



AEROSPACE STANDARD

AS5372™**REV. A**

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Superseding AS5372

(R) Fuse, Current Limiter Type, Aircraft

RATIONALE

This revision is required to correct the overload damage test requirement in 4.7.10, to delete the packaging requirements of Section 5 (MIL-P-17555 has been cancelled without replacement), to update all references, and to update the document format to the most current SAE guidelines.

AS5372A has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

1.1 Scope

This specification covers the requirements for current limiter type fuses for use in aircraft primary electrical power systems conforming to MIL-STD-704. These limiters are suitable for use in AS53731 fuse holders for operation at -54 to 125 °C.

1.2 Classification

Limiters shall be as described on the applicable specification or specification detail sheet (see 6.2).

1.2.1 Style

A style of limiter shall consist of all part numbers in the same current range (0-30A and 35-60A) covered by one specification sheet. For example: all part numbers 0-30A of AS28937 shall be the same style (see 6.5 for part number example).

1.2.2 Ampere Rating

The ampere rating designator shall be a number specified on each military standard or specification sheet to indicate the ampere rating.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AS7928	Terminals, Lug: Splices, Conductor: Crimp Style, Copper, General Specification For
AS20659	Terminal, Lug, Crimp Style, Copper, Uninsulated, Ring Tongue, Type I, Class 1, For 175 °C Total Conductor Temperature
AS28937	Fuse, Limiter Type, Enclosed Link, 5-60 Amp, Aircraft
AS28938	Fuse, Limiter Type, Enclosed Link, Intermediate Rating, Aircraft
AS50861	Wire, Electric, Polyvinyl Chloride Insulated, Copper or Copper Alloy
AS53731	Fuse Holder, Block Type, Aircraft

2.2 U. S. Government Publications

Copies of these documents are available online at <http://quicksearch.dla.mil>.

MIL-STD-202	Test Methods for Electronic And Electrical Component Parts
MIL-STD-704	Aircraft Electric Power Characteristics
MIL-STD-889	Dissimilar Metals
MIL-STD-1285	Marking of Electrical and Electronic Parts

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, Tel: 212-642-4900, www.ansi.org.

ANSI/NCSL-Z540-1 or ISO-10012-1	Calibration System Requirements
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2.4 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM-D5948	Molding Compounds, Thermosetting
ASTM D635-88	Plastics, Self-supporting, In a Horizontal Position, Rate of Burning and/or Extent of Time of Burning of

2.5 Order of Precedence

In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets or military standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.6 Definitions

The following definitions apply to terminology used in this specification.

2.6.1 ARCING TIME

Arcing time is the time measured from that point when element melt time ends to that point when current is interrupted and permanently becomes a zero. If a mechanical indicator is utilized which incorporates a secondary element parallel to the fusible element, arcing time will commence from the point at which indicator melt time ends.

2.6.2 CURRENT DROOP

Current droop is the percentage decrease of the fusing current from the moment fusing current is initiated to the point where indicator melt time or arcing time begins. Current droop is usually caused by increase in limiter element resistance due to increased temperature caused by flow of current. Current droop can be encountered if care is not exercised in the selection of interconnecting wire, resistive loads, and battery source (see Figure 3).

$$\text{Current droop} = \frac{\text{initial current} - \text{final current}}{\text{initial current}} \times 100 \quad (\text{Eq. 1})$$

2.6.3 ELEMENT MELT TIME

Element melt time is the time elapsed from the moment a fusing current begins to flow to the moment the current sharply drops in value and indicator melt time or arcing commences.

2.6.4 CURRENT LIMITER

A current limiter is an aircraft fuse designed specially with a high temperature melting point to provide protection for electrical power distribution systems against fault current.

2.6.5 LIMITER CURRENT RATING

Limiter current rating is a value of current assigned to a limiter that is below the minimum fusing current and can be carried continuously under all environmental conditions encountered by the limiter without deterioration of the element, the body, or the terminals.

2.6.6 LIMITER ELEMENT

That part of a limiter designed to melt by an excessive flow of current and thus interrupt a faulty condition.

2.6.7 LIMITER VOLTAGE RATING

Limiter voltage rating is that value assigned to a limiter denoting the maximum open-circuit voltage it can safely interrupt under specified test conditions.

2.6.8 LIMITER HOLDER

A limiter holder is a mounting device with contacts and terminals for the purpose of accepting limiters for easy connection within a circuit.

2.6.9 FUSING CURRENT

A fusing current is a current of such a magnitude that, under specified environmental conditions, the limiter element will melt.

2.6.10 MINIMUM FUSING CURRENT

The smallest value of current that will melt the limiter element at a specified ambient temperature.

2.6.11 PROSPECTIVE CURRENT

The value of short-circuit current (rms or DC) that would flow in a circuit if the limiter element were replaced by an element of negligible impedance.

2.6.12 INTERRUPT CAPACITY

The largest prospective current the fuse can safely interrupt under specified conditions of voltage and of power factor or time constant.

2.6.13 SELF-INDICATING CURRENT LIMITER

The type of limiter that incorporates a device to visually denote severance of the fusible element as an integral part of the limiter. Those limiters that visually display the fusible element or incorporate a mechanical indicating device are classified as self-indicating current limiters.

2.6.14 TOTAL CLEARING TIME

Total clearing time is the total time obtained by adding element melt time, indicator melt time, and arcing time (see Figure 2).

3. REQUIREMENTS

3.1 Specification Sheet or Military Standard

The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification

The current limiters furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable Qualified Products Database (QPD) at the time of award of contract (see 4.5 and 6.3).

3.3 Materials

Materials shall be as specified herein. However, when a definite material is not specified, a suitable material shall be used that will enable the current limiters to meet the performance requirements of this specification. Recovered material shall be used to the maximum extent possible.

3.3.1 Fungus

Materials shall be used which are not nutrients for fungus.

3.3.2 Metal

All metals used in the construction of current limiters shall be corrosion resistant or shall be suitably protected to resist corrosion. The use of dissimilar metals, especially contacts between brass, copper, or steel and aluminum or magnesium alloys, shall be avoided. Where contact between dissimilar metals is unavoidable, the metals shall be protected against electrolytic corrosion. Dissimilar metals are defined in MIL-STD-889.

3.3.3 Plastics

Plastic materials used in the limiters shall be in accordance with MIL-M-14, type MSI-30 (silicone) or Type GII-30F (diallyl isophthalate) as specified on the individual specification sheet or military standard. When other plastic materials are used, the manufacturer shall submit satisfactory evidence to the activity responsible for qualification that the materials are suitable for the purpose intended. The plastic materials used shall neither support combustion nor release noxious gases when subject to arcs, such as those arcs caused by interrupting heavy short circuit currents, or explosions of gaseous vapors to which the materials may be subjected in service. Plastic materials with cellulose fillers will not be permitted in parts that may be subjected to arcing or surface creepage. Plastic materials used shall be certified to exhibit a minimum ignition time of 90 seconds and a maximum extinguishing time of 90 seconds when tested for flammability in accordance with ASTM D635-88.

3.3.3.1 Color

The color of external plastic parts shall be as specified on the applicable specification sheet. After exposure to the temperature conditions specified in 4.7.3, there shall be no degradation of these requirements.

3.3.4 Protective Coating

Protective coating shall not be used.

3.4 Design and Construction

The current limiter shall conform to the requirements specified herein and in the applicable military standard or specification sheet.

3.4.1 Visual Indication

An open limiter shall be self-indicating and so designed that visual indication of an open condition will not require removal from the limiter holder. The design shall be such that an energized electrical circuit will not be necessary to visually indicate an open-circuit limiter after a fault has occurred.

3.4.2 Insertion and Removal

The design shall be such that the limiter can be inserted into or removed from the limiter holder without requiring use of a tool. The contour of the molding shall provide finger grips or other means to facilitate removal by hand.

3.4.3 Fuse holders

The limiter shall be designed for use with fuse holders in accordance with AS53731.

3.4.4 Mounting Position

Limiter performance shall not be affected by its mounting position.

3.4.5 Terminals

Limiter terminals shall be as specified on AS20659.

3.4.6 Current Rating

The rating of the limiter shall be as specified on the applicable specification sheet.

3.4.7 Dimensions

The dimensions of the limiter shall be as specified on the applicable specification sheet.

3.4.8 Weight

The weight of the limiter shall be as specified on the applicable specification sheet.

3.5 Performance

Limiters shall pass the performance requirements of this specification and the applicable specification sheet when tested as specified in Section 4.

3.5.1 Time-Current Characteristics

Time-current characteristics shall be as specified on the applicable specification sheet.

3.5.2 Initial Loading

Loads up to 100% of rating may not reduce the current required to melt the limiter by more than 10% in any specified time (see 4.7.11).

3.5.3 Ambient Temperature Influence

The time-current characteristics of the limiter shall be within the tolerance limits specified on the applicable specification sheet (see 4.7.3) for the temperatures specified.

3.5.4 Overloading

The characteristics specified herein shall not be altered by overloading the limiter up to 70% of the current required to melt the limiter in a specified time, as shown on the applicable specification sheet (see 4.7.10).

3.5.5 Terminal Voltage Drop

The voltage drop across the limiter terminals, while the limiter is carrying rated current, shall not exceed the following (see 4.7.20):

Table 1

Ampere Rating	Terminal Voltage Drop
1	1.2
2, 3, and 5	0.25
10 through 60	0.1

3.5.6 Alternating Current Interruption Capacity

When specified, the current limiter shall be capable of interrupting prospective line-to-neutral faults on a 115/200 V, three phase, 400 Hz system that is capable of producing a line-to-neutral fault current of 6000 A during the first cycle of fault current; for a sustained fault, the current may be allowed to decrease at a gradual rate to 3600 A within 0.05 second after fault initiation. Two limiters, connected in series, shall be capable of interrupting line-to-line faults on a system conforming to MIL-STD-704 and capable of producing a line-to-line fault current of 4200 A during the first cycle of fault current and, for a sustained fault, the current may be allowed to decrease in a gradual rate of 2500 A within 0.05 second after fault initiation (see 4.7.14).

3.5.7 Direct Current Interruption Capacity

When specified, the limiter shall be capable of interrupting prospective fault currents of 6000 A, with this value achieved in 0.01 to 0.03 second after fault initiation. The system voltage shall not be less than 28 V before the fault. The transient recovery voltage at the terminals of the limiter holder shall not be less than 28 V within 0.002 second after the interruption and shall maintain 28 V at maximum value with the steady-state, open-circuit voltage reaching no less than 28 V after the fault.

3.5.8 Temperature Rise

The temperature rise shall not exceed 90 °C (194 °F) when subjected to the test of 4.7.21.

3.5.9 Continuity

When tested as specified in 4.7.23, fuses shall have electrical continuity.

3.5.10 Environment

The limiter shall perform satisfactorily when subjected to any natural combination of the following environmental conditions. There shall be no breakage, malfunction, or evidence of damage that would prevent additional testing.

3.5.10.1 Temperature

Temperatures shall be from -54 to +125 °C (see 4.7.2 through 4.7.5)

3.5.10.2 Altitude

Pressure altitude shall be from sea level to 60 000 feet (see 4.7.14).

3.5.10.3 Moisture Resistance

Moisture resistance shall be as specified in 4.7.4.

3.5.10.4 Salt Spray

There shall be no peeling, chipping, or blistering of metal or plastic surfaces, or exposure of base metal when the limiter is subjected to the test of 4.7.7.

3.5.10.5 Sand and Dust

There shall be no peeling, chipping, or blistering of metal or plastic surfaces, or exposure of base metal. The indicator shall operate on the subsequent time current test when the limiter is subjected to the test of 4.7.17.

3.5.10.6 Vibration

When the limiter is tested in accordance with 4.7.12, there shall be no physical or electrical damage to the limiter and each limiter shall meet the room ambient time-current requirements of the applicable military standard at 500% of rated current.

3.5.10.7 Mechanical Shock

Mechanical shock shall be as specified in 4.7.19. Following this test, the limiter shall withstand the time-current test of 4.7.13 for 500% of the rated current.

3.5.10.8 Indicator Pin

The indicator pin shall be extended as the result of the current limiter opening during any overcurrent test requiring the fuse element to open.

3.5.10.9 Acceleration

The limiter shall be subjected to and pass the acceleration test as specified in 4.7.18.

3.5.10.10 Explosion Proof

The limiter shall be subjected to and pass the explosion test conditions specified in 4.7.16.

3.5.11 Terminal strength

There shall be no physical damage to the limiter after the forces specified in 4.7.9 are applied.

3.5.12 Thermal Shock

The limiter shall withstand the thermal shock test of 4.7.5 with no evidence of limiter cracks, delamination of finishes, obscuring of identification markings, severance of the fuse element, loosening of parts, or false indication. Following this test, the limiter shall withstand the time-current test of 4.7.13 for 500% of the rated current.

3.5.13 Random Drop

There shall be no physical damage and the limiter shall remain in proper position with respect to the fuse holder clips when subjected to the random drop test of 4.7.8.

3.5.14 Life Test

There shall be no physical damage to the limiter when subjected to the life test specified in 4.7.2.

3.5.15 Rated Current

When tested as specified in 4.7.22 there shall be no evidence of mechanical damage or failure. The temperature of the terminals shall not rise more than 90 °C (194 °F) above ambient temperature.

3.6 Identification of Product

All current limiters shall be permanently and legibly marked as shown on the applicable military standard or specification sheet. The markings shall remain legible during and after all of the tests specified in this specification. The marking for identification shall be in accordance with MIL-STD-1285 as follows:

Part number (see 6.5)

Current rating

Manufacturer's name or trademark

3.7 Position

Current limiters shall operate satisfactorily in any position.

3.8 Workmanship

Limiters shall be in accordance with the requirements of this specification and shall be free from defects which will affect life, serviceability, or appearance. All corners shall be broken and smooth. Surfaces shall be free from burrs and cracks.

3.8.1 Cleaning

The limiter shall be thoroughly cleaned of metal chips and other foreign material, before and after final assembly.