment
- Seismic loads : IEC 56 (17A (Sec) 274) and subsequent documents.

The alternative combinations are representative sets of loads for particular equipments for particular applications. The column 1 of table 1 covers the routinely expected loads and has been assigned a safety factor of 2,1 for type test bending stress.

The three other conditions cover rarely occurring extreme loads and have been assigned safety factors of 1,2 for type test bending stress, or for seismic stresses a safety factor of 1,0.

The most onerous of the applicable alternatives shall be used to determine the test withstand bending stress

From the test withstand bending stress, the test withstand bending moment can be calculated.

Table 1

Loads	Stress from routinely expected loads	Stress from rarely occurring extreme loads		
		ALT 1 Short-circuit Load	ALT 2 Ice Load	ALT 3 Seismic Load
Design pressure*	100 %	100 %	100 %	100 %
Mass	100 %	100 %	100 %	100 %
Rated terminal load	100 %	50 %	0 %	70 %
Wind pressure	30 %	100 %	0 %	10 %
Short circuit load	0 %	100 %	0 %	0 %
Ice load	0 %	0 %	100 %	0 %
Seismic load	0 %	0 %	0 %	100 %
Safety factor f :	2,1	1,2	1,2	1,0

* (see Annex B)

Figure 1 shows the relation between the testing values and the utilisation values for the bending moment of a hollow insulator or hollow post insulator.

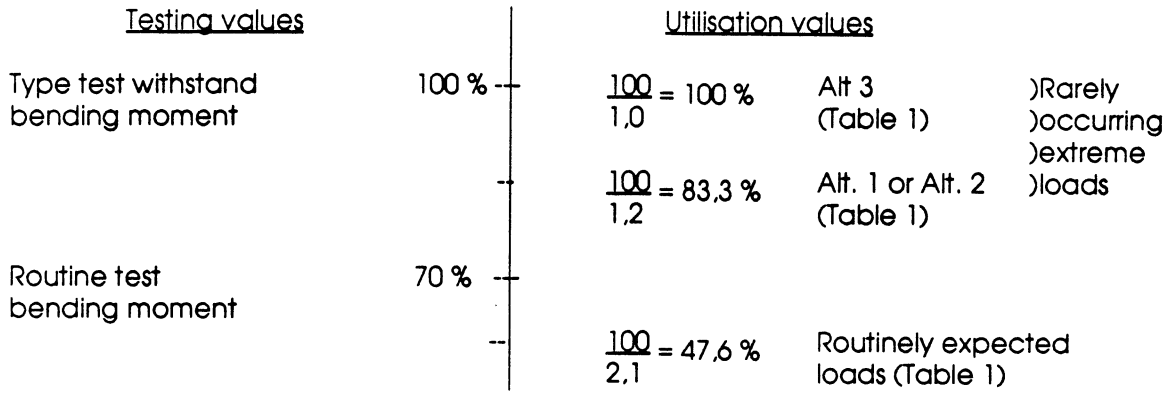

Figure 1 : Bending moments

3. GENERAL REQUIREMENTS FOR TEST

3.1 Classification of tests

The tests are divided into three groups as follows :

a) Type tests

These tests are intended to verify the principal characteristics of a hollow insulator which depend mainly on its shape and size. They are made once only on hollow insulators complying with the conditions specified in subclause 5.4.
They shall be repeated only when the design or the material or the manufacturing process of the hollow insulator is changed.

b) Sample tests

These tests are for the purpose of verifying the characteristics of a hollow insulator which depend on the manufacturing quality. They are made on hollow insulators taken at random from batches.

c) Routine tests

These tests are for the purpose of eliminating hollow insulators with manufacturing defects. They are made on every hollow insulator.