UL 1417

STANDARD FOR SAFETY

Special Fuses for Radio- and Television- Type Appliances

UL Standard for Safety for Special Fuses for Radio- and Television- Type Appliances, UL 1417

Sixth Edition, Dated October 18, 1999

Summary of Topics

This revision of ANSI/UL 1417 dated May 3, 2022 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

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.

The requirements are substantially in accordance with Proposal(s) on this subject dated February 21, 2022.

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OCTOBER 18, 1999
(Title Page Reprinted: May 3, 2022)

ANSI/UL 1417-2012 (R2022)

UL 1417

Standard for Special Fuses for Radio- and Television- Type Appliances

The First edition was titled Special Fuses for Radio and Television Receiving Appliances and Other Electronic Equipment and numbered UL 492.7.

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

Sixth Edition

October 18, 1999

This ANSI/UL Standard for Safety consists of the Sixth Edition including revisions through May 3, 2022.

The most recent designation of ANSI/UL 1417 as a Reaffirmed American National Standard (ANS) occurred on May 3, 2022. 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 special types of fuses not covered by separate requirements and that are for use in radio- and television-type appliances where they are relied upon to limit power or current, or both. These requirements also apply to holders intended to accept such special fuses, where the holder may be an integral part of the fuse design. It should be noted, however, that compliance of a special fuse with these requirements does not assure that it is acceptable for use as a protective device in the end-use product.

1.2 A special fuse is a single function (providing protection only) device intended to interrupt a current flow when the current passing through it exceeds a preselected value. It is nonrenewable; that is, the fuse element cannot be replaced after operation, but it can be multi-operational (multi-element).

1.3 The acceptability of any special fuse covered by these requirements in any particular device or appliance depends upon its effectiveness in continued use under the conditions that prevail in actual service. Accordingly, for a particular application, the special fuse may be affected by the requirements for the device or appliance in question, and it may be necessary to employ protective devices having features other than, or in addition to, those specified in these requirements.

1.4 *Deleted*

2 Units of Measurement

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

3 References

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 General

4.1 A special fuse shall be complete, including means for connection.

4.2 A special fuse shall have an enclosure that shall be tight fitting so as to keep lint and dust from collecting around the fuse element and becoming ignited when the fuse clears.

4.3 The enclosure referred to in 4.2 may be a part of the fuse or a part of the appliance that individually encloses the fuse.

4.4 A current-carrying part shall have the necessary mechanical strength and current-carrying capacity, and shall be of a material, that is acceptable for the particular application.

5 Corrosion Protection

5.1 Iron and steel parts, except where such protection is detrimental, shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means.

5.2 The requirement of 5.1 applies to all enclosing cases, and to all springs and other parts upon which proper 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 the malfunction of such unprotected parts does not result in an inability of the component to operate as intended, but the protection of all such parts is recommended. Parts made of stainless steel (properly polished or treated if necessary) do not require additional protection against corrosion.

6 Insulating Material

6.1 A base for the support of current-carrying parts shall be of insulating material that is able to withstand the conditions of actual service. Strength, flammability, arc resistance, moisture resistance, and resistance to hot-wire ignition are among the characteristics that are to be considered. See Sections 9 and 18 – 21.

6.2 Insulating material, including barriers between parts of different potential and material that may be subject to the influence of the arc formed by the opening of the interruption mechanism, shall be acceptable for the particular application. Among the characteristics that are to be considered are performance in the overcurrent, limited short-circuit, flammability, arc-resistance, moisture-resistance, and resistance to hot-wire ignition tests described in Sections 9, 14, 15, and 18 – 21.

7 Mounting

7.1 A fuse and its mounting means shall not be adversely affected by strain, pressure, or torsion on terminals or leads. A bolt, screw, or other part used for mounting a fuse shall be independent of any part used for securing parts of the assembly so that replacement of the fuse does not require disassembly of the fuse or its mounting means.

7.2 A lead or terminal shall be capable of withstanding for 1 minute, without permanent damage to the fuse body, lead or terminal a 5 lbf (22.2 N) applied in any direction permitted by the construction.

7.3 Except for a fuse that is 1/4 inch (6.35 mm) or less in diameter (or diagonal), each terminal shall be capable of withstanding for 1 minute without permanent damage to the fuse body, lead or terminal a torque of 25 inch ounces (0.19 N·m) applied at a right angle to the direction of the terminal extension from the fuse. Each terminal of a fuse 1/4 inch (6.35 mm) in diameter (or diagonal) or less needs to withstand only 10 inch-ounces (0.08 N·m).

7.4 A plug-in fuse that requires full insertion in its holder to comply with the Limited Short-Circuit Test, Section 14 and the Overcurrent Test, Section 15 shall comply with both of the following:

a) A plug-in fuse shall be positive seating in its holder.

b) A plug-in fuse shall be securely held in the fully seated position by a detent, clip, or equivalent means.

7.5 It shall be obvious by sight, sound, or feel when the fuse mentioned in 7.4 is fully seated. See 24.1.

7.6 If alignment or positioning of a fuse with respect to its holder is necessary, the fuse and its holder shall be constructed to provide for such alignment or positioning.

8 Spacings

8.1 The minimum spacings between any uninsulated live part and an uninsulated live part of different potential or an uninsulated dead metal part that is not conductively connected to live parts shall not be less than that specified in Table 8.1. For 600-V rms potentials or less, a fiber barrier or liner used in place of required spacings shall not be less than 0.028 inch (0.71 mm) thick. For 600-V rms potentials or less, a

fiber barrier or liner used in place of one-half the required spacings shall not be less than 0.013 inch (0.33 mm) thick. Barriers or liners of materials other than fiber shall be considered with regard to their dielectric capability, mechanical strength, and other factors needed for the application.

Table 8.1
Minimum acceptable spacings in inches(mm)[a,b]

Potential involved in volts	Over surface	Through air
0 – 125 (rms)	1/16 (1.6)	1/16 (1.6)
126 – 250 (rms)	3/32 (2.4)	3/32 (2.4)
251 – 600 (rms)	3/16 (4.8)	5/32 (4.0)
850 – 2500 (peak)	5/16 (7.9)	3/16 (4.8)

[a] When protection against contamination (externally and internally generated) is provided, lesser spacings may be considered.

[b] This tabulation is based on sinusoidal waveforms. Special fuses intended for use in circuits with other waveforms shall be considered with regard to the intent of the requirements.

8.2 A required barrier shall be held in place by a means more secure than friction between surfaces.

8.3 Each uninsulated live part, including a terminal, shall be secured to its supporting surface by a method other than friction between surfaces so that it is kept from turning or shifting in position if such motion could result in a reduction of spacings to less than those required.

9 Flammability

9.1 Each material used in a special fuse shall be classified as V-0 as determined by the requirements for tests for flammability of plastic materials for parts in devices and appliances, UL 94.

PERFORMANCE

10 General

10.1 For all tests the special fuse is to be mounted in the position that has the greatest adverse effect on the performance. If intended to be used in a holder, it is to be inserted in the holder for all tests in which it is to be electrically connected.

10.2 All ratings are to be tested with a full complement of representative devices for each. All tests are to be conducted in a 25.0 ±3.0°C (77.0 ±5.4°F) ambient. All deviations referred to are absolute values.

10.3 These tests may be performed at other conditions than those specified in 10.1 and 10.2 if the conditions:

a) Will not significantly affect the test results and

b) Are agreeable to those concerned.

11 Carrying Capacity Test

11.1 A special fuse shall carry rated current until thermal equilibrium is reached, without clearing the circuit.

11.2 To determine whether a special fuse complies with 11.1, six representative fuses are to be individually connected in series with a variable load resistor to a supply source of rated voltage.

11.3 The test specified in 11.2 is to be conducted both before and after the accelerated aging test specified in 13.2 – 13.4. The same or different representative devices may be used for each test.

12 Clearing-Time Calibration Test

12.1 The clearing time of a special fuse shall be consistent as determined by the test in this Section.

12.2 To determine whether a special fuse complies with 12.1, a clearing time versus current curve is to be drawn using random current values. Seven representative fuses are to be tested at each current value, and the average of the clearing times utilized for the determination of the curve. Clearing times at a minimum of eight current values are to be evaluated. The curve is to be drawn as a reasonably symmetrical approximation of a hyperbola, the clearing time and current scales being chosen to affect this. The curve asymptote and transverse axis of the curve are then to be drawn, and the intersection of the curve and the transverse axis located. The difference in current values between that at the transverse axis hyperbola intersection and the asymptote is then to be determined. Thirty percent of this value is then to be taken and located on the current scale symmetrically about the transverse axis-hyperbola intersection current value. This current range on the curve is then defined as the in-range values. If fewer than six clearing time-current values are located within the in-range band, additional current values are to be chosen and special fuses calibrated at current values in-range to obtain tests on representative devices at six current values. For each current value determined to be in-range, the average of the deviations in clearing time from the mean clearing time is not to exceed 10 percent of the mean clearing time.

12.3 Current values 1.2 and 1.4 times the current value to which the clearing time versus current curve is asymptotic are to be determined. Seven representative devices of each special fuse are to be subjected to clearing time calibration tests at these values. For each of these current values, the average of the deviations in the clearing time from the mean clearing time is not to exceed 10 percent of the mean clearing time.

12.4 A resistance load and a source of maximum rated voltage are to be utilized for the tests of 12.2 and 12.3.

13 Clearing-Time Recalibration Test

13.1 A special fuse shall carry rated current until thermal equilibrium is reached without clearing the circuit, and maintain its calibration after being subjected to accelerated aging and elevated humidity as indicated in this Section.

13.2 Representative devices of each fuse (that is, each rating) are to be placed in a circulating-air oven maintained at a temperature 50°C (90°F) above the maximum acceptable operating temperature of the special fuse for 28 days.

13.3 Additional representative devices of each fuse (that is, each rating) are to be placed in a 90 – 95 percent relative humidity, 40.0 ±2.0°C (104.0 ±3.6°F) environment for 28 days.

13.4 If deemed more severe, the representative fuses are to be cycled between the high-humidity environment and the elevated temperature. The total combination time is to be 28 days.

13.5 Aged representative fuses are to be tested at the current values and by the methods specified in 12.2 – 12.4. Using 10 representative fuses at each current value originally utilized, each clearing time is to be within 50 – 150 percent of the mean of the original (that is, unaged representative fuses) clearing times. For the aged representative fuse for each current value, the average of the deviations in the clearing time from the mean clearing time is not to exceed 10 percent of the mean clearing time, and the mean clearing time is not to exceed 110 percent of the mean clearing time obtained from unaged representative fuses