UL 130

STANDARD FOR SAFETY

Electric Heating Pads

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UL Standard for Safety for Electric Heating Pads, UL 130

Thirteenth Edition, Dated July 15, 2011

Summary of Topics

This revision of UL 130 is being issued to address the following:

Revisions to Include Cord Flag Markings

The revised requirements are substantially in accordance with Proposal(s) on this subject dated February 8, 2013 and March 29, 2013.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a ″SUPERSEDED REQUIREMENTS″ notice.

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UL 130

Standard for Electric Heating Pads

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

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INTRODUCTION

1 Scope

1.1 These requirements cover electric heating pads for use in accordance with the National Electrical Code on either direct-current or single-phase alternating-current nominal 120 V supply circuits.

1.2 Pads are made in a variety of shapes and sizes for direct or indirect application to persons. A pad of unusual size or odd shape is to be judged on its compliance with the requirements in this standard and on further examination and tests to determine its acceptability for the intended use and possible misuses.

2 Components

2.1 A component of a product covered by this standard shall:

a) Comply with the requirements for that component as indicated in this standard;

b) Be used in accordance with its rating(s) established for the intended conditions of use;

c) Be used within its established use limitations or conditions of acceptability;

d) Additionally comply with the applicable requirements of this end product standard; and

e) Not contain mercury.

Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

Exception No. 1: A component of a product covered by this standard is not required to comply with a specific component requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product;

b) Is superseded by a requirement in this standard; or

c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.

Exception No. 2: A component complying with a component standard other than those cited in this standard is acceptable if:

a) The component also complies with the applicable component standard identified in this standard; or

b) The component standard:

1) Is compatible with the ampacity and overcurrent protection requirements NFPA 70, where appropriate;

2) Considers long-term thermal properties of polymeric insulating materials in accordance with Polymeric Materials - Long Term Property Evaluations, UL 746B; and

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3) Any use limitations of the other component standard is identified and appropriately accommodated in the end use application. For example, a component used in a household application, but intended for industrial use and complying with the relevant component standard may assume user expertise not common in household applications.

2.2 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.

Exception: Where these other functions are not required for the application and not identified as part of markings, instructions, or packaging for the appliance, the additional component standard(s) need not be applied.

2.3 A component not anticipated by the requirements of this standard, not specifically covered by the component standards identified in this standard, and that involves a potential risk of electric shock, fire, or personal injury, shall be additionally investigated in accordance with the applicable standard.

2.4 With regard to a component being additionally investigated, reference to construction and performance requirements in another end product standard is appropriate where that standard anticipates normal and abnormal use conditions consistent with the application of this standard.

2.5 Materials used in a Class 105 (A) insulation system shall comply with the Heating Test, Section 27. Materials used in an insulation system that operates above Class 105 (A) temperatures shall comply with the Standard for Systems of Insulating Materials - General, UL 1446.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

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5 Glossary

5.1 For the purpose of this standard, the following definitions apply.

5.2 LOW-VOLTAGE CIRCUIT – A circuit involving a potential of not more than 30 volts and supplied by a primary battery, by a standard Class 2 transformer, or by a combination of a transformer and a fixed impedance that, as a unit, complies with all the performance requirements for a Class 2 transformer. A circuit derived from 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.

CONSTRUCTION

6 General

6.1 Each pad shall be provided with a means to limit temperatures, be cord-connected, and have a moisture-resistant construction. A pad shall also be supplied with a switch, and a vinyl envelope with a supplementary cover or a treated fabric envelope with or without a supplementary cover, and shall be single- or multiple-heat.

6.2 Any supplementary cover, when provided, shall be easily removable to make the heating pad envelope readily accessible for inspection.

7 Envelope

7.1 The envelope shall be of materials acceptable for the application and shall enclose all electrical parts of the pad without any ventilation or other openings.

7.2 An envelope of unsupported vinyl sheeting on a household pad shall not be thinner than 0.012 inch (0.3 mm). See 7.3 and 7.4 for the method of measurement.

7.3 The average thickness of a rectangular specimen measuring approximately 1 by 4 inches (25 by 102 mm) is to be determined from measurements made by means of a dead-weight dial micrometer having a flat anvil and a flat-faced cylindrical presser foot that is 0.25 ±0.01 inch (6.35 ±0.25 mm) in diameter and exerts 85 ±3 gf (0.83 ±0.03 N) on the specimen. The calibration of the dial on the micrometer is to facilitate estimation of each measurement to 0.0001 inch (0.0025 mm).

7.4 The thickness of a specimen is to be measured midway across the width of the specimen at the center of its length and at points 1/2 inch (13 mm) from each end. Each measurement is to be estimated at the nearest 0.0001 inch (0.0025 mm) and recorded. The smallest of the three recorded thicknesses is to be rounded off to the nearest 0.001 inch (0.025 mm).

7.5 A heating pad provided with a treated fabric envelope and no supplementary cover shall comply with the flammability tests specified in 21.2.1 – 21.6.17 and the Ease of Ignition Test, Section 22.

7.6 All seams in a treated-fabric envelope shall be strongly stitched or otherwise equivalently secured and shall be positioned where they are not unduly subject to stress during actual use.

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8 Insulation

8.1 Electrical insulation is to be judged with respect to its usability for the particular application. If an investigation is required to determine whether or not a material is usable, the key factors to be examined are 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, electric shock or injury to persons in conjunction with conditions of service. All of these factors are to be investigated with respect to thermal aging.

8.2 Vulcanized fiber is a usable material for insulating bushings, washers, separators, and barriers, but not as the sole support for uninsulated current-carrying parts where shrinkage, leakage current, or warpage introduce a potential risk of fire or electric shock. Thermoplastic materials generally are not determined to be able to serve as the sole support of uninsulated current-carrying parts, but are capable of being used if found to have the physical strength and rigidity, resistance to heat, resistance to flame propagation, dielectric properties, and other properties that serve the purpose of the application. All of these factors are to be investigated with respect to thermal aging.

8.3 Vulcanized fiber or a similar material employed where spacings otherwise do not meet specification shall be 1/32 inch (0.8 mm) thick or thicker and shall be so located or of such material that it cannot be adversely affected by arcing. However, 1/64 inch (0.4 mm) or thicker vulcanized fiber used in conjunction with an additional air spacing of 50 percent or more of the spacing required for air alone meets the intent of the requirement. Barriers shall be held in place by a means more secure than friction between surfaces. The elasticity of tubing shall not be depended upon to hold the tubing in place, but dilated or heat-shrunk tubing are capable of performing as intended.

8.4 The heating element shall be electrically insulated for its entire length so that it is not in contact with the envelope at any point. The insulated heating element shall be held in position and shall be so located that its heat is not concentrated in less than half of the area of the pad.

8.5 Current-carrying metal parts within a pad shall be electrically insulated with material capable of withstanding the temperatures to which they are able to be subjected. The thickness (not including the envelope or padding material) of insulation applied directly to the current-carrying metal parts shall not be less than 0.028 inch (0.71 mm) unless the parts are secured in position (to prevent their motion relative to one another, the envelope, or both). If the parts are secured, 0.013 inch (0.33 mm) is the minimum intended thickness.

8.6 Polymeric electrical insulating materials and enclosures shall comply with the applicable requirements of the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C.

8.7 The requirements for supplemental insulation (e.g. tape, sleeving or tubing) are not specified unless the insulation or device is required to fulfill 8.1 – 8.3 and 8.5 or a performance requirement of this standard. In such cases:

a) Insulating tape shall comply with the Standard for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape, UL 510;

b) Sleeving shall comply with the Standard for Coated Electrical Sleeving, UL 1441;

c) Tubing shall comply with the Standard for Extruded Insulating Tubing, UL 224.

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9 Spacings

9.1 Over-surface and through-air spacings no smaller than 1/16 inch (1.6 mm) shall be maintained from uninsulated current carrying parts:

a) To uninsulated current-carrying parts of opposite polarity; and

b) To accessible metal parts.

Exception No. 1: Within a thermostat, other than at the contacts, the spacings between uninsulated current-carrying parts on opposite sides of the contacts that are less than 1/16 inch (1.6 mm) but not less than 1/32 inch (0.8 mm) over the surface of insulating material meet the intent of the requirement.

Exception No. 2: The spacings may be less than specified in 9.1 if in compliance with the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment UL 840. The following parameters shall be used unless the microenvironment is further evaluated and found to comply with other parameters:

a) Overvoltage shall be II;

b) Pollution Degree shall be 2; and

c) Material Group IIIb.

9.2 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) meets the intent of the requirement.

10 Thermostats

10.1 A thermostat shall be durable, reliable, uniform in operation, and shall have the sensitivity necessary for its intended use as determined by the tests of this Standard.

10.2 If proper performance of a thermostat depends upon the integrity of a closed chamber, the construction shall prevent moisture leaks, which may affect the uniformity and proper operation of the thermostat.

10.3 A thermostat shall not be adjustable by the user of the pad and shall be covered or sealed to prevent the entrance of dirt and lint.

10.4 Materials employed in a thermostat shall not be affected adversely by any operating conditions presented by the tests described in these requirements.

10.5 Plated steel (except that the bimetal is not required to be plated) is capable of being used for a current-carrying part in a thermostat under condition that the part is protected by supplementary means (such as tape or sealed sleeving) against any conditions involving moisture to which the thermostat is capable of being exposed during actual use of the pad.

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10.6 A pad shall be provided with as many thermostats as necessary and connected such that, under any operating conditions, no section of the heating element is in series with less than two thermostats in a pad. Each thermostat shall be held in position.

Exception: Thermostats are not required for heating pads that incorporate PTC (Positive Temperature Coefficient) semiconductor type heating element wire.

10.7 A pad shall be provided with at least one thermostat for each unit area of 90 inches^2 (0.058 m^2) or portion thereof, the unit area being considered with respect to only one side (face) of the pad. The location of thermostats shall afford protection for the pad as a whole.

Exception: Thermostats are not required for heating pads that incorporate PTC (Positive Temperature Coefficient) semiconductor type heating element wire.

10.8 If a pad consists of two or more adjoining sections, each section shall be provided with at least two thermostats. See also 15.6 and 38.6.

Exception: Thermostats are not required for heating pads that incorporate PTC (Positive Temperature Coefficient) semiconductor type heating element wire.

10.9 No particular arrangement or relative location of thermostats is specified, but the acceptability of the arrangement and the number of thermostats employed are to be judged from the results of the specified tests on the complete pad.

11 Control Units

11.1 A temperature control shall comply with the requirements of the following:

a) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1; and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9; or

b) The Standard for Temperature-Indicating and –Regulating Equipment, UL 873.

Exception No. 1: A thermostat used in a heating pad assembly that complies with Thermostats, Section 10 of this end product standard is considered to meet the intent of this requirement.

Exception No. 2: For a control, the failure of which would not increase the risk of electric shock, fire, or personal injury, need only be subjected to the applicable requirements of this end product standard.

11.2 A timer used to comply with the maximum temperature requirements of this standard shall be evaluated per 11.1.

11.3 When a product employing a temperature control system employs an electronic circuit intended to provide a degree of protection against the risk of fire, electric shock, or injury if a fault should occur in the wire, the circuit shall comply with the requirements of the following:

a) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1; including Annex H; or

b) The Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991.

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11.4 Software relied on to provide a degree of protection against the risk of fire, electric shock, or injury if a fault should occur with the programming shall comply with the requirements of the following:

a) The Standard for Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements, UL 60730-1; including Annex H, as software Class B; or

b) The Standard for Software in Programmable Components, UL 1998.

11.5 When the electronic circuit is provided with a fuse which is intended to open as a result of a fault in the wire, rendering the product inoperable, the fuse shall comply with the Standard for Low-Voltage Fuses - Part 1: General Requirements, UL 248-1, and the Standard for Low-Voltage Fuses - Part 14: Supplemental Fuses, UL 248-14.

11.6 A thermal cutoff shall comply with the Standard for Thermal-Links (Thermal Cutoffs) for Use in Electrical Appliances and Components, UL 60691.

12 Switches

12.1 A household pad shall be provided with a through-cord or end-of-cord switch having an ″off″ position. The switch shall be of a type intended for the particular application, shall have current and voltage ratings at least equal to the load controlled, and, in the case of a multiple-heat household pad, shall have positions that facilitate adjustment of the pad temperature.

12.2 The switch shall be located or protected to prevent it from being damaged physically during use. Each ″off ″, ″low ″, ″medium ″, ″high ″ and other position of the switch shall be appropriately indicated by a marking on the switch in letters and, if desired, also in braille.

12.3 A manually-operated, line-connected, single-pole switch for appliance on-off operation shall be connected to the ungrounded conductor of the power-supply cord. Table 15.1 specifies the polarity identification of the power-supply cord conductors.

12.4 If a detachable power-supply cord is provided, the switch specified in 12.1, or a control unit on a PTC semiconductor pad, shall be integral with the detachable power-supply cord.

12.5 Mechanical air-gap type switches shall comply with one of the following, as applicable:

a) The Standard for Switches for Appliances - Part 1: General Requirements, UL 61058-1;

b) The Standard for Special-Use Switches, UL 1054;

c) The Standard for General-Use Snap Switches, UL 20; or

d) The Standard for Nonindustrial Photoelectric Switches for Lighting Control, UL 773A.

Exception No. 1: Switching devices that comply with the appropriate Standard for specialty applications (e.g. transfer switch equipment), industrial use (e.g. contactors, relays, auxiliary devices), or are integral to another component need not comply.

Exception No. 2: A switching device in a low-energy circuit of 2.2 need not comply with this requirement.

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13 Pilot Light

13.1 A household heating pad shall be provided with a neon or similarly durable pilot light that is extinguished only while the pad is unplugged or the switch is in the off position.

13.2 The pilot light shall be installed as a component of the switch assembly, being readily visible to the user of the pad when energized.

14 Internal Wiring

14.1 Internal wiring, including heater wire, composed of insulated conductors shall comply with the Standard for Appliance Wiring Material, UL 758.

Exception No. 1: Insulated conductors need not comply with the Standard for Appliance Wiring Material, UL 758 if they comply with one of the following:

a) The Standard for Thermoset-Insulated Wires and Cables, UL 44;

b) The Standard for Thermoplastic-Insulated Wires and Cables, UL 83;

c) The Standard for Fixture Wire, UL 66; or

d) The appropriate UL standard(s) for other insulated conductor types specified in Chapter 3, Wiring Methods and Materials, of NFPA 70.

Exception No. 2: Insulated conductors for specialty applications (e.g. data processing or communications) and located in a low-voltage circuit not involving the risk of fire or personal injury need not comply with the Standard for Appliance Wiring Material, UL 758.

15 Supply, Control, and Interconnecting Cords

15.1 For connection to the supply circuit, a pad shall be provided with a 125 V attachment plug attached to a length of two-conductor flexible cord. In the absence of a through-cord switch, the cord shall not be less than 6 ft long (1.8 m), measured from the face of the plug to the point at which the cord enters the pad. If a through-cord switch is used, the length of cord between the plug and the switch (supply cord) may be less than 6 ft (1.8 m) but the overall length of the supply cord, the switch, and the cord from the switch to the pad (control cord), measured from the face of the plug to the point at which the control cord enters the pad, shall not be less than 6 ft (1.8 m). The attachment plug connections shall comply with Figure 15.1, and the polarity identification of the flexible cord shall comply with Table 15.1

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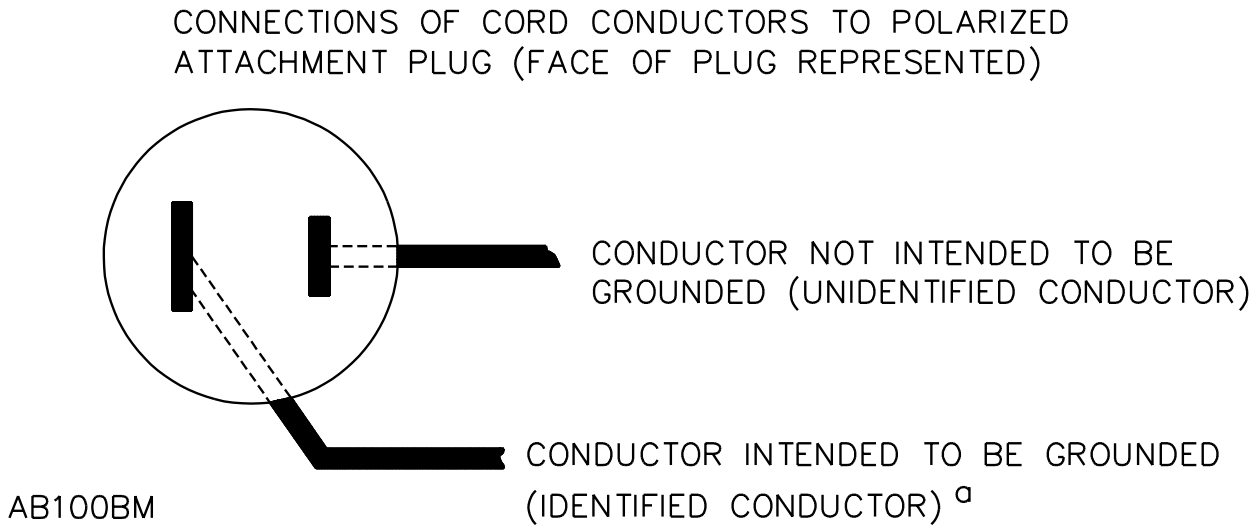
Figure 15.1
Connection to attachment plug



[a] Signifies a conductor identified in accordance with Table 15.1

Table 15.1
Polarity identification of flexible cords

Method of identification	Acceptable combinations		
	Wire intended to be grounded[d]		Other wire[d]
Color of braids on individual conductors	A	Solid white or gray – without tracer	Solid color other than white or gray – without tracer
	B	Color other than white or gray, with tracer in braid	Solid color other than white or gray – without tracer
Color of insulation on individual conductors	C[a]	Solid white or gray	Solid color other than white or gray
	C1[d]	Light blue	Solid color other than light blue, white, or gray
Color of separators	D[b]	White or gray	Color other than white or gray
Other means	E[c]	Tin or other white metal on all strands of the conductor	No tin or other white metal on the strands of the conductor
	F[b]	A stripe, ridge or groove on the exterior surface of the cord	

[a] Only the cords – other than Type SP-1, and SPT-1 – having no braid on any individual conductor.
[b] Only for Type SP-1, SP-2, SPT-1, and SPT-2 cords.
[c] Only for Type SPT-1 and SPT-2 cords.
[d] For jacketed cord.

15.2 A cord set, power supply cord, or interconnecting cord shall comply with the Standard for Cord Sets and Power Supply Cords, UL 817.

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15.3 The ampacity of the supply cord shall not be less than the current stated or implied in the ratings marked on the pad.

15.4 The supply cord supplied with a household pad shall be a Type SPT-2, SP-2, or heavier flexible cord. The bond between the cord and the envelope of a moisture-resistant pad shall be mechanically complete, secure, watertight, and otherwise appropriate for the purpose.

15.5 The wiring (control cord) between a switch or a control unit and a household pad or the female half of the pad connector and the wiring (pigtail cord), if any, between the male half of the pad connector and the pad itself shall be Type SPT-2, SP-2, or heavier flexible cord containing two or more circuit conductors (no grounding conductor) or shall be appliance-wiring material of the SPT-2, SP-2, or other appropriate construction containing two or more circuit conductors (no grounding conductor). The wiring (control cord) between a switch or a control unit and a hospital pad or the female half of the pad connector and the wiring (pigtail cord), if any, between the male half of the pad connector and the pad itself shall be Type SJT or heavier flexible cord containing two or more circuit conductors (no grounding conductor) or shall be appliance-wiring material of the SJT or other appropriate construction containing two or more circuit conductors (no grounding conductor).

15.6 Wiring interconnecting two adjacent sections of a pad shall comply with 15.5.

15.7 Both ends of each supply, control, and interconnecting cord shall be permanently attached.

Exception: A detachable power-supply cord is capable of being used if a heating pad complies with the requirements of 15.11; the Connector Flexing Test, Section 31; the Laundering Test, Section 32; the Leakage Current Test, Section 33; the Dielectric Voltage-Withstand Test, Section 34; and the Effect of Cleaning Solvents Test, Section 45.

15.8 Strain relief shall be provided on all cords to reduce the risk of mechanical stress on the cord being transmitted to any wire connections. See 37.1 and 43.1.

Exception: A switch is not required to comply with this requirement if all connections are made as described in 15.9.

15.9 A switch shall be provided with an effective means for strain relief unless all connections in the switch (except for a soldered joint in the slack portion of the through conductor in a through-cord switch) are riveted or welded, or unless such connections are made by means of eyelets, pressure wire connectors with closed-loop tangs, soldered loops in the conductor, or soldered joints where mechanical security is provided without depending upon the solder. Terminal binding screws shall be prevented from unthreading completely when the switch is assembled.

15.10 Supply and control cords shall be secured to the switch such that the conductor insulation and the braid, if any, are prevented from slipping to the extent that the conductor is exposed or a short circuit may occur.

15.11 When a detachable power-supply cord is provided, the female connector on the control cord shall not accommodate any attachment plug with an American National Standard configuration of the contacts. The male connector attached (pigtail or other) to the pad shall not fit into any receptacle, current tap, or cord connector body with an American National Standard configuration of contacts. While both halves of the pad connector are completely mated, current-carrying parts shall not be exposed to unintentional contact. The pad connector shall be rated 125 V, and shall have a current rating at least equal to the current rating marked on the pad.

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16 Connections

16.1 All connections shall be mechanically secure, shall provide good electrical continuity and conductivity, and shall be insulated. A soldered connection shall be made mechanically secure before being soldered if breaking or loosening of the connection shall result in risk of fire, electric shock, or injury to persons. Consideration shall be given to flexure and other conditions of use when judging the acceptability of electrical connections. Mechanical splicing devices shall be of a type intended for the application. Each connection to a thermostat shall be provided with strain relief.

16.2 Connectors complying with any of the following fulfill 16.1:

a) Quick-connect terminals, both connectors and tabs, for use with one or two 22 - 10 AWG copper conductors, having nominal widths of 0.110, 0.125, 0.187, 0.205, and 0.250 inch (2.8, 3.2, 4.8, 5.2, and 6.3 mm), intended for internal wiring connections in appliances, or for the field termination of conductors to the appliance, complying with the Standard for Electrical Quick-Connector Terminals, UL 310.

Exception No. 1: Other sizes of quick-connect terminals shall be investigated with respect to crimp pull out, insertion-withdrawal, temperature rise, and all tests shall be conducted in accordance with the Standard for Electrical Quick-Connector Terminals, UL 310.

Exception No. 2: A connector that complies with the Standard for Electrical Quick-Connector Terminals, UL 310 may be used with an appropriately sized tab that complies with the Table for Dimensions of Production and Test Tabs in Inches and the Figure for Dimensions of Production and Test Tabs of UL 310. The connector is the part of a quick-connect terminal that is pushed onto the male tab, and the tab is the part that receives the female connector.

b) Single and multipole connectors for use in data, signal, control and power applications within and between electrical equipment, and that are intended for factory assembly to copper or copper alloy conductors, or for factory assembly to printed wiring boards, complying with the Standard for Component Connectors for Data, Signal, Control and Power Applications, UL 1977.

c) Wire connectors complying with the Standard for Wire Connectors, UL 486A-486B.

d) Splicing wire connectors shall comply with the Standard for Splicing Wire Connectors, UL 486C.

e) Equipment wiring terminals for use with all alloys of copper, aluminum, or copper-clad aluminum conductors, shall comply with the Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors, UL 486E.

f) Terminal blocks shall comply with the Standard for Terminal Blocks, UL 1059, and, if applicable, be suitably rated for field wiring.

Exception: A fabricated part performing the function of a terminal block need not comply with the Standard for Terminal Blocks, UL 1059 if the part complies with the requirements of Insulation, Section 8 and Spacings, Section 9 of this standard. This exception does not apply to protective conductor terminal blocks.

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