

Subject 430

August 18, 2017

SUMMARY OF TOPICS

The following changes in requirements to the Standard for Waste Disposers, UL 430, are being proposed:

1. Alternate Method For Evaluating Protective Electronic Circuits And Controls Using Requirements Based On the Standard for Safety of Household and Similar Electrical Appliances, Part 1: General Requirements, UL 60335-1

2. Proposed Addition Of Requirements For Waste Disposers with Wireless Control

3. Proposed Addition Of Requirements For Battery-Operated Waste Disposers

STP BALLOTS AND ALL COMMENTS DUE: October 2, 2017

UL's goal is to have no interest category comprise more than one-third of the STP membership balance. To improve the current balance for STP 430, UL is looking for participants in the Supply Chain, Commercial/Industrial User, AHJ, Government and Testing and Standards interest categories. Definitions for these interest categories are available on the Standards STP Internet site:

<http://ulstandards.ul.com/develop-standards/participation/interest-categories/>

If you are interested in applying for STP 430 membership or are aware of potential candidates for this STP, please contact the STP Project Manager, wilbert.fletcher@ul.com.

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~.

1. Alternate Method For Evaluating Protective Electronic Circuits And Controls Using Requirements Based On the Standard for Safety of Household and Similar Electrical Appliances, Part 1: General Requirements, UL 60335-1

BACKGROUND

Prior to the use of electronic controls, most safety controls would have been components produced separately from the appliance in which they were installed. The control would have been evaluated to one of UL's legacy controls standards, for example the Standard for Temperature-Indicating and-Regulating Equipment, UL 873. With the onset of electronic controls, the solid-state designs were evaluated to either the Standard for Solid-state Controls for Appliances, UL 244A or a combination of UL 873 with the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991 and the Standard for Software in Programmable Components, UL 1998, as applicable. The most recent set of UL 430 revisions for controls added the option to use UL 60730, Automatic Electrical Controls for Household and Similar Use, series of standards (this series of standards is planned to replace UL 244A and UL 873 when they are withdrawn in October 2018), and a number of additional individual Standards for specific control types.

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM**



Documents

Document Sharing Hub

The existing options for evaluating safety controls in:

The National Difference Page and IEC Foreword have been provided for your reference in reviewing this document. However, they are not considered to be part of the ANSI balloted material.

- The Standard for Standard for Solid-State Controls for Appliances, UL 244A;
- The Standard for Temperature-Indicating and -Regulating Equipment, UL 873;
- The Standard for Industrial Control Equipment, UL 508;
- The Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1;

and other referenced control Standards, are written in terms of separate components that might be assembled into the end appliance. A new option is being proposed to be added to allow for electronic controls and other types of electronic circuits to be tested as part of the appliance.

Requirements are being proposed that allow the evaluation of electronic circuits in the specific end-product application. These proposed requirements are based on the requirements for electronic circuits specified in the Standard for Safety of Household and Similar Electrical Appliances, Part 1: General Requirements, UL 60335-1.

These requirements are proposed to be included as a normative supplement to this Standard. These requirements provide an alternative option to evaluate these circuits. The existing requirements in UL 430 are not being removed, and the manufacturer will have an additional option for evaluation of these circuits.

RATIONALE

Proposal submitted by: Steven Kuscsik, UL LLC

Why a UL 60335-1 option?

A set of requirements for electronic circuits is being proposed based on those specified in the Standard for Safety of Household and Similar Electrical Appliances, Part 1: General Requirements, UL 60335-1. The requirements are similar to those of the UL 60730 series of controls standards except that they are end-product specific. These requirements are intended to address electronic circuits that are part of the appliance construction. This will allow such circuits to be tested in conjunction with the other performance tests required by this Standard.

How do the UL 60335-based requirements differ from legacy circuits requirements such as those in UL 244A, UL 873 or those in UL 508?

The requirements for electronic circuits in traditional UL appliance standards have typically been based on the risk of fire mitigation by Class 2 circuits as defined in the National Electrical Code ANSI/NFPA 70 (NEC).

The mitigation of electrically generated fire in NEC Class 2 circuits is addressed from a different perspective than that of UL 60730-1 or UL 60335-1. While restricting power levels to Class 2 limits reduces the risk of fire and/or electric shock, the use of the NEC Class 2 available current and power limits is based on the use of a robust enclosure that is capable of containing flame or molten particles resulting from internal faults that may arise during abnormal conditions. The UL 60730-1 and 60335-1 limits are based on mitigating the risk of electrically generated fire at the circuit board level. The use of

the UL 60335-1 mitigation concept (maximum 15 watts available power) provides for the maximum design flexibility and potential for a single circuit design being utilized in both US and international markets. A circuit with a maximum available power of 15 watts or less has also proven highly unlikely to generate a fire on printed circuit boards in the Automatic Electrical Controls, Information Technology Equipment and Audio/Video Equipment industries.

The other main difference is with regards to programmable devices. Early generations of circuits were only evaluated from the view of simple faults at the various outputs. No evaluation was made of the software/firmware other than verification of the control function in the appliance. When considering how “software” can fail, it is really the coded instructions that can have errors due to specification mistakes (wrong requirements), implementation mistakes (coding errors), tool problems (compiler flaws), component defects (transistors shorting within the programmable device), external disturbances (EMI), etc.

For electronic controls evaluated to UL 60730-1 that provide safety critical functions (SCF), software that is relied upon for these functions is typically required to be Class B. This same level of software evaluation would be required for circuits evaluated to the requirements of Supplement SA that provided SCFs based on the UL 60335 evaluation approach to protective electronic circuits (PEC).

The Programmable Component Reduced Supply Voltage Test in UL 60335-1 is also being proposed because supply voltage dips can cause some programmable devices to not perform their program instructions correctly.

How do the UL 60730-1 and UL 60335 requirements differ?

One key difference is the evaluation of electronic circuits providing SCFs for their immunity to electromagnetic sources. Circuits may be provided with metal oxide varistors (MOVs) or capacitors to help mitigate the effects of electromagnetic sources. The UL 60730 series of standards will allow the MOVs to be relied upon during EMC immunity testing provided the component meets its own requirements as specified in the Standard for Surge Protective Devices, UL 1449. The requirements being proposed for UL 430 are based on UL 60335-1 and assumes line transients will eventually cause the MOV to fail. They are defeated for the EMC immunity testing, unless they are provided with spark gaps (gas tube surge suppressors).

Safety Critical Functions (SCF) and Terminology

Historically, SCFs have not been explicitly identified for a given appliance. Controls/circuits employing safety critical functionality have been identified by differing terms in the various UL appliance standards. They were referred to as “safety controls”, “limiting-controls” or “safety circuits”. Controls of appliances that were evaluated to the UL 60730 series of controls standards might have been identified as “Protective Controls”, “Protective Electronic Controls” or simply as “Controls with Class B control function”. UL 430 uses terms including “auxiliary control”, “operating (regulating) control”, and “protective (limiting) control”.

When applying the UL 60335-1 based set of electronic circuit requirements, the terms adopted by UL 60335 are used to categorized and describe control functions. The terms “safety critical function (SCF)”, “dangerous malfunction”, and “protective electronic circuit (PEC)”, are examples of terms introduced in the proposed Supplement SA. Use of these terms facilitates application of the proposed requirements. Additionally, since these terms are already used in the international community when working with IEC 60335 series of Standards, use of these same terms provides consistency, and would facilitate efforts if harmonization of UL 430 with the 60335 series of Standards is considered at any point in the future.

Basic Requirements for the Evaluation of Electronic Circuits that Provide Safety Critical Functions (SCF)

The proposed requirements are based upon several basic parameters.

Electronic circuits that manage a SCF shall be:

a) Reliable; and

b) Not susceptible to electromagnetic environmental stresses encountered in the anticipated environments where the appliance will operate.

Reliable, in this case, is defined as being able to maintain the SCF in the event of single defined component faults within the circuit providing the SCF. The original test that caused the PEC to operate is repeated with defined single component faults. The SCF of this circuit should not be adversely affected.

The resistance to electromagnetic environmental stresses encountered in anticipated environments where the appliance will operate is also defined in the standard.

The set of component faults as well as the specifications for the EMC stresses are based on those in UL 60335-1.

Why a Supplement?

Addition of Supplement SA, Alternative Requirements for the Evaluation of Electronic Circuits, is being proposed to incorporate the UL 60335-1 based requirements in a single location, to allow these requirements to easily evolve without requiring modification of the main body of the standard.

For UL 430, the existing requirements for controls in the main body of the Standard will remain essentially as is. Where applicable, a reference to the Supplement as an option will be added within the controls sections of UL 430. The new UL 60335-1 based requirements in the Supplement would simply be an option for manufacturers to use, as an alternative to the requirements in the main body.

Power Supplies

As the risk of electrically generated fire depends greatly on the available current or power due to a fault, the evaluation of electronic circuits frequently revolves around the characteristics of the circuit power supply.

Power supplies intended to only deliver low-voltage at a few milliamps might not use a transformer to step down the incoming line voltage. These derived low-voltage power supplies use series impedances to drop the line voltage, typically using either resistors or capacitors. Test requirements are being proposed to evaluate the ability of these supplies to limit the output power to 15 watts as well as not to present a risk of fire in the event that the limiting component(s) fails.

Other Components

Some definitions in proposed Supplement SA correlate with those used in typical switch mode power supplies. Requirements are also being proposed for some of the typical components used in switch-mode power supplies and circuits that manage SCFs.

Summary

UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM  Documents
Document Sharing Hub

This proposal provides a set of requirements to evaluate electronic circuits which are inherent to a product evaluated under UL 430. It is intended that the proposed requirements will provide additional options and a more self-contained set of requirements, that considers the use and operation of the end-product and its integral controls together as one product. These requirements are not intended to replace other requirement options presently covered by the standard.

Based on comments received during the preliminary review and comment period expressing support for this proposal, and the fact that this is an additional option only (not a mandatory new requirement), the proposal is being submitted for ballot as originally proposed.

PROPOSAL

5.5.1.8 An electronic circuit that complies with the requirements in Alternative Requirements for the Evaluation of Electronic Circuits, Supplement SA is considered to comply with the requirements of a control in Section 5.5.1 - Section 5.5.7.

5.13.4 Motor overload protection

5.13.4.3 Electronic protection integral to the motor shall comply with the Standard for Electronically Protected Motors, UL 1004-7, or the requirements in Alternative Requirements for the Evaluation of Electronic Circuits, Supplement SA.

5.13.4.4 Except as indicated in 5.13.4.3, electronically protected motor circuits shall comply with one of the following. See 5.5.4 for basic control requirements:

- a) The Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991. When the protective electronic circuit is relying upon software as a protective component, it shall comply with the requirements in the Standard for Software in Programmable Components, UL 1998. If software is relied upon to perform a safety function, it shall be considered software Class 1;
- b) The Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1. If software is relied upon to perform a safety function, it shall be considered software Class B; or
- c) The Standard for Power Conversion Equipment, UL 508C; or
- d) Electronic protection complying with the tests of Standard for Thermally Protected Motors, UL 1004-3 and the circuit requirements in Alternative Requirements for the Evaluation of Electronic Circuits, Supplement SA.

Exception: Compliance with the above standards is not required for an electronically protected motor circuit if there is no risk of fire, electric shock, or injury to persons during abnormal testing with the motor electronic circuit rendered ineffective; compliance with the applicable requirements of this end product standard is then required.

19.2 Auxiliary controls

19.2.2 Auxiliary controls shall comply with the requirements of this end product standard.

Exception No. 1: An auxiliary control that complies with a component standard(s) specified in Controls, Section 5.5 is considered to comply with this requirement.

Exception No. 2: An auxiliary control that complies with Alternative Requirements for the Evaluation of Electronic Circuits, Supplement SA, is considered to comply with this requirement.

UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL



Documents

Document Sharing Hub

SUPPLEMENT SA - Alternative Requirements for the Evaluation of Electronic Circuits

Requirements in Supplement SA are adapted by UL from IEC 60335-1 Ed. 5.1 b:2013 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

INTRODUCTION**SA1 Scope**

SA1.1 Throughout this supplement, when reference is made to requirements in "this standard," the reference is to requirements in the main body of the standard and not to other requirements of this supplement. Throughout this Supplement, when reference is made to requirements in "this Standard," the reference is to requirements in the main body of the Standard and not to other requirements of this Supplement.

SA1.2 The requirements in this supplement provide alternate requirements for the investigation of electronic controls and other electronic circuits used in appliances covered by this standard. The requirements in this Supplement provide alternate requirements for the investigation of electronic controls and other electronic circuits used in appliances covered by this Standard.

SA1.3 Thermal motor protectors in direct contact with motor windings and intended for direct control of the motor supply are outside the scope of this Supplement even if they incorporate one or more electronic components.

SA2 General

SA2.1 The requirements in this supplement are intended to apply to the electronic circuit and how it is integrated into the appliance. the overall appliance construction, performance testing and marking requirements are applicable as specified in this standard, except as specified in this supplement. The requirements in this Supplement are intended to apply to the electronic circuit and how it is integrated into the appliance. The overall appliance construction, performance testing and marking requirements are applicable as specified in this Standard, except as specified in this supplement.

SA3 Glossary

SA3.1 DANGEROUS MALFUNCTION - Unintended operation of the appliance that may impair safety. Operating control functions whose failure would result in a dangerous malfunction would be considered safety critical functions. SeeSA3.8. Control functions whose failure might result in a dangerous malfunction would include unexpected operation of the appliance where the operation would result in risk of fire, electric shock, or injury to persons.

SA3.2 ELECTRONIC DISCONNECTION - The de-energizing of the functional load of the appliance by an electronic device of a circuit with no air gap.

SA3.3 INTENTIONALLY WEAK PART - A part intended to rupture under conditions of abnormal operation to prevent the occurrence of a condition which could impair compliance with this standard.

SA3.4 LOW-POWER CIRCUIT - A circuit or parts of circuits farther from the supply source than a low-power point.

SA3.5 LOW-POWER POINT - A point closest to the supply source in an electronic circuit where the maximum available power to an external load at the end of 5 seconds does not exceed 15 watts.

SA3.6 PROTECTIVE ELECTRONIC CIRCUIT (PEC) - An electronic circuit that prevents a risk of fire, electric shock, or injury to persons under abnormal operating conditions. The function of a PEC would be considered a Safety Critical Function. See SA3.8.

SA3.7 RISK OF FIRE - A risk of fire is considered to exist at any two points in a circuit where a power of more than 15 watts can be delivered into an external resistor connected between the two points.

SA3.8 SAFETY CRITICAL FUNCTION (SCF) - Control, protection and monitoring functions which are being relied upon to reduce the risk of fire, electric shock or injury to persons.

CONSTRUCTION

SA4 Components

SA4.1 Capacitors

SA4.1.1 A capacitor connected between two line conductors in a primary circuit, or between one line conductor and the neutral conductor or between primary and accessible secondary circuits or between the primary circuit and protective earth (equipment grounding conductor connection) shall comply with one of the subclasses specified in the Standard for Fixed Capacitors for Use in Electronic Equipment - Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14 and shall be used in accordance with its rating.

SA4.2 Isolation devices

SA4.2.1 An optical isolator that is relied upon to provide isolation between primary and secondary circuits or between other circuits as required by this Standard shall be constructed in accordance with the Standard for Optical Isolators, UL 1577, and shall be able to withstand for 1 minute, without breakdown, an ac dielectric voltage withstand potential of 2500 volts, as specified in the Dielectric Voltage Withstand Test, Section 40 of this Standard between the input and output circuits.

SA4.2.2 A power switching semiconductor device that is relied upon to provide isolation to ground shall be constructed in accordance with the Standard for Optical Isolators, UL 1577. The dielectric voltage withstand tests required by UL 1557 shall be conducted at a dielectric potential of 2500 volts for 1 minute, as specified in the Dielectric Voltage Withstand Test, 40 of this Standard .

SA4.2.3 A power switching semiconductor device that is relied upon to provide isolation between primary and secondary circuits or between other circuits shall be a device (such as a solid state motor controller) that complies with the Standard for Industrial Control Equipment, UL 508.

Exception: Exception: A power switching semiconductor device located within a component that has been separately evaluated to the requirements for that component is not required to be further evaluated, provided the component is used within its established ratings and limitations.