

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**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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INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

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# CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references .....	9
3 Terms and definitions .....	10
4 Design and installation of a LEMP protection measures system (LPMS).....	23
4.1 Design of an LPMS.....	16
4.2 Lightning protection zones (LPZ).....	16
4.3 Basic protection measures in an LPMS .....	20
5 Earthing and bonding .....	20
5.1 Earth termination system.....	21
5.2 Bonding network.....	23
5.3 Bonding bars .....	28
5.4 Bonding at the boundary of an LPZ .....	28
5.5 Material and dimensions of bonding components.....	28
6 Magnetic shielding and line routing.....	29
6.1 Spatial shielding.....	29
6.2 Shielding of internal lines .....	29
6.3 Routing of internal lines.....	29
6.4 Shielding of external lines .....	30
6.5 Material and dimensions of magnetic shields.....	30
7 Coordinated SPD protection .....	30
8 Management of an LPMS .....	31
8.1 LPMS management plan.....	31
8.2 Inspection of an LPMS .....	33
8.3 Maintenance.....	34
Annex A (informative) Basics for evaluation of electromagnetic environment in a LPZ .....	35
Annex B (informative) Implementation of LEMP protection measures for electronic systems in existing structures .....	61
Annex C (informative) SPD coordination .....	78
Annex D (informative) Selection and installation of a coordinated SPD protection.....	96
Bibliography.....	101
Figure 1 – General principle for the division into different LPZ .....	13
Figure 2 – Protection against LEMP – Examples of possible LEMP protection measures systems (LPMS) .....	15
Figure 3 – Examples for interconnected LPZ.....	18
Figure 4 – Examples for extended lightning protection zones .....	19
Figure 5 – Example of a three-dimensional earthing system consisting of the bonding network interconnected with the earth termination system.....	21
Figure 6 – Meshed earth termination system of a plant .....	22

Figure 7 – Utilization of reinforcing rods of a structure for equipotential bonding .....	24
Figure 8 – Equipotential bonding in a structure with steel reinforcement .....	25
Figure 9 – Integration of electronic systems into the bonding network .....	26
Figure 10 – Combinations of integration methods of electronic systems into the bonding network .....	27
Figure A.1 – LEMP situation due to lightning flash .....	37
Figure A.2 – Simulation of the rise of magnetic field by damped oscillations .....	39
Figure A.3 – Large volume shield built by metal reinforcement and metal frames .....	40
Figure A.4 – Volume for electrical and electronic systems inside an inner LPZ n .....	41
Figure A.5 – Reducing induction effects by line routing and shielding measures .....	43
Figure A.6 – Example of an LPMS for an office building .....	44
Figure A.7 – Evaluation of the magnetic field values in case of a direct lightning flash .....	46
Figure A.8 – Evaluation of the magnetic field values in case of a nearby lightning flash .....	48
Figure A.9 – Distance $s_a$ depending on rolling sphere radius and structure dimensions .....	51
Figure A.10 – Types of grid-like large volume shields .....	53
Figure A.11 – Magnetic field strength $H_{1/\max}$ inside a grid-like shield Type 1 .....	54
Figure A.12 – Magnetic field strength $H_{1/\max}$ inside a grid-like shield Type 1 .....	54
Figure A.13 – Low-level test to evaluate the magnetic field inside a shielded structure .....	56
Figure A.14 – Voltages and currents induced into a loop built by lines .....	57
Figure B.1 – Upgrading of LEMP protection measures and electromagnetic compatibility in existing structures .....	63
Figure B.2 – Possibilities to establish LPZs in existing structures .....	69
Figure B.3 – Reduction of loop area using shielded cables close to a metal plate .....	71
Figure B.4 – Example of a metal plate for additional shielding .....	72
Figure B.5 – Protection of aerials and other external equipment .....	74
Figure B.6 – Inherent shielding provided by bonded ladders and pipes .....	75
Figure B.7 – Ideal positions for lines on a mast (cross-section of steel lattice mast) .....	76
Figure C.1 – Example for the application of SPD in power distribution systems .....	79
Figure C.2 – Basic model for energy coordination of SPD .....	81
Figure C.3 – Combination of two voltage-limiting type SPDs .....	82
Figure C.4 – Example with two voltage-limiting type MOV 1 and MOV 2 .....	84
Figure C.5 – Combination of voltage-switching type spark gap and voltage-limiting type MOV .....	85
Figure C.6 – Example with voltage-switching type spark gap and voltage-limiting type MOV .....	86
Figure C.7 – Determination of decoupling inductance for 10/350 $\mu$ s and 0,1kA/ $\mu$ s surges ....	87
Figure C.8 – Example with spark gap and MOV for a 10/350 $\mu$ s surge .....	89

Figure C.9 – Example with spark gap and MOV for 0,1kA/μs surge .....	91
Figure C.10 – Coordination variant I – Voltage-limiting type SPD .....	92
Figure C.11 – Coordination variant II – Voltage-limiting type SPD .....	93
Figure C.12 – Coordination variant III – Voltage-switching type SPD and voltage-limiting type SPD .....	93
Figure C.13 – Coordination variant IV – Several SPDs in one element .....	94
Figure C.14 – Coordination according to the “let through energy” method .....	94
Figure D.1 – Surge voltage between live conductor and bonding bar .....	97

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**PROTECTION AGAINST LIGHTNING –****Part 4: Electrical and electronic systems within structures**

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International Standard IEC 62305-4 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 in a more simple and rational form and updates the publications of the IEC 61024 series, IEC 61312 series and the IEC 61663 series.

The text of this first edition of IEC 62305-4 is compiled from and replaces

- IEC 61312-1, first edition (1995);
- IEC 61312-2, first edition (1998);
- IEC 61312-3, first edition (2000);
- IEC 61312-4, first edition (1998).

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

FDIS	Report on voting
81/265/FDIS	81/270/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: Services<sup>1</sup>

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;
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- replaced by a revised edition, or
- amended.

<sup>1</sup> To be published.

## 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 may be sufficient to cause damage to sensitive electronic equipment in electrical and electronic systems within a structure, it is clear that 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 particular 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 62305-2:

- D1 injuries to living beings due to touch and step voltages;
- D2 physical damage due to mechanical, thermal, chemical and explosive effects;
- D3 failures of electrical and electronic systems due to electromagnetic effects.

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 4 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:

- a) conducted and induced surges transmitted to apparatus via connecting wiring;
- b) the effects of radiated electromagnetic fields directly into apparatus itself.

Surges to the structure can be generated externally or internally:

- surges external to the structure are created by lightning flashes striking incoming lines or the nearby ground, and are transmitted to electrical and electronic systems via these lines;
- surges internal to the structure are created by lightning flashes striking the structure or the nearby ground.

The coupling can arise from different mechanisms:

- 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 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 according to IEC 62305-3 or in an external spatial shield according to this standard).