



BSI Standards Publication

Audio/video, information and communication technology equipment

Part 1: Safety requirements

National foreword

This British Standard is the UK implementation of EN IEC 62368-1:2024+A11:2024. It is derived from IEC 62368-1:2023. It supersedes BS EN IEC 62368-1:2024, which is withdrawn. It also supersedes BS EN IEC 62368-1:2020+A11:2020, which will be withdrawn on 15 February 2027.

The start and finish of text introduced or altered by amendment A11 is indicated in the text by tags. Tags indicating changes to text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A11 is indicated by A11 A11.

The UK participation in its preparation was entrusted to Technical Committee EPL/108, Safety of electronic equipment within the field of audio/video, information technology and communication technology.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Amendments/corrigenda issued since publication

Date	Text affected
31 May 2024	Implementation of CENELEC amendment A11:2024
31 July 2024	Correction to supersession details in national foreword

English Version

Audio/video, information and communication technology
equipment - Part 1: Safety requirements
(IEC 62368-1:2023)

Équipements des technologies de l'audio/vidéo, de
l'information et de la communication - Partie 1: Exigences
de sécurité
(IEC 62368-1:2023)

Einrichtungen für Audio/Video-, Informations- und
Kommunikationstechnik - Teil 1: Sicherheitsanforderungen
(IEC 62368-1:2023)

This European Standard was approved by CENELEC on 2024-02-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 108/800/FDIS, future edition 4 of IEC 62368-1, prepared by IEC/TC 108 "Safety of electronic equipment within the field of audio/video, information technology and communication technology" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62368-1:2024.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2025-02-15 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2027-02-15 document have to be withdrawn

This document supersedes EN IEC 62368-1:2020 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62368-1:2023 was approved by CENELEC as a European Standard without any modification.

European foreword to amendment A11

This document (EN IEC 62368-1:2024/A11:2024) has been prepared by CLC/TC 108X "Safety of electronic equipment within the fields of Audio/Video, Information Technology and Communication Technology".

The following dates are fixed:

- latest date by which this document has to be (dop) 2025-02-15
implemented at national level by publication of
an identical national standard or by
endorsement
- latest date by which the national standards (dow) 2027-02-15
conflicting with this document have to be
withdrawn

This document modifies EN IEC 62368-1:2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 62368-1:2023 are prefixed "Z".

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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 Where 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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60027-1	-	Letters symbols to be used in electrical technology - Part 1: General	EN 60027-1 + A2	2006 2007
IEC 60038 (mod)	-	IEC standard voltages CENELEC standard voltages	EN 60038	2011
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60068-2-11	-	Basic environmental testing procedures - Part 2-11: Tests - Test Ka: Salt mist	EN IEC 60068-2-11	2021
IEC 60068-2-78	-	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady-state	EN 60068-2-78	2013
IEC 60073	-	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators	EN 60073	2002
IEC 60076-14	-	Power transformers - Part 14: Liquid-immersed power transformers using high-temperature insulation materials	EN 60076-14	2013
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	2008
IEC 60086-4	-	Primary batteries - Part 4: Safety of lithium batteries	EN IEC 60086-4	2019
IEC 60086-5	-	Primary batteries - Part 5: Safety of batteries with aqueous electrolyte	EN IEC 60086-5	2021
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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60112	-	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN IEC 60112	2020
IEC 60127	series	Miniature fuses		
		Miniature fuses - Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links	EN 60127-1 + A1 + A2	2006 2011 2015
		Miniature fuses - Part 2: Cartridge fuse-links	EN 60127-2 + A1	2014 2023
		Miniature fuses - Part 3: Sub-miniature fuse-links	EN 60127-3 +A1	2015 2020
		Miniature fuses - Part 4: Universal modular fuse-links (UMF) - Through-hole and surface mount types	EN 60127-4 + A1 + A2	2005 2009 2013
		Miniature fuses - Part 5: Guidelines for quality assessment of miniature fuse-links	EN 60127-5	2017
		Miniature fuses - Part 6: Fuse-holders for miniature fuse-links	EN 60127-6	2014
		Miniature fuses - Part 7: Miniature fuse-links for special applications	EN 60127-7	2016
		Miniature fuses - Part 8: Fuse resistors with particular overcurrent protection	EN IEC 60127-8	2018
		Miniature fuses - Part 10: User guide for miniature fuses	EN 60127-10	2002
IEC 60227-1	2007	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements	¹	-
IEC 60227-2 + A1	1997 2003	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 2: Test methods	¹	-
IEC 60245-1	2003	Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 1: General requirements	¹	-
IEC 60268-1 + A1 + A2	1985 1988 1988	Sound system equipment - Part 1: General		-
IEC 60309	series	Plugs, socket-outlets and couplers for industrial purposes		
		Plugs, socket-outlets and couplers for industrial purposes - Part 1: General requirements	EN 60309-1 + A1 + A2	1999 2007 2012

¹ The EN 50525 series is related to, but not directly equivalent with the IEC 60227 series and IEC 60245-1. Also EN 50525-1, EN 50525-2-11, EN 50363, EN 50395 and EN 50396 are to be taken into account.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
		Plugs, socket-outlets and couplers for industrial purposes - Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories	EN 60309-2 + A1 + A2	1999 2007 2012
		Plugs, socket-outlets and couplers for industrial purposes - Part 4: Switched socket-outlets and connectors with or without interlock	EN 60309-4 + A1	2007 2012
		Plugs, socket-outlets and couplers for industrial purposes - Part 5: Dimensional compatibility and interchangeability requirements for plugs, socket-outlets, ship connectors and ship inlets for low-voltage shore connection systems (LVSC)	EN IEC 60309-5	2019
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 + A1	1997 2010
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	2017
IEC 60320	series	Appliance couplers for household and similar general purposes		
		Appliance couplers for household and similar general purposes - Part 1: General requirements	EN IEC 60320-1	2021
		Appliance couplers for household and similar general purposes - Part 2-1: Sewing machine couplers	EN IEC 60320-2-1	2021
		Appliance couplers for household and similar general purposes - Part 2-2: Interconnection couplers for household and similar equipment	EN 60320-2-2	1998
		Appliance couplers for household and similar general purposes - Part 2-3: Appliance coupler with a degree of protection higher than IPX0	EN IEC 60320-2-3	2021
		Appliance couplers for household and similar general purposes - Part 2-4: Couplers dependent on appliance weight for engagement	EN IEC 60320-2-4	2021
		Appliance couplers for household and similar general purposes - Part 3: Standard sheets and gauges	EN 60320-3 + A1 + A2	2014 2021 2022
IEC 60320-1	-	Appliance couplers for household and similar general purposes - Part 1: General requirements	EN IEC 60320-1	2021

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60332-1-2 (mod)	-	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 + A1 + A11 + A12	2004 2015 2016 2020
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 + A1	2004 2015
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	2004
IEC 60384-14 + A1	2013 2016	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 + A1	2013 2016
IEC 60417	Datab ase	Graphical symbols for use on equipment	-	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529 + A1 + A2	1991 2000 2013
IEC 60664-1	2020	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN IEC 60664-1	2020
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	2017
IEC 60691	2015	Thermal-links - Requirements and application guide	EN 60691 + A1	2016 2019
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 IEC 60695-2-11	2021
IEC 60695-10-2	-	Fire hazard testing - Part 10–2: Abnormal heat - Ball pressure test method	EN 60695-10-2	2014
IEC 60695-10-3	-	Fire hazard testing - Part 10–3: Abnormal heat - Mould stress relief distortion test	EN 60695-10-3	2016
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	2013

Publication	Year	Title	EN/HD	Year
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	2005	Fire hazard testing - Part 11–21: Test flames - 500 W vertical flame test method for tubular polymeric materials	-	-
IEC 60728-11 (mod)	2016	Cable networks for television signals, sound signals and interactive services - Part 11: Safety	EN 60728-11 + A11	2017 2018
IEC 60730-1 (mod)	2013	Automatic electrical controls - Part 1: General requirements	EN 60730-1	2016
+ A1	2015		+ A1	2019
+ A2	2020		+ A2	2022
			+ A11	2024
IEC 60738-1 + A1	2006 2009	Thermistors - Directly heated positive temperature coefficient - Part 1: Generic specification	EN 60738-1 + A1	2006 2009
IEC 60747-5-5	2020	Semiconductor devices - Discrete devices - Part 5–5: Optoelectronic devices - Photocouplers	EN IEC 60747-5-5	2020
IEC 60825-1	-	Safety of laser products - Part 1: Equipment classification and requirements	EN 60825-1 + A11	2014 2021
IEC 60825-2	-	Safety of laser products - Part 2: Safety of optical fibre communication systems (OFCS)	EN IEC 60825-2	— ²
IEC 60825-12	-	Safety of laser products - Part 12: Safety of free space optical communication systems used for transmission of information	EN IEC 60825-12	— ³
			+ A11	— ⁴
IEC 60836	-	Specifications for unused silicone insulating liquids for electrotechnical purposes	EN 60836	2015
IEC 60851-3 + A1	2009	Winding wires - Test methods - Part 3: Mechanical properties	EN 60851-3	2009
+ A2	2013		+ A1	2013
	2019		+ A2	2019
IEC 60851-5 + A1	2008	Winding wires - Test methods - Part 5: Electrical properties	EN 60851-5	2008
+ A2	2011		+ A1	2011
	2019		+ A2	2019
IEC 60884-1	2022	Plugs and socket-outlets for household and similar purposes – Part 1: General requirements	⁵	-
IEC 60896-11	-	Stationary lead-acid batteries - Part 11: Vented types - General requirements and methods of tests	EN 60896-11	2003

² To be published. Stage at the time of publication: FprEN IEC 60825-2:2020.

³ To be published. Stage at the time of publication: FprEN IEC 60825-12:2022.

⁴ To be published. Stage at the time of publication: FprEN IEC 60825-12:2022/prAA:2022..

⁵ Note that throughout Europe, national standards exist for plugs and socket-outlets.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60896-21	2004	Stationary lead-acid batteries - Part 21: Valve regulated types - Methods of test	EN 60896-21	2004
IEC 60896-22	-	Stationary lead-acid batteries - Part 22: Valve regulated types - Requirements	EN 60896-22	2004
IEC 60906-1	2009	IEC system of plugs and socket-outlets for household and similar purposes - Part 1: Plugs and socket-outlets 16 A 250 V a.c.	⁵	-
IEC 60906-2	2011	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.	⁵	-
IEC 60947-1	-	Low-voltage switchgear and controlgear - Part 1: General rules	EN IEC 60947-1	2021
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 + A1 + A11 + A2	1997 2005 2013 2017
IEC 60990	2016	Methods of measurement of touch current and protective conductor current	EN 60990	2016
IEC 60998-1 (mod)	-	Connecting devices for low-voltage circuits for household and similar purposes - Part 1: General requirements	EN 60998-1	2004
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 mm ² up to 35 mm ² (included)	EN 60999-1	2000
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 mm ² up to 300 mm ² (included)	EN 60999-2	2003
IEC 61039	-	Classification of insulating liquids	EN 61039	2008
IEC 61051-1	-	Varistors for use in electronic equipment - Part 1: Generic specification	EN IEC 61051-1	2018
IEC 61051-2 +A1	1991 2009	Varistors for use in electronic equipment - Part 2: Sectional specification for surge suppression varistors	EN IEC 61051-2	2021
IEC 61056-1	-	General purpose lead-acid batteries (valve-regulated types) - Part 1: General requirements, functional characteristics - Methods of test	EN 61056-1	2012
IEC 61056-2	-	General purpose lead-acid batteries (valve-regulated types) - Part 2: Dimensions, terminals and marking	EN 61056-2	2012

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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	2010
IEC 61204-7	-	Low-voltage switch mode power supplies - Part 7: Safety requirements	EN IEC 61204-7	2018
IEC 61260-1	2014	Electroacoustics – Octave-band and fractional-octave-band filters – Part 1: Specifications	EN 61260-1	2014
IEC 61293	-	Marking of electrical equipment with ratings related to electrical supply - Safety requirements	EN IEC 61293	2020
IEC 61427	series	Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 1: Photovoltaic off-grid application	EN 61427-1	2013
		Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 2: On-grid applications	EN 61427-2	2015
IEC/TS 61430	1997	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	1996
IEC 61558-1	2017	Safety of transformers, reactors, power supply units and combinations thereof - Part 1: General requirements and tests	EN IEC 61558-1	2019
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 IEC 61558-2-16	— ⁶
IEC 61587-1	2022	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 series - Part 1: Environmental requirements, test set-up and safety aspects for cabinets, racks, subracks and chassis under indoor condition use and transportation	EN IEC 61587-1	2022
IEC 61643-11	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

⁶ To be published. Stage at the time of publication: FprEN IEC 61558-2-16:2021.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61643-331	2020	Components for low-voltage surge protection - Part 331: Performance requirements and test methods for metal oxide varistors (MOV)	EN IEC 61643-331	2020
IEC 61810-1 + A1	2015 2019	Electromechanical elementary relays - Part 1: General and safety requirements	EN IEC 61810-1 + A1	2015 2020
IEC 61959	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Mechanical tests for sealed portable secondary cells and batteries	EN 61959	2004
IEC 61965	-	Mechanical safety of cathode ray tubes	EN 61965	2003
IEC 61984	-	Connectors - Safety requirements and tests	EN 61984	2009
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	2017
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 + A1	2017 2021
IEC 62281	-	Safety of primary and secondary lithium cells and batteries during transport	EN IEC 62281 + A1	2019 2021
IEC/TS 62332-1	2011	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	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	2018
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 IEC 62619	2022
IEC 63044-3	-	Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 3: Electrical safety requirements	EN IEC 63044-3	2018
ISO 37	2017	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 178	-	Plastics - Determination of flexural properties	EN ISO 178	2019
ISO 179-1	-	Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test	EN ISO 179-1	2010
ISO 180	-	Plastics - Determination of Izod impact strength	EN ISO 180	2019
ISO 306	-	Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST)	EN ISO 306	2013
ISO 527	series	Plastics - Determination of tensile properties		
		Plastics - Determination of tensile properties - Part 1: General principles (ISO 527-1:2019)	EN ISO 527-1	2019
		Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:2012)	EN ISO 527-2	2012
		Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets (ISO 527-3:2018)	EN ISO 527-3	2018
		Plastics - Determination of tensile properties - Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites (ISO 527-4:2021)	EN ISO 527-4	2021
		Plastics - Determination of tensile properties - Part 5: Test conditions for unidirectional fibre-reinforced plastic composites (ISO 527-5:2021)	EN ISO 527-5	2021
ISO 871	2022	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	2008
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 + A1	2016 2021
ISO 3679	-	Determination of flash no-flash and flash point - Rapid equilibrium closed cup method	EN ISO 3679	2015
ISO 3864	series	Graphical symbols - Safety colours and safety signs	-	-
ISO 3864-2	2016	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	2016
ISO 4892-2	-	Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps	EN ISO 4892-2 + A1	2013 2021

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 4892-4	2013	Plastics - Methods of exposure to laboratory light sources - Part 4: Open-flame carbon-arc lamps	-	-
ISO 7000	2019	Graphical symbols for use on equipment - Registered symbols	-	-
ISO 7010	-	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010 + A1 + A2 + A3 + A4 + A5 + A6	2020 2020 2022 2022 2023 2023 2023
ISO 8256	-	Plastics - Determination of tensile-impact strength	EN ISO 8256	2004
ISO 9772	2020	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 + A1	1998 2003
ISO 14993	2018	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	EN ISO 21207	2022
ISO 22479	-	Corrosion of metals and alloys — Sulfur dioxide test in a humid atmosphere (fixed gas method)	EN ISO 22479	2022
ASTM D412	-	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension	-	-
ASTM 471-98	-	Standard Test Method for Rubber Property - Effect of Liquids	-	-
ASTM D3574	-	Standard Test Methods for Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams	-	-
		Safety of toys - Part 1: Mechanical and physical properties	EN 71-1 EN 71-1:2014+A1	2014 2018
		Sound system equipment: Headphones and earphones associated with personal music players - Maximum sound pressure level measurement methodology and limit considerations - Part 1: General method for “one package equipment”	EN 50332-1	2013

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
		Sound system equipment: Headphones and earphones associated with personal music players - Maximum sound pressure level measurement methodology - Part 2: Matching of sets with headphones if either or both are offered separately, or are offered as one package equipment but with standardised connectors between the two allowing to combine components of different manufacturers or different design	EN 50332-2	2013
		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	2017

Annex ZB
(normative)

Special national conditions

Special national condition: National characteristic or practice that cannot be changed even over a long period, e.g. climatic conditions, electrical earthing conditions.

NOTE If it affects harmonization, it forms part of the European Standard.

For the countries in which the relevant special national apply these provisions are normative, for other countries they are informative.

Clause	Special national condition
4.1.15	<p>Finland, Norway and Sweden</p> <p>To the end of the subclause the following is added:</p> <p>Class I pluggable equipment type A intended for connection to other equipment or a network shall, if safety relies on connection to reliable earthing or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment shall be connected to an earthed mains socket-outlet.</p> <p>The marking text in the applicable countries shall be as follows:</p> <p>In Finland: “Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan”</p> <p>In Norway: “Apparatet må tilkoples jordet stikkontakt”</p> <p>In Sweden: “Apparaten skall anslutas till jordat uttag”</p>
4.7.3	<p>United Kingdom</p> <p>To the end of the subclause the following is added:</p> <p>The torque test is performed using a socket-outlet complying with BS 1363, and the plug part shall be assessed to the relevant clauses of BS 1363. Also see Annex G.4.2 of this annex.</p>
5.4.11.1 and Annex G	<p>Finland and Sweden</p> <p>To the end of the subclause the following is added:</p> <p>For separation of the telecommunication network from earth the following is applicable:</p> <p>If this insulation is solid, including insulation forming part of a component, it shall at least consist of either</p> <ul style="list-style-type: none">— two layers of thin sheet material, each of which shall pass the electric strength test below, or— one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. <p>If this insulation forms part of a semiconductor component (e.g. an optocoupler), there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that clearances and creepage distances do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition</p> <ul style="list-style-type: none">— passes the tests and inspection criteria of 5.4.7 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 5.4.9 shall be performed using 1,5 kV), and— is subject to routine testing for electric strength during manufacturing, using a test voltage of 1,5 kV.

Clause	Special national condition
	<p>It is permitted to bridge this insulation with a capacitor complying with EN 60384-14, subclass Y2.</p> <p>A capacitor classified Y3 according to EN 60384-14, may bridge this insulation under the following conditions:</p> <ul style="list-style-type: none"> — the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 60384-14, which in addition to the Y3 testing, is tested with an impulse test of 2,5 kV defined in 5.4.10; — the additional testing shall be performed on all the test specimens as described in EN 60384-14; — the impulse test of 2,5 kV is to be performed before the endurance test in EN 60384-14, in the sequence of tests as described in EN 60384-14.
5.5.2.1	<p>Norway</p> <p>After the 3rd paragraph the following is added:</p> <p>Due to the IT power distribution system used, capacitors are required to be rated for the applicable line-to-line voltage (230 V).</p>
5.5.6	<p>Finland, Norway and Sweden</p> <p>To the end of the subclause the following is added:</p> <p>Resistors used as basic safeguard or bridging basic insulation in class I pluggable equipment type A shall comply with G.10.1 and the test of G.10.3.</p>
5.6.4.2.1	<p>Ireland and United Kingdom</p> <p>After the indent for pluggable equipment type A, the following is added:</p> <ul style="list-style-type: none"> — the protective current rating is taken to be 13 A, this being the largest rating of fuse used in the mains plug.
5.6.4.2.1	<p>France</p> <p>After the indent for pluggable equipment type A, the following is added:</p> <ul style="list-style-type: none"> — in certain cases, the protective current rating of the circuit supplied from the mains is taken as 20 A instead of 16 A. <p><i>Justification:</i></p> <p>In France, according to NF C15-100 standard, in certain cases, the maximum rated current of the protective device circuit-breaker is 20 A.</p>
5.6.5.1	<p>Ireland and United Kingdom</p> <p>To the second paragraph the following is added:</p> <p>The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current over 10 A and up to and including 13 A is:</p> <p>1,25 mm² to 1,5 mm² in cross-sectional area.</p>
5.6.8	<p>Norway</p> <p>To the end of the subclause the following is added:</p> <p>Equipment connected with an earthed mains plug is classified as class I equipment. See the Norway marking requirement in 4.1.15. The symbol IEC 60417-6092, as specified in F.3.6.2, is accepted.</p>

Clause	Special national condition
5.7.7.1	<p>Norway and Sweden</p> <p>To the end of the subclause the following is added:</p> <p>The screen of the television distribution system is normally not earthed at the entrance of the building and there is normally no equipotential bonding system within the building. Therefore the protective earthing of the building installation needs to be isolated from the screen of a cable distribution system.</p> <p>It is however accepted to provide the insulation external to the equipment by an adapter or an interconnection cable with galvanic isolator, which may be provided by a retailer, for example.</p> <p>The user manual shall then have the following or similar information in Norwegian and Swedish language respectively, depending on in what country the equipment is intended to be used in:</p> <p>“Apparatus connected to the protective earthing of the building installation through the mains connection or through other apparatus with a connection to protective earthing – and to a television distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a television distribution system therefore has to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11)”</p> <p>NOTE In Norway, due to regulation for CATV-installations, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1,5 kV RMS, 50 Hz or 60 Hz, for 1 min.</p> <p>Translation to Norwegian (the Swedish text will also be accepted in Norway):</p> <p>“Apparater som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplede utstyr – og er tilkoplede et koaksialbasert kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av apparater til kabel-TV nett installeres en galvanisk isolator mellom apparatet og kabel-TV nettet.”</p> <p>Translation to Swedish:</p> <p>”Apparater som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av apparaten till kabel-TV nät galvanisk isolator finnas mellan apparaten och kabel-TV nätet.”</p>
8.5.4.2.3	<p>United Kingdom</p> <p>Add the following after the 2nd dash bullet in 3rd paragraph:</p> <p>An emergency stop system complying with the requirements of EN IEC 60204-1 and EN ISO 13850 is required where there is a risk of personal injury.</p>
B.3.1 and B.4	<p>Ireland and United Kingdom</p> <p>The following is applicable:</p> <p>To protect against excessive currents and short-circuits in the primary circuit of direct plug-in equipment, tests according to Annexes B.3.1 and B.4 shall be conducted using an external miniature circuit breaker complying with EN 60898-1, Type B, rated 32 A. If the equipment does not pass these tests, suitable protective devices shall be included as an integral part of the direct plug-in equipment, until the requirements of Annexes B.3.1 and B.4 are met.</p>
G.4.2	<p>United Kingdom</p> <p>To the end of the subclause the following is added:</p> <p>The plug part of direct plug-in equipment shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.13, 12.16, and 12.17, except that the test of 12.17 is performed at not less than 125 °C. Where the metal earth pin is replaced by an Insulated Shutter Opening Device (ISOD), the requirements of subclauses 22.2 and 23 also apply.</p>

Clause	Special national condition
G.7.1	<p>United Kingdom</p> <p>To the first paragraph the following is added:</p> <p>Equipment which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord shall be fitted with a 'standard plug' in accordance with the Plugs and Sockets etc (Safety) Regulations 1994, Statutory Instrument 1994 No. 1768, unless exempted by those regulations.</p> <p>NOTE "Standard plug" is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.</p>
G.7.1	<p>Ireland</p> <p>To the first paragraph the following is added:</p> <p>Apparatus which is fitted with a flexible cable or cord shall be provided with a plug in accordance with Statutory Instrument 525: 1997, "13 A Plugs and Conversion Adapters for Domestic Use Regulations: 1997. S.I. 525 provides for the recognition of a standard of another Member State which is equivalent to the relevant Irish Standard.</p>
G.7.2	<p>Ireland and United Kingdom</p> <p>To the first paragraph the following is added:</p> <p>A power supply cord with a conductor of 1,25 mm² is allowed for equipment which is rated over 10 A and up to and including 13 A.</p>

Annex ZC
(informative)

A-deviations

A-deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CEN and/or CENELEC member.

This European Standard does not fall under any Directive/Regulation of the EU.

In the relevant CEN and/or CENELEC countries, these A-deviations are valid instead of the respective provisions of the European Standard until the national situation causing the A-deviation has changed.

Clause	Deviation
10.5.2	<p>Germany</p> <p>The following requirement applies:</p> <p>For the operation of any cathode ray tube intended for the display of visual images operating at an acceleration voltage exceeding 40 kV, authorization is required, or application of type approval (Bauartzulassung) and marking.</p> <p><i>Justification:</i></p> <p>German ministerial decree against ionizing radiation (Röntgenverordnung), in force since 2002-07-01, implementing the European Directive 96/29/EURATOM.</p> <p>NOTE Contact address:</p> <p>Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig, Tel.: Int+49–531–592–6320, Internet: http://www.ptb.de</p>

Annex ZD
(informative)

IEC and CENELEC code designations for flexible cords

Type of flexible cord	Code designations	
	IEC	CENELEC
PVC insulated cords Flat twin tinsel cord Light polyvinyl chloride sheathed flexible cord Ordinary polyvinyl chloride sheathed flexible cord	60227 IEC 41 60227 IEC 52 60227 IEC 53	H03VH-Y H03VV-F H03VVH2-F H05VV-F H05VVH2-F
Rubber insulated cords Ordinary tough rubber sheathed flexible cord Ordinary polychloroprene sheathed flexible cord Heavy polychloroprene sheathed flexible cord	60245 IEC 53 60245 IEC 57 60245 IEC 66	H05RR-F H05RN-F H07RN-F
Cords having high flexibility High flexibility braided cables with cross linked elastomeric insulation	60245 IEC 89	H03RT-H
Cords insulated and sheathed with halogen-free thermoplastic compounds Light halogen-free thermoplastic insulated and sheathed flexible cords Ordinary halogen-free thermoplastic insulated and sheathed flexible cords		H03Z1Z1-F H03Z1Z1H2-F H05Z1Z1-F H05Z1Z1H2-F

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**AUDIO/VIDEO, INFORMATION AND
COMMUNICATION TECHNOLOGY EQUIPMENT –****Part 1: Safety requirements****FOREWORD**

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This fourth edition cancels and replaces the third edition published in 2018. This edition constitutes a technical revision.

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

- a) new table with requirements for external circuits;
- b) revision of requirements for openings in fire enclosures;
- c) revision of requirements for liquid filled components;
- d) revision of battery charging requirements.

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

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

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

A list of all parts in the IEC 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, 5.4.2.3.2.4, 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.3.3.4, F.3.3.6, Y.4.1, Y.4.5, Table 12, Table 13 and Table 38.

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.

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

- reconfirmed,
- withdrawn,
- 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 document 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.

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 in this document, 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.

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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 can possibly have access to the equipment or who could 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 can 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.

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).

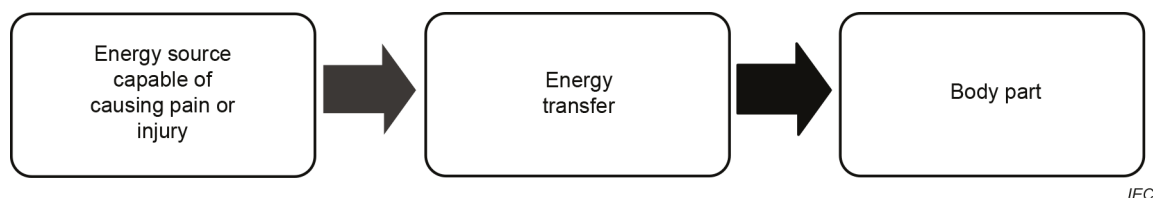


Figure 1 – Three block model for pain and injury

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 can 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 can occur some considerable time after the transfer of energy to a body part. For example, it is possible that pain or injury from some chemical or physiological reaction does not manifest itself 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 unit, or a **battery**. An electrical product uses the electrical energy to perform its intended functions.

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 can 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 can 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 can use energy sources that are non-electrical energy sources such as moving parts or chemicals. The energy in these other sources can be transferred to or from a body part, or can be transformed into other energy forms (for example, chemical energy can 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).



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Figure 2 – Three block model for safety

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** can be a single element or 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 shall 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**.

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 can 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 can 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**.

As an **equipment safeguard** provides protection for all persons, it is preferred above a behavioural **safeguard**. However, in certain situations a **precautionary safeguard** or a **skill safeguard** is accepted as a replacement of an **equipment safeguard**.

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** can 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 use 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, it is possible that an **instructed person** will 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.

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, it is possible that a **skilled person** will 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 can be applicable. Such **safeguards** may 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.

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 can 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.