



REDLINE VERSION



HORIZONTAL STANDARD

**Insulation co-ordination –
Part 2: Application guidelines**



CONTENTS

FOREWORD	9
<u>General</u>	
1 Scope	11
2 Normative references	11
3 Terms, definitions, abbreviated terms and symbols	12
3.1 Terms and definitions	12
3.2 Abbreviated terms	12
3.3 Symbols	13
4 Representative voltage stresses in service	18
4.1 Origin and classification of voltage stresses	18
4.2 Characteristics of overvoltage protective protection devices	18
4.2.1 General remarks	20
4.2.2 Metal-oxide surge arresters without gaps (MOSA)	21
<u>Spark gaps</u>	
4.2.3 Line surge arresters (LSA) for overhead transmission and distribution lines	22
4.3 Representative voltages and overvoltages	23
4.3.1 Continuous (power-frequency) voltage	23
4.3.2 Temporary overvoltages	23
4.3.3 Slow-front overvoltages	27
4.3.4 Fast-front overvoltages	33
4.3.5 Very-fast-front overvoltages [13]	37
5 Co-ordination withstand voltage	38
5.1 Insulation strength characteristics	38
5.1.1 General	38
5.1.2 Influence of polarity and overvoltage shapes	40
5.1.3 Phase-to-phase and longitudinal insulation	40
5.1.4 Influence of weather conditions on external insulation	41
5.1.5 Probability of disruptive discharge of insulation	41
5.2 Performance criterion	43
5.3 Insulation co-ordination procedures	43
5.3.1 General	43
5.3.2 Insulation co-ordination procedures for continuous (power-frequency) voltage and temporary overvoltage	44
5.3.3 Insulation co-ordination procedures for slow-front overvoltages	46
5.3.4 Insulation co-ordination procedures for fast-front overvoltages	51
6 Required withstand voltage	52
6.1 General remarks	52
6.2 Atmospheric correction	52
6.2.1 General remarks	52
6.2.2 Altitude correction	52
6.3 Safety factors	54
6.3.1 General	54
6.3.2 Ageing	54
6.3.3 Production and assembly dispersion	54
6.3.4 Inaccuracy of the withstand voltage	54

6.3.5	Recommended safety factors (K_s)	55
7	Standard withstand voltage and testing procedures	55
7.1	General remarks	55
7.1.1	Overview	55
7.1.2	Standard switching impulse withstand voltage	55
7.1.3	Standard lightning impulse withstand voltage.....	56
7.2	Test conversion factors	56
7.2.1	Range I.....	56
7.2.2	Range II	57
7.3	Determination of insulation withstand by type tests	57
7.3.1	Test procedure dependency upon insulation type	57
7.3.2	Non-self-restoring insulation	58
7.3.3	Self-restoring insulation	58
7.3.4	Mixed insulation.....	58
7.3.5	Limitations of the test procedures	59
7.3.6	Selection of the type test procedures	60
7.3.7	Selection of the type test voltages	60
8	Special considerations for overhead lines	61
8.1	General remarks	61
8.2	Insulation co-ordination for operating voltages and temporary overvoltages	61
8.3	Insulation co-ordination for slow-front overvoltages.....	61
8.3.1	General	61
8.3.2	Earth-fault overvoltages.....	62
8.3.3	Energization and re-energization overvoltages	62
8.4	Insulation co-ordination for lightning overvoltages.....	62
8.4.1	General	62
8.4.2	Distribution lines.....	62
8.4.3	Transmission lines	63
9	Special considerations for substations	63
9.1	General remarks	63
9.1.1	Overview	63
9.1.2	Operating voltage	63
9.1.3	Temporary overvoltage	63
9.1.4	Slow-front overvoltages	64
9.1.5	Fast-front overvoltages	64
9.2	Insulation co-ordination for overvoltages	64
9.2.1	Substations in distribution systems with U_m up to 36 kV in range I	64
9.2.2	Substations in transmission systems with U_m between 52,5 kV and 245 kV in range I	65
9.2.3	Substations in transmission systems in range II.....	66
Annex (normative) Clearances in air to assure a specified impulse withstand voltage installation		
Annex A (informative) Determination of temporary overvoltages due to earth faults		71
Annex B (informative) Weibull probability distributions		75
B.1	General remarks	75
B.2	Disruptive discharge probability of external insulation	76
B.3	Cumulative frequency distribution of overvoltages.....	78
Annex C (informative) Determination of the representative slow-front overvoltage due to line energization and re-energization		81

C.1	General remarks	81
C.2	Probability distribution of the representative amplitude of the prospective overvoltage phase-to-earth	81
C.3	Probability distribution of the representative amplitude of the prospective overvoltage phase-to-phase	81
C.4	Insulation characteristic	83
C.5	Numerical example	85
Annex D (informative)	Transferred overvoltages in transformers	91
D.1	General remarks	91
D.2	Transferred temporary overvoltages	92
D.3	Capacitively transferred surges	92
D.4	Inductively transferred surges	94
Annex E (informative)	Lightning overvoltages	98
E.1	General remarks	98
E.2	Determination of the limit distance (X_p)	98
E.2.1	Protection with arresters in the substation	98
E.2.2	Self-protection of substation	99
E.3	Estimation of the representative lightning overvoltage amplitude	100
E.3.1	General	100
E.3.2	Shielding penetration	100
E.3.3	Back flashovers	101
E.4	Simplified method	103
E.5	Assumed maximum value of the representative lightning overvoltage	104
Annex F (informative)	Calculation of air gap breakdown strength from experimental data	106
F.1	General	106
F.2	Insulation response to power-frequency voltages	106
F.3	Insulation response to slow-front overvoltages	107
F.4	Insulation response to fast-front overvoltages	108
Annex G (informative)	Examples of insulation co-ordination procedure	112
G.1	Overview	112
G.2	Numerical example for a system in range I (with nominal voltage of 230 kV)	112
G.2.1	General	112
G.2.2	Part 1: no special operating conditions	113
G.2.3	Part 2: influence of capacitor switching at station 2	120
G.2.4	Part 3: flow charts related to the example of Clause G.2	122
G.3	Numerical example for a system in range II (with nominal voltage of 735 kV)	127
G.3.1	General	127
G.3.2	Step 1: determination of the representative overvoltages – values of U_{rp}	127
G.3.3	Step 2: determination of the co-ordination withstand voltages – values of U_{cw}	128
G.3.4	Step 3: determination of the required withstand voltages – values of U_{rw}	129
G.3.5	Step 4: conversion to switching impulse withstand voltages (SIWV)	130
G.3.6	Step 5: selection of standard insulation levels	130
G.3.7	Considerations relative to phase-to-phase insulation co-ordination	131
G.3.8	Phase-to-earth clearances	132
G.3.9	Phase-to-phase clearances	133

G.4	Numerical example for substations in distribution systems with U_m up to 36 kV in range I	133
G.4.1	General	133
G.4.2	Step 1: determination of the representative overvoltages – values of U_{rp}	133
G.4.3	Step 2: determination of the co-ordination withstand voltages – values of U_{cw}	134
G.4.4	Step 3: determination of required withstand voltages – values of U_{rw}	135
G.4.5	Step 4: conversion to standard short-duration power-frequency and lightning impulse withstand voltages	136
G.4.6	Step 5: selection of standard withstand voltages	137
G.4.7	Summary of insulation co-ordination procedure for the example of Clause G.4	137
Annex H (informative)	Atmospheric correction – Altitude correction	139
H.1	General principles	139
H.1.1	Atmospheric correction in standard tests	139
H.1.2	Task of atmospheric correction in insulation co-ordination	140
H.2	Atmospheric correction in insulation co-ordination	142
H.2.1	Factors for atmospheric correction	142
H.2.2	General characteristics for moderate climates	142
H.2.3	Special atmospheric conditions	143
H.2.4	Altitude dependency of air pressure	144
H.3	Altitude correction	145
H.3.1	Definition of the altitude correction factor	145
H.3.2	Principle of altitude correction	146
H.3.3	Standard equipment operating at altitudes up to 1 000 m	147
H.3.4	Equipment operating at altitudes above 1 000 m	147
H.4	Selection of the exponent m	148
H.4.1	General	148
H.4.2	Derivation of exponent m for switching impulse voltage	148
H.4.3	Derivation of exponent m for critical switching impulse voltage	151
Annex I (informative)	Evaluation method of non-standard lightning overvoltage shape for representative voltages and overvoltages	154
I.1	General remarks	154
I.2	Lightning overvoltage shape	154
I.3	Evaluation method for GIS	154
I.3.1	Experiments	154
I.3.2	Evaluation of overvoltage shape	155
I.4	Evaluation method for transformer	155
I.4.1	Experiments	155
I.4.2	Evaluation of overvoltage shape	155
Annex J (informative)	Insulation co-ordination for very-fast-front overvoltages in UHV substations	162
J.1	General	162
J.2	Influence of disconnector design	162
J.3	Insulation co-ordination for VFFO	163
Bibliography	165	

Figure 1 – Range of 2 % slow-front overvoltages at the receiving end due to line energization and re-energization.....26

Figure 2 – Ratio between the 2 % values of slow-front overvoltages phase-to-phase and phase-to-earth	27
Figure 3 – Diagram for surge arrester connection to the protected object.....	34
Figure 4 – Distributive discharge probability of self-restoring insulation described on a linear scale	42
Figure 5 – Disruptive discharge probability of self-restoring insulation described on a Gaussian scale	43
Figure 6 – Evaluation of deterministic co-ordination factor K_{cd}	43
Figure 7 – Evaluation of the risk of failure	44
Figure 8 – Risk of failure of external insulation for slow-front overvoltages as a function of the statistical co-ordination factor K_{cs}	46
Figure 9 – Dependence of exponent m on the co-ordination switching impulse withstand voltage	48
Figure 10 – Probability P of an equipment to pass the test dependent on the difference K between the actual and the rated impulse withstand voltage.....	54
Figure 11 – Example of a schematic substation layout used for the overvoltage stress location (see 7.1)	58
Figure A.1 – Earth fault factor k on a base of X_0/X_1 for $R_1/X_1 = R = 0$	64
Figure A.2 – Relationship between R_0/X_1 and X_0/X_1 for constant values of earth fault factor k where $R_1 = 0$	64
Figure A.3 – Relationship between R_0/X_1 and X_0/X_1 for constant values of earth fault factor k where $R_1 = 0,5 X_1$	65
Figure A.4 – Relationship between R_0/X_1 and X_0/X_1 for constant values of earth fault factor k where $R_1 = X_1$	65
Figure A.5 – Relationship between R_0/X_1 and X_0/X_1 for constant values of earth fault factor k where $R_1 = 2X_1$	66
Figure B.1 – Conversion chart for the reduction of the withstand voltage due to placing insulation configurations in parallel.....	72
Figure C.1 – Example for bivariate phase-to-phase overvoltage curves with constant probability density and tangents giving the relevant 2 % values	79
Figure C.2 – Principle of the determination of the representative phase-to-phase overvoltage U_{pre}	80
Figure C.3 – Schematic phase-phase-earth insulation configuration.....	81
Figure C.4 – Description of the 50 % switching impulse flashover voltage of a phase-phase-earth insulation	81
Figure C.5 – Inclination angle of the phase-to-phase insulation characteristic in range "b" dependent on the ratio of the phase-phase clearance D to the height H_t above earth	82
Figure D.1 – Distributed capacitances of the windings of a transformer and the equivalent circuit describing the windings	88
Figure D.2 – Values of factor J describing the effect of the winding connections on the inductive surge transference	89
Figure H.1 – Principle of the atmospheric correction during test of a specified insulation level according to the procedure of IEC 60060-1	132
Figure H.2 – Principal task of the atmospheric correction in insulation co-ordination according to IEC 60071-1	133
Figure H.3 – Comparison of atmospheric correction $\delta \times k_h$ with relative air pressure p/p_0 for various weather stations around the world	135
Figure H.4 – Deviation of simplified pressure calculation by exponential function in this document from the temperature dependent pressure calculation of ISO 2533	137

Figure H.5 – Principle of altitude correction: decreasing withstand voltage U_{10} of equipment with increasing altitude	138
Figure H.6 – Sets of m -curves for standard switching impulse voltage including the variations in altitude for each gap factor	142
Figure H.7 – Exponent m for standard switching impulse voltage for selected gap factors covering altitudes up to 4 000 m	143
Figure H.8 – Sets of m -curves for critical switching impulse voltage including the variations in altitude for each gap factor	144
Figure H.9 – Exponent m for critical switching impulse voltage for selected gap factors covering altitudes up to 4 000 m	144
Figure H.10 – Accordance of m -curves from Figure 9 with determination of exponent m by means of critical switching impulse voltage for selected gap factors and altitudes	145
Figure I.1 – Examples of lightning overvoltage shapes	149
Figure I.2 – Example of insulation characteristics with respect to lightning overvoltages of the SF ₆ gas gap (Shape E)	150
Figure I.3 – Calculation of duration time T_d	150
Figure I.4 – Shape evaluation flow for GIS and transformer	151
Figure I.5 – Application to GIS lightning overvoltage	152
Figure I.6 – Example of insulation characteristics with respect to lightning overvoltage of the turn-to-turn insulation (Shape C)	152
Figure I.7 – Application to transformer lightning overvoltage	153
Figure J.1 – Insulation co-ordination for very-fast-front overvoltages	156
 Table – Recommended creepage distances	
Table – Correlation between standard lightning impulse withstand voltages and minimum air clearances	
Table – Correlation between standard switching impulse withstand voltages and minimum phase-to-earth air clearances	
Table – Correlation between standard switching impulse withstand voltages and minimum phase-to-phase air clearances	
Table 1 – Test conversion factors for range I, to convert required SIWV to SDWV and LIWV	52
Table 2 – Test conversion factors for range II to convert required SDWV to SIWV	52
Table 3 – Selectivity of test procedures B and C of IEC 60060-1	54
Table B.1 – Breakdown voltage versus cumulative flashover probability – Single insulation and 100 parallel insulations	70
Table E.1 – Corona damping constant K_{Co}	91
Table E.2 – Factor A for various overhead lines	96
Table F.1 – Typical gap factors K for switching impulse breakdown phase-to-earth (according to [1] and [4])	102
Table F.2 – Gap factors for typical phase-to-phase geometries	103
Table G.1 – Summary of minimum required withstand voltages obtained for the example shown in G.2.2	111
Table G.2 – Summary of required withstand voltages obtained for the example shown in G.2.3	113
Table G.3 – Values related to the insulation co-ordination procedure for the example in G.4	130
Table H.1 – Comparison of functional expressions of Figure 9 with the selected parameters from the derivation of m -curves with critical switching impulse	145

Table I.1 – Evaluation of the lightning overvoltage in the GIS of UHV system	150
Table I.2 – Evaluation of lightning overvoltage in the transformer of 500 kV system	153

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSULATION CO-ORDINATION -

Part 2: Application guidelines

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60071-2 has been prepared by IEC technical committee 28: Insulation co-ordination.

This fourth edition cancels and replaces the third edition published in 1996. This edition constitutes a technical revision.

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

- a) the annex on clearance in air to assure a specified impulse withstand voltage installation is deleted because the annex in IEC 60071-1 is overlapped;
- b) 4.2 and 4.3 on surge arresters are updated;
- c) 4.3.5 on very-fast-front overvoltages is revised. Annex J on insulation co-ordination for very-fast-front overvoltages in UHV substations is added;
- d) Annex H on atmospheric correction – altitude correction is added.
- e) Annex I on evaluation method of non-standard lightning overvoltage shape is added.

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

FDIS	Report on voting
28/255/FDIS	28/256/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.

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INSULATION CO-ORDINATION –

Part 2: Application guidelines

1 General

1 Scope

This part of IEC 60071 constitutes ~~an~~ application guidelines and deals with the selection of insulation levels of equipment or installations for three-phase electrical 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 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 60071-1:2006. Clauses 4 to 7 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 56: 1987, High-voltage alternating-current circuit-breakers

IEC 60060-1:1989 2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60071-1:1993 2006, *Insulation co-ordination – Part 1: Definitions, principles and rules*
IEC 60071-1:2006/AMD1:2010

~~IEC 99-1:1991, Surge arresters – Part 1: Non-linear resistor type gapped surge arresters for a.c. systems~~

~~IEC 99-4:1991, Surge arresters – Part 4: Metal oxide surge arresters without gaps for a.c. systems~~

~~IEC 99-5:1996, Surge arresters – Part 5: Selection and application recommendations – Section 1: General~~

~~IEC 505:1975, Guide for the evaluation and identification of insulation systems of electrical equipment~~

~~IEC 507:1991, Artificial pollution test on high-voltage insulators to be used on a.c. systems~~

~~IEC 721-2-3:1987, Classification of environmental conditions – Part 2: Environmental conditions appearing in nature – Air pressure~~

~~IEC 815:1986, Guide for the selection of insulators in respect of polluted conditions~~

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

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

ISO 2533:1975, *Standard Atmosphere*



IEC 60071-2

Edition 4.0 2018-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE



HORIZONTAL STANDARD
NORME HORIZONTALE

**Insulation co-ordination –
Part 2: Application guidelines**

**Coordination de l'isolation –
Partie 2: Lignes directrices en matière d'application**



CONTENTS

FOREWORD	8
1 Scope	10
2 Normative references	10
3 Terms, definitions, abbreviated terms and symbols	11
3.1 Terms and definitions	11
3.2 Abbreviated terms	11
3.3 Symbols	11
4 Representative voltage stresses in service	16
4.1 Origin and classification of voltage stresses	16
4.2 Characteristics of overvoltage protection devices	17
4.2.1 General remarks	17
4.2.2 Metal-oxide surge arresters without gaps (MOSA)	17
4.2.3 Line surge arresters (LSA) for overhead transmission and distribution lines	19
4.3 Representative voltages and overvoltages	19
4.3.1 Continuous (power-frequency) voltage	19
4.3.2 Temporary overvoltages	20
4.3.3 Slow-front overvoltages	23
4.3.4 Fast-front overvoltages	29
4.3.5 Very-fast-front overvoltages [13]	33
5 Co-ordination withstand voltage	34
5.1 Insulation strength characteristics	34
5.1.1 General	34
5.1.2 Influence of polarity and overvoltage shapes	35
5.1.3 Phase-to-phase and longitudinal insulation	36
5.1.4 Influence of weather conditions on external insulation	36
5.1.5 Probability of disruptive discharge of insulation	37
5.2 Performance criterion	38
5.3 Insulation co-ordination procedures	39
5.3.1 General	39
5.3.2 Insulation co-ordination procedures for continuous (power-frequency) voltage and temporary overvoltage	40
5.3.3 Insulation co-ordination procedures for slow-front overvoltages	40
5.3.4 Insulation co-ordination procedures for fast-front overvoltages	45
6 Required withstand voltage	46
6.1 General remarks	46
6.2 Atmospheric correction	46
6.2.1 General remarks	46
6.2.2 Altitude correction	46
6.3 Safety factors	48
6.3.1 General	48
6.3.2 Ageing	48
6.3.3 Production and assembly dispersion	48
6.3.4 Inaccuracy of the withstand voltage	48
6.3.5 Recommended safety factors (K_S)	49
7 Standard withstand voltage and testing procedures	49

7.1	General remarks	49
7.1.1	Overview	49
7.1.2	Standard switching impulse withstand voltage	49
7.1.3	Standard lightning impulse withstand voltage.....	50
7.2	Test conversion factors	50
7.2.1	Range I.....	50
7.2.2	Range II	51
7.3	Determination of insulation withstand by type tests	51
7.3.1	Test procedure dependency upon insulation type	51
7.3.2	Non-self-restoring insulation	52
7.3.3	Self-restoring insulation	52
7.3.4	Mixed insulation.....	52
7.3.5	Limitations of the test procedures	53
7.3.6	Selection of the type test procedures	54
7.3.7	Selection of the type test voltages	54
8	Special considerations for overhead lines	55
8.1	General remarks	55
8.2	Insulation co-ordination for operating voltages and temporary overvoltages	55
8.3	Insulation co-ordination for slow-front overvoltages.....	55
8.3.1	General	55
8.3.2	Earth-fault overvoltages.....	56
8.3.3	Energization and re-energization overvoltages	56
8.4	Insulation co-ordination for lightning overvoltages.....	56
8.4.1	General	56
8.4.2	Distribution lines.....	56
8.4.3	Transmission lines	57
9	Special considerations for substations	57
9.1	General remarks	57
9.1.1	Overview	57
9.1.2	Operating voltage	57
9.1.3	Temporary overvoltage	57
9.1.4	Slow-front overvoltages	58
9.1.5	Fast-front overvoltages	58
9.2	Insulation co-ordination for overvoltages	58
9.2.1	Substations in distribution systems with U_m up to 36 kV in range I	58
9.2.2	Substations in transmission systems with U_m between 52,5 kV and 245 kV in range I	59
9.2.3	Substations in transmission systems in range II.....	60
Annex A (informative)	Determination of temporary overvoltages due to earth faults	61
Annex B (informative)	Weibull probability distributions	65
B.1	General remarks	65
B.2	Disruptive discharge probability of external insulation	66
B.3	Cumulative frequency distribution of overvoltages.....	68
Annex C (informative)	Determination of the representative slow-front overvoltage due to line energization and re-energization	71
C.1	General remarks	71
C.2	Probability distribution of the representative amplitude of the prospective overvoltage phase-to-earth	71

C.3	Probability distribution of the representative amplitude of the prospective overvoltage phase-to-phase	71
C.4	Insulation characteristic	73
C.5	Numerical example	75
Annex D (informative)	Transferred overvoltages in transformers	81
D.1	General remarks	81
D.2	Transferred temporary overvoltages	82
D.3	Capacitively transferred surges	82
D.4	Inductively transferred surges	84
Annex E (informative)	Lightning overvoltages	88
E.1	General remarks	88
E.2	Determination of the limit distance (X_p)	88
E.2.1	Protection with arresters in the substation	88
E.2.2	Self-protection of substation	89
E.3	Estimation of the representative lightning overvoltage amplitude	90
E.3.1	General	90
E.3.2	Shielding penetration	90
E.3.3	Back flashovers	91
E.4	Simplified method	93
E.5	Assumed maximum value of the representative lightning overvoltage	95
Annex F (informative)	Calculation of air gap breakdown strength from experimental data	96
F.1	General	96
F.2	Insulation response to power-frequency voltages	96
F.3	Insulation response to slow-front overvoltages	97
F.4	Insulation response to fast-front overvoltages	98
Annex G (informative)	Examples of insulation co-ordination procedure	102
G.1	Overview	102
G.2	Numerical example for a system in range I (with nominal voltage of 230 kV)	102
G.2.1	General	102
G.2.2	Part 1: no special operating conditions	103
G.2.3	Part 2: influence of capacitor switching at station 2	110
G.2.4	Part 3: flow charts related to the example of Clause G.2	112
G.3	Numerical example for a system in range II (with nominal voltage of 735 kV)	117
G.3.1	General	117
G.3.2	Step 1: determination of the representative overvoltages – values of U_{rp}	117
G.3.3	Step 2: determination of the co-ordination withstand voltages – values of U_{cw}	118
G.3.4	Step 3: determination of the required withstand voltages – values of U_{rw}	119
G.3.5	Step 4: conversion to switching impulse withstand voltages (SIWV)	120
G.3.6	Step 5: selection of standard insulation levels	120
G.3.7	Considerations relative to phase-to-phase insulation co-ordination	121
G.3.8	Phase-to-earth clearances	122
G.3.9	Phase-to-phase clearances	122
G.4	Numerical example for substations in distribution systems with U_m up to 36 kV in range I	123
G.4.1	General	123

G.4.2	Step 1: determination of the representative overvoltages – values of U_{rp}	123
G.4.3	Step 2: determination of the co-ordination withstand voltages – values of U_{cw}	124
G.4.4	Step 3: determination of required withstand voltages – values of U_{rw}	125
G.4.5	Step 4: conversion to standard short-duration power-frequency and lightning impulse withstand voltages	126
G.4.6	Step 5: selection of standard withstand voltages	126
G.4.7	Summary of insulation co-ordination procedure for the example of Clause G.4	127
Annex H (informative)	Atmospheric correction – Altitude correction	129
H.1	General principles	129
H.1.1	Atmospheric correction in standard tests	129
H.1.2	Task of atmospheric correction in insulation co-ordination	130
H.2	Atmospheric correction in insulation co-ordination	132
H.2.1	Factors for atmospheric correction	132
H.2.2	General characteristics for moderate climates	132
H.2.3	Special atmospheric conditions	133
H.2.4	Altitude dependency of air pressure	134
H.3	Altitude correction	135
H.3.1	Definition of the altitude correction factor	135
H.3.2	Principle of altitude correction	136
H.3.3	Standard equipment operating at altitudes up to 1 000 m	137
H.3.4	Equipment operating at altitudes above 1 000 m	137
H.4	Selection of the exponent m	138
H.4.1	General	138
H.4.2	Derivation of exponent m for switching impulse voltage	138
H.4.3	Derivation of exponent m for critical switching impulse voltage	141
Annex I (informative)	Evaluation method of non-standard lightning overvoltage shape for representative voltages and overvoltages	144
I.1	General remarks	144
I.2	Lightning overvoltage shape	144
I.3	Evaluation method for GIS	144
I.3.1	Experiments	144
I.3.2	Evaluation of overvoltage shape	145
I.4	Evaluation method for transformer	145
I.4.1	Experiments	145
I.4.2	Evaluation of overvoltage shape	145
Annex J (informative)	Insulation co-ordination for very-fast-front overvoltages in UHV substations	152
J.1	General	152
J.2	Influence of disconnector design	152
J.3	Insulation co-ordination for VFFO	153
Bibliography	155	
Figure 1 – Range of 2 % slow-front overvoltages at the receiving end due to line energization and re-energization	25	
Figure 2 – Ratio between the 2 % values of slow-front overvoltages phase-to-phase and phase-to-earth	26	
Figure 3 – Diagram for surge arrester connection to the protected object	33	

Figure 4 – Distributive discharge probability of self-restoring insulation described on a linear scale	41
Figure 5 – Disruptive discharge probability of self-restoring insulation described on a Gaussian scale	41
Figure 6 – Evaluation of deterministic co-ordination factor K_{cd}	42
Figure 7 – Evaluation of the risk of failure	43
Figure 8 – Risk of failure of external insulation for slow-front overvoltages as a function of the statistical co-ordination factor K_{cs}	45
Figure 9 – Dependence of exponent m on the co-ordination switching impulse withstand voltage	47
Figure 10 – Probability P of an equipment to pass the test dependent on the difference K between the actual and the rated impulse withstand voltage	53
Figure 11 – Example of a schematic substation layout used for the overvoltage stress location	57
Figure A.1 – Earth fault factor k on a base of X_0/X_1 for $R_1/X_1 = R = 0$	62
Figure A.2 – Relationship between R_0/X_1 and X_0/X_1 for constant values of earth fault factor k where $R_1 = 0$	62
Figure A.3 – Relationship between R_0/X_1 and X_0/X_1 for constant values of earth fault factor k where $R_1 = 0,5 X_1$	63
Figure A.4 – Relationship between R_0/X_1 and X_0/X_1 for constant values of earth fault factor k where $R_1 = X_1$	63
Figure A.5 – Relationship between R_0/X_1 and X_0/X_1 for constant values of earth fault factor k where $R_1 = 2X_1$	64
Figure B.1 – Conversion chart for the reduction of the withstand voltage due to placing insulation configurations in parallel	70
Figure C.1 – Example for bivariate phase-to-phase overvoltage curves with constant probability density and tangents giving the relevant 2 % values	77
Figure C.2 – Principle of the determination of the representative phase-to-phase overvoltage U_{pre}	78
Figure C.3 – Schematic phase-phase-earth insulation configuration	79
Figure C.4 – Description of the 50 % switching impulse flashover voltage of a phase-phase-earth insulation	79
Figure C.5 – Inclination angle of the phase-to-phase insulation characteristic in range "b" dependent on the ratio of the phase-phase clearance D to the height H_t above earth	80
Figure D.1 – Distributed capacitances of the windings of a transformer and the equivalent circuit describing the windings	86
Figure D.2 – Values of factor J describing the effect of the winding connections on the inductive surge transference	87
Figure H.1 – Principle of the atmospheric correction during test of a specified insulation level according to the procedure of IEC 60060-1	130
Figure H.2 – Principal task of the atmospheric correction in insulation co-ordination according to IEC 60071-1	131
Figure H.3 – Comparison of atmospheric correction $\delta \times k_h$ with relative air pressure p/p_0 for various weather stations around the world	133
Figure H.4 – Deviation of simplified pressure calculation by exponential function in this document from the temperature dependent pressure calculation of ISO 2533	135
Figure H.5 – Principle of altitude correction: decreasing withstand voltage U_{10} of equipment with increasing altitude	136

Figure H.6 – Sets of <i>m</i> -curves for standard switching impulse voltage including the variations in altitude for each gap factor	140
Figure H.7 – Exponent <i>m</i> for standard switching impulse voltage for selected gap factors covering altitudes up to 4 000 m	141
Figure H.8 – Sets of <i>m</i> -curves for critical switching impulse voltage including the variations in altitude for each gap factor	142
Figure H.9 – Exponent <i>m</i> for critical switching impulse voltage for selected gap factors covering altitudes up to 4 000 m	142
Figure H.10 – Accordance of <i>m</i> -curves from Figure 9 with determination of exponent <i>m</i> by means of critical switching impulse voltage for selected gap factors and altitudes	143
Figure I.1 – Examples of lightning overvoltage shapes	147
Figure I.2 – Example of insulation characteristics with respect to lightning overvoltages of the SF ₆ gas gap (Shape E)	148
Figure I.3 – Calculation of duration time <i>T_d</i>	148
Figure I.4 – Shape evaluation flow for GIS and transformer	149
Figure I.5 – Application to GIS lightning overvoltage	150
Figure I.6 – Example of insulation characteristics with respect to lightning overvoltage of the turn-to-turn insulation (Shape C)	150
Figure I.7 – Application to transformer lightning overvoltage	151
Figure J.1 – Insulation co-ordination for very-fast-front overvoltages	154
Table 1 – Test conversion factors for range I, to convert required SIWV to SDWV and LIWV	51
Table 2 – Test conversion factors for range II to convert required SDWV to SIWV	51
Table 3 – Selectivity of test procedures B and C of IEC 60060-1	53
Table B.1 – Breakdown voltage versus cumulative flashover probability – Single insulation and 100 parallel insulations	67
Table E.1 – Corona damping constant <i>K_{co}</i>	89
Table E.2 – Factor A for various overhead lines	94
Table F.1 – Typical gap factors <i>K</i> for switching impulse breakdown phase-to-earth (according to [1] and [4])	100
Table F.2 – Gap factors for typical phase-to-phase geometries	101
Table G.1 – Summary of minimum required withstand voltages obtained for the example shown in G.2.2	109
Table G.2 – Summary of required withstand voltages obtained for the example shown in G.2.3	111
Table G.3 – Values related to the insulation co-ordination procedure for the example in G.4	128
Table H.1 – Comparison of functional expressions of Figure 9 with the selected parameters from the derivation of <i>m</i> -curves with critical switching impulse	143
Table I.1 – Evaluation of the lightning overvoltage in the GIS of UHV system	148
Table I.2 – Evaluation of lightning overvoltage in the transformer of 500 kV system	151

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSULATION CO-ORDINATION –

Part 2: Application guidelines

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International Standard IEC 60071-2 has been prepared by IEC technical committee 28: Insulation co-ordination.

This fourth edition cancels and replaces the third edition published in 1996. This edition constitutes a technical revision.

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

- a) the annex on clearance in air to assure a specified impulse withstand voltage installation is deleted because the annex in IEC 60071-1 is overlapped;
- b) 4.2 and 4.3 on surge arresters are updated;
- c) 4.3.5 on very-fast-front overvoltages is revised. Annex J on insulation co-ordination for very-fast-front overvoltages in UHV substations is added;
- d) Annex H on atmospheric correction – altitude correction is added.

e) Annex I on evaluation method of non-standard lightning overvoltage shape is added.

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

FDIS	Report on voting
28/255/FDIS	28/256/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.

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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 electrical 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 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 60071-1:2006. Clauses 4 to 7 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 60071-1:2006, *Insulation co-ordination – Part 1: Definitions, principles and rules*
IEC 60071-1:2006/AMD1:2010

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

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

ISO 2533:1975, *Standard Atmosphere*

Withdrawn

SOMMAIRE

AVANT-PROPOS	164
1 Domaine d'application	166
2 Références normatives	166
3 Termes, définitions, termes abrégés et symboles	167
3.1 Termes et définitions	167
3.2 Termes abrégés	167
3.3 Symboles	167
4 Contraintes de tension représentatives en service	172
4.1 Origine et classification des contraintes de tension	172
4.2 Caractéristiques des dispositifs de protection contre les surtensions	173
4.2.1 Remarques générales	173
4.2.2 Parafoudres à oxyde métallique (MOSA) sans éclateur	174
4.2.3 Parafoudres de ligne (LSA) pour les lignes aériennes de transmission et de distribution	175
4.3 Tensions et surtensions représentatives	176
4.3.1 Tension permanente (à la fréquence industrielle)	176
4.3.2 Surtensions temporaires	176
4.3.3 Surtensions à front lent	180
4.3.4 Surtensions à front rapide	186
4.3.5 Surtensions à front très rapide [13]	191
5 Tension de tenue de coordination	191
5.1 Caractéristiques de résistance d'isolement	191
5.1.1 Généralités	191
5.1.2 Influence de la polarité et des formes de surtension	193
5.1.3 Isolation entre phases et isolation longitudinale	193
5.1.4 Influence des conditions climatiques sur l'isolation externe	194
5.1.5 Probabilité de décharge disruptive de l'isolation	194
5.2 Critère de performance	196
5.3 Procédures de coordination de l'isolement	196
5.3.1 Généralités	196
5.3.2 Procédures de coordination de l'isolement pour la tension permanente (à fréquence industrielle) et pour les surtensions temporaires	197
5.3.3 Procédures de coordination de l'isolement pour les surtensions à front lent	198
5.3.4 Procédures de coordination de l'isolement pour les surtensions à front rapide	203
6 Tension de tenue exigée	204
6.1 Remarques générales	204
6.2 Correction atmosphérique	204
6.2.1 Remarques générales	204
6.2.2 Correction de l'altitude	205
6.3 Facteurs de sécurité	206
6.3.1 Généralités	206
6.3.2 Vieillissement	207
6.3.3 Dispersion due à la fabrication et au montage	207
6.3.4 Inexactitude de la tension de tenue	207
6.3.5 Facteurs de sécurité recommandés (K_S)	207

7	Tension de tenue normalisée et procédures d'essai	208
7.1	Remarques générales	208
7.1.1	Aperçu	208
7.1.2	Tension normalisée de tenue au choc de manœuvre	208
7.1.3	Tension normalisée de tenue au choc de foudre	208
7.2	Facteurs de conversion d'essai	209
7.2.1	Plage I	209
7.2.2	Plage II	210
7.3	Détermination de la tenue de l'isolement par des essais de type	210
7.3.1	Relation entre procédure d'essai et type d'isolement	210
7.3.2	Isolation non autorégénératrice	210
7.3.3	Isolation non autorégénératrice	211
7.3.4	Isolation mixte	211
7.3.5	Limitations des procédures d'essai	212
7.3.6	Choix des procédures d'essai de type	212
7.3.7	Choix des tensions d'essai de type	213
8	Points particuliers concernant les lignes aériennes	214
8.1	Remarques générales	214
8.2	Coordination de l'isolement vis-à-vis des tensions de service et des surtensions temporaires	214
8.3	Coordination de l'isolement pour les surtensions à front lent	214
8.3.1	Généralités	214
8.3.2	Surtensions de défaut à la terre	215
8.3.3	Surtensions à l'enclenchement et au réenclenchement	215
8.4	Coordination de l'isolement vis-à-vis des surtensions de foudre	215
8.4.1	Généralités	215
8.4.2	Lignes de distribution	215
8.4.3	Lignes de transport	216
9	Points particuliers concernant les postes	216
9.1	Remarques générales	216
9.1.1	Aperçu	216
9.1.2	Tension de service	216
9.1.3	Surtension temporaire	217
9.1.4	Surtensions à front lent	217
9.1.5	Surtensions à front rapide	217
9.2	Coordination de l'isolement vis-à-vis des surtensions	218
9.2.1	Postes sur des réseaux de distribution avec U_m jusqu'à 36 kV, dans la plage I	218
9.2.2	Postes de réseaux de transport dont U_m est comprise entre 52,5 kV et 245 kV dans la plage I	219
9.2.3	Postes de réseaux de transport dans la plage II	219
Annexe A (informative)	Détermination des surtensions temporaires dues à des défauts à la terre	220
Annexe B (informative)	Fonction de répartition de Weibull	224
B.1	Remarques générales	224
B.2	Probabilité de décharge disruptive de l'isolation externe	225
B.3	Distribution de fréquence cumulative des surtensions	227
Annexe C (informative)	Détermination de la surtension représentative à front lent due à l'enclenchement et au réenclenchement d'une ligne	230

C.1	Remarques générales	230
C.2	Fonction de répartition de l'amplitude représentative de la surtension présumée phase-terre	230
C.3	Fonction de répartition de l'amplitude représentative de la surtension présumée entre phases.....	231
C.4	Caractéristiques de l'isolation	232
C.5	Exemple numérique	234
Annexe D (informative)	Surtensions transmises dans les transformateurs	240
D.1	Remarques générales	240
D.2	Surtensions temporaires transmises	241
D.3	Surtensions transmises par voie capacitive.....	242
D.4	Surtensions transmises par voie inductive	243
Annexe E (informative)	Surtensions de foudre	247
E.1	Remarques générales	247
E.2	Détermination de la distance limite (X_p)	247
E.2.1	Protection par parafoudres dans le poste	247
E.2.2	Autoprotection des postes	248
E.3	Estimation de l'amplitude de la surtension de foudre représentative	249
E.3.1	Généralités.....	249
E.3.2	Pénétration du blindage.....	249
E.3.3	Amorçages en retour	250
E.4	Méthode simplifiée	252
E.5	Valeur maximale présumée de la surtension de foudre représentative	254
Annexe F (informative)	Calcul de la rigidité diélectrique des intervalles d'air à partir des données expérimentales	255
F.1	Généralités	255
F.2	Comportement de l'isolation aux tensions à fréquence industrielle	255
F.3	Comportement de l'isolation aux surtensions à front lent.....	256
F.4	Comportement de l'isolation aux surtensions à front rapide	257
Annexe G (informative)	Exemples de procédures de coordination de l'isolation	261
G.1	Aperçu	261
G.2	Exemple numérique pour un réseau de la plage I (tension nominale de 230 kV)	261
G.2.1	Généralités.....	261
G.2.2	Partie 1: absence de conditions de service particulières	262
G.2.3	Partie 2: influence de manœuvres de condensateurs au poste 2.....	269
G.2.4	Partie 3: organigrammes relatifs à l'exemple de l'Article G.2.....	271
G.3	Exemple numérique pour un réseau de la plage II (tension nominale de 735 kV)	276
G.3.1	Généralités	276
G.3.2	Étape 1: détermination des surtensions représentatives – valeurs de U_{rp}	276
G.3.3	Étape 2: détermination des tensions de tenue de coordination – valeurs de U_{cw}	277
G.3.4	Étape 3: détermination des tensions de tenue exigées – valeurs de U_{rw}	279
G.3.5	Étape 4: conversion en tensions de tenue au choc de manœuvre (SIWV).....	279
G.3.6	Étape 5: choix de niveaux d'isolation normalisés	280
G.3.7	Considérations relatives à la coordination de l'isolation entre phases	280
G.3.8	Distances d'isolation phase-terre	281
G.3.9	Distances d'isolation entre phases	282
G.4	Exemple numérique pour des postes de réseaux de distribution avec U_m jusqu'à 36 kV dans la plage I	282

G.4.1	Généralités	282
G.4.2	Étape 1: détermination des surtensions représentatives – valeurs de U_{Rp}	283
G.4.3	Étape 2: détermination des tensions de tenue de coordination – valeurs de U_{CW}	284
G.4.4	Étape 3: détermination des tensions de tenue exigées – valeurs de U_{RW}	284
G.4.5	Étape 4: conversion en tensions de tenue normalisées de courte durée à fréquence industrielle et en tensions de tenue au choc de foudre	285
G.4.6	Étape 5: choix des tensions de tenue normalisées	286
G.4.7	Résumé de la procédure de coordination de l'isolement pour l'exemple de l'Article G.4	286
Annexe H (informative)	Correction atmosphérique et correction de l'altitude	288
H.1	Principes généraux	288
H.1.1	Correction atmosphérique dans les essais normatifs	288
H.1.2	Fonction de la correction atmosphérique dans la coordination de l'isolement	289
H.2	Correction atmosphérique dans la coordination de l'isolement	291
H.2.1	Facteurs de correction atmosphérique	291
H.2.2	Caractéristiques générales pour les climats modérés	291
H.2.3	Conditions atmosphériques particulières	292
H.2.4	Relation entre l'altitude et la pression atmosphérique	293
H.3	Correction d'altitude	294
H.3.1	Définition du facteur de correction d'altitude	294
H.3.2	Principe de la correction d'altitude	295
H.3.3	Matériel normalisé en exploitation à des altitudes jusqu'à 1 000 m	296
H.3.4	Matériel en exploitation à des altitudes de plus de 1 000 m	296
H.4	Choix de l'exposant m	297
H.4.1	Généralités	297
H.4.2	Déduction de l'exposant m pour la tension de choc de manœuvre	297
H.4.3	Déduction de l'exposant m pour la tension de choc de manœuvre critique	300
Annexe I (informative)	Méthode d'évaluation de la forme de la surtension de foudre non normalisée pour les tensions et surtensions représentatives	303
I.1	Remarques générales	303
I.2	Forme de surtension de foudre	303
I.3	Méthode d'évaluation pour les GIS	303
I.3.1	Expériences	303
I.3.2	Évaluation de la forme de surtension	304
I.4	Méthode d'évaluation pour les transformateurs	304
I.4.1	Expériences	304
I.4.2	Évaluation de la forme de surtension	305
Annexe J (informative)	Coordination de l'isolement pour les surtensions à front très rapide dans les postes UHT	311
J.1	Généralités	311
J.2	Influence de la conception du sectionneur	311
J.3	Coordination de l'isolement vis-à-vis des surtensions à front très rapide	312
Bibliographie	315	
Figure 1 – Plages de valeurs à 2 % des surtensions à front lent côté aval dues à l'enclenchement ou au réenclenchement de ligne	182	
Figure 2 – Rapport entre les valeurs à 2 % des surtensions à front lent entre phases et phase-terre	183	

Figure 3 – Schéma du raccordement d'un parafoudre à l'objet protégé	190
Figure 4 – Probabilité de décharge disruptive d'une isolation autorégénératrice sur une échelle linéaire	199
Figure 5 – Probabilité de décharge disruptive d'une isolation autorégénératrice sur une échelle gaussienne	199
Figure 6 – Évaluation du facteur de coordination déterministe K_{cd}	200
Figure 7 – Évaluation du risque de défaillance	201
Figure 8 – Risque de défaillance de l'isolation externe pour les surtensions à front lent en fonction du facteur de coordination statistique K_{CS}	203
Figure 9 – Relation entre l'exposant m et la tension de coordination de tenue de choc de manœuvre	206
Figure 10 – Probabilité P qu'un matériel réussisse l'essai en fonction de la différence K entre la tension de tenue au choc réelle et la tension de tenue au choc assignée	212
Figure 11 – Exemple de disposition schématique de poste utilisé pour la localisation des contraintes	216
Figure A.1 – Facteur de défaut à la terre k en fonction de X_0/X_1 lorsque $R_1/X_1 = R = 0$	221
Figure A.2 – Relation entre R_0/X_1 et X_0/X_1 pour des valeurs constantes du facteur de défaut à la terre k lorsque $R_1 = 0$	221
Figure A.3 – Relation entre R_0/X_1 et X_0/X_1 pour des valeurs constantes du facteur de défaut à la terre k lorsque $R_1 = 0,5 X_1$	222
Figure A.4 – Relation entre R_0/X_1 et X_0/X_1 pour des valeurs constantes du facteur de défaut à la terre k lorsque $R_1 = X_1$	222
Figure A.5 – Relation entre R_0/X_1 et X_0/X_1 pour des valeurs constantes du facteur de défaut à la terre k lorsque $R_1 = 2X_1$	223
Figure B.1 – Graphique de conversion donnant la réduction de la tension de tenue due à la mise en parallèle des configurations d'isolation	229
Figure C.1 – Exemple de courbes de surtensions entre phases à deux variables avec densité de probabilité constante et des tangentes donnant les valeurs 2 % correspondantes	236
Figure C.2 – Principe de détermination de la surtension représentative entre phases U_{pre}	237
Figure C.3 – Configuration schématique de l'isolation entre phases et phase-terre	238
Figure C.4 – Description de la tension de contournement 50 % de choc de manœuvre d'une isolation entre phases et phase-terre	238
Figure C.5 – Angle d'inclinaison de la caractéristique de l'isolation entre phases dans la plage "b" en fonction du rapport de la distance entre phases D à la hauteur au-dessus du sol H_t	239
Figure D.1 – Capacités réparties des enroulements d'un transformateur et circuit équivalent décrivant les enroulements	245
Figure D.2 – Valeurs du facteur J décrivant l'effet des connexions d'enroulement sur la transmission des surtensions par voie inductive	246
Figure H.1 – Principe de correction atmosphérique pendant l'essai d'un niveau d'isolement spécifié selon la procédure de l'IEC 60060-1	289
Figure H.2 – Principale fonction relative à la correction atmosphérique de la coordination de l'isolement selon l'IEC 60071-1	290
Figure H.3 – Comparaison de la correction atmosphérique $\delta \times k_h$ à la pression atmosphérique relative p/p_0 pour différentes stations météorologiques dans le monde	292
Figure H.4 – Écart entre le calcul de pression simplifié à l'aide de la fonction exponentielle du présent document et le calcul de la pression en fonction de la température de l'ISO 2533	294

Figure H.5 – Principe de la correction d'altitude: diminution de la tension de tenue U_{10} du matériel avec augmentation de l'altitude	295
Figure H.6 – Ensembles de courbes m pour la tension de choc de manœuvre normalisée incluant les variations d'altitude pour chaque facteur d'intervalle	299
Figure H.7 – Exposant m pour la tension de choc de manœuvre normalisée pour les facteurs d'intervalle choisis couvrant des altitudes jusqu'à 4 000 m	300
Figure H.8 – Ensembles de courbes m pour la tension de choc de manœuvre critique incluant les variations d'altitude pour chaque facteur d'intervalle	301
Figure H.9 – Exposant m pour la tension de choc de manœuvre critique pour les facteurs d'intervalle choisis couvrant des altitudes jusqu'à 4 000 m	301
Figure H.10 – Conformité des courbes m de la Figure 9 à la détermination de l'exposant m au moyen de la tension de choc de manœuvre critique pour les facteurs d'intervalle et altitude choisis	302
Figure I.1 – Exemples de formes de surtension de foudre	306
Figure I.2 – Exemple de caractéristiques d'isolation par rapport aux surtensions de foudre de la lame de gaz SF ₆ (Forme E).....	307
Figure I.3– Calcul de la durée T_d	307
Figure I.4 – Processus d'évaluation de forme pour un GIS et un transformateur.....	308
Figure I.5 – Application à la surtension de foudre d'un GIS.....	309
Figure I.6 – Exemple de caractéristiques d'isolation par rapport à la surtension de foudre de l'isolation entre spires (Forme C)	309
Figure I.7 – Application à la surtension de foudre d'un transformateur	310
Figure J.1 – Coordination de l'isolement pour les surtensions à front très rapide	314
Tableau 1 – Facteurs de conversion d'essai pour la plage I, permettant de convertir les SIWV exigées en SDWV et en LIWV.....	209
Tableau 2 – Facteurs de conversion d'essai pour la plage II, permettant de convertir les SDWV exigées en SIWV.....	210
Tableau 3 – Sélectivité des procédures d'essai B et C de l'IEC 60060-1	211
Tableau B.1 – Tension de claquage en fonction de la probabilité cumulative de contournement – Isolation unique et 100 isolations parallèles	227
Tableau E.1 – Constante d'atténuation par effet couronne K_{co}	248
Tableau E.2 – Facteur A pour différents types de lignes aériennes	254
Tableau F.1 – Facteurs d'intervalles K typiques pour le claquage au choc de manœuvre phase-terre (selon [1] et [4])	259
Tableau F.2 – Facteurs d'intervalle pour des géométries phase-phase typiques	260
Tableau G.1 – Résumé des tensions de tenue exigées minimales pour l'exemple en G.2.2.....	268
Tableau G.2 – Résumé des tensions de tenue exigées pour l'exemple en G.2.3	270
Tableau G.3 – Valeurs relatives à la procédure de coordination de l'isolement pour l'exemple à l'Article G.4	287
Tableau H.1 – Comparaison des expressions fonctionnelles de la Figure 9 aux paramètres choisis provenant des courbes m avec choc de manœuvre critique	302
Tableau I.1 – Évaluation de la surtension de foudre dans le GIS du réseau UHT	307
Tableau I.2 – Évaluation de la surtension de foudre dans le transformateur d'un réseau 500 kV	310

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

COORDINATION DE L'ISOLEMENT –

Partie 2: Lignes directrices en matière d'application

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La Norme internationale IEC 60071-2 a été établie par le Comité d'études 28 de l'IEC: Coordination de l'isolement.

Cette quatrième édition annule et remplace la troisième édition parue en 1996. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) l'annexe relative à la distance d'isolement dans l'air pour installation garantissant une tension de tenue aux chocs spécifiée est supprimée car cette annexe est déjà présente dans l'IEC 60071-1;
- b) 4.2 et 4.3 relatifs aux parafoudres ont été mis à jour;

- c) 4.3.5 relatif aux surtensions à front très rapide a été révisé. L'Annexe J relative à la coordination de l'isolement pour les surtensions à front très rapide dans les postes UHT a été ajoutée;
- d) l'Annexe H relative à la correction atmosphérique – correction de l'altitude a été ajoutée;
- e) l'Annexe I relative à la méthode d'évaluation de la forme de la surtension de foudre non normalisée a été ajoutée.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
28/255/FDIS	28/256/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2.

Il a le statut d'une norme horizontale conformément au Guide 108 de l'IEC.

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COORDINATION DE L'ISOLEMENT –

Partie 2: Lignes directrices en matière d'application

1 Domaine d'application

La présente partie de l'IEC 60071 constitue des lignes directrices en matière d'application et concerne le choix des niveaux d'isolement des matériels ou des installations pour les réseaux triphasés. Elle a pour objet de donner des recommandations pour la détermination des tensions de tenue assignées pour les plages I et II de l'IEC 60071-1 et de justifier l'association de ces valeurs assignées avec les valeurs normalisées des tensions les plus élevées pour le matériel.

Cette association ne couvre que les besoins de la coordination de l'isolement. Les exigences relatives à la sécurité des personnes ne sont pas traitées dans le présent document.

Le présent document traite des réseaux triphasés de tension nominale supérieure à 1 kV. Les valeurs déduites ou qui y sont proposées ne sont généralement applicables qu'à ces seuls réseaux. Cependant, les principes présentés sont également valables pour les réseaux biphasés ou monophasés.

Le présent document traite de l'isolement phase-terre, entre phases et longitudinal.

Le présent document n'est pas destiné à détailler les essais individuels de série, qui doivent être spécifiés par les comités de produits concernés.

Le contenu du présent document suit strictement l'organigramme de la procédure de coordination de l'isolement présenté à la Figure 1 de l'IEC 60071-1:2006. Les Articles 4 à 7 correspondent à chacun des rectangles de l'organigramme et donnent des informations détaillées sur les principes de la procédure de coordination de l'isolement qui conduit à déterminer les niveaux de tenue spécifiés.

Ce document insiste sur la nécessité de prendre en considération, dès le départ, toutes les origines, toutes les classes et tous les types de contraintes de tension en service quelle que soit la plage de la tension la plus élevée pour le matériel. Ce n'est qu'à la fin de la procédure, au moment de sélectionner les tensions de tenue normalisées, que le principe de couvrir une contrainte de tension particulière en service par une tension de tenue normalisée est appliqué. De même, le document fait référence, à cette étape finale, aux corrélations établies dans l'IEC 60071-1 entre les niveaux d'isolement normalisés et la tension la plus élevée pour le matériel.

Les annexes contiennent des exemples et des informations détaillées qui expliquent ou corroborent les principes décrits dans le texte principal, et les techniques analytiques de base qui sont utilisées.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60071-1:2006, *Coordination de l'isolation – Partie 1: Définitions, principes et règles*
IEC 60071-1:2006/AMD1:2010

IEC 60505:2011, *Évaluation et qualification des systèmes d'isolation électrique*

IEC TS 60815-1, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions– Part 1: Definitions, information and general principles* (disponible en anglais seulement)

ISO 2533:1975, *Atmosphère type*

Withdrawn