IEC 60305

Edition 5.0 2021-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Insulators for overhead lines with a nominal voltage above 1 000 V – Ceramic or glass insulator units for AC systems – Characteristics of insulator units of the cap and pin type

Isolateurs pour lignes aériennes de tension nominale supérieure a 1 000 V – Éléments d'isolateurs en céramique ou en verre pour réseaux à tension alternative – Caractéristiques des éléments d'isolateurs du type capot et tige

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CONTENTS

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INSULATORS FOR OVERHEAD LINES WITH A NOMINAL VOLTAGE ABOVE 1 000 V – CERAMIC OR GLASS INSULATOR UNITS FOR AC SYSTEMS – CHARACTERISTICS OF INSULATOR UNITS OF THE CAP AND PIN TYPE

FOREWORD

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International Standard IEC 60305 has been prepared by IEC technical committee 36: Insulators.

This fifth edition cancels and replaces the fourth edition published in 1995. This edition constitutes a technical revision.

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

a) wording in Scope changed from "it is recommended" to "it is applicable";
b) new normative references added;
c) electromechanical or mechanical failing load in Clause 4 specified;
d) new figures added showing profiles;
e) Tables 1, 2, 3, 4 and 5 expanded to include more specified values.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
36/499/FDIS	36/501/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

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

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- withdrawn,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

INSULATORS FOR OVERHEAD LINES WITH A NOMINAL VOLTAGE ABOVE 1 000 V – CERAMIC OR GLASS INSULATOR UNITS FOR AC SYSTEMS – CHARACTERISTICS OF INSULATOR UNITS OF THE CAP AND PIN TYPE

1 Scope

This International Standard applies to string insulator units of the cap and pin type with insulating parts of ceramic material or glass, intended for AC overhead lines with a nominal voltage greater than 1 000 V and a frequency not greater than 100 Hz. It also applies to insulators of similar design used in substations.

This document applies to string insulator units of the cap and pin type either with ball and socket couplings or with clevis and tongue couplings.

This document applies to string insulator units for use on overhead lines in clean areas and polluted areas. For use in areas characterized by very heavy pollution levels and for other particular or extreme environmental conditions, it may be necessary for certain dimensions to be changed and insulator units having different creepage distances, spacing and forms may be preferred (for example, flat profile, hemispherical etc.). Insulators for use on DC systems may also need different dimensions. In any case, it is applicable that the standardized mechanical characteristics of this document and coupling sizes are retained.

The object of this document is to prescribe specified values for the mechanical characteristics and for the main dimensions of string insulator units of the cap and pin type.

The power frequency, lightning impulse and puncture withstand voltages of string insulator units are not specified in this document. IEC 60383-1 gives the electrical characteristics which define string insulator units; their values are agreed between purchaser and manufacturer.

Ball and socket couplings are covered by IEC 60120, clevis and tongue couplings by IEC 60471.

NOTE For the definition of site pollution severity see IEC TS 60815-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60383-1, *Insulators for overhead lines with a nominal voltage above 1000 V – Part 1: Ceramic or glass insulator units for AC systems – Definitions, test methods and acceptance criteria*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Mechanical characteristics, dimensions and types

String insulator units of the cap and pin type are standardized by the following specified characteristics:

– Specified electromechanical or mechanical failing load (SFL) according to IEC 60383-1;
– maximum nominal diameter of the insulating part;
– nominal spacing;
– minimum nominal creepage distance;
– standard coupling.

The corresponding values are indicated in Table 1, Table 2, Table 3, Table 4 and Table 5.

NOTE 1 The following points merit attention for insulators for use in polluted areas:

a) even if the creepage distance is the same, the withstand voltage characteristics may change with shed shape of the insulators;

b) even if the string length is the same, the withstand voltage characteristics may decrease with increasing insulator strength due to the lower efficiency of creepage distance for a larger average diameter.

NOTE 2 IEC 60815 gives details on the important parameters of shed profiles for antipollution insulators.

5 Designation and marking with respect to shed profile

Insulators are designated in Table 1, Table 2, Table 3, Table 4 and Table 5 by the letter U followed by a number indicating the specified electromechanical or mechanical failing load in kilonewtons.

The letter B or C which follows specifies a ball and socket or clevis and tongue, respectively.

The following letter S or L, if present, specifies a short or long spacing.

The letter P, D, V, or T present for "anti-fog" profile, "aerodynamic" profile, "two-alternating" profile, or "three-alternating" profile, as shown in Figure 1, Figure 2, Figure 3,Figure 4 and Figure 5, respectively.

IEC 60383-1 specifies that insulators shall be marked with the specified electromechanical or mechanical failing load. This load may be indicated by using the first part of the designation given in the first column of Table 1, Table 2, Table 3, Table 4 and Table 5: For instance, the insulator may be marked U 160 for the units U 160 BS, U 160 BL and U 160 BLP.

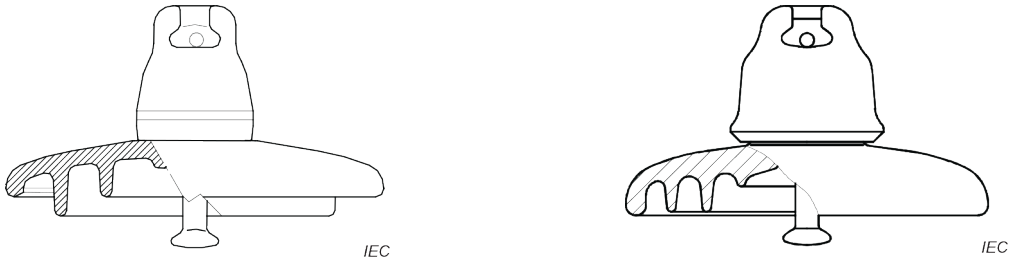

Figure 1 – Typical "standard" profile

Figure 2 – Typical "anti-fog" profile "P"

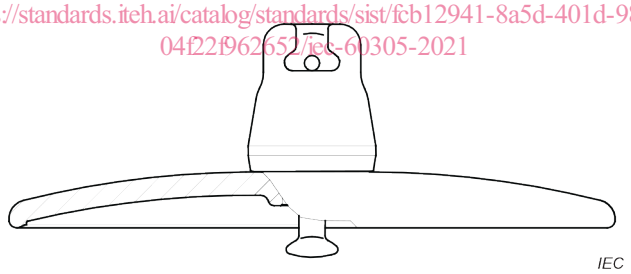

Figure 3 – Typical "aerodynamic" profile "D"

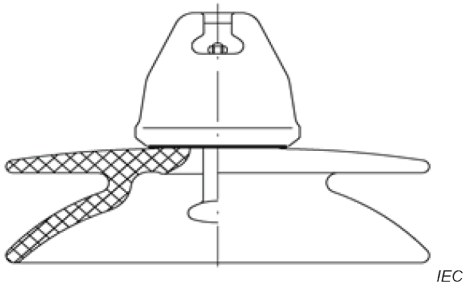

Figure 4 – Typical "two-alternating" profile "V"

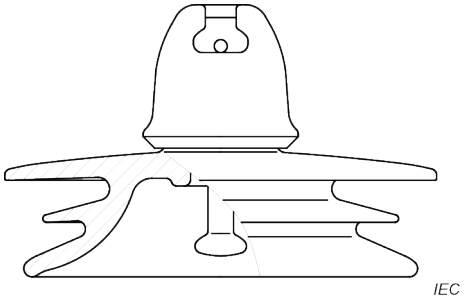

Figure 5 – Typical "three-alternating" profile "T"

6 Tolerances

Except for nominal spacing, tolerances for dimensions indicated in IEC 60383-1 are applicable to all nominal values including maximum nominal diameter and minimum nominal creepage distance values given in Table 1, Table 2, Table 3, Table 4 and Table 5.

Diagram of Table 1, Table 2, Table 3, Table 4 and Table 5 is shown in Figure 6, Figure 7, Figure 8, Figure 9 and Figure 10, respectively.

Nominal spacing tolerance shall be:

± (0,03 P + 0,3) mm

P being spacing expressed in millimetres.

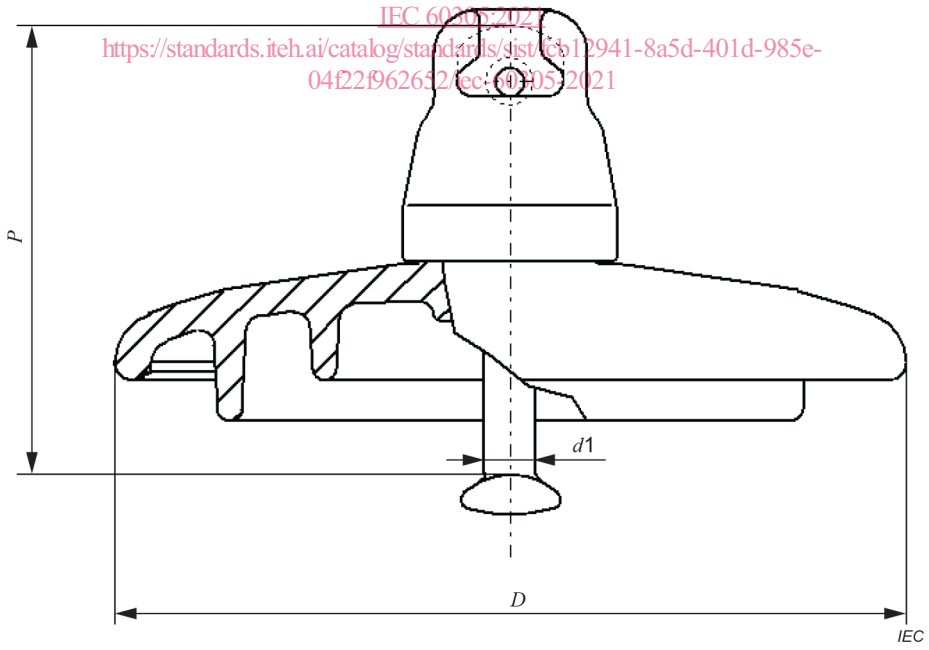

Figure 6 – String insulator unit of standard and anti-fog profile with ball and socket coupling

Table 1 – Specified values of mechanical and dimensional characteristics for string insulator units of standard and anti-fog profile with ball and socket couplings

Designation	Specified electromechanical or mechanical failing load kN	Maximum nominal diameter of the insulating part D mm	Nominal spacing P mm	Minimum nominal creepage distance mm	Standard coupling according to IEC 60120 d1
U 40 B	40	175	110	190	11
U 40 BP	40	210	110	295	11
U 70 BS	70	255	127	295	16
U 70 BL	70	255	146	295	16
U 70 BLP	70	280	146	440	16
U 100 BS	100	255	127	295	16
U 100 BL	100	255	146	295	16
U 100 BLP	100	280	146	440	16
U 120 B	120	255	146	295	16
U 120 BP	120	280	146	440	16
U 160 BS	160	280	146	315	20
U 160 BSP	160	330	146	440	20
U 160 BL	160	280	170	340	20
U 160 BLP	160	330	170	525	20
U 210 B	210	300	170	370	20
U 210 BP	210	330	170	525	20
U 300 B	300	330	195	390	24
U 300 BP	300	400	195	590	24
U 400 B	400	380	205	525	28
U 420 B	420	380	205	525	28
U 530 B	530	380	240	600	32
U 550 B	550	380	240	600	32
U 700 B	700	430	280	600	36
U 840 B	840	430	300	600	40

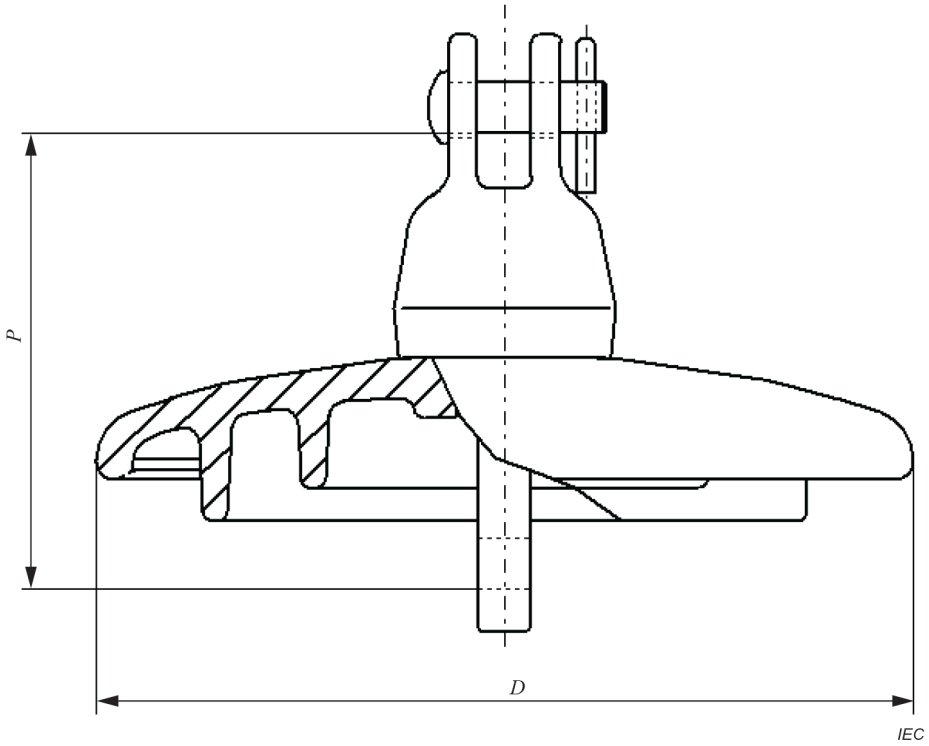

Figure 7 – String insulator unit of standard and anti-fog profile with clevis and tongue coupling

Table 2 – Specified values of mechanical and dimensional characteristics for string insulator units of standard and anti-fog profile with clevis and tongue couplings

Designation	Specified electromechanical or mechanical failing load kN	Maximum nominal diameter of the insulating part D mm	Nominal spacing P mm	Minimum nominal creepage distance mm	Standard coupling according to IEC 60471
U 40 C	40	190	140	200	16 C
U 70 C	70	255	146	295	16 C
U 70 CP	70	280	146	440	16 C
U 100 C	100	255	146	295	16 C
U 100 CP	100	280	146	440	16 C
U 120 C	120	255	146	295	16 C
U 120 CP	120	280	146	440	16 C
U 160 C	160	280	170	340	19 C
U 160 CP	160	330	170	525	19 C
U 210 C	210	300	178	370	22 C
U 210 CP	210	330	178	525	22 C

NOTE Insulators having an electromechanical or mechanical failing load exceeding 210 kN are not specified. If necessary, the insulators with ball and socket coupling defined in Table 1 shall preferably be used.