UL 2157

STANDARD FOR SAFETY

Electric Clothes Washing Machines and Extractors

UL Standard for Safety for Electric Clothes Washing Machines and Extractors, UL 2157

Fifth Edition, Dated October 30, 2024

Summary of Topics

This new Fifth Edition of ANSI/UL 2157 dated October 30, 2024 incorporates editorial changes including renumbering and reformatting to align with current style.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated September 15, 2023 and May 3, 2024.

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CSA Group
CSA C22.2 No. 169:24
Sixth Edition

ULSE Inc.
UL 2157
Fifth Edition

Electric Clothes Washing Machines and Extractors

October 30, 2024

Approved American National Standard

ANSI/UL 2157-2024

Commitment for Amendments

This Standard is issued jointly by the Canadian Standards Association (operating as "CSA Group") and ULSE Inc. (ULSE). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or ULSE at anytime. Revisions to this Standard will be made only after processing according to the standards development procedures of CSA Group and ULSE. CSA Group and ULSE will issue revisions to this Standard by means of a new edition or revised or additional pages bearing their date of issue.

ISBN 978-1-4883-5255-3 © 2024 Canadian Standards Association

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This ANSI/UL Standard for Safety consists of the Fifth Edition. The most recent designation of ANSI/UL 2157 as an American National Standard (ANSI) occurred on October 30, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

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PREFACE

This is the harmonized CSA Group and UL Standard for Electric Clothes Washing Machines and Extractors. It is the sixth edition of CSA C22.2 No. 169, and the fifth edition of UL 2157. This edition of CSA C22.2 No. 169 supersedes the previous edition published in 2018. This edition of UL 2157 supersedes the previous edition published in 2018.

This harmonized standard was prepared by the CSA Group and ULSE The efforts and support of the Technical Harmonization Committee for Laundry Standards and Association of Home Appliance Manufacturers (AHAM) are gratefully acknowledged.

This Standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This Standard was reviewed by the CSA Subcommittee on Clothes Washers – Household and Commercial, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products, and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this Standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of Harmonization

This Standard is published as an identical standard for CSA Group and ULSE.

An identical standard is a standard that is exactly the same in technical content except for national differences resulting from conflicts in codes and governmental regulations. Presentation is word for word except for editorial changes.

Reasons for Differences From IEC

This Standard provides requirements for electric clothes washing machines and extractors for use in accordance with the electrical installation codes of Canada and the United States. This Standard does not employ any IEC standard for base requirements.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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1 Scope

1.1 This Standard applies to electric clothes washing machines and extractors intended to be used in nonhazardous locations in accordance with the Canadian Electrical Code, Part I (CE Code), CSA C22.1-21, and the (U.S.) National Electrical Code (NEC), NFPA 70, on circuits having a nominal voltage not exceeding 600 V.

NOTE: Wherever practical, for convenience, the term "appliance" has been used in lieu of "clothes washer "or "machine".

1.2 This Standard applies to both cord-connected and permanently connected appliances. The appliances covered by this Standard are intended for use by the general public not specifically trained in the use of the appliance, regardless of the mode by which its operation is initiated. They are for use in household and commercial purposes, including appliances provided with coin-, ticket-, or card-operated mechanisms, tumbler, agitator and spinner machines, combination washer-dryers, and extractors of the centrifugal type.

1.3 This Standard does not apply to industrial and institutional type appliances. Industrial or institutional appliances are covered under the scope of Electric Washing Machines, CSA C22.2 No. 53, or Electric Commercial Clothes-Washing Equipment, UL 1206.

NOTE: Industrial and institutional type appliances are not intended for use by the general public, but only by trained or supervised personnel.

2 Definitions

NOTE: For the purpose of this Standard, the following definitions apply.

2.1 APPLIANCE, CORD-CONNECTED – an appliance that is connected to the electrical supply by a cord set or by a power-supply cord terminating in an acceptable attachment plug.

2.2 APPLIANCE, HOUSEHOLD TYPE – an appliance commonly used in, but not restricted to, a single-family dwelling.

2.3 APPLIANCE, PERMANENTLY CONNECTED – an appliance that is connected to the electrical supply by means other than a supply cord and an attachment plug.

2.4 APPLIANCE, RECESSED – an appliance intended to be:

a) supported by the floor; and

b) located immediately adjacent to a wall in the rear or located immediately adjacent to a wall, a cabinet, or another appliance on each side.

If the construction permits, a countertop can cover the appliance and adjacent cabinets and appliances. A recessed appliance is not intended for permanent attachment to the building structure or to adjacent cabinets or appliances.

2.5 APPLIANCE, STATIONARY – any appliance that is intended to be fastened in place or located in a dedicated space.

2.6 APPLIANCE, WALL-INSERT – an appliance intended to be mounted permanently in a wall or other vertical surface of a building or cabinet.

2.7 AUTOMATIC – an appliance is considered to be automatically controlled if one or more of the following conditions applies:

a) repeated starting of the appliance, beyond one complete predetermined cycle of operation, to the point where some form of limit switch opens the circuit, is independent of any manual control;

b) during any single predetermined cycle of operation, the motor is caused to stop and restart one or more times;

c) upon energizing the appliance, the initial starting of the motor could be intentionally delayed beyond normal, conventional starting; or

d) during any single predetermined cycle of operation, automatic changing of the mechanical load could reduce the motor speed to re-establish starting-winding connections to the supply circuit.

2.8 BARRIER – a partition for the insulation or isolation of electric circuits, for the isolation of electric arcs, or for the isolation of moving parts or hot surfaces. In this respect, a barrier could serve as a portion of an enclosure and as a functional part.

2.9 CIRCUIT, LINE-VOLTAGE – a circuit having characteristics in excess of those of a low-voltage circuit.

2.10 CIRCUIT, LOW-VOLTAGE – a circuit having limited voltage and energy capacity supplied by:

a) a primary battery having an output voltage of 30 V or less;

b) a Class 2 transformer; or

c) a Class 2 power supply.

NOTE 1: A circuit that is derived from a circuit that exceeds 30 V by connecting resistance or impedance, or both, in series with the supply circuit to limit the voltage and current is not considered to be a low-voltage circuit.

NOTE 2: The term "low voltage" as used in this clause relates to "extra low voltage" in Canada.

2.11 CONTROL, OPERATING – control, the operation of which starts or regulates the appliance during normal operation.

2.12 CONTROL, PROTECTIVE – control, the operation of which is intended to prevent the risk of electric shock, fire, or injury to persons during normal or abnormal operation of the appliance.

NOTE: During the evaluation of the protective control, the protective functions are verified under normal and single-fault conditions of the control.

2.13 CRITICAL COMPONENT – a component that performs one or more safety related functions whose failure would result in an increased risk of fire, electric shock or injury to persons.

2.14 CURRENT-CARRYING PARTS – parts carrying current during normal or abnormal operation in line-voltage circuits.

NOTE: With respect to Separation of circuits, 18.3, this term refers to parts in both low-voltage and line-voltage circuits.

2.15 ELECTRICAL CONNECTION – the physical interface between two points in a circuit such as spade terminals, pin terminals, micro switch contacts, relay contacts, timer contacts, crimped connections, and connections that are welded or soldered.

2.16 ENCLOSURE – a material used to:

a) render inaccessible, by itself or in conjunction with acceptable enclosure barriers and supplementary enclosures, any or all uninsulated current-carrying parts, internal wiring, or electrical components not having their own enclosures;

b) reduce the likelihood of propagation of ignition due to electrical disturbances occurring within; or

c) both (a) and (b).

2.17 ENCLOSURE BARRIER – a material used to reduce the size of an opening in an enclosure that:

a) will not permit the entrance of a 19.1 mm diameter rod; and

b) does not comply with 6.2(a)(1) or (2).

A polymeric enclosure barrier is evaluated as a functional polymeric part.

2.18 ENCLOSURE, SUPPLEMENTARY – a material used to reduce the size of an opening in an enclosure that:

a) will permit the entrance of a 19.1 mm diameter rod; and

b) does not comply with 6.2(a)(1) or (2); when enclosure barriers, if provided, are removed.

A polymeric supplementary enclosure is evaluated as an enclosure.

2.19 FIELD WIRING TERMINAL – a terminal to which a wire may be connected in the field, unless the wire and a means of making the connection, such as:

a) a pressure wire connector;

b) soldering lugs;

c) a soldered loop; or

d) a crimped eyelet;

factory-assembled to the wire, is provided as a part of the appliance.

2.20 FLAME CYLINDER – a projection of a vertical cylinder having a diameter of 20 mm and a height of 50 mm.

2.21 HEATER ASSEMBLY – an assembly of:

a) a heating element;

b) electrical insulation (eg, refractory, mica, magnesium oxide); and

c) a frame or housing (eg, a metal sheath or the like) that holds the assembly together.

2.22 HEATING ELEMENT – the actual electrical conducting medium that is intended to be heated by an electric current.

2.23 MEMBRANE SWITCH – a momentary switching device in which at least one contact is on, or made of a flexible substrate.

2.24 NONCOMBUSTIBLE MATERIAL – for purposes of this Standard a noncombustible material is:

a) metal;

b) a 5VA material; or

c) a material that complies with the requirements for enclosure flammability in accordance with the 127 mm flame test in UL 746C.

2.25 PART, DECORATIVE – a material used for no other function except appearance. A removable polymeric control knob or lever may be considered a decorative part.

2.26 PART, FUNCTIONAL – a material used in such a way that deterioration or breakage of the part would result in a risk of fire, electric shock, or injury to persons.

2.27 PART, NONFUNCTIONAL – a part, such as thermal insulation or decorative material, that does not serve as electrical insulation or to support or enclose electrical components, maintain electrical spacings, or reduce the risk of injury to persons.

2.28 RISK OF ELECTRIC SHOCK – a risk of electric shock is considered to exist if under normal conditions and single component fault conditions the potential between the part and earth ground or any other simultaneously accessible part is more than the following relevant values (these low-voltage circuits shall be supplied from an isolating source):

a) 30 V rms;

b) 42.4 V peak for sinusoidal or nonsinusoidal AC;

c) 60 V dc continuous, or 60 V peak for interrupted DC outside the range of 10 – 200 Hz; and

d) 24.8 V peak for DC interrupted at a rate of 200 Hz or less

NOTE 1: A low-voltage circuit and the secondary circuit of a Class 2 circuit do not involve a risk of electric shock.

NOTE 2: In Canada, the low-voltage circuit in NOTE 1 is an extra low-voltage power circuit.

2.29 RISK OF FIRE – A risk of fire is considered to exist at any two points in a circuit where a power of more than 15 W can be delivered into an external variable resistor connected between the two points at the end of 5 seconds under normal conditions and single component fault conditions; see 26.6.3.2 and D14.

NOTE: A low power circuit does not involve a risk of fire.

2.30 TEMPERATURE-REGULATING AND -LIMITING DEVICE, COMBINATION – a device that functions to:

a) regulate the temperature under normal conditions of use; and

b) limit abnormal temperatures that might result from conditions of abnormal operation of the appliance.

2.31 TEMPERATURE-LIMITING DEVICE – a device that:

a) functions only under conditions that produce abnormal temperatures; and

b) is not intended to function during normal operation of the appliance.

2.32 TEMPERATURE-REGULATING DEVICE – a device that:

a) regulates temperature; and

b) functions during normal operation of the appliance.

2.33 VULCANIZED FIBRE – a material that, if 0.8 mm thick minimum and acceptably mounted and secured, may be used as an enclosure barrier, but not as an enclosure or supplementary enclosure.

2.34 WITHIN 3 MM – falling within the dotted boundary formed by the flame cylinder with hemispherical ends as shown in Figure 26.2.

3 General Requirements and Reference Publications

3.1 General requirements

3.1.1 Combination washer-dryers shall comply with this Standard and also with the requirements of CSA C22.2 No. 112 and UL 2158. Where more than one Standard applies, preference shall be given to that Standard considered to require the highest standard of construction or testing.

3.1.2 In Canada, the general requirements applicable to this Standard are provided in CSA C22.2 No. 0.

3.1.3 The values given in SI (metric) units shall be normative. Any other values given shall be for information purposes only.

3.2 Reference publications

3.2.1 This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below. Such reference shall include all amendments published up to the time this referencing Standard was approved. Where reference is made to undated CSA Group Standards, such reference shall be considered to refer to the latest edition and all amendments published to that edition.

ASSE 1001-2021, *Performance Requirements for Atmospheric Type Vacuum Breakers*

ASTM B344-20, *Standard Specification for Drawn or Rolled Nickel-Chromium and Nickel-Chromium-Iron Alloys for Electrical Heating Elements*

ASTM D638M-96, *Test Method for Tensile Properties of Plastics (Metric)*

ASTM D1822-21, *Standard Test Method for Determining the Tensile-Impact Resistance of Plastics*

ASTM D6670-18, *Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products*

ASTM E230/E230M-17, *Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples*

Code of Federal Regulations, Title 10, Part 430, as amended from time to time (referenced as 49 CFR 430)

CSA B64 Series 21, *Backflow Preventers and Vacuum Breakers*

CSA C22.1-21, *Canadian Electrical Code, Part I*

CSA C22.2 No. 0:20, *General Requirements – Canadian Electrical Code, Part II*

CSA C22.2 No. 0.1:19, *General Requirements for Double-Insulated Equipment*

CSA C22.2 No. 0.2-16 (R2020), *Insulation Coordination*

CSA C22.2 No. 0.4:17 (R2022), *Bonding of Electrical Equipment*

CSA C22.2 No. 0.5:16 (R2020), *Threaded Conduit Entries*

CSA C22.2 No. 0.8:19, *Safety Functions Incorporating Electronic Technology*

CSA C22.2 No. 0.15:15 (R2020), *Adhesive Labels*

CSA C22.2 No. 0.17:22, *Evaluation of Properties of Polymeric Materials*

CSA C22.2 No. 8-13 (R2018), *Electromagnetic Interference (EMI) Filters*

CSA C22.2 No. 14-18, *Industrial Control Equipment*

CSA C22.2 No. 18.1:13 (R2022), *Metallic Outlet Boxes*

CSA C22.2 No. 18.2:06 (R2021), *Nonmetallic Outlet Boxes*

CSA C22.2 No. 18.3:12 (R2022), *Conduit, Tubing, and Cable Fittings*

CSA C22.2 No. 18.5:22, *Positioning Devices*

CSA C22.2 No. 21-18, *Cord Sets and Power Supply Cords*

CSA C22.2 No. 24:21, *Temperature-Indicating and Regulating Equipment*

CSA C22.2 No. 38-18, *Thermoset-Insulated Wires and Cables*

CSA C22.2 No. 39-13 (R2022), *Fuseholder Assemblies*

CSA C22.2 No. 42:10 (R2020), *General Use Receptacles, Attachment Plugs, and Similar Wiring Devices*

CSA C22.2 No. 42.1:13 (R2022), *Cover Plates for Flush-Mounted Wiring Devices*

CSA C22.2 No. 43:17 (2022), *Lampholders*

CSA C22.2 No. 49-18, *Flexible Cords and Cables*

CSA C22.2 No. 53:68 (R2019), *Electric Washing Machines*

CSA C22.2 No. 55:15 (R2020), *Special Use Switches*

CSA C22.2 No. 65-18, *Wire Connectors*

CSA C22.2 No. 66.1:06 (R2020), *Low Voltage Transformers – Part 1: General Requirements*

CSA C22.2 No. 66.2-18, *Low Voltage Transformers – Part 2: General Purpose Transformers*

CSA C22.2 No. 66.3-06 (R2020), *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

CSA C22.2 No. 72:10 (2019), *Heater Elements*

CSA C22.2 No. 74:16 (R2020), *Equipment for Use with Electric Discharge Lamps*

CSA C22.2 No. 75:17 (R2022), *Thermoplastic-Insulated Wires and Cables*

CSA C22.2 No. 77:14 (R2019), *Motors with Inherent Overheating Protection*

CSA C22.2 No. 100-14 (R2019), *Motors and Generators*

CSA C22.2 No. 107.1:16 (R2021), *Power Conversion Equipment*

CSA C22.2 No. 108:14 (R2019), *Liquid Pumps*

CSA C22.2 No. 111-18, *General Use Snap Switches*

CSA C22.2 No. 112:21, *Electric Clothes Dryers*

CSA C22.2 No. 127-18, *Equipment and Lead Wires*

CSA C22.2 No. 139:19, *Electrically Operated Valves*

CSA C22.2 No. 153:14 (R2019), *Electrical Quick Connect Terminals*

CSA C22.2 No. 156-M1987 (R2018), *Solid-State Speed Controls*

CSA C22.2 No. 158:10 (R2019), *Terminal Blocks*

CSA C22.2 No. 177:13 (R2018), *Clock Operated Switches*

CSA C22.2 No. 182.3-16 (R2021), *Special Use Attachment Plugs, Receptacles, and Connectors*

CSA C22.2 No. 188-18, *Splicing Wire Connectors*

CSA C22.2 No. 190 (R2021), *Capacitors for Power Factor Correction*

CSA C22.2 No. 197:M83 (R2018), *PVC Insulating Tape*

CSA C22.2 No. 198.1:21, *Extruded Insulating Tubing*

CSA C22.2 No. 198.3:21, *Coated Electrical Sleeving*

CSA C22.2 No. 210:15 (R2020), *Appliance Wiring Material Products*

CSA C22.2 No. 223:15 (R2020), *Power Supplies with Extra-Low-Voltage Class 2 Outputs*

CSA C22.2 No. 235-04 (R2017), *Supplementary Protectors*

CSA C22.2 No. 248.1:22, *Low-Voltage Fuses – Part 1: General Requirements*

CSA C22.2 No. 248.2:00 (R2019), *Low Voltage Fuses – Part 2: Class C Fuses*

CSA C22.2 No. 248.3:00 (R2019), *Low Voltage Fuses – Part 3: Class CA and CB Fuses*

CSA C22.2 No. 248.4:00 (R2019), *Low Voltage Fuses – Part 4: Class CC Fuses*

CSA C22.2 No. 248.5:00 (R2019), *Low Voltage Fuses – Part 5: Class G Fuses*

CSA C22.2 No. 248.6:00 (R2019), *Low Voltage Fuses – Part 6: Class H Non-Renewable Fuses*

CSA C22.2 No. 248.7:00 (R2019), *Low Voltage Fuses – Part 7: Class H Renewable Fuses*

CSA C22.2 No. 248.8:11 (R2020), *Low Voltage Fuses – Part 8: Class J Fuses*

CSA C22.2 No. 248.9:00 (R2019), *Low Voltage Fuses – Part 9: Class K Fuses*

CSA C22.2 No. 248.10-11 (R2020), *Low Voltage Fuses – Part 10: Class L Fuses*

CSA C22.2 No. 248.11:11 (R2020), *Low Voltage Fuses – Part 11: Plug Fuses*

CSA C22.2 No. 248.12:11 (R2020), *Low Voltage Fuses – Part 12: Class R Fuses*

CSA C22.2 No. 248.14:00 (R2019), *Low Voltage Fuses – Part 14: Supplemental Fuses*

CSA C22.2 No. 248.15-18, *Low Voltage Fuses – Part 15: Class T Fuses*

CSA C22.2 No. 250.13:22, *Light emitting diode (LED) equipment for lighting applications*

CSA C22.2 No. 2459-08 (R2017), *Insulated Multi-pole Splicing Wire Connectors*

CSA C22.2 No. 2556:21, *Wire and cable test methods*

CSA C22.2 No. 4248.1:22, *Fuseholders – Part 1: General Requirements*

CSA C22.2 No. 4248.4:02 (R2021), *Fuseholders – Part 4: Class CC*

CSA C22.2 No. 4248.5:22, *Fuseholders – Part 5: Class G*

CSA C22.2 No. 4248.6-07 (R2021), *Fuseholders – Part 6: Class H*

CSA C22.2 No. 4248.8:18, *Fuseholders – Part 8: Class J*

CSA C22.2 No. 4248.9:07 (R2021), *Fuseholders – Part 9: Class K*

CSA C22.2 No. 4248.11-07 (R2021), *Fuseholders – Part 11: Type C (Edison Base)*

CSA C22.2 No. 4248.12-18, *Fuseholders – Part 12: Class R*

CSA C22.2 No. 4248.15-07 (R2021), *Fuseholders – Part 15: Class T*

CSA C22.2 No. 60065:16 (R2020), *Audio, Video and Similar Electronic Apparatus – Safety Requirements*

CSA C22.2 No. 60335-1:16 (R2021), *Safety of Household and Similar Electrical Appliances, Part 1: General Requirements*

CSA C22.2 No. 60691:19, *Thermal-links – Requirements and application guide*

CSA C22.2 No. 60950-1-07 (R2021), *Information Technology Equipment Safety – Part 1: General Requirements*

CSA C22.2 No. 61058-1:17 (R2022), *Switches for Appliances – Part 1: General Requirements*

CSA C22.2 No. 62368-1:19, *Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements*

CSA C360-13 (R2018), *Energy Performance and Drum Volume of Household Electric Clothes Dryers*

CSA E60384-1:14 (R2018), *Fixed Capacitors for use in Electronic Equipment – Part 1: Generic Specification*

CSA E60384-14:14 (R2018), *Fixed Capacitors for Use in Electronic Equipment Part 14: Sectional specification – Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains*

CSA E60730-1:15, *Automatic Electrical Controls for Household and Similar Use – Part 1: General Requirements*

CSA E60730-2-6:17 (R2022), *Automatic electrical controls – Part 2-6: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements*

CSA E60730-2-7:18, *Automatic Electrical Controls for Household and Similar Use – Part 2: Particular Requirements for Timers and Time Switches*

CSA E60730-2-8:17 (R2022), *Automatic Electrical Controls for Household and Similar Use – Part 2-8: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements*

CSA E60730-2-9:18, *Automatic Electrical Controls for Household and Similar Use – Part 2-9: Particular Requirements for Temperature Sensing Controls*

CSA E60730-2-15:14 (R2019), *Automatic Electrical Controls for Household and Similar Use – Part 2-15: Particular Requirements for Automatic Electrical Air Flow, Water Flow and Water Level Sensing Controls*

CSA Component Acceptance Notice 5A, *Announcement of Extension of the Component Acceptance Service for Optocouplers and Related Devices*

IEC 60127-1:2015, *Miniature Fuses – Part 1: Definitions for Miniature Fuses and General Requirements for Miniature Fuse-links*

IEC 60695-2-10:2021, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods - Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2021, *Fire Hazard Testing – Part 2-11: Glowing/Hot-Wire Based Test Methods – Glow-Wire Flammability Test Method for End-Products*

IEC 60695-2-13:2021, *Fire Hazard Testing – Part 2-13: Glowing/Hot-Wire Based Test Methods – Glow Wire Ignitability Test Method for Materials*

IEC 60695-11-10:2013, *Fire Hazard Testing – Part 11-10: Test Flames – 50 W Horizontal and Vertical Flame Test Methods*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2020, *Electromagnetic compatibility (EMC) – Part 4-3 : Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2012 RLV, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014+AMD1:2017 CSV, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6L2023 RLV, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11:22, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

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ISO 16000-9:2011, *Indoor Air – Part 9: Determination of the Emission of Volatile Organic Compounds from Building Products and Furnishing – Emission Test Chamber Method*

ISO/IEC 28360:2015, *Information Technology – Office Equipment – Determination of Chemical Emission Rates from Electronic Equipment*

NFPA 70, *National Electrical Code*

UL 20, *General-Use Snap Switches*

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UL 248-15, *Low-Voltage Fuses – Part 15: Class T Fuses*

UL 248-17, *Low-Voltage Fuses – Part 17: Class CF Fuses*

UL 248-18, *Low-Voltage Fuses – Part 18: Class CD Fuses*

UL 310, *Electrical Quick-Connect Terminals*

UL 429, *Electrically Operated Valves*

UL 486A-486B, *Wire Connectors*

UL 486C, *Splicing Wire Connectors*

UL 486E, *Equipment Wiring Terminals for Use with Aluminum Conductors and/or Copper Conductors*

UL 496, *Lampholders*

UL 498, *Attachment Plugs and Receptacles*

UL 508, *Industrial Control Equipment*

UL 508C, *Power Conversion Equipment*

UL 510, *Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape*

UL 510A, *Component Tapes*

UL 514A, *Metallic Outlet Boxes*

UL 514B, *Conduit, Tubing, and Cable Fittings*

UL 514C, *Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers*

UL 514D, *Cover Plates for Flush-Mounted Wiring Devices*

UL 635, *Insulating Bushings*

UL 723, *Test for Surface Burning Characteristics of Building Materials*

UL 746A, *Polymeric Materials – Short Term Property Evaluations*

UL 746B, *Polymeric Materials – Long Term Property Evaluations*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 746E, *Polymeric Materials – Industrial Laminates, Filament Wound Tubing, Vulcanized Fibre, and Materials Used in Printed Wiring Boards*

UL 758, *Appliance Wiring Material*

UL 778, *Motor-Operated Water Pumps*

UL 810, *Capacitors*

UL 817, *Cord Sets and Power-Supply Cords*

UL 840, *Insulation Coordination Including Clearances and Creepages Distances for Electrical Equipment*

UL 906, *Outline of Investigation for Solenoids*

UL 917, *Clock-Operated Switches*

UL 935, *Fluorescent-Lamp Ballasts*

UL 969, *Marking and Labeling Systems*

UL 1004-1, *Rotating Electrical Machines – General Requirements*

UL 1004-2, *Impedance Protected Motors*

UL 1004-3, *Thermally Protected Motors*

UL 1004-7, *Electronically Protected Motors*

UL 1012, *Power Units Other Than Class 2*

UL 1029, *High-Intensity-Discharge Lamp Ballast*

UL 1030, *Sheathed Heating Elements*

UL 1059, *Terminal Blocks*

UL 1077, *Supplementary Protectors for Use in Electrical Equipment*

UL 1097, *Double Insulation Systems for Use in Electrical Equipment*

UL 1206, *Electric Commercial Clothes-Washing Equipment*

UL 1283, *Electromagnetic Interference Filters*

UL 1310, *Class 2 Power Units*

UL 1434, *Thermistor-Type Devices*

UL 1441, *Coated Electrical Sleeving*

UL 1565, *Positioning Devices*

UL 1577, *Optical Isolators*

UL 1581, *Reference Standard for Electrical Wires, Cables, and Flexible Cords*

UL 1694, *Tests for Flammability of Small Polymeric Component Materials*

UL 1977, *Component Connectors for Use in Data, Signal, Control and Power Applications*

UL 2158, *Electric Clothes Dryers*

UL 2459, *Insulated Multi-Pole Splicing Wire Connectors*

UL 2557, *Membrane Switches*

UL 4200A, *Products Incorporating Button Batteries or Coin Cell Batteries*

UL 4248-1, *Fuseholders – Part 1: General Requirements*

UL 4248-4, *Fuseholders – Part 4: Class CC*

UL 4248-5, *Fuseholders – Part 5: Class G*

UL 4248-6, *Fuseholders – Part 6: Class H*

UL 4248-8, *Fuseholders – Part 8: Class J*

UL 4248-9, *Fuseholders – Part 9: Class K*

UL 4248-11, *Fuseholders – Part 11: Type C (Edison Base) and Type S Plug Fuse*

UL 4248-12, *Fuseholders – Part 12: Class R*

UL 4248-15, *Fuseholders – Part 15: Class T*

UL 5085-2, *Low Voltage Transformers – Part 2: General Purpose Transformers*

UL 5085-3, *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

UL 8750, *Light Emitting Diode (LED) Equipment for Use in Lighting Products*

UL 60065, *Audio, Video and Similar Electronic Apparatus – Safety Requirements*

UL 60335-1, *Household and Similar Electrical Appliances, Part 1: General Requirements*

UL 60384-14, *Safety Requirements for Fixed Capacitors for Use in Electronic Equipment - Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains*

UL 60691, *Thermal-Links – Requirements and Application Guide*

UL 60730-1, *Automatic Electrical Controls – Part 1: General Requirements*

UL 60730-2-6, *Automatic Electrical Controls – Part 2: Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements*

UL 60730-2-7, *Automatic Electrical Controls – Part 2: Particular Requirements for Timers and Time Switches*

UL 60730-2-8, *Automatic Electrical Controls – Part 2: Particular Requirements for Electrically Operated Water Valves, Including Mechanical Requirements*

UL 60730-2-9, *Automatic Electrical Controls – Part 2: Particular Requirements for Temperature Sensing Controls*

UL 60730-2-15, *Automatic Electrical Controls – Part 2: Particular Requirements for Automatic Electrical Water and Air Flow Sensing Controls*

UL 60939-3, *Passive Filter Units for Electromagnetic Interference Suppression – Part 3: Passive Filter Units for which Safety Tests are Appropriate*

UL 60950-1, *Information Technology – Safety – Part 1; General Requirements*

UL 61058-1, *Switches for Appliances – Part 1: General Requirements*

UL 61800-5-1, *Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy*

UL 62368-1, *Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements*

4 General Conditions for the Tests

4.1 Voltage and frequency

4.1.1 Unless otherwise specified in the requirements, all tests shall be conducted with the appliance connected to a supply circuit with a rated frequency and a voltage (Vs) of:

a) 120 V for an appliance rated from 110 to 120 V;

b) 240 V for an appliance rated from 220 to 240 V; or

c) the maximum rated voltage of the appliance for an appliance rated other than as mentioned in (a) or (b).

4.1.2 The test voltage (Vt) used during the heating tests of Section 11 and the abnormal operation tests of Section 19 shall be adjusted so that the calculated (see formula below) heating circuit input (Wt) is achieved. This compensates for heating elements with inputs at Vs (see 4.1.1) that are different than their rated (marked) inputs.

$$W_t = Wm(V_s / V_m)^2$$

where:

W_t = the calculated heating circuit input, *W*

W_m = the heating element rated (marked) input, *W*

V_s = the supply circuit voltage specified in 4.1.1

V_m = the heating element rated (marked) input, *V*

4.1.3 If it is necessary to increase the appliance test voltage beyond the voltage as specified in 4.1.1, the motor shall be supplied from a separate circuit not exceeding the nominal system voltage (eg, 120 V, 240 V).

4.2 Test load

4.2.1 Unless otherwise specified, the test load shall:

a) consist of cloths as described in 4.3; and

b) have a dry mass equal to the manufacturer's recommended load or 0.048 kg/L of clothes- drum volume, whichever is greater.

NOTE: Whenever a referee method is necessary to determine clothes-drum volume, the measurement is made in accordance with the method described in CSA C360 or the U.S. Department of Energy (DOE) Energy Conservation Program for Consumer Products – Paragraph 3.1 of Appendix J to Subpart B of 10 CFR 430, Uniform Test Method for Measuring the Energy Consumption of Automatic and Semi-Automatic Clothes Washers.

4.3 Test fabric

4.3.1 The fabric used for tests shall be bleached, preshrunk cotton suiting, having a warp of 55 ±2 threads per 25.4 mm and a filling of 48 ±2 threads per 25.4 mm. Individual cloths shall be 610 × 915 mm, double hemmed to a size of approximately 560 × 865 mm. A small number of smaller cloths, 305 × 305 mm, double hemmed to a size of 255 × 255 mm, may be used if necessary to make the total weight of cloth correct.

4.4 Thermocouples

4.4.1 Thermocouples shall consist of wires not larger than 24 AWG (0.21 mm^2) and not smaller than 30 AWG (0.05 mm^2). The thermocouple wire shall conform with the requirements for Special Tolerances thermocouples as listed in the Tolerances on Initial Values of EMF versus Temperature tables in ASTM E230/E230M.

4.5 Laundry detergent

4.5.1 Whenever laundry detergent is required for a test in this Standard it shall be AHAM detergent or any other powdered laundry detergent having similar properties.

4.6 Laundry bleach

4.6.1 Whenever laundry bleach is specified in this Standard, commercially available liquid chlorine bleaches for household use shall be acceptable.

4.7 Cheesecloth for heating and abnormal tests

4.7.1 Whenever cheesecloth is required for a test in this Standard, the cloth shall be bleached cheesecloth running approximately 34 g/m^2 with a thread count in the range of 10 – 13 × 9 – 12 threads/cm.

4.8 Test temperature

4.8.1 The tests shall be conducted in a draught-free location and in general at an ambient temperature in the range of 10 – 40 °C (50 – 104 °F).

5 Marking and Instructions

5.1 Marking

Advisory Note: In Canada, there are two official languages. Therefore, it is necessary to have CAUTION, WARNING, and DANGER markings in both English and French. Annex A lists acceptable translations of the markings specified in this Standard. When a product is not intended for use in Canada, cautionary markings may be provided in English only.

5.1.1 General

5.1.1.1 A marking that is required to be permanent shall be moulded, die-stamped, paint-stencilled, stamped, or etched metal that is permanently secured, or indelibly stamped on a pressure-sensitive label secured by adhesive. Pressure-sensitive labels and adhesive shall comply with CSA C22.2 No. 0.15 and UL 969. If a pressure-sensitive label would be exposed to fabric softeners, bleach, or detergent because of its location, the label shall comply with 5.1.1.2 and 5.1.1.3.

5.1.1.2 After being conditioned as described in 5.1.1.3, a pressure-sensitive label or a label secured by cement or adhesive, immediately following removal from each test medium and after being exposed to room temperature for 24 h following removal from each medium, shall:

a) demonstrate good adhesion and not have curled edges;

b) resist defacement or removal as demonstrated by scraping across the test panel with a flat metal blade 0.8 mm thick held at right angles to the test panel; and