

Insulators — Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV

The European Standard EN 60660:1999 has the status of a British Standard

ICS 29.080.10

National foreword

This British Standard is the official English language version of EN 60660:1999. It is identical with IEC 60660:1999.

The UK participation in its preparation was entrusted by Technical Committee PEL/36, Insulators for power systems, to Subcommittee PEL/36/3, Sub-station insulators, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 25, two annex ZA pages and a back cover.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 June 2000

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ISBN 0 580 34911 X

Amendments issued since publication

Amd. No.	Date	Comments

English version

Insulators

**Tests on indoor post insulators of organic material for systems
with nominal voltages greater than 1 kV up to but not including 300 kV
(IEC 60660:1999)**

Isolateurs

Essais des supports isolants d'intérieur
en matière organique destinés à des
installations de tension nominale
supérieure à 1 kV jusqu'à 300 kV
non compris
(CEI 60660:1999)

Isolatoren

Prüfungen an Innenraum-Stützern aus
organischem Werkstoff für Netze mit
Nennspannungen über 1 kV bis kleiner
300 kV
(IEC 60660:1999)

This European Standard was approved by CENELEC on 1999-12-01. 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.

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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/111/FDIS, future edition 2 of IEC 60660, 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 60660 on 1999-12-01.

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) 2000-09-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2002-12-01

Endorsement notice

The text of the International Standard IEC 60660:1999 was approved by CENELEC as a European Standard without any modification.

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INSULATORS – TESTS ON INDOOR POST INSULATORS OF ORGANIC MATERIAL FOR SYSTEMS WITH NOMINAL VOLTAGES GREATER THAN 1 000 V UP TO BUT NOT INCLUDING 300 kV

1 General

1.1 Scope and object

This International Standard is applicable to post insulators of organic material for indoor service in electrical installations or equipment operating in air at atmospheric pressure on alternating current with a nominal voltage greater than 1 000 V up to, but not including, 300 kV, as defined by range I of IEC 60071-1, and a frequency not greater than 100 Hz. Composite insulators are not covered by this standard.

The object of this standard is

- to define the terms used;
- to define electrical and mechanical characteristics of post insulators of organic material and to prescribe the conditions under which the specified values of these characteristics are verified;
- to prescribe methods of testing;
- to prescribe acceptance criteria.

This standard does not give numerical values for insulator characteristics; nor does it deal with a choice of insulators for specific operating conditions. IEC 60273 specifies numerical values for electrical and mechanical characteristics and gives the dimensions necessary for inter-changeability of post insulators.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of the ISO/IEC Directives. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the ISO/IEC Directives are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

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

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60071-1, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60270, *Partial discharge measurements*

IEC 60273, *Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1 000 V*

IEC 60587, *Test method for evaluating resistance to tracking and erosion of electrical insulating materials used under severe ambient conditions*

IEC 60695-11-10:1999, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60932, *Additional requirements for enclosed switchgear and controlgear from 1 kV to 72,5 kV to be used in severe climatic conditions*

ISO 9000-1, *Quality management and quality assurance standards – Part 1: Guidelines for selection and use*

ISO 9002, *Quality systems – Model for quality assurance in production, installation and servicing*

1.3 Definitions

For the purpose of this standard, the following definitions apply, together with those in IEC 60050(471)

NOTE – The definitions regarding test voltages are given for convenience. For additional details, see IEC 60060-1.

1.3.1

post insulator of organic material

post insulator intended to give rigid support to a live part which is to be insulated from earth and from another live part. The whole or part of the material composing the post insulator consists of organic materials, i.e. of material pertaining to the chemistry of the compounds produced from carbon or to the chemistry of the compounds produced from carbon and silicon. These organic materials may be used alone or in conjunction with other materials (mineral or organic) as fillers, reinforcements, etc.

1.3.2

indoor post insulator

a post insulator not intended to be exposed to outdoor atmospheric conditions. For indoor installations subject to excessive condensation, outdoor post insulators or special indoor post insulators may be used
[IEV 471-04-04, modified]

1.3.3

design category

post insulators of organic materials are divided into two different design categories according to their construction. The design categories covered by this standard are:

Design category A

Cylindrical post insulators with internal metal fittings in which the length of the shortest puncture path through solid insulating material is equal to or greater than one-third the external arcing distance between the metal fittings

Design category B

Cylindrical post insulators with internal metal fittings in which the length of the shortest puncture path through solid insulating material is less than one-third the external arcing distance between the metal fittings

NOTE – The term “cylindrical insulators” is intended to cover insulators of the truncated conical form.

1.3.4

lot

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

1.3.5

flashover

disruptive discharge external to the insulator, and over its surface, connecting those parts which normally have the operating voltage between them. 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 [IEV 471-01-12, modified]

1.3.6

puncture

a disruptive discharge passing through the solid insulating material of the insulator which produces a permanent loss of dielectric strength

A fragment breaking away from the rim of a shed or damage to the insulator due to the heat of the surface discharge is not considered as a puncture [IEV 471-01-11, modified]

1.3.7

dry lightning impulse withstand voltage

lightning impulse voltage which the dry post insulator withstands under the prescribed conditions of test

1.3.8

50 % dry lightning impulse flashover voltage

value of the lightning impulse voltage which has a 50 % probability of producing flashover on the dry post insulator under the prescribed conditions of test

1.3.9

dry power-frequency withstand voltage

power-frequency voltage which the dry post insulator withstands under the prescribed conditions of test

1.3.10

dry power-frequency flashover voltage

arithmetic mean value of the measured voltages which cause flashover on the dry post insulator under the prescribed conditions of test

1.3.11

mechanical failing load

maximum load reached when an organic insulator is tested under the prescribed conditions of test

1.3.12

creepage distance

shortest distance along the contours of the external surfaces of the insulating parts of the post insulator between those parts which normally have the operating voltage between them. However, to take account of the metal fittings attached to the post insulator, the distance which in service conditions is covered by metal fittings is not included in the creepage distance

NOTE 1 – If high-resistance coatings are applied to parts of the post insulators, such coatings are considered as effective creepage surfaces and the distance over them is included in the creepage distance.

NOTE 2 – The surface resistivity of such high-resistance coatings is usually about $10^6 \Omega$ but may be as low as $10^4 \Omega$.

NOTE 3 – 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 is subject to agreement between the manufacturer and the purchaser.

NOTE 4 – The creepage distance is normally not specified.

1.3.13

specified characteristic

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

Specified withstand and flashover voltages are referred to standard atmospheric conditions

1.3.14

parallelism of the end faces

maximum difference in the height of the post insulator measured across the surface of the metal fittings at each end

1.3.15

eccentricity

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

1.3.16

angular deviation of fixing holes

rotational displacement, expressed as an angle, between corresponding fixing holes in the metal fittings at the top and bottom of a post insulator

1.4 Values which characterise a post insulator of organic material

A post insulator of organic material is characterised by the following values where applicable:

- a) the specified dry lightning impulse withstand voltage;
- b) the specified dry power-frequency withstand voltage;
- c) the specified lightning impulse puncture voltage (for post insulators of design category B only);
- d) the specified mechanical failing loads;
- e) the specified significant dimensions;
- f) the maximum difference between the deflection at 20 % and 50 % of the specified mechanical failing load.

If requested, a design drawing of the post insulator shall be submitted.

NOTE 1 – Service voltage is not considered as a characteristic of a post insulator.

NOTE 2 – The withstand voltages of post insulators under service conditions may differ from the voltages under standard testing conditions.