SLOVENSKI STANDARD
oSIST prEN IEC 60383-1:2022

01-junij-2022

Izolatorji za nadzemne vode za nazivne napetosti nad 1 kV - 1. del: Keramični ali stekleni izolatorji za izmenične sisteme - Definicije, preskusne metode in prevzemna merila

Insulators for overhead lines with a nominal voltage above 1000 V - Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria

Isolateurs pour lignes aériennes de tension nominale supérieure à 1000 V - Partie 1: Eléments d'isolateurs en matière céramique ou en verre pour systèmes à courant alternatif - Définitions, méthodes d'essai et critères d'acceptation

Ta slovenski standard je istoveten z: prEN IEC 60383-1:2022

ICS:

01.040.29	Elektrotehnika (Slovarji)	Electrical engineering (Vocabularies)
29.080.10	Izolatorji	Insulators
29.240.20	Daljnovodi	Power transmission and distribution lines

oSIST prEN IEC 60383-1:2022 **en,fr,de**

36/544/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 60383-1 ED5	
DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
2022-04-08	**2022-07-01**
SUPERSEDES DOCUMENTS:	
36/505/CD, 36/525/CC	

IEC TC 36 : INSULATORS	
SECRETARIAT: Sweden	SECRETARY: Mr Dan Windmar
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 11	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☒ QUALITY ASSURANCE ☐ SAFETY	
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TITLE:

Insulators for overhead lines with a nominal voltage above 1000 V - Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria

PROPOSED STABILITY DATE: 2026

NOTE FROM TC/SC OFFICERS:

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INSULATORS FOR OVERHEAD LINES WITH A NOMINAL VOLTAGE ABOVE 1 000 V –

Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria

FOREWORD

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International Standard IEC 60383 has been prepared by technical committee 36:MT20.

This 5th edition cancels and replaces the 4th edition published in 1993. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) The complete document has been revised and updated. The layout of the document has been changed in order to increase the readability.

b) RIV test has been added (clause 14)

c) Impulse puncture test in air has been added (clause 15.1)

d) Residual strength test has been added (clause 21)

e) Zinc sleeve test has been added (clause 28)

f) Impact test has been added (clause 30)

g) Annex C, coatings on ceramic and glass insulators has been added

h) Annex D, impact test has been added

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This standard deals with four different types of insulators:

- Pin insulators
- Line post insulators
- String insulator units
- Insulators for overhead electric traction lines

The user of this part need only refer to the clause dealing with the type of insulator to be tested and to the general requirements and relevant test.

INSULATORS FOR OVERHEAD LINES WITH A NOMINAL VOLTAGE ABOVE 1 000 V –

Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria

1 Scope

This part of IEC 60383 applies to insulators of ceramic material or glass for use on a.c. overhead power lines and overhead traction lines with a nominal voltage greater than 1 000 V and a frequency not greater than 100 Hz. It also applies to insulators for use on d.c. overhead electric traction lines.

This part applies to string insulator units, rigid overhead line insulators and to insulators of similar design when used in substations.

It does not apply to insulators forming parts of electrical apparatus or to parts used in their construction or to post insulators which are covered by IEC 60168: Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 000 V.

Tests on insulator strings and insulator sets (for example, wet switching impulse voltage) are dealt with in part 2 of IEC 60383.

The object of this part is:

– to define the terms used
– to define insulator characteristics and to prescribe the conditions under which the specified values of these characteristics shall be verified
– to prescribe test methods
– to prescribe acceptance criteria.

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

Specific requirements on the use of coatings on ceramic or glass insulators are described in the informative Annex C.

NOTE A guide for the choice of insulators under polluted conditions has been published, see IEC 60815-1 and -2.

Numerical values for insulator characteristics are specified in IEC 60305, IEC 60433 and IEC 60720.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-471: International Electrotechnical Vocabulary (IEV) - Insulators

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

IEC 60120: Dimensions of ball and socket couplings of string insulator units

IEC 60305: Insulators for overhead lines with a nominal voltage above 1000 V - Ceramic or glass insulator units for a.c. systems - Characteristics of insulator units of the cap and pin type

IEC 60372: Locking devices for ball and socket couplings of string insulation units: Dimensions and tests

IEC 60433: Insulators for overhead lines with a nominal voltage above 1 000 V - Ceramic insulators for a.c. systems - Characteristics of insulator units of the long rod type

IEC 60437: Radio interference test on high-voltage insulators

IEC 60471: Dimensions of clevis and tongue couplings of string insulator units

IEC 60720: Characteristics of line post insulators

IEC TR 60797: Residual strength of string insulator units of glass or ceramic material for overhead lines after mechanical damage of the dielectric

IEC 61211: Insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1 000 V - Impulse puncture testing in air

ISO 1459: Metallic coatings - Protection against corrosion by hot dip galvanizing - Guiding principles

ISO 1460: Metallic coatings - Hot dip galvanized coatings on ferrous metals - Determination of the mass per unit area - Gravimetric method

ISO 1461: Metallic coatings - Hot dip galvanized coatings on fabricated ferrous products - Requirements

ISO 1463: Metal and oxide coatings - Measurement of coating thickness - Microscopical method

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

ISO 2178: Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method

3 Terms and definitions

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

3.1
insulator string
one or more string insulator units coupled together and intended to give flexible support to conductors and stressed mainly in tension

3.2
rigid insulator
insulator intended to give rigid support to an overhead line conductor and to be stressed mainly by bending and compressive loads

3.3

long rod insulator
rigid insulator intended to be subjected to tensile loads, comprising an insulating part having an approximately circular cylindrical shank, with or without sheds, and external or internal fixing devices attached to each end

3.4

cap and pin insulator
insulator comprising an insulating part usually having the form of a disk or bell, with or without ribs on its surface, and end fittings consisting of an outside cap and an inside pin attached axially

3.5
pin insulator
rigid insulator consisting of an insulating component intended to be mounted rigidly on a supporting structure by means of a pin passing up inside the insulating component which consists of one or more pieces of insulating material permanently connected together

Note 1 to entry: The pin can have two basic shapes. With one shape, the insulating component is fixed to the end of the pin and does not allow contact of the insulating component with the supporting structure. With the other shape, the insulating component is fixed by means of the pin in contact with the supporting structure either directly or with a plate in between, the plate being either a separate washer or part of the pin (sometimes referred to as a pin post insulator).

3.6
line post insulator
rigid insulator intended to be subjected to cantilever, tensile and compressive loads, constructed with one or more insulating materials and assembled on a metal base that is intended to be mounted rigidly on a supporting structure

3.7
traction insulator
an insulator or insulator set intended to give flexible or rigid support for overhead electric traction lines. All types of overhead line insulators may be used for this purpose.

3.8

annealed glass
glass which has been treated to eliminate internal stresses

3.9

toughened glass
glass in which pre-stresses have been created in order to improve its mechanical characteristics

3.10
lot
a group of insulators offered for acceptance from the same manufacturer, of the same design and manufactured under presumed 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.

3.11
flashover (of an insulator)
disruptive discharge external to the insulator, and over its surface, connecting those parts which normally have the operating voltage between them

3.12
impulse withstand voltage
highest peak value of impulse voltage of prescribed form and polarity which does not cause breakdown of insulation under specified conditions

3.13
power frequency withstand voltage
rms value of sinusoidal power frequency voltage that the insulation of the given equipment can withstand during tests made under specified conditions and for a specified duration

3.14
electromechanical failing load
maximum load reached when a string insulator unit is tested under the prescribed conditions of the test

3.15

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

3.16
specified mechanical failing load, SFL
mechanical load that causes the loss of mechanical characteristics of any part of an insulator, when tested according to the relevant standard

Note 1 to entry: SFL can also be used for specified electromechanical failing load.

3.17
puncture (of an insulator)
disruptive discharge passing through the solid insulating material of the insulator which produces a permanent loss of dielectric strength

3.18
creepage distance
shortest distance or the sum of the shortest distances along the surface on an insulator between two conductive parts which normally have the operating voltage between them

Note 1 to entry: The surface of cement or of any other non-insulating jointing material is not considered as forming part of the creepage distance.

Note 2 to entry: 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 to entry: Insulators with grooves e.g. pin insulators, the creepage measurements shall start at the centre of the side groove

3.19
minimum creepage distance
is the defined minimum allowed creepage distance which cannot be subject to a specified negative tolerance.

3.20
nominal creepage distance
is the value of the creepage distance which can also be subject to a specified positive or negative tolerance.

3.21
minimum nominal creepage distance
is the defined minimum allowed creepage distance which can also be subject to a specified negative tolerance.

Note 1 to entry: Minimum nominal creepage distance is a definition that normally applies to cap and pin insulators

3.22
displacements
axial displacement
maximum positional variation, parallel to the insulator axis, of a definite point on the circumference of the considered insulator during one complete revolution around the insulator axis.

radial displacement
maximum positional variation, perpendicular to the insulator axis, of a definite point on the circumference of the considered insulator during one complete revolution around the insulator axis.

angular displacement
angular deviation around the insulator axis between corresponding planes of the two coupling pieces.

3.23
short standard string
is used to verify characteristics of a unit which are significant only to an insulator string

For cap and pin units:

an insulator string of 5 insulator units.

For long rod insulator units:

an insulator string between 1 m and 2 m in length for long rod insulator units intended to be assembled in a string. For long rod insulators less than 1 m long intended to be used as a string, the unit itself is considered as a short standard string.

Note 1 to entry – The definition short standard string is different to the definition of short string in IEC 61467

Note 2 to entry - For systems with insulator string with less than 5 insulators, must be considered the string with the real number of insulators

3.24
specified characteristics
A specified characteristic is:

-either the numeric value of a voltage or of a mechanical load or any other characteristic specified in an IEC international standard;

-or the numeric value of any such characteristic agreed between the purchaser and the manufacturer.

4 Classification, types of insulators and insulating materials

4.1 Insulator classes

Insulators for overhead lines are divided into two classes according to their design:

Class A: an insulator or insulator unit in which the length of the shortest puncture path through solid insulating material is at least equal to half the arcing distance. An example of a class A insulator is a long rod insulator with external fittings.

Class B: an insulator or insulator unit in which the length of the shortest puncture path through solid insulating material is less than half the arcing distance. An example of a class B insulator is a cap and pin insulator.

4.2 Insulator types

For the purposes of this part of IEC 60383, overhead line insulators are divided into the four following types:

- pin insulators
- line post insulators
- string insulator units, divided into two sub-types:
  - cap and pin insulators
  - long rod insulators
- insulators for overhead electric traction lines.

NOTE - Insulators for overhead traction lines are normally insulators of one of the first three types above, with or without special adaptations of the metal fittings, designed for use on overhead electric traction lines.

4.3 Insulating materials

The insulating materials of overhead line insulators covered by this part are:

- ceramic material, porcelain
- annealed glass, being glass in which the mechanical stresses have been relaxed by thermal treatment
- toughened glass, being glass in which controlled mechanical stresses have been induced by thermal treatment.

NOTE 1 Further information on the definition and classification of ceramic and glass insulating materials can be found in IEC 60672-1 and IEC 60672-3.

NOTE 2 The term "ceramic material" is used in this part to refer to porcelain materials and, contrary to North American practice, does not include glass.

5 Identification of insulators

Each insulator shall be marked, either on the insulating component or on a metal part, with the name or trademark of the manufacturer and the year of manufacture. In addition, each string insulator unit shall be marked with the specified electromechanical or mechanical failing load whichever is applicable. These markings shall be legible and indelible.

The designations included in IEC 60305, IEC 60433 and IEC 60720 may be used.