



**SLOVENSKI STANDARD**  
**oSIST prEN IEC 60071-2:2022**  
**01-julij-2022**

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

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

**iTeh 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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Electrical insulation in general

**oSIST prEN IEC 60071-2:2022**

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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

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OF INTEREST TO THE FOLLOWING COMMITTEES: 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	PROPOSED HORIZONTAL STANDARD: <input checked="" type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
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TITLE:

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

PROPOSED STABILITY DATE: 2027

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**INSULATION CO-ORDINATION –****Part 2: Application guidelines****FOREWORD**

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

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

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

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

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

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

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

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

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

FDIS	Report on voting
99/xxx/FDIS	99/xxx/RVD

387  
388 Full information on the voting for the approval of this International Standard can be found in the  
389 report on voting indicated in the above table.

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

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

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

- 395 • reconfirmed,  
396 • withdrawn,  
397 • replaced by a revised edition, or  
398 • amended.

399

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# INSULATION CO-ORDINATION –

## Part 2: Application guidelines

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### 1 Scope

409 This part of IEC 60071 constitutes application guidelines and deals with the selection of  
410 insulation levels of equipment or installations for three-phase a.c. systems. Its aim is to give  
411 guidance for the determination of the rated withstand voltages for ranges I and II of IEC 60071-  
412 1 and to justify the association of these rated values with the standardized highest voltages for  
413 equipment.

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

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

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

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

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

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

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

### 2 Normative references

436 The following documents are referred to in the text in such a way that some or all of their content  
437 constitutes requirements of this document. For dated references, only the edition cited applies.  
438 For undated references, the latest edition of the referenced document (including any  
439 amendments) applies.

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

442 IEC 60071-1:2019, *Insulation co-ordination – Part 1: Definitions, principles and rules*  
443

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

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

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

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

450 ISO 2533:1975, *Standard Atmosphere*

### 451 **3 Terms, definitions, abbreviated terms and symbols**

#### 452 **3.1 Terms and definitions**

453 No terms and definitions are listed in this document.

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

- 456 • IEC Electropedia: available at <http://www.electropedia.org/>
- 457 • ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 458 **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

#### 459 **3.3 Symbols**

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

462 Some quantities are expressed in p.u. A per unit quantity is the ratio of the actual value of an  
 463 electrical parameter (voltage, current, frequency, power, impedance, etc.) to a given reference  
 464 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