

UL 1411

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Transformers and Motor Transformers for Use in Audio-, Radio-, and Television-Type Appliances

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UL Standard for Safety for Transformers and Motor Transformers for Use in Audio-, Radio-, and Television-Type Appliances, UL 1411

Fifth Edition, Dated February 18, 1998

Revisions: This Standard contains revisions through and including June 18, 2004.

Summary of Topics:

These revisions to UL 1411 are being issued:

- 1. To correct an error in the equation located in Paragraph 13.1;***
- 2. To delete the Announcement Bulletin dated January 31, 1994 from the standard;***
- 3. To delete the Foreword from the standard; and***
- 4. To make editorial changes to some of the requirements of the standard.***

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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 June 18, 2004 include a reprinted title page (page1) for this Standard.

The revisions dated June 18, 2004 were issued to replace a dot used in the beginning of the equation for Paragraph 13.1 with the correct "less-than-or-equal" symbol, to delete the Announcement Bulletin dated January 31, 1994 from the standard, to delete "No." from references to AWG in Paragraph 16.2 and Page CRG3, and to make editorial (non-technical) changes to Paragraphs 1.5, 2.1.2 – 2.1.4, and Page CRG3.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: <http://ulstandardsinfo.net/ulforeword.html>

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New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Recognition and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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Page	Date
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7-12	February 18, 1998
13	June 18, 2004
14-17	February 18, 1998
18-18B	June 18, 2004
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20-32	February 18, 1998
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UL 1411

**Standard for Transformers and Motor Transformers for Use in Audio-,
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February 18, 1998

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

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UL AND CANADIAN STANDARDS FOR TRANSFORMERS AND MOTOR TRANSFORMERS FOR
USE IN AUDIO-, RADIO-, AND TELEVISION-TYPE APPLIANCES CRG1

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INTRODUCTION

1 Scope

1.1 These requirements apply to transformers, autotransformers, and motor-transformers intended to be used in audio-, radio-, and television-type appliances in which the primary winding is connected across the supply circuit.

1.2 The requirements in Sections 4 – 15, 23 – 26, 28, and 29 also apply to transformers intended for use in high-frequency, switching-type power supplies in which the transformer provides isolation from the supply circuit.

1.3 These requirements do not apply to transformers that are intended to transform only audio, video, and other signal waveforms. Those transformers are covered by the Standard for Isolating Signal and Feedback Transformers for Use in Electronic Equipment, UL 1876.

1.4 These requirements apply to a transformer or motor transformer that includes a separate current-limiting impedance such as a positive temperature coefficient (PTC) device complying with the requirements for thermistor-type devices, or a resistor complying with the Standard for Fusing Resistors and Temperature-Limited Resistors for Radio- and Television-Type Appliances, UL 1412.

1.5 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involves a risk of fire or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the level of safety as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this standard does not comply with this standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.1.2 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.

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

2.1.4 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.

2.2 Units of measurement

2.2.1 When a value for measurement is followed by a valued in other units in parentheses, the first stated valued is the requirement.

2.3 Undated references

2.3.1 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 ENCAPSULATION COMPOUND – A material, generally of the polymeric type, that is at least 1/32 inch (0.8 mm) thick (when solidified) and that covers the transformer windings.

3.3 HOUSING – A partial or complete enclosure, generally of polymeric material or metal, that is around the outside of all or part of the transformer (such as end bells) but is not in contact with current-carrying parts.

3.4 IMPREGNATION COMPOUND – A coating material less than 1/32 inch (0.8 mm) thick, generally of the polymeric type and commonly in the form of varnish, that is absorbed by insulating materials such as electrical grade paper.

3.5 LAYER-WOUND TRANSFORMER – A transformer in which all of the turns in each layer of each winding are in a single plane. Turns in each layer are wound tightly next to each other with no gaps between them and the turns do not cross over other turns in that layer or the adjacent layers.

3.6 POTTING COMPOUND – A material intended to fill all the air spaces inside the housing of a transformer.

3.7 TRANSFORMER – A collective term used to designate a transformer, a motor transformer, or an autotransformer.

3.8 WINDING – A coil of wire including the start, finish, and crossover leads up to the point where insulated leads or terminals are connected.

CONSTRUCTION

4 Enclosure

4.1 A material used as all or part of the enclosure (end bells) of a transformer shall be classified 94V-0 or less flammable in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

Exception: This requirement does not apply to a bushing through which a lead passes.

4.2 A complete, individual enclosure (end bells) is not required when:

- a) Live parts are not accessible or

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- b) The transformer is used in an appliance having an enclosure that renders the live parts inaccessible.

An individual enclosure may be required in the end product if the transformer has not been tested as described in Abnormal Operation Tests, Section 27.

4.3 A potting compound employed in a transformer shall be classified 94HB or less flammable in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. A potting compound classified 94HB or less flammable using 1/16-inch (1.6-mm) thick flat-stock samples may be used in lesser thicknesses in the transformer when determined acceptable.

4.4 An encapsulation compound that covers the exterior surface of a transformer shall be classified 94HB or less flammable in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. An encapsulation compound classified 94HB or less flammable using 1/16-inch (1.6-mm) thick flat-stock samples may be used in lesser thicknesses in the transformer when determined acceptable.

5 Leads

5.1 Insulation

5.1.1 The insulation on lead wires shall be rated for the voltage involved and the highest temperature reached under any condition of actual use, and shall be rated "VW-1."

5.2 Cords

5.2.1 A flexible cord of a transformer shall comply with the requirements in the standard for the end-use product in which the transformer is intended to be used and shall be rated "VW-1."

5.2.2 A power-supply cord or wiring harness shall be provided with a polarized (two-blade polarized or three-wire grounding) type attachment plug that conforms with one of the configurations covered in the Standard for Wiring Devices – Dimensional Requirements, NEMA WD-6, and in the Standard for Attachment Plugs and Receptacles, UL 498. The attachment plug shall comply with the requirements in the Standard for Cord Sets and Power-Supply Cords, UL 817.

Exception: When the product is intended to be connected to supply circuits not defined in the National Electrical Code, ANSI/NFPA 70, or for connection to supply-circuit receptacles that are not defined in the Standard for Wiring Devices – Dimensional Requirements, NEMA WD-6, the configuration of the attachment plug is to conform to the applicable Standards of the country into which the product is intended to be shipped. This exception applies only when the product is set for use on the foreign supply circuit when leaving the factory.

5.2.3 The conductors of a parallel flexible cord of a transformer shall not be split external to the transformer enclosure (end-bells).

5.3 Sleeving, tape, and tubing

5.3.1 Sleeving and tubing used on lead wires shall be rated "VW-1." Tape used on lead wires shall be flame-retardant.