UL 2388

STANDARD FOR SAFETY

Flexible Lighting Products

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UL Standard for Safety for Flexible Lighting Products, UL 2388

Second Edition, Dated May 3, 2017

Summary of Topics

This revision to ANSI/UL 2388 dated August 7, 2023 is being issued to incorporate the following requirements:

– Addition of UL 969A, the Standard for Marking and Labeling Systems – Flag Labels, Flag Tags, Wrap-Around Labels and Related Products, as an Option into UL 2388; 47.1

– Addition of the reference to the Standard for Marking and Labeling Systems, UL 969, for clarification; 47.1

– Editorial revisions to test conditions for cord tags; 40.2.5, 40.2.7, 40.3.1

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated April 28, 2023.

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ANSI/UL 2388-2023

UL 2388

Standard for Flexible Lighting Products

First Edition – July, 2002

Second Edition

May 3, 2017

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through August 7, 2023.

The most recent designation of ANSI/UL 2388 as an American National Standard (ANSI) occurred on August 7, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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

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INTRODUCTION

1 Scope

1.1 This standard covers portable flexible lighting products with a maximum input voltage rating of 120 volts to be used in accordance with the National Electrical Code, ANSI/NFPA 70. These products are provided with a power supply cord and are intended for outline and decorative lighting use.

1.2 These requirements cover lighting products incorporating non-replaceable series and series/parallel connected lamps enclosed within a flexible polymeric tube or extrusion.

1.3 These requirements also cover flexible lighting products used in light sculptures.

1.4 These requirements do not cover lighting products with replaceable lamps.

1.5 These requirements do not cover the temporary-use, seasonal decorative-lighting products and accessories with a maximum input voltage rating of 120 V that are covered by the Standard for Seasonal and Holiday Decorative Products, UL 588.

1.6 These requirements do not cover flexible lighting products that are intended for use as a sign, such as self-contained product, usually with advertising or other words, numbers, or symbols, intended for use in a nonresidential environment to convey information or attract attention. These products shall be covered under the Standard for Electric Signs, UL 48.

2 Components

2.1 Except as indicated in 2.2, 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 used in the products covered by this standard.

2.2 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.

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

2.4 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.

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 EXTENSION SEGMENT – A flexible lighting product intended to be connected to a connector of another flexible lighting product and not provided with a means to independently connect to a 120 V supply circuit.

5.3 INTERNAL LAMP SHUNT – A device that provides a current path when the filament of a lamp opens so that the remaining lamps in a series-connected circuit remain illuminated.

5.4 LIGHT SCULPTURE – A polymeric or metallic rigid frame to which a flexible light is attached. The flexible light provides outline illumination of the figure or object created by the frame.

5.5 NON-EXTENDABLE FLEXIBLE LIGHT – A flexible light product that is not provided with any means to add an extension segment.

CONSTRUCTION

6 Assembly and Packaging

6.1 A flexible lighting product shall be completely wired with each electrical component mounted in place and with each splice and connection completed.

6.2 Detachable power-supply cords and extension segments that comply with Section 17, Interconnecting Means, need not be connected.

6.3 The package for a flexible lighting product designed to be connected to its source of supply by means of a detachable power-supply cord shall include the detachable power-supply cord.

7 Enclosures

7.1 The enclosure shall withstand the abuses that it is subjected to without total or partial collapse of the enclosure, reduction of spacing, loosening or displacement of parts, or other defects that increase the risk of fire, electric shock, or injury to persons.

7.2 A polymeric material used to enclose or provide structural support for electrical current carrying parts shall:

a) Have a minimum flammability rating of V-0; and

b) Have a minimum HWI (hot-wire resistance to ignition) Performance Level Category (PLC) of 3, a minimum HAI (high-current arc resistance to ignition) PLC of 3, and a minimum CTI PLC of 4, if marked for indoor use, or a minimum PLC of 3, if marked for outdoor use.

Exception No. 1: The minimum flame rating shall be HB when the flexible lighting product is located in a Class 2 circuit.

Exception No. 2: A flexible lighting product whose enclosure is extruded of an insulation compound that is rated 105°C, and also complies with the requirements of the VW-1 flame test, and 720 hour weatherometer test, need not comply with 7.2(a) and (b) when the ropelight body complies with the VW-1 flame test as described in the Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581, and when intended for outdoor use, complies with the VW-1 flame test and crush test after being subjected to the Ultraviolet (UV) Light Exposure and Water Immersion Tests described in Section 31.

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7.3 The polymeric tube or extrusion section of the flexible light enclosure that is used to enclose the lamps shall comply with the:

a) Crush Test, Section 30;

b) Flexing Test, Section 33; and

c) Oven Conditioning Test, Section 34.

7.4 There shall be a minimum of 3/64 inch (1.2 mm) of insulating material between uninsulated current carrying parts of the series or series/parallel circuit and the outer surface of the ropelight body.

Exception: A ropelight located in a Class 2 circuit need not comply with this requirement.

7.5 A polymeric enclosure for a controller or other accessory used with a flexible light shall comply with the:

a) Crush Test, Section 30;

b) Ball Impact Test, Section 32; and

c) Oven Conditioning Test, Section 34.

7.6 The flammability rating specified in 7.2(a) is to be determined by the applicable tests in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

7.7 As an alternative to 7.2(a), the polymeric material is able to comply with the 3/4 inch or 12 mm flame test of the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. At the conclusion of the test there shall not be openings large enough to enable a 1/4 inch (6.4 mm) diameter rod to penetrate the enclosure and there shall not be ignition of the cotton indicator. The indicator is to be absorbent, 100 percent cotton thinned to approximately 2 by 2 inches (50 by 50 mm) and a maximum thickness of 0.24 inches (6 mm). The cotton is to be placed horizontally 11.8 ±0.39 inches (300 ±10 mm) below the component material.

7.8 With regard to consideration of thermal endurance in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, the material shall possess a mechanical temperature index, with impact, as a result of long term aging or a generic temperature index of at least the measured temperature in the Normal Temperature Test, Section 26.

7.9 The temperature index specified in 7.8 shall include temperatures measured on polymeric materials closest to or in direct contact with any lamp.

7.10 An enclosure formed of polymeric material and marked for outdoor use in accordance with Section 48, Outdoor Use Markings, shall comply with:

a) The UV resistance and water exposure requirements from the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C;

b) The Rain Test, Section 39; and

c) For an enclosure of a flexible light, the Cold Bend Test, Section 35.

7.11 As an alternative to 7.10(a), a polymeric material may be employed as an enclosure of a flexible lighting product marked for outdoor use provided it complies with the flammability rating evaluation of 7.6 or 7.7 as applicable, the Crush Test, Section 30, and the Ball Impact Test, Section 32, after being subjected to the Ultraviolet (UV) Light Exposure and Water Immersion Tests described in Section 31. The

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end-product test force and impact values shall be reduced by 30 percent after the UV light exposure test, and reduced by 50 percent after the water immersion test. At the conclusion of the conditioning and end-product tests, the flammability rating shall not be reduced and the samples shall comply with the requirements of 30.3 and 32.6. The ball impact test is only applicable to a controller or other accessory used with a flexible light.

7.12 If a flexible light enclosure consists of multiple layers of polymeric materials, all layers shall comply with 7.2 and only the outermost layer needs to comply with the UV resistance and water exposure requirements of 7.10(a), providing that the material used for the outermost layer is suitable for the purpose and complies with the minimum thickness of 7.4.

8 Decorative Parts

8.1 A material used as a decorative part that is near any component that generates heat shall:

a) Be installed on the unit when it is temperature tested;

b) Have a minimum flammability rating of HB; and

c) Not melt or deform in any way that interferes with the normal operation of the flexible lighting product or causes a risk of fire or electric shock during the Normal Temperature Test, Section 26.

9 Light Sculptures

9.1 The frame of a light sculpture shall be:

a) Metal that is free of sharp edges or burrs that are able to cut or abrade conductors or the insulation; or

b) A polymeric material that complies with the Oven Conditioning Test, Section 34, such that stress is not placed on electrical connections or wire as a result of the test.

Exception: A light sculpture supplied by a Class 2 circuit is not required to comply with 9.1.

9.2 If the light sculpture folds, such as for storage, it shall have sufficient free length of wire to avoid pinching, cutting, or abrading of the conductors or insulation.

10 Accessibility of Current Carrying Parts

10.1 An uninsulated current carrying part involving a risk of shock shall be enclosed so that it is not accessible to unintentional contact by persons during normal use.

10.2 A current carrying part is considered inaccessible when the UL articulated accessibility probe, shown in Figure 10.1, is unable to be manipulated to touch it. The probe shall be applied to any depth that the opening will permit; and shall be rotated or angled, before, during, and after insertion through the opening, to any position that is necessary to try and contact the current carrying part.

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