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UL Standard for Safety
for

Class K Fuses, UL 198D

Fifth Edition, Dated April 10, 1995

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UL 198D

Standard for

Class K Fuses

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Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated April 10, 1995. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the ANSI approved text.

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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 published set of revision pages.

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements cover Class K fuses rated 250 or 600 V ac, 600 A or less for use in accordance with the National Electrical Code, NFPA 70.

1.2 Class K fuses are of the nonrenewable cartridge type and may have an interrupting rating of 50,000, 100,000, or 200,000 rms symmetrical A, with I_p (peak let-through current) and total I^2t (clearing amperes-squared-seconds) specified for the individual subclasses.

1.3 Class K fuses are divided into three subclasses, depending upon I_p and I^2t characteristics. These subclasses are identified by the designations K1, K5, or K9.

1.4 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involve a risk of fire, electric shock, or injury to persons, shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the acceptable 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 cannot be judged to comply with this standard. Where considered appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

2 Glossary

2.1 **CASE SIZE** — Fuses of all ratings for which the size of the cartridge is the same — for example fuses rated in the range of 31 — 60 A are 60 A case size and fuses rated in the range of 61 — 100 A are 100 A case size.

2.2 **CLEARING TIME** — The time elapsing from the beginning of an overcurrent condition to the final circuit interruption. The clearing time is equal to the sum of the melting time and the arcing time.

2.3 **CURRENT-LIMITING FUSE** — A fuse that:

- a) interrupts all available currents within its interrupting rating,
- b) limits the clearing time at rated voltage to an interval equal to or less than the first major or symmetrical current-loop duration when tested within its current-limiting range, and
- c) limits I_p to a value less than the peak current that would be possible with the fuse replaced by a solid conductor of the same impedance. (Class K fuses are not permitted to be designated as current-limiting since the current-limiting range is not determined, although current limitation does occur in order to meet maximum values of I_p).

2.4 **CURRENT-LIMITING RANGE** — That range of rms symmetrical available current, equal to and less than the interrupting rating, in which the total clearing time at rated voltage and frequency is less than 1/2 cycle.

2.5 INTERRUPTING RATING — The rating specifying the highest rms symmetrical alternating current that the fuse is required to interrupt under the conditions of these requirements.

2.6 I_p (PEAK LET-THROUGH CURRENT) — The maximum instantaneous current through the fuse during the total clearing time.

2.7 I^2t (AMPERES-SQUARED-SECONDS) — An expression of the energy available as a result of current flow. The term is usually applied during the melting, arcing, or total clearing time of the fuse; in the latter instance it is often designated as Clearing I^2t .

2.8 MAXIMUM ENERGY — The test condition under which, in a specified maximum time (1/2 cycle), the maximum amount of heat possible is generated in the fuse before clearing.

2.9 MELTING TIME — The time between the initiation of a current large enough to cause the current-responsive element to melt and the instant when arcing starts.

2.10 NORMAL-FREQUENCY RECOVERY VOLTAGE — The normal-frequency rms voltage impressed upon the fuse after the circuit has been interrupted and after high-frequency transients have subsided.

2.11 RATING TESTS — Current-carrying-capacity, temperature, and clearing time-current tests.

2.12 RECOVERY VOLTAGE — The voltage impressed upon the fuse after a circuit has been interrupted.

2.13 THRESHOLD CURRENT — The rms symmetrical available current at the threshold of the current-limiting range, where melting of the current-responsive element has occurred at approximately 90 degrees on the symmetrical current wave and total clearing time is less than 1/2 cycle under specific conditions.

2.14 THRESHOLD RATIO — The ratio obtained by dividing the threshold current by the current rating of the fuse.

2.15 TIME DELAY FUSE — A fuse which does not interrupt the circuit before a minimum specified time when carrying 500 percent of its rated current in the Clearing-Time Current Test, Section 9. See Table 9.1.

3 Units of Measurement

3.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

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.

CONSTRUCTION

5 General

- 5.1 Iron or steel, plated or unplated, shall not be used for parts that are depended upon to carry current.
- 5.2 A ferrule shall be of brass or copper and shall be circular in cross section, as shown in Figure 5.1.
- 5.3 The ferrules of a fuse shall be aligned so the fuse passes through a cylindrical gauging tube having a length not less than that of the fuse and an inside diameter as indicated in Table 5.1.

Table 5.1
Diameters of gauging tubes

Case size, A	Inside diameter of gauging tube, inches (mm)	
	250 V fuses	600 V fuses
30	0.580 (14.73)	0.830 (21.08)
60	0.830 (21.08)	1.080 (27.43)

- 5.4 The blades of a fuse shall be of copper or brass and shall be in substantial alignment.
- 5.5 Alignment of the blades shall be provided and maintained by means other than friction between surfaces.

Exception: A press-fitted assembly of materials not subject to shrinkage or warping due to heat or moisture is considered acceptable for maintaining blade alignment provided the construction complies with the requirements in the Blade Alignment Test, Section 12.

5.6 A cap shall be of metal of a thickness that provides acceptable physical strength and, if depended upon to carry current, shall be of brass or copper. Caps, assembly rings, washers, and the like, of iron or steel shall be protected against corrosion.

5.7 A connection between the fusible element and a contact of a fuse shall provide positive and permanent electrical connection. The connection shall be soldered, brazed, or welded, or shall otherwise be made equivalently secure.

5.8 The tube of a fuse shall be of ceramic, melamine-impregnated glass fiber, or the equivalent.

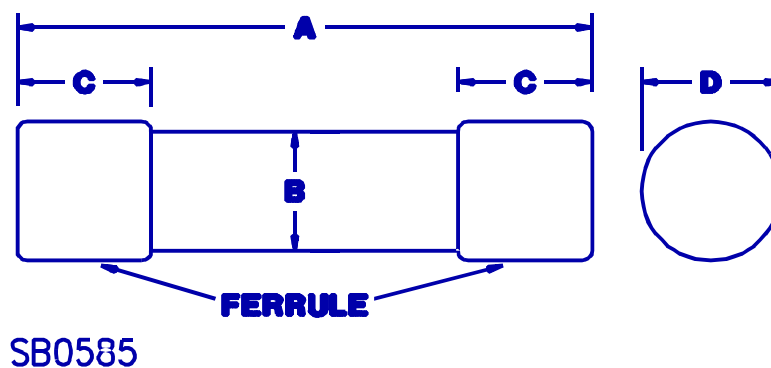
Exception: A tube of a fuse may be hard fiber or other material that has been shown by investigation to be acceptable for the application. See 11.6.3.

5.9 An adhesive employed in a fuse shall be acceptable for the application and shall function as intended. See 6.5 — 6.7.

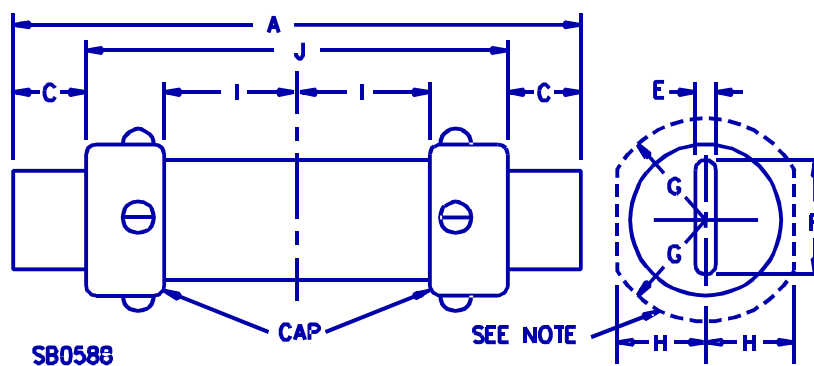
5.10 The dimensions of a Class K fuse shall be in accordance with Figure 5.1 and Table 5.2.

Figure 5.1
Class K cartridge fuses

Ferrule-type fuses
0 — 60 A



Knife-blade type fuses
61 — 600 A



Note — The dash line represents the limit of the maximum projection of a screw, rivet head, or the like. It becomes a circle for a fuse rated more than 200 A.

Table 5.2
Dimensions of Class K cartridge fuses in inches (mm)

Case size, A	Overall length of fuse ^a	Maximum outside diameter of tube	Minimum length of ferrule or blade	Outside diameter of ferrule ^b	Thick-ness of blade ^c	Width of blade ^d	Maximum dimensions over projections ^e		Minimum distance from mid-point of fuse to nearest live part	Minimum overall length of cylindrical body ^f
							Measured parallel to blade	Measured at right angles to blade		
A	A	B	C	D	E	F	G	H	I	J
Fuses rated 250V										
30	2.00 (50.8)	0.53 (13.5)	0.50 (12.7)	0.562 (14.27)						
60	3.00 (76.2)	0.78 (19.8)	0.625 (15.9)	0.812 (20.62)						
100	5.87 (149.2)		1.00 (25.4)		0.125 (3.18)	0.750 (19.05)	0.66 (16.7)	0.59 (15.1)	1.03 (26.2)	
200	7.12 (181.0)		1.37 (34.9)		0.188 (4.78)	1.125 (28.58)	0.94 (23.8)	0.84 (21.4)	1.19 (30.2)	4.12 (104.8)
400	8.62 (291.1)		1.87 (47.6)		0.250 (6.35)	1.625 (41.28)	1.20 (30.6)	1.20 (30.6)	1.19 (30.2)	4.62 (117.5)
600	10.37 (263.5)		2.25 (57.1)		0.250 (6.35)	2.000 (50.80)	1.45 (36.9)	1.45 (36.9)	1.53 (38.9)	5.19 (131.8)
Fuses rated 600V										
30	5.00 (127.0)	0.78 (19.8)	0.50 (12.7)	0.812 (20.62)						
60	5.50 (139.7)	1.03 (26.2)	0.62 (15.9)	1.062 (26.97)						
100	7.87 (200.0)		1.00 (25.4)		0.125 (3.18)	0.750 (19.05)	0.78 (19.8)	0.72 (18.3)	1.75 (44.4)	
200	9.62 (244.5)		1.37 (34.9)		0.188 (4.78)	1.125 (28.58)	1.06 (27.0)	0.98 (25.0)	2.25 (57.1)	6.12 (155.6)
400	11.62 (295.3)		1.87 (47.6)		0.250 (6.35)	1.625 (41.28)	1.45 (36.9)	1.45 (36.9)	2.50 (63.5)	7.12 (181.0)
600	13.37 (339.7)		2.25 (57.1)		0.250 (6.35)	2.000 (50.80)	1.72 (43.7)	1.72 (43.7)	2.69 (68.3)	8.19 (208.0)

^a Tolerances: 0 — 60 A, ± 0.03 inch (± 0.8 mm); 61 — 200 A, ± 0.06 inch (± 1.6 mm); 201 — 600 A, ± 0.09 inch (± 2.4 mm).

^b Tolerance: ± 0.008 inch (± 0.20 mm).

^c Tolerance: ± 0.003 inch (± 0.08 mm).

^d Tolerance: ± 0.035 inch (± 0.89 mm).

^e The maximum overall dimension of a screw ring, the position of which with respect to the position of the knife blade cannot be predetermined, shall not be greater than the value specified for dimension H.

^f The length of the cylindrical body may be less than the indicated value if other acceptable interference means such as pins through the blades or collars, are provided to prevent mounting the fuse in a fuseholder that will accommodate a fuse rated in the next lower bracket of current ratings.