



UL 244A

STANDARD FOR SAFETY

Solid-State Controls for Appliances

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UL Standard for Safety for Solid-State Controls for Appliances, UL 244A

Third Edition, Dated April 30, 2003

SUMMARY OF TOPICS

The revisions to UL 244A dated August 15, 2013 are being issued to adopt the following proposals:

1. Addition Of The Abnormal Operations Test

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.

The new requirements are substantially in accordance with Proposal(s) on this subject dated April 12, 2013.

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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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.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 244A

Standard for Solid-State Controls for Appliances

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Third Edition

April 30, 2003

This UL Standard for Safety consists of the Third Edition including revisions through August 15, 2013.

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 component electronic controls intended to be factory installed on or in appliances and other utilization equipment rated 600 V or less, used in ordinary dry locations as defined in the National Electrical Code, NFPA 70, and that comply with the requirements for such appliances and equipment.

1.2 For a control covered by this standard, it is assumed that:

- a) No voltage greater than 600 V above ground will be present in a control,
- b) An isolation transformer, if provided, will generally furnish power at a lower potential than the primary voltage, and
- c) The output of the control will not be located in a circuit operating at greater than 600 V above ground in the end-use product.

If conditions other than these are provided, consideration shall be given to the need for additional requirements.

1.3 A control covered by this standard is a single device or a series of separate components with interconnecting wiring employing one or more input power and possibly signal ports, solid-state circuitry, and one or more output switching components to directly control all or a portion of the end-use product load. Included are controls that respond directly or indirectly to changes in temperature, humidity, or pressure to affect operation of an appliance, function as an electronic timer, or electronically store or process information by virtue of a memory system.

1.4 These requirements cover controls intended for connection only to a low-voltage circuit of limited power supplied by a primary battery or by a Class 2 transformer, where a failure of such a control would result a risk of fire, electric shock, or injury to persons in the end-use product.

1.5 These requirements do not cover a control intended for installation in or on refrigeration or air conditioning equipment that is used in industrial applications or in hazardous locations as defined in the National Electrical Code, NFPA 70. Such equipment is covered in the Standard for Temperature-Indicating and -Regulating Equipment, UL 873. Compliance with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.

1.5 revised March 4, 2010. UL 873 will be withdrawn on October 19, 2016.

1.6 These requirements do not cover controls for use where exposed to oil, grease vapors, lint, other contaminants, or high humidity in the end application.

1.7 These requirements address the potential risks unique to the electronic nature of a control. Equipment or components employing an electronic feature shall also comply with the basic requirements contained in the applicable end-product or component standard. These requirements are intended to supplement applicable end-product or component standards and are not intended to serve as the sole basis for investigating all risks associated with a control. For example, requirements for the means of enclosing live parts, mechanical assembly of components, corrosion protection, use of polymeric materials, evaluation of internal wiring and connections within the control, calibration, and similar requirements, are not included in this standard.

2 Undated References

2.1 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.

3 Glossary

3.1 For the purpose of this standard the following definitions apply.

3.2 CLASS 2 CIRCUIT – An isolated secondary circuit involving a potential of not more than 42.4 V peak supplied by:

- a) An inherently-limited Class 2 transformer;
- b) A combination of an isolated transformer secondary winding and a fixed impedance or regulating network that together comply with the performance requirements for an inherently-limited Class 2 transformer;
- c) A dry-cell battery having output characteristics not greater than those of an inherently-limited Class 2 transformer;
- d) Any combination of (a), (b), and (c) that together comply with the performance requirements for an inherently-limited Class 2 transformer; or
- e) One or more combinations of a Class 2 transformer and an overcurrent protective device that together comply with the performance requirements for a noninherently-limited Class 2 transformer.

A circuit derived from a line-connected circuit by connecting impedance in series with the supply circuit as a means of limiting the voltage and current is not a Class 2 circuit. See Class 2 Circuits, Section 20.

3.3 CONFORMAL COATING – An insulating coating which conforms to the configuration of the object coated and is used as a protective covering against environmental conditions or when electrical spacings are insufficient.

3.4 CONTROLLED ENVIRONMENT – An environment:

- a) Relatively free of conductive contaminants, such as normal cooking vapors, carbon dust, and similar contaminants, which are a result of the end-use product in which a control will be installed or due to the location of the end-use product, and
- b) Not subject to humidity and the formation of condensation. A controlled environment is provided, for example, by means of a:
 - 1) Hermetically sealed enclosure;
 - 2) Encapsulation;
 - 3) A conformal coating; or
 - 4) A gasketed, tight-fitting enclosure or filter system preventing contamination in conjunction with a system preventing condensation –for example, the maintaining of the surrounding air at constant temperature and a suitably low relative humidity.

3.5 DEAD-CASE-MOUNTED SEMICONDUCTOR – A semiconductor, such as a triac or silicon-controlled rectifier, employing an integral metal tab or stud that is insulated from live parts.

3.6 ELECTRICAL STRESS FACTOR – For a circuit component, the ratio of operating electrical stress to rated electrical stress. Examples include the ratio of operating wattage to maximum rated wattage of a resistor and operating voltage to maximum rated voltage of a capacitor. A circuit component having no assigned maximum operating electrical rating is made the subject of an investigation.

3.7 HAZARDOUS ENERGY – Circuit energy that involves a risk of fire or electric shock.

3.8 ISOLATED SECONDARY CIRCUIT – A circuit derived from an isolated secondary winding of a transformer and that has no direct connection back to the line-connected circuit, other than through the grounding means. A secondary circuit that has a direct connection back to the line-connected circuit is considered part of the line-connected circuit.

3.9 LIMITED-ENERGY CIRCUIT – A line-connected circuit in which the wattage from any point in the circuit to any return to the power supply is limited to 15 W; or an isolated secondary circuit in which the wattage from any point in the circuit to any return to the power supply is limited to 50 W.

3.10 LINE-CONNECTED CIRCUIT – A circuit in which the wiring and components are conductively connected to the branch circuit. It is also called a primary- or direct-connected circuit. See also 3.8.

3.11 OPPOSITE POLARITY – A difference in potential between two points, such that shorting of these two points results in a condition involving an overload; rupturing of printed wiring-board-tracks, components, or fuses; or similar condition.

3.12 OPTICAL ISOLATOR (PHOTON-COUPLED ISOLATOR) – A circuit-coupling device that provides circuit isolation by means of a light source and sensor integrated into a single package.

3.13 SAFETY CIRCUIT – A primary or secondary circuit that is relied upon to reduce the risk of fire, electric shock, injury to persons, operation of controlled equipment that is capable of resulting in a risk of fire, electric shock, or injury to persons. Examples include an interlock circuit, a circuit which limits leakage current to accessible parts, a circuit which limits the wattage to a limited-energy circuit, or a phase control or other circuit designed to limit temperatures in the end-use product to acceptable levels.

3.14 THYRISTOR – A bistable semiconductor device comprised of three or more junctions that can be switched from the off state to the on state or vice versa, by means of the controlled conductivity of the semiconductor, with such switching occurring within at least one quadrant of the principal voltage-current characteristics. Such switching includes random switching in which conduction occurs at any phase angle of the alternating current load voltage cycle or regulated switching in which conduction occurs at some precise phase angle or load-voltage magnitude. A phase-controlled semiconductor device is one in which the semiconductor conducts for some portion of the load-voltage cycle.

a) Bidirectional Triode Thyristor (Triac) – A three-terminal thyristor having substantially the same switching behavior in the first and third quadrants of the principal voltage-current characteristics.

b) Silicon-Controlled Rectifier (SCR) – A reverse blocking triode thyristor. A three-terminal thyristor that conducts only for positive anode-to-cathode voltages and exhibits a reverse blocking state for negative anode-to-cathode voltages.

3.15 TRANSFORMER – The term includes a motor-transformer or an autotransformer. For the purpose of these requirements, the types of transformers typically encountered in or supplying power to controls are:

- a) Class 2 – An isolation type transformer as specified in 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.
- b) Power – A transformer other than Class 2 that is intended to transmit power. Included are isolation and nonisolation (such as an autotransformer) types.
- c) Pulse – An isolation-type transformer designed to pass pulse waveforms as distinguished from sine waves. It is not considered to be a power transformer.
- d) Current Sensing – An isolation-type transformer designed to have the primary winding connected in series with a circuit carrying current to be measured or controlled. In window type current transformers, the primary winding is provided by a separate conductor and is not an integral part of the transformer.
- e) Isolating – A transformer in which one or more secondary windings are electrically separated by insulation, spacings, or both, from the primary windings. Secondary windings are not required to be electrically separated from other secondary windings.

3.15 revised October 31, 2007

4 Components

4.1 Except as indicated in 4.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

4.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

4.3 A component shall be used in accordance with its rating established for the intended conditions of use.

4.4 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.