UL 749

STANDARD FOR SAFETY

Household Dishwashers

UL Standard for Safety for Household Dishwashers, UL 749

Twelfth Edition, Dated May 25, 2023

Summary of Topics

This new edition of ANSI/UL 749 dated May 25, 2023 includes the following changes in requirements:

- ***DW Terminal Blocks***
- ***Terminal Blocks***
- ***Remote Operation of Smart Dishwashers***
- ***Remote Safety Firmware/Software Update Requirements***
- ***Appliance Filter Requirements***
- ***Annex D – Alternative Electronic Circuit Requirements***
- ***Liquid Leaking from an Auxiliary Reservoir Requirements***
- ***Circuit Interrupters with Fire Extinguishing Agent for Use in Electrical Appliances***
- ***Leakage Current Detection Requirements***
- ***Switch Requirements***
- ***Control Requirement Revisions – (removal of legacy standards)***
- ***Clarifications to the Control Requirements***
- ***French Language Requirements***
- ***Double Insulation Requirements***
- ***Nichrome Wire Test Clarification***
- ***Update to NiCr Wire Test***
- ***Unintentional Operation***
- ***Miscellaneous Revisions to Clarify the Standard***

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated April 29, 2022, November 11, 2022 and February 17, 2023.

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CSA Group
CSA C22.2 No. 167:23
Ninth Edition

ULSE Inc.
UL 749
Twelfth Edition

Household Dishwashers

May 25, 2023

Approved American National Standard

ANSI/UL 749-2023

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.

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This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the Twelfth edition.

The most recent designation of ANSI/UL 749 as an American National Standard (ANSI) occurred on May 25, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

The Department of Defense (DoD) has adopted UL 749 on August 2, 1994. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in UL's Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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Preface

This is the harmonized CSA Group and ULSE standard for Household Dishwashers. It is the ninth edition of CSA C22.2 No. 167 and the twelfth edition of UL 749. This edition of CSA C22.2 No. 167 supersedes the previous editions published in 2018. This edition of UL 749 supersedes the previous edition published in 2018.

This harmonized standard was prepared by CSA Group and ULSE. The efforts and support of the Harmonization Committee for Household Dishwashers and the Association of Home Appliance Manufactures (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 Household and Commercial Dishwashers, 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 and basic safety principles and requirements. Presentation is word for word except for editorial changes.

Reasons for Differences From IEC

This standard provides requirements for electric clothes dryers 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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Household dishwashers

1 Scope

1.1 This Standard applies to electric household dishwashers intended to be used in nonhazardous locations in accordance with CSA C22.1, Canadian Electrical Code, Part I (CE Code, Part I) and the National Electrical Code (NEC), NFPA 70, on circuits having a nominal voltage not exceeding 250 V.

1.2 This standard applies to both cord-connected appliances and permanently-connected appliances.

1.3 This Standard applies to smart-enabled household dishwashers that are intended to receive and respond to communication signals or data relating to power billing rate or demand response, or communication signals from a remote user interface such as a smart phone or computer. See Annex B.

1.4 This standard applies to household dishwashers generating ozone during normal operation. See Annex C.

1.5 This standard does not apply to commercial appliances. Commercial appliances are covered under the scope of the Standard for Commercial Dishwashing Machines, CSA C22.2 No. 168, or the Standard for Commercial Dishwashers, UL 921.

2 Referenced Publications

2.1 Where reference is made to other publications, such reference shall be considered to refer to the latest edition and any revisions thereto.

AHAM DW-2, *Household Electric Dishwashers*

ANSI Z97.1, *Safety Glazing Materials Used in Buildings-Safety Performance Specifications and Methods of Test*

ASME B94.11M, *Twist drills*

ANSI/ASME B1.20.1, *Pipe Threads, General Purpose, Inch*

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

ASTM A90/A90M-13, *Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings*

ASTM A653/A653M-15, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*

ASTM D638, *Standard Test Method for Tensile Properties of Plastics*

ASTM D1822, *Standard Test Method for Tensile-Impact Energy to Break Plastics and Electrical Insulating Materials*

ASTM E162, *Standard Tests Method for Surface Flammability of Materials Using a Radiant Heat Energy Source*

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

ASTM G30-97 (2009), *Standard Practice for Making and Using U-Bend Stress-Corrosion Test Specimens*

ASTM G36, *Standard Practice for Evaluating Stress-Corrosion-Cracking Resistance of Metals and Alloys in a Boiling Magnesium Chloride Solution*

CSA B64 Series-11, *Backflow preventers and vacuum breakers*

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

CSA C22.2 No. 0-10, *General Requirements – Canadian Electrical Code (CEC), Part II*

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

CSA C22.2 No. 0.2, *Insulation Coordination*

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

CSA C22.2 No. 0.15, *Adhesive Labels*

CAN/CSA-C22.2 No. 0.17, *Evaluation of Properties of Polymeric Materials*

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

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

CSA C22.2 No. 18.1, *Metallic Outlet Boxes*

CSA C22.2 No. 18.2, *Nonmetallic Outlet Boxes*

CSA C22.2 No. 18.3, *Conduit, Tubing, and Cable Fittings*

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

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

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

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

CSA C22.2 No. 39, *Fuseholder Assemblies*

CSA C22.2 No. 42, *General Use Receptacles, Attachment Plugs, and Similar Wiring Devices*

CSA C22.2 No. 42.1, *Cover Plates for Flush-Mounted Wiring Devices*

CSA C22.2 No. 43, *Lampholders*

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

CSA C22.2 No. 55, *Special Use Switches*

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

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

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

CSA C22.2 No. 66.3, *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

CSA C22.2 No. 72, *Heater Elements*

CSA C22.2 No. 74, *Equipment for Use with Electric Discharge Lamps*

CSA C22.2 No. 75, *Thermoplastic Insulated Wires and Cables*

CSA C22.2 No. 77, *Motors with Inherent Overheating Protection*

CSA C22.2 No. 100, *Motors and Generators*

CSA C22.2 No. 107.1, *General Use Power Supplies*

CSA C22.2 No. 108, *Liquid Pumps*

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

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

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

CSA C22.2 No. 144, *Ground Fault Circuit Interrupters*

CSA C22.2 No. 153, *Electrical Quick-Connect Terminals*

CSA C22.2 No. 156, *Solid-State Speed Controls*

CSA C22.2 No. 158, *Terminal Blocks*

CSA/ANSI Z83.21:20/CSA C22.2 No. 168, *Commercial Dishwashers*

CSA C22.2 No. 177, *Clock-Operated Switches*

CSA C22.2 No. 182.3, *Special Use Attachment Plugs, Receptacles, and Connectors*

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

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

CSA C22.2 No. 197, *PVC Insulating Tape*

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

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

CSA C22.2 No. 210, *Appliance Wiring Material Products*

CSA C22.2 No. 223, *Power Supplies with Extra-Low-Voltage Class 2 Outputs*

CSA C22.2 No. 235, *Supplementary Protectors*

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

CSA C22.2 No. 250.4, *Portable Luminaires*

CSA C22.2 No. 2459, *Insulated Multi-pole Splicing Wire Connectors*

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

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

CSA C22.2 No. 4248 series

CSA Component Acceptance Notice No. 5A

CAN/CSA-C22.2 No. 61058-1, *Switches for Appliances – Part 1: General Requirements*

CAN/CSA-C22.2 No. 60950-1, *Information Technology Equipment – Safety – Part 1: General Requirements*

CSA E60730-1, *Automatic electrical controls – Part 1: General requirements*

CAN/CSA-E60730-2-6, *Automatic electrical controls – Part 2-6: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements*

CAN/CSA-E60730-2-7, *Automatic electrical controls – Part 2-7: Particular requirements for timers and time switches*

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

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

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

CSA C22.2 No. 60691, *Thermal Links – Requirements and Application Guide*

CSA C22.2 No. 62368-1, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

IEC 60127-1-06, *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links*

IEC 60335-1, *Safety of Household and Similar Electrical Appliances, Part 1: General Requirements*

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

IEC 60695-2-13, *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 61000-4-2-08, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3-06, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4-12, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5-14, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6-13, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11-04, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-13-02, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*

NFPA 70, *National Electrical Code*

UL 20, *General-Use Snap Switches*

UL 44, *Thermoset-Insulated Wires and Cables*

UL 62, *Flexible Cords and Cables*

UL 66, *Fixture Wire*

UL 83, *Thermoplastic-Insulated Wires and Cables*

UL 94, *Test for Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 101, *Leakage Current For Utilization Equipment*

UL 157, *Gaskets and Seals*

UL 224, *Extruded Insulating Tubing*

UL 248-1, *Low-Voltage Fuses – Part 1: General Requirements*

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UL 310, *Electrical Quick-Connect Terminals*

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

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

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

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UL 778, *Motor-Operated Water Pumps*

UL 796 *Printed Wiring Boards*

UL 810, *Capacitors*

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

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

UL 873, *Temperature-Indicating and -Regulating Equipment*

UL 906, *Outline for Solenoids*

UL 921, *Commercial Dishwashers*

UL 935, *Fluorescent-Lamp Ballasts*

UL 943, *Ground-Fault Circuit-Interrupters*

UL 969, *Marking and Labeling Systems*

UL 991, *Tests for Safety-Related Controls Employing Solid-State Devices*

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 1053, *Ground-Fault Sensing and Relaying Equipment*

UL 1059, *Terminal Blocks*

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

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

UL 1310, *Class 2 Power Units*

UL 1332, *Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment*

UL 1434, *Thermistor-Type Devices*

UL 1439, *Tests for Sharpness of Edges on Equipment*

UL 1441, *Coated Electrical Sleeving*

UL 1446, *Safety Systems of Insulating Materials*

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 1998, *Software in Programmable Components*

UL 2353, *Single- and Multi-Layer Insulated Winding Wire*

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

UL 2557, *Membrane Switches*

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

UL 60730-2-15, *Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Air Flow, Water Flow and Water Level Sensing Controls*

UL 60730-2-18, *Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Water and Air Flow Sensing Controls, Including Mechanical Requirements*

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

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

UL 61058-1 series

UL 60692, *Outline of Investigation for Circuit Interrupters with Fire Extinguishing Agent for Use in Electrical Appliances and Components* – Issue 1

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

3 Definitions

3.1 For the purposes of this standard, where practical, the term “appliance” has been used instead of "dishwasher" or "machine."

3.2 The definitions in 3.3 – 3.32 apply in this standard.

3.3 APPLIANCE, AUTOMATIC – An appliance equipped with a timer switch or an equivalent control that, after the appliance has been energized, governs the sequence and duration of the various portions of the operating cycle, including its termination.

3.4 APPLIANCE, BUILT-IN – An appliance that is constructed to be permanently installed in a cabinet or wall.

3.5 APPLIANCE, CORD-CONNECTED – An appliance that is connected to the electrical supply by a power-supply cord terminating in an attachment plug of configuration 5-15P or 5-20P.

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

3.7 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 may serve as a portion of an enclosure and as a functional part.

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

3.9 CIRCUIT, LOW-VOLTAGE – A circuit having limited voltage and energy capacity supplied by the following:

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: 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.

3.10 CONTROL, OPERATING – Control, the operation of which starts or regulates the appliance during normal operation.

3.11 CONTROL, PROTECTIVE – Control, the operation of which is intended to prevent the risk of electric shock, fire, or injury to persons during 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.

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

Note: With respect to Separation of Circuits, 21.3, this term refers to parts in both low-voltage and line-voltage circuits.

3.13 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.

3.14 ENCLOSURE – A material used to:

a) Limit accessibility of all or any parts of the product that might otherwise present a risk of electric shock or injury to persons; and

b) Retard propagation of flame initiated by electrical disturbances that might occur within the product.

3.15 FIELD WIRING TERMINAL – A terminal to which a wire can be connected in the field. A wire that is provided as part of the appliance and is provided with a means of making the connection that is factory-assembled to the wire is not considered a field wiring terminal. The following are examples of means of making wiring connections:

a) A pressure wire connector;

b) Soldering lugs;

c) A soldered loop; or

d) A crimped eyelet.

3.16 FLAME CYLINDER – A projection of a vertical cylinder having a diameter of 20 mm (0.79 in) and a height of 50 mm (2 in), placed above the center of the connection zone(s) and on top of any polymeric parts that are supporting current-carrying electrical connections as shown in Figure 30.3.

3.17 HEATER ASSEMBLY – An assembly of:

a) A heating element;

b) Electrical insulation (e.g., refractory, mica, magnesium oxide); and

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

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

3.19 LOCATION, OUTDOOR – An area that is open and subjected to the full effects of weathering. A dishwasher intended for installation in a protected location is required to comply with the requirements for dishwashers intended for installation outdoors.

3.20 LOCATION, PROTECTED – An outdoor location that is partially protected from the effects of weathering by installation in a cabinet or wall or by the use of a roof, canopy, marquee, or similar protective structure.

3.21 LOW-POWER CIRCUIT – Circuits where the power available is limited to 15 watts.

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

3.23 NORMAL CYCLE – The cycle type recommended by the manufacturer for completely washing a full load of normally soiled dishes, including the power-dry feature.

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

3.25 PART, FUNCTIONAL – A part 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.

3.26 POWER-DRY FEATURE – That function in a cycle in which electrically generated heat is introduced into the washing compartment for the purpose of improving the drying performance of the appliance.

3.27 RISK OF ELECTRIC SHOCK – For indoor use appliances, 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:

a) 30 V rms;

b) 42.4 V peak;

c) 60 V dc continuous; or

d) 24.8 V peak for DC interrupted at a rate of 200 Hz or less with approximately 50 percent duty cycle.

For outdoor use appliances, or appliances used in a protected location, 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:

1) 15 V rms;

2) 21.2 Vac peak; or

3) 30 V continuous dc.

Note: Either a low-voltage circuit or the secondary circuit of a Class 2 circuit does not involve a risk of electric shock.

3.28 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 watts can be delivered into an external resistor connected between the two points at the end of 5 seconds.

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

3.29 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.

3.30 TEMPERATURE-REGULATING AND -LIMITING DEVICE, COMBINED – 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.

3.31 TEMPERATURE-REGULATING DEVICE – A device that:

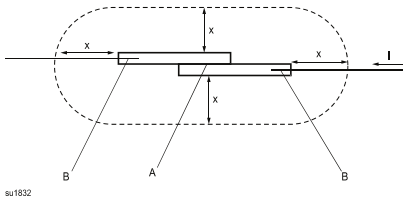
a) Regulates temperature; and

b) Functions during normal operation of the appliance.

3.32 WITHIN 3MM – Falling within the dotted boundary formed by the cylinder with hemispherical ends, as shown in Figure 3.1.

Figure 3.1

Definition of "Within 3 mm of an Electrical Connection"



Note: "Within 3 mm of an electrical connection" means falling within the dotted boundary formed by the cylinder with hemispherical ends, as shown in the above drawing.

A Terminal connection zone

B Wire crimp connection zone

I Current through the connection

X Distance from the connection

4 General Requirements

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

4.2 In Canada, general requirements applicable to this standard are given in CSA C22.2 No. 0 and grounding and bonding requirements are given in C22.2 No. 0.4.

5 General Conditions for the Tests

5.1 Voltage and frequency

5.1.1 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 (V_s) 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 specified in (a) or (b).

5.1.2 The test voltage (V_t) used during the heating tests of Section 12 and the abnormal operation tests of Section 17 shall be adjusted so that the calculated (see formula below) heating circuit input (W_t) is achieved during the heated wash cycle of the appliance. This compensates for heating elements with inputs at V_s (see 5.1.1) that are different than their rated (marked) inputs.

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

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 5.1.1

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

5.1.3 If it is necessary to increase the heater test voltage as specified in 5.1.2 through a separate circuit, the rest of the appliance shall be supplied at the voltage specified in 5.1.1.

5.1.4 If an appliance is rated for more than one frequency, testing shall be conducted at the frequency that would result in the highest temperature condition.

5.2 Cheesecloth for heating and abnormal tests

5.2.1 Whenever cheesecloth is required for a test in this standard, the cloth shall be bleached cheesecloth measuring approximately 34 g/m^2 (lbs-/ft^2) with a thread count in the range of 10 – 13 × 9 – 12 threads/cm.

5.3 Test temperature

5.3.1 The tests shall be conducted in a draft-free location and, unless otherwise specified, at an ambient temperature in the range of 10 – 40 °C (50 – 104 °F).

5.4 Thermocouples

5.4.1 Thermocouples shall consist of wires not larger than 24 AWG (0.21 mm^2). The thermocouple wire shall conform with the requirements for special thermocouples as specified in the Initial Calibration Tolerances for Thermocouples table in ASTM E230/E230M.

5.5 Dishwashing detergent

5.5.1 If a dishwashing detergent is required for a test in this standard, it shall:

a) Have the following formula by mass:

Sodium carbonate	40 %
Sodium tripolyphosphate	25 %
Sodium sulfate	15 %
Water	10 %
Sodium silicate solids	8 %
Nonionic surfactant (low-foaming alcohol alkoxylate)	1 %
Sodium dichloroisocyanurate	1 %

or

b) Be a powdered dishwashing detergent as specified in AHAM DW-1, or any other powdered dishwashing detergent having similar properties.

5.6 Rinse agent

5.6.1 If a rinse agent is required for a test in this standard, it shall be a rinse agent recommended by the manufacturer.

5.7 Place setting

5.7.1 If a test load or a place setting is required for a test in this standard, the place setting shall consist of dishes and cutlery as specified in AHAM DW-2.

5.8 High-sudsing detergent

5.8.1 If a high-sudsing detergent is required for a test in this standard, it shall be any commercially available liquid handwashing dish soap.

5.9 Water temperature

5.9.1 If a test in this standard requires that an appliance be connected to a water supply, an appliance shall be connected to a hot-water supply with a nominal water temperature of 60 ±2 °C (140 ±3.6 °F).

5.9.2 For an appliance with a water-heating feature intended to be connected to a cold-water supply in accordance with the installation instructions of 8.3.5, testing shall be repeated with the appliance connected to a cold-water supply with a nominal temperature of 15 ±5 °C (59 ±9 °F), unless the water temperature does not affect the test results.

5.9.3 For an appliance with a water-heating feature intended to be connected to a hot-water supply in accordance with the installation instructions of 8.3.5, testing shall be repeated with the appliance connected to a hot-water supply with a nominal temperature of 50 ±2 °C (122 ±3.6 °F), unless the water temperature does not affect the test results.

6 Classification

6.1 Appliances shall be grounded or double-insulated with respect to electric shock.

6.2 Appliances shall have the appropriate degree of protection against ingress of water that might introduce a risk of fire or electric shock (see 15.5).

7 Marking

Advisory Note: *In Canada, there are two official languages, English and French. Therefore, it is necessary to have CAUTION, WARNING, and DANGER markings in both English and French. Annex E provides acceptable examples of French translations of the markings specified in this standard. Markings required by this standard may have to be provided in other languages to conform with the language requirements of the country where the product is to be used.*

7.1 General

7.1.1 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. Adhesive labels shall comply with CSA C22.2 No. 0.15 and UL 969. If adhesive labels will be exposed to detergents or rinse agents, they shall also comply with 7.1.2 and 7.1.3.

7.1.2 After being conditioned as described in 7.1.3, an adhesive label, 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 0.81 mm (0.03 in) thick held at right angles to the test panel; and

c) Be legible and resist defacement when rubbed with thumb or finger pressure.

7.1.3 Three samples of the label specified in 7.1.2 shall be applied to test surfaces as intended in the application and shall be conditioned for 24 h in a controlled atmosphere maintained at 23 ±2 °C (73.4 ±3.6 °F). with a 50 ±5 percent relative humidity. The samples shall then be immersed for 48 h in a solution representative of the solution used during a normal cycle, maintained at the temperature the solution would attain during a normal cycle, but not less than 23 ±2 °C (73.4 ±3.6 °F).

7.1.4 A marking on a readily removable part shall not be acceptable.

7.1.5 A cautionary marking that is required to be permanent shall be located on a part that:

a) Requires the use of a tool for removal;