UL 1413

STANDARD FOR SAFETY

High-Voltage Components for Television-Type Appliances

UL Standard for Safety for High-Voltage Components for Television-Type Appliances, UL 1413

Sixth Edition, Dated December 16, 1999

Summary of Topics

This revision to ANSI/UL 1413 is being issued to reflect the recent reaffirmation of UL 1413 as an American National Standard. No changes have been made to the requirements within this standard.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated September 16, 2016.

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.

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UL 1413

Standard for High-Voltage Components for Television-Type Appliances

The First edition was titled High-Voltage Components for Television Receiving Appliances and Other Electronic Equipment and numbered UL 492.3.

First Edition – January, 1974
Second Edition – May, 1981
Third Edition – March, 1983
Fourth Edition – June, 1988
Fifth Edition – October, 1994

Sixth Edition

December 16, 1999

This ANSI/UL Standard for Safety consists of the Sixth Edition including revisions through November 1, 2016.

The most recent designation of ANSI/UL 1413 as a Reaffirmed American National Standard (ANS) occurred on November 1, 2016. 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 UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover flyback transformers, high-voltage multipliers, deflection yokes and picture-tube high-voltage-neck components intended to be employed in television-type appliances.

1.2 High voltage is defined as a potential equal to or greater than 2500 V peak.

1.3 Unless stated otherwise, each paragraph applies to all components covered by the scope of these requirements.

1.4 Protective devices or circuits that are an integral part of a component are to be considered as part of that component.

1.5 Deleted and relocated to Foreword February 26, 2002.

2 Units of Measurement

2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.1 revised February 26, 2002

3 References

Section 3 added December 16, 1999

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.

CONSTRUCTION

4 Electrical Connections

4.1 Where malfunction of electrical connections involves risk of fire or electric shock, the connections shall be soldered, welded, or otherwise securely connected. A soldered joint shall be mechanically secure before soldering.

4.2 A lead is considered to be mechanically secure when one or more of the following is provided:

a) At least one full wrap around a terminal.

b) At least one right-angle bend when passed through an eyelet or opening.

c) Twisted with other conductors.

4.3 The placing of a lead along a flat surface and soldering (identified as tack soldering) is not acceptable unless it can be demonstrated that a risk of fire, electric shock, or personal injury does not exist with the lead(s) detached.

4.4 Any other means of securing integral leads, for example, spade-type connectors, wire wrapping, or the like, is to be evaluated to determine its mechanical security.

5 Component Leads

5.1 All leads intended to connect the component to the circuitry of the appliance shall be provided with a strain relief means so that stress on an external lead, or combination of leads, shall not:

a) Result in damage to or displacement of the leads, or

b) Reduce spacings to any connection on or inside the component. The strain-relief means shall comply with Strain-Relief Test, Section 15.

6 Lead Exit

6.1 If wires pass through an opening in a component enclosure, cover, or the like, the edges of the opening shall be smooth and well rounded, without burrs or fins that might damage the conductor insulation.

7 Bushings

7.1 A bushing, if used, shall be securely held in place. The material of the bushing shall comply with the requirements outlined by Table 11.1.

8 Corrosion Protection

8.1 All metal parts necessary for functioning of the component as intended shall be protected against corrosion.

8.2 The requirement in 8.1 applies to all parts upon which operation may depend. It does not apply to small, minor parts of iron or steel such as washers, screws, bolts, and the like that are not current carrying, if a malfunction of such unprotected parts cannot result in a risk of fire, electric shock, personal injury, or inability of the component to operate, but the protection of all such parts is recommended.

8.3 Parts made of nonferrous metal, coated or treated if necessary, do not require additional protection against corrosion.

9 Insulating Materials

9.1 Insulating material employed to maintain spacings between terminals involving risk of fire, electric shock, or personal injury, or as the sole means of physically supporting such terminals, shall be a material that complies with the requirements outlined by Table 11.1.

10 Small-Gauge Wire

10.1 Leads of a component that are smaller than No. 24 AWG (0.21 mm^2) and are to be connected to the circuitry of an appliance shall be protected against mechanical damage including the effects of vibration and impact in service.

10.2 If the leads and coil windings are of dissimilar metals, the connection between them, whether welded, soldered, crimped, or the like, shall be considered with respect to mechanical security, flexure, galvanic action, and strain.

11 Materials

11.1 General

11.1.1 Materials, combinations of materials, or both, excluding lead wire, shall comply with the requirements outlined by Table 11.1.

11.1.1 revised February 26, 2002

11.1.2 Components such as flyback transformer enclosures, CRT socket materials, anode capacitors, and similar components, shall comply with the Component-Part Flame Test described in Section 14 of this standard.

11.1.2 added February 26, 2002

Table 11.1
Requirements for properties of materials

Resistance to ignition[m] from hot bar[a] or hot wire[b] seconds	Flammability classification[c]	Other criteria[h]
10	V-0	d,e,f,g,i,j,k,l
15	V-1	d,e,f,g,i,j,k,l
30	V-2	d,e,f,g,i,j,k,l

[a] Resistance to Ignition-Hot-Bar – Hot-bar ignition performance is expressed as the number of seconds needed to ignite a specimen (finished component) by a bar that dissipates a specified level of electrical energy as described in the requirements for television receivers and video products, UL 1410.

[b] Resistance to Ignition-Hot-Wire – Hot-wire ignition performance is expressed as the number of seconds needed to ignite standard specimens that are wrapped with resistance wire that dissipates a specified level of electrical energy. Bar samples as described in note[c] are to be used during this test. This test is described in the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A.

[c] Flammability Classification – Determined by tests described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. For testing a material, the samples are to be flat stock (bar samples) approximately 5 inches (130 mm) long by 1/2 inch (13 mm) wide, and of the smallest thickness used; for an assembly, the samples can consist of the assembly. High-voltage transformers, deflection yokes, printed-wiring boards, terminal strips, and the like can be tested as finished parts, or test samples can be cut from finished parts. In the case of small parts that might be consumed before the test is completed, large samples of the same material can be tested provided they represent the same or lesser thickness than the part in question. None of the larger samples is to be entirely consumed. Samples that consist of an assembly or a section thereof that are not flat stock samples are to be positioned in what is considered to be the worst position in the application. The parts evaluated by Table 11.1 and classified using 1/16 inch (1.6 mm) thick bar specimens may be accepted in lesser thicknesses in the end product.

[d] Dielectric Breakdown Strength – At least 175 volts per mil as determined in accordance with the Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies, ASTM D 149-97A, after conditioning for 96 hours at 35°C (95°F) and 90 percent relative humidity as described in Procedure C in the Standard Practice for Conditioning Plastics and Electrical Insulating Materials for Testing, ASTM D 618-96. These are minimum values usually characteristic of the majority of materials classified as insulators. Higher values might be needed to perform acceptably in the end product.

See note n for information regarding effective date of note d

[e] Volume Resistivity – 50 megohms-centimeter as measured after conditioning for 40 hours at 23.0°C (73.4°F) and 50-percent relative humidity as indicated in Procedure A of the Standard Practice for Conditioning Plastics and Electrical Insulating Materials for Testing, ASTM D 618-96 and 10 megohms-centimeters after being conditioned for 96 hours at 35°C (95°F) and 90 percent humidity as indicated in Procedure C, conducted in accordance with the Standard Test Methods for DC Resistance or Conductance of Insulating Materials, ASTM D 257-93. These are minimum values usually characteristic of the majority of materials classified as insulators. Higher values might be needed to perform acceptably in the end product.

See note n for information regarding effective date of note e

[f] Heat Distortion Temperature – When measured at 66 pounds per square inch (4.64 kg/cm^2) the heat distortion temperature shall not be less than 10°C (18°F) more than the maximum operating temperature of the material in the appliance when tested as described in the Standard Test Method for Deflection Temperature of Plastics Under Flexural Load, ASTM D 648-98C. Materials having a heat distortion temperature less than this can be considered on the basis of the results of the 7 hour oven test used to evaluate the effects of mold-stress relief.

See note n for information regarding effective date of note f

[g] Mold-Stress Relief – The part is required to withstand a temperature-stability test or, at the manufacturer's option, an oven test as described in the requirements for television receivers and video products, UL 1410. There is to be no shrinkage, warpage or other distortion that:

1) Interferes with intended operation or servicing,

2) Results in accessibility of live parts or

3) Reduces electrical spacings below the level necessary to comply with the applicable requirements pertaining to dielectric strength and leakage current.

[h] Insulation Properties and Stability – Mechanical strength is to be considered in the application.

Table 11.1 Continued on Next Page

Table 11.1 Continued

Resistance to ignition[m] from hot bar[a] or hot wire[b] seconds	Flammability classification[c]	Other criteria[h]
[i] Corona Degradation – Unless the material is shown by accelerated tests at higher voltages to be resistant to corona degradation (as evidenced by blistering, cracking, discoloration or other signs of material deterioration) in the thickness involved and at the potential to which it is exposed, high voltage arcing tests as described in the requirements for television receivers and video products, UL 1410, are to be conducted. See note n for information regarding effective date of note i [j] Moisture Resistance – Maximum change of 2.0 percent in dimension as measured before and after 24 hours in water at 23.0°C (73.4°F) as indicated in the Standard Test Method for Water Absorption of Plastics, ASTM D 570-98. See note n for information regarding effective date of note j [k] Spacings – See the requirements for television receivers and video products, UL 1410, to determine acceptability of spacing. [l] Dimensional Stability – Materials having a maximum change in any dimension not exceeding this value [2 percent equals 0.02 inch/inch (0.02 mm/mm)] have generally been found to provide acceptable end-product performance. Lower values may be necessary where close-fit tolerances are encountered. Dimensional stability is the permanent change in dimension that may occur as a result of long-term exposure to the maximum operating temperature for which the material has been evaluated. Where such long-term aging data is not available, this property can be estimated reasonably by measuring permanent dimensional changes after 1000 hours of exposure to a temperature 55°C (99°F) above its operating temperature. See note n for information regarding effective date of note l [m] The parts evaluated by Table 11.1 and classified using 1/16 inch (1.6 mm) thick bar specimens may be accepted in lesser thicknesses in the end product. [n] A program has yet to be implemented whereby information regarding the acceptability of component insulating materials can be transmitted to the end-product manufacturer. When such a program is developed, effective dates will be established and announced.		

12 Tubing, Tape, and Sleeving

12.1 Tubing, tape and sleeving used as insulation shall be rated for the maximum voltage and temperature anticipated under conditions of actual use. Tubing and sleeving shall have a flame-retardance rating of VW-1. Tape shall be flame retardant.

12.2 Tubing used as supplementary insulation over an insulated wire is to be given consideration with respect to the voltage rating.

PERFORMANCE

13 Representative Components

13.1 The test program shall include tests on three complete representative components except that, as an option, finished parts of the assembly can be tested individually.

14 Component-Part Flame Test

14.1 A part shall not continue to flame for more than 10 seconds after each of five 15-second applications of a test flame, and, after the fifth application of the test flame, the part shall be capable of performing its intended mechanical function(s).

14.2 Three representative components are to be conditioned for 168 hours at a temperature of 20°C (36°F) higher than the rated temperature, but not less than 70.0 ±2.0°C (158.0 ±3.6°F). Immediately after completion of the 168 hour conditioning, the representative components are to be removed from the oven, placed in a calcium chloride desiccator, and given time to cool to room temperature before being tested.