

L.23.201 CELLS employed in tools or cells employed in BATTERY packs shall comply with IEC 62133.

NOTE The above requirement for testing according to IEC 62133 does not include the BATTERY pack itself.

L.23.202 Rechargeable CELLS employed in tools or in BATTERY packs shall not be of lithium-metal type.

Compliance is checked by inspection.

NOTE Lithium-ion CELLS are not lithium-metal CELLS.

L.24 Supply connection and external flexible cords

L.24.1 This subclause also applies to a flexible cord between a NON-ISOLATED SOURCE and the tool.

L.24.3 This subclause also applies to a flexible cord between a NON-ISOLATED SOURCE and the tool.

L.24.4 This subclause applies, except a flexible cord provided between a NON-ISOLATED SOURCE and the tool shall not be provided with a plug that can be connected directly to the mains.

L.24.5 This subclause does not apply to a flexible cord provided between a NON-ISOLATED SOURCE and the tool.

L.24.20 This subclause applies, except a flexible cord provided between a NON-ISOLATED SOURCE and the tool shall not be provided with an appliance inlet that can be connected directly to the mains.

L.24.201 For BATTERY tools with SEPARABLE BATTERY PACKS, the external flexible cable or cord shall have anchorages such that the conductors are relieved from strain, including twisting, where they are connected within the tool, and protected from abrasion.

Compliance is checked by inspection.

L.25 Terminals for external conductors

This clause does not apply to INTERCONNECTION CORDS.

L.26 Provision for earthing

This clause only applies when the tool is in the configuration where it is directly connected to the mains or to a NON-ISOLATED SOURCE.

L.28 CREEPAGE DISTANCES, CLEARANCES and distances through insulation

This clause is applicable except as follows:

L.28.1 Addition:

This subclause only applies when the tool is in the configuration where it is directly connected to the mains or to a NON-ISOLATED SOURCE. During the evaluation in this condition, BATTERY packs are to be connected to the tool. The tool is also evaluated with the BATTERY pack removed if such removal can be accomplished without the use of a tool.

Between parts of opposite polarity that are live during charging, the CREEPAGE DISTANCES and CLEARANCES of IEC 60335-1:2010 shall apply, if they are greater than the values in Table 12.

L.28.201 CREEPAGE DISTANCES and CLEARANCES shall not be less than values in millimetres shown in Table L.1. The CLEARANCES specified do not apply to the air gap between the contacts of thermal controls, overload protection devices, switches of micro-gap construction, and the like, or to the air gap between the current-carrying members of such devices where the CLEARANCES vary with the movement of the contacts. CREEPAGE DISTANCES and CLEARANCES also do not apply to the construction of BATTERY CELLS or the interconnections between CELLS in a BATTERY pack. The values specified in Table L.1 do not apply to cross-over points of motor windings.

The values in Table L.1 are equal or larger than the values required by IEC 60664-1, when

- an overvoltage category II;
- a material group III;
- a pollution degree 1 for parts protected against deposition of dirt and for lacquered or enamelled windings;
- a pollution degree 3 for other parts;
- inhomogeneous electric field

are applied.

For parts of different polarity, CLEARANCE and CREEPAGE DISTANCES less than those given in Table L.1 are acceptable if the shorting of the two parts does not result in the tool starting.

NOTE 1 The risk of fire due to spacings below the required values is covered by the requirements of 18.1.

Table L.1 – Minimum CREEPAGE DISTANCES and CLEARANCES between parts of opposite polarity

<i>Dimensions in millimetres</i>					
WORKING VOLTAGE		WORKING VOLTAGE		WORKING VOLTAGE	
≤ 15 V		> 15 V and ≤ 32 V		> 32 V	
CREEPAGE DISTANCE	CLEARANCE	CREEPAGE DISTANCE	CLEARANCE	CREEPAGE DISTANCE	CLEARANCE
0,8 ^a	0,8	1,5	1,5	2,0 ^a	1,5
^a These CREEPAGE DISTANCES are slightly lower than suggested by IEC 60664-1. CREEPAGE DISTANCES between LIVE PARTS of different polarity (functional insulation) are only associated to fire hazard, not to electric shock hazard. As products in the scope of IEC 62841 are products supervised during NORMAL USE, lower distances are justified.					

For parts having a HAZARDOUS VOLTAGE between them, the sum total of the measured distances between each of these parts and their nearest accessible surface shall not be less than 1,5 mm CLEARANCE and 2,0 mm CREEPAGE DISTANCE.

NOTE 2 Figure L.1 provides clarification on the measurement method.

Compliance is checked by measurement.

The way in which CREEPAGE DISTANCES and CLEARANCES are measured is indicated in Annex A.

Distances through slots or openings in external parts of insulating material are measured to metal foil in contact with the accessible surface; the foil is pushed into corners and the like by means of the test probe B of IEC 61032:1997, but is not pressed into openings.

The sum total of distances measured between parts operating at *HAZARDOUS VOLTAGE* and accessible surfaces is determined by measuring the distance from each part to the accessible surface. The distances are to be added together to determine the sum total. See Figure L.1. For the purpose of this determination, one of the distances shall be 1,0 mm or greater. See Annex A, cases 1 to 10.

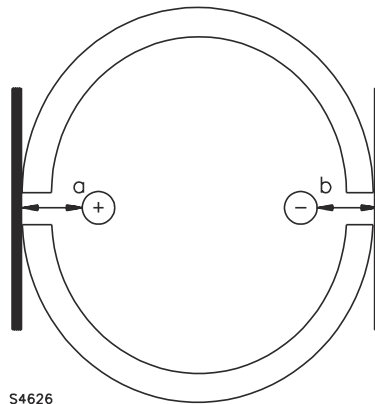
If necessary, a force is applied to any point on bare conductors and to the outside of metal enclosures, in an endeavour to reduce the *CREEPAGE DISTANCES* and *CLEARANCES* while taking the measurements.

The force is applied by means of the test probe B of IEC 61032:1997 and has a value of:

- 2 N for bare conductors;
- 30 N for enclosures.

Means provided for fixing the tool to a support are considered to be accessible.

Figure L.1 – Measurement of *CLEARANCES*



IEC 0310/14

Dimension a = distance from positive bare conductive part to the external surface as defined by foil stretched across the openings.

Dimension b = distance from negative bare conductive part to the external surface as defined by foil stretched across the openings.

$a + b$ is the sum total as defined in clause L.28.201

Bibliography

IEC 60127-3 (all parts)

Miniature fuses – Part 3: Sub-miniature fuse-links

IEC 60204 (all parts)

Safety of machinery – Electrical equipment of machines

IEC 60335 (all parts)

Household and similar electrical appliances – Safety

IEC 60335-2-29

Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers

IEC 60335-2-45

Household and similar electrical appliances – Safety – Part 2-45: Particular requirements for portable heating tools and similar appliances

IEC 60601 (all parts)

Medical electrical equipment

IEC 60664-3

Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution

IEC 62281

Safety of primary and secondary lithium cells and batteries during transport

ANNEX DVA
(Normative)
Canadian and U.S. Reference Standards

DVA.1 D2 Addition: Add a new Annex DVA as follows:

The following is a cross reference of component standards. The requirements of the subject standards listed in Clause 2 shall be applicable, except where they are replaced by the U.S./Canadian standards listed in the table below.

For dated references, only the edition specified applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Table DVA – Standards Cross Reference

Clause, Table or Figure from this Standard	Purpose for Reference	Referenced Publication in Clause 2	U.S. Replacement Standard Requirement	Canadian Replacement Standard Requirement
13.2 K.13.2.201	Resistance to Heat and Fire	IEC 60695-11-10 • Fire Hazard Testing Part 11-10: Test Flames 50 W Horizontal and Vertical Flame Test Methods	*	*
7.2 14.2.2 21.20	Degrees of Protection Provided by Enclosures (IP Code)	IEC 60529 • Degrees of Protection Provided by Enclosures (IP Code)	*	*
23.1.10 23.1.10.1 23.1.10.2 23.1.10.2.1 23.1.10.2.2	Switches for Appliances	IEC 61058-1 • Switches for Appliances – Part 1: General Requirements	UL 61058-1 • Switches for Appliances – Part 1: General Requirements Or UL 6059 • Outline for Particular Requirements for Switches for Tools	CSA-C22.2 No. 61058-1 • Switches for Appliances – Part 1: General Requirements or Or CSA T.I.L. A-37 • Interim Certification Requirements for Switches Used in Tools
14.5	Portable Residual Current Devices (PRCDs)	IEC 61540 • Electrical Accessories – Portable Residual Current Devices without Integral Overcurrent Protection for Household and Similar Use (PRCDs)	UL 943 • Ground-Fault Circuit-Interrupters	C22.2 No. 144.1 • Ground-Fault Circuit-Interrupters

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Table DVA – Standards Cross Reference Continued

Clause, Table or Figure from this Standard	Purpose for Reference	Referenced Publication in Clause 2	U.S. Replacement Standard Requirement	Canadian Replacement Standard Requirement
3.1 9.3 9.4 9.5 19.1 19.3 21.22 21.28 24.19 28.1 K.9.3 K.18.1 K.28.1 L.9.201 L.18.201 L.28.201	Test Probes	IEC 61032 • Protection of Persons and Equipment by Enclosures – Probes for Verification	*	*
5.18	General Tolerances	ISO 2768-1 • General Tolerances – Part 1: Tolerances for Linear and Angular Dimensions Without Individual Tolerance Indications	*	*
6.1	Measurement Methods for Electromagnetic Fields of Household Appliances and Similar Apparatus with Regard to Human Exposure	IEC 62233 • Measurement Methods for Electromagnetic Fields of Household Appliances and Similar Apparatus with Regard to Human Exposure	*	*
6.2	Lasers	IEC 60825-1 • Safety of Laser Products – Part 1: Equipment Classification and Requirements	Title 21 part 1040 • US, Code of Federal Regulations (CFR)	CSA E60825-1 • Safety Of Laser Products – Part 1: Equipment Classification and Requirements • Radiation Emitting Devices Regulations, C.R.C (CRC C.1370)
6.3.2 6.3.3	Photo-Biological Safety of Lamps and Lamp Systems	IEC 62471-1 • Photobiological Safety of Lamps and Lamp Systems	*	*
6.3.3	Photo-Biological Safety of Lamps and Lamp Systems	IEC/TR 62471-2 • Photobiological Safety of Lamps and Lamp Systems – Part 2: Guidance on Manufacturing Requirements Relating to Non-Laser Optical Radiation Safety	*	*

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Table DVA – Standards Cross Reference Continued

Clause, Table or Figure from this Standard	Purpose for Reference	Referenced Publication in Clause 2	U.S. Replacement Standard Requirement	Canadian Replacement Standard Requirement
6.3.2 8.6 symbols 8.8 8.10	Graphical Symbols for Use on Equipment	IEC 60417 (DB) • Graphical Symbols for Use on Equipment	*	*
8.2	Graphical Symbols – Design Principles	ISO 3864-2 • Graphical Symbols Safety Colours and Safety Signs Part 2: Design Principles for Product Safety Labels	*	*
8.2	Graphical Symbols – Design Principles	ISO 3864-3 • Graphical Symbols – Safety Colours and Safety Signs – Part 3: Design Principles for Graphical Symbols for Use in Safety Signs	*	*
8.2 8.6 symbols	Graphical Symbols	ISO 7000 • Graphical Symbols for Use on Equipment – Registered Symbols	*	*
8.2 8.6 symbols	Graphical Symbols	ISO 7010 • Graphical Symbols – Safety Colours and Safety Signs – Registered Safety Signs	*	*
8.6 symbols 18.6 18.6.2	Symbol of Time-Delay Characteristic of Miniature Fuses	IEC 60127-1 • Miniature Fuses – Part 1: Definitions for Miniature Fuses and General Requirements for Miniature Fuse-Links	*	*
8.10	Emergency Stop	ISO 13850 • Safety of Machinery – Emergency Stop – Principles for Design	*	*
12.3.1 D.1 L.28.1	Heating Elements	IEC 60335-1 • Safety of Household and Similar Electrical Appliances, Part 1: General Requirements	*	*
I.3.1 I.3.6.2	Mechanical Vibration – Declaration and Verification of Vibration Emission Values	EN 12096 • Mechanical Vibration. Declaration and Verification of Vibration Emission Values.	*	*
13.1 K.13.1	Resistance to Heat and Fire	IEC 60695-10-2 • Fire Hazard Testing – Part 10-2: Abnormal Heat – Ball Pressure Test	*	*
13.2	Resistance to Heat and Fire	IEC 60695-2-13 • Fire Hazard Testing – Part 2-13: Glowing/Hot-Wire Based Test Methods – Glow-Wire Ignition Temperature (GWIT) Test Method for Materials	*	*
13.2 K.13.2 L.13.2	Resistance to Heat and Fire	IEC 60695-2-11 • Fire Hazard Testing – Part 2-11: Glowing/Hot-Wire Based Test Methods – Glow-Wire Flammability Test Method for End-Products	*	*

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Table DVA – Standards Cross Reference Continued

Clause, Table or Figure from this Standard	Purpose for Reference	Referenced Publication in Clause 2	U.S. Replacement Standard Requirement	Canadian Replacement Standard Requirement
13.2	Resistance to Fire	ISO 9772 • Cellular Plastics – Determination of Horizontal Burning Characteristics of Small Specimens Subjected to a Small Flame	UL 94 • Tests for Flammability of Plastic Materials for Parts in Devices and Appliances	CSA C22.2 No. 0.17 • Evaluation of Properties of Polymeric Materials
18.5.3	Class P2 AC Motor Capacitors	IEC 60252-1 • AC Motor Capacitors – Part 1: General – Performance, Testing and Rating – Safety Requirements – Guidance for Installation and Operation	*	*
18.6 18.6.2	Miniature Fuses	<p>IEC 60127-1 • Miniature Fuses – Part 1: Definitions for Miniature Fuses and General Requirements for Miniature Fuse-Links</p> <p>IEC 60127-2 • Miniature Fuses – Part 2: Cartridge Fuse-Links</p> <p>IEC 60127-3 • Miniature Fuses – Part 3: Sub-Miniature Fuse Links</p> <p>IEC 60127-4 • Miniature Fuses – Part 4: Universal Modular Fuse-Links (UMF) – Through-Hole and Surface Mount Types</p> <p>IEC 60127-5 • Miniature Fuses Part 5: Guidelines for Quality Assessment of Miniature Fuse-Links</p> <p>IEC 60127-6 • Miniature Fuses Part 6: Fuse-Holders for Miniature Cartridge Fuse-Links</p> <p>IEC 60127-10 • Miniature Fuses – Part 10: User Guide for Miniature Fuses</p>	<p>UL 248-1 • Low-Voltage Fuses – Part 1: General Requirements</p> <p>UL 248-4 • Low-Voltage Fuses – Part 4: Class CC Fuses</p> <p>UL 248-8 • Low-Voltage Fuses – Part 8: Class J Fuses</p> <p>UL 248-10 • Low-Voltage Fuses – Part 10: Class L Fuses</p> <p>UL 248-12 • Low-Voltage Fuses – Part 12: Class R Fuses</p> <p>UL 4248 • Fuse Holders, All Parts,</p>	<p>CSA-C22.2 No. 248-1 • Low-Voltage Fuses - Part 1: General Requirements</p> <p>CSA-C22.2 No. 248-4 • Low-Voltage Fuses – Part 4: Class CC Fuses</p> <p>CSA-C22.2 No. 248-8 • Low-Voltage Fuses – Part 8: Class J Fuses</p> <p>CSA-C22.2 No. 248-10 • Low-Voltage Fuses – Part 10: Class L Fuses</p> <p>CSA C22.2 No. 248-12 • Low-Voltage Fuses – Part 12: Class R Fuses</p> <p>CSA C22.2 No. 4248 • Fuse Holders, All Parts</p>
20.2	Spring-Operated Impact Test Apparatus	Clause 5 of IEC 60068-2-75:1997 • Environmental Testing – Part 2: Tests – Test Eh: Hammer Tests	*	*
21.34 Table 1	Resistors and Capacitors Used for Protective Impedance	Clause 14.1 and 14.2 of IEC 60065:2011 • Audio, Video, and Similar Electronic Apparatus – Safety Requirements	*	*

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Table DVA – Standards Cross Reference Continued

Clause, Table or Figure from this Standard	Purpose for Reference	Referenced Publication in Clause 2	U.S. Replacement Standard Requirement	Canadian Replacement Standard Requirement
22.6	Internal Wiring	IEC 60227 • Polyvinyl chloride insulated cables of rated voltages up to and including 450/750, All Parts IEC 60245 • Rubber Insulated Cables – Rated Voltages Up To and Including 450/750, All Parts	UL 62 • Flexible Cords and Cables Not lighter than Junior service cord in accordance with the NFPA 70 • National Electrical Code	CSA C22.2 No. 49 • Flexible Cords and Cables Not lighter than Hard Usage Cord in accordance with CSA C22.1 • Canadian Electrical Code, Part 1
23.1.3	E10 Lampholders	IEC 60238 • Edison Screw Lampholders	UL 496 • Lampholders	CSA C22.2 No. 43 • Lampholders
23.1.3	E10 Lampholders Caps	IEC 60061 (DB2):2011 • Lamp Caps and Holders Together With Gauges for the Control of Interchangeability and Safety – Part 1: Lamp Caps	*	*
16 23.1.4	Isolating Transformers or Safety Isolating Transformers, Except Incorporated Transformers as Defined in IEC 61558-1 • Safety of Power Transformers, Power Supplies, Reactors and Similar Products – Part 1: General Requirements and Tests	IEC 61558-1 • Safety of Power Transformers, Power Supplies, Reactors and Similar Products – Part 1: General Requirements and Tests	*	*

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Table DVA – Standards Cross Reference Continued

Clause, Table or Figure from this Standard	Purpose for Reference	Referenced Publication in Clause 2	U.S. Replacement Standard Requirement	Canadian Replacement Standard Requirement
23.1.4	<p>“...shall comply with IEC 61558-2-4 • Safety of Transformers, Reactors, Power Supply Units and Similar Products for Supply Voltages up to 1 100 V – Part 2-4: Particular Requirements and Tests for Isolating Transformers and Power Supply Units Incorporating Isolating Transformers</p> <p>Or</p> <p>IEC 61558-2-6 • Safety of Transformers, Reactors, Power Supply Units and Similar Products for Supply Voltages Up to 1 100 V – Part 2-6: Particular Requirements and Tests for Safety Isolating Transformers and Power Supply Units Incorporating Safety Isolating Transformers, respectively.”</p>	IEC 61558-2-4 • Safety of Transformers, Reactors, Power Supply Units and Similar Products for Supply Voltages up to 1 100 V – Part 2-4: Particular Requirements and Tests for Isolating Transformers and Power Supply Units Incorporating Isolating Transformers	<p>UL 5085-1 • Low Voltage Transformers – Part 1: General Requirements</p> <p>And</p> <p>UL 5085-2 • Low Voltage Transformers – Part 2: General Purpose Transformers</p>	<p>CSA C22.2 No. 66.1 • Low Voltage Transformers – Part 1: General Requirements</p> <p>And</p> <p>CSA C22.2 No. 66.2 • Low Voltage Transformers – Part 2: General Purpose Transformers</p>
		IEC 61558-2-6 • Safety of Transformers, Reactors, Power Supply Units and Similar Products for Supply Voltages Up to 1 100 V – Part 2-6: Particular Requirements and Tests for Safety Isolating Transformers and Power Supply Units Incorporating Safety Isolating Transformers	<p>UL 5085-1 • Low Voltage Transformers – Part 1: General Requirements</p> <p>And</p> <p>UL 5085-3 • Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers</p>	<p>CSA C22.2 No. 66.1 • Low Voltage Transformers – Part 1: General Requirements</p> <p>And</p> <p>CSA C22.2 No. 66.3 • Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers</p>

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Table DVA – Standards Cross Reference Continued

Clause, Table or Figure from this Standard	Purpose for Reference	Referenced Publication in Clause 2	U.S. Replacement Standard Requirement	Canadian Replacement Standard Requirement
23.1.4	“Switch mode power supply units and transformers for switch mode power supply units shall comply with 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.”	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	UL 5085-1 • Low Voltage Transformers – Part 1: General Requirements And UL 5085-2 • Low Voltage Transformers – Part 2: General Purpose Transformers Or UL 5085-1 • Low Voltage Transformers – Part 1: General Requirements And UL 5085-3 • Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers	CSA C22.2 No. 66.1 • Low Voltage Transformers – Part 1: General Requirements And CSA C22.2 No. 66.2 • Low Voltage Transformers – Part 2: General Purpose Transformers: Or CSA C22.2 No. 66.1 • Low Voltage Transformers – Part 1: General Requirements And CSA C22.2 No. 66.3 • Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers

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