UL 964

STANDARD FOR SAFETY

Electrically Heated Bedding

UL Standard for Safety for Electrically Heated Bedding, UL 964

Twelfth Edition, Dated August 31, 2011

Summary of Topics

This revision of UL 964 dated September 18, 2020 includes a new Supplement SA with requirements that cover remotely operated electrically heated bedding, including smart enabled.

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.

The new requirements are substantially in accordance with Proposal(s) on this subject dated March 27, 2020 and July 15, 2020.

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UL 964

Standard for Electrically Heated Bedding

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Second Edition – June, 1935
Third Edition – September, 1942
Fourth Edition – October, 1950
Fifth Edition – December, 1954
Sixth Edition – November, 1968
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August 31, 2011

This ANSI/UL Standard for Safety consists of the Twelfth Edition including revisions through September 18, 2020.

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 https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover electrically heated blankets, comforters, quilts, sheets, mattress pads, mattresses, foot warmers, throw blankets and similar bedding.

1.2 These products are for use in accordance with the National Electrical Code, ANSI/NFPA 70, on single-phase alternating-current supply circuits operating at a nominal potential of 110 to 120 V ac.

1.3 All bedding is cord-connected and is supplied with either a switch or one or two user-adjustable temperature-control units. Bedding may be thermostatically controlled.

1.4 Bedding intended for connection to other than a nominal 120 V ac supply voltage, and bedding for use with waterbeds, mechanical beds and the like, are to be subject to additional investigation, with consideration given to their intended use.

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

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 Normal Temperature Test, Section 19. 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.

5 Glossary

5.1 For the purposes of this Standard, the following definition applies.

5.2 CLASS 2 SUPPLY – A secondary circuit supplied by a Class 2 power supply that complies with the Standard for Class 2 Power Units, UL 1310.

5.3 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.

5.4 SEMICONDUCTOR HEATER WIRE – A heating element consisting of two conductors separated by a conductive material which has a rapid non-linear increase in resistance when the temperature is raised through a particular range.

5.5 THROW BLANKET – An electric blanket intended for use in indoor locations but not specifically for use only on beds. Electric throw blankets are typically smaller in overall size than blankets intended for use on beds. The length is typically less than 75 inches (109.5 cm) and/or the width is typically less than 38 inches (96.5 cm).

CONSTRUCTION

6 Covering of Electrical Parts

6.1 Except for the connector attached to the bedding, all electrical parts of the bedding shall be enclosed in a shell or other covering of a fabric in which there are no openings. All stuffing, padding, springs, and similar nonelectrical components of bedding shall be outside this covering and shall not be detrimental to the covering or its electrical contents.

6.2 All seams in the fabric enclosing electrical parts shall be strongly stitched or otherwise equivalently secured.

7 Insulation

7.1 Electrical insulation is to be considered with respect to its acceptability for the particular application. If 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, electric shock, and injury to persons involved, in conjunction with conditions of actual service. All of these factors are to be considered with respect to thermal aging.

7.2 Ordinary vulcanized fiber may be used for insulating bushings, washers, separators, and barriers, but not as the sole support for uninsulated live parts where shrinkage, current leakage, or warpage may introduce a risk of fire or electric shock. Thermoplastic materials are not considered to be acceptable for the sole support of uninsulated live parts, unless they have been found to have the necessary strength and rigidity, resistance to heat, resistance to flame propagation, dielectric properties, and other properties acceptable for the application. All of these factors are to be considered with respect to thermal aging.

7.3 An insulating liner shall be acceptable for the purpose. Vulcanized fiber or a similar material employed where spacings would otherwise be unacceptable 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 is acceptable in conjunction with an additional air spacing of 50 percent or more of the spacing required for air alone. Barriers shall be secured in place by a means other than friction between surfaces. The elasticity of tubing shall not be depended upon to hold the tubing in place.

7.4 The heating element shall be electrically insulated for its entire length so that it is not in contact with the shell or other covering fabric at any point. The insulated heating element shall be appliance-wiring material acceptable for the application. The insulated heating element shall be so secured in position that there is no undue stress on it during use, handling, and cleaning of the bedding. At least 9 inches (229 mm) of the foot of a blanket, sheet, quilt or comforter that can be tucked in during normal use shall be devoid of all electrical parts other than the male half of the bedding connector and the portion of the insulated heating element leading to the connector.

Exception: Bedding constructed with self-limiting semiconductor heater wire is able to be provided with electrical parts to the perimeter of the bedding.

7.5 Heater wire, including semiconductor heater wire, shall comply with the Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581. Semiconductor heater wire shall additionally comply with the requirements for thermistor-type devices, UL 1434.

7.6 Flexural relief shall be provided for the conductors that exit the male-connector body of a blanket, sheet, quilt, or comforter.

7.7 Each thermostat and other live part within the shell or other covering fabric shall not have any sharp edges and shall be electrically insulated with insulating tubing acceptable for the voltage and temperature involved. The insulation on each part shall be:

a) Bonded, a watertight seal is required, to the insulation on the heating element or other wiring connected to the part; and

b) At least as thick at the bond and elsewhere as the insulation on the heating element or other wiring connected to the part.

7.8 A splice in wiring within a thermostat shall be insulated if permanence of spacing from the splice to other metal parts of the thermostat is not provided.

7.9 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.

7.10 The requirements for supplemental insulation (e.g. tape, sleeving or tubing) are not specified unless the insulation or device is required to fulfill 7.1 – 7.4 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.

8 Spacings

8.1 Except as indicated in 8.2 – 8.4, over surface and through-air spacings no smaller than 1/16 inch (1.6 mm) shall be maintained from uninsulated live parts to:

a) Uninsulated live parts of opposite polarity; and

b) Accessible metal parts.

Exception: The spacings may be less than specified in 8.1 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.

If a circuit employs a voltage limiting device for application of the requirements in the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment UL 840, the device shall comply with the Standard for Surge Protective Devices, UL 1449.

8.2 Within a thermostat, except at the contacts, the spacings between uninsulated live parts on opposite sides of the contacts shall not be less than 1/32 inch (0.8 mm) through air and 3/64 inch (1.2 mm) over the surface of insulating material.

8.3 The spacings mentioned in 8.1 and 8.2 do not apply to the inherent spacings of a component. Such spacings are to be considered under the requirements for the component in question.

8.4 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.

9 Temperature Limitation

9.1 Bedding shall be provided with means to preclude the attainment of unacceptable temperatures, see 19.1.1 – 19.1.3 and 31.1.1, on any part of the bedding.

9.2 Means to avert the attainment of unacceptable temperatures may be inherent in the construction of bedding – such as a low-wattage heating element – thus necessitating no thermostats or external control.

9.3 Thermostats shall be durable, reliable, uniform in operation, and sufficiently sensitive for their intended use as determined by compliance with Thermostats in Bedding, Section 37, and other applicable requirements.

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

9.5 A thermostat in the bedding shall not be adjustable by the user of the bedding and shall be covered or sealed to preclude the entrance of dirt and lint.

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

9.7 Plated steel, except that the bimetal need not be plated, may be used for a current-carrying part in a thermostat provided that the part is protected by supplementary means (such as sealed sleeving) against any conditions involving moisture to which the thermostat may be subjected during use and cleaning of the bedding.

9.8 If thermostats or other types of discrete temperature sensing devices are used in the bedding itself, they shall be sufficient in number in accordance with 9.10, and shall be appropriately located to enable the bedding to comply with 9.9, 19.1.1 – 19.1.3, 31.1.1, 31.4.1 – 31.4.3, 31.6.1 – 31.6.4, 31.6.6, and 31.6.7. No section of the heating element shall be in series with fewer than two discrete sensing devices when thermostats or other types of discrete sensing devices are employed.

9.9 Compliance with the requirement in 9.8 is to be determined by appropriate testing that, in the case of a sheet, overblanket, quilt, or comforter, is to include the bunching test described in 31.6.1 – 31.6.4, 31.6.6 and 31.6.7.

9.10 A blanket, sheet, quilt, or comforter incorporating discrete sensing devices and intended for use on a twin, double, queen or king-size bed shall comply with each of the following:

a) At least 10 discrete sensing devices are to be used in a size intended for a twin bed and in each half of a king-size bed. Twelve or more devices are to be used in a size intended for a double or queen-size bed.

Exception: A blanket, sheet, quilt, or comforter tested as specified in 31.5.1 and 31.6.5 may employ fewer sensors.

b) The top row of discrete sensing devices in a size intended for a twin bed, in a size intended for a double or queen bed, and in each half of a size intended for a king-size bed is to be secured against migration during use, handling, and cleaning of the product.

9.11 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 for tests for Safety-Related Controls Employing Solid-State Devices, UL 991. 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.

Exception: Controls complying with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, including Annex H, fulfills the above requirements of the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991.

9.12 Software relied on to comply with this standard shall comply with the Standard for Software in Programmable Components, UL 1998.

Exception: Controls complying with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, including Annex H, fulfills the above requirements of the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991.

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

9.14 The following test parameters are to be used in the investigation of the circuit covered by 9.11 for compliance with the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991:

a) With regard to electrical supervision of critical components, a controller shall not permit electric bedding from exceeding temperature limits specified in 19.1.1 and 19.1.2 of this standard.

b) A field strength of 3 V per meter is to be used for the Radiated EMI Test.

c) The Composite Operational and Cycling Test is to be conducted for 14 days at temperature extremes of 0°C (32°F) and 25°C (77°F).

d) Exposure Class H3 is to be used for the Humidity Test.

e) A vibration level of 5 g is to be used for the Vibration Test.

f) When a Computational Investigation is conducted, λ_p shall not be greater than 6 failures/10^6 hours for the entire system. The Operational Test is to be conducted for 14 days.

g) When the Demonstrated Method Test is conducted, the multiplier is to be based on the continuous usage level for nonindustrial use with a minimum multiplier and test acceleration factor declared by the manufacturer.

h) Compliance to the Overload and Endurance Test of the Standard for Temperature-Indicating and –Regulating Equipment, UL 873, satisfies this requirement.

i) For the Electrical Fast Transient Burst Test, test level 3 is to be used.

Exception: Controls complying with 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, including Annex H, fulfills the above requirements of the Standard for Requirements for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991.

9.15 When a product employing a temperature control system employs an software intended to provide a degree of protection against the risk of fire, electric shock, or injury if a fault should occur in the software programming or algorithm, the circuit shall comply with the requirements of Standard for Software in Programmable Components, UL 1998.

Exception: Controls complying with 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, including Annex H, as software Class B fulfills the above requirements of the Standard for Software in Programmable Components, UL 1998.

10 Control Units

10.1 The enclosure of a control unit shall be of material acceptable for the particular application and, except for ventilation openings, shall completely enclose all uninsulated live parts and film-coated wire.

10.2 A ventilation opening in a control unit is acceptable if the probe illustrated in Figure 10.1 – inserted point first as far as possible into the opening does not:

a) Enter the opening farther than 1/8 inch (3.2 mm); and

b) Touch any uninsulated live part or film-coated wire.