
Zaščita pred delovanjem strele – 2. del: Vodenje tveganja (vključuje program za oceno tveganja)

Protection against lightning - Part 2: Risk management

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 62305-2:2006](https://standards.iteh.ai/catalog/standards/sist/444994b4-badf-432a-acde-1c1571049daf/sist-en-62305-2-2006)

<https://standards.iteh.ai/catalog/standards/sist/444994b4-badf-432a-acde-1c1571049daf/sist-en-62305-2-2006>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62305-2:2006

<https://standards.iteh.ai/catalog/standards/sist/444994b4-badf-432a-acde-1c1571049daf/sist-en-62305-2-2006>

**Protection against lightning
Part 2: Risk management
(IEC 62305-2:2006)**

Protection contre la foudre
Partie 2: Evaluation du risque
(CEI 62305-2:2006)

Blitzschutz
Teil 2: Risiko-Management
(IEC 62305-2:2006)

This European Standard was approved by CENELEC on 2006-02-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Rumania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 81/263/FDIS, future edition 1 of IEC 62305-2, prepared by IEC TC 81, Lightning protection, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62305-2 on 2006-02-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2006-11-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-02-01

This European Standard makes reference to International Standards. Where the International Standard referred to has been endorsed as a European Standard or a home-grown European Standard exists, this European Standard shall be applied instead. Pertinent information can be found on the CENELEC web site.

Endorsement notice

The text of the International Standard IEC 62305-2:2006 was approved by CENELEC as a European Standard without any modification.

(standards.iteh.ai)

SIST EN 62305-2:2006

<https://standards.iteh.ai/catalog/standards/sist/444994b4-badf-432a-acde-1c1571049daf/sist-en-62305-2-2006>



IEC 62305-2

Edition 1.0 2006-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Protection against lightning –
Part 2: Risk management

STANDARD PREVIEW
(standards.iteh.ai)

Protection contre la foudre –
Partie 2: Evaluation des risques

[SIST EN 62305-2:2006](#)

<https://standards.iteh.ai/catalog/standards/sist/444994b4-badf-432a-acde-1c1571049daf/sist-en-62305-2-2006>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

XE

CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	11
2 Normative references	11
3 Terms, definitions, symbols and abbreviations.....	11
4 Explanation of terms.....	21
4.1 Damage and loss	21
4.2 Risk and risk components.....	23
4.3 Composition of risk components related to a structure.....	25
4.4 Composition of risk components related to a service	27
4.5 Factors influencing the risk components	28
5 Risk management.....	29
5.1 Basic procedure	29
5.2 Structure to be considered for risk assessment	29
5.3 Service to be considered for risk assessment.....	29
5.4 Tolerable risk R_T	30
5.5 Specific procedure to evaluate the need of protection.....	30
5.6 Procedure to evaluate the cost effectiveness of protection	31
5.7 Protection measures	33
5.8 Selection of protection measures.....	33
6 Assessment of risk components for a structure.....	36
6.1 Basic equation.....	36
6.2 Assessment of risk components due to flashes to the structure (S1).....	36
6.3 Assessment of the risk component due to flashes near the structure (S2)	36
6.4 Assessment of risk components due to flashes to a line connected to the structure (S3)	37
6.5 Assessment of risk component due to flashes near a line connected to the structure (S4)	37
6.6 Summary of risk components in a structure	39
6.7 Partitioning of a structure in zones Z_S	39
6.8 Assessment of risk components in a structure with zones Z_S	40
7 Assessment of risk components for a service	41
7.1 Basic equation.....	41
7.2 Assessment of components due to flashes to the service (S3).....	41
7.3 Assessment of risk component due to flashes near the service (S4)	41
7.4 Assessment of risk components due to flashes to structures to which the service is connected (S1)	42
7.5 Summary of risk components for a service	42
7.6 Partitioning of a service into sections S_S	43

Annex A (informative) Assessment of annual number N of dangerous events.....	44
Annex B (informative) Assessment of probability P_X of damage for a structure.....	53
Annex C (informative) Assessment of amount of loss L_X in a structure.....	59
Annex D (informative) Assessment of probability P'_X of damage to a service.....	64
Annex E (informative) Assessment of the amount of loss L'_X in a service.....	68
Annex F (informative) Switching overvoltages.....	70
Annex G (informative) Evaluation of costs of loss.....	71
Annex H (informative) Case study for structures.....	72
Annex I (informative) Case study for services – Telecommunication line.....	99
Annex J (informative) Simplified software for risk assessment for structures.....	105
Bibliography.....	110
Figure 1 – Procedure for deciding the need of protection.....	31
Figure 2 – Procedure for evaluating the cost-effectiveness of protection measures.....	32
Figure 3 – Procedure for selecting protection measures in structures.....	34
Figure 4 – Procedure for selecting protection measures in services.....	35
Figure 5 – Structures at line ends: at “b” end the structure to be protected (structure b) and at “a” end an adjacent structure (structure a).....	38
Figure A.1 – Collection area A_d of an isolated structure.....	45
Figure A.2 – Complex shape structure.....	46
Figure A.3 – Different methods to determine the collection area for the structure of Figure A.2.....	47
Figure A.4 – Structure to be considered for evaluation of collection area A_d	48
Figure A.5 – Collection areas (A_d , A_m , A_i , A_l).....	52
Figure I.1 – Telecommunication line to be protected.....	99
Figure J.1 – Example for a country house (see Clause H.1 – no protection measures provided).....	108
Figure J.2 – Example for a country house (see Clause H.1 – protection measures provided).....	109
Table 1 – Sources of damage, types of damage and types of loss selected according to the point of strike.....	22
Table 2 – Risk in a structure for each type of damage and of loss.....	23
Table 3 – Risk components to be considered for each type of loss in a structure.....	26
Table 4 – Risk components to be considered for each type of loss in a service.....	27
Table 5 – Factors influencing the risk components in a structure.....	28
Table 6 – Factors influencing the risk components in a service.....	29
Table 7 – Typical values of tolerable risk R_T	30
Table 8 – Parameters relevant to the assessment of risk components for a structure.....	38
Table 9 – Risk components for a structure for different types of damage caused by different sources.....	39

Table 10 – Parameters relevant to the assessment of risk components for a service.....	42
Table 11 – Risk components for a service for different types of damage caused by different sources	43
Table A. 1 – Values of collection area depending on the evaluation method.....	46
Table A.2 – Location factor C_d	49
Table A.3 – Collection areas A_l and A_i depending on the service characteristics.....	50
Table A.4 – Transformer factor C_t	51
Table A.5 – Environmental factor C_e	51
Table B.1 – Values of probability P_A that a flash to a structure will cause shock to living beings due to dangerous touch and step voltages.....	53
Table B.2 – Values of P_B depending on the protection measures to reduce physical damage	54
Table B.3 – Value of the probability P_{SPD} as a function of LPL for which SPDs are designed.....	54
Table B.4 – Value of the probability P_{MS} as a function of factor K_{MS}	55
Table B.5 – Value of factor K_{S3} depending on internal wiring	56
Table B.6 – Values of the probability P_{LD} depending on the resistance R_S of the cable screen and the impulse withstand voltage U_w of the equipment	57
Table B.7 – Values of the probability P_{LI} depending on the resistance R_S of the cable screen and the impulse withstand voltage U_w of the equipment	58
Table C.1 – Typical mean values of L_t , L_f and L_o	60
Table C.2 – Values of reduction factors r_a and r_u as a function of the type of surface of soil or floor	60
Table C.3 – Values of reduction factor r_p as a function of provisions taken to reduce the consequences of fire.....	61
Table C.4 – Values of reduction factor r_f as a function of risk of fire of structure	61
Table C.5 – Values of factor h increasing the relative amount of loss in presence of a special hazard	61
Table C.6 – Typical mean values of L_f and L_o	62
Table C.7 – Typical mean values of L_t , L_f and L_o	63
Table D.1 – Values of factor K_d as function of the characteristics of the shielded line	64
Table D.2 – Values of the factor K_p as function of the protection measures.....	65
Table D.3 – Impulse withstand voltage U_w as a function of the type of cable.....	65
Table D.4 – Impulse withstand voltage U_w as a function of the type of apparatus.....	65
Table D.5 – Values of probability P'_B , P'_C , P'_V and P'_W as function of the failure current I_a	66
Table E.1 – Typical mean values of L'_f and L'_o	68
Table H.1 – Structure data and characteristics.....	72
Table H.2 – Data and characteristics of lines and connected internal systems	73
Table H.3 – Zone Z_2 (inside the building) characteristics	74
Table H.4 – Collection areas of structure and lines	74
Table H.5 – Expected annual number of dangerous events.....	75
Table H.6 – Risk components involved and their calculation (values x 10^{-5})	75

Table H.7 – Values of risk components relevant to risk R_1 (values $\times 10^{-5}$) for suitable cases.....	77
Table H.8 – Structure characteristics	77
Table H.9 – Internal power system and connected power line characteristics.....	78
Table H.10 – Internal telecom system and connected TLC line characteristics	78
Table H.11 – Zone Z_1 (entrance area to the building) characteristics	79
Table H.12 – Zone Z_2 (garden) characteristics	79
Table H.13 – Zone Z_3 (archive) characteristics	79
Table H.14 – Zone Z_4 (offices) characteristics	80
Table H.15 – Zone Z_5 (computer centre) characteristics.....	80
Table H.16 – Collection areas of structure and lines	80
Table H.17 – Expected annual number of dangerous events	81
Table H.18 – Risk R_1 - Values of risk components according to zones (values $\times 10^{-5}$).....	81
Table H.19 –Composition of risk R_1 components according to zones (values $\times 10^{-5}$).....	81
Table H.20 – Values of risk R_1 according to solution chosen (values $\times 10^{-5}$)	82
Table H.21 – Structure characteristics	83
Table H.22 – Internal power system and relevant incoming power line characteristics	84
Table H.23 – Internal telecom system and relevant incoming line characteristics	84
Table H.24 – Zone Z_1 (outside building) characteristics	85
Table H.25 – Zone Z_2 (rooms block) characteristics.....	86
Table H.26 – Zone Z_3 (operating block) characteristics	86
Table H.27 – Zone Z_4 (intensive care unit) characteristics.....	87
Table H.28 – Expected annual number of dangerous events.....	87
Table H.29 – Risk R_1 – Risk components to be considered according to zones	88
Table H.30 – Risk R_1 – Values of probability P for unprotected structure	88
Table H.31 – Risk R_1 – Values of risk components for unprotected structure according to zones (values $\times 10^{-5}$)	89
Table H.32 – Composition of risk R_1 components according to zones (values $\times 10^{-5}$).....	89
Table H.33 – Risk R_1 – Values of probability P for the protected structure according to solution a).....	91
Table H.34 – Risk R_1 – Values of probability P for protected structure according to solution b).....	91
Table H.35 – Risk R_1 – Values of probability P for the protected structure according to solution c).....	92
Table H.36 – Risk R_1 – Values of risk according to solution chosen (values $\times 10^{-5}$).....	92
Table H.37 – Values of costs of loss relevant to zones (values in \$ $\times 10^6$)	93
Table H.38 – Values relevant to rates	93
Table H.39 – Risk R_4 – Values of risk components for unprotected structure according to zones (values $\times 10^{-5}$)	94

Table H.40 – Amount of losses C_L and C_{RL} (values in \$)	94
Table H.41 – Costs C_P and C_{PM} of protection measures (values in \$).....	95
Table H.42 – Annual saving of money (values in \$).....	95
Table H.43 – Structure characteristics	96
Table H.44 – Zone Z_2 parameters	96
Table H.45 – Internal power system and relevant incoming line parameters.....	97
Table H.46 – Internal telecom system and relevant incoming line parameters	97
Table H.47 – Protection measures to be adopted according to the height of the building and its risk of fire	98
Table I.1 – Section S_1 of line characteristics	100
Table I.2 – Section S_2 of line characteristics	100
Table I.3 – End of line structure characteristics.....	101
Table I.4 – Expected annual number of dangerous events	101
Table I.5 – Risk R'_2 - Risk components relevant to sections S of the line	101
Table I.6 – Risk R'_2 - Values of failure currents and probabilities P' for unprotected line	102
Table I.7 – Risk R'_2 - Values of risk components for unprotected line according to sections S of the line (values $\times 10^{-3}$)	103
Table I.8 – Risk R'_2 - Values of probabilities P' for the protected line.....	104
Table I.9 – Risk R'_2 - Values of risk components for the line protected with SPDs installed in the transition point $T_{1/2}$ and T_a with $P_{SPD} = 0,03$ (values $\times 10^{-3}$).....	104
Table J.1 – Parameters for the user to change freely	105
Table J.2 – Limited subset of parameters to be changed by the user	105
Table J.3 – Fixed parameters (not to altered by the user)	107

iTeH STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62305-2:2006
94b4-badf-432a-acde-
1c1571049daf/sist-en-62305-2-2006

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PROTECTION AGAINST LIGHTNING –**Part 2: Risk management**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62305-2 has been prepared by IEC technical committee 81: Lightning protection.

The IEC 62305 series (Parts 1 to 5), is produced in accordance with the New Publications Plan, approved by National Committees (81/171/RQ (2001-06-29)), which restructures and updates, in a more simple and rational form, the publications of the IEC 61024 series, the IEC 61312 series and the IEC 61663 series.

The text of this first edition of IEC 62305-2 is compiled from and replaces

- IEC 61662, first edition (1995) and its Amendment (1996).

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

FDIS	Report on voting
81/263/FDIS	81/268/RVD

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

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

IEC 62305 consists of the following parts, under the general title *Protection against lightning*:

- Part 1: General principles
- Part 2: Risk management
- Part 3: Physical damage to structures and life hazard
- Part 4: Electrical and electronic systems within structures
- Part 5: Services¹

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or [SIST EN 62305-2:2006](https://standards.iteh.ai/catalog/standards/sist/444994b4-badf-432a-acde-1c1571049daf/sist-en-62305-2-2006)
- amended.

¹ To be published

INTRODUCTION

Lightning flashes to earth may be hazardous to structures and to services.

The hazard to a structure can result in

- damage to the structure and to its contents,
- failure of associated electrical and electronic systems,
- injury to living beings in or close to the structure.

Consequential effects of the damage and failures may be extended to the surroundings of the structure or may involve its environment.

The hazard to services can result in

- damage to the service itself,
- failure of associated electrical and electronic equipment.

To reduce the loss due to lightning, protection measures may be required. Whether they are needed, and to what extent, should be determined by risk assessment.

The risk, defined in this standard as the probable average annual loss in a structure and in a service due to lightning flashes, depends on:

- the annual number of lightning flashes influencing the structure and the service;
- the probability of damage by one of the influencing lightning flashes;
- the mean amount of consequential loss.

Lightning flashes influencing the structure may be divided into

- flashes terminating on the structure,
- flashes terminating near the structure, direct to connected services (power, telecommunication lines, other services) or near the services.

Lightning flashes influencing the service may be divided into

- flashes terminating on the service,
- flashes terminating near the service or direct to a structure connected to the service.

Flashes to the structure or a connected service may cause physical damage and life hazards. Flashes near the structure or service as well as flashes to the structure or service may cause failure of electrical and electronic systems due to overvoltages resulting from resistive and inductive coupling of these systems with the lightning current.

Moreover, failures caused by lightning overvoltages in users' installations and in power supply lines may also generate switching type overvoltages in the installations.

NOTE 1 Malfunctioning of electrical and electronic systems is not covered by the IEC 62305 series. Reference should be made to IEC 61000-4-5 [1]².

NOTE 2 Information on assessment of the risk due to switching overvoltages is given in Annex F.

² Figures in square brackets refer to the bibliography.

The number of lightning flashes influencing the structure and the services depends on the dimensions and the characteristics of the structure and of the services, on the environment characteristics of the structure and the services, as well as on lightning ground flash density in the region where the structure and the services are located.

The probability of lightning damage depends on the structure, the services, and the lightning current characteristics; as well as on the type and efficiency of applied protection measures.

The annual mean amount of the consequential loss depends on the extent of damage and the consequential effects which may occur as result of a lightning flash.

The effect of protection measures results from the features of each protection measure and may reduce the damage probabilities or the amount of consequential loss.

The assessment of risk due to all possible effects of lightning flashes to structures and services is given in this standard, which is a revised version of IEC 61662:1995 and its Amendment 1:1996.

The decision to provide lightning protection may be taken regardless of the outcome of any risk assessment where there is a desire that there be no avoidable risk.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

SIST EN 62305-2:2006

<https://standards.iteh.ai/catalog/standards/sist/444994b4-badf-432a-acde-1c1571049daf/sist-en-62305-2-2006>

PROTECTION AGAINST LIGHTNING –

Part 2: Risk management

1 Scope

This part of IEC 62305 is applicable to risk assessment for a structure or for a service due to lightning flashes to earth.

Its purpose is to provide a procedure for the evaluation of such a risk. Once an upper tolerable limit for the risk has been selected, this procedure allows the selection of appropriate protection measures to be adopted to reduce the risk to or below the tolerable limit.

2 Normative references

The following referenced documents are indispensable for the application 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 60079-10:2002, *Electrical apparatus for explosive gas atmosphere – Part 10: Classification of hazardous areas*

IEC 61241-10:2004, *Electrical apparatus for use in the presence of combustible dust – Part 10: Classification of areas where combustible dusts are or may be present*

IEC 62305-1, *Protection against lightning – Part 1: General principles*

IEC 62305-3, *Protection against lightning – Part 3: Physical damage to structures and life hazard*

IEC 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures*

IEC 62305-5, *Protection against lightning – Part 5: Services³*

ITU-T Recommendation K.46:2000, *Protection of telecommunication lines using metallic symmetric conductors against lightning induced surges*

ITU-T Recommendation K.47:2000, *Protection of telecommunication lines using metallic conductors against direct lightning discharges*

3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the following terms, definitions, symbols and abbreviations, some of which have already been cited in Part 1 but are repeated here for ease of reading, as well as those given in other parts of IEC 62305, apply.

³ To be published