

SLOVENSKI STANDARD
SIST EN 60168:1997**01-november-1997**

Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V (IEC 168:1994)

Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 kV

Prüfungen an Innenraum- und Freiluft-Stützisolatoren aus keramischem Werkstoff oder Glas für Systeme mit Nennspannungen über 1 kV

Essais des supports isolants d'intérieur et d'extérieur, en matière céramique ou en verre, destinés à des installations de tension nominale supérieure à 1 kV

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Ta slovenski standard je istoveten z: EN 60168:1994**ICS:**

29.080.10 Izolatorji Insulators

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60168

December 1994

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Descriptors: Post insulators, ceramic material, glass, test

English version

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ceramic material or glass for systems with nominal
voltages greater than 1 000 V
(IEC 168:1994)**

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This European Standard was approved by CENELEC on 1994-12-06. 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 lists 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

The text of document 36C(CO)58, future edition 4 of IEC 168, prepared by SC 36C, Insulators for substations, of IEC TC 36, Insulators, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60168 on 1994-12-06.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1995-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1995-12-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annexes A, B and C are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 168:1994 was approved by CENELEC as a European Standard without any modification.

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ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD
WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

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 amendment or revision. For undated references the latest edition of the publication referred to applies.

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

IEC Publication	Date	Title	EN/HD	Date
50(471)	1984	International Electrotechnical Vocabulary (IEV) Chapter 471: Insulators	-	-
60-1	1989	High-voltage test techniques Part 1: General definitions and test requirements (corrigenda March 1990 + March 1992)	HD 588.1 S1	1991
71-1	1993	Insulation co-ordination Part 1: Definitions, principles and rules	-	-
71-2	1976	Part 2: Application guide	HD 540.2 S1	1991
71-3	1982	Part 3: Phase-to-phase insulation co-ordination - Principles, rules and application guide	HD 540.3 S1	1991
273	1990	Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000 V	HD 578 S1	1992
438	1973	Tests and dimensions for high-voltage d.c. insulators	-	-

Other publications:

-
- ISO 1459:1973 - Metallic coatings - Protection against corrosion by hot dip galvanizing - Guiding principles
 - ISO 1460:1992 - Metallic coatings - Hot dip galvanized coatings on ferrous metals
Gravimetric determination of the mass per unit area
 - ISO 1461:1973 - Metallic coatings - Hot dip galvanized coatings on fabricated ferrous products - Requirements
 - ISO 1463:1982 - Metal and oxide coatings - Measurement of coating thickness
Microscopical method
 - ISO 2064:1980 - Metallic and other non-organic coatings - Definitions and conventions concerning the measurement of thickness
 - ISO 2178:1982 - Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method

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1994-11

**Essais des supports isolants d'intérieur et
d'extérieur, en matière céramique ou en verre,
destinés à des installations de tension nominale
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Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TESTS ON INDOOR AND OUTDOOR POST INSULATORS
OF CERAMIC MATERIAL OR GLASS FOR SYSTEMS
WITH NOMINAL VOLTAGES GREATER THAN 1 000 V**

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 cooperation 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, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 3) They have the form of recommendations for international use 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.

International Standard IEC 168 has been prepared by sub-committee 36C, Insulators for substations, of IEC technical committee 36: Insulators.

This fourth edition cancels and replaces the third edition published in 1988 and constitutes a technical revision.

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

DIS	Report on voting
36C(CO)58	36C(CO)60

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.

INTRODUCTION

The main purpose in preparing this edition has been to align the text and presentation as far as practicable with the fourth edition of IEC 383-1 and IEC 383-2.

Concepts of electrical and mechanical equivalence of post insulators have been introduced, and the clauses dealing with mechanical testing have been redrafted to clarify the test requirements.

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TESTS ON INDOOR AND OUTDOOR POST INSULATORS OF CERAMIC MATERIAL OR GLASS FOR SYSTEMS WITH NOMINAL VOLTAGES GREATER THAN 1 000 V

Section 1: General

1.1 Scope and object

This International Standard IEC 168 is applicable to post insulators and post insulator units of ceramic material or glass, for indoor and outdoor use in electrical installations or equipment, operating on alternating current with a nominal voltage greater than 1 000 V and a frequency not greater than 100 Hz.

This standard may be regarded as a provisional standard for post insulators for use on d.c. systems. IEC 438 gives general guidance for those insulators.

This standard does not apply to composite insulators, or to those indoor post insulators in organic material which are covered by another IEC standard [1]*.

The object of this standard is to define:

- the terms used;
- the electrical and mechanical characteristics of post insulators;
- the conditions under which the specified values of these characteristics are verified;
- the methods of test;
- the acceptance criteria.

Numerical values of characteristics of post insulators are specified in IEC 273.

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

NOTES

- 1 A guide for the choice of insulators under polluted conditions is available, see [2].
- 2 This standard does not include radio interference tests or artificial pollution tests. These subjects and relevant test methods are dealt with in other IEC publications, see [3], [4] and [5].
- 3 When this standard is applied to hollow post insulators, other IEC publications should also be taken into account, see [6] and [7].

* The figures in square brackets refer to annex C (Bibliography).

1.2 Normative references

The following normative documents 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 normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative documents listed below. Members of IEC and ISO maintain registers of currently valid normative documents.

IEC 50(471): 1984, *International Electrotechnical Vocabulary (IEV) – Chapter 471: Insulators*

IEC 60-1: 1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 71-1: 1993, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 71-2: 1976, *Insulation co-ordination – Part 2: Application guide*

IEC 71-3: 1982, *Insulation co-ordination – Part 3: Phase-to-phase insulation co-ordination. Principles, rules and application guide*

IEC 273: 1990, *Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1 000 V*

IEC 438: 1973, *Tests and dimensions for high-voltage d.c. insulators*

ISO 1459: 1973, *Metallic coatings – Protection against corrosion by hot dip galvanizing – Guiding principles*

ISO 1460: 1992, *Metallic coatings – Hot dip galvanized coatings on ferrous metals – Gravimetric determination of the mass per unit area*

ISO 1461: 1973, *Metallic coatings – Hot dip galvanized coatings on fabricated ferrous products – Requirements*

ISO 1463: 1982, *Metal and oxide coatings – Measurement of coating thickness – Microscopical method*

ISO 2064: 1980, *Metallic and other non-organic coatings – Definitions and conventions concerning the measurement of thickness*

ISO 2178: 1982, *Non-magnetic coatings on magnetic substrates – Measurement of coating thickness – Magnetic method*

1.3 Definitions

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

The definitions given below are those which either do not appear in IEC 50(471), or differ from those given in IEC 50(471).

1.3.1 insulator: The term "insulator" is used in this standard to refer to the object being tested. Unless otherwise specified, this refers to an assembled post insulator, complete with metal fittings. In this standard, the term "post insulator" shall be taken to mean post insulator, or post insulator unit, as required by the text.

NOTES

- 1 The term "approximately cylindrical shape" covers a unit of circular cross-section, which may vary in diameter.
- 2 For indoor installations subject to excessive condensation, outdoor post insulators, or special indoor post insulators may be used.

1.3.2 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.

1.3.3 dry lightning-impulse withstand voltage: The lightning-impulse voltage which the post insulator withstands dry, under the prescribed conditions of test.

1.3.4 50 % dry lightning impulse flashover voltage: The value of the lightning-impulse voltage which, under the prescribed conditions of test, has a 50 % probability of producing flashover on the post insulator, dry.

NOTE – The term "flashover" used in this standard includes flashover across the insulator surface as well as disruptive discharges by sparkover through air adjacent to the insulator. Disruptive discharges should only occur occasionally elsewhere (for instance, to other structures or to earth), in which event they should not be taken into account for the purpose of this standard.

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1.3.5 dry or wet switching-impulse withstand voltage: The switching-impulse voltage which the post insulator withstands, dry or wet respectively, under the prescribed conditions of test.

1.3.6 50 % dry or wet switching-impulse flashover voltage: The value of the switching-impulse voltage which, under the prescribed conditions of test, has a 50 % probability of producing flashover on the post insulator, dry or wet respectively.

1.3.7 dry or wet power-frequency withstand voltage: The power-frequency voltage which the post insulator withstands dry or wet respectively, under the prescribed conditions of test.

1.3.8 dry or wet power-frequency flashover voltage: The arithmetic mean value of the measured voltages which cause flashover on the post insulator, dry or wet respectively, under the prescribed conditions of test.

1.3.9 puncture voltage: The voltage which causes puncture of a post insulator under the prescribed conditions of test.

1.3.10 mechanical failing load: The maximum load reached when a post insulator is tested under the prescribed conditions of test.

1.3.11 creepage distance: The shortest distance, or the sum of the shortest distances, along the contours of the external surfaces of the ceramic or glass insulating parts of the post insulator between those parts which normally have the operating voltage between them.

NOTES

- 1 The surface of cement, or other non-insulating jointing material, is not considered as forming part of the creepage distance.
- 2 If a high-resistance coating is applied to parts of the surface of an insulator, such parts are considered to be effective insulating surfaces, and the distance over them is included in the creepage distance.
- 3 The surface resistivity of such high-resistance coatings is usually about $10^6 \Omega$, but may be as low as $10^4 \Omega$.
- 4 If high-resistance coatings are applied to the whole surface of the post insulator (the so-called stabilized insulator), the questions of surface resistivity and creepage distance should be subject to agreement between the purchaser and the manufacturer.
- 5 The creepage distance according to this definition is specified as minimum nominal creepage distance in IEC 273.

1.3.12 specified characteristic: A specified characteristic is:

- either the numeric value of a voltage, of a mechanical load, or any other characteristic specified in an IEC standard,
- or the numeric value of any such characteristic agreed between the purchaser and the manufacturer.

Specified withstand and flashover voltages are referred to standard atmospheric conditions (see 4.2.1).

1.3.13 parallelism of the end faces: The maximum difference in the height of a post insulator measured across the surfaces of the metal fittings at each end.

NOTE - The difference in height is usually related to a circle of 250 mm diameter.

1.3.14 eccentricity: The displacement, perpendicular to the axis of the post insulator, between the centres of the pitch circles of the fixing holes in the top and bottom metal fittings.

1.3.15 angular deviation of the fixing holes: The rotational displacement, expressed as an angle, between corresponding fixing holes in the metal fittings at the top and bottom of a post insulator.

Section 2: Insulators

2.1 Insulator designs and insulating materials

2.1.1 Insulator designs

Post insulators and post insulator units are divided into different design categories according to their construction. The design categories covered by the tests in this standard are:

- 1) solid-core cylindrical post insulators with external metal fittings, having solid insulating material throughout the height of each post insulator unit, i.e. a puncture-proof insulator (see figure 1);