UL 697

Toy Transformers

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UL Standard for Safety for Toy Transformers,UL 697

Sixth Edition, Dated October 13, 2004

Revisions: This Standard contains revisions through and including February 7, 2008.

Summary of Topics

These revisions to ANSI/UL 697 include an Exception to 15.5 for coil insulation, Instructions for products identified as a ″hobby transformer″, and Reference updates to Appendix A.

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Text that has been changed in any manner 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 revisions dated February 7, 2008 include a reprinted title page (page1) for this Standard.

The revisions dated January 31, 2006 editorially replace all references to UL 1020 with the reference to UL 60691.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

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Page	Date
1	February 7, 2008
2-5	October 13, 2004
6	January 31, 2006
7-19	October 13, 2004
20-20B	February 7, 2008
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Standard for Toy Transformers

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Sixth Edition

October 13, 2004

The most recent designation of ANSI/UL 697 as an American National Standard (ANSI) occurred on February 1, 2008. The ANSI approval for this standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

This ANSI/UL Standard for Safety consists of the Sixth edition including revisions through February 7, 2008.

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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Standards for Components. A1

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INTRODUCTION

1 Scope

1.1 These requirements cover toy transformers designed to be used on nominal 120-V branch circuits. A toy transformer is a step-down isolating transformer of the low-secondary-voltage type. It is intended primarily to supply current to electrically operated toys, and as such is expected to be subjected to careless use and probable short circuit of the secondary terminals. Accordingly, the design of a toy transformer takes into consideration the rather unusual risk of fire that may be involved, and the construction is made to reduce the risk of fire with respect to the ignition of nearby combustible material as the result of overheating or eventual inoperative condition of the transformer itself.

1.2 These requirements do not cover toys or the like designed to operate from the secondary output of a toy transformer.

1.3 Toy transformers marked ″Class 2″ are evaluated to the requirements in the Standard for Class 2 Power Units, UL 1310, and to the requirements in this Standard.

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 generally 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.

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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 purpose of this Standard the following definitions apply.

5.2 ENCLOSURE – Any surface or surrounding structure that makes unlikely any access to a real or potential risk of fire, electric shock, or injury to persons.

5.3 ORDINARY TOOL – Pliers, flat-bladed and Phillips-head screw drivers are considered to be ordinary tools.

CONSTRUCTION

6 General

6.1 Only materials that reduce the risk of fire, electric shock, and injury to persons, and are intended for the particular use shall be used in a transformer. A transformer shall be made and finished with the degree of uniformity and grade of workmanship that are practicable in a well-equipped factory.

6.2 A thermostat incorporated in a transformer shall not increase the risk of fire or electric shock due to improper application. If a thermostat is relied upon to satisfy the requirements of this standard, its acceptability shall be determined by the Standard for Temperature-Indicating and -Regulating Equipment, UL 873.

6.3 A thermal cutoff incorporated in a transformer shall not increase the risk of fire or electric shock due to improper application. If relied upon to satisfy the requirements of this standard, its acceptability shall be determined by the Standard for Thermal-Links – Requirements and Application Guide, UL 60691.

6.3 revised January 31, 2006

6.4 There shall be no electrical connection between the primary and secondary windings of a toy transformer, or between a secondary circuit and the enclosure.

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7 Mechanical Assembly

7.1 A toy transformer shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it is subjected, without producing or increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other serious defects. See also 42.1.

7.2 A transformer shall have all parts secured in place.

7.3 A transformer shall be constructed so that it is not necessary to open or remove the enclosure during use.

7.4 Each switch, lampholder, and similar component shall be mounted securely and, except as noted in 7.5 and 7.6 for certain switches and lampholders, shall be kept from turning in accordance with 7.7.

7.5 A plunger or other type of nontoggle switch that does not tend to rotate when operated and that is operated by mechanical means rather than by direct contact by persons need not be kept from turning if both of the following conditions are met:

a) The means by which the switch is mounted is such as to make it unlikely that the switch can loosen as a result of being operated.

b) Rotation of the intentionally loosened switch does not reduce spacings below the minimum acceptable values.

7.6 A lampholder of a type in which the lamp cannot be replaced (such as a neon pilot or indicator light in which the lamp is sealed in by a nonremovable jewel) need not be kept from turning if rotation cannot reduce spacings below the minimum acceptable values or produce stress on a connection.

7.7 A switch or other similar component shall be securely mounted and kept from turning, unless the turning of such a component is part of the design of the transformer, and introduces no additional risk of injury to persons, fire, or electric shock – such as reduced spacings below minimum acceptable values, or stress on a connection.

7.8 The mounting means noted in 7.7 is to consist of more than friction between surfaces. For example, the correct use of a lock washer or a keyed and notched insert plus a lock washer for a single-hole mounting is considered acceptable.

7.9 A replaceable pilot lamp in a transformer shall be of the incandescent type, shall be wired in the secondary circuit, and shall not have a potential difference greater than 30 V rms (42.4 V peak) between any of its electrodes or lampholder contacts and any other part or ground. During relamping, the enclosure shall comply with 8.1.2 and 8.1.3.

7.10 A nonreplaceable pilot lamp, such as an indicating type of overload or short-circuit protector, a neon light, or an indicator light, is one in which the lamp is sealed-in, such as by a nonremovable jewel. Such a lamp may be in the primary circuit.

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7.11 A protective device, built into a toy transformer, shall comply with the requirements for that component. See also 6.2 and 6.3.

7.12 Protective devices covered by 7.11 include fuses, overtemperature and overcurrent protectors, eutectic material, and similar devices intended to interrupt the flow of current as a result of transformer overload. A protective device that is relied upon shall not be replaceable. A protective device that is not relied upon may be replaceable provided it is wired in the secondary circuit and is replaceable without opening the enclosure.

7.13 A switch in the primary circuit or an overcurrent-protective device shall be located within the transformer enclosure in such a manner that is not accessible or exposed to tampering or subject to damage during normal use. This requirement does not apply to the actuating means of a switch.

7.14 If the exterior part of the switch or control forms part of a transformer enclosure, those parts shall comply with the requirements for abuse stated in 42.1.

7.15 The requirements stated in 7.13 shall also apply to the actuating means (toggle handle and the like) if the dislodging of such a part exposes live parts or film-coated magnet wire that can be contacted by the probe specified in 8.1.3.

8 Enclosure

8.1 General

8.1.1 In addition to the requirements in 8.1, a wall-mounted (direct plug-in type) transformer shall comply with the requirements in 8.2.

8.1.2 An enclosure containing a wire, splice, connection, or electrical component at a potential of more than 42.4 V peak to any other part or to ground shall:

a) Be assembled by welding, riveting, the use of special screws that are not removable with an ordinary tool used in the intended manner, or the equivalent; and

b) Have no opening that enables the entry of a straight rod 1/4 inch (6.4 mm) in diameter.

8.1.3 An enclosure shall have no opening through which a 0.010 inch (0.26 mm) diameter music wire can be inserted to contact a part at a potential of more than 42.4 V peak to any other part or to ground. A single bend in the wire is acceptable prior to insertion. A protective barrier that can be penetrated by the wire is not acceptable.

8.1.4 If access to the interior of a transformer presents a risk of fire, electric shock, or injury to persons of any sort, seams and joints of the enclosure shall be assembled by welding, riveting, the use of special screws or fasteners that are not removable by the use of an ordinary tool, or the equivalent. Bent tabs shall not be used unless they comply with 8.1.5 or are made inaccessible by a reliable hard covering such as potting, encapsulation, or the equivalent that would require drilling, filing, or the like for removal. A thermoplastic potting or encapsulating material shall comply with the applicable requirements in 42.1 – 42.8.

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8.1.5 Cross-notch-head screws, spring clips, bent tabs, and the like are to be considered defeatable by an ordinary tool, except that bent tabs may be used if:

a) The metal thickness of the tabs complies with 8.1.7; and

b) The tabs are located in such a manner that they successfully resist attempts to open them by means of a screwdriver of the type shown in Figure 8.1.

The screwdriver is to be applied to each tab forcibly by hand as a lever prying and twisting, for 15 minutes at any angle and as many times as necessary to truly attempt to open the tab.

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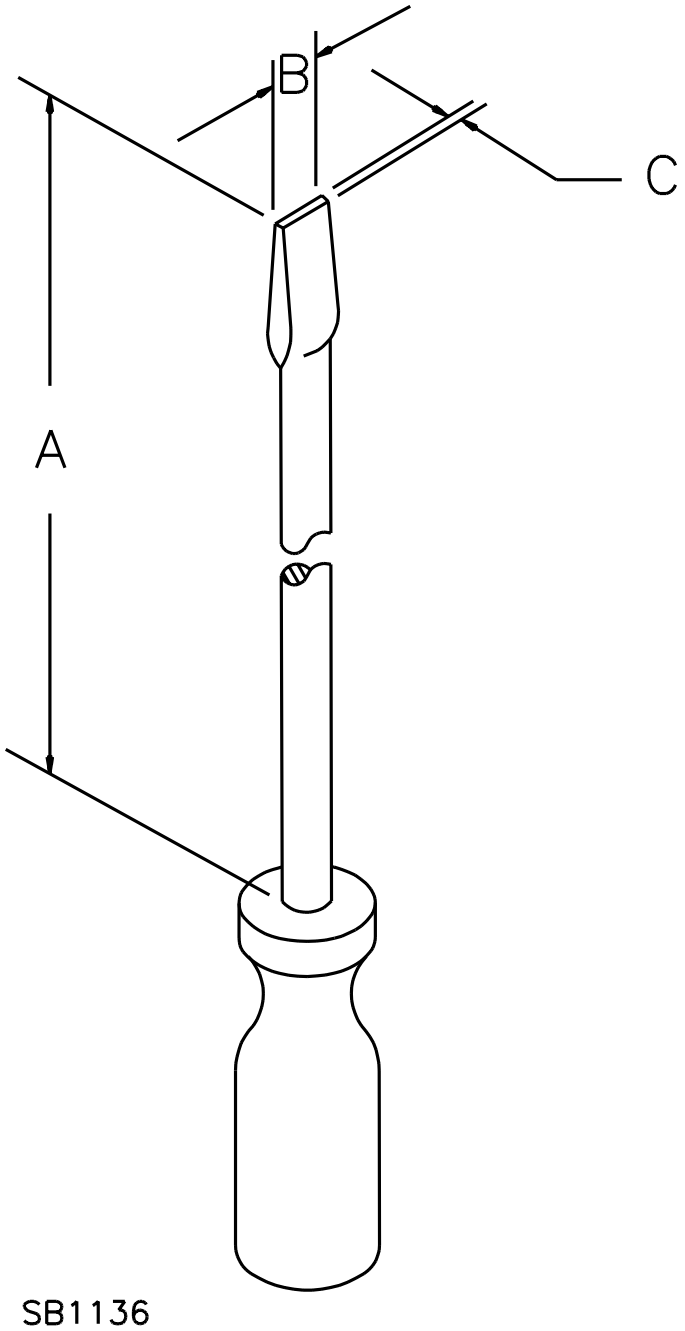
Figure 8.1
Bent tab screwdriver



A – 6 inches (152 mm)

B – 1/8 inch (3.2 mm)

C – 0.023 ±0.002 inch (0.6 ±0.05 mm)

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8.1.6 If an acceptable grade of vulcanized fiber is used as part of the enclosure for the support of secondary parts (terminals and the like), it shall not be more than is necessary to support the secondary parts in question, and the fiber shall not be less than 1/32 inch (0.8 mm) thick. Any fiber used shall not introduce a risk of fire, electric shock, or injury to persons as a result of abuse. See 42.1 for further specifications.

8.1.7 An enclosure constructed of sheet metal shall be formed from stock having a thickness not less than that specified in Table 8.1. The thickness of enclosure sheet metal other than steel or aluminum shall not be less than that specified in Table 8.1 for uncoated steel and shall have strength and rigidity.

Table 8.1
Thickness of sheet metal enclosure

Material	Minimum thickness	
	inches	(mm)
Uncoated steel	0.026	0.66
Zinc-coated steel	0.029	0.74
Aluminum	0.040	1.02

8.1.8 For unreinforced, flat surfaces in general, cast metal shall not be less than 1/8 inch (3.2 mm) thick, except that malleable iron may not be less than 3/32 inch (2.4 mm) thick, and die-cast metal may not be less than 5/64 inch (2.0 mm) thick. Corresponding thicknesses of not less than 3/32, 1/16, and 3/64 inch (2.4, 1.6, and 1.2 mm) respectively, may be used if the surface under consideration is curved, ribbed, or otherwise reinforced, or if the size, shape, or both, of the surface is such that adequate mechanical strength is provided.

8.1.9 A lanced tab provided for internal component mounting may have a small opening caused by die clearance if:

a) The opening caused by the lanced tab is substantially closed by the mounted component;

b) The lanced tab is located on the bottom surface of the enclosure only; and

c) Film-coated magnet wire or live parts cannot be contacted by the probe specified in 8.1.3.

8.1.10 In addition to complying with the requirements in this standard, a polymeric enclosure shall be evaluated in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

8.1.11 A polymeric part that is decorative or otherwise is not involved with protection against the risk of fire, electric shock, or injury to persons, and either is larger in volume than 79 inches^2 (2000 mm^2) or has a dimension longer than 1.2 inches (30 mm), shall be of a material whose flammability classification is HB when the material is tested as specified in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

8.1.12 If a screen is used to cover an opening in a transformer enclosure, the force specified in 42.7 shall be applied to that screen.

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8.1.13 The minimum thickness of a metal screen shall comply with 8.1.7.

8.1.14 A screen constructed of material other than metal shall comply with 8.1.10.

8.1.15 An adhesive that is used in the assembly of an enclosure and is relied upon to reduce a risk of electric shock, fire, or injury to persons shall comply with the requirements for adhesives in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

Exception: Any means using a fusion technique – solvent cementing, ultrasonic welding, electromagnetic induction welding, thermal welding, and the like, need not comply with the requirements for adhesives in UL 746C.

8.1.16 The requirement in 8.1.15 applies to an adhesive used to secure a metal nameplate or other conductive part that, if loosened or dislodged, could do one or more of the following:

a) Energize an accessible dead metal part;

b) Make a live part accessible;

c) Reduce spacings below the minimum acceptable values; or

d) Short-circuit live parts.

8.2 Enclosure – direct plug-in type

8.2.1 The maximum acceptable moment, center of gravity, dimensions, and weight of a direct plug-in unit shall comply with the following requirements (see also 8.2.2 and 8.2.3):

a) The quotient of WY/Z shall not exceed 48 ounces (1361 g).

b) The quotient of WY/S shall not exceed 48 ounces.

c) The product of WX shall not exceed 80 ounce-inches (0.56 N·m).

d) The weight of a unit shall not exceed 28 ounces (794 g).

8.2.2 Definitions for the symbols used in 8.2.1 are as follows:

S is the lesser of the two distances, S_1 or S_2, as illustrated in Figure 8.2 in inches (mm).

W is the weight of the unit in ounces (g).

X is the greater of the two distances, X_1 or X_2, as illustrated in Figure 8.2 in inches (mm).

Y is the distance illustrated in Figure 8.2 in inches (mm).

Z is the lesser of the two distances, Z_1 or Z_2, as illustrated in Figure 8.2 in inches (mm).

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