IEC 62305-4

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Protection against lightning –
Part 4: Electrical and electronic systems within structures

Protection contre la foudre –
Partie 4: Réseaux de puissance et de communication dans les structures

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CONTENTS

FOREWORD 8
INTRODUCTION 10
1 Scope 11
2 Normative references 11
3 Terms and definitions 12
4 Design and installation of SPM 16
4.1 General 16
4.2 Design of SPM 20
4.3 Lightning protection zones (LPZs) 20
4.3.1 General 20
4.3.2 Outer zones 20
4.3.3 Inner zones 21
4.4 Basic SPM 23
5 Earthing and bonding networks 24
5.1 General 24
5.2 Earth-termination system 25
5.3 Bonding network 26
5.4 Bonding bars 31
5.5 Bonding at the boundary of an LPZ 32
5.6 Material and dimensions of bonding components 32
6 Magnetic shielding and line routing 33
6.1 General 33
6.2 Spatial shielding 33
6.3 Shielding of internal lines 33
6.4 Routing of internal lines 34
6.5 Shielding of external lines 34
6.6 Material and dimensions of magnetic shields 34
7 Coordinated SPD system 34
8 Isolating interfaces 35
9 SPM management 35
9.1 General 35
9.2 SPM management plan 36
9.3 Inspection of SPM 38
9.3.1 General 38
9.3.2 Inspection procedure 38
9.3.3 Inspection documentation 39
9.4 Maintenance 39
Annex A (informative) Basis of electromagnetic environment evaluation in an LPZ 40
A.1 General 40
A.2 Damaging effects on electrical and electronic systems due to lightning 40
A.2.1 Sources of damage 40
A.2.2 Object of damage 40
A.2.3 Withstand of equipment signal ports 40
A.2.4 Withstand of equipment power ports 41
A.2.5 Relationship between the object of damage and the source of damage 42
A.3 Spatial shielding, line routing and line shielding 42

A.3.1 General 42
A.3.2 Grid-like spatial shields 45
A.3.3 Line routing and line shielding 47
A.4 Magnetic field inside LPZ 51
A.4.1 Approximation for the magnetic field inside LPZ 51
A.4.2 Numerical magnetic field calculation in case of direct lightning strikes 57
A.4.3 Experimental evaluation of the magnetic field due to a direct lightning strike 61
A.5 Calculation of induced voltages and currents 62
A.5.1 General 62
A.5.2 Situation inside LPZ 1 in the case of a direct lightning strike 62
A.5.3 Situation inside LPZ 1 in the case of a nearby lightning strike 65
A.5.4 Situation inside LPZ 2 and higher 66
Annex B (informative) Implementation of SPM for an existing structure 67
B.1 General 67
B.2 Checklists 67
B.3 Design of SPM for an existing structure 68
B.4 Design of basic protection measures for LPZs 70
B.4.1 Design of basic protection measures for LPZ 1 70
B.4.2 Design of basic protection measures for LPZ 2 70
B.4.3 Design of basic protection measures for LPZ 3 71
B.5 Improvement of an existing LPS using spatial shielding of LPZ 1 71
B.6 Establishment of LPZs for electrical and electronic systems 71
B.7 Protection using a bonding network 74
B.8 Protection by surge protective devices 74
B.9 Protection by isolating interfaces 75
B.10 Protection measures by line routing and shielding 75
B.11 Protection measures for externally installed equipment 77
B.11.1 General 77
B.11.2 Protection of external equipment 77
B.11.3 Protection by maintaining electrical insulation to the LPS 79
B.11.4 Reduction of overvoltages in cables 80
B.12 Improving interconnections between structures 81
B.12.1 General 81
B.12.2 Isolating lines 81
B.12.3 Metallic lines 81
B.13 Integration of new internal systems into existing structures 81
B.14 Overview of possible protection measures 82
B.14.1 Power supply 82
B.14.2 Surge protective devices 83
B.14.3 Isolating interfaces 83
B.14.4 Line routing and shielding 83
B.14.5 Spatial shielding 83
B.14.6 Bonding 83
B.15 Upgrading a power supply and cable installation inside the structure 83
Annex C (informative) Selection and installation of a coordinated SPD system 84
C.1 General 84
C.2 Selection of SPDs 85
C.2.1 Location of SPDs according to source of damage 85

C.2.2 Selection with regard to lightning current I 86
C.2.3 Selection with regard to voltage protection level U_p 87
C.2.4 SPD arrangements 92
C.2.5 Equipment protection by two SPDs 92
C.2.6 Equipment connected to two different services 93
C.2.7 Selection with regard to location and discharge current 93
C.2.8 Coordination of the SPD with back-up overcurrent protective device (OCPD) 96
C.3 Installation of a coordinated SPD system 97
C.3.1 General 97
C.3.2 Installation location of SPDs 97
C.3.3 Connecting conductors 98
C.3.4 Coordination of SPDs 98
C.3.5 Procedure for installation of a coordinated SPD system 98
Annex D (informative) Factors to be considered in the selection of SPDs 99
D.1 General 99
D.2 Factors determining the stress experienced by an SPD 99
D.3 Quantifying the statistical threat level to an SPD 101
D.3.1 General 101
D.3.2 Installation factors effecting current distribution 101
D.3.3 Considerations in the selection of SPD ratings: I_{imp}, [I_{max}], I_n, U_{OC} 102
Annex E (informative) Lightning current sharing using simulation modelling 104
E.1 General 104
E.1.1 Overview 104
E.1.2 Methods to determine the lightning current distribution 104
E.2 Lightning current parameters for SPDs 105
E.2.1 Lightning current parameters in accordance with IEC 62305-1 105
E.2.2 Conclusion on lightning current sharing from numerical modelling 105
E.3 Distribution of lightning currents in power supply systems 106
E.3.1 Influencing factors 106
E.3.2 Considerations in lightning current sharing using numerical modelling 108
E.4 Current distribution in structures 111
E.4.1 General 111
E.4.2 Structures with externally installed equipment and non-isolated LPS 112
E.4.3 Tall buildings 113
E.4.4 Transformer located inside a structure 114
Annex F (informative) Lightning current sharing in photovoltaic installations 115
F.1 General 115
F.2 Structures with roof-mounted PV systems 117
F.2.1 Description and assumptions 117
F.2.2 Simplified calculation for the lightning current flowing in DC conductors 117
F.3 Outside free-field power plant with a non-isolated LPS 119
F.3.1 General 119
F.3.2 Finding the lightning current flowing through the DC conductor via the SPD 120
F.3.3 Results 120
Annex G (informative) Testing system level behaviour under lightning discharge conditions 122
G.1 General 122

G.2 SPD discharge current test under normal service conditions 122
G.3 Induction test due to lightning currents 122
G.4 Recommended test classification of system level immunity (IEC 61000-4-5) 122
Annex H (informative) Induced voltage in the circuits protected by an SPD 124
H.1 General 124
H.2 Direct flashes to the structure (Figure H.1) 124
H.3 Flashes near the structure (Figure H.2) 125
H.4 Flashes to the service 126
Annex I (informative) Isolation interfaces using surge isolation transformers (SITs) 128
I.1 SIT for low-voltage power distribution system 128
I.2 SIT for communication systems 128
I.3 SIT surge mitigation performance (low-voltage power distribution systems) 128
Bibliography 130

Figure 1 – General principle for the division into different LPZs 17
Figure 2 – Examples of possible SPM (LEMP protection measures) 19
Figure 3 – Examples of interconnected LPZs 22
Figure 4 – Examples of extended lightning protection zones 23
Figure 5 – Example of a three-dimensional earthing system consisting of the bonding network interconnected with the earth-termination system 25
Figure 6 – Meshed earth-termination system of a plant 26
Figure 7 – Utilization of reinforcing rods of a structure as a protection measure against LEMP and for equipotential bonding 28
Figure 8 – Equipotential bonding in a structure with steel reinforcement 29
Figure 9 – Integration of conductive parts of internal systems into the bonding network 30
Figure 10 – Combinations of integration methods of conductive parts of internal systems into the bonding network 31
Figure A.1 – LEMP situation due to lightning strike to the structure 42
Figure A.2 – Simulation of the rise of the field of the subsequent stroke (0,25/100 µs) by damped 1 MHz oscillations (multiple impulses 0,2/0,5 µs) 45
Figure A.3 – Large volume shield built by metal reinforcement and metal frames 46
Figure A.4 – Volume for electrical and electronic systems inside an inner LPZ n 47
Figure A.5 – Reducing induction effects by line routing and shielding measures 48
Figure A.6 – Example of SPM for an office building 50
Figure A.7 – Evaluation of the magnetic field values in case of a direct lightning strike 51
Figure A.8 – Evaluation of the magnetic field values in case of a nearby lightning strike 53
Figure A.9 – Distance s_a depending on rolling sphere radius and structure dimensions 56
Figure A.10 – Types of structure geometries with different volume shields 58
Figure A.11 – Magnetic field strength $H_{1/MAX}$ inside a grid-like shield for the cubic structure shown in Figure A.10 [14] 59
Figure A.12 – Magnetic field strength $H_{1/MAX}$ inside a grid-like shield for the cubic structure according to mesh width 60
Figure A.13 – Low-level test to evaluate the magnetic field inside a shielded structure 61
Figure A.14 – Voltages and currents induced into a loop formed by lines 62
Figure B.1 – SPM design steps for an existing structure 70
Figure B.2 – Methods of establishing LPZs in existing structures 73

Figure B.3 – Reduction of loop area using shielded cables close to a metal plate 76
Figure B.4 – Example of a metal plate for additional shielding 76
Figure B.5 – Protection of aerials and other external equipment 78
Figure B.6 – Separation distance maintained or not maintained 79
Figure B.7 – Inherent shielding provided by bonded ladders and pipes 80
Figure B.8 – Ideal positions for lines on a mast (cross-section of steel lattice mast) 80
Figure B.9 – Upgrading of the SPM in existing structures 82
Figure C.1 – Selection of SPDs by source of damage 86
Figure C.2 – Example of installation of an SPD to reduce the effect of SPD lead length 88
Figure C.3 – Surge voltage between live conductor and bonding bar 91
Figure C.4 – Equipment with two ports and SPDs on both services bonded to two different earthing points of a non-equipotential earthing system 93
Figure D.1 – Installation example of SPD test class I, class II and class III in a TN system 100
Figure D.2 – Basic example of different sources of damage to a structure and lightning current distribution within a system 101
Figure D.3 – Example of the simplified current distribution in a TN power distribution system 102
Figure E.1 – Approach to computer simulation used to analyse lightning current sharing 105
Figure E.2 – MEN earthing system 108
Figure E.3 – Parallel connected structures 109
Figure E.4 – Influence of lightning current flow in parallel connected structures 109
Figure E.5 – Influence of lightning current flow in star connected structures 110
Figure E.6 – Influence of other metallic conductive services on lightning current sharing 110
Figure E.7 – Influence of lightning current flow from S3 events 111
Figure E.8 – Structures with externally installed equipment and non-isolated LPS 112
Figure E.9 – Protection of internally located sub-station transformers 114
Figure F.1 – Current sharing between LPS down conductors and the internal cabling of a PV system in which the separation distance s has not been maintained 116
Figure F.2 – Protection of a roof-mounted PV system 117
Figure F.3 – Free-field PV power plant with multiple earthing and meshed earthing system 120
Figure G.1 – Example circuit of an SPD discharge current test under service conditions 123
Figure G.2 – Example circuit of an induction test due to lightning currents 123
Figure H.1 – Induced loop by a lightning current on the structure 125
Figure H.2 – Induced loop by a lightning current near the structure 125
Figure I.1 – Use of SPDs to protect windings of SIT 129

Table 1 – Minimum cross-sections for bonding components 33
Table 2 – SPM management plan for new buildings and for extensive changes in construction or use of existing buildings 37
Table A.1 – Rated impulse voltage of equipment per IEC 60364-4-44:2007, Clause 443 and IEC 60364-4-44:2007/AMD1:2015, Clause 443 41
Table A.2 – Parameters relevant to source of harm and equipment 43

Table A.3 – Examples for $I_{0/MAX}$ = 100 kA and w_m = 2 m 53
Table A.4 – Attenuation of the magnetic field of grid-like spatial shields for a plane wave 54
Table A.5 – Rolling sphere radius corresponding to maximum lightning current 56
Table A.6 – Examples for $I_{0/MAX}$ = 100 kA and w_m = 2 m corresponding to SF = 12,6 dB 57
Table B.1 – Structural characteristics and surroundings 67
Table B.2 – Installation characteristics 68
Table B.3 – Equipment characteristics 68
Table B.4 – Other questions to be considered for the protection concept 68
Table B.5 – Type of LPS 68
Table C.1 – Required rated impulse voltage of equipment 87
Table C.2 – Connection of the SPD dependent on supply system 94
Table C.3 – Selection of impulse discharge current (I_{imp}) where the building is protected against direct lightning strike (S1) based on simplified rules 95
Table C.4 – Nominal discharge current (I_n) in kA depending on supply system and connection type 95
Table C.5 – Selection of impulse discharge current (I_{imp}) where the building is protected from direct strikes to the line (S3) 96
Table D.1 – Preferred values of I_{imp} 99
Table E.1 – General trends associated with protection installations for different power distribution systems 107
Table F.1 – Simplified calculated values of I_{imp} ($I_{10/350}$) and I_n ($I_{8/20}$) for voltage-limiting SPDs on the DC side of a PV installation mounted on the roof of a building with an external LPS if the separation distance is not maintained (see Figure F.1) 118
Table F.2 – Simplified calculated values of I_{imp} ($I_{10/350}$) for voltage switching SPDs on the DC side of a PV installation mounted on the roof of a building with an external LPS if the separation distance is not maintained (see Figure F.1) 119
Table F.3 – Simplified calculated values of $I_{10/350}$ and $I_{8/20}$ for SPDs intended to be used in free-field PV power plants with multiple earthing and a meshed earthing system based on Figure F.3 121
Table H.1 – Flashes near the structure: induced voltage per square metre q as a function of LPL 126
Table H.2 – Values of k_c 127
Table H.3 – Values of k_{S1} and k_{S2} for some copper shields 127

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PROTECTION AGAINST LIGHTNING –

Part 4: Electrical and electronic systems within structures

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IEC 62305-4 has been prepared by IEC technical committee 81: Lightning protection. It is an International Standard.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

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

a) addition of new informative Annex E and Annex F on the determination of current sharing using modelling and current sharing in PV installations respectively;
b) addition of a new informative Annex G on methods of testing of system level behaviour;
c) addition of a new informative Annex H on induced voltages in SPD-protected installations.

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

Draft	Report on voting
81/733/FDIS	81/752/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62305 series, published under the general title *Protection against lightning*, can be found on the IEC website.

The following differing practices of a less permanent nature exist in the countries indicated below.

1) Subclause 5.6: In Japan, the minimum values of the cross-section are reduced from:
   - 16 mm^2 to 14 mm^2 for copper and 25 mm^2 to 22 mm^2 for aluminium, for bonding conductors connecting different bonding bars and conductors connecting the bars to the earth-termination system;
   - 6 mm^2 to 5 mm^2 for copper, 10 mm^2 to 8 mm^2 for aluminium and 16 mm^2 to 14 mm^2 for steel, for bonding conductors connecting internal metal installations to the bonding bars;
   - 16 mm^2 to 14 mm^2, 6 mm^2 to 5 mm^2 and 2,5 mm^2 to 2 mm^2 for copper, for earthing conductors to the SPD, conductors connecting SPDs and overcurrent protective devices to live conductors.
2) Subclause E.3.2.3: In South Africa SANS 10142-1:2020, Clause 6.1.6 [1][1] states that 'The neutral conductor shall not be connected direct to earth or to the earth continuity conductor on the load side of the point of control'.

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

- reconfirmed,
- withdrawn, or
- revised.

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[1] Numbers in square brackets refer to the Bibliography.

INTRODUCTION

Lightning as a source of harm is a very high energy phenomenon. Lightning flashes release many hundreds of mega-joules of energy. When compared with the milli-joules of energy that can be enough to cause damage to sensitive electronic equipment in electrical and electronic systems within a structure, additional protection measures will be necessary to protect some of this equipment.

The need for this International Standard has arisen due to the increasing cost of failures of electrical and electronic systems, caused by electromagnetic effects of lightning. Of importance are electronic systems used in data processing and storage as well as process control and safety for plants of considerable capital cost, size and complexity (for which plant outages are very undesirable for cost and safety reasons).

Lightning can cause different types of damage in a structure, as defined in IEC 62305-1.

IEC 62305-3 deals with the protection measures to reduce the risk of physical damage and life hazard but does not cover the protection of electrical and electronic systems.

This part of IEC 62305 therefore provides information on protection measures to reduce the risk of permanent failures of electrical and electronic systems within structures.

Permanent failure of electrical and electronic systems can be caused by the lightning electromagnetic impulse (LEMP) via:

– conducted and induced surges transmitted to equipment via connecting wiring;
– the effects of radiated electromagnetic fields directly into equipment itself.

Surges to the structure can originate from sources external to the structure or from within the structure itself:

– surges which originate externally from the structure are created by lightning flashes striking incoming lines or the nearby ground, and are transmitted to electrical and electronic systems within the structure via these lines;
– surges which originate internally within the structure are created by lightning flashes striking the structure itself or the nearby ground.

NOTE 1 Surges can also originate internally within the structure, from switching effects, e.g. switching of inductive loads, tripping of circuit breakers, blowing of fuses.

NOTE 2 Further information about the protection against switching overvoltages created within structures can be found in IEC 60364-4-43 [2], IEC 60364-5-53 and IEC 61643-12.

Coupling can arise from different mechanisms, namely:

– resistive coupling (e.g. the earth impedance of the earth-termination system or the cable shield resistance);
– magnetic field coupling (e.g. caused by wiring loops in the electrical and electronic system or by inductance of bonding conductors);
– electric field coupling (e.g. caused by rod antenna reception).

NOTE 3 The effects of electric field coupling are generally very small when compared to the magnetic field coupling and can be disregarded.

Radiated electromagnetic fields can be generated via

– the direct lightning current flowing in the lightning channel;
– the partial lightning current flowing in conductors (e.g. in the down conductors of an external LPS, or its natural components, in accordance with IEC 62305-3 or in an external spatial shield in accordance with this document).

PROTECTION AGAINST LIGHTNING –

Part 4: Electrical and electronic systems within structures

1 Scope

This part of IEC 62305 provides requirements for the design, installation, inspection, maintenance, and testing of surge protection measures (SPM) for electrical and electronic systems to reduce the risk of permanent failures due to lightning electromagnetic impulse (LEMP) within a structure.

This document does not cover protection against electromagnetic interference due to lightning, which can cause malfunctioning of internal systems. However, the information reported in Annex A can also be used to evaluate such disturbances. Protection measures against electromagnetic interference are covered in IEC 60364-4-44 [3] and in the IEC 61000 series [4].

This document provides guidelines for cooperation between the designer of the electrical and electronic system and the designer of the protection measures, in order to achieve optimum protection effectiveness.

This document does not deal with detailed design of the electrical and electronic systems themselves.

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 60364-5-53:2019, *Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Devices for protection for safety, isolation, switching, control and monitoring*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements, and tests*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-9, *Electromagnetic compatibility (EMC) – Part 4-9: Testing and measurement techniques – Impulse magnetic field immunity test*

IEC 61000-4-10, *Electromagnetic compatibility (EMC) – Part 4-10: Testing and measurement techniques – Damped oscillatory magnetic field immunity test*

IEC 61643-11:2011, *Low-voltage surge protective devices– Part 11: Surge protective devices connected to low-voltage power systems – Requirements and test methods*

IEC 61643-12:2020, *Low-voltage surge protective devices – Part 12: Surge protective devices connected to low-voltage power systems – Selection and application principles*

IEC 61643-21, *Low-voltage surge protective devices – Part 21: Surge protective devices connected to telecommunications and signalling networks – Performance requirements and testing methods*

IEC 61643-22, *Low-voltage surge protective devices – Part 22: Surge protective devices connected to telecommunications and signalling networks – Selection and application principles*

IEC 61643-31, *Low-voltage surge protective devices – Part 31: Requirements and test methods for SPDs for photovoltaic installations*

IEC 61643-32:2017, *Low-voltage surge protective devices – Part 32: Surge protective devices connected to the d.c. side of photovoltaic installations – Selection and application principles*

IEC 62305-1:2024, *Protection against lightning – Part 1: General principles*

IEC 62305-2:2024, *Protection against lightning – Part 2: Risk management*

IEC 62305-3:2024, *Protection against lightning – Part 3: Physical damage to structures and life hazard*

IEC 62561 (all parts), *Lightning protection system components (LPSC)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62305-1, IEC 62305-2 and IEC 62305-3 and the following apply.

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

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

3.1
electrical system
system incorporating low-voltage power supply components

3.2
electronic system
system incorporating sensitive electronic components such as telecommunication equipment, computer, control and instrumentation systems, radio systems, power electronic installations

3.3
internal systems
electrical and electronic systems of a structure

Note 1 to entry: Internal systems may for example be located on the roof of the structure provided they are connected internally to the structure.

3.4
lightning protection system
LPS
complete system used to reduce physical damage due to lightning flashes to a structure

Note 1 to entry: The LPS consists of both external and internal lightning protection systems but not measures taken to protect internal systems against the effects of LEMP.