SLOVENSKI STANDARD
oSIST prEN IEC 60071-2:2022

01-julij-2022

Koordinacija izolacije - 2. del: Smernice za uporabo (predlagan horizontalni standard)

Insulation co-ordination - Part 2: Application guidelines (Proposed horizontal standard)

Coordination de l'isolement - Partie 2: Lignes directrices en matière d'application

Ta slovenski standard je istoveten z: **prEN IEC 60071-2:2022**

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COMMITTEE DRAFT FOR VOTE (CDV)

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IEC TC 99 : INSULATION CO-ORDINATION AND SYSTEM ENGINEERING OF HIGH VOLTAGE ELECTRICAL POWER INSTALLATIONS ABOVE 1,0 kV AC AND 1,5 kV DC

SECRETARIAT:	SECRETARY:
Australia	Ms Erandi Chandrasekare
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD:
TC 8,TC 11,TC 14,TC 17,SC 17A,SC 17C,TC 20,TC 22,SC 22F,SC 22G,TC 33,TC 36,TC 37,TC 38,TC 42,TC 115,TC 122	☒ 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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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Insulation co-ordination - Part 2: Application guidelines (Proposed horizontal standard)

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INSULATION CO-ORDINATION –

Part 2: Application guidelines

FOREWORD

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International Standard IEC 60071-2 has been prepared by IEC technical committee 99: Insulation co-ordination and system engineering of high voltage electrical power installations above 1,0 kV AC and 1,5 kV DC.

This fifth edition cancels and replaces the fourth edition published in 2018. This edition constitutes a technical revision.

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

a) Clause 4 Concepts governing the insulation co-ordination is added.

b) Subclause 5.3 is revised, and Subclause 5.4 Detailed simulation is added because it is widely applied in the recent practices of insulation coordination.

c) Special considerations for cable line and GIL/GIB are added in Clause 9.

d) Annex K (informative) Application of line shunt reactor to limitation of TOV and SFO in high voltage overhead transmission lines is added.

e) Annex L (informative) Calculation of lightning stroke rate and lightning outage rate is added.

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

FDIS	Report on voting
99/xxx/FDIS	99/xxx/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.

It has the status of a horizontal standard in accordance with IEC Guide 108.

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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INSULATION CO-ORDINATION –

Part 2: Application guidelines

1 Scope

This part of IEC 60071 constitutes application guidelines and deals with the selection of insulation levels of equipment or installations for three-phase a.c. systems. Its aim is to give guidance for the determination of the rated withstand voltages for ranges I and II of IEC 60071-1 and to justify the association of these rated values with the standardized highest voltages for equipment.

This association is for insulation co-ordination purposes only. The requirements for human safety are not covered by this document.

This document covers three-phase a.c. systems with nominal voltages above 1 kV. The values derived or proposed herein are generally applicable only to such systems. However, the concepts presented are also valid for two-phase or single-phase systems.

This document covers phase-to-earth, phase-to-phase and longitudinal insulation.

This document is not intended to deal with routine tests. These are to be specified by the relevant product committees.

The content of this document strictly follows the flow chart of the insulation co-ordination process presented in Figure 1 of IEC 60071-1:2019. Clauses 5 to 8 correspond to the squares in this flow chart and give detailed information on the concepts governing the insulation co-ordination process which leads to the establishment of the required withstand levels.

This document emphasizes the necessity of considering, at the very beginning, all origins, all classes and all types of voltage stresses in service irrespective of the range of highest voltage for equipment. Only at the end of the process, when the selection of the standard withstand voltages takes place, does the principle of covering a particular service voltage stress by a standard withstand voltage apply. Also, at this final step, this document refers to the correlation made in IEC 60071-1 between the standard insulation levels and the highest voltage for equipment.

The annexes contain examples and detailed information which explain or support the concepts described in the main text, and the basic analytical techniques used.

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 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60071-1:2019, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60505:2011, *Evaluation and qualification of electrical insulation systems*

IEC TS 60815-1: 2008, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles*

IEC TR 60071-4:2004, *Insulation co-ordination – Part 4: Computational guide to insulation co-ordination and modelling of electrical networks*

IEC 60099-5:2018, *Surge arresters – Part 5: Selection and application recommendations*

ISO 2533:1975, *Standard Atmosphere*

3 Terms, definitions, abbreviated terms and symbols

3.1 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

3.2 Abbreviated terms

TOV	temporary overvoltages
SFO	slow-front overvoltage
FFO	fast-front overvoltage
VFFO	very-fast-front overvoltage
SDWV	short-duration power-frequency withstand voltage
SIWV	switching impulse withstand voltage
LIWV	lightning impulse withstand voltage
MOSA	metal-oxide surge arrester
LSA	line surge arrester
EGLA	externally gapped line arrester
NGLA	non-gapped line arrester
LIPL	lightning impulse protection level
SIPL	switching impulse protection level
SVU	series varistor unit
AIS	air-insulated substation
GIS	gas-insulated switchgear, gas-insulated substation
EHV	extra high voltage: the highest voltage for equipment above 245 kV and up to and including 800 kV
UHV	ultra high voltage: the highest voltage for equipment above 800 kV
ESDD	equivalent salt deposit density
TCV	trapped charge voltage
MTBF	mean time between failure
EMT	electro-magnetic transients

3.3 Symbols

For the purpose of this document, the following symbols and definitions apply. The symbol is followed by the unit to be normally considered, dimensionless quantities being indicated by (-).

Some quantities are expressed in p.u. A per unit quantity is the ratio of the actual value of an electrical parameter (voltage, current, frequency, power, impedance, etc.) to a given reference value of the same parameter.

A	(kV)	parameter characterizing the influence of the lightning severity for the equipment depending on the type of overhead line connected to it
a_1	(m)	length of the lead connecting the surge arrester to the line
a_2	(m)	length of the lead connecting the surge arrester to earth
a_3	(m)	length of the phase conductor between the surge arrester and the protected equipment
a_4	(m)	length of the active part of the surge arrester
B	(-)	factor used when describing the phase-to-phase discharge characteristic
C_e	(nF)	capacitance to earth of transformer primary windings
C_s	(nF)	series capacitance of transformer primary windings
C_2	(nF)	phase-to-earth capacitance of the transformer secondary winding
C_{12}	(nF)	capacitance between primary and secondary windings of transformers
C_{1in}	(nF)	equivalent input capacitance of the terminal 1 of three-phase transformers
C_{2in}	(nF)	equivalent input capacitance of the terminal 2 of three-phase transformers
C_{3in}	(nF)	equivalent input capacitance of the terminal 3 of three-phase transformers
c	(m/μs)	velocity of light
c_f	(p.u.)	coupling factor of voltages between earth wire and phase conductor of overhead lines
d	(m)	air gap length
d_r	(-)	dividing ratio of capacitively transferred surges
E_0	(kV/m)	soil ionization gradient
F		function describing the cumulative distribution of overvoltage amplitudes, where $F(U) = 1 - P(U)$; see Clause B.3
f		function describing the probability density of overvoltage amplitudes
H	(m)	altitude above sea-level
h	(-)	power-frequency voltage factor for transferred surges in transformers
H_t	(m)	height above ground
I	(kA)	lightning current amplitude
I_g	(kA)	limit lightning current in tower footing resistance calculation
I_n	(kA)	nominal discharge current of an arrester
J	(-)	winding factor for inductively transferred surges in transformers
K	(-)	gap factor taking into account the influence of the gap configuration on the strength
K_a	(-)	altitude correction factor
K_c	(-)	co-ordination factor
K_s	(-)	safety factor
K_{cd}	(-)	deterministic co-ordination factor