



TEST REPORT

UL 499

Standard for Electric Heating Appliances

Report Number.....: DNT241107S1559-3689

Tested by
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Reviewed by
(printed name and signature): Bob Wang

Approved by
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Testing laboratory name.....: Dongguan DN Testing Co., Ltd.

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Applicant's name: Dezhou Zhongying Automobile Supplies Sales Co., Ltd

Address: No.26, Section 1, Comprehensive Building, JingyuanCommunity, 59
Yingbin Road, Decheng District, Dezhou City

Manufacturer's name: Dezhou Zhongying Automobile Supplies Sales Co., Ltd

Address: No.26, Section 1, Comprehensive Building, JingyuanCommunity, 59
Yingbin Road, Decheng District, Dezhou City

Test specification:

Standard: UL 499: February 07, 2017 Standard for Electric Heating
Appliances

Test procedure.....: UL report

Non-standard test method.....: N/A

General disclaimer:

The test results presented in this report relate only to the object tested.

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Dongguan DN Testing Co., Ltd.

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Test item description	Plastic welder
Trade Mark(s)	N/A
Manufacturer	Dezhou Zhongying Automobile Supplies Sales Co., Ltd
Model/Type reference	XCER-110
Ratings	Input: 110V~, 50/60Hz, 100W

Summary of construction and testing:

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items:

Lab information:



List of Attachments (including a total number of pages in each attachment): Attachment 1: Photo documentation (2 pages)	
Summary of testing:	
Tests performed (name of test and test clause): The sample(s) tested complies with the requirements of UL 499: February 07, 2017. When determining the test conclusion, the Measurement Uncertainty of test has been considered.	Testing location: Dongguan DN Testing Co., Ltd. Add: No. 1, West Fourth Street, Xingfa South Road, Wusha Community, Chang 'an Town, Dongguan City, Guangdong P.R.China
Summary of compliance with National Differences (List of countries addressed): N/A	

**Copy of marking plate:**

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Plastic welder

Model: XCER-110

Ratings: 110V~, 50/60Hz, 100W

Manufacturer: Dezhou Zhongying Automobile Supplies Sales Co., Ltd

**Remark:**

The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.



Test item particulars:	
Classification of installation and use:	Class II
Supply connection:	Connected to AC source
Possible test case verdicts:	
- test case does not apply to the test object	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement	F (Fail)
Testing:	
Date of receipt of test item:	2024-05-30
Date (s) of performance of tests	2024-05-30 to 2024-05-31
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.	
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.	
General product information and other remarks:	
Product Description – Plastic welder, Class II apparatus, indoor used only.	
Model Differences: N/A	
Additional application considerations – (Considerations used to test a component or sub-assembly) – N/A	
Name and address of factory (ies) : /	



UL 499			
Clause	Requirement – Test	Result – Remark	Verdict
5	General		P
5.1	A heating appliance intended for use in a hazardous location is judged on the basis of its compliance with the requirements in this Standard, and further appropriate examination and tests to determine whether it is acceptable for the purpose.		P
5.2	Only materials that are acceptable for the particular use shall be used in a heating appliance. A heating appliance shall be made and finished with the degree of uniformity and grade of workmanship practicable in a well- equipped factory.		P
5.3	If the operation of a heating appliance involves the generation and confining under pressure of steam or other gas, consideration is to be given to the possibility of risk of explosion incident to such operation. This applies in the case of a product having immersed electrodes, where the electrolysis of water may result in the accumulation of oxygen and hydrogen. The product is not acceptable unless its strength has been investigated with respect to any risk of explosion that may be involved.		N/A
5.4	Adhesive guns shall be constructed such that adhesive is not discharged on the user's hand during normal operation.		N/A
6	Components		P
6.1	General		P
6.1.1	Except as indicated in 6.1.2, a component of a product covered by this Standard shall comply with the requirements for that component as indicated in 6.2.		P
6.1.2	A component of a product covered by this standard is not required to comply with a specific requirement that:		P
	a) Involves a feature or characteristic not required in the application of the component in the product,		N/A
	b) Is superseded by a requirement in this standard, or		N/A
	c) Is separately investigated when forming part of another component, provided the component is used within its established rating and limitations.		N/A
6.1.3	A component shall be used in accordance with its rating established for the intended conditions of use.		P



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6.1.4	A component that is also intended to perform other functions, such as over current protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall comply additionally with the requirements of the applicable Standard(s) that cover devices that provide those functions.		P
6.1.5	Unless they also comply with the requirements of 6.2, components complying with standards other than those cited are not acceptable.		P
6.1.6	Components not anticipated by the requirements of this Standard, not specifically covered by a component standard of 6.2, and which pose a potential risk of electric shock, fire or casualty hazard shall be additionally investigated. Reference to other product standards is appropriate where those standards anticipate normal and abnormal use conditions consistent with the application of this Standard.		P
6.1.7	Components shall not contain mercury.		P
6.2	Requirements for Components		P
6.2.1	Insulated Wire, Cable and Cords		P
6.2.1.1	A cord set or power supply cord shall comply with the Standard for Cord Sets and Power Supply Cords, UL 817.		P
6.2.1.2	Flexible cord and cables shall comply with the Standard for Flexible Cords and Cables, UL 62. Flexible cord and cables are considered to fulfill this requirement when preassembled in a cord set or power supply cord complying with Standard for Cord Sets and Power Supply Cords, UL 817.		P
6.2.1.3	Internal wiring composed of insulated conductors shall comply with the Standard for Appliance Wiring Material, UL 758.		N/A
6.2.1.4	The requirements for film coated wire and Class 105 (A) insulation systems are not specified.		N/A
6.2.1.5	Film coated wire in intimate combination with one or more insulators, and incorporated in an insulation system rated Class 120 (E) or higher, shall comply with the magnet wire requirements in the Standard for Systems of Insulating Materials – General, UL 1446.		N/A
6.2.2	Attachment Plugs, Receptacles, Connectors and Terminals		P



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6.2.2.1	Attachment plugs (including appliance and flat iron plugs) and receptacles that may be detached during use shall comply with the Standard for Attachment Plugs and Receptacles, UL 498, or as appropriate, the Standard for Plugs, Receptacles and Cable Connectors of the Pin and Sleeve Type, UL1682.		P
6.2.2.2	Electrical splices and connections accomplished via devices complying with the Standard for Electrical Quick – Connect Terminals, UL 310.		N/A
6.2.2.3	Insulated splices complying with the Standard for Splicing Wire Connectors, UL 486C, (or the Standard for Electrical Quick-Connect Terminals, UL 310, are considered to fulfill the requirement of Section 16.		N/A
6.2.2.4	Terminal blocks shall comply with the Standard for Terminal Blocks, UL 1059, and where appropriate be indicated as suitable for field wiring.		N/A
6.2.3	Switches		N/A
6.2.3.1	Switches shall comply with the Standard for Switches for Appliances – Part 1: General Requirements, UL 61058-1.		N/A
6.2.4	Low-Voltage Circuit Transformers		N/A
6.2.4.1	A transformer complying with the Standard for Low Voltage Transformers – Part 1: General Requirements, UL 5085-1 and the Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3, need not comply with 14.4.2.		N/A
6.2.5	Light Sources and Associated Components		N/A
6.2.5.1	Lamp holders and indicating lamps with integral lamp/lamp holder (e.g. neon pilot lamp) shall comply with the Standard for Lamp holders, UL 496. Lamp holders forming part of a luminaire that complies with an appropriate luminaire standard are considered to fulfill this requirement.		N/A
6.2.5.2	Lighting ballasts shall comply with the Standard for Fluorescent-Lamp Ballasts, UL 935, or the Standard for High-Intensity Discharge Lamp Ballasts, UL 1029. Ballasts forming part of a luminaire that complies with an appropriate luminaire standard are considered to fulfill this requirement.		N/A
6.2.5.3	Light emitting diode (LED) light sources shall comply with the Standard for Light Emitting Diode (LED) Equipment For Use In Lighting Products, UL 8750. LED light sources forming part of a luminaire that complies with an appropriate luminaire standard are considered to fulfill this requirement.		N/A



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6.2.6	Heating Devices		P
6.2.6.1	Insulated heating wire shall comply with the Standard for Appliance Wiring Material, UL758.		P
6.2.6.2	Thermistor-type heaters (e.g. PTC heater) shall comply with the Standard for Thermistor-Type Devices, UL 1434.		N/A
6.2.6.3	A flexible heating device shall comply with applicable requirements in the Standard for Electric Heating Pads, UL 130.		N/A
6.2.7	Controls		N/A
6.2.7.1	A thermal cutoff shall comply with the Standard for Thermal-Links – Requirements and Application Guide, UL 60691.		N/A
6.2.7.2	Except where superseded in this standard, a temperature control that complies with the construction requirements of the Standard for Temperature-Indicating and - Regulating Equipment, UL 873; the Standard for Limit Controls, UL 353; or the Standard for Automatic Electrical Controls – Part 1: General Requirements, UL 60730-1, and the Standard for Automatic Electrical Controls – Part 2-9: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9, is Considered to comply with the construction requirements of this standard. See Testing of Component Switches and Control Devices, Section 43 for performance requirements.		N/A
6.2.8	Cord Reel		N/A
6.2.8.1	A cord reel shall comply with “special use cord reel” requirements of the Standard for Cord Reels, UL 355.		N/A
6.2.9	Overcurrent Protection		N/A
6.2.9.1	Fuses shall comply with the Standard for Low-Voltage Fuses – Part 1: General Requirements, UL 248-1, and the applicable subsequent part (e.g. UL 248-5). Defined use fuses that comply with UL 248-1 and another appropriate standard for the fuse are considered to fulfill this requirement.		N/A
6.2.9.2	Fuse holders shall comply with the Standard for Fuse holders – Part 1: General Requirements, UL 4248-1, and applicable subsequent part (e.g. UL 4248-9).		N/A



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6.2.9.3	Circuit breakers shall comply with the Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures, UL 489.		N/A
6.2.9.4	Circuit breakers having integral ground fault circuit interrupter capability for protection against electrical shock shall additionally comply with the Standard for Ground-Fault Circuit-Interrupters, UL 943.		N/A
6.2.10	Ground-Fault, Arc-Fault and Leakage Current Detectors/Interrupters		N/A
6.2.10.1	Ground-fault circuit-interrupters (GFCI) for protection against electrical shock shall comply with the Standard for Ground-Fault Circuit- Interrupters, UL 943.		N/A
6.2.10.2	Appliance-leakage-current interrupters (ALCI) for protection against electrical shock shall comply with the Standard for Appliance- Leakage-Current Interrupters, UL 943B. An ALCI is not considered an acceptable substitute for a GFCI when a GFCI is required by the National Electrical Code, NFPA 70.		N/A
6.2.10.3	Equipment ground-fault protective devices shall comply with the Standard for Ground-Fault Sensing and Relaying Equipment, UL 1053, and applicable requirements of the Standard for Ground-Fault Circuit-Interrupters, UL 943.		N/A
6.2.10.4	Arc-fault circuit-interrupters (AFCI) shall comply with the Standard for Arc-Fault Circuit- Interrupters, UL 1699.		N/A
6.2.10.5	Leakage-current detector-interrupters (LCDI) and any shielded cord between the LCDI and appliance shall comply with the Standard for Arc-Fault Circuit-Interrupters, UL 1699.		N/A
6.2.11	Power Supplies		N/A
6.2.11.1	Power supplies that comply with the Standard for Class 2 Power Units, UL 1310, are considered to fulfill Class 2 output requirements of this Standard. They need not be additionally investigated if they comply with 6.1.3 when installed as intended in or on the appliance		N/A
6.2.11.2	Power supplies that comply with Standard for Power Units Other Than Class 2, UL 1012, are considered to fulfill the requirements of this Standard. They need not be additionally investigated if they comply with 6.1.3 when installed as intended in or on the appliance.		N/A



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6.2.12	Supplemental Insulation, Insulating Bushings and Assembly Aids		P
6.2.12.1	The requirements for supplemental insulation (e.g. tape, sleeving or tubing) are not specified unless the insulation or device is required to fulfill 14.3.3 or a performance requirement of this Standard. In such cases:		P
	a) Sleeving shall comply with the Standard for Coated Electrical Sleeving, UL 1441,		P
	b) Tubing shall comply with the Standard for Extruded Insulating Tubing, UL 224.		P
6.2.12.2	Wire positioning devices shall comply with Sections 15 and 17. A device that complies with the Standard for Positioning Devices, UL 1565, is considered to fulfill this requirement.		P
6.2.12.3	Insulating bushings that comply with the Standard for Insulating Bushings, UL 635, and 6.1.3 are considered to fulfill the requirements of this Standard. Tests specified in this standard (e.g. Strain Relief Test) may still need to be performed to confirm the combination of the insulating bushing and the supporting part are suitable.		P
6.2.13	Gaskets and Seals		N/A
6.2.13.1	Gaskets and seals that comply with the Standard for Gaskets and Seals, UL 157, are considered to fulfill the requirements of 36.1.4 and 36.1.5.		N/A
6.2.14	Printed Wiring Boards		N/A
6.2.14.1	Printed wiring boards shall comply with the Standard for Printed-Wiring Boards, UL 796. Unless otherwise specified, the flammability class shall be that specified for insulating materials.		N/A
7	Frame and Enclosure		P
7.1	The frame and enclosure of a heating appliance shall be strong and rigid to resist the abuses to be encountered during intended use. The degree of resistance inherent in the product shall preclude total and partial collapse with the attendant reduction of spacings, loosening or displacement of parts, and other defects which alone or in combination constitute an increase in the risk of fire, electric shock, or injury to persons.		P
7.2	Pet heating mats/pads are evaluated as follows:		N/A
	a) Rigidly enclosed pet heating mats/pads are evaluated to the applicable requirements detailed in this Standard.		N/A



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	b) Semi-rigid pet heating mats/pads are evaluated to the applicable requirements detailed in this Standard including the performance testing of 32.2, Sections 36.14 and 37; and the construction requirements for Envelope and Insulation in Sections 6 and 7 of the Standard for Electric Heating Pads, UL 130. These appliances are for indoor use only.		N/A
	c) Flexible pet heating mats/pads are evaluated to the applicable requirements of this Standard including the performance test of Section 37; and the Standard for Electric Heating Pads, UL 130. These appliances are for indoor use only		N/A
7.3	A vaporizer water reservoir of glass or similar material that might, upon breaking, cause skin lacerations shall be resistant to thermal-shock and impact.		N/A
7.4	A heating appliance shall be provided with an enclosure of material acceptable for the application, that shall house all electrical parts, except a supply cord and a recessed open-wire-element unit as mentioned in 15.3, that may result in risk of electric shock or injury to persons under any condition of use. If a heater is for permanent installation (intended for permanent connection to the power supply), the enclosure shall be provided with means for mounting in the intended manner and shall be furnished with any necessary fittings, such as brackets, hangers, or the like.		N/A
7.5	If openings for ventilation are provided in the enclosure of a heating appliance or in an externally mounted component intended for permanent connection to the power supply, they shall be so located that they will not vent into concealed spaces of a building structure, such as into false-ceiling space, into hollow spaces in the wall, and the like, when the product is installed.		N/A
7.6	Among the factors when an enclosure is being considered for acceptability, are its:		P
	a) Physical strength;		P
	b) Resistance to impact;		P
	c) Moisture-absorptive properties;		P
	d) Combustibility		P
	e) Resistance to corrosion; and		P
	f) Resistance to distortion at temperatures to which the enclosure may be subjected under conditions of use.		P



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7.7	A polymeric enclosure of outdoor use equipment shall comply with requirements contained in the Standard for Polymeric Materials – Use in Electrical Equipment, UL 766C, outdoor use requirements.		N/A
7.8	Outdoor use equipment shall be subjected to the Test of Insulation Resistance and Leakage Current as a Result of Moisture, Section 37, with acceptable results.		N/A
7.9	The enclosures of semi-rigid enclosed and flexible pet heating mats/pads shall have a minimum V-2 enclosure.		N/A
7.10	Rigid molded enclosure parts of a semi-rigid enclosed or flexible pet heating mat/pad shall comply with the requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 766C.		N/A
7.11	Cast- and sheet-metal portions of the enclosure shall be no thinner than indicated in Table 7.1 unless the enclosure complies with 7.6 and 7.12.		N/A
7.12	In addition to the factors in 7.6, an enclosure of sheet metal is to be considered with respect to its size and shape, the thickness of metal and the intended use of the product.		P
7.13	Electrical parts of a heating appliance, including open-wire elements, shall be so located or enclosed that protection against unintentional contact with uninsulated live parts will be provided (see also 25.6). Insulated motor brush caps do not require additional enclosure.		N/A
7.14	The enclosure shall be such that molten metal, burning insulation, flaming particles, or the like, is not likely to fall on combustible materials, including the surface upon which the enclosure is supported.		P
7.15	The requirement in 7.14 necessitates use of a barrier of metal, phenolic, urea, ceramic or similar material:		N/A
	a) Under a motor unless:		N/A
	b) Under wiring, unless it complies with the VW- 1 (Vertical-Specimen) Flame Test described in the Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581.		N/A



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7.16	The requirement in 7.14 also necessitates that a switch, transformer, relay, solenoid, or the like, be individually and completely enclosed except at terminals, unless it can be shown that malfunction of the component is not likely to result in a fire, or unless there are no openings in the bottom of the enclosure. An opening in the bottom of the enclosure is not acceptable if it is located directly below field- or factory-made splices or overload or overcurrent protective devices.		N/A
7.17	The barrier mentioned in 7.15 shall be horizontal, shall be located as indicated in Figure 7.1, and shall not have an area less than that described in that illustration. Openings for drainage, ventilation, and the like, may be employed provided molten metal, burning insulation, or the like, is not likely to fall through the opening onto combustible material.		N/A
7.18	The criteria for judging a heating appliance enclosure, other than as described in 7.13, are given in 7.20 and 7.21 and in the following items and related illustrations:		P
	a) An opening in the enclosure is acceptable if the probe (illustrated in Figure 7.2), when inserted into the opening, cannot be made to touch any uninsulated live part of film-coated wire that involves a risk of electric shock. The probe is to be applied to any depth that the opening will permit; and shall be rotated and articulated in all possible configurations before, during and after insertion.		P
	b) An opening that will not prevent entrance of the probe as mentioned in (a) is acceptable under the conditions described in Figure 7.3.		P
7.19	The opening illustrated in Figure 7.3 is acceptable if, within the enclosure, there is no uninsulated live part or enamel-insulated wire less than X distance from the perimeter of the opening, as well as within the volume generated by projecting the perimeter X distance perpendicular to its plane. X equals five times the diameter of the largest diameter rod which can be inserted through the opening, but not less than 4 inches (102 mm). In evaluating an opening, any barrier located within the volume usually is ignored unless it intersects the boundaries of the volume in a continuous, closed line. 7.20 Although meeting the requirements in 7.18, an opening is unacceptable:		N/A
	a) Anywhere in the enclosure of a hand- supported product; or		N/A



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	b) In any portion of a product hand-held during use if a probe as illustrated in Figure 7.4, when inserted point first a maximum distance of 2 inches (50.8 mm) into the opening touches any uninsulated live part or touches any enamel- insulated wire.		N/A
7.21	If a marking draws the user's attention to a hole of any size in the enclosure for the adjustment of a thermostat or for a similar activity, it shall not be possible to damage insulation or contact uninsulated live parts through the hole with a 1/16 inch (1.6 mm) diameter rod.		N/A
7.22	During the examination of a heating appliance in connection with the requirements in 7.13 – 7.18, a part of the outer enclosure that may be removed without the use of tools by the user of the product (for the attachment of accessories, for access to means for making operating adjustments, or for other reasons) is to be disregarded – that is, it is not to be assumed that the part in question affords protection against risk of electric shock. A warning marking, such as that specified in 53.6 is not considered to eliminate this risk of electric shock.		N/A
7.23	Any moving parts, such as rotors of motors, chains, pulleys, belts, and gears, shall be enclosed or guarded to reduce the risk of injury to persons.		N/A
7.24	With reference to the requirement in 7.23, the degree of protection required of the enclosure depends upon the general design and intended use of the product. The factors to be taken into consideration in judging the acceptability of exposed moving parts are:		N/A
	a) The degree of exposure;		N/A
	b) The sharpness of the moving parts;		N/A
	c) The likelihood of unintentional contact with the moving parts		N/A
	d) The speed of movement of those parts; and		N/A
7.25	The door or cover of an enclosure shall be provided with a means for securing it in place in the closed position.		N/A
7.26	The door or cover of an enclosure shall be hinged or otherwise attached in an equivalent manner if it gives access to any overload protective device whose functioning requires renewal, or if it is necessary to open the cover in connection with the operation of the protective device. Such a door or cover shall be provided with a latch or the equivalent, and shall be tight-fitting or shall overlap the surface of the enclosure around the opening.		N/A



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7.27	A component of a heating appliance that is likely to need inspection, replacement, cleaning, or other servicing shall be as accessible as possible. Except as noted in 7.28, the component shall be readily accessible without the use of special tools – tools not available to other than service personnel – if it is intended to be manually operated or adjusted or periodically serviced.		P
7.28	If a product is intended primarily for use in public places, such as gas stations, theaters, bus terminals, or the like:		N/A
	a) The construction may be such that special tools are required to gain access to components that are likely to need inspection, replacement, cleaning, adjustment, or other servicing.		N/A
	b) A door or cover giving access to an overload protective device need not be provided with a hinge, latch, or equivalent if the cover intended must be in place to perform its function.		N/A
7.29	The bulb and capillary tube of a thermostat shall be protected from physical damage if such damage of the tube or bulb may result in a risk of fire.		N/A
7.30	The mounting means of a wall-mounted insecticide vaporizer shall be such that:		N/A
	a) The product will be secured against tipping or dislodgement as a result of unintentional contact with the body of the product itself or with the power-supply cord; and		N/A
	b) The removal of the vaporizer can be accomplished readily, if it is necessary that the vaporizer be removed from its mounting for cleaning, refilling, or other servicing.		N/A
7.31	With reference to the requirement in 7.30, a simple keyhole slot or hanger ring is not acceptable as a mounting means unless other provisions are made, such that spillage of the insecticide will not result from tipping or dislodgement of the product.		N/A
7.32	If the enclosure of an insecticide vaporizer for wall mounting is of porcelain, glass, or other similarly brittle material, it shall not break or crack to the extent that uninsulated live parts will be exposed to contact, when dropped on a hardwood surface. The height through which the product is to be dropped is to be 8 ft (2.44 m) for a commercial-type vaporizer, and 6 ft (1.83 m) for a household product.		N/A



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7.33	The sheath employed to enclose the heating element of an immersion-type heater for use with fuel oil shall be of steel, stainless steel, or other metal resistant to corrosion in fuel oil; brass, bronze, or copper is not considered acceptable for this application. The sheath employed to enclose the heating element of an immersion-type water heater shall be of a metal resistant to corrosion in water.		N/A
7.34	Openings provided in a soldering tool, such as for ventilating purposes, shall be of such size and orientation with respect to the soldering tip that entry of falling or dripping molten solder, or unintentional insertion of solder wire is not likely to contact, bridge, or otherwise reduce the spacings between uninsulated live parts of opposite polarity, or uninsulated live parts and accessible dead metal parts. Consideration shall be given to the orientation of the soldering tool during use.		P
7.35	A cord-connected product that is provided with keyhole slots, notches, hanger holes, or the like, for mounting the product on a wall shall be constructed in such a manner that the mounting means shall not be accessible without removing the product from the supporting means.		N/A
7.36	When determining compliance with 7.35, any part of the enclosure or barriers that can be removed without the use of tools to gain access to the mounting means are to be removed.		N/A
7.37	A keyhole slot, notch, or hanger hole shall be located so that the supporting screws or the like cannot damage any electrical insulation or contact uninsulated current-carrying parts of the product.		N/A
8	Assembly		N/A
8.1	A soldering iron, or other cord-connected heating appliance that is likely to be laid on combustible material shall be provided with a stand of noncombustible material upon which it may be placed when not in use, unless the temperature attained by the product is not high enough to cause the ignition of the combustible material.		N/A
8.2	The stand may be a separate device or attached to the product, except that an integral type of stand is required for a charcoal ignitor.		N/A
8.3	A switch, lampholder, attachment-plug receptacle, or plug-type connector provided as a part of a heating appliance shall be secured so that it is not likely to turn.		N/A



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8.4	Uninsulated live parts shall be so secured to the base or surface that they are not likely to turn or shift in position as the result of stresses if such motion results in a reduction of spacings below the minimum required in 27.1.1.1 – 27.1.1.4.		N/A
8.5	Friction between surfaces is not acceptable as a means to keep live parts or components from shifting or turning. A lock washer, properly applied, is acceptable for this purpose.		N/A
9	Stability		N/A
9.1	The stability of a heating appliance shall be such that it will not be overturned readily during use.		N/A
9.2	A portable household heating appliance in which liquid is heated to a temperature greater than 115°F(46°C) is to be placed on a plane inclined at an angle of 15 degrees to the horizontal. The product is to be positioned and loaded with whatever combination of separable components, liquid, or other media (material) that results in the maximum tendency to overturn under conditions of intended use. The product is to contain at least 5 oz (148 mL) of liquid. The product is to be prevented from sliding on the inclined surface. The product shall not overturn as a result of this test.		N/A
9.3	To determine if a vaporizer in which water is heated complies with the requirements of 9.1, the product shall not overturn when subjected to the test described in 9.4.		N/A
9.4	The vaporizer is to be placed at any position of use on a plane inclined at an angle of 30 degrees to the horizontal. For this test the product is to be assembled and filled with liquid in any condition simulating operating conditions, so as to result in the maximum tendency to overturn. The product is to be supported so that it does not slide on the inclined plane		N/A
10	Corrosion Protection		N/A
10.1	Except as noted in 10.2, iron and steel parts shall be protected against corrosion by enameling, galvanizing, plating, or other means, if the deterioration of such unprotected parts would be likely to result in risk of fire or electric shock.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
10.2	In certain equipment where the oxidation of steel is not likely to be accelerated due to the exposure of metal to air and moisture or other oxidizing influence – thickness of metal and temperature also being factors – surfaces of sheet steel within an enclosure may not be required to be protected against corrosion. Cast- iron parts are not required to be protected against corrosion. A sheath employed on a heating element operating in air and terminal parts attached directly to the heating element need not be protected against corrosion.		N/A
10.3	The aging characteristics of plating or other finish used in a heating appliance shall be such that deterioration of the finish will not result eventually in unacceptable performance of the product.		N/A
11	Supply Connections – Permanently-Connected Products		N/A
11.1	General		N/A
11.1.1	Except as noted in 11.1.2 and 12.1.5, a product intended for permanent connection electrically to the power supply shall have provision for connection of one of the wiring systems that in accordance with the National Electrical Code, ANSI/NFPA 70, would be acceptable for the product.		N/A
11.1.2	An insecticide vaporizer intended for wall mounting may employ a flexible cord for connection to the power supply, provided that the length of the cord is not more than 3 ft (0.9m) for a commercial product and not more than 6 ft (1.8 m) for a household product.		N/A
11.1.3	The location of a terminal box or compartment in which power-supply connections to a heating appliance intended to be permanently connected electrically are to be made shall be such that these connections may be readily inspected after the product is installed as intended.		N/A
11.1.4	A terminal compartment intended for the connection of a supply raceway shall be so attached to the product that it shall not turn with respect to the product.		N/A
11.1.5	An electrical component shall not be mounted on a part, such as the cover of a wiring-terminal compartment, that must be removed for the purpose of making or inspecting field-wiring connections.		N/A
11.2	Wiring terminals		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
11.2.1	A heating appliance intended for permanent connection to the power supply shall be provided with wiring terminals or leads for the connection of conductors having an ampacity of not less than 125 percent of the current rating of the product when the load is continuous (3 hours or more) and not less than the current rating of the product when the load will be intermittent.		N/A
11.2.2	For the purpose of these requirements, wiring terminals are considered to be terminals to which power-supply or control connections will be made in the field when the product is installed. It is to be assumed that 60°C (140°F) wire will be used for connections to a continuous-load type of heating appliance rated at 80 A or less and an intermittent-load type of heating appliance rated at 100 A or less. Wire rated for 75°C (167°F) will be assumed to be used with product rated in excess of these values.		N/A
11.2.3	A wiring terminal shall be provided with a soldering lug or with a pressure wire connector securely fastened in place for example, bolted or held by a screw, except that a wire-binding screw may be employed at a wiring terminal intended to accommodate a 10 AWG (5.3 mm ²) or smaller conductor if upturned lugs or the equivalent are provided to hold the wire in position.		N/A
11.2.4	A wiring terminal shall not turn or shift in position. Friction between surfaces is not an acceptable means. An acceptable means may be by the use of two screws or rivets, by square shoulders or mortises, by a dowel pin, lug or offset, by a connecting strap or clip fitted into an adjacent part, or by some other equivalent method.		N/A
11.2.5	A wire-binding screw at a wiring terminal shall not be smaller than No. 10, except that a No. 8 screw may be used at a terminal intended only for the connection of a 14 AWG (2.1 mm ²) or smaller conductor, and a No. 6 screw may be used for the connection of a 16 or 18 AWG (1.3 or 0.82 mm ²) control-circuit conductor.		N/A
11.2.6	A terminal plate tapped for a wire-binding screw shall be of metal not less than 0.050 inch (1.3 mm) thick, except that a plate not less than 0.030 inch (0.8 mm) thick is acceptable if the tapped threads have acceptable mechanical strength. There shall be two or more full threads in the metal, which may be extruded if necessary to provide the threads.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
11.2.7	Upturned lugs or a cupped washer shall be capable of retaining a conductor of the size mentioned in 11.2.1, but not smaller than 14 AWG (2.1 mm ²), under the head of the screw or the washer.		N/A
11.2.8	A wire-binding screw shall thread into metal.		N/A
11.2.9	A heating appliance intended for connection to a grounded power-supply conductor and employing:		N/A
11.2.10	A terminal provided for the connection of a grounded circuit conductor shall be made of or plated with a metal white in color, or have the word "white" located adjacent to the terminal and shall be readily distinguishable from the other terminals, or proper identification of that terminal shall be clearly shown in some other manner, such as on an attached wiring diagram. A lead intended for the connection of a grounded circuit conductor shall be finished to show a white or gray color and shall be distinguishable from the other leads.		N/A
11.2.11	Except as noted in 11.2.12, the free length of a lead inside an outlet box or wiring compartment shall be 6 inches (152 mm) or more if the lead is intended for field connection to an external circuit.		N/A
11.2.12	A lead may be less than 6 inches (152 mm) in length if it is evident that the use of a longer lead might result in a risk of fire or electric shock.		N/A
11.2.13	The surface of an insulated lead intended solely for the connection of an equipment-grounding conductor shall be green with or without one or more yellow stripes, and no other lead in the field wiring area shall be so identified.		N/A
11.2.14	A wire-binding screw intended for the connection of an equipment-grounding conductor shall be identified by:		N/A
11.2.15	A pressure-wire connector intended for connection of such a conductor shall be plainly identified by:		N/A
	Being marked "G", "GR", "GND", "Ground", "Grounding" or the like;		N/A
	b) A marking on the wiring diagram provided on the heating appliance; or		N/A
	c) The grounding symbol illustrated in Figure 11.1 on or adjacent to the terminal or on a wiring diagram provided on the product.		N/A
11.2.16	The wire-binding screw or pressure-wire connectors shall be so located that it is unlikely to be removed during the servicing of the product.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
11.2.17	A terminal intended solely for connection of an equipment-grounding conductor shall be capable of securing a conductor of the size acceptable for the particular product, in accordance with the National Electrical Code, ANSI/NFPA 70.		N/A
12	Supply Connections – Cord Connected Products		P
12.1	General		P
12.1.1	A cord-connected heating appliance shall be provided with a length of attached flexible cord and an attachment plug for connection to the supply circuit, or shall have male pin terminals that accommodate a detachable power-supply cord. The length of the cord shall be within the limits indicated in Table 12.1. All detachable power-supply cords and permanently-connected power-supply cords shall comply with the requirements of the Standard for Cord Sets and Power-Supply Cords, UL 817.		P
12.1.2	A hand-supported indoor use heating appliance employing a detachable power-supply cord shall include a positive means for retaining the appliance coupler body to the appliance during use. Typical retaining means may include a friction type fit coupled with a rib-type construction, snap-type fit or similar techniques. Friction type fit alone does not meet the intent of the requirement.		N/A
12.1.3	A hand-supported outdoor use heating appliance shall employ a permanently attached supply cord. 12.1.4, 12.1.5, 12.1.6, 12.1.7, 12.1.8		N/A
12.1.4	Hand-supported heating appliances provided with detachable power supply cords, including hand-supported appliances likely to be disconnected while under load, shall not pose a risk of electric shock, fire or injury when mated or disconnected under any orientation or polarity permitted by the construction. The mating connector shall be held securely in place and shall not be allowed to rotate. Compliance is determined by the connector current interruption test in Section 49.		N/A
12.1.5	A cord-connected heating product intended to be fastened in place or located in a dedicated space may be acceptable if provided with a short length of flexible cord and an attachment plug for supply connection. The investigation of such a feature will include consideration of the utility of the product and the necessity of having it readily detachable from its source of supply by means of the attachment plug.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
12.1.6	For a cord-connected heating appliance, the rating (both current and voltage) of the cord and the fittings, for a product rated at 15 A or less, shall not be less than that of the product. For a product rated at more than 15 A, the ampacity of the cord and fittings shall not be less than the current rating of the product. The current rating of the attachment plug shall not be less than 125 percent of the current rating of the product when the load will constitute a continuous load (3 hours or more), except that a 20-A attachment plug is acceptable for a product rated at no more than 4000 W at 240 V.		N/A
12.1.7	The attachment plug of the power-supply cord of an appliance provided with a 15- or 20-ampere general-use receptacle shall be of the 3-wire grounding type. The attachment plug of the power-supply cord of an appliance provided with either a manually operated, line-connected, single pole switch for appliance on-off operation or an Edison-base lampholder shall be of the 2- wire polarized or 3-wire grounding type.		N/A
12.1.8	If a 3-wire grounding-type attachment plug or a 2-wire polarized attachment plug is provided, the attachment plug connections shall comply with Figure 12.1 and the polarity identification of the flexible cord shall comply with Table 12.2.		N/A
12.1.9	The conductor of the power-supply cord that is intended to be grounded, identified by Table 12.2, shall have the following items connected to it:		N/A
	The screw shell of an Edison base lampholder; and The terminal or lead of a receptacle intended to be grounded.		N/A
12.1.10	A cord-connected product that is provided with keyhole slots, notches, hanger holes, brackets, or the like, for mounting to a wall shall be considered as not intended to be moved		N/A
12.1.11	If a commercial-type heating appliance intended for cord connection does not have an attached cord, the male pins shall not accommodate a conventional flatiron or appliance plug, see 12.3.7 and Table 12.4, and a detachable power-supply cord shall be provided with the product.		N/A
12.1.12	An attached power-supply cord and the cord in a detachable power-supply cord that is provided with a heating appliance shall be of a type indicated in Table 12.3, or shall have such properties that it will be at least as serviceable for the particular application.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
12.1.3	A vaporizer intended for use with glycol shall not employ thermoplastic-insulated flexible cord if the construction is such that the cord is likely to be exposed to the vapor. 12.1.14, 12.1.15, 12.1.16, 12.1.17, 12.1.18		N/A
12.1.14	The flexible cord provided with a stock tank de-icer, poultry water heater, or comparable heating appliance intended or likely to be used out of doors shall be suitable for outdoor use and have a type letter suffix of "W".		N/A
12.1.15	Supplementary insulation, if employed on a flexible cord, shall not extend more than 1/2 inch (13mm) outside the product – unless provided with additional mechanical protection – shall not fray or unravel, and shall not affect adversely the means for providing strain relief.		N/A
12.1.16	An attachment plug having an Edison screw shell shall not be supplied with a cord-connected product rated at more than 6 A or 660 W.		N/A
12.1.17	If the power source for a product is electrically separable from the product, both the power source and the product shall be marked in accordance with 53.30.		N/A
12.1.18	In addition to the requirement in 12.1.17, if the power source is not provided with a special connector, or if it is not permanently attached to the product, the power source shall comply with the applicable requirements for that power equipment.		N/A
12.1.19	Stock tank deicers, pond deicers, heated pet mats, bucket heaters, bucket deicers and heated pet bowls may be provided with a special use detachable power supply cord provided all the following conditions are met:		N/A
12.2	Strain relief		P
12.2.1	Strain relief shall be provided to restrict a mechanical stress on an attached power-supply cord from being transmitted to terminals, splices, or interior wiring.		P
12.2.2	If wood, pressed board, or other fibrous material is used to secure the strain-relief assembly, the fibrous material shall be secured to the product by a pin, setscrew, or other positive means.		N/A
12.2.3	Means shall be provided to restrict an attached power-supply cord from being pushed into the enclosure of a product through the cord-entry hole. To determine compliance, the supply cord shall be tested in accordance with the Push-Back Relief Test, Section 45.		P



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Clause	Requirement – Test	Result – Remark	Verdict
12.2.4	If a knot serves as strain relief in an attached power-supply cord, any surface with which the knot may come in contact shall be free from projections, sharp edges, burrs, fins, and the like, that may cause abrasion of the insulation on the conductors.		P
12.3	Pin terminals		N/A
12.3.1	If a heating appliance is provided with pin terminals, the construction of the product shall be such that live parts will not be exposed to unintentional contact both during and after the placement of the plug on the pins, in the intended manner.		N/A
12.3.2	A pin guard is required, such that:		—
12.3.3	The plug used in 12.3.2(b) is to be the plug supplied with the product.		N/A
12.3.4	If a heating appliance employs three or more pin terminals designed for use with a plug that covers all the pins, the terminals shall be so spaced that they will not accommodate a flatiron or appliance plug or cord connector. The plug which these pins will accommodate shall be acceptable for the particular application.		N/A
12.3.5	A pin terminal shall be securely mounted by means other than friction between surfaces, and shall not shift in position.		N/A
12.3.6	The requirement in 12.3.5 is intended primarily to provide for the maintenance of spacings as given in 27.1.1.1 and Tables 27.1 and 27.2 and to provide for the maintenance of proper spacings between pin terminals. Under this requirement, consideration is also to be given to the means for locking terminals in position to maintain tightness.		N/A
12.3.7	For a household-type heating appliance, the dimensions of pins and their center-to-center spacings – including the corresponding spacings of the female contacts of general-use plugs that these arrangements of pins will accommodate are as indicated in Table 12.4.		N/A
12.3.8	If a vaporizer is provided with pin terminals, they may be affected adversely by the steam spray or careless filling of the reservoir, consideration is to be given to:		N/A
12.4	Bushings		P



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Clause	Requirement – Test	Result – Remark	Verdict
12.4.1	At a point where a flexible cord passes through an opening in a wall, barrier, or enclosing case, there shall be a bushing or the equivalent that shall be secured in place, and shall have a smooth, well-rounded surface against which the cord may bear. If Type SP-1, SPT-1, SP-2, SPT- 2, or other cord lighter than Type HSJ is employed, if the wall or barrier is of metal, and if the construction is such that the cord may be subjected to strain or motion, an insulating bushing shall be provided. The heat- and moisture-resistant properties of the bushing material shall be such that the bushing is acceptable for the particular application.		P
12.4.2	If the cord hole is in wood, porcelain, phenolic composition, or other nonconducting material, a smooth, well-rounded surface is considered to be equivalent to a bushing.		N/A
12.4.3	Ceramic materials and some molded compositions are acceptable generally for insulating bushings, but a separate bushing of wood, hot-molded shellac and tar composition, or rubber material (other than in a motor) is not acceptable. Vulcanized fiber may be employed if the bushing is not less than 3/64 inch (1.2 mm) thick and if it is so formed and secured in place that it will not be affected adversely by moist conditions.		N/A
12.4.4	A separate soft-rubber, neoprene, or polyvinyl chloride bushing may be employed in the frame of a motor or in the enclosure of a capacitor physically attached to a motor – but not elsewhere in a heating appliance, except as indicated in 12.4.5 – provided that:		N/A
12.4.5	A bushing of any of the materials mentioned in 12.4.4 may be employed at any point in a product if used in conjunction with a type of cord for which an insulating bushing is not required, and if the edges of the hole in which the bushing is mounted are smooth and free from burrs, fins, and the like.		N/A
12.4.6	An insulated metal grommet is acceptable in place of an insulating bushing if the insulating material used is not less than 1/32 inch (0.8 mm) thick, and completely fills the space between the grommet and the metal in which it is mounted.		N/A
13	Current-Carrying Parts		N/A
13.1	Each current-carrying part shall be made of metal that is acceptable for the particular application.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
13.2	Current-carrying parts made of corrosion- resistant alloys, for example, stainless steel, are acceptable regardless of temperature. Current- carrying parts made of ordinary iron and steel are not acceptable unless they are rendered corrosion-resistant by a coating and, even then, they are acceptable only as follows:		N/A
13.3	A heating appliance that is provided with a reservoir (intended to hold a liquid), shall have all live parts so located or otherwise protected so that they will not be subject to wetting if the reservoir were to leak.		N/A
14	Internal Wiring		P
14.1	General		P
14.1.1	The internal wiring of a heating appliance shall consist of wires of a size and type or types that are acceptable for the particular application, when considered with respect to:		P
14.1.2	There is no temperature limit applicable to glass fiber, beads of inorganic material, or the equivalent employed as conductor insulation.		N/A
14.1.3	Thermoplastic-insulated wire employed for the internal wiring of a heating appliance shall be standard building wire, fixture wire, or appliance-wiring material acceptable for the particular application.		N/A
14.2	Protection of wiring		P
14.2.1	The wiring and connection between parts of a heating appliance shall be protected or enclosed, except that a length of flexible cord may be employed for external connections, or for internal connections that may be exposed during servicing, if flexibility of the wiring is essential. A bare conductor or a conductor with beads for insulation shall not be used outside an enclosure.		P
14.2.2	Internal wiring which is exposed through an opening in the enclosure of a heating appliance is considered to be protected as required in 14.2.1 if, when judged as if it were enamel- insulated wire, the wiring would be acceptable according to 7.13 – 7.18. Internal wiring within an enclosure is acceptable if, even though it can be touched with the probe, it is so protected or guarded that it cannot be grasped or hooked in such a manner that it could be subjected to stress.		P
14.2.3	Internal terminals and wiring of a vaporizer may be adversely affected by the steam spray or careless filling of the reservoir. Accordingly, the items mentioned in 12.3.8 should be given consideration.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
14.2.4	If the wiring of a heating appliance is so located that it may be in proximity to combustible material or may be subjected to mechanical injury, it shall be armored cable or in rigid metal conduit, electrical metallic tubing, metal raceway, or shall otherwise be protected.		N/A
14.2.5	Wires within an enclosure, compartment, raceway, or the like, shall be so located or protected that damage to conductor insulation cannot result from contact with any rough, sharp, or moving part.		P
14.2.6	A hole by means of which insulated wires pass through a sheet-metal wall within the overall enclosure of a heating appliance shall be provided with a smooth, well-rounded bushing or shall have smooth, well-rounded surfaces upon which the wires may bear, so as not to abrade the insulation. A flexible cord used for external interconnection as mentioned in 14.2.1 shall be provided with a strain relief and bushings in accordance with 12.2.1 – 12.2.4 and 12.4.1 – 12.4.6 unless the construction is such that the cord will be protected from stress or motion.		P
14.2.7	Insulated wires may be bunched and passed through a single opening in a metal wall within the enclosure of a heating appliance. 14.3, 14.3.1, 14.3.2, 14.3.3, 14.3.4		N/A
14.3	Splices		N/A
14.3.1	All splices and connections shall be mechanically secure and shall provide good electrical contact. A soldered connection shall be made mechanically secure before being soldered if breaking or loosening of the connection may result in risk of fire or electric shock.		N/A
14.3.2	A splice shall be provided with insulation equivalent to that of the wires involved if permanence of spacing between the splice and other metal parts of the product is not reliably maintained.		N/A
14.3.3	Insulation consisting of two layers of friction tape, two layers of thermoplastic tape, or of one layer of friction tape on top of one layer of rubber tape, is acceptable on a splice if the voltage involved is not more than 250 V. In determining whether splice insulation consisting of coated fabric, thermoplastic, or other type of tubing is acceptable, consideration is to be given to such factors as its dielectric properties, heat-resistant and moisture-resistant characteristics. Thermoplastic tape wrapped over a sharp edge is not acceptable.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
14.3.4	Where stranded internal wiring is connected to a wire-binding screw, loose strands of wire shall not contact any other uninsulated live part that is not always of the same polarity as the wire, and shall not contact any dead metal part. This may be accomplished by the use of pressure terminal connectors, soldering lugs, crimped eyelets, soldering all strands of the wire together, or other reliable means.		N/A
14.4	Separation of circuit		N/A
14.4.1	General		N/A
14.4.1.1	Unless provided with insulation rated for the highest voltage involved, insulated conductors of circuits connected to separate sources of supply shall be separated by barriers or segregated. Except as described in 14.4.1.3, an insulated conductor of one circuit shall be separated or segregated from any uninsulated live parts of a different circuit.		N/A
14.4.1.2	Segregation of insulated conductors may be accomplished by clamping, routing, or an equivalent means that provides permanent separation from insulated or uninsulated live parts of a different circuit.		N/A
14.4.1.3	Field-installed conductors of any circuit shall be segregated by barriers from:		N/A
14.4.1.4	With respect to 14.4.1.3(a), if the intended uses of a product are such that in some applications a barrier is required, a removable barrier or one having opening for the passage of conductors may be employed provided instructions for the use of the barrier are a permanent part of the product, and complete instructions in conjunction with a wiring diagram may be acceptable instead of a barrier if, upon investigation, the combination is found to be adequate.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
14.4.1.5	Segregation of field-installation conductors from other field-installation conductors and from uninsulated live parts of a product connected to different circuits may be accomplished by arranging the location of the openings in the enclosure for the various conductors – with respect to the terminals or other uninsulated live parts – so that there is no likelihood of the intermingling of the conductors or parts of different circuits. If the number of openings in the enclosure does not exceed the minimum required for the proper wiring of the product, and if each opening is located opposite a set of terminals, it is to be assumed – for the purpose of determining whether the product complies with the requirement in 14.4.1.3– that the conductors entering each opening will be connected to the terminals opposite the opening. If more than the minimum number of openings are provided, the possibility of conductors entering at points other than opposite the terminals to which they are intended to be connected and contacting insulated conductors or uninsulated current- carrying parts connected to a different circuit is to be investigated. To determine whether the product complies with the requirement in 14.4.1.3, it is to be wired as it would be in service, and in doing so, a reasonable amount of slack is to be left in each conductor, within the enclosure		N/A
14.4.2	Low-voltage circuit		N/A
14.4.2.1	A low-voltage circuit is one involving a potential of not more than 30 V (42.4 volts peak) and supplied by a primary battery, by a standard Class 2 transformer, or by an impedance which, as a unit, complies with all of the performance requirements for a Class 2 transformer.		N/A
14.2.2.2	A circuit derived from a source of supply classified in 14.4.3.1 as a line-voltage circuit, by connecting resistance in series with the supply circuit as a means of limiting the voltage and current, is not considered to be a low-voltage circuit as described in 14.4.2.1.		N/A
14.4.3	Line-voltage circuit		P
14.4.3.1	A line-voltage circuit is one involving a potential of not more than 600 V and having circuit characteristics in excess of those of a low- voltage circuit.		P
14.4.4	Barriers		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
14.4.4.1	If a barrier is used to provide separation between the wiring of different circuits, it shall be of metal or of insulating material, of adequate mechanical strength if exposed or otherwise likely to be subjected to mechanical damage, and reliably held in place. Unclosed openings in a barrier for the passage of conductors shall not be larger in diameter than 1/4 inch (6.4 mm) and shall not exceed in number, on the basis of one opening per conductor, the number of wires that will need to pass through the barrier. The closure for any other opening shall present a smooth surface wherever an insulated wire may be in contact with it, and the area of any such opening, with the closure removed, shall not be larger than required for the passage of the necessary wires.		N/A
14.4.4.2	A metal barrier shall have a thickness at least as great as the minimum acceptable thickness of the enclosure metal. A barrier of insulating material shall not be less than 0.028 inch (0.71 mm) thick and shall be of greater thickness if its deformation may be readily accomplished so as to defeat its purpose.		N/A
15	Heating Elements		P
15.1	A heating element shall be supported in an acceptable manner. It shall be protected against mechanical damage and contact with outside objects.		P
15.2	In determining whether a heating element is acceptably supported, consideration is to be given to sagging, loosening, and other adverse conditions of the element resulting from continuous heating.		P
15.3	An open-wire element – that is, uninsulated resistance wire – may be used in heating appliances provided it is enclosed or protected by barriers or covers that require tools for removal, and it complies with the accessibility of live parts requirements outlined in 7.18 – 7.22		N/A
15.4	An instantaneous water heater with an open-wire element immersed in water shall additionally comply with the requirements of Sections 11, 27, 29 and 35. It shall not employ a power supply cord or plug.		N/A
15.5	A heating appliance in which the heating element is constructed for use only in an air blast shall be so wired or controlled that the element can be operated only while under the cooling effect of the blast. A product in which the cooling effect of the motion of a part is necessary to limit temperatures shall be so wired or controlled that the element cannot be operated without such motion.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
16	Electrical Insulation 16.1, 16.2, 16.3 In the mounting or supporting of small, fragile insulating parts, screws or other fastenings should not be tight enough to cause cracking or breaking of these parts with expansion and contraction. Generally, such parts should be slightly loose.		P
16.1	Insulating washers, bushings, and the like, that are integral parts of a heating appliance and bases or supports for the mounting of current- carrying parts shall be of a moisture-resistant material that will not be damaged by the temperatures to which they will be subjected under conditions of actual use. Molded parts shall be so constructed that they will have the mechanical strength and rigidity necessary to withstand the stresses of actual service.		P
16.2	Insulating material employed in a heating appliance is to be judged with respect to its acceptability for the particular application. Materials, such as mica, some molded compounds, and certain refractory materials are usually acceptable for use as the sole support of live parts, and some other materials that are not acceptable for general use, such as magnesium oxide, may be acceptable if used in conjunction with other more acceptable insulating materials or if so located and protected such that it is not subject to mechanical damage and the absorption of moisture is minimized. When it is necessary to investigate a material to determine whether it is acceptable, consideration is to be given to its mechanical strength, dielectric properties, insulation resistance, heat-resistant qualities, the degree to which it is enclosed or protected, and any other features having a bearing on the risk of fire or electric shock involved, in conjunction with conditions of actual service. All of these factors are considered with respect to thermal aging.		P
17	Thermal Insulation		N/A
17.1	Thermal insulation, if employed, shall be of such a nature and so located and mounted or supported that it will not be affected by any intended operation of the product. See 36.1.22.		N/A
17.2	Combustible or electrically conductive thermal insulation shall not make contact with uninsulated live parts of a heating appliance.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
17.3	Some types of mineral-wool thermal insulation contain conductive impurities in the form of slag, which make its use unacceptable if in contact with uninsulated live parts. See 37.1.		N/A
18	Motors 18.1. 18.2. 18.3		N/A
18.1	A motor shall be acceptable for the particular application, and shall be capable of handling its maximum intended load without risk of fire, electric shock, or injury to persons		N/A
18.2	A motor winding shall resist the absorption of moisture and shall be formed and assembled in a workmanlike manner.		N/A
18.3	With reference to the requirement in 18.2, enameled wire is not required to be additionally treated, but fiber slot liners, cloth coil wrap, and similar moisture-absorptive materials should be provided with impregnation or otherwise treated.		N/A
19	Overcurrent Protection of Conductors and Heating Elements		N/A
19.1	Except as noted in 19.2 and 19.3, each bus bar and insulated wire, including those in heater, motor, and control circuits, in a heating appliance rated at more than 40 A shall be protected by an overcurrent protective device provided as a part of the product. If the product is intended for connection to more than one branch circuit, each section of the product intended for connection to a different branch circuit is to be considered individually in applying the foregoing requirement. The rating of the overcurrent protective device shall be in accordance with Table 19.1.		N/A
19.2	The requirement in 19.1 does not apply to a conductor:		N/A
19.3	No overcurrent protective device is required as a part of the product if it is determined that equivalent or better protection will be obtained from the branch-circuit overcurrent protective device through which the product will be supplied.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
19.4	The rating of the branch-circuit overcurrent protective device shall be 150 percent of the rating of the product unless the product is marked to specify the use of a protective device having a lower rating. Standard ampere ratings for overcurrent protective devices are 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, and 200. If 150 percent of the rating of the product does not equal one of the standard overcurrent- protective- device ratings mentioned above, then the next lower rating or setting of overcurrent protective device shall be employed.		N/A
19.5	The overcurrent protection mentioned in 19.1 – 19.4, 19.6 and 19.7 shall be of a type intended for branch-circuit protection. A fuse used for this purpose shall be a Class CC, G, H, J, K, R, or T cartridge fuse or a plug fuse.		N/A
19.6	A product that employs resistance-type heating elements and is rated at more than 48 A shall have the heating elements subdivided. Each subdivided load shall not exceed 48 A and shall be protected at not more than 60 A		N/A
19.7	The overcurrent protective devices required in 19.6 shall be provided as an integral part of the product or shall be provided by the product manufacturer as a separate assembly, for independent mounting, for use with the product. See 53.31.		N/A
19.8	The supplementary overcurrent protective devices required in 19.6 shall be factory- installed within or on the heater enclosure or provided as a separate assembly by the heating appliance manufacturer, shall be accessible, and shall be suitable for branch circuit protection.		N/A
19.9	The main conductors supplying these overcurrent protective devices required in 19.6 shall be considered to be branch-circuit conductors.		N/A
20	Motor-Running Overload Protection		N/A
20.1	The following heating appliances in which a 1 hp or smaller motor is used shall incorporate thermal or overload protection so that the motor shall not attain excessively high temperatures under any operating conditions: A remotely or automatically controlled product. A permanently connected, continuous-duty, manually started product. An impedance-protected motor is not required to have additional thermal or overload protection.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
20.2	A heating appliance intended to be automatically or remotely controlled and employing a motor rated at more than 1 hp shall incorporate thermal or overcurrent protection. 20.3 Fuses shall not be used in motor-overload- protective devices unless the motor is protected by the largest size of fuse that can be inserted in the fuseholder		N/A
21	Motor and Power-Transformer Short-Circuit and Ground-Fault Protection		N/A
21.1	A motor or power transformer in a heating appliance rated at more than 16 A shall be protected against short circuits and grounding by an overcurrent device having a maximum ampere rating in accordance with the National Electrical Code, ANSI/NFPA 70. Such overcurrent protection shall be provided as a part of the heating appliance unless it can be determined in accordance with 19.3 that equivalent overcurrent protection would be incorporated as the branch-circuit protective device.		N/A
21.2	The overcurrent protection mentioned in 21.1 shall be of a type indicated as being acceptable for branch-circuit protection.		N/A
22	General (Short-Circuit and Ground-Fault) Overcurrent Protection		N/A
22.1	Overcurrent protection at not more than 20 A shall be provided by means of a circuit breaker or fuse, as a part of a heating appliance, for each general-use receptacle circuit and each lampholder circuit independent of a heating element, included in the product, unless the product would be properly connected to a branch circuit rated at 20 A or less.		N/A
22.2	The overcurrent protection mentioned in 22.1 shall be of a type indicated as being acceptable for branch-circuit protection.		N/A
22.3	A fuseholder or circuit breaker provided as a part of a heating appliance shall not be accessible without opening a door or cover. However, the operating handle of a circuit breaker, and a removable end cap of a fuseholder, except on a household product, see 22.4, may project outside of the enclosure. A fuseholder shall be so installed that no uninsulated live parts other than the screw shell or clips of the fuseholder are exposed to contact by a person removing or replacing a fuse. If the fuseholder is intended to be accessible only to service personnel, uninsulated live parts other than the screw shell or clips may be exposed if they are guarded, or the fuseholder is so located such that these live parts shall not be subjected to unintentional contact.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
22.4	A removable end cap of a fuseholder in a product intended for household use shall not be accessible from the outside of the product.		N/A
23	Thermal Cutoffs		N/A
23.1	If a heating appliance is provided with a thermal cutoff, it shall be secured in place and shall be so located that it will be accessible for replacement without damaging other connections or internal wiring. See 53.6.		N/A
23.2	If a heating appliance is provided with a thermal cutoff, it shall be capable of opening the circuit in the intended manner without causing the short-circuiting of live parts and without causing live parts to become grounded to the enclosure when the product is connected to a circuit of voltage in accordance with 36.1.13, and operated in a normal position to cause abnormal heating. 23.3 To determine whether a thermal cutoff complies with the requirement in 23.2, the product is to be operated with separate cutoffs five times as described above while any other thermally operated control devices in the product are short-circuited. Each cutoff is required to perform acceptably. During the test, the enclosure is to be connected through a 3-A fuse to a supply conductor not containing the cutoff.		N/A
24	Lampholders		N/A
24.1	If a heating appliance intended for permanent connection to the power supply or a heating appliance equipped with a polarized attachment plug is intended to be connected to the identified (grounded) conductor of a power-supply circuit, a lampholder supplied as a part of the product shall be so wired that the screw shell is connected to the identified conductor.		N/A
24.2	Except as noted in 24.3, a lampholder shall be so constructed and installed that uninsulated live parts other than the screw shell will not be exposed to contact by persons removing or replacing lamps.		N/A
24.3	The requirement in 24.2 does not apply if, in order to remove or replace a lamp, it is necessary to dismantle the product by means of tools.		N/A
24.4	A medium-base lampholder or screw-shell receptacle shall not be used as a holder for a heating element rated at more than 6 A or 660 W, except that a screw shell with a left-handed thread may be used with a heating element rated at not more than 10 A.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
24.5	Except as noted in 24.6, a screw-shell lampholder for an infrared lamp shall be of the unswitched, medium-base type and shall be used with a 300-W or smaller lamp.		N/A
24.6	A lamp-and-lampholder combination need not comply with the requirement in 24.5 if no unacceptable temperature is produced on any of the components in the normal-temperature test, and if the switching mechanism of a switched lampholder is capable of performing acceptably without undue burning, pitting, and the like.		N/A
24.7	A female screwshell used as a holder for a heating element shall be of copper or of a copper-base alloy and shall be plated with nickel or equivalent oxidation-resistant metal.		N/A
25	Switch		N/A
25.1	A switch or other control device provided as a part of a heating appliance shall be of a type intended for the particular application and shall have a current and voltage rating not less than that of the circuit (load) that it controls.		N/A
25.2	A switch employed on a heating appliance shall be so located or protected that it will not be subjected to mechanical damage during use.		N/A
25.3	It is recommended that all switches be of an indicating type.		N/A
25.4	A switch on a cord-connected heating appliance or the flow actuated switch of an instantaneous water heater, either of which incorporating an open-wire heating element construction, shall be of such a type and so connected that it will disconnect the element or elements that it controls from all conductors of the supply circuit.		N/A
25.5	The requirement in 25.4 applies to a switch in the off position or any other setting in which the element is not heated, and also to a through- cord switch or a plug in which a switch is incorporated in an attached or detachable power-supply cord that is provided with such a heating appliance.		N/A
25.6	A switch or other device controlling one or more elements of a heating appliance intended for permanent connection to the power supply shall be so arranged that the opening of the switch will disconnect all of the ungrounded conductors of the supply circuit, unless there will be no live parts exposed to unintentional contact when the switch is open or unless the fact that such parts are alive is definitely apparent.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
25.7	A switch or other means of control intended to provide for the use of a limited number of elements at one time shall be so located or of such a type that the user cannot change the connections to energize more elements than intended.		N/A
25.8	A switch controlling a lampholder shall be acceptable for use with tungsten-filament lamps.		N/A
25.9	Except as noted in 25.10, a switch shall not be incorporated in a wooden handle or in other combustible material unless enclosed in metal or insulating material.		N/A
25.10	In a small, low-wattage product such as a wood burning pencil, a switch may be acceptable in a wooden handle.		N/A
25.11	If a heating appliance that is intended for connection to the supply circuit by means of flexible cord and an attachment plug employs a motor rated at more than 1/3 hp, a manually operated motor controller shall be provided in the product.		N/A
25.12	A manually operated, line-connected, single pole switch, or other control device, intended for appliance on-off operation shall be connected to the ungrounded conductor of the power-supply cord. Table 12.2 specifies the polarity identification of the power-supply cord conductors.		N/A
26	Automatic Controls and Control Circuits		N/A
26.1	A control circuit shall comply with the requirements in 14.4.1.1 – 14.4.2.2.		N/A
26.2	The operation of an auxiliary control device in a heating appliance shall disconnect the element or elements that it controls from all ungrounded conductors of the supply circuit, unless there will be no live parts exposed to unintentional contact when the auxiliary control device is open or unless the fact that such parts are alive is apparent.		N/A
26.3	An auxiliary control is considered to be one that is intended primarily for time, temperature or pressure regulation, and the like, under conditions of intended operation, and not for protection against overload or excessive temperature conditions resulting from abnormal operation.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
26.4	A device intended to reduce the risk of fire or electric shock shall be operative whenever the product is connected to its power supply. Except for the inherent thermal protector of a motor, the control of a product intended to be permanently connected electrically that has exposed live parts shall disconnect the element or elements it controls from all ungrounded conductors of the supply circuit. The operation of such a control shall comply with the requirements in 26.2. A controlled contactor shall comply with the endurance requirement for a limiting control if it is a part of the limiting-control circuit.		N/A
26.5	A control device shall not be constructed to deliberately overload the branch-circuit protective device as a means of disconnecting the product from the supply.		N/A
26.6	A contactor or similar device, such as a silicon controlled rectifier, required for use with a limit control shall be provided by the manufacturer of the product, but need not be mounted on the product. See 53.31.		N/A
26.7	The terminals of a device mentioned in 26.4 within the enclosure of a heating appliance shall be so located or further enclosed that they will be protected against unintentional short circuiting and damage.		N/A
26.8	Except where superseded in this standard, a temperature control that complies with the construction requirements of:		N/A
26.9	Instantaneous water heaters shall be equipped with a temperature-limiting means in addition to its control thermostat to disconnect all ungrounded conductors. Such temperature-limiting means shall be installed to sense maximum water temperature and be a trip-free, manually reset type.		N/A
27	Spacings		P
27.1	Line-voltage circuits		P
27.1.1	General		P
27.1.1.1	Except as noted in 27.1.1.2 – 27.1.1.4, the spacings in a heating appliance shall be in accordance with Tables 27.1 and 27.2.		P
27.1.1.2	The spacings specified in Tables 27.1 and 27.2 do not apply to the inherent spacings of a component part of a heater; such spacings are judged under the requirements for the component in question.		P
27.1.1.3	The spacings within a motor shall comply with the requirements in the Standard for Rotating Electrical Machines – General Requirements, UL 1004-1.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
27.1.1.4	At closed-in points only, such as the screw-and-washer construction of an insulated terminal mounted in metal, a spacing of 3/64 inch (1.2 mm) is acceptable in a product rated at 250 V or less. Within a thermostat, except at contacts, the spacings between uninsulated live parts on opposite sides of the contacts are to be not less than 1/32 inch (0.8 mm) through air and 3/64 inch (1.2 mm) over the surface of insulating material, and the construction is to be such that the spacings will be maintained permanently.		N/A
27.1.2	Barriers		N/A
27.1.2.1	Except as noted in 27.1.2.2, an insulating liner or barrier of fiber or similar material employed where spacings would otherwise be unacceptable shall not be less than 1/32 inch (0.8 mm) thick and shall be so located or of such material that it cannot be affected by arcing, except that fiber not less than 1/64 inch (0.4 mm) thick may be used in conjunction with an air spacing of not less than 50 percent of the spacing required for air alone.		N/A
27.1.2.2	Insulating material having a thickness less than specified in 27.1.2.1 may be used if it is equivalent in appropriate properties.		N/A
27.1.2.3	Unless protected from mechanical abuse during assembly and intended functioning of a product, a barrier of mica shall be 0.010 inch (0.25 mm) or thicker.		N/A
27.2	Low-voltage circuits		N/A
27.2.1	Limiting controls		N/A
27.2.1.1	The spacings in a low-voltage limiting control shall comply with the requirements in 27.1.1.1 – 27.1.2.3 and Tables 27.1 and 27.2.		N/A
27.2.2	Other than limiting controls		N/A
27.2.2.1	The spacing between uninsulated live parts of opposite polarity and between such parts and dead metal that may be grounded in service is not specified for parts of circuits that are classified as low-voltage in 14.4.2.1.		N/A
28	Grounding		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
28.1	In a heating appliance intended for permanent connection to the power supply by a metal- enclosed wiring system, such as rigid metal conduit or armored cable, all exposed dead metal parts and all dead metal parts inside the enclosure that are exposed to contact during any servicing operation – including maintenance and repair – and that are likely to become energized shall be conductively connected to the point at which the cable armor, conduit, and the like, is attached to the product.		N/A
28.2	In a product intended for permanent connection to the power supply by means other than a metal- enclosed wiring system, such as nonmetallic- sheathed cable:		N/A
28.3	On a portable product where grounding is required or provided, the power-supply cord or cord set shall include a grounding conductor that shall be:		N/A
28.4	If any accessible dead metal part of a product is grounded, all accessible dead metal parts that are likely to become energized, including those exposed during any servicing operation – including maintenance and repair – shall be grounded.		N/A
28.5	A cord-connected heating appliance constructed for operation on a circuit involving a potential of more than 150 V to ground shall have provision for grounding, in accordance with 28.3, of all exposed dead metal parts, and all dead metal parts exposed during any servicing operation – including maintenance and repair– that are likely to be energized.		N/A
28.6	A cord-connected stock-tank de-icer, poultry- water heater, branding iron, dehorning iron, poultry cauterizer, charcoal ignitor, incubator, and brooder, or similar device intended for outdoor use, and a refrigerator defroster and heat gun shall either:		N/A
28.7	A cord-connected, 2-wire heating appliance intended to operate at a nominal potential of 240 V –and similarly any other potential within the 220 – 250 V range – is considered as requiring provision for grounding in accordance with 28.3 unless the marked rating on the product is 120/240 V or unless the product is otherwise marked to indicate that it is to be connected only to a 120/240-V circuit with a grounded neutral.		N/A
28.8	Sheet metal screws shall not be used for: Field connection of equipment grounding conductors to an enclosure; and Connection of a factory-provided grounding lead to an enclosure.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
29	Leakage Current Collectors		N/A
29.1	An instantaneous water heater with an open-wire element immersed in water shall be provided with a leakage current collector that complies with 29.2 – 29.7 and Escape Current Test, Section 35.		N/A
29.2	A leakage current collector shall be provided at the water inlet and outlet. It shall be continuous metal piping, including the inlet / outlet, or may be discrete metal parts at the inlet / outlet.		N/A
29.3	Leakage current collectors shall be reliably bonded to the equipment grounding terminal of the appliance. A bonding conductor shall not be accessible to the user when the appliance is installed as intended.		N/A
29.4	A leakage current collector shall have a minimum length of five times its own inside diameter or the equivalent ratio of length to cross-section for non-circular configurations.		N/A
29.5	A leakage current collector shall be made of an unplated metal such as brass, stainless steel, or other equally corrosion-resistant metal that is intended to resist galvanic action in accordance with 29.6. Galvanized metal pipe is not considered to be sufficiently corrosion-resistant for use as a current collector. When copper alloy is used, it shall be comprised of not more than 15 percent zinc.		N/A
29.6	In accordance with 29.5, sheet and plate aluminum in contact with water shall be of an alloy of the 5000 series as given in the American National Standard Specification for Aluminum-Alloy Sheet and Plate, ANSI/ASTM B209; and cast aluminum shall be one of the alloys shown in Table 29.1.		N/A
29.7	Replaceable heater elements shall be replaceable without disturbing the grounding or bonding of the appliance or current collectors. See 53.50.		N/A
30	Pressure Vessels and Parts Subject to Pressure 30.1, 30.2, 30.3		N/A
30.1	Except as noted in 30.2, a pressure vessel having an inside diameter of more than 6 inches (152mm) and subject to a pressure of more than 15 lbf/in ² (103 kN/m ²) and within the scope of the applicable American Society of Mechanical Engineers (ASME) pressure vessel codes, shall be marked in accordance with these codes to include the code symbol and a working pressure no less than the pressure determined by applying 30.3.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
30.2	If a pressure vessel, because of its application, is not covered under the inspection procedures of the ASME code, it shall be so designed and constructed that it will comply with the requirements in 30.3.		N/A
30.3	Except as noted in 30.4, a part that is subject to air or vapor pressure, including the vapor pressure in a vessel containing only a superheated fluid, during normal or abnormal operation shall withstand without bursting or leaking a pressure equal to the highest of the following that is applicable:		N/A
30.4	A test need not be performed to determine whether a part complies with the requirement in 30.3 if study and analysis of the material and dimensions indicate that the part has the strength acceptable for the application – for example, copper or steel pipe of standard size and provided with standard fittings might be considered to have the strength for the application.		N/A
30.5	Deleted		N/A
30.6	If a test is necessary to determine whether a part complies with the requirement in 30.3, two samples of the part are to be subjected to a hydrostatic-pressure test. Each sample is to be so filled with water as to exclude air and is to be connected to a hydraulic pump. The pressure is to be raised gradually to the specified test value and is to be held at that value for 1 minute. The results are not acceptable if either sample bursts or leaks, except as indicated in 30.7.		N/A
30.7	Leakage at a gasket during the hydrostatic- pressure test is acceptable if it does not occur at a pressure 40 percent or less of the required test value.		N/A
30.8	A means for relieving pressure shall be provided for all parts in which pressure might be generated in the event of fire.		N/A
30.9	Pressure-relief devices (see 30.15), fusible plugs, soldered joints, nonmetallic tubing, or other pressure-relief means or the equivalent may be employed to comply with the requirements in 30.8.		N/A
30.10	There shall be no shut-off valve between the pressure-relief means and the parts that it is intended to protect		N/A
30.11	A vessel having an inside diameter of more than 3.0 inches (76.2 mm) and subject to air or steam pressure generated or stored within the product shall be protected by a pressure-relief device.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
30.12	The start-to-discharge pressure setting of the pressure-relief device shall not be higher than the working pressure marked on the vessel. The discharge rate of the device shall be capable of relieving the pressure.		N/A
30.13	A pressure-relief device shall comply with all four of the following:		N/A
30.14	A pressure-relief device having an adjustable setting is judged on the basis of its maximum setting unless the adjusting means is sealed at a lower setting.		N/A
30.15	A pressure-relief device is considered to be a pressure-actuated valve or rupture member constructed to relieve excessive pressures automatically.		N/A
30.16	Where a pressure-relief device is required, the control responsible for limiting the pressure in the vessel shall be capable of performing under rated load for 100,000 cycles of operation and the control shall limit the pressure so that it does not exceed 90 percent of the relief device setting under any condition of intended operation.		N/A
31	Protection Against Injury to Persons 31.1, 31.2, 31.3		P
31.1	Materials employed in the construction of the product that reduce the risk of injury to persons shall be acceptable for the particular use. See 7.1 and 7.6.		P
31.2	All heating appliances, or any items furnished with the product, shall have no sharp edges, burrs, points, or spikes inside or outside the product, that may present a risk of injury to persons during use, including cleaning operations.		P
31.3	The temperature of a surface that is likely to be contacted by the user – other than a heating function surface and an adjacent surface known to be hot because of its proximity to a heating function surface – shall not be more than the value specified in Table 36.2 when measured in accordance with the applicable requirements in the Normal Temperature Test, Section 36.		P
32	General		P



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Clause	Requirement – Test	Result – Remark	Verdict
32.1	The performance of a heating appliance shall be investigated by subjecting the requisite number of specimens to all the applicable tests as described in Sections 33 – 46. Insofar as practicable, the tests shall be conducted in the order in which they are presented here. Specimens employed for leakage-current tests shall be first tested for leakage prior to employing the specimens for other tests.		P
32.2	With respect to 7.2, semi-rigid enclosed pet mats/pads shall additionally be subjected to the following tests detailed in the Standard for Electric Heating Pads, UL 130: Resistance to moisture test, Flexing test; Twisting test; Heating test (Repeated); and Dielectric Voltage Withstand test (Repeated).		N/A
33	Power Input Test		P
33.1	The power input to a heating appliance shall not be more than 105 percent of its marked rating.		P
33.2	To determine whether a heating appliance complies with the requirement in 33.1, the power input is to be measured with the product at normal operating temperature under full-load conditions and while connected to a supply circuit adjusted to be the highest of the following: The marked voltage rating; or The highest voltage of the applicable range of voltages specified in 52.1 if the marked voltage is within one of the voltage ranges indicated in 52.1.		P
33.3	In a test to determine whether a heating appliance of the immersed-electrode type complies with the requirement in 33.1, the hard- water solution described in 34.10 is to be used.		N/A
34	Leakage Current		N/A
34.1	The leakage current of a cord-connected product rated for a nominal 120-, 208-, or 240-V supply when tested in accordance with 34.3 – 34.8 shall not be more than:		N/A
34.2	Leakage current refers to all currents, including capacitively coupled currents, that may be conveyed between exposed conductive surfaces of a product and ground or other exposed conductive surfaces of a product.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
34.3	All exposed conductive surfaces are to be tested for leakage currents. The leakage currents from these surfaces are to be measured to the grounded supply conductor individually as well as collectively where simultaneously accessible and from one surface to another where simultaneously accessible. Parts are considered to be exposed surfaces unless guarded by an enclosure considered acceptable for protection against a risk of electric shock as defined in 7.1 – 7.22. Surfaces are considered to be simultaneously accessible when they can be contacted by one or both hands of a person at the same time. These measurements do not apply to terminals operating at voltage levels that do not involve a risk of electric shock.		N/A
34.4	If a conductive surface other than metal is used for the enclosure or part of the enclosure, the leakage current is to be measured using a metal foil with an area of 10 by 20 cm in contact with surface. Where the surface is less than 10 by 20 cm, the metal foil is to be the same size as the surface. The metal foil is not to remain in place long enough to affect the temperature of the product.		N/A
34.5	A heated surface of insulating material is to be investigated concerning the leakage current available from the use of metal utensils.		N/A
34.6	The measurement circuit for leakage current is to be as shown in Figure 34.1. The ideal measurement instrument is defined in (a) – (d). The meter which is actually used for a measurement need only indicate the same numerical value for a particular measurement as would the ideal instrument. The meter used need not have all the attributes of the ideal instrument.		N/A
34.7	A sample of the product is to be tested for leakage current starting with the as-received condition with all its switches and thermostats closed, but with its grounding conductor, if any, open at the attachment plug. The as-received condition is defined as being without prior energization, except as may occur as part of the production-line testing. The supply voltage is to be 120, 208, or 240 V depending on product rating. The test sequence, with reference to the measuring circuit, Figure 34.1, is to be as follows:		N/A
34.8	A sample will be carried through the complete leakage-current test program as covered by 34.7, without interruption for other tests. However, with the concurrence of those concerned, the leakage-current tests may be interrupted for the purpose of conducting other nondestructive tests.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
34.9	When intended for permanent connection to the power supply, a liquid-heating appliance of the electrode type and a product in which live parts of the heating element are in contact with the liquid shall not have a leakage current to ground in excess of 0.5 A with current flowing through the element or with one side of the line open as explained in 34.10.		N/A
34.10	To determine whether a liquid-heating appliance complies with the requirement in 34.9, the product is to be connected to a grounded supply circuit having full rated voltage between the ungrounded side of the line and ground. The case is to be so mounted that it will be insulated from ground, and the liquid is to be supplied by means of a rubber tube. A solution of 0.5 gram of calcium sulphate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) per liter of distilled water is to be employed for the testing of a water heater constructed for general use. An ammeter is to be placed between the pipe connections on the heater and the water pipe or other ground, and leakage readings are to be observed under all conditions representing an open fuse or fuses, except that in the case of a heater constructed and marked for use with a solid (unfused) and grounded neutral, the grounded conductor need not be disconnected.		N/A
34.11	The greatest leakage current is usually noted with the maximum water temperature that, in the case of an instantaneous or faucet heater, may be obtained by reducing the flow of water to a minimum.		N/A
34.12	The leakage current of a cord-connected liquid-heating appliance of the electrode type, or a product in which live parts of the heating element are in contact with the liquid, shall be investigated with reference to the inherent leakage current occurring during conditions of normal and abnormal use.		N/A
35	Escape Current Test		N/A
35.1	An instantaneous water heater with a leakage current collector as described in Leakage Current Collectors, Section 29 shall not produce leakage currents greater than 0.5 mA when tested in accordance with 35.2 – 35.4.		N/A
35.2	The appliance shall be connected to a closed loop water supply system that is insulated from ground, accommodates insertion of an escape current probe and is provided with a variable flow rate pump. The maximum length of the water path from the inlet and outlet fittings of the product to the point of escape current measurement shall not exceed 12 in (300 mm). The water shall be the hard water solution of 36.5.1.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
35.3	The appliance shall be supplied at rated voltage from an isolating transformer with controls set to the most unfavorable condition. An escape current probe (see 35.4) shall be connected to a milliammeter having a maximum 500 Ω input impedance and that is, in turn, connected to the equipment grounding terminal of the appliance.		N/A
35.4	The escape current probe shall consist of uncoated wire mesh screen having approximately 5 strands/in of 0.2 in (5 strands/cm 0.6 mm) diameter wire and measuring approximately 4 by 4 in (100 by 100 mm) and provided with a solid copper conductor for connection to the milliammeter. The conductor shall be no smaller than the equipment grounding conductor required for installation of the appliance. The probe shall be immersed to intercept the water flow from each outlet individually as well as the combined flow. The probe shall be located within 1 in (25 mm) of the water outlet openings.		N/A
36	Normal Temperature Test		P
36.1	General		P
36.1.1	A heating appliance, when tested under the conditions described in 36.1.3 – 36.12.1 shall comply with all four of the following conditions:36.1.1		P
36.1.2	Initial temperature transients may be in excess of the value shown in Table 36.1 if the duration and extent of the excursion do not result in a risk of fire or electric shock and do not unduly shorten the life of the product.		P
36.1.3	All values in Table 36.1 are based on an assumed room ambient temperature of 25°C (77°F), but a test may be conducted at any ambient temperature within the range of 10 – 40°C (50-104°F).However, if the operation of an automatic thermal control during the test limits the temperatures under observation, no temperature higher than 25°C plus the specified maximum rise is acceptable.		P
36.1.4	A gasket that is depended upon to keep water from entering into a heating appliance during cleaning shall not become hard or brittle, shall not crack, and shall show no other signs of deterioration as a result of an accelerated-aging test in which the gasket is subjected to elevated temperatures.		P



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Clause	Requirement – Test	Result – Remark	Verdict
36.1.5	The temperature to which the gasket is subjected during the test, as well as the duration of the test, is to be determined in accordance with the material of the gasket, the temperature to which it is subjected during operation, and other conditions of the particular application. Usually the product is to be operated dry and for a period of 240 hours.		P
36.1.6	Following the accelerated aging, the sample is to be immersed, tested, and examined for the entrance of water.		N/A
36.1.7	A vaporizer, insecticide or medicament, shall not subject the stored or vaporized chemical to temperatures likely to result in ignition.		N/A
36.1.8	Temperatures are to be measured by thermocouples consisting of wires not larger than 24 AWG(0.21 mm ²) and not smaller than 30 AWG (0.05 mm ²), except that a coil temperature may be determined by the change- of-resistance method if the coil is inaccessible for mounting thermocouples. When thermocouples are used in determining temperatures in electrical equipment, it is standard practice to employ thermocouples consisting of 30 AWG (0.05 mm ²) iron and constantan wire and a potentiometer-type instrument, and such equipment is to be used whenever referee temperature measurements by thermocouples are necessary. The thermocouple wire is to conform with the requirements listed in the Tolerances on Initial Values of EMF versus Temperature tables in the Standard Specification and Temperature- Electromotive Force (emf) Tables for Standardized Thermocouples, ANSI/ASTM E230/E230M. The thermocouples and related instruments are to be accurate and calibrated in accordance with good laboratory practice.		P
36.1.9	For tests that are to be continued until constant temperatures are attained, thermal equilibrium is to be considered to exist only if three successive readings indicate no change when taken at the conclusion of each of three consecutive equal intervals of time, the duration of each interval being whichever of the following is longer: a. 5 minutes; or b. 10 percent of the total test time elapsed previous to the start of the first interval.		P
36.1.10	A thermocouple junction and adjacent thermocouple lead wire are to be securely held in good thermal contact with the surface of the material whose temperature is being measured. In most cases, good thermal contact will result from securely taping or cementing the thermocouple in place but, if a metal surface is involved, brazing or soldering the thermocouple to the metal may be necessary.		P



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Clause	Requirement – Test	Result – Remark	Verdict
36.1.11	The temperature of a coil or winding is to be measured by means of thermocouples mounted on the outside of the coil wrap. If the coil is inaccessible for mounting thermocouples, for example, a coil immersed in sealing compound, or if the coil wrap includes thermal insulation, or more than 1/32 inch (0.8mm) of cotton, paper, rayon, or similar insulation, the change-of- resistance method is to be used. For the thermocouple-measured temperature of a coil of an alternating-current motor, other than a universal motor, having a frame diameter of 7 inches (178 mm) or less (items 9 and 12 in Table 36.1), the thermocouple is to be mounted on the integrally applied insulation of the conductor.		N/A
36.1.12	At a point on the surface of a coil where the temperature is affected by an external source of heat, the temperature rise measured by means of a thermocouple may be higher by the following amount than the maximum indicated in Table 36.1, provided that the temperature rise measured by the change-of-resistance method does not exceed the values indicated in Table 36.1:		N/A
36.1.13	To determine whether a heating appliance complies with the requirements in 36.1.1, the product is to be operated continuously until constant temperatures have been reached. The test voltage is to be the highest of the following: a. The marked voltage rating; or b. The highest voltage of the applicable range of voltages specified in 52.1 if the marked voltage is within one of the voltage ranges indicated in 52.1.		P
36.1.14	Unless a particular voltage or other test condition is specified in 36.1.24 – 36.12.1, the test voltage specified in 36.1.13 is to be increased, if necessary, to cause the wattage input to the product to be equal to the wattage rating marked on the product		P
36.1.15	If a heating appliance employs a motor in addition to a heating element, the voltage applied to an integrally connected motor is to be the test voltage as specified in 36.1.13. A motor supplied from a separate circuit is to be connected to a test voltage derived from its marked rated voltage in accordance with 36.1.13.		N/A
36.1.16	In conducting a test to determine whether a heating appliance complies with the temperature requirements, it is to be mounted or supported as in service and tested under conditions approximating those of normal operation, except as otherwise noted. Temperatures are to be observed on nearby surfaces, on the supporting surface, at points of support, on attachment plugs, and at other points as may be necessary		P



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Clause	Requirement – Test	Result – Remark	Verdict
36.1.17	A heating appliance intended to be permanently connected to the power supply or a product that is cord-connected and that is intended to be fastened in place or located in a dedicated space is to be supported in the intended manner on black-painted wood not less than 3/8 inch (9.5 mm) thick and is to be located in a corner – vertical walls meeting at a right angle – formed by two black-painted, vertical sheets of 3/8 inch (9.5 mm) plywood having such width and height that they extend not less than 2 ft (610 mm) beyond the physical limits of the heater. The heater is to be located as close to both walls of the corner as its construction permits, and it is to be so placed relative to the walls that maximum heating of the walls will occur, except that it may be spaced away from the walls to limit the wall temperatures from rising more than 65°C (117°F) if the heater is marked as described in 53.9.		N/A
36.1.18	Unless otherwise indicated in the description of the test for a specific product, a cord-connected product is to be supported on two layers of white tissue paper on a softwood surface.		N/A
36.1.19	An automatic temperature-regulating or -limiting control or other protective device is to be shunted out of the circuit, unless the control has been shown, in accordance with Table 43.1, to be rugged, reliable, and unlikely to be defeated by the user. The control is considered to be unlikely to be defeated if tools are required to gain access to the control, or a positive stop is incorporated in the control.		N/A
36.1.20	If the construction of a heating appliance is such that cooking or heating of a liquid is a determining factor in the temperature attained, the intended duty of a product is to be taken into consideration. Normal operating conditions cannot be obtained, however, if certain types of products are operated continuously and in a dry condition. Accordingly, in determining whether a product complies with the requirements in 36.1.1, actual service conditions or an approximation thereof are to be employed. Unless otherwise specifically indicated below:		N/A
36.1.21	A product that may be either open or closed in actual service, such as a heat transfer press, is to be tested both open and closed to determine which condition produces the higher operating temperature. In the case of an open-front tabletop product, where some heating operation may be performed without a tray in place, temperatures are to be measured on the horizontal supporting surface in front of the open face of the product. 36.1.22 36.1.23		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
36.1.22	External thermal insulation, such as woven glass fiber or mineral wool, is to be removed before a heating appliance is installed in the test enclosure unless the material is bonded or permanently attached to the product. Rubber or other material similarly subject to deterioration is to be removed from feet or other supports if the removal of the material is likely to result in higher temperatures being attained on the product.		N/A
36.1.23	Wherever cheesecloth is mentioned in connection with either a temperature test or an abnormal test, the cloth is to be bleached cheesecloth running 14–15 yd/lb (approximately 28–30 m/kg) and having what is known to the trade as a “count of 32 x 28” – that is, for any square inch, 32 threads in one direction and 28 threads in the other direction (for any square centimeter, 13 threads in one direction and 11 threads in the other direction).		N/A
36.1.24	For most of the common types of heating appliances, standardized normal conditions for the temperature tests are given in 36.2 – 36.12.		N/A
36.2	Ceramics-baking kilns and ovens		N/A
36.2.1	If marked with a warning statement as indicated in 53.22, the product is to be operated until the internal temperature reaches a value indicated in that statement, and the power supply is then to be cut off. Temperatures are to be recorded over such interval as may be necessary to determine that the maximums have been observed. In the absence of the marking mentioned above, the product is to be operated until observed temperatures have become stabilized, and they are then to be recorded.		N/A
36.3	Charcoal ignitors		N/A
36.3.1	A cord-connected charcoal ignitor is to be operated until maximum temperatures are reached in a brazier-held conical bed of charcoal briquettes that is 18 inches (457 mm) in diameter and 4 inches (102mm) high. The diameter of the brazier is to be 24 inches (610 mm) and the bed of charcoal is to be located tangent to the brazier rim. The center of the area enclosed by the heated ignitor element is to be located as close to the center of the bed of charcoal as the length of the heating element permits but, in any case, the handle of the ignitor is to be outside the rim of the brazier at the point at which the charcoal bed is tangent to the rim. At the conclusion of the normal temperature test, operation is to be continued as described in 42.4.2.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
36.4	Stock-tank de-icers, stock waterers, and the like 36.4.1 A device intended for heating in low-temperature air is to be operated in the intended manner while in air at 25°C (77°F) and while in air at minus 23.0 ±3.0°C (minus 9.4±5.4°F). The temperature limitations are to be those indicated in Table 36.1 plus 25°C.		N/A
36.5	Liquid heaters and vaporizers, cord-connected		N/A
36.5.1	The product is to be operated continuously with water. If the product is of the immersed- electrode type, a hard water solution of:		N/A
36.6	Poultry and livestock brooders		N/A
36.6.1	If marked in accordance with 53.25, a brooder is to be tested while mounted at the height above the supporting surface recommended by the manufacturer. A brooder not so marked is to be tested while mounted as close to the supporting surface as its construction will permit. If the product has an adjustable temperature control, it is to be set at the value recommended by the manufacturer.		N/A
36.7	Soldering irons and soldering guns and desoldering tools		P
36.7.1	A product equipped with a momentary-contact switch, such as a high-speed resistance-type soldering iron or a transformer-type soldering gun, is to be tested as follows. The product is to be connected to a circuit that provides the test voltage indicated in 36.1.13 and is to be supported at an angle of 45 degrees from the horizontal with its tips resting in a pool of solder approximately 1/2 inch (13 mm) in diameter. It is to be operated in cycles of 1 minute on and 4 minutes off until stabilized temperatures are attained. An iron or desoldering tool of any other type is to be operated continuously until temperatures become stabilized, while resting on its stand with the applied voltage reduced to give a temperature of 275°C (527°F) at the tip.		P
36.8	Solder pots, nonautomatic		N/A
36.8.1	For a nonautomatic solder pot in which means are provided to adjust the heat to values for melting different metals or alloys, and that is plainly and permanently marked to indicate which wattage setting should be used for each metal or alloy, the test is to be performed as follows: the solder pot is to be operated at each setting until temperatures become stabilized, while charged with the metal or alloy corresponding to that setting, as indicated in the marking.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
36.9	Warming trays		N/A
36.9.1	Warming trays, intended to receive only vessels on the heated surface, are to be operated continuously with the thermostat set at the maximum-heat position and with the surface empty. If the thermostat cycles, the test is to be repeated with a vessel – containing water to a minimum depth of 1 inch (25 mm) – placed on the heating surface over the thermostat. The vessel will usually consist of a 6 inch (152 mm) diameter shallow pan.		N/A
36.10	Water heaters of the side-arm type		N/A
36.10.1	A water temperature of 77.0°C (170.6°F) is considered to be the highest normal value.		N/A
36.11	Refrigerator defrosters		N/A
36.11.1	No external surface of a refrigerator defroster shall exceed 100°C (180°F) rise over ambient temperature. See 53.34.		N/A
36.12	Heat guns		N/A
36.12.1	The temperature rise of the supporting surface of a heat gun incorporating a built-in stand shall not exceed 125°C (225°F) when tested in accordance with 36.1.1 with the heat gun utilizing its stand with all possible combinations of attachments available for the heat gun.		N/A
36.13	Hybrid adhesive guns		N/A
36.13.1	Temperature testing of 36.12.1 shall additionally be conducted under “battery only” and “battery-plus-mains” conditions. Testing will commence with new fully charged batteries at the start of each test. Temperatures will be monitored during the test and maximum temperatures will be recorded in order to determine compliance with Table 36.1. Testing under battery conditions will continue until the batteries are fully discharged or until temperatures stabilize.		N/A
36.13.2	Temperature testing shall be conducted in various orientations. Examples of orientations include but are not limited to:		N/A
36.14	Semi-rigid enclosed pet heating mat/pad		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
36.14.1	A semi-rigid enclosed mat/pad is to be operated at rated voltage until thermal equilibrium when laid out flat between two felt mats with an area that will cover the mat/pad completely and extends beyond the entire perimeter not less than 2 inches (51mm). During this test, temperatures are to be observed via no fewer than six thermocouple probes located at points in close contact with the exterior of the mat/pad.		N/A
36.14.2	The felt mentioned is to be 1-inch-thick (25-mm-thick), 100-percent Standard-weight, all-cattle- hair, punched felt with center reinforcement consisting of burlap having a mass of 5 oz/yd ² (170g/m ²). The felt is to have a mass of 105 ±15 oz/yd ² (3.560 ±0.508 kg/m ²). An acceptable alternative to the all-cattle hair felt is SAE J314, Grade F-11, 25.4-mm (1-inch) thick wool felt.		N/A
36.14.3	In addition to the temperature limits in Tables 36.1 and 36.2, the surface of the mat/pad provided shall not exceed 80°C maximum temperature regardless of room ambient.		N/A
36.14.4	Internal pad temperatures shall not exceed the temperatures of Table 36.3.		N/A
37	Test of Insulation Resistance and Leakage Current as a Result of Moisture		P
37.1	A product employing insulation material likely to be adversely affected by moisture under condition of intended use shall be conditioned for 48 hours in moist air having a relative humidity of 88 ±2 percent at a temperature of 32.0 ±2.0°C (89.6 ±3.6°F). After the conditioning:		P
37.2	The insulation resistance is to be measured by:		P
37.3	A product that by design and intended use can be expected to be used outdoors – for example, a stock-tank de-icer, or charcoal ignitor, or heat gun – and a product such as a refrigerator defroster, which may be exposed to wet or moist conditions, when tested after being conditioned as indicated in 37.4 – 37.6:		N/A
37.4	After being conditioned as follows, and in the sequence indicated, each of two samples of a charcoal ignitor is to be tested first for leakage current and then dielectric voltage-withstand as indicated in 37.3.		N/A
37.5	After being conditioned as follows, and in the sequence indicated, each of two samples of a refrigerator defroster is to be tested first for leakage current and then dielectric voltage- withstand as indicated in 37.3:		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
37.6	Except for a charcoal lighter, one sample of a product that can be expected to be used outdoors is to be mounted as in actual service – the product is to be mounted in any shield or other shelter that the manufacturer provides for use with the product. While so mounted and without being energized the product is to be subjected for 4 hours to a water spray applied at an angle 45° from the vertical and adjusted to be equivalent to a beating rain. After this conditioning and while still mounted, the product is to be tested first for leakage current or for insulation resistance and then dielectric voltage-withstand as indicated in 37.3.		N/A
37.7	A heat gun, as mentioned in the Exceptions to 37.6, shall not have a leakage current greater than 2.0 mA after being conditioned as described in 37.8 and 37.9. Following conditioning, a heat gun with a leakage current that exceeds 0.5 mA shall be additionally tested as follows: after a minimum of 10 hours storage at room temperature and humidity, or after 1 hour running on the lowest heat setting, the leakage current shall not exceed 0.5 mA.		N/A
37.8	The heat gun is to be conditioned in a cold chamber at $5.0 \pm 2.0^{\circ}\text{C}$ ($41.0 \pm 3.6^{\circ}\text{F}$) for at least 4 hours, then transferred from the cold chamber to a humidity chamber at 88 ± 2 percent relative humidity at $32.0 \pm 2.0^{\circ}\text{C}$ ($89.6 \pm 3.6^{\circ}\text{F}$). The transfer time shall not exceed 1 minute.		N/A
37.9	Immediately after being placed in the humidity chamber, the leakage current is to be measured between all exposed conductive surfaces and all gripping surfaces and earth ground with the heat gun connected to the intended branch-circuit supply but not operating. The leakage current shall be continuously monitored until it stabilizes or drops.		N/A
37.10	In the case of a warming tray, a volume of hard water solution made as described in 34.10 and in sufficient quantity to cover the product surface to a depth of 5 mm, is to be sponged over the serving surface. The sponging operation is to consist of using the volume of water described above in a simulated cleaning operation with the water being allowed to drain from the edges. At the conclusion of this test, the leakage-current or insulation-resistance and the dielectric voltage-withstand tests described in 37.3 are to be conducted. The leakage current is not to exceed 0.5 mA.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
37.11	Except as noted in 37.12, a product that can be expected to be immersed in water for cleaning shall show a leakage current of not more than 0.5 mA and shall be capable of withstanding a potential of 1000V when tested in accordance with 37.12 – 37.15. The test shall not result in the entrance of water into the interior of the product such that the water might come into contact with uninsulated live parts.		N/A
37.12	A product marked to indicate that it is not intended for immersion need not comply with the requirements in 37.11. See 53.24.		N/A
37.13	Three samples of the product are to be heated and are then to be immersed immediately in water at a temperature of 10 – 25°C (50 – 77°F). The immersion is to be complete unless the product is marked to indicate that it is intended for partial immersion only, see 53.24, in which case each product is to be immersed only to the extent indicated. After 1 hour of immersion, the samples are to be removed from the water, dried with a soft cloth to remove all surface moisture, including surface moisture from terminal pins, and the samples are to be tested for leakage current as indicated in 37.3.		N/A
37.14	The entire procedure of immersion and leakage-current measurement is to be repeated four times, immediately following which each sample is to be subjected to a 1000-V dielectric voltage-withstand test as described in 38.1. The three samples are to be used for aging tests, and are required to comply with the requirements in 36.1.4 – 36.1.6. If there is an air cavity having electrical components, the three samples are to be disassembled and the internal parts visually examined for the presence of water (37.11). See Table 37.1.		N/A
37.15	An immersible heating appliance is to be heated for the immersion test by operating it dry, with the thermostat at the highest setting, until the thermostat automatically switches to the "low" or "off" position.		N/A
37.16	The three samples to be used for the tests described in 37.13 and 37.14 are to be operated, as described in 37.15.		N/A
38	Dielectric Voltage-Withstand Test		P
38.1	A heating appliance shall be capable of withstanding for 1 minute without breakdown a 60 Hz essentially sinusoidal potential applied between live parts and dead parts, with the product at its maximum normal operating temperature. The test potential (rms) shall be as indicated in Table 38.1.		P



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Clause	Requirement – Test	Result – Remark	Verdict
38.2	To determine whether a product complies with the requirement in 38.1, the product is to be tested by means of a 500 VA or larger-capacity testing transformer, the output voltage of which is essentially sinusoidal and can be varied. The applied potential is to be increased gradually from zero until the required test value is reached, and held at that value for 1 minute. The increase in the applied potential is to be at a uniform rate and as rapid as consistent with its value being correctly indicated by the voltmeter.		P
38.3	In the case of a product in which the electric wiring passes through a hinged member or spring, the cover is to be raised and lowered three or more times while the test potential is being applied in order to determine whether a breakdown may result from damaged insulation on the conductors while the cover is in other than simply the closed position.		N/A
38.4	An immersion-type heater in which the electrodes make contact with a liquid shall be capable of withstanding successfully, for a period of 1 minute, the application of a potential of 150 percent of the maximum rated voltage of the product across the supply connections, under any condition of intended operation of the product.		N/A
38.5	In addition to the test of 38.1, a hybrid adhesive gun shall withstand a 1000 V, 60 Hz essentially sinusoidal potential applied between ac current carrying parts and the battery terminals.		N/A
39	Mechanical Endurance Test		P
39.1	If the intended operation of a heating appliance causes movement of the internal wiring, the product shall be capable of operating for 6000 cycles in the intended manner while connected to a supply circuit of the voltage indicated in the Normal Temperature Test, Section 36. If the normal cleaning of a heating appliance causes movement of the internal wiring, the movable part shall be capable of operating successfully for 1000 cycles unenergized in the intended manner indicated in 36.1.2. There shall not be any electrical or mechanical malfunction and, after the test, the product shall comply with the requirements for dielectric voltage-withstand in 38.1 – 38.3.		P



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Clause	Requirement – Test	Result – Remark	Verdict
39.2	In a test to determine whether a heating appliance complies with the requirement in 39.1, any mechanical arrangement may be employed to operate the movable member at a rate of approximately 12 cycles per minute, but, in any case, the cover or movable member is to be so operated that it will reach the actual limits of travel in both directions, each cycle. In the case of a product that has two different stop positions for the hinged cover, 1000 operations out of the total of 6000 are to be made with the cover moved to the wide-open position.		N/A
39.3	If flexing or internal electric wiring or uninsulated live parts occurs during installation or inspection of electrical field-wiring connections, see 11.1.5, then internal electric wiring or uninsulated live parts are to be flexed 50 cycles under the conditions specified in 39.4.		N/A
39.4	Prior to the flexing test required in 39.3, the terminal box or area adjacent to the component termination leads shall be filled with the field-wiring leads, branch-circuit wiring, and the like, as would be encountered in intended use. Flexing of the component leads shall not result in damage to the electrical insulation in the flexing area or disarrangement of the electrical connections that would preclude proper storage of the component connecting leads and there shall be no electrical or mechanical malfunction. After the test,		N/A
40	Resistance to Impact		P
40.1	The material of a reservoir, the breakage of which may result in risk of fire or electric shock, shall have such properties as to meet the conditions anticipated in use		P
40.2	The reservoir mentioned in the Exception to 13.3 shall withstand the applicable impact test described in 40.3 or 40.6 without cracking, breaking or sustaining other damage that could cause leaking of the liquid it is intended to contain.		P
40.3	Each of three samples of a product that is hand-supported in normal use is to be subjected to the impact that results from the product being dropped through a distance of 3 feet (914 mm) onto a hardwood surface. Depending upon intended usage, the product is to be dropped so as to strike the floor in the positions most likely to produce adverse results.		P



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Clause	Requirement – Test	Result – Remark	Verdict
40.4	The hardwood surface mentioned in 40.3 is to consist of a layer of nominal 1 inch (25 mm) thick tongue-and-groove oak flooring mounted on two layers of 3/4 inch (19 mm) thick plywood. The hardwood surface assembly is to rest on a concrete floor or the equivalent during the test.		P
40.5	With reference to 40.3, the test on the product is to be conducted so that each sample strikes the surface in a position different from those of the other two samples. Three individual samples may be employed for the tests, or if the manufacturer so elects, fewer samples may be used in accordance with Figure 40.1. The overall performance is acceptable upon acceptable completion of any one of the procedures represented in the table. If any sample is not acceptable on its first drop in any of three positions, the results of the test are unacceptable.		P
40.6	A product not normally hand-supported is to be subjected to an impact as required in Table 40.1 on any surface that is susceptible to a blow during normal use. For the top surface the impact is to be produced by dropping a steel sphere, 2 inches (50.8 mm) in diameter and weighing approximately 1.18 lb (535 g), from the height necessary to produce the specified impact as shown in Figure 40.2. The steel sphere shall strike the surface in a location different from those in the other two impacts. For surfaces other than the top of the product, the steel sphere is to be suspended by a cord and allowed to swing as a pendulum, dropping through the vertical distance necessary to cause it to strike the surface with the specified impact as shown in Figure 40.2.		N/A
40.7	A product is to be subjected to the applicable impact test described in 40.3 or 40.6 with or without any attachment recommended by the manufacturer, whichever would result in the most severe test.		P
40.8	After the applicable Impact Test of 40.3 or 40.6 the product shall:		N/A
41	Overflow Test		N/A
41.1	If a heating appliance – such as a vaporizer, sterilizer, or the like – incorporates a reservoir or liquid-storage chamber that is likely to be overfilled in intended use, liquid overflowing from the reservoir or chamber shall not wet uninsulated live parts or enamel-insulated wires, and shall not wet electrical insulation that is likely to be adversely affected by the liquid usually used in the reservoir or chamber.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
41.2	To determine whether a product complies with the requirement in 41.1, it is to be tested as follows: water is to be used for the test and is to be poured into the reservoir through an orifice 3/8 inch (9.5 mm) in diameter. The reservoir is to be filled to the level recommended by the manufacturer if such level is plainly marked; otherwise, the reservoir is to be filled to maximum capacity. Additional water, equal to 50 percent of the volume just mentioned, but not more than 1 pint (470 mL), is then to be poured into the reservoir. Determination of whether uninsulated live parts have become wet as a result of the overflow is to be by means of visual inspection, but this may be supplemented by an insulation-resistance test, a dielectric voltage- withstand test, or both if considered to be appropriate.		N/A
42	Abnormal Operation Test		P
42.1	General		P
42.1.1	If the conditions of normal operation are not representative also of abnormal conditions likely to be obtained in actual service, a heating appliance shall not involve the risk of fire or electric shock when operated continuously under such abnormal conditions.		P
42.1.2	To determine whether a risk of fire or electric shock actually exists, a separate burnout or abnormal test is to be conducted with the product operating continuously until the ultimate result has been observed. Unless otherwise indicated, the test is to be conducted with the applied voltage, method of mounting and thermostat connection in accordance with 36.1.13 – 36.1.16 and 36.1.19. In most cases, continuous operation for 7 to 8 hours will be necessary to determine the ultimate result. A cord-connected product is to be placed on white tissue paper on a softwood surface.		P
42.1.3	When operated under such abnormal conditions, a product is considered to involve a risk of fire if there is any emission of flame or molten metal, other than drops of melted solder, or if the operation of the product results in the glowing or flaming of combustible material upon which the product may be placed or – in the case of a permanently installed product – may be in proximity to the product as installed.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
42.1.4	After having been subjected to an abnormal test, the cord-connected heating appliance is considered to involve a risk of electric shock if the current measured through a 500-ohm resistor between an accessible part and ground is more than 5 mA. The current need not be measured at terminals operating at voltage levels that do not involve a risk of electric shock. In the case of a product utilizing a liquid in its intended operation, the liquid container is to be filled with the hard-water solution described in 34.10 in the intended manner, prior to the current measurement. Liquid need not be added if it is obviously apparent that the product will not hold liquid. Otherwise, water in an amount equal to the capacity of the container is to be poured into the container and the current is to be measured as quickly as possible thereafter.		N/A
42.1.5	If a motor is connected across a portion of a resistance element, the product shall not involve a risk of fire or electric shock as the result of an open circuit in the portion of the element that is in parallel with the motor.		N/A
42.1.6	For most of the common types of heating appliances, standardized abnormal test conditions are given in 42.2 – 42.18.		P
42.2	Products with breakable exterior surfaces		N/A
42.2.1	If a product, such as a warming tray, has an exterior surface of glass, ceramic, or comparably brittle material in or on which the heating element is mounted or that is an essential part of the enclosure of live parts, the material shall be capable of withstanding the stresses likely to be encountered in actual service.		N/A
42.2.2	Certain specific tests are described in 42.3.1 – 42.3.3, but other tests may be necessitated by the design or intended operation of the product.		N/A
42.3	Products with breakable surfaces		N/A
42.3.1	The glass or ceramic surface shall withstand without cracking or breaking the application of a cloth fully saturated with water – the hard-water solution described in 34.10 – at room temperature, with the product in the fully heated condition. The quantity of water involved shall wet the surface completely.		N/A
42.3.2	The glass or ceramic surface of a warming tray shall withstand without cracking or breaking the impact of a 2 inch (50.8 mm) diameter, 1.18-lb (0.535-kg) steel ball, dropped from a height of 40.5 inches (1.03 m). Four impacts shall be made at different places on the tray.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
42.3.3	In the case of a product other than a warming tray, the glass or ceramic surface shall withstand without cracking or breaking the impact of a utensil loaded with 4 lb (1.81 kg) of shot and dropped from a height of 6 inches (152 mm). The size and shape of the utensil shall be as appropriate as possible for the product, and ten impacts of the utensil shall be made.		N/A
42.4	Heat guns		N/A
42.4.1	Each of three samples of a heat gun shall be energized at rated wattage and set to operate at maximum normal speed. While still operating, each heat gun shall be dropped three times, from a height of 3 ft (0.91 m), onto a concrete surface so that the point of impact is different for each of the three drops. After the third drop the units are to be examined and tested for compliance with the requirements of 42.4.2.		N/A
42.4.2	If a sample, after being subjected to the test specified in 42.4.1:		N/A
42.4.3	If a heat gun appears operable following the three drops, it is to be energized for 1 hour or until ultimate results are noted, whichever occurs first. Upon completion of this test, after dropping and operation, compliance with 42.4.2 shall be determined for each sample.		N/A
42.5	Ceramics-baking kilns and ovens		N/A
42.5.1	A kiln or oven which bears the warning marking described in 53.22 is to be operated until temperatures have become constant		N/A
42.6	Charcoal ignitors		N/A
42.6.1	Without adding charcoal, the operation of the sample used in the normal-temperature test is to be continued for a total of 7 hours. During the test, the grounding means provided by a 3- conductor cord is to be disconnected and the ignitor sheath is to be connected to ground through a 3-A fuse. Rupture of the sheath, opening of the fuse, or dielectric breakdown when the product is tested in accordance with 38.1 and 38.2 indicates that the ignitor is not acceptable.		N/A
42.6.2	An ignitor is to be operated while supported on its integral stand on a softwood surface covered with two layers of white tissue paper.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
42.6.3	There shall be no exposed live parts as a result of the following tests. The sheaths of charcoal or log lighters that have been subjected to the following tests shall not rupture or result in a dielectric breakdown when tested in accordance with 38.1 and 38.2.		N/A
42.7	Stock-tank de-icers, stock waterers, and the like		N/A
42.7.1	A device intended for heating in low- temperature air shall be operated dry in air at 25°C (77°F) and in air at minus 23.0 ±3.0°C (minus 9.4 ±5.4°F) while supported on a tissue- paper-covered softwood supporting surface with dry, shredded newspaper placed loosely over the active part of the heating surface or surfaces.		N/A
42.8	Warming trays 42.8.1 42.9 Immersion heaters 42.9.1, 42.10, 42.10.1, 42.11 42.11.1, 42.12, 42.12.1, 42.13, 42.13.1		N/A
42.8.1	A warming tray is to be operated with the entire serving surface covered with a double layer of cheesecloth and with a 1 inch (25 mm) thick hair-felt pad. If the thermostat cycles, the test is to be repeated with only two-thirds of the serving surface covered and again with one- third of the serving surface covered. In the partial coverage test, the area of the tray farthest from the thermostat is to be covered. Operation under each of the above conditions is to be continuous for a period of 7 hours.		N/A
42.9	Immersion heaters		N/A
42.9.1	A cord-connected immersion heater is to be operated on a softwood surface covered with two layers of white tissue paper, with the sheath of the element in contact with the paper-covered surface.		N/A
42.10	Liquid heaters		N/A
42.10.1	A liquid heater is to be operated dry and with all automatic temperature controls or protective devices shunted out of the circuit, except as noted in 36.1.19.		N/A
42.11	Ovens		P
42.11.1	A nonautomatic oven is to be operated without any temperature regulation.		P
42.12	Poultry and livestock brooders		N/A



UL 499			
Clause	Requirement – Test	Result – Remark	Verdict
42.12.1	The brooder is to be tested while supported on a softwood surface covered with two layers of white tissue paper, and mounted in the 90 degree corner described in 36.1.17. The brooder is to be located as close to the supporting surface and to both walls of the corner as its construction will permit, and is to be so oriented that maximum heating on the walls and supporting surface will result.		N/A
42.13	Solder pots, nonautomatic		N/A
42.13.1	A nonautomatic solder pot is to be operated continuously until ultimate results are observed, while charged with the commonly used metal or alloy that results in highest temperatures. If the product incorporates a means for adjusting the heat input, this is to be set at the maximum.		N/A
42.14	Soldering irons		P
42.14.1	A soldering iron that does not incorporate a momentary-contact switch is to be operated on its stand until ultimate results are obtained.		P
42.15	Hot plates		N/A
42.15.1	A hot plate is to be operated continuously with each heating unit covered with a cast-iron circular stove plate. The plate to be used with a 6 inch (152 mm) or smaller surface unit is 7–8 inches (178 –203 mm) in diameter and weighs approximately 3 lb (1.36 kg). The plate to be used with a larger surface unit is 10 – 11 inches (254 – 279 mm) in diameter and weighs approximately 7 lb (3.18 kg).		N/A
42.16	Ceramic products		N/A
42.16.1	A ceramic liquid heating appliance shall not involve risk of electric shock when operated as described in 42.16.2.		N/A
42.16.2	The product is to be filled with just enough water – the hard water solution described in 34.10 – to cover the heating element and then operated continuously, without the addition of any more water, until the heating element burns out to open the circuit, except that the time of operation is not to exceed 7 hours. After the product has cooled to room temperature, it is to be half filled with water again and connected to the supply circuit. A risk of electric shock is considered to exist if the current measured through a 500-ohm resistor between the water in the product and ground exceeds 5.0 mA. The current is to be measured again with reversed polarity of the supply circuit.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
42.16.3	If the product breaks during the heating described in 42.16.2, the test is to be discontinued and the product is not to present a risk of fire or electric shock.		N/A
42.16.4	An insulating washer, gasket, or the like, used as a seal or barrier between uninsulated live parts and the liquid chamber of a liquid heating appliance shall be such that there will not be a leakage current of more than 0.5 mA between liquid in the product and ground after a product has been operated as described in 42.16.5.		N/A
42.16.5	The product is to be operated continuously for 168 hours after having been filled with the liquid usually used in the product. Liquid is to be added from time to time to keep the liquid chamber from becoming less than half full. The product is then to be subjected to a repeated leakage-current test, see 34.1, except that the test is to be discontinued when leakage current stabilizes.		N/A
42.16.6	An insulating washer or gasket as described in 42.16.4 shall show no visible signs of deterioration after being aged for 168 hours in a circulating-air oven at a temperature of 135.0 $\pm 1.0^{\circ}\text{C}$ (275.0 $\pm 1.8^{\circ}\text{F}$).		N/A
42.17	Vaporizers of the resistance-wire type		N/A
42.17.1	A vaporizer of the resistance-wire type is to be operated dry, for not less than 4 hours or until ultimate conditions are obtained. The product is to be completely wrapped in a pad consisting of eight layers of bleached cheesecloth, with the pad in contact with the vaporizer parts, and then placed on a softwood surface.		N/A
42.18	Heating appliances employing fans or blowers		N/A
42.18.1	Heating appliances employing blowers or fans shall be positioned as intended on a softwood surface covered with white tissue paper. The rotor of the fan / blower motor shall be stalled. The appliance shall be operated continuously until the ultimate results have been determined.		N/A
42.19	Hybrid adhesive guns		N/A
42.19.1	General		N/A
42.19.1.1	Hybrid adhesive guns shall not pose a risk of fire or electric shock as determined by 42.1.3 – 42.1.4 and Section 38 when tested in accordance with 42.19.2 – 42.19.4.		N/A
42.19.2	Hybrid adhesive gun reverse battery polarity test		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
42.19.2.1	Unless the hybrid adhesive gun design precludes incorrect installation, the manufacturer's recommend battery shall be installed in the battery compartment such that the battery (ies) is inserted in the incorrect polarity. The compartment cover shall be installed and the unit placed on a softwood supporting surface covered with tissue paper, with the battery compartment oriented in contact with or as close to the surface as the design permits. The unit shall be covered with a layer of cheesecloth and then to be energized for a period of 7 hours.		N/A
42.19.3	Battery short-circuit test		N/A
42.19.3.1	A sample of the hybrid adhesive gun with fully charged battery (ies) specified by the manufacturer shall be positioned, with the battery compartment cover closed, in the most unfavorable orientation as determined by the Normal Temperature Test of Section 36. The battery terminals shall be short-circuited. The total resistance of the shorting circuit shall not exceed 0.1 ohm. The test is to continue until the battery is to completely discharged or until the battery case temperature has peaked or reached a steady state condition.		N/A
42.19.4	Hybrid adhesive gun component fault test		N/A
42.19.4.1	Components whose failure could result in an increase risk of fire and/or electric shock during any condition of operation shall be subjected to a short of any two terminals or an open at a single connection, one test at a time. These components include electrolytic capacitors, semiconductors and resistors (open circuit only) in the battery and mains connected circuits. The sample shall be energized prior to introducing the fault shall employ new fully charged batteries.		N/A
43	Testing of Component Switches and Control Devices		N/A
43.1	Overload test for motor switches		N/A
43.1.1	A switch or other device that controls a motor employed in a heating appliance, unless previously investigated for the application or unless so interlocked that it will not have to break the locked-rotor motor current, shall be capable of performing acceptably when subjected to an overload test consisting of 50 cycles of operation, making and breaking the locked-rotor current of the motor. There shall be neither electrical nor mechanical malfunction of the device, nor undue burning, pitting, or welding of the contacts.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
43.1.2	To determine whether a switch or other control device is capable of performing acceptably in the overload test, the product is to be connected to a grounded supply circuit of rated frequency and of voltage in accordance with 36.1.13 with the rotor of the motor locked in position. During the test, exposed dead metal parts of the product are to be connected to ground through a 3-A fuse, and the current-rupturing device, if single-pole, is to be located in an ungrounded conductor of the supply circuit. If the product is intended for use on direct current, or on direct current as well as alternating current, the test is to be conducted with direct current and exposed dead metal parts are to be so connected as to be positive with respect to a single-pole, current-rupturing device. The device is to be operated at the rate of 10 cycles per minute, except that a faster rate of operation may be employed if agreeable to all concerned. The performance is unacceptable if the fuse in the grounding connection opens during the test.		N/A
43.2	Overload test for automatic controls		N/A
43.2.1	An automatic control for temperature regulating or temperature limiting shall be capable of performing successfully for 50 cycles of operation, when the heater is connected to a supply circuit having a potential of 120 percent of the voltage specified in 36.1.13. There shall be neither electrical nor mechanical malfunction of the control, nor undue burning, pitting, or welding of the contacts.		N/A
43.2.2	In tests to determine whether an automatic control complies with the requirements in 43.2.1 and		N/A
43.2.3	the product is to be connected to a grounded supply circuit; the enclosure of the product, if of metal, is to be connected to ground through a 3- A fuse; and the control, if single-pole, is to be connected in an ungrounded conductor of the circuit. If the heater is intended for use on direct current, or on direct current as well as on alternating current, the test is to be conducted with direct current, and the enclosure is to be so connected as to be positive with respect to a single-pole automatic control. The device is to be operated at the rate of 10 cycles per minute, except that a faster rate of operation may be employed if agreeable to all concerned. The performance is unacceptable if the fuse in the grounding connection opens during the test.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
43.2.3	An automatic control intended for use on direct current, which is so constructed that the starting handle does not stay latched with the timing knob in all of its position settings, thereby resulting in a slow break of the switch contacts upon release of the handle, shall be capable of performing successfully when tested as follows. The switch shall be subjected to 50 cycles of operation at normal load by releasing the handle slowly and, during the test, the metal frame of the product shall be connected to ground through a 3-A fuse to give indication of a flashover, should this occur. This test shall be made following the overload test and preceding the endurance test on the control. See 43.2.1 and 43.3.1.		N/A
43.3	Endurance test for thermostats		N/A
43.3.1	A thermostat shall be capable of withstanding an endurance test that, except as noted in 43.3.3, shall consist of the number of cycles indicated in Table 43.1. Unless it is specified that the test be made without load, the thermostat shall make and break the rated current of the product while connected to a circuit of rated voltage. There shall be neither electrical nor mechanical malfunction of the thermostat, nor undue burning, pitting, or welding of the contacts.		N/A
43.3.2	With reference to 43.3.1 and Table 43.1, thermostats are classified as follows:		N/A
43.3.3	For a medicament vaporizer of the resistance- wire type, the endurance test of a thermostat is to consist of 100,000 cycles under load.		N/A
43.4	Limited short circuit test for motor-control devices		N/A
43.4.1	There shall not be any ignition of cotton surrounding the outer enclosure of the protective device, that, in some cases, will be the enclosure of the motor that it protects, when three samples of a device controlling a 1/2 hp or smaller motor are subjected to short circuits on a circuit limited to 200 A, and when three samples of a device controlling a motor larger than 1/2 hp are subjected to short circuits on a circuit limited to 1000 A.		N/A
43.4.2	A motor is to be considered to comply with the requirement in 43.4.1 if it is equipped with an inherent overheating protector that complies with the requirements for such protectors.		N/A
43.4.3	For the tests mentioned in 43.4.1, the power factor of the test circuit is to be 0.9 – 1.0, and the circuit capacity is to be measured without the device in the circuit.		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
43.4.4	In each case, a nonrenewable cartridge fuse is to be connected in series with the device under test; the fuse is to be of the maximum current rating that will be accommodated by a fuseholder of the branch circuit to which the product would be connected. The test on one sample is to be made by closing the device on the short circuit.		N/A
44	Strain Relief Test		P
44.1	The strain-relief means provided on an attached flexible cord, when tested in accordance with 44.2, shall be capable of withstanding for 1 minute, without displacement, a pull of 35 lbf (156 N) applied to the cord, with the connections within the product disconnected.		P
44.2	The strain relief means provided on leads as mentioned in the Exception to 11.1.5 when tested in accordance with 44.3, shall be capable of withstanding for 1 minute without displacement a pull of 5 lbf (22 N) applied to the leads with connections at the termination disconnected.		P
44.3	The specified force is to be applied to the cord or leads, and the product so supported that the strain-relief means will be stressed from any angle that the construction of the product permits. The strain-relief is not acceptable if, at the point of disconnection of the conductors, there is sufficient movement of the cord or leads, to indicate that stress on the connections would have resulted.		P
45	Push-Back Relief Test		P
45.1	To determine compliance with 12.2.3, a product shall be tested in accordance with 45.2 without occurrence of any of the following conditions:		P
45.2	The supply cord is to be held 1 inch (25.4 mm) from the point where the cord emerges from the product or cord bushing, when provided, and is then to be pushed back into the product. The cord is to be pushed back into the product in 1 inch (25.4 mm) increments until the cord buckles or the force to push the cord into the product exceeds 6 pounds-force (26.7 N). The supply cord within the product is to be manipulated to determine compliance with 45.1.		P
46	Test for Permanence of Cord Tag for Outdoor- Use Heating Appliances with Power-Supply Cords Less than 6 Feet (1.8 m)		N/A
46.1	These tests are intended for tags employed with outdoor-use heating appliances requiring the marking of 53.38 with power-supply cords less than 6 ft (1.8 m), other than as mentioned in 53.14		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
46.2	To determine compliance with 53.39, representative samples that have been subjected to the tests described in 46.4 – 46.7 shall meet the following requirements:		N/A
46.3	For each type of conditioning mentioned in 46.4 – 46.6, three samples of the tag applied to the power-supply cord in the intended manner are to be used. If tags are applied by an adhesive, tests are to be conducted no sooner than 25 hours after application of the tag.		N/A
46.4	Three samples are to be tested as received.		N/A
46.5	Following conditioning in an air-circulating oven at $60 \pm 1^\circ\text{C}$ ($140 \pm 1.8^\circ\text{F}$) for 240 hours, three samples are to be tested after 30 minutes of conditioning at a room temperature of $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) and 50 ± 5 percent relative humidity.		N/A
46.6	Three samples are to be tested within 1 minute after exposure for 72 hours to a humidity of 85 ± 5 percent at $32 \pm 2^\circ\text{C}$ ($89.6 \pm 3.6^\circ\text{F}$). 46.7 Each sample is to consist of a length of power-supply cord to which the tag has been applied. The power-supply cord, with the attachment plug pointing up, is to be held tautly in a vertical plane. A force of 5 lbf (22.2 N) is to be applied for one minute to the upper-most corner of the tag farthest from the power-supply cord, within 1/4 inch (6.4 mm) of the vertical edge of the tag. The force is to be applied vertically downward in a direction parallel to the major axis of the cord. In determining compliance with 46.2(d), manipulation is permissible, such as straightening of the tag by hand. To determine compliance with 46.2(d), each sample is to be scraped 10 times across printed areas and edges, with a force of approximately 2 lbf (8.9 N), using the edge of a 5/64 inch (2.0 mm) thick steel blade held at a right angle to the test surface		N/A
47	Crushing Resistance for Flexible Pet Heating Mats/Pads		N/A
47.1	Flexible pet heating mats/pads shall withstand a 1-minute application of the crushing force described in 47.2 without resulting in any of the following:		N/A



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Clause	Requirement – Test	Result – Remark	Verdict
47.2	Three samples of the flexible pet heating mat/pad are to be backed on the mounting side by a fixed rigid supporting surface. A crushing force is to be applied to the side opposite the mounting surface. The force is to be applied through hardwood applicators each no more than 0.5 inch (12.7 mm) thick and having flat surfaces each 4 by 10 in (102 by 254 mm). Each force applicator is to exert 100 lb (45.4 kg) on the sample. As many applicators are to be applied as the sample can accommodate on the surface opposite the mounting surface, based on an arrangement of applicators as indicated in Figure 47.1.		N/A
48	Appliance Coupler Retention		N/A
48.1	In order to determine compliance with the exception to 12.1.2 a hand-supported indoor use heating appliance employing a detachable supply cord shall be subjected to the requirements of 48.2 and 48.3 with acceptable results.		N/A
48.2	If a hand-supported heating appliance employs a detachable power-supply cord without a positive means of retention, the retention means shall comply with the endurance test specified in 48.3. At the end of this test the retention means shall withstand for 1 minute a 1 lb (4.4 N) withdrawal force axially applied to the cord, without the appliance coupler becoming disengaged from the retention system.		N/A
48.3	The retention means is to be subjected to 1000 cycles of appliance coupler insertion and removal, with each cycle consisting of a full insertion into and removal from the appliance. The insertion and removal of the appliance coupler is to be done at a rate not exceeding ten cycles per minute unless the manufacturer agrees to a faster rate. The appliance is not to be energized during the test.		N/A
49	Connector Current Interruption		N/A
49.1	A sample of the appliance constructed as detailed in 12.1.4 shall be subjected to the testing detailed in 49.2 without occurrence of any of the following:		N/A
49.2	A sample of the appliance shall be connected to a supply adjusted to rated voltage and operated under conditions of maximum loading. The appliance coupler shall be fully inserted and withdrawn for 50 cycles of operation at a rate of not more than 10 operations per minute with the blades or pins of the mating part connected for not more than one second. At the conclusion of the test, the appliance shall be examined for compliance with 49.1.		N/A



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Clause	Requirement - Test	Result - Remark	Verdict

TABLE: List of critical components					P
Object / part no.	Manufacturer / trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Power plug	DONGGUAN EJUN WIRE CO LTD (CHINA)	EJ-301	10A, 125VAC	UL 817	UL E365821
(Alternative)	SHENG YI ELECTRICAL FACTORY	SY-11	10A, 125VAC	UL 817	UL E233157
(Alternative)	DONGGUAN YUXIN ELECTRIC WIRE & CABLE CO., LTD	YX-129	13A, 125VAC	UL 817	UL E306959
(Alternative)	CHING CHENG WIRE MATERIAL CO LTD	EL-015	15A, 125VAC	UL 817	UL E88446
Power supply cord	I SHENG ELECTRIC WIRE & CABLE CO LTD	SPT-2, SVT	2x0.75mm ² (18AWG), 105°C	UL 62	UL E88265
(Alternative)	SHENG YI ELECTRICAL FACTORY	SPT-2	2x0.75mm ² (18AWG), 105°C	UL 62	UL E233157
(Alternative)	DONGGUAN YUXIN ELECTRIC WIRE & CABLE CO., LTD	SPT-2, SVT	2x0.75mm ² (18AWG), 105°C	UL 62	UL E306959
¹⁾ An asterisk indicates a mark which assures the agreed level of surveillance					
Supplementary information:					

33.1	TABLE: Power Input Test						P
U (V)	I (A)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status
110V/ 50Hz	0.90	--	76.20	100	--	--	Max, loading
110V/ 60Hz	0.91	--	75.32	100	--	--	Max, loading
Supplementary information: The measured input power did not exceed the marked input rating by more than 10 percent when the apparatus was operated to produce the maximum normal input power.							

36	TABLE: Normal Temperature Test				P
	Supply voltage (V)	110V	--	--	—
	Ambient T _{min} (°C)	24.9	--	--	—
	Ambient T _{max} (°C)	24.8	--	--	—
Maximum measured temperature T of part/at:		T (K)			Allowed T _{max} (K)
Power supply cord		20.0	--	--	25
Plastic enclosure, outside		20.3	--	--	75

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Clause	Requirement - Test		Result - Remark	Verdict
Test conner	25.0	--	--	Ref.

38	TABLE: Dielectric Voltage-Withstand Test			P
Test voltage applied between:		Voltage shape (AC, DC)	Test voltage (V)	Breakdown Yes / No
Input port to plastic enclosure		AC	1000	No
Supplementary information:				

34.1	TABLE: Leakage Current			N/A
Measured between:		Measured (mA)	Limit (mA)	Comments/conditi ons
--		--	--	--
Supplementary information:				

42	TABLE: Abnormal Operation Test					P
	Ambient temperature (。C)			See below		—
	Power source for EUT: Manufacturer, model/type, output rating			--		—
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
--	Continuous operation	110VAC	10min	--	--	Normal operation. No damage, no hazards
Supplementary information:						

--END OF TEST REPORT--



Details of: External view

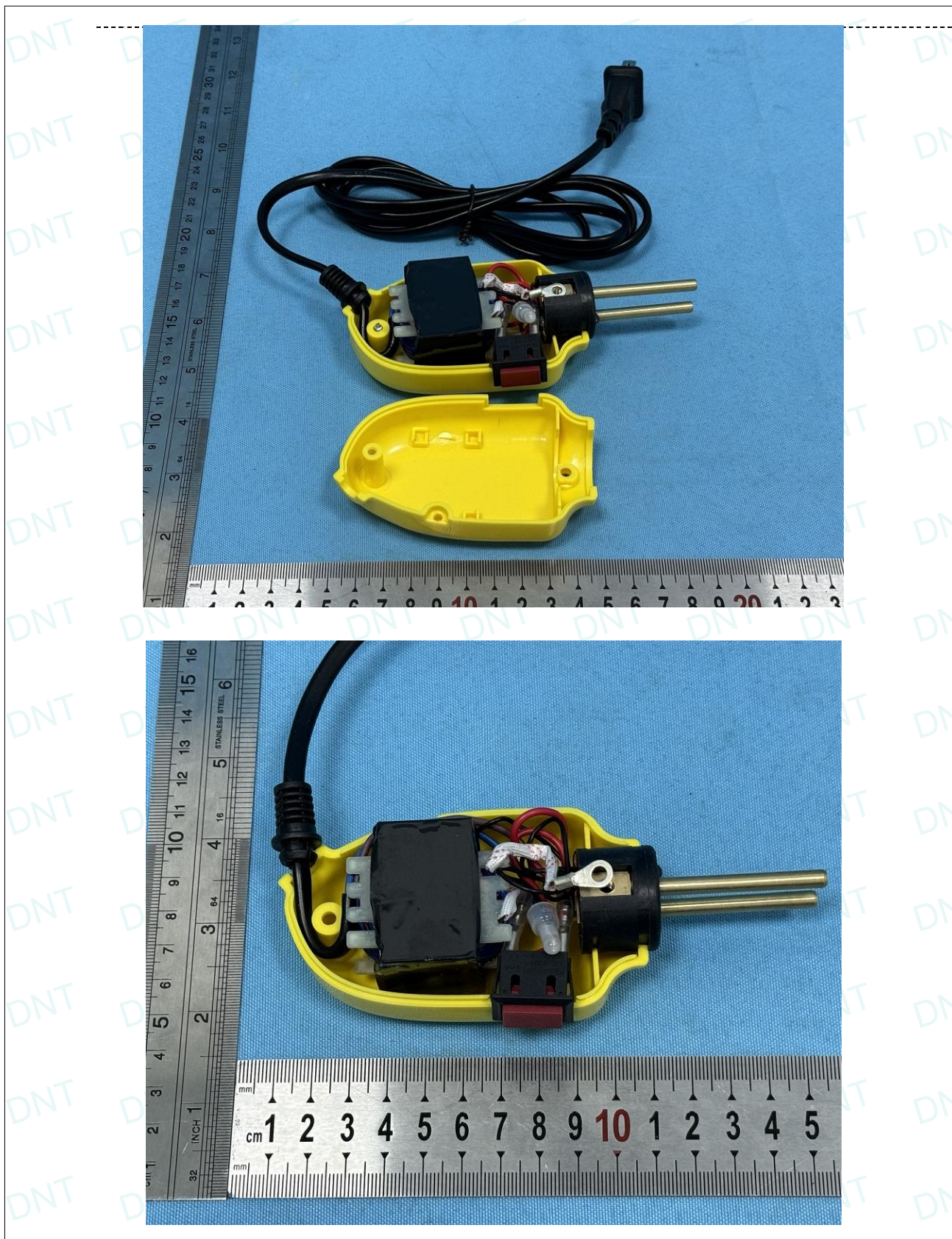


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Details of: Internal view



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