EESTI STANDARD EVS-EN IEC 62368-1:2020

AUDIO-, VIDEO-, INFORMATSIOONI- JA SIDETEHNOLOOGIA SEADMED. OSA 1: OHUTUSNÕUDED

Audio/video, information and communication technology equipment - Part 1: Safety requirements

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EESTI STANDARDI EESSÕNA	NATIONAL FOREWORD
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EUROPEAN STANDARD

NORME EUROPÉENNE

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English Version

Audio/video, information and communication technology equipment - Part 1: Safety requirements (IEC 62368-1:2018)

Équipements des technologies de l'audio/vidéo, de l'information et de la communication - Partie 1: Exigences de sécurité (IEC 62368-1:2018)

Einrichtungen für Audio/Video-, Informations- und Kommunikationstechnik - Teil 1: Sicherheitsanforderungen (IEC 62368-1:2018)

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European foreword

This document (EN IEC 62368-1:2020) consists of the text of IEC 62368-1:2018 prepared by IEC/TC 108 "Safety of electronic equipment within the field of audio/video, information technology and communication technology".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-01-06
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2023-01-06

This document supersedes EN 60950-22:2017, EN 60950-23:2006 and EN 62368-1:2014 and all of its amendments and corrigenda (if any).

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The text of the International Standard IEC 62368-1:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60204-1	NOTE	Harmonized as EN 60204-1.
IEC 60204-11	NOTE	Harmonized as EN 60204-11.
IEC 60664-1	NOTE	Harmonized as EN 60664-1.
IEC 60664-4:2005	NOTE	Harmonized as EN 60664-4:2006 (not modified).
IEC 60721-3-4	NOTE	Harmonized as EN 60721-3-4.
IEC 61140:2016	NOTE	Harmonized as EN 61140:2016 (not modified).
IEC 61439-5:2014	NOTE	Harmonized as EN 61439-5:2015 (not modified).
IEC 61587-1	NOTE	Harmonized as EN 61587-1.
IEC 61969-3	NOTE	Harmonized as EN 61969-3.
IEC 62040-1	NOTE	Harmonized as EN 62040-1.
IEC 62305-1	NOTE	Harmonized as EN 62305-1.
IEC 62368-3	NOTE	Harmonized as FprEN 62368-3:2017.
ISO 4628-3	NOTE	Harmonized as EN ISO 4628-3.
ISO 10218-1	NOTE	Harmonized as EN ISO 10218-1.
ISO 10218-2	NOTE	Harmonized as EN ISO 10218-2.
ISO 13482	NOTE	Harmonized as EN ISO 13482.
ISO 13850	NOTE	Harmonized as EN ISO 13850.

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Annex ZA
(normative)
Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60027-1	-	Letters symbols to be used in electrical technology - Part 1: General	EN 60027-1	-
IEC 60065	-	Audio, video and similar electronic apparatus - Safety requirements	EN 60065	-
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	-
IEC 60068-2-11	-	Basic environmental testing procedures - Part 2-11: Tests - Test Ka: Salt mist	EN 60068-2-11	-
IEC 60068-2-78	-	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	EN 60068-2-78	-
IEC 60073	-	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators	EN 60073	-
IEC 60076-14	-	Power transformers - Part 14: Liquid-immersed power transformers using high-temperature insulation materials	EN 60076-14	-
IEC/TR 60083	-	Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC	-	-
IEC 60085	-	Electrical insulation - Thermal evaluation and designation	EN 60085	-
IEC 60086-4	-	Primary batteries - Part 4: Safety of lithium batteries	EN 60086-4	-
IEC 60086-5	-	Primary batteries - Part 5: Safety of batteries with aqueous electrolyte	EN 60086-5	-
IEC 60107-1	1997	Methods of measurement on receivers for television broadcast transmissions - Part 1: General considerations - Measurements at radio and video frequencies	EN 60107-1	1997
IEC 60112	-	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN 60112	-
IEC 60127	series	Miniature fuses	EN 60127	series
IEC 60227-1	-	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements	-	-
IEC 60227-2 + A1	1997 2003	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 2: Test methods	-	-
IEC 60245-1	-	Rubber insulated cables - Rated voltages up to and including 450/750 V -- Part 1: General requirements	-	-

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IEC 60296	-	Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear	EN 60296	-
IEC 60309	series	Plugs, socket-outlets and couplers for industrial purposes	EN 60309	series
IEC 60317	series	Specifications for particular types of winding wires	EN 60317	series
IEC 60317-0-7	2017	Specifications for particular types of winding wires - Part 0-7: General requirements - Fully insulated (FIW) zero-defect enamelled round copper wire	EN 60317-0-7	2017
IEC 60317-43	-	Specifications for particular types of winding wires - Part 43: Aromatic polyimide tape wrapped round copper wire, class 240	EN 60317-43	-
IEC 60317-56	-	Specifications for particular types of winding wires - Part 56: Solderable fully insulated (FIW) zero-defect polyurethane enamelled round copper wire, class 180	EN 60317-56	-
IEC 60320	series	Appliance couplers for household and similar general purposes	EN 60320	series
IEC 60320-1	-	Appliance couplers for household and similar general purposes - Part 1: General requirements	EN 60320-1	-
IEC 60332-1-2	-	Tests on electric and optical fibre cables under fire conditions - Part 1-2: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame	EN 60332-1-2	-
IEC 60332-1-3	-	Tests on electric and optical fibre cables under fire conditions - Part 1-3: Test for vertical flame propagation for a single insulated wire or cable - Procedure for determination of flaming droplets/particles	EN 60332-1-3	-
IEC 60332-2-2	-	Tests on electric and optical fibre cables under fire conditions - Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable - Procedure for diffusion flame	EN 60332-2-2	-
IEC 60384-14	-	Fixed capacitors for use in electronic equipment - Part 14: Sectional specification - Fixed capacitors for electromagnetic interference suppression and connection to the supply mains	EN 60384-14	-
IEC 60417	Data-base	Graphical symbols for use on equipment	-	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
IEC 60664-3	-	Insulation coordination for equipment within low-voltage systems - Part 3: Use of coating, potting or moulding for protection against pollution	EN 60664-3	-
IEC 60691	2015	Thermal-links - Requirements and application guide	EN 60691	2016

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IEC 60695-2-11	-	Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end-products (GWEPT)	EN 60695-2-11	-
IEC 60695-10-2	-	Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method	EN 60695-10-2	-
IEC 60695-10-3	-	Fire hazard testing - Part 10-3: Abnormal heat - Mould stress relief distortion test	EN 60695-10-3	-
IEC 60695-11-5	2016	Fire hazard testing - Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance	EN 60695-11-5	2017
IEC 60695-11-10	-	Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods	EN 60695-11-10	-
IEC 60695-11-20	2015	Fire hazard testing - Part 11-20: Test flames - 500 W flame test method	EN 60695-11-20	2015
IEC/TS 60695-11-21	-	Fire hazard testing - Part 11-21: Test flames - 500 W vertical flame test method for tubular polymeric materials	-	-
IEC 60728-11	2016	Cable networks for television signals, sound signals and interactive services - Part 11: Safety	EN 60728-11	2017
-	-		+ A11	2018
IEC 60730	series	Automatic electrical controls	EN 60730	series
IEC 60730-1 (mod)	2013	Automatic electrical controls - Part 1: General requirements	EN 60730-1	2016
IEC 60738-1	2006	Thermistors - Directly heated positive temperature coefficient - Part 1: Generic specification	EN 60738-1	2006
IEC 60747-5-5	2007	Semiconductor devices - Discrete devices - Part 5-5: Optoelectronic devices - Photocouplers	EN 60747-5-5	2011
+ A1	2013		+ A1	2015
IEC 60825-1	-	Safety of laser products - Part 1: Equipment classification and requirements	EN 60825-1	-
IEC 60825-2	-	Safety of laser products - Part 2: Safety of optical fibre communication systems (OFCS)	EN 60825-2	-
IEC 60825-12	-	Safety of laser products - Part 12: Safety of free space optical communication systems used for transmission of information	EN 60825-12	-
IEC 60836	-	Specifications for unused silicone insulating liquids for electrotechnical purposes	EN 60836	-
IEC 60851-3	2009	Winding wires - Test methods - Part 3: Mechanical properties	EN 60851-3	2009
+ A1	2013		+ A1	2013
IEC 60851-5	2008	Winding wires - Test methods - Part 5: Electrical properties	EN 60851-5	2008
+ A1	2011		+ A1	2011
IEC 60884-1	-	Plugs and socket-outlets for household and similar purposes -- Part 1: General requirements	-	-
IEC 60896-11	-	Stationary lead-acid batteries - Part 11: Vented types - General requirements and methods of tests	EN 60896-11	-
IEC 60896-21	2004	Stationary lead-acid batteries - Part 21: Valve regulated types - Methods of test	EN 60896-21	2004

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IEC 60896-22	-	Stationary lead-acid batteries - Part 22: Valve regulated types - Requirements	EN 60896-22	-
IEC 60906-1	-	IEC system of plugs and socket-outlets for household and similar purposes - Part 1: Plugs and socket-outlets 16 A 250 V a.c.	-	-
IEC 60906-2	-	IEC system of plugs and socket-outlets for household and similar purposes - Part 2: Plugs and socket-outlets 15 A 125 V a.c. and 20 A 125 V a.c.	-	-
IEC 60947-1	-	Low-voltage switchgear and controlgear - Part 1: General rules	EN 60947-1	-
IEC 60947-5-5	-	Low-voltage switchgear and controlgear - Part 5-5: Control circuit devices and switching elements - Electrical emergency stop device with mechanical latching function	EN 60947-5-5	-
IEC 60950-1	-	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1	-
IEC 60990	2016	Methods of measurement of touch current and protective conductor current	EN 60990	2016
IEC 60998-1	-	Connecting devices for low-voltage circuits for household and similar purposes - Part 1: General requirements	EN 60998-1	-
IEC 60999-1	-	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm2 up to 35 mm2 (included)	EN 60999-1	-
IEC 60999-2	-	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 2: Particular requirements for clamping units for conductors above 35 mm2 up to 300 mm2 (included)	EN 60999-2	-
IEC 61039	-	Classification of insulating liquids	EN 61039	-
IEC 61051-1	-	Varistors for use in electronic equipment - Part 1: Generic specification	-	-
IEC 61051-2 +A1	1991 2009	Varistors for use in electronic equipment - Part 2: Sectional specification for surge suppression varistors	-	-
IEC 61056-1	-	General purpose lead-acid batteries (valve-regulated types) - Part 1: General requirements, functional characteristics - Methods of test	EN 61056-1	-
IEC 61056-2	-	General purpose lead-acid batteries (valve-regulated types) - Part 2: Dimensions, terminals and marking	EN 61056-2	-
IEC 61058-1	2016	Switches for appliances - Part 1: General requirements	EN IEC 61058-1	2018
IEC 61099	-	Insulating liquids - Specifications for unused synthetic organic esters for electrical purposes	EN 61099	-
IEC 61204-7	-	Low-voltage switch mode power supplies - Part 7: Safety requirements	EN IEC 61204-7	-
IEC 61293	-	Marking of electrical equipment with ratings related to electrical supply - Safety requirements	EN 61293	-

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IEC 61427	series	Secondary cells and batteries for renewable energy storage - General requirements and methods of test	EN 61427	series
IEC/TS 61430	-	Secondary cells and batteries - Test methods for checking the performance of devices designed for reducing explosion hazards - Lead-acid starter batteries	-	-
IEC 61434	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Guide to designation of current in alkaline secondary cell and battery standards	EN 61434	-
IEC 61558-1	2017	Safety of transformers, reactors, power supply units and combinations thereof - Part 1: General requirements and tests	FprEN 61558-1	2017
IEC 61558-2-16	-	Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units	EN 61558-2-16	-
IEC 61643-11 (mod)	2011	Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods	EN 61643-11	2012
-	-		+ A11	2018
IEC 61643-331	2017	Components for low-voltage surge protection - Part 331: Performance requirements and test methods for metal oxide varistors (MOV)	EN IEC 61643-331	2018
IEC 61810-1	2015	Electromechanical elementary relays - Part 1: General and safety requirements	EN 61810-1	2015
IEC 61959	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Mechanical tests for sealed portable secondary cells and batteries	EN 61959	-
IEC 61965	-	Mechanical safety of cathode ray tubes	EN 61965	-
IEC 61984	-	Connectors - Safety requirements and tests	EN 61984	-
IEC 62133	series	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications	EN 62133	series
IEC 62133-1	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 1: Nickel systems	EN 62133-1	-
IEC 62133-2	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems	EN 62133-2	-
IEC 62281	-	Safety of primary and secondary lithium cells and batteries during transport	EN 62281	-

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IEC/TS 62332-1	-	Electrical insulation systems (EIS) - Thermal evaluation of combined liquid and solid components - Part 1: General requirements	-	-
IEC 62440	2008	Electric cables with a rated voltage not exceeding 450/750 V - Guide to use	-	-
IEC 62471 (mod)	2006	Photobiological safety of lamps and lamp systems	EN 62471	2008
IEC 62471-5	2015	Photobiological safety of lamps and lamp systems - Part 5: Image projectors	EN 62471-5	2015
IEC 62485-2	-	Safety requirements for secondary batteries and battery installations - Part 2: Stationary batteries	EN IEC 62485-2	-
IEC 62619	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications	EN 62619	-
ISO 37	-	Rubber, vulcanized or thermoplastic_- Determination of tensile stress-strain properties	-	-
ISO 178	-	Plastics - Determination of flexural properties	EN ISO 178	-
ISO 179-1	-	Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test	EN ISO 179-1	-
ISO 180	-	Plastics - Determination of Izod impact strength	EN ISO 180	-
ISO 306	-	Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST)	EN ISO 306	-
ISO 527	series	Plastics - Determination of tensile properties	EN ISO 527	series
ISO 871	-	Plastics - Determination of ignition temperature using a hot-air furnace	-	-
ISO 1798	-	Flexible cellular polymeric materials - Determination of tensile strength and elongation at break	EN ISO 1798	-
ISO 1817	2015	Rubber, vulcanized or thermoplastic_- Determination of the effect of liquids	-	-
ISO 2719	-	Determination of flash point - Pensky-Martens closed cup method	EN ISO 2719	-
ISO 3231	-	Paints and varnishes - Determination of resistance to humid atmospheres containing sulfur dioxide	EN ISO 3231	-
ISO 3679	-	Determination of flash no-flash and flash point - Rapid equilibrium closed cup method	EN ISO 3679	-
ISO 3864	series	Graphical symbols - Safety colours and safety signs	-	-
ISO 3864-2	-	Graphical symbols - Safety colours and safety signs – Part 2: Design principles for product safety labels	-	-
ISO 4892-1	-	Plastics - Methods of exposure to laboratory light sources - Part 1: General guidance	EN ISO 4892-1	-
ISO 4892-2	-	Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps	EN ISO 4892-2	-

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ISO 4892-4	-	Plastics - Methods of exposure to laboratory light sources - Part 4: Open-flame carbon-arc lamps	-	-
ISO 7000	-	Graphical symbols for use on equipment - Registered symbols	-	-
ISO 7010	-	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	-
ISO 8256	-	Plastics - Determination of tensile-impact strength	EN ISO 8256	-
ISO 9772	-	Cellular plastics -- Determination of horizontal burning characteristics of small specimens subjected to a small flame	-	-
ISO 9773	-	Plastics - Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source	EN ISO 9773	-
ISO 14993	-	Corrosion of metals and alloys - Accelerated testing involving cyclic exposure to salt mist, dry and wet conditions	-	-
ISO 21207	-	Corrosion tests in artificial atmospheres - Accelerated corrosion tests involving alternate exposure to corrosion-promoting gases, neutral salt-spray and drying	-	-
ASTM D3574	-	Standard Test Methods for Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams	-	-
ASTM D412	-	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension	-	-
ASTM 471-98	-	Standard Test Method for Rubber Property - Effect of Liquids	-	-
-	-	Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 1: General method for “one package equipment”	EN 50332-1	2013
-	-	Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 2: Matching of sets with headphones if either or both are offered separately	EN 50332-2	-
-	-	Sound system equipment: Headphones and earphones associated with personal music players - maximum sound pressure level measurement methodology - Part 3: Measurement method for sound dose management	EN 50332-3	-

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CONTENTS

FOREWORD 20
INTRODUCTION 23
0 Principles of this product safety standard 23
0.1 Objective 23
0.2 Persons 23
0.2.1 General 23
0.2.2 Ordinary person 23
0.2.3 Instructed person 23
0.2.4 Skilled person 23
0.3 Model for pain and injury 24
0.4 Energy sources 24
0.5 Safeguards 25
0.5.1 General 25
0.5.2 Equipment safeguard 26
0.5.3 Installation safeguard 26
0.5.4 Personal safeguard 26
0.5.5 Behavioural safeguards 27
0.5.6 Safeguards during ordinary or instructed person service conditions 28
0.5.7 Equipment safeguards during skilled person service conditions 28
0.5.8 Examples of safeguard characteristics 28
0.6 Electrically-caused pain or injury (electric shock) 29
0.6.1 Models for electrically-caused pain or injury 29
0.6.2 Models for protection against electrically-caused pain or injury 30
0.7 Electrically-caused fire 31
0.7.1 Models for electrically-caused fire 31
0.7.2 Models for protection against electrically-caused fire 31
0.8 Injury caused by hazardous substances 32
0.9 Mechanically-caused injury 32
0.10 Thermally-caused injury (skin burn) 33
0.10.1 Models for thermally-caused injury 33
0.10.2 Models for protection against thermally-caused pain or injury 34
0.11 Radiation-caused injury 35
1 Scope 36
2 Normative references 37
3 Terms, definitions and abbreviated terms 44
3.1 Energy source abbreviations 44
3.2 Other abbreviations 45
3.3 Terms and definitions 46
3.3.1 Circuit terms 49
3.3.2 Enclosure terms 49
3.3.3 Equipment terms 50
3.3.4 Flammability terms 51
3.3.5 Electrical insulation 53
3.3.6 Miscellaneous 53
3.3.7 Operating and fault conditions 55
3.3.8 Persons 56

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3.3.9 Potential ignition sources 57
3.3.10 Ratings 57
3.3.11 Safeguards 58
3.3.12 Spacings 60
3.3.13 Temperature controls 60
3.3.14 Voltages and currents 60
3.3.15 Classes of equipment with respect to protection from electric shock 61
3.3.16 Chemical terms 62
3.3.17 Batteries 62
3.3.18 FIW terms 63
3.3.19 Sound exposure 63
4 General requirements 64
4.1 General 64
4.1.1 Application of requirements and acceptance of materials, components and subassemblies 64
4.1.2 Use of components 65
4.1.3 Equipment design and construction 65
4.1.4 Equipment installation 65
4.1.5 Constructions and components not specifically covered 66
4.1.6 Orientation during transport and use 66
4.1.7 Choice of criteria 66
4.1.8 Liquids and liquid filled components (LFC) 66
4.1.9 Electrical measuring instruments 67
4.1.10 Temperature measurements 67
4.1.11 Steady state conditions 67
4.1.12 Hierarchy of safeguards 67
4.1.13 Examples mentioned in this document 67
4.1.14 Tests on parts or samples separate from the end-product 67
4.1.15 Markings and instructions 67
4.2 Energy source classifications 68
4.2.1 Class 1 energy source 68
4.2.2 Class 2 energy source 68
4.2.3 Class 3 energy source 68
4.2.4 Energy source classification by declaration 68
4.3 Protection against energy sources 68
4.3.1 General 68
4.3.2 Safeguards for protection of an ordinary person 68
4.3.3 Safeguards for protection of an instructed person 70
4.3.4 Safeguards for protection of a skilled person 71
4.3.5 Safeguards in a restricted access area 72
4.4 Safeguards 72
4.4.1 Equivalent materials or components 72
4.4.2 Composition of a safeguard 72
4.4.3 Safeguard robustness 72
4.4.4 Displacement of a safeguard by an insulating liquid 74
4.4.5 Safety interlocks 75
4.5 Explosion 75
4.5.1 General 75
4.5.2 Requirements 75

This document is a preview generated by EVS

4.6 Fixing of conductors 76
4.6.1 Requirements 76
4.6.2 Compliance criteria 76
4.7 Equipment for direct insertion into mains socket-outlets 76
4.7.1 General 76
4.7.2 Requirements 76
4.7.3 Compliance criteria 76
4.8 Equipment containing coin / button cell batteries 77
4.8.1 General 77
4.8.2 Instructional safeguard 77
4.8.3 Construction 77
4.8.4 Tests 77
4.8.5 Compliance criteria 78
4.9 Likelihood of fire or shock due to entry of conductive objects 79
4.10 Components requirements 79
4.10.1 Disconnect device 79
4.10.2 Switches and relays 79
5 Electrically-caused injury 79
5.1 General 79
5.2 Classification and limits of electrical energy sources 80
5.2.1 Electrical energy source classifications 80
5.2.2 Electrical energy source ES1 and ES2 limits 80
5.3 Protection against electrical energy sources 86
5.3.1 General 86
5.3.2 Accessibility to electrical energy sources and safeguards 86
5.4 Insulation materials and requirements 89
5.4.1 General 89
5.4.2 Clearances 94
5.4.3 Creepage distances 104
5.4.4 Solid insulation 108
5.4.5 Antenna terminal insulation 117
5.4.6 Insulation of internal wire as a part of a supplementary safeguard 117
5.4.7 Tests for semiconductor components and for cemented joints 118
5.4.8 Humidity conditioning 118
5.4.9 Electric strength test 119
5.4.10 Safeguards against transient voltages from external circuits 122
5.4.11 Separation between external circuits and earth 124
5.4.12 Insulating liquid 125
5.5 Components as safeguards 126
5.5.1 General 126
5.5.2 Capacitors and RC units 126
5.5.3 Transformers 127
5.5.4 Optocouplers 127
5.5.5 Relays 127
5.5.6 Resistors 128
5.5.7 SPDs 128
5.5.8 Insulation between the mains and an external circuit consisting of a coaxial cable 129
5.5.9 Safeguards for socket-outlets in outdoor equipment 129

This document is a preview generated by EVS

5.6 Protective conductor ... 130
5.6.1 General ... 130
5.6.2 Requirements for protective conductors ... 130
5.6.3 Requirements for protective earthing conductors ... 131
5.6.4 Requirements for protective bonding conductors ... 131
5.6.5 Terminals for protective conductors ... 134
5.6.6 Resistance of the protective bonding system ... 135
5.6.7 Reliable connection of a protective earthing conductor ... 137
5.6.8 Functional earthing ... 137
5.7 Prospective touch voltage, touch current and protective conductor current ... 137
5.7.1 General ... 137
5.7.2 Measuring devices and networks ... 138
5.7.3 Equipment set-up, supply connections and earth connections ... 138
5.7.4 Unearthed accessible parts ... 138
5.7.5 Earthed accessible conductive parts ... 139
5.7.6 Requirements when touch current exceeds ES2 limits ... 139
5.7.7 Prospective touch voltage and touch current associated with external circuits ... 139
5.7.8 Summation of touch currents from external circuits ... 141
5.8 Backfeed safeguard in battery backed up supplies ... 143
6 Electrically-caused fire ... 143
6.1 General ... 143
6.2 Classification of power sources (PS) and potential ignition sources (PIS) ... 143
6.2.1 General ... 143
6.2.2 Power source circuit classifications ... 144
6.2.3 Classification of potential ignition sources ... 147
6.3 Safeguards against fire under normal operating conditions and abnormal operating conditions ... 148
6.3.1 Requirements ... 148
6.3.2 Compliance criteria ... 149
6.4 Safeguards against fire under single fault conditions ... 149
6.4.1 General ... 149
6.4.2 Reduction of the likelihood of ignition under single fault conditions in PS1 circuits ... 149
6.4.3 Reduction of the likelihood of ignition under single fault conditions in PS2 circuits and PS3 circuits ... 149
6.4.4 Control of fire spread in PS1 circuits ... 151
6.4.5 Control of fire spread in PS2 circuits ... 151
6.4.6 Control of fire spread in a PS3 circuit ... 152
6.4.7 Separation of combustible materials from a PIS ... 152
6.4.8 Fire enclosures and fire barriers ... 155
6.4.9 Flammability of an insulating liquid ... 160
6.5 Internal and external wiring ... 161
6.5.1 General requirements ... 161
6.5.2 Requirements for interconnection to building wiring. ... 161
6.5.3 Internal wiring for socket-outlets ... 161
6.6 Safeguards against fire due to the connection of additional equipment ... 162
7 Injury caused by hazardous substances ... 162
7.1 General ... 162
7.2 Reduction of exposure to hazardous substances ... 162

This document is a preview generated by EVS

7.3 Ozone exposure ... 162
7.4 Use of personal safeguards or personal protective equipment (PPE) ... 162
7.5 Use of instructional safeguards and instructions ... 163
7.6 Batteries and their protection circuits ... 163
8 Mechanically-caused injury ... 163
8.1 General ... 163
8.2 Mechanical energy source classifications ... 163
8.2.1 General classification ... 163
8.2.2 MS1 ... 165
8.2.3 MS2 ... 166
8.2.4 MS3 ... 166
8.3 Safeguards against mechanical energy sources ... 166
8.4 Safeguards against parts with sharp edges and corners ... 166
8.4.1 Requirements ... 166
8.4.2 Compliance criteria ... 166
8.5 Safeguards against moving parts ... 167
8.5.1 Requirements ... 167
8.5.2 Instructional safeguard requirements ... 168
8.5.3 Compliance criteria ... 168
8.5.4 Special categories of equipment containing moving parts ... 168
8.5.5 High pressure lamps ... 173
8.6 Stability of equipment ... 174
8.6.1 Requirements ... 174
8.6.2 Static stability ... 176
8.6.3 Relocation stability ... 177
8.6.4 Glass slide test ... 178
8.6.5 Horizontal force test and compliance criteria ... 178
8.7 Equipment mounted to a wall, ceiling or other structure ... 178
8.7.1 Requirements ... 178
8.7.2 Test methods ... 178
8.7.3 Compliance criteria ... 180
8.8 Handle strength ... 180
8.8.1 General ... 180
8.8.2 Test method ... 180
8.9 Wheels or casters attachment requirements ... 181
8.9.1 General ... 181
8.9.2 Test method ... 181
8.10 Carts, stands, and similar carriers ... 181
8.10.1 General ... 181
8.10.2 Marking and instructions ... 181
8.10.3 Cart, stand or carrier loading test and compliance criteria ... 182
8.10.4 Cart, stand or carrier impact test ... 183
8.10.5 Mechanical stability ... 183
8.10.6 Thermoplastic temperature stability ... 183
8.11 Mounting means for slide-rail mounted equipment (SRME) ... 183
8.11.1 General ... 183
8.11.2 Requirements ... 184
8.11.3 Mechanical strength test ... 184
8.11.4 Compliance criteria ... 185

This document is a preview generated by EVS

8.12 Telescoping or rod antennas ... 185
9 Thermal burn injury ... 185
9.1 General ... 185
9.2 Thermal energy source classifications ... 186
9.2.1 TS1 ... 186
9.2.2 TS2 ... 186
9.2.3 TS3 ... 186
9.3 Touch temperature limits ... 186
9.3.1 Requirements ... 186
9.3.2 Test method and compliance criteria ... 186
9.4 Safeguards against thermal energy sources ... 187
9.5 Requirements for safeguards ... 188
9.5.1 Equipment safeguard ... 188
9.5.2 Instructional safeguard ... 188
9.6 Requirements for wireless power transmitters ... 188
9.6.1 General ... 188
9.6.2 Specification of the foreign objects ... 189
9.6.3 Test method and compliance criteria ... 191
10 Radiation ... 192
10.1 General ... 192
10.2 Radiation energy source classifications ... 192
10.2.1 General classification ... 192
10.2.2 RS1 ... 193
10.2.3 RS2 ... 194
10.2.4 RS3 ... 194
10.3 Safeguards against laser radiation ... 194
10.4 Safeguards against optical radiation from lamps and lamp systems (including LED types) ... 194
10.4.1 General requirements ... 194
10.4.2 Requirements for enclosures ... 196
10.4.3 Instructional safeguard ... 196
10.4.4 Compliance criteria ... 198
10.5 Safeguards against X-radiation ... 198
10.5.1 Requirements ... 198
10.5.2 Compliance criteria ... 198
10.5.3 Test method ... 198
10.6 Safeguards against acoustic energy sources ... 199
10.6.1 General ... 199
10.6.2 Classification ... 200
10.6.3 Requirements for dose-based systems ... 201
10.6.4 Measurement methods ... 201
10.6.5 Protection of persons ... 202
10.6.6 Requirements for listening devices (headphones, earphones, etc.) ... 202
Annex A (informative) Examples of equipment within the scope of this document ... 204
Annex B (normative) Normal operating condition tests, abnormal operating condition tests and single fault condition tests ... 205
B.1 General ... 205
B.1.1 Test applicability ... 205
B.1.2 Type of test ... 205

This document is a preview generated by EVS

B.1.3 Test samples 205
B.1.4 Compliance by inspection of relevant data 205
B.1.5 Temperature measurement conditions 205
B.2 Normal operating conditions 206
B.2.1 General 206
B.2.2 Supply frequency 206
B.2.3 Supply voltage 206
B.2.4 Normal operating voltages 206
B.2.5 Input test 207
B.2.6 Operating temperature measurement conditions 208
B.2.7 Battery charging and discharging under normal operating conditions 208
B.3 Simulated abnormal operating conditions 208
B.3.1 General 208
B.3.2 Covering of ventilation openings 209
B.3.3 DC mains polarity test 210
B.3.4 Setting of voltage selector 210
B.3.5 Maximum load at output terminals 210
B.3.6 Reverse battery polarity 210
B.3.7 Audio amplifier abnormal operating conditions 210
B.3.8 Compliance criteria during and after abnormal operating conditions 210
B.4 Simulated single fault conditions 210
B.4.1 General 210
B.4.2 Temperature controlling device 211
B.4.3 Motor tests 211
B.4.4 Functional insulation 211
B.4.5 Short-circuit and interruption of electrodes in tubes and semiconductors 212
B.4.6 Short-circuit or disconnection of passive components 212
B.4.7 Continuous operation of components 212
B.4.8 Compliance criteria during and after single fault conditions 213
B.4.9 Battery charging and discharging under single fault conditions 213
Annex C (normative) UV radiation 214
C.1 Protection of materials in equipment from UV radiation 214
C.1.1 General 214
C.1.2 Requirements 214
C.1.3 Test method and compliance criteria 214
C.2 UV light conditioning test 215
C.2.1 Test apparatus 215
C.2.2 Mounting of test samples 215
C.2.3 Carbon-arc light-exposure test 215
C.2.4 Xenon-arc light-exposure test 215
Annex D (normative) Test generators 216
D.1 Impulse test generators 216
D.2 Antenna interface test generator 216
D.3 Electronic pulse generator 217
Annex E (normative) Test conditions for equipment containing audio amplifiers 218
E.1 Electrical energy source classification for audio signals 218
E.2 Audio amplifier normal operating conditions 218
E.3 Audio amplifier abnormal operating conditions 219
Annex F (normative) Equipment markings, instructions, and instructional safeguards 220

This document is a preview generated by EVS

F.1 General ... 220
F.2 Letter symbols and graphical symbols ... 220
F.2.1 Letter symbols ... 220
F.2.2 Graphical symbols ... 220
F.2.3 Compliance criteria ... 220
F.3 Equipment markings ... 220
F.3.1 Equipment marking locations ... 220
F.3.2 Equipment identification markings ... 221
F.3.3 Equipment rating markings ... 221
F.3.4 Voltage setting device ... 223
F.3.5 Markings on terminals and operating devices ... 223
F.3.6 Equipment markings related to equipment classification ... 225
F.3.7 Equipment IP rating marking ... 225
F.3.8 External power supply output marking ... 226
F.3.9 Durability, legibility and permanence of markings ... 226
F.3.10 Test for the permanence of markings ... 226
F.4 Instructions ... 226
F.5 Instructional safeguards ... 227
Annex G (normative) Components ... 230
G.1 Switches ... 230
G.1.1 General ... 230
G.1.2 Requirements ... 230
G.1.3 Test method and compliance criteria ... 231
G.2 Relays ... 231
G.2.1 Requirements ... 231
G.2.2 Overload test ... 232
G.2.3 Relay controlling connectors supplying power to other equipment ... 232
G.2.4 Test method and compliance criteria ... 232
G.3 Protective devices ... 232
G.3.1 Thermal cut-offs ... 232
G.3.2 Thermal links ... 233
G.3.3 PTC thermistors ... 234
G.3.4 Overcurrent protective devices ... 235
G.3.5 Safeguard components not mentioned in G.3.1 to G.3.4 ... 235
G.4 Connectors ... 235
G.4.1 Clearance and creepage distance requirements ... 235
G.4.2 Mains connectors ... 235
G.4.3 Connectors other than mains connectors ... 236
G.5 Wound components ... 236
G.5.1 Wire insulation in wound components ... 236
G.5.2 Endurance test ... 236
G.5.3 Transformers ... 238
G.5.4 Motors ... 246
G.6 Wire insulation ... 250
G.6.1 General ... 250
G.6.2 Enamelled winding wire insulation ... 251
G.7 Mains supply cords ... 251
G.7.1 General ... 251
G.7.2 Cross sectional area ... 252

This document is a preview generated by EVS

G.7.3 Cord anchorages and strain relief for non-detachable power supply cords ... 254
G.7.4 Cord entry ... 255
G.7.5 Non-detachable cord bend protection ... 255
G.7.6 Supply wiring space ... 256
G.8 Varistors ... 257
G.8.1 General ... 257
G.8.2 Safeguards against fire ... 258
G.9 Integrated circuit (IC) current limiters ... 260
G.9.1 Requirements ... 260
G.9.2 Test program ... 260
G.9.3 Compliance criteria ... 261
G.10 Resistors ... 261
G.10.1 General ... 261
G.10.2 Conditioning ... 261
G.10.3 Resistor test ... 262
G.10.4 Voltage surge test ... 262
G.10.5 Impulse test ... 262
G.10.6 Overload test ... 262
G.11 Capacitors and RC units ... 262
G.11.1 General ... 262
G.11.2 Conditioning of capacitors and RC units ... 262
G.11.3 Rules for selecting capacitors ... 263
G.12 Optocouplers ... 263
G.13 Printed boards ... 264
G.13.1 General ... 264
G.13.2 Uncoated printed boards ... 264
G.13.3 Coated printed boards ... 264
G.13.4 Insulation between conductors on the same inner surface ... 265
G.13.5 Insulation between conductors on different surfaces ... 266
G.13.6 Tests on coated printed boards ... 266
G.14 Coatings on component terminals ... 268
G.14.1 Requirements ... 268
G.14.2 Test method and compliance criteria ... 268
G.15 Pressurized liquid filled components ... 269
G.15.1 Requirements ... 269
G.15.2 Test methods and compliance criteria ... 269
G.15.3 Compliance criteria ... 270
G.16 IC that includes a capacitor discharge function (ICX) ... 270
G.16.1 Requirements ... 270
G.16.2 Tests ... 270
G.16.3 Compliance criteria ... 271
Annex H (normative) Criteria for telephone ringing signals ... 272
H.1 General ... 272
H.2 Method A ... 272
H.3 Method B ... 275
H.3.1 Ringing signal ... 275
H.3.2 Tripping device and monitoring voltage ... 275

This document is a preview generated by EVS

Annex I (informative) Overvoltage categories (see IEC 60364-4-44) 277
Annex J (normative) Insulated winding wires for use without interleaved insulation 278
J.1 General 278
J.2 Type tests 278
J.2.1 General 278
J.2.2 Electric strength 278
J.2.3 Flexibility and adherence 279
J.2.4 Heat shock 279
J.2.5 Retention of electric strength after bending 280
J.3 Testing during manufacturing 280
J.3.1 General 280
J.3.2 Spark test 280
J.3.3 Sampling test 280
Annex K (normative) Safety interlocks 281
K.1 General 281
K.1.1 General requirements 281
K.1.2 Test method and compliance criteria 281
K.2 Components of the safety interlock safeguard mechanism 281
K.3 Inadvertent change of operating mode 282
K.4 Interlock safeguard override 282
K.5 Fail-safe 282
K.5.1 Requirement 282
K.5.2 Test method and compliance criteria 282
K.6 Mechanically operated safety interlocks 283
K.6.1 Endurance requirement 283
K.6.2 Test method and compliance criteria 283
K.7 Interlock circuit isolation 283
K.7.1 Separation distances for contact gaps and interlock circuit elements 283
K.7.2 Overload test 284
K.7.3 Endurance test 284
K.7.4 Electric strength test 284
Annex L (normative) Disconnect devices 285
L.1 General requirements 285
L.2 Permanently connected equipment 285
L.3 Parts that remain energized 285
L.4 Single-phase equipment 285
L.5 Three-phase equipment 286
L.6 Switches as disconnect devices 286
L.7 Plugs as disconnect devices 286
L.8 Multiple power sources 286
L.9 Compliance criteria 287
Annex M (normative) Equipment containing batteries and their protection circuits 288
M.1 General requirements 288
M.2 Safety of batteries and their cells 288
M.2.1 Requirements 288
M.2.2 Compliance criteria 288
M.3 Protection circuits for batteries provided within the equipment 288
M.3.1 Requirements 288

This document is a preview generated by EVS

M.3.2 Test method ... 289
M.3.3 Compliance criteria ... 290
M.4 Additional safeguards for equipment containing a portable secondary lithium battery ... 290
M.4.1 General ... 290
M.4.2 Charging safeguards ... 290
M.4.3 Fire enclosure ... 291
M.4.4 Drop test of equipment containing a secondary lithium battery ... 291
M.5 Risk of burn due to short-circuit during carrying ... 292
M.5.1 Requirements ... 292
M.5.2 Test method and compliance criteria ... 293
M.6 Safeguards against short-circuits ... 293
M.6.1 Requirements ... 293
M.6.2 Compliance criteria ... 293
M.7 Risk of explosion from lead acid and NiCd batteries ... 293
M.7.1 Ventilation preventing an explosive gas concentration ... 293
M.7.2 Test method and compliance criteria ... 294
M.7.3 Ventilation tests ... 297
M.7.4 Marking requirement ... 298
M.8 Protection against internal ignition from external spark sources of batteries with aqueous electrolyte ... 298
M.8.1 General ... 298
M.8.2 Test method ... 298
M.9 Preventing electrolyte spillage ... 301
M.9.1 Protection from electrolyte spillage ... 301
M.9.2 Tray for preventing electrolyte spillage ... 301
M.10 Instructions to prevent reasonably foreseeable misuse ... 301
Annex N (normative) Electrochemical potentials (V) ... 303
Annex O (normative) Measurement of creepage distances and clearances ... 304
Annex P (normative) Safeguards against conductive objects ... 311
P.1 General ... 311
P.2 Safeguards against entry or consequences of entry of a foreign object ... 311
P.2.1 General ... 311
P.2.2 Safeguards against entry of a foreign object ... 311
P.2.3 Safeguards against the consequences of entry of a foreign object ... 312
P.3 Safeguards against spillage of internal liquids ... 314
P.3.1 General ... 314
P.3.2 Determination of spillage consequences ... 314
P.3.3 Spillage safeguards ... 314
P.3.4 Compliance criteria ... 315
P.4 Metallized coatings and adhesives securing parts ... 315
P.4.1 General ... 315
P.4.2 Tests ... 315
Annex Q (normative) Circuits intended for interconnection with building wiring ... 317
Q.1 Limited power source ... 317
Q.1.1 Requirements ... 317
Q.1.2 Test method and compliance criteria ... 317
Q.2 Test for external circuits – paired conductor cable ... 318
Annex R (normative) Limited short-circuit test ... 319

This document is a preview generated by EVS

R.1 General ... 319
R.2 Test setup ... 319
R.3 Test method ... 319
R.4 Compliance criteria ... 320
Annex S (normative) Tests for resistance to heat and fire ... 321
S.1 Flammability test for fire enclosure and fire barrier materials of equipment where the steady state power does not exceed 4 000 W ... 321
S.2 Flammability test for fire enclosure and fire barrier integrity ... 322
S.3 Flammability tests for the bottom of a fire enclosure ... 323
S.3.1 Mounting of samples ... 323
S.3.2 Test method and compliance criteria ... 323
S.4 Flammability classification of materials ... 324
S.5 Flammability test for fire enclosure materials of equipment with a steady state power exceeding 4 000 W ... 325
Annex T (normative) Mechanical strength tests ... 327
T.1 General ... 327
T.2 Steady force test, 10 N ... 327
T.3 Steady force test, 30 N ... 327
T.4 Steady force test, 100 N ... 327
T.5 Steady force test, 250 N ... 327
T.6 Enclosure impact test ... 327
T.7 Drop test ... 328
T.8 Stress relief test ... 328
T.9 Glass impact test ... 329
T.10 Glass fragmentation test ... 329
T.11 Test for telescoping or rod antennas ... 330
Annex U (normative) Mechanical strength of CRTs and protection against the effects of implosion ... 331
U.1 General ... 331
U.2 Test method and compliance criteria for non-intrinsically protected CRTs ... 332
U.3 Protective screen ... 332
Annex V (normative) Determination of accessible parts ... 333
V.1 Accessible parts of equipment ... 333
V.1.1 General ... 333
V.1.2 Test method 1 – Surfaces and openings tested with jointed test probes ... 333
V.1.3 Test method 2 – Openings tested with straight unjointed test probes ... 333
V.1.4 Test method 3 – Plugs, jacks, connectors ... 336
V.1.5 Test method 4 – Slot openings ... 336
V.1.6 Test method 5 – Terminals intended to be used by an ordinary person ... 337
V.2 Accessible part criterion ... 338
Annex W (informative) Comparison of terms introduced in this document ... 339
W.1 General ... 339
W.2 Comparison of terms ... 339
Annex X (normative) Alternative method for determining clearances for insulation in circuits connected to an AC mains not exceeding 420 V peak (300 V RMS) ... 356
Annex Y (normative) Construction requirements for outdoor enclosures ... 358
Y.1 General ... 358
Y.2 Resistance to UV radiation ... 358
Y.3 Resistance to corrosion ... 358

This document is a preview generated by EVS

Y.3.1 General ... 358
Y.3.2 Test apparatus ... 359
Y.3.3 Water – saturated sulphur dioxide atmosphere ... 359
Y.3.4 Test procedure ... 359
Y.3.5 Compliance criteria ... 360
Y.4 Gaskets ... 360
Y.4.1 General ... 360
Y.4.2 Gasket tests ... 360
Y.4.3 Tensile strength and elongation tests ... 360
Y.4.4 Compression test ... 361
Y.4.5 Oil resistance ... 362
Y.4.6 Securing means ... 362
Y.5 Protection of equipment within an outdoor enclosure ... 363
Y.5.1 General ... 363
Y.5.2 Protection from moisture ... 363
Y.5.3 Water spray test ... 364
Y.5.4 Protection from plants and vermin ... 366
Y.5.5 Protection from excessive dust ... 367
Y.6 Mechanical strength of enclosures ... 367
Y.6.1 General ... 367
Y.6.2 Impact test ... 368
Bibliography ... 369

Figure 1 – Three block model for pain and injury ... 24
Figure 2 – Three block model for safety ... 25
Figure 3 – Schematic and model for electrically-caused pain or injury ... 30
Figure 4 – Model for protection against electrically-caused pain or injury ... 30
Figure 5 – Model for electrically-caused fire ... 31
Figure 6 – Models for protection against fire ... 32
Figure 7 – Schematic and model for thermally-caused injury ... 34
Figure 8 – Model for protection against thermally-caused injury ... 34
Figure 9 – Model for protection of an ordinary person against a class 1 energy source ... 69
Figure 10 – Model for protection of an ordinary person against a class 2 energy source ... 69
Figure 11 – Model for protection of an ordinary person against a class 2 energy source during ordinary person servicing conditions ... 69
Figure 12 – Model for protection of an ordinary person against a class 3 energy source ... 70
Figure 13 – Model for protection of an instructed person against a class 1 energy source ... 70
Figure 14 – Model for protection of an instructed person against a class 2 energy source ... 70
Figure 15 – Model for protection of an instructed person against a class 3 energy source ... 71
Figure 16 – Model for protection of a skilled person against a class 1 energy source ... 71
Figure 17 – Model for protection of a skilled person against a class 2 energy source ... 71
Figure 18 – Model for protection of a skilled person against a class 3 energy source ... 71

This document is a preview generated by EVS

Figure 19 – Model for protection of a skilled person against class 3 energy sources during equipment servicing conditions 72
Figure 20 – Test hook 79
Figure 21 – Illustration showing ES limits for voltage and current 81
Figure 22 – Maximum values for combined AC current and DC current 83
Figure 23 – Maximum values for combined AC voltage and DC voltage 83
Figure 24 – Contact requirements to bare internal conductive parts 87
Figure 25 – Mandrel 112
Figure 26 – Initial position of mandrel 113
Figure 27 – Final position of mandrel 113
Figure 28 – Position of metal foil on insulating material 113
Figure 29 – Example of electric strength test instrument for solid insulation 121
Figure 30 – Application points of test voltage 122
Figure 31 – Test for separation between an external circuit and earth 125
Figure 32 – Test circuit for touch current of single-phase equipment 141
Figure 33 – Test circuit for touch current of three-phase equipment 141
Figure 34 – Power measurement for worst-case fault 145
Figure 35 – Power measurement for worst-case power source fault 146
Figure 36 – Illustration of power source classification 147
Figure 37 – Minimum separation requirements from a PIS 153
Figure 38 – Extended separation requirements from a PIS 153
Figure 39 – Deflected separation requirements from a PIS when a fire barrier is used 154
Figure 40 – Determination of top, bottom and side openings 156
Figure 41 – Top openings 157
Figure 42 – Bottom openings 158
Figure 43 – Baffle plate construction 158
Figure 44 – PIS trajectory downwards 159
Figure 45 – Limits for moving fan blades made of non-plastic materials 165
Figure 46 – Limits for moving fan blades made of plastic materials 165
Figure 47 – Steel disc 189
Figure 48 – Aluminium ring 190
Figure 49 – Aluminium foil 191
Figure 50 – Example of a warning label for a lamp with multiple hazard spectral regions 198
Figure D.1 – 1,2/50 μs and 10/700 μs voltage impulse generator 216
Figure D.2 – Antenna interface test generator circuit 217
Figure D.3 – Example of an electronic pulse generator 217
Figure E.1 – Band-pass filter for wide-band noise measurement 219
Figure F.1 – Example of an instructional safeguard 228
Figure G.1 – Determination of arithmetic average temperature 241
Figure G.2 – Test voltages 246
Figure G.3 – Thermal ageing time 267
Figure G.4 – Abrasion resistance test for coating layers 268
Figure H.1 – Definition of ringing period and cadence cycle 273

This document is a preview generated by EVS

Figure H.2 – I_{TS1} limit curve for cadenced ringing signal 274
Figure H.3 – Peak and peak-to-peak currents 274
Figure H.4 – Ringing voltage trip criteria 276
Figure M.1 – Distance d as a function of the rated capacity for various charge currents I (mA/Ah) 301
Figure O.1 – Narrow groove 304
Figure O.2 – Wide groove 305
Figure O.3 – V-shaped groove 305
Figure O.4 – Intervening unconnected conductive part 305
Figure O.5 – Rib 305
Figure O.6 – Uncemented joint with narrow groove 306
Figure O.7 – Uncemented joint with wide groove 306
Figure O.8 – Uncemented joint with narrow and wide grooves 306
Figure O.9 – Narrow recess 307
Figure O.10 – Wide recess 307
Figure O.11 – Coating around terminals 308
Figure O.12 – Coating over printed wiring 308
Figure O.13 – Example of measurements in an enclosure of insulating material 309
Figure O.14 – Cemented joints in multi-layer printed boards 309
Figure O.15 – Device filled with insulating compound 310
Figure O.16 – Partitioned bobbin 310
Figure P.1 – Examples of cross-sections of designs of top openings which prevent vertical entry 312
Figure P.2 – Examples of cross-sections of designs of side opening louvres which prevent vertical entry 312
Figure P.3 – Internal volume locus for foreign object entry 313
Figure S.1 – Top openings / surface of fire enclosure or fire barrier 323
Figure T.1 – Impact test using sphere 328
Figure V.1 – Jointed test probe for equipment likely to be accessible to children 334
Figure V.2 – Jointed test probe for equipment not likely to be accessible to children 335
Figure V.3 – Blunt probe 336
Figure V.4 – Wedge probe 337
Figure V.5 – Terminal probe 338
Figure Y.1 – Gasket test 362
Figure Y.2 – Water-spray test spray-head piping 365
Figure Y.3 – Water-spray test spray head 366

Table 1 – Response to energy class 24
Table 2 – Examples of body response or property damage related to energy sources 25
Table 3 – Examples of safeguard characteristics 29
Table 4 – Electrical energy source limits for steady state ES1 and ES2 82
Table 5 – Electrical energy source limits for a charged capacitor 84
Table 6 – Voltage limits for single pulses 85
Table 7 – Current limits for single pulses 85

This document is a preview generated by EVS

Table 8 – Minimum air gap distance 88
Table 9 – Temperature limits for materials, components and systems 90
Table 10 – Minimum clearances for voltages with frequencies up to 30 kHz 96
Table 11 – Minimum clearances for voltages with frequencies above 30 kHz 97
Table 12 – Mains transient voltages 98
Table 13 – External circuit transient voltages 100
Table 14 – Minimum clearances using required withstand voltage 102
Table 15 – Electric strength test voltages 103
Table 16 – Multiplication factors for clearances and test voltages 104
Table 17 – Minimum creepage distances for basic insulation and supplementary insulation in mm 107
Table 18 – Minimum values of creepage distances (in mm) for frequencies higher than 30 kHz and up to 400 kHz 108
Table 19 – Tests for insulation in non-separable layers 111
Table 20 – Electric field strength E_P for some commonly used materials 115
Table 21 – Reduction factors for the value of breakdown electric field strength E_P at higher frequencies 116
Table 22 – Reduction factors for the value of breakdown electric field strength E_P at higher frequencies for thin materials 116
Table 23 – Values for insulation resistance 117
Table 24 – Distance through insulation of internal wiring 118
Table 25 – Test voltages for electric strength tests based on transient voltages 120
Table 26 – Test voltages for electric strength tests based on the peak of the working voltages and recurring peak voltages 120
Table 27 – Test voltages for electric strength tests based on temporary overvoltages 120
Table 28 – Test values for electric strength tests 123
Table 29 – Overview of tests for resistor applications 128
Table 30 – Protective earthing conductor sizes for reinforced safeguards for permanently connected equipment 131
Table 31 – Minimum protective bonding conductor size of copper conductors 133
Table 32 – Sizes of terminals for protective conductors 135
Table 33 – Test duration, mains connected equipment 136
Table 34 – List of applicable IEC standards regarding insulating liquids 160
Table 35 – Classification for various categories of mechanical energy sources 164
Table 36 – Overview of requirements and tests 175
Table 37 – Torque to be applied to screws 180
Table 38 – Touch temperature limits for accessible parts 187
Table 39 – Radiation energy source classifications 192
Table 40 – Allowable radiation level according to IEC 62471 (all parts) for each hazard type 195
Table 41 – Hazard-related risk group marking of equipment 197
Table 42 – Explanation of marking information and guidance on control measures 197
Table C.1 – Minimum property retention limits after UV exposure 214
Table D.1 – Component values for Figure D.1 and Figure D.2 217
Table E.1 – Audio signal electrical energy source classes and safeguards 218

This document is a preview generated by EVS

Table F.1 – Instructional safeguard element description and examples 228
Table F.2 – Examples of markings, instructions, and instructional safeguards 229
Table G.1 – Peak surge current 231
Table G.2 – Test temperature and testing time (days) per cycle 237
Table G.3 – Temperature limits for transformer windings and for motor windings (except for the motor running overload test) 240
Table G.4 – Test voltages for electric strength tests based on the peak of the working voltages 242
Table G.5 – Values of FIW wires with maximum overall diameter and minimum test voltages according to the enamel increase 245
Table G.6 – Temperature limits for running overload tests 247
Table G.7 – Sizes of conductors 253
Table G.8 – Strain relief test force 254
Table G.9 – Range of conductor sizes to be accepted by terminals 256
Table G.10 – Varistor overload and temporary overvoltage test 259
Table G.11 – Performance test program for integrated circuit (IC) current limiters 261
Table G.12 – Capacitor ratings according to IEC 60384-14 263
Table G.13 – Minimum separation distances for coated printed boards 265
Table G.14 – Insulation in printed boards 266
Table I.1 – Overvoltage categories 277
Table J.1 – Mandrel diameter 279
Table J.2 – Oven temperature 280
Table M.1 – Values for current I_{float} and I_{boost}, factors f_{g} and f_{s}, and voltages U_{float} and U_{boost} 296
Table O.1 – Value of X 304
Table Q.1 – Limits for inherently limited power sources 317
Table Q.2 – Limits for power sources not inherently limited (overcurrent protective device required) 318
Table S.1 – Foamed materials 324
Table S.2 – Rigid materials 324
Table S.3 – Very thin materials 324
Table T.1 – Impact force 329
Table T.2 – Torque values for end-piece test 330
Table W.1 – Comparison of terms and definitions in IEC 60664-1:2007 and IEC 62368-1 340
Table W.2 – Comparison of terms and definitions in IEC 61140:2016 and IEC 62368-1 342
Table W.3 – Comparison of terms and definitions in IEC 60950-1:2005 and IEC 62368-1 345
Table W.4 – Comparison of terms and definitions in IEC 60728-11:2016 and IEC 62368-1 349
Table W.5 – Comparison of terms and definitions in IEC 62151:2000 and IEC 62368-1 351
Table W.6 – Comparison of terms and definitions in IEC 60065:2014 and IEC 62368-1 353
Table X.1 – Alternative minimum clearances for insulation in circuits connected to ac mains not exceeding 420 V peak (300 V RMS) 356
Table X.2 – Additional clearances for insulation in circuits connected to ac mains not exceeding 420 V peak (300 V RMS) 357

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Table Y.1 – Examples of the provision of pollution degree environments 363

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT –

Part 1: Safety requirements

FOREWORD

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International Standard IEC 62368-1 has been prepared by TC 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

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

– addition of requirements for outdoor equipment;
– new requirements for optical radiation;
– addition of requirements for insulating liquids;
– addition of requirements for work cells;

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– addition of requirements for wireless power transmitters;
– addition of requirements for fully insulated winding wire (FIW);
– alternative method for determination of top, bottom and side openings for fire enclosures;
– alternative requirements for sound pressure.

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

FDIS	Report on voting
108/701/FDIS	108/707/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.

A list of all parts in the IEC 62368 series, published under the general title *Audio/video, information and communication technology equipment*, can be found on the IEC website.

The “in some countries” notes regarding differing national practices are contained in the following clauses, subclauses and tables:

0.2.1, Clause 1, 3.3.8.1, 3.3.8.3, 4.1.15, 4.7.3, 5.2.2.2, 5.4.2.3.2.4, 5.4.2.5, 5.4.5.1, 5.4.10.2.1, 5.4.10.2.2, 5.4.10.2.3, 5.5.2.1, 5.5.6, 5.6.4.2.1, 5.6.8, 5.7.6, 5.7.7.1, 8.5.4.2.3, 10.5.3, 10.6.1, F.3.3.6, Y.4.1, Y.4.5, Table 12, Table 13 and Table 39.

In this document, the following print types or formats are used:

– requirements proper and normative annexes: in roman type;
– compliance statements and test specifications: *in italic type*;
– notes/explanatory matter: in smaller roman type;
– normative conditions within tables: in smaller roman type;
– terms that are defined in 3.3: **bold**.

In figures and tables, if colour is available:

– green colour denotes a class 1 energy source;
– yellow colour denotes a class 2 energy source;
– red colour denotes a class 3 energy source.

A comparison of terms introduced in this document that are different from other existing IEC documents is given in Annex W.

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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.

NOTE Explanatory information related to IEC 62368-1 is contained in IEC TR 62368-2. It provides rationale together with explanatory information related to this document.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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INTRODUCTION

0 Principles of this product safety standard

0.1 Objective

This part of IEC 62368 is a product safety standard that classifies energy sources, prescribes **safeguards** against those energy sources, and provides guidance on the application of, and requirements for, those **safeguards**.

The prescribed **safeguards** are intended to reduce the likelihood of pain, injury and, in the case of fire, property damage.

The objective of the INTRODUCTION is to help designers to understand the underlying principles of safety in order to design safe equipment. These principles are informative and not an alternative to the detailed requirements of this document.

0.2 Persons

0.2.1 General

This document describes **safeguards** for the protection of three kinds of persons: the **ordinary person**, the **instructed person**, and the **skilled person**. Unless otherwise specified, the requirements for an **ordinary person** apply. This document assumes that a person will not intentionally create conditions or situations that could cause pain or injury.

NOTE 1 In Australia, the work conducted by an **instructed person** or **skilled person** may require formal licensing from regulatory authorities.

NOTE 2 In Germany, a person may only be regarded as an **instructed person** or a **skilled person** if certain legal requirements are fulfilled.

0.2.2 Ordinary person

Ordinary person is the term applied to all persons other than **instructed persons** and **skilled persons**. **Ordinary persons** include not only users of the equipment, but also all persons who may have access to the equipment or who may be in the vicinity of the equipment. Under **normal operating conditions** or **abnormal operating conditions**, **ordinary persons** should not be exposed to parts comprising energy sources capable of causing pain or injury. Under a **single fault condition**, **ordinary persons** should not be exposed to parts comprising energy sources capable of causing injury.

0.2.3 Instructed person

Instructed person is a term applied to persons who have been instructed and trained by a **skilled person**, or who are supervised by a **skilled person**, to identify energy sources that may cause pain (see Table 1) and to take precautions to avoid unintentional contact with or exposure to those energy sources. Under **normal operating conditions**, **abnormal operating conditions** or **single fault conditions**, **instructed persons** should not be exposed to parts comprising energy sources capable of causing injury.

0.2.4 Skilled person

Skilled person is a term applied to persons who have training or experience in the equipment technology, particularly in knowing the various energies and energy magnitudes used in the equipment. **Skilled persons** are expected to use their training and experience to recognize energy sources capable of causing pain or injury and to take action for protection from injury from those energies. **Skilled persons** should also be protected against unintentional contact or exposure to energy sources capable of causing injury.

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0.3 Model for pain and injury

An energy source that causes pain or injury does so through the transfer of some form of energy to or from a body part.

This concept is represented by a three-block model (see Figure 1).

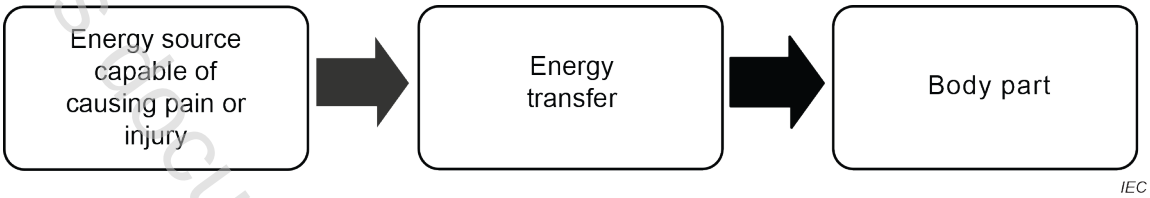

Figure 1 – Three block model for pain and injury

This safety standard specifies three classes of energy sources defined by magnitudes and durations of source parameters relative to the body responses to those electrical and thermal energy sources (see Table 1). Source parameters relative to responses to **combustible material**, mechanical energy sources and radiation energy sources are specified based on experience and basic safety standards.

Table 1 – Response to energy class

Energy source	Effect on the body	Effect on combustible materials
Class 1	Not painful, but may be detectable	Ignition not likely
Class 2	Painful, but not an injury	Ignition possible, but limited growth and spread of fire
Class 3	Injury	Ignition likely, rapid growth and spread of fire

The energy threshold for pain or injury is not constant throughout the population. For example, for some energy sources, the threshold is a function of body mass; the lower the mass, the lower the threshold, and vice-versa. Other body variables include age, state of health, state of emotions, effect of drugs, skin characteristics, etc. Furthermore, even where outward appearances otherwise appear equal, individuals differ in their thresholds of susceptibility to the same energy source.

The effect of duration of energy transfer is a function of the specific energy form. For example, pain or injury from thermal energy can be very short (1 s) for high skin temperature, or very long (several hours) for low skin temperature.

Furthermore, the pain or injury may occur some considerable time after the transfer of energy to a body part. For example, pain or injury from some chemical or physiological reaction may not be manifested for days, weeks, months, or years.

0.4 Energy sources

Energy sources are addressed by this document, together with the pain or injury that results from a transfer of that energy to the body, and the likelihood of property damage that results from fire escaping the equipment.

An electrical product is connected to an electrical energy source (for example, the **mains**), an external power supply, or a **battery**. An electrical product uses the electrical energy to perform its intended functions.

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In the process of using electrical energy, the product transforms the electrical energy into other forms of energy (for example, thermal energy, kinetic energy, optical energy, audio energy, electromagnetic energy, etc.). Some energy transformations may be a deliberate part of the product function (for example, moving parts of a printer, images on a visual display unit, sound from a speaker, etc.). Some energy transformations may be a by-product of the product function (for example, heat dissipated by functional circuits, X-radiation from a cathode-ray tube, etc.).

Some products may use energy sources that are non-electrical energy sources such as moving parts or chemicals. The energy in these other sources may be transferred to or from a body part, or may be transformed into other energy forms (for example, chemical energy may be converted to electrical energy through a **battery**, or a moving body part transfers its kinetic energy to a sharp edge).

Examples of the types of energy forms and the associated injuries and property damage addressed in this document are in Table 2.

Table 2 – Examples of body response or property damage related to energy sources

Forms of energy	Examples of body response or property damage	Clause
Electrical energy (for example, energized conductive parts)	Pain, fibrillation, cardiac arrest, respiratory arrest, skin burn, or internal organ burn	5
Thermal energy (for example, electrical ignition and spread of fire)	Electrically-caused fire leading to burn-related pain or injury, or property damage	6
Chemical reaction (for example, electrolyte, poison)	Skin damage, organ damage, or poisoning	7
Kinetic energy (for example, moving parts of equipment, or a moving body part against an equipment part)	Laceration, puncture, abrasion, contusion, crush, amputation, or loss of a limb, eye, ear, etc.	8
Thermal energy (for example, hot **accessible** parts)	Skin burn	9
Radiated energy (for example, electromagnetic energy, optical energy, acoustic energy)	Loss of sight, skin burn, or loss of hearing	10

0.5 Safeguards

0.5.1 General

Many products necessarily use energy capable of causing pain or injury. Product design cannot eliminate such energy use. Consequently, such products should use a scheme that reduces the likelihood of such energy being transferred to a body part. The scheme that reduces the likelihood of energy transfer to a body part is a **safeguard** (see Figure 2).

Figure 2 – Three block model for safety

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A **safeguard** is a device or scheme or system that:

– is interposed between an energy source capable of causing pain or injury and a body part, and
– reduces the likelihood of transfer of energy capable of causing pain or injury to a body part.

NOTE **Safeguard** mechanisms against transfer of energy capable of causing pain or injury include:

– attenuating the energy (reduces the value of the energy); or
– impeding the energy (slows the rate of energy transfer); or
– diverting the energy (changes the energy direction); or
– disconnecting, interrupting, or disabling the energy source; or
– enveloping the energy source (reduces the likelihood of the energy from escaping); or
– interposing a barrier between a body part and the energy source.

A **safeguard** can be applied to the equipment, to the local installation, to a person or can be a learned or directed behaviour (for example, resulting from an **instructional safeguard**) intended to reduce the likelihood of transfer of energy capable of causing pain or injury. A **safeguard** may be a single element or may be a set of elements.

Generally, this document uses an order of preference for providing **safeguards** based on the requirements given in ISO/IEC Guide 51 as follows:

– **equipment safeguards** are always useful, since they do not require any knowledge or actions by persons coming into contact with the equipment;
– **installation safeguards** are useful when a safety characteristic can only be provided after installation (for example, the equipment has to be bolted to the floor to provide stability);
– behavioural **safeguards** are useful when the equipment requires an energy source to be **accessible**.

In practice, **safeguard** selection accounts for the nature of the energy source, the intended user, the functional requirements of the equipment, and similar considerations.

0.5.2 Equipment safeguard

An **equipment safeguard** may be a **basic safeguard**, a **supplementary safeguard**, a **double safeguard**, or a **reinforced safeguard**.

0.5.3 Installation safeguard

Installation safeguards are not controlled by the equipment manufacturer, although in some cases, **installation safeguards** may be specified in the equipment installation instructions.

Generally, with respect to equipment, an **installation safeguard** is a **supplementary safeguard**.

NOTE For example, the **supplementary safeguard** providing **protective earthing** is located partly in the equipment and partly in the installation. The **supplementary safeguard** providing **protective earthing** is not effective until the equipment is connected to the **protective earthing** of the installation.

Requirements for **installation safeguards** are not addressed in this document. However, this document does assume some **installation safeguards**, such as **protective earthing**, are in place and are effective.

0.5.4 Personal safeguard

A **personal safeguard** may be a **basic safeguard**, a **supplementary safeguard**, or a **reinforced safeguard**.

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Requirements for **personal safeguards** are not addressed in this document. However, this document does assume that **personal safeguards** are available for use as specified by the manufacturer.

0.5.5 Behavioural safeguards

0.5.5.1 Introduction to behavioural safeguards

In the absence of an **equipment**, **installation**, or **personal safeguard**, a person may use a specific behaviour as a **safeguard** to avoid energy transfer and consequent injury. A behavioural **safeguard** is a voluntary or instructed behaviour intended to reduce the likelihood of transfer of energy to a body part.

Three kinds of behavioural **safeguards** are specified in this document. Each kind of behavioural **safeguard** is associated with a specific kind of person. An **instructional safeguard** is usually addressed to an **ordinary person**, but may also be addressed to an **instructed person** or a **skilled person**. A **precautionary safeguard** is used by an **instructed person**. A **skill safeguard** is used by a **skilled person**.

0.5.5.2 Instructional safeguard

An **instructional safeguard** is a means of providing information, describing the existence and location of an energy source capable of causing pain or injury, and is intended to invoke a specific behaviour on the part of a person to reduce the likelihood of transfer of energy to a body part (see Annex F).

An **instructional safeguard** may be a visual indicator (symbols or words or both) or an audible message, as applicable to the expected use of the product.

When accessing locations where the equipment needs to be energized to perform a service activity, an **instructional safeguard** may be considered acceptable protection to bypass an **equipment safeguard** such that the person is made aware of how to avoid contact with a class 2 or class 3 energy source.

If **equipment safeguards** would interfere with or prohibit the equipment function, an **instructional safeguard** may replace an **equipment safeguard**.

If exposure to an energy source capable of causing pain or injury is essential to the correct functioning of equipment, an **instructional safeguard** may be used to ensure protection of persons instead of another **safeguard**. Consideration should be given as to whether the **instructional safeguard** should require the use of a **personal safeguard**.

Provision of an **instructional safeguard** does not result in an **ordinary person** becoming an **instructed person** (see 0.5.5.3).

0.5.5.3 Precautionary safeguard (used by an instructed person)

A **precautionary safeguard** is the training and experience or supervision of an **instructed person** by a **skilled person** to use precautions to protect the **instructed person** against class 2 energy sources. **Precautionary safeguards** are not specifically prescribed in this document but are assumed to be effective when the term **instructed person** is used.

During equipment servicing, an **instructed person** may need to remove or defeat an **equipment safeguard**. In this case, an **instructed person** is expected to then apply precaution as a **safeguard** to avoid exposure to class 2 energy sources.

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0.5.5.4 Skill safeguard (used by a skilled person)

A **skill safeguard** is the education, training, knowledge and experience of the **skilled person** that is used to protect the **skilled person** against class 2 or class 3 energy sources. **Skill safeguards** are not specifically prescribed in this document but are assumed to be effective when the term **skilled person** is used.

During equipment servicing, a **skilled person** may need to remove or defeat an **equipment safeguard**. In this case, a **skilled person** is expected to then apply skill as a **safeguard** to avoid injury.

0.5.6 Safeguards during ordinary or instructed person service conditions

During **ordinary person** or **instructed person** service conditions, **safeguards** for such persons may be necessary. Such **safeguards** can be **equipment safeguards**, **personal safeguards**, or **instructional safeguards**.

0.5.7 Equipment safeguards during skilled person service conditions

During **skilled person** service conditions, **equipment safeguards** should be provided to protect against the effects of a body's involuntary reaction (for example, startle) that might cause unintentional contact with a class 3 energy source located outside the view of the **skilled person**.

NOTE This **safeguard** typically applies in large equipment, where the **skilled person** needs to partially or wholly enter between two or more class 3 energy source locations while servicing.

0.5.8 Examples of safeguard characteristics

Table 3 lists some examples of **safeguard** characteristics.

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Table 3 – Examples of safeguard characteristics

Safeguard	Basic safeguard	Supplementary safeguard	Reinforced safeguard
Equipment safeguard: a physical part of an equipment	Effective under **normal operating conditions**	Effective in the event of failure of the **basic safeguard**	Effective under **normal operating conditions** and in the event of a **single fault condition** elsewhere in the equipment
	Example: **basic insulation**	Example: **supplementary insulation**	Example: **reinforced insulation**
	Example: normal temperatures below ignition temperatures	Example: **fire enclosure**	Not applicable
Installation safeguard: a physical part of a man-made installation	Effective under **normal operating conditions**	Effective in the event of failure of an equipment **basic safeguard**	Effective under **normal operating conditions** and in the event of a **single fault condition** elsewhere in the equipment
	Example: wire size	Example: overcurrent protective device	Example: socket outlet
Personal safeguard: a physical device worn on the body	In the absence of any **equipment safeguard**, effective under **normal operating conditions**	Effective in the event of failure of an equipment **basic safeguard**	In the absence of any **equipment safeguard**, effective under **normal operating conditions** and in the event of a **single fault condition** elsewhere in the equipment
	Example: gloves	Example: insulating floor mat	Example: electrically-insulated glove for handling live conductors
Instructional safeguard: a voluntary or instructed behaviour intended to reduce the likelihood of transfer of energy to a body part	In the absence of any **equipment safeguard**, effective under **normal operating conditions**	Effective in the event of failure of an equipment **basic safeguard**	Only effective on an exceptional basis, when providing all appropriate **safeguards** would prevent the intended functioning of the equipment
	Example: **instructional safeguard** to disconnect telecommunication cable before opening the cover	Example: after opening a door, an **instructional safeguard** against hot parts	Example: **instructional safeguard** of hot parts in an office photocopier, or a continuous roll paper cutter on a commercial printer

0.6 Electrically-caused pain or injury (electric shock)

0.6.1 Models for electrically-caused pain or injury

Electrically-caused pain or injury may occur when electrical energy capable of causing pain or injury is transferred to a body part (see Figure 3).

Electrical energy transfer occurs when there are two or more electrical contacts to the body:

– the first electrical contact is between a body part and a conductive part of the equipment;
– the second electrical contact is between another body part and
  - earth, or
  - another conductive part of the equipment.

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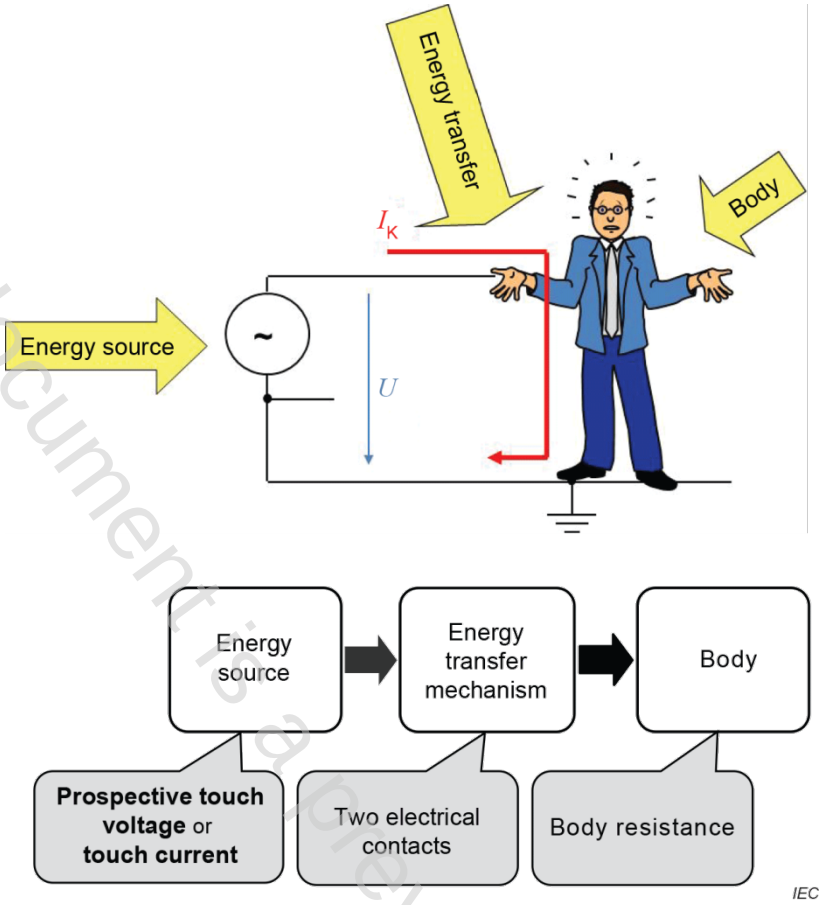

Figure 3 – Schematic and model for electrically-caused pain or injury

Depending on the magnitude, duration, wave shape, and frequency of the current, the effect on the human body varies from undetectable to detectable to painful to injurious.

0.6.2 Models for protection against electrically-caused pain or injury

One or more **safeguards** are interposed between an electrical energy source capable of causing pain or injury and a body part to protect against electrically-caused pain or injury (see Figure 4).

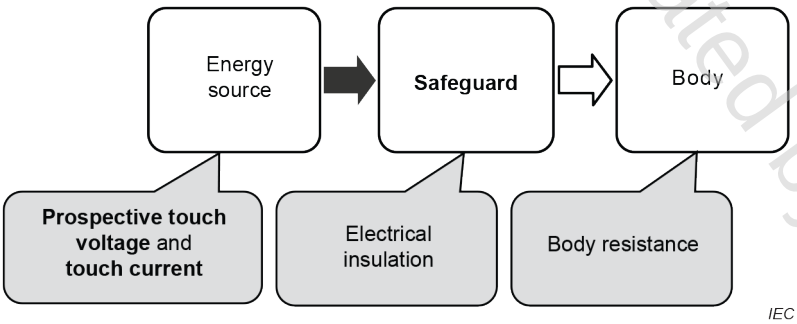

Figure 4 – Model for protection against electrically-caused pain or injury

Protection against electrically-caused pain is provided under **normal operating conditions** and **abnormal operating conditions**. For such protection, under **normal operating conditions** and **abnormal operating conditions**, a **basic safeguard** is interposed between an electrical energy source capable of causing pain and an **ordinary person**.

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The most common **basic safeguard** against an electrical energy source capable of causing pain is electrical insulation (also known as **basic insulation**) interposed between the energy source and a body part.

Protection against electrically-caused injury is provided under **normal operating conditions**, **abnormal operating conditions**, and **single fault conditions**. For such protection, under **normal operating conditions** and **abnormal operating conditions**, both a **basic safeguard** and a **supplementary safeguard** are interposed between an electrical energy source capable of causing injury and an **ordinary person** (see 4.3.2.4), or an **instructed person** (see 4.3.3.3). In the event of a failure of either **safeguard**, the other **safeguard** becomes effective. The **supplementary safeguard** against an electrical energy source capable of causing injury is placed between the **basic safeguard** and a body part. A **supplementary safeguard** may be additional electrical insulation (**supplementary insulation**) or a protectively earthed conductive barrier or other construction that performs the same function.

Another **safeguard** against an electrical energy source capable of causing injury is electrical insulation (also known as **double insulation** or **reinforced insulation**) placed between the energy source and a body part.

Likewise, a **reinforced safeguard** may be placed between an electrical energy source capable of causing injury and a body part.

0.7 Electrically-caused fire

0.7.1 Models for electrically-caused fire

Electrically-caused fire is due to conversion of electrical energy to thermal energy (see Figure 5), where the thermal energy heats a fuel material followed by ignition and combustion.

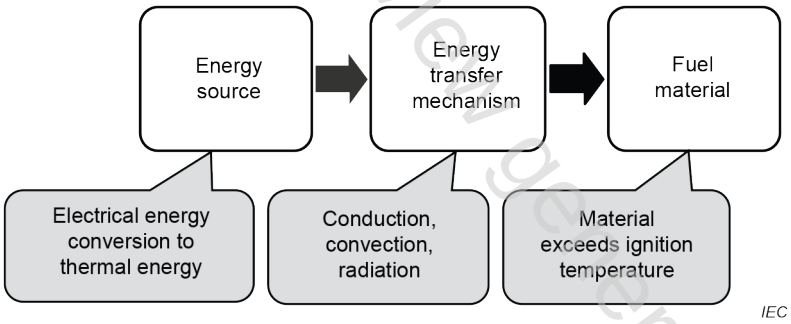

Figure 5 – Model for electrically-caused fire

Electrical energy is converted to thermal energy either in a resistance or in an arc and is transferred to a fuel material by conduction, convection, or radiation. As the fuel material heats, it chemically decomposes into gases, liquids and solids. When the gas is at its ignition temperature, the gas can be ignited by an ignition source. When the gas is at its spontaneous ignition temperature, the gas ignites by itself. Both result in fire.

0.7.2 Models for protection against electrically-caused fire

The **basic safeguard** against electrically-caused fire (see Figure 6) is that the temperature of a material, under **normal operating conditions** and **abnormal operating conditions**, does not cause the material to ignite.

The **supplementary safeguard** against electrically-caused fire reduces the likelihood of ignition or, in the case of ignition, reduces the likelihood of spread of fire.

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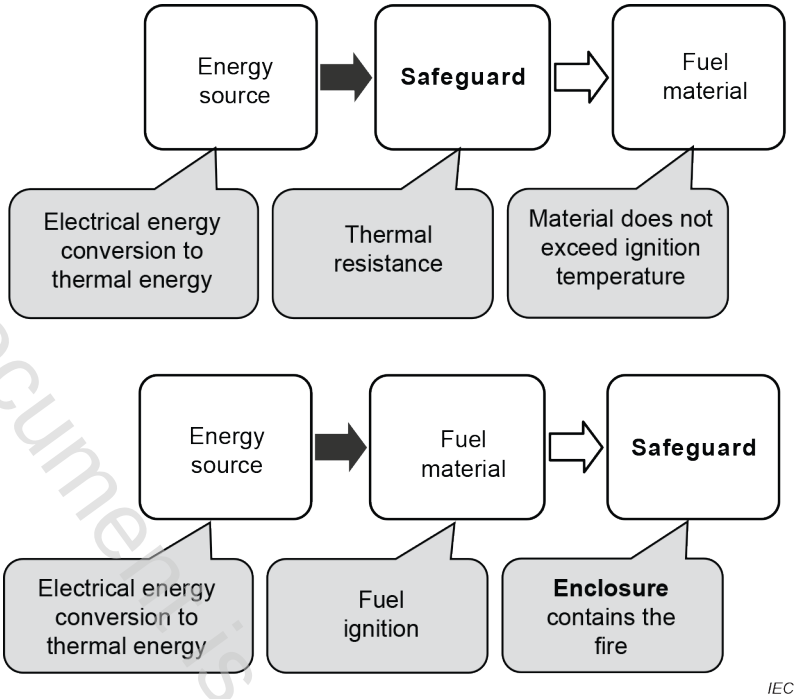

Figure 6 – Models for protection against fire

0.8 Injury caused by hazardous substances

Injury caused by **hazardous substances** is due to a chemical reaction with a body part. The extent of injury by a given substance depends on both the magnitude and duration of exposure and on the body part susceptibility to that substance.

The **basic safeguard** against injury caused by **hazardous substances** is containment of the material.

Supplementary safeguards against injury caused by **hazardous substances** may include:

– a second container or a spill-resistant container;
– containment trays;
– tamper-proof screws to prevent unauthorized access;
– **instructional safeguards**.

National and regional regulations govern the use of and exposure to **hazardous substances** used in equipment. These regulations do not enable a practical classification of **hazardous substances** in the manner in which other energy sources are classified in this document. Therefore, energy source classifications are not applied in Clause 7.

0.9 Mechanically-caused injury

Mechanically-caused injury is due to kinetic energy transfer to a body part when a collision occurs between a body part and an equipment part. The kinetic energy is a function of the relative motion between a body part and **accessible** parts of the equipment, including parts ejected from the equipment that collide with a body part.

Examples of kinetic energy sources are:

– body motion relative to sharp edges and corners;
– part motion due to rotating or other moving parts, including pinch points;
– part motion due to loosening, exploding, or imploding parts;

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– equipment motion due to instability;
– equipment motion due to wall, ceiling, or rack mounting means failure;
– equipment motion due to handle failure;
– part motion due to an exploding **battery**;
– equipment motion due to cart or stand instability or failure.

The **basic safeguard** against mechanically-caused injury is a function of the specific energy source. **Basic safeguards** may include:

– rounded edges and corners;
– an **enclosure** to prevent a moving part from being **accessible**;
– an **enclosure** to prevent expelling a moving part;
– a **safety interlock** to control access to an otherwise moving part;
– means to stop the motion of a moving part;
– means to stabilize the equipment;
– robust handles;
– robust mounting means;
– means to contain parts expelled during **explosion** or implosion.

The **supplementary safeguard** against mechanically-caused injury is a function of the specific energy source. **Supplementary safeguards** may include:

– **instructional safeguards**;
– instructions and training;
– additional **enclosures** or barriers;
– **safety interlocks**.

The **reinforced safeguard** against mechanically-caused injury is a function of the specific energy source. **Reinforced safeguards** may include:

– extra thick glass on the front of a CRT;
– rack slide-rails and means of support;
– **safety interlock**.

0.10 Thermally-caused injury (skin burn)

0.10.1 Models for thermally-caused injury

Thermally-caused injury may occur when thermal energy capable of causing injury is transferred to a body part (see Figure 7).

Thermal energy transfer occurs when a body touches a hot equipment part. The extent of injury depends on the temperature difference, the thermal mass of the object, rate of thermal energy transfer to the skin, and duration of contact.

The requirements in this document only address **safeguards** against thermal energy transfer by conduction. This document does not address **safeguards** against thermal energy transfer by convection or radiation.

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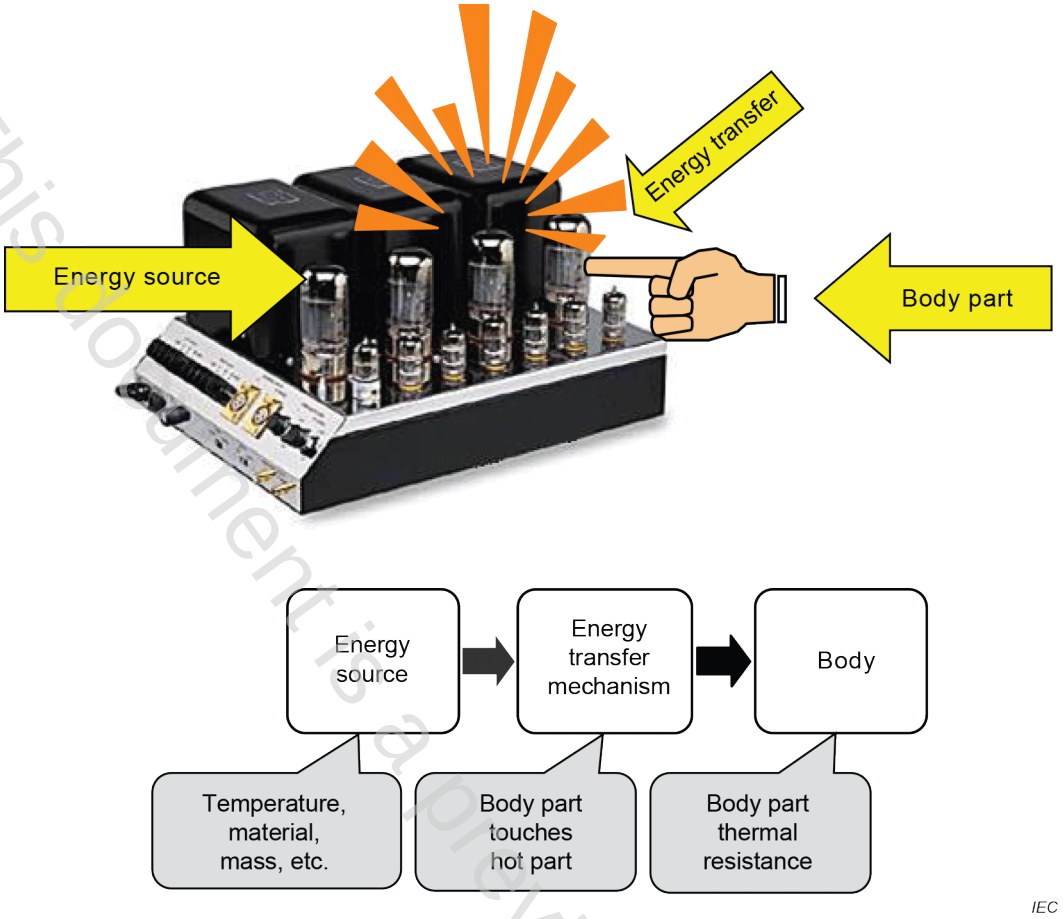

Figure 7 – Schematic and model for thermally-caused injury

Depending on the temperature, contact duration, material properties, and mass of the material, the perception of the human body varies from warmth to heat that may result in pain or injury (burn).

0.10.2 Models for protection against thermally-caused pain or injury

One or more **safeguards** are interposed between a thermal energy source capable of causing pain or injury and an **ordinary person** (see Figure 8).

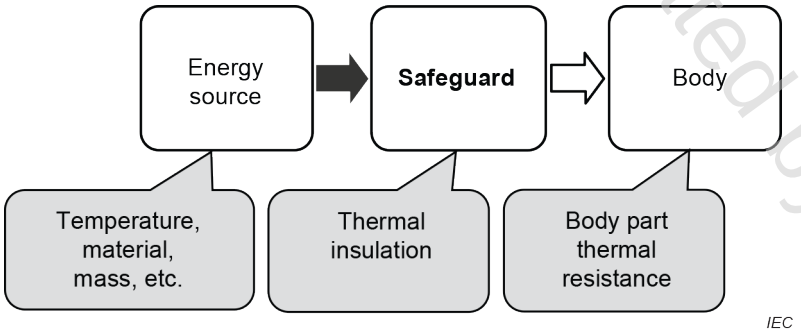

Figure 8 – Model for protection against thermally-caused injury

Under **normal operating conditions** and **abnormal operating conditions**, protection is used against thermally-cause pain. For such protection, a **basic safeguard** is interposed between a thermal energy source capable of causing pain and an **ordinary person**.

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Under **normal operating conditions**, **abnormal operating conditions** and **single fault conditions**, protection is used against thermally-caused injury. For such protection, a **basic safeguard** and a **supplementary safeguard** are interposed between a thermal energy source capable of causing injury and an **ordinary person**.

The **basic safeguard** against a thermal energy source capable of causing pain or injury is thermal insulation placed between the energy source and a body part. In some cases, a **basic safeguard** against a thermal energy source capable of causing pain or injury may be an **instructional safeguard** identifying the hot parts and how to reduce the likelihood of injury. In some cases, a **basic safeguard** reduces the likelihood of a non-injurious thermal energy source from becoming a thermal energy source capable of causing pain or injury.

Examples of such **basic safeguards** are:

– control of electrical energy being converted to thermal energy (for example, a **thermostat**);
– heat sinking, etc.

The **supplementary safeguard** against a thermal energy source capable of causing injury is thermal insulation placed between the energy source and a body part. In some cases, a **supplementary safeguard** against a thermal energy source capable of causing pain or injury may be an **instructional safeguard** identifying the hot parts and how to reduce the likelihood of injury.

0.11 Radiation-caused injury

Radiation-caused injury within the scope of this document is generally attributed to one of the following energy transfer mechanisms:

– heating of a body organ caused by exposure to non-ionising radiation, such as the highly localised energy of a laser impinging on the retina; or
– auditory injury caused by over stimulation of the ear by excessive peaks or sustained loud sound, leading to physical or nerve damage; or
– X-radiation; or
– UV radiation.

Radiated energy is transferred by impingement of wave emission upon a body part.

The **basic safeguard** against radiation-caused injury is containment of the energy within an **enclosure** that is opaque to the radiated energy.

There are several **supplementary safeguards** against radiation-caused injury. The **supplementary safeguards** may include **safety interlocks** to disconnect power to the generator, tamper-proof screws to prevent unauthorized access, etc.

The **basic safeguard** against auditory injury is to limit the acoustic output of personal music players and their associated headphones and earphones.

Examples of **supplementary safeguards** against auditory pain and injury are the provision of warnings and information advising the user how to use the equipment correctly.

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AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT –

Part 1: Safety requirements

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1 Scope

This part of IEC 62368 is applicable to the safety of electrical and electronic equipment within the field of audio, video, information and communication technology, and business and office machines with a **rated voltage** not exceeding 600 V. This document does not include requirements for performance or functional characteristics of equipment.

NOTE 1 Examples of equipment within the scope of this document are given in Annex A.

NOTE 2 A **rated voltage** of 600 V is considered to include equipment rated 400/690 V.

This document is also applicable to:

– components and subassemblies intended for incorporation in this equipment. Such components and subassemblies need not comply with every requirement of this document, provided that the complete equipment, incorporating such components and subassemblies, does comply;

– external power supply units intended to supply other equipment within the scope of this document;

– accessories intended to be used with equipment within the scope of this document;

– large equipment installed in **restricted access areas**. For equipment having large machinery aspects, additional requirements may apply; and

– equipment to be used in tropical regions.

This document also includes requirements for audio/video, information and communication technology equipment intended to be installed in an **outdoor location**. The requirements for **outdoor equipment** also apply, where relevant, to **outdoor enclosures** suitable for direct installation in the field and supplied for housing audio/video, information and communication technology equipment to be installed in an **outdoor location**. See Annex Y for specific construction requirements not covered elsewhere in this document.

Each installation may have particular requirements. In addition, requirements for protection of the **outdoor equipment** against the effects of direct lightning strikes are not covered by this document.

NOTE 3 For information on this subject, see IEC 62305-1.

This document assumes a maximum altitude of 2 000 m unless otherwise specified by the manufacturer.

Additional requirements for equipment having the capability to supply DC power over commonly used communication cables, such as USB or Ethernet (PoE), are given in IEC 62368-3. IEC 62368-3 does not apply to:

– equipment supplying power using proprietary connectors; or

– equipment using a proprietary protocol for power selection.

This document specifies **safeguards** for **ordinary persons**, **instructed persons**, and **skilled persons**. Additional requirements may apply for equipment that is clearly designed or intended for use by children or specifically attractive to children.

NOTE 4 In Australia, the work conducted by an **instructed person** or a **skilled person** may require formal licensing from regulatory authorities.

NOTE 5 In Germany, in many cases a person may only be regarded as an **instructed person** or a **skilled person** if certain legal requirements are fulfilled.

This document does not apply to:

– equipment with non-self-contained hazardous moving parts, such as robotic equipment; and

NOTE 6 For requirements related to robotic equipment in an industrial environment, see IEC 60204-1, IEC 60204-11, ISO 10218-1 and ISO 10218-2.

– personal care robots, including mobile servant robots, physical assistant robots, and person carrier robots; and

NOTE 7 For requirements related to personal care robots, see ISO 13482.

– power supply systems that are not an integral part of the equipment, such as motor-generator sets, **battery** backup systems and distribution transformers.

This document does not address:

– manufacturing processes except for **routine tests**;
– injurious effects of gases released by thermal decomposition or combustion;
– disposal processes;
– effects of transport (other than as specified in this document);
– effects of storage of materials, components, or the equipment itself;
– the likelihood of injury from particulate radiation such as alpha particles and beta particles;
– the likelihood of thermal injury due to radiated or convected thermal energy;
– the likelihood of injury due to flammable liquids;
– the use of the equipment in oxygen-enriched or **explosive** atmospheres;
– exposure to chemicals other than as specified in Clause 7;
– electrostatic discharge events;
– exposure to electromagnetic fields;
– environmental aspects; or
– requirements for functional safety, except for those related to **work cells**.

NOTE 8 For specific functional and software safety requirements of electronic safety-related systems (for example, protective electronic circuits), see IEC 61508-1.

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 60027-1, *Letter symbols to be used in electrical technology – Part 1: General*

IEC 60065, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-11, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

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