

INCH-POUND

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SUPERSEDING  
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MILITARY SPECIFICATION  
FLASHER, SOLID STATE, AIRCRAFT NAVIGATIONAL LIGHT,  
GENERAL SPECIFICATION FOR

Inactive for new design after 28 June 1996.  
No superseding specification.

This specification is approved for use by all Departments  
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for solid state aircraft flashers which are used for cycling aircraft position lights on and off. Flashers will have the load current controlled by a transistor, controlled rectifier, magnetic amplifier or equivalent device. Flashers have either single or dual output circuits.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-PRF-5606	-	Hydraulic Fluid, Petroleum Base; Aircraft, Missile and Ordnance.
MIL-DTL-5624	-	Turbine Fuel, Aviation, Grades JP-4, JP-5, and JP-5/JP-8 ST.
MIL-A-8625	-	Anodic Coatings for Aluminum and Aluminum Alloys.
MS24577	-	Flasher, Solid State, Aircraft Navigation Light.
MS25205	-	Flasher, Solid State, Aircraft Light.
MS27710	-	Flasher, Solid State, Aircraft Navigation Light, 28 V dc.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, Post Office Box 3990, Columbus, OH 43216-5000, or emailed to [Relay@dsccl.dla.mil](mailto:Relay@dsccl.dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at [www.dodssp.daps.mil](http://www.dodssp.daps.mil).

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STANDARDS

FEDERAL

FED-STD-H28 - Screw-Thread Standards for Federal Services.

DEPARTMENT OF DEFENSE

MIL-STD-129 - Military Marking for Shipment and Storage.  
MIL-STD-461 - Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment.  
MIL-STD-704 - Aircraft Electric Power Characteristics.  
MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests.  
MIL-STD-1285 - Marking of Electrical and Electronic Parts.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094).

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

NCSL-Z540.1 - Calibration Laboratories and Measuring and Test Equipment - General Requirements.

(Application for copies should be addressed to NCSL International, 1800 30th Street, Suite 305, Boulder, Colorado 80301-1026).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.  
ASTM D910 - Gasolines, Aviation.  
ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

(Application for copies should be addressed to ASTM International, PO Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

INTERNATIONAL ORGANIZATION FOR STANDARDS (ISO)

ISO 10012-1 - Quality Assurance Requirements for Measuring Equipment - Part 1: Metrological Confirmation System for Measuring Equipment.

(Application for copies should be addressed to American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036.)

2.4 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, specifications sheets, or MS 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.

### 3. REQUIREMENTS

3.1 Specification sheets. 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 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.2.

3.3 Materials. Materials shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the flashers to meet the performance requirements of this specification. Materials used shall be self-extinguishing and shall not support combustion, emit noxious gases in harmful quantities, emit gases in quantities sufficient to cause explosion of sealed enclosures, or form current-carrying tracks when subjected to any of the tests specified herein. Unless otherwise specified (see 3.1), the selection of material shall be such as to provide a shelf life of at least 2 years without affecting the operation of the flasher. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.3.1 Metals. Metals shall be of a corrosion-resistant type or shall be plated or treated to resist corrosion.

3.3.1.1 Dissimilar metals. When dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. The use of dissimilar metals in contact, which tends toward active electrolytic corrosion (particularly brass, copper, or steel used in contact with aluminum or aluminum alloy), is not acceptable. However, metal spraying or metal plating of dissimilar or aluminum base metals to provide suitable abutting surfaces is permitted. Dissimilar metals should be as defined in 6.4. In hermetic seals, the 0.25 volt difference between the header material and the housing material is not applicable.

3.3.1.2 Aluminum alloy parts. Aluminum alloy parts, where practicable, shall be anodically treated in accordance with MIL-A-8625. The aluminum oxide film deposited by this treatment shall be removed from actual contact areas of all surfaces required to act as paths for electrical power and from local areas under screws, nuts, etc., used for assembly or mounting purposes to provide an adequate bonding connection.

3.3.2 Fungus resistance. Materials used in construction of flashers shall be fungus inert in accordance with ASTM G 21.

3.3.3 Plating. Metals shall be of a corrosion-resistant type, or shall be plated or treated to resist corrosion. Cadmium plating shall not be used for plating any part of the flasher. Zinc and unfused tin plating shall not be used for plating internal parts of the flasher. Zinc plating shall be in accordance with ASTM B633.

3.4 Design and construction. Flashers shall be of the design, construction, weight, and physical dimensions specified (see 3.1). Flashers shall be designed to operate properly when mounted in any position. Construction shall be such as to take full advantage of the design for minimum size and weight, long life, maximum reliability, and minimum radio noise.

3.4.1 Envelope. When specified (see 3.1), flashers shall be provided with a means to permit assured contact to case ground through a secure low resistance connection. The enclosure shall not be electrically connected to any terminal unless specified.

3.4.2 Paralleled semiconductors. Flashers shall not utilize paralleled semiconductors for carrying rated lamp load.

3.4.3 Dimensions. The overall dimensions of the flasher shall be as specified (see 3.1).

3.4.4 Weight. The weight of the flasher shall be the minimum practicable and shall not exceed the specified maximum weight (see 3.1).

3.4.5 Mounting means. The mounting means shall be as specified (see 3.1).

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3.4.6 Threaded parts. All threaded parts shall be in accordance with FED-STD-H28. Where practical, all threads shall be in conformity with the coarse-thread series. The fine-thread series may be used only for applications that show a definite advantage through their use. Where a special diameter-pitch combination is required, the thread shall be of American National Form and of any pitch between 16 and 36, which is used in the fine thread series. Terminal threads shall be class 2A and 2B for external and internal threads, respectively.

3.4.7 Functional diagram. A connection diagram of the external wiring of the flasher shall be provided. The diagram shall identify each terminal, shall be permanently attached to the flasher, and shall remain legible and securely attached to the flasher during all tests required by this specification.

3.4.8 Fail safe. Flashers shall be designed so that with rated voltage applied to the input terminals, only internal failure of the flasher timing circuitry will result in continuous rated power output from the output terminals.

3.4.9 Encapsulation. Unless otherwise specified (see 3.1), flashers shall be encapsulated.

3.5 Electrical requirements.

3.5.1 Input power. The flashers shall meet all applicable requirements of this specification when operating from power sources as defined in MIL-STD-704, category B. Voltage transients having magnitudes and time durations as defined therein shall not damage the flashers.

3.5.2 Input voltage. The rated input voltage of each type of flasher shall be as indicated (see 3.1). When the rated input voltage is given as 28 volts ac or dc, the limiting input voltage for performance requirements shall be 26.3 to 29 volts. When the rated input voltage is given as 115 volts, 400 hertz (Hz), the limiting input voltage and frequency for performance requirements shall be 107.5 to 119.5 volts, rms, and 380 to 420 Hz, respectively.

3.5.3 Load requirement. Unless otherwise specified (see 3.1), flashers shall be capable of operating the applicable incandescent lamp load specified in table I. Unless otherwise specified, lamp ratings are considered steady state current values.

TABLE I. Lamp rating.

Source voltage	Load range (amperes)
28 V dc	1.0 to 7.5
28 V 400 Hz ac	1.0 to 5.0
115 V 400 Hz ac	0.25 to 4.0
28 V ac or dc	1.0 to 15.0

3.5.4 Flash characteristics.

3.5.4.1 Flash rate. The flash rate shall be as specified in 3.5.4.1.1 and 3.5.4.1.2, as applicable.

3.5.4.1.1 Single output circuits. When flashers are tested as specified in 4.4.2.1.1, the flash rate shall be as specified (see 3.1).

3.5.4.1.2 Dual output circuits. When flashers are tested as specified in 4.4.2.1.2, the flash rate shall be as specified (see 3.1).

3.5.4.2 Flash cycle (on-to-off ratio). The "on" time of the flash cycle shall be considered that portion of the cycle during which the voltage supplied to the lamp load is 90 percent or more of the rated voltage. The "off" time shall be considered that portion when the voltage supplied to the load is less than 10 percent of rated voltage. The flash cycle shall be as specified in 3.5.4.2.1 and 3.5.4.2.2, as applicable.

3.5.4.2.1 Single output circuits. When flashers are tested as specified in 4.4.2.2.1, the "on" time shall be 70 ±10 percent of the total cycle.

3.5.4.2.2 Dual output circuits. When flashers are tested as specified in 4.4.2.2.2., the "on" time of one circuit shall equal the "off" time of the other and vice versa within  $\pm 5$  percent.

3.5.4.3 Switching time. When flashers are tested as specified in 4.4.2.3, the switching time shall be as specified in 3.5.4.3.1 and 3.5.4.3.2, as applicable.

3.5.4.3.1 DC flashers. The elapsed time for switching the "off" to "on" or "on" to "off" condition shall be not greater than 0.03 second for dc flashers.

3.5.4.3.2 AC flashers. Zero crossover switching shall be used for initiation and termination of the "on" time of each cycle. Initiation of the "on" time shall coincide with zero voltage crossover and termination of "on" time shall coincide with zero current crossover within 20 degrees, respectively.

3.6 Voltage drop. Flashers shall be tested as specified in 4.4.3 and unless otherwise specified (see 3.1), the voltage drop within the flasher shall not exceed 4.0 percent of the input voltage for any value of load within the specified limits.

3.7 High and low temperature soak and operation. When tested as specified in 4.4.4, flashers shall operate satisfactorily when tested under the following conditions.

3.7.1 High temperature. At 71°C (unless otherwise specified) (see 3.1), following the soak period specified in 4.4.4.1, flashers shall meet the requirements of 3.5.4.1, 3.5.4.2, 3.5.4.3, and 3.6, as applicable.

3.7.2 Low temperature. At -62°C and -54°C, following the soak period specified in 4.4.4.2, flashers shall meet the requirements of 3.5.4.1, 3.5.4.2, 3.5.4.3, and 3.6, as applicable. There shall be no distortions, cracking, differential expansion or pliability of nonmetallic parts.

3.8 Vibration. After flashers are tested as specified in 4.4.5, they shall meet the requirements of 3.5.4.1, 3.5.4.2, 3.5.4.3, and 3.6, as applicable.

3.9 Immersion. When flashers are tested as specified in 4.4.6, there shall be no damage that would affect subsequent operation.

3.10 Shock. After flashers are tested as specified in 4.4.7, they shall meet the requirements of 3.5.4.1 and 3.5.4.2, as applicable.

3.11 Altitude. When flashers are tested as specified in 4.4.8, there shall be no damage that would affect subsequent operation.

3.12 Humidity. After flashers are tested as specified in 4.4.9, they shall meet the requirements of 3.5.4.1 and 3.5.4.2, as applicable.

3.13 Salt fog. When flashers are tested as specified in 4.4.10, they shall meet the requirements of 3.5.4.1, 3.5.4.2, and 3.5.4.3, as applicable.

3.14 Sand and dust (when specified) (see 3.1). When flashers are tested as specified in 4.4.11, they shall meet the requirements of 3.5.4.1, 3.5.4.2, and 3.5.4.3, as applicable.

3.15 Electromagnetic interference. When flashers are tested as specified in 4.4.12, they shall meet the requirements of MIL-STD-461, equipment class A-1. Following the test, flashers shall meet the requirements of 3.5.4.1 and 3.5.4.2, as applicable.

3.16 Transient voltage. When flashers are tested as specified in 4.4.13, there shall be no evidence of damage.

3.17 Life. When flashers are continuously operated as specified in 4.4.14 for the specified period of time (see 3.1), there shall be no failures. Following this test, flashers shall meet the requirements of 3.5.4.1, 3.5.4.2, 3.5.4.3, and 3.6, as applicable.

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3.18 Marking. Flashers shall be marked in accordance with MIL-STD-1285 with the following information, as a minimum:

- a. MS or specification sheet Part or Identifying Number (PIN) (as applicable).
- b. Item name (from document title).
- c. Manufacturer's CAGE code (as applicable).
- d. Functional diagram (see 3.4.7).
- e. Load rating (as applicable).

3.19 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.20 Workmanship. Flashers shall be uniform in quality and shall be free from cracks, displaced parts, sharp edges, burrs, and other defects that could affect life, serviceability, and appearance.

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall be performed at a laboratory acceptable to the Government on sample flashers produced with equipment and procedures normally used in production.

4.2.1 Sample size. Thirteen flashers shall be selected at random and subjected to first article testing as specified in table II.

4.2.2 Inspection routine. Sample flashers shall be subjected to the inspections specified in table II, in the order shown. All flashers shall be subjected to group I inspection. Upon completion of group I inspection, the sample shall be subdivided as specified in table II for groups II, III, IV, and V.

4.2.3 Failures. Failures in excess of the number allowed in table II shall be cause for refusal to grant first article approval.

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TABLE II. First article inspection.

Inspection	Requirement paragraph	Test paragraph	Number of sample flashers to be inspected	Number of allowable failures
<u>Group I</u>				
Visual and mechanical examination (external)	3.1, 3.3, 3.4, 3.18, and 3.19	4.4.1	All flashers in sample (13 total <u>1/</u> )	1
Flash characteristics	3.5.4	4.4.2		
Voltage drop	3.6	4.4.3		
<u>Group II</u>				
High and low temperature soak and operation.	3.7	4.4.4	3	1
Vibration	3.8	4.4.5		
Immersion	3.9	4.4.6		
<u>Group III</u>				
Shock	3.10	4.4.7	3	1
Altitude	3.11	4.4.8		
Humidity	3.12	4.4.9		
Salt fog	3.13	4.4.10		
Sand and dust (when specified)	3.14	4.4.11		
<u>Group IV</u>				
Electromagnetic interference	3.15	4.4.12	2	0
Transient voltage	3.16	4.4.13		
<u>Group V</u>				
Life	3.17	4.4.14	4	0

1/ One additional flasher is included in the sample to allow for the one defective flasher allowed for group I.

4.3 Conformance inspection.

4.3.1 Inspection of product for delivery. Inspection of product for delivery shall consist of the group A inspection specified in table III.

4.3.1.1. Inspection lot. An inspection lot shall consist of all flashers covered by a single military standard or specification sheet, produced under essentially the same conditions within a period not to exceed 4 weeks, or 500 units, whichever occurs first, and offered for inspection at one time.

4.3.1.2 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table III in the order shown.

4.3.1.2.1 Sampling plan. Group A inspection shall be performed on 100 percent of the flashers furnished under this specification.

4.3.1.2.2 Rejected lots. The lot shall be rejected if more than 10 percent of the flashers fail to pass group A inspection. If an inspection lot is rejected, the supplier may rework it to correct the defects and resubmit for inspection. Such lots shall be separated from new lots and shall be clearly identified as reinspected lots. Individual flashers which are rejected from accepted lots may be reworked, when practicable, and may be resubmitted for inspection.

4.3.1.2.3 Disposition of sample units. Sample flashers which have passed all the group A inspections may be delivered on the contract or purchase order, if the lot is accepted and sample flashers are still within specified electrical tolerances.

TABLE III. Group A inspection.

Inspection <sup>1/</sup>	Requirement paragraph	Test paragraph
Flash characteristics	3.5.4	4.4.2
Voltage drop	3.6	4.4.3
Visual and mechanical	3.1, 3.3, 3.4, 3.18, and 3.19	4.4.1

<sup>1/</sup> Flashers shall be tested at a rated voltage and rated lamp load.

4.4 Methods of inspection. When applicable, testing of flashers with plug-in terminations shall be performed with the appropriate connector mated to the flasher.

4.4.1 Visual and mechanical examination.

4.4.1.1 External. Flashers shall be examined to verify that the materials, external design and construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.3, 3.4, 3.18, and 3.20).

4.4.2 Flash characteristics (3.5.4).

4.4.2.1 Flash rate (see 3.5.4.1). Flashers shall be tested at an atmospheric pressure of approximately 29.92 inches and a room temperature of 23°C ±5°C over the input voltage range specified in 3.5.2.

4.4.2.1.1 Single output circuits (see 3.5.4.1.1). Flashers shall be operated at rated voltage for 5 minutes for compliance with the flashing requirements specified (see 3.1) by loading in turn with the specified maximum rated and minimum rated lamp load. Flashers shall be operated 80 percent of the time at maximum rated load and 20 percent of the time at minimum rated load. The flash rate shall be as specified (see 3.1).

4.4.2.1.2 Dual output circuits (see 3.5.4.1.2). Flashers shall be operated as specified in 4.4.2.1.1 except that the operation cycle shall be 10 minutes. The flash rate shall be as specified (see 3.1).

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4.4.2.2 Flash cycle (on-to-off ratio) (see 3.5.4.2). Flashers shall be tested at an atmospheric pressure of approximately 29.92 inches and a room temperature of  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  over the input voltage range specified in 3.5.2.

4.4.2.2.1 Single output circuits (see 3.5.4.2.1). Flashers shall be operated for 5 minutes for compliance with the flash cycle requirements by loading in turn with a maximum and minimum lamp load as specified in table I. The flash cycle shall be as specified in 3.5.4.2.1.

4.4.2.2.2 Dual output circuits (see 3.5.4.2.2). Flashers shall be operated as specified in 4.4.2.2.1 except that the operation cycle shall be 10 minutes. The flash cycle shall be as specified in 3.5.4.2.2.

4.4.2.3 Switching time (see 3.5.4.3). Flashers shall be tested with rated input voltage and rated lamp load applied (see 3.1).

4.4.3 Voltage drop (see 3.6). Flashers shall be operated for 10 minutes each at minimum rated and maximum rated voltages, and maximum rated lamp load. Unless otherwise specified (see 3.1), the voltage drop in the lamp load shall not exceed 4.0 percent of the applied input voltage.

4.4.4 High and low temperature soak and operation (see 3.7). Environmental tests shall be conducted in accordance with the following procedures of MIL-STD-810.

4.4.4.1 High temperature (see 3.7.1). Flashers shall be subjected to high temperature testing in accordance with procedure I, method 501, except that the soak period shall be for 24 hours in lieu of 48 hours. At the completion of the 24-hour soak period, the flashers shall be operated at the soak temperature ( $71^{\circ}\text{C}$ ) and tested as specified in 4.4.2.1, 4.4.2.2, 4.4.2.3, and 4.4.3, as applicable.

4.4.4.2 Low temperature (see 3.7.2). Flashers shall be subjected to low temperature in accordance with procedure I, method 502. Flashers shall be exposed to, but not operated in, an ambient temperature of  $-62^{\circ}\text{C}$  for a period of 48 hours. The temperature of the chamber shall be raised to  $-54^{\circ}\text{C}$  and maintained for an additional 24 hour period or until temperature stabilization is reached. While the flashers are being maintained at  $-54^{\circ}\text{C}$ , the minimum specified input voltage shall be applied to the input terminals and the minimum specified lamp load connected to the output. The flashers shall begin to operate at the specified flash rate (see 3.1) within 30 seconds after the input power is applied. Operation shall continue at the low temperature for a period of 10 minutes with the voltage held at the same rated value as was used to start the flasher. At the end of the test, flashers shall be tested as specified in 4.4.2.1, 4.4.2.2, 4.4.2.3, and 4.4.3, as applicable, except that the flashers shall be operated at rated voltage and rated lamp load (see 3.1).

4.4.5 Vibration (see 3.8). Flashers shall be subjected to vibration in accordance with procedure I, curve AT, method 514, of MIL-STD-810, except the frequency range shall extend from 500 Hz to 1500 Hz at 10 G's. During the entire test, the flashers shall be operated and connected to flash the lamp load specified in 4.4.14. Flashers shall be tested as specified in 4.4.2.1, 4.4.2.2, 4.4.2.3, and 4.4.3, as applicable, except that flashers shall be tested at rated input voltage and rated lamp load (see 3.1).

4.4.6 Immersion (3.9).

4.4.6.1 Gasoline resistance. Flashers shall be immersed in a high-test gasoline of any grade conforming to ASTM D910 for a period of 1 hour at a temperature of  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . Flashers shall then be removed from the test fluid and allowed to drain for 1 hour at room temperature. There shall be no swelling of seals, gaskets, or other components. There shall be no separation of components, dissolving of compounds or adhesives, or deterioration that would cause the flashers to fail if exposed to gasoline in service.

4.4.6.2 Jet fuel resistance. Flashers shall be immersed in JP-4 fuel conforming to MIL-DTL-5624 for a period of 1 hour at a temperature of  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . Flashers shall then be removed and allowed to drain for 1 hour at room temperature. There shall be no swelling of seals, gaskets, or other components. There shall be no separation of components, dissolving of compounds or adhesives, or deterioration that would cause the flashers to fail if exposed to jet fuel in service.

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4.4.6.3 Hydraulic fluid resistance. Flashers shall be immersed in hydraulic fluid conforming to MIL-PRF-5606 for a period of 1 hour at a temperature of 23°C ±5°C. Flashers shall then be removed from the test fluid and allowed to drain for 1 hour at room temperature. There shall be no swelling of seals, gaskets, or other components. There shall be no separation of components, dissolving of compounds or adhesives, or deterioration that would cause the flashers to fail if exposed to hydraulic fluid in service.

4.4.7 Shock (see 3.10). Flashers shall be subjected to method 516, procedure I, of MIL-STD-810 (half-sine shock wave). Three shocks, each having an acceleration of 30 ±3 G's and a duration of 9.0 ±2.0 milliseconds, shall be applied in each of the three mutually perpendicular directions. Flashers shall then be tested as specified in 4.4.2.1.1 and 4.4.2.1.2, as applicable, except that the flashers shall be operated at rated input voltage and rated lamp load (see 3.1).

4.4.8 Altitude (see 3.11). Flashers shall be subjected to altitude testing in accordance with procedure II, method 500, of MIL-STD-810. Reduce internal pressure to 1.32 inch of Hg or 70,000 feet above sea level.

4.4.9 Humidity (see 3.12). Flashers shall be subjected to humidity test in accordance with procedure I, method 507, of MIL-STD-810, except that the temperature and humidity in the chamber shall be +49°C (+120°F) and 95 percent, respectively. At the end of the 24-hour period, the flashers shall be tested as specified in 4.4.2.1 and 4.4.2.2, as applicable, at rated input voltage and rated lamp load (see 3.1).

4.4.10 Salt fog (see 3.13). Flashers shall be subjected to the salt fog test specified in procedure I, method 509, of MIL-STD-810. After exposure, the flashers shall be washed, shaken, air blasted, and then permitted to dry for 48 hours at room temperature. The flashers shall then be visually examined. There shall be no physical damage which would interfere with the operation or use of the flashers. Flashers shall then be tested as specified in 4.4.2.1.1 and 4.4.2.1.2, as applicable, except that flashers shall be operated at rated input voltage and rated lamp load (see 3.1). Flashers shall again be operated and inspected 48 hours later.

4.4.11 Sand and dust (when specified) (see 3.1 and 3.14). Flashers shall be tested as specified in method 510 of MIL-STD-810. Flashers shall then be tested as specified in 4.4.2.1.1 or 4.4.2.1.2, as applicable.

4.4.12 Electromagnetic interference (see 3.15). Flashers shall be subjected to electromagnetic interference as specified in MIL-STD-461, equipment class A-1. During this test the flashers shall be operating an electrical load in accordance with 4.4.14. The radio noise caused by the flashers shall be within the specified limits both before and after the test. During testing, flashers shall be loaded in accordance with 4.4.14 except minimum rated lamp loads shall be applied. Following the test, flashers shall meet the requirements of 4.4.2.1 and 4.4.2.2, as applicable, except flashers shall be tested at rated input voltage and rated lamp load (see 3.1).

4.4.13 Transient voltage (see 3.16). Flashers shall be subjected to a total of 80 transient voltage pulses applied to the input (control power) terminals. A resistive load of the applicable lamp voltage and current rating shall be connected to the output (lamp load) circuit. Flashers requiring dc control power shall be tested as follows: With the flasher operating at normal voltage, 20 voltage pulses shall be applied across the input terminals when the flasher output circuit is in the nonconducting or "load off" condition. Negative polarity shall be applied to the flasher "positive" terminal, and positive polarity to the flasher "negative" terminal. Repeat the test with 20 additional pulses applied when the flasher is in the conducting or "load on" condition. Pulse voltage shall be 286 +0, -5 percent of rated voltage. Forty additional pulses shall be applied as above except that a positive pulse voltage shall be applied to the flasher control "positive" terminal and a negative pulse voltage to the "negative" terminal. Duration of applied transient voltage shall be 0.1 second, minimum. Flashers requiring ac control power shall be tested similarly to the flasher units having dc control power except that only 40 pulses are required. The peak pulse voltage shall be 166 +0, -5 percent of the rated rms voltage. Twenty pulses shall be applied when the flasher output is in the nonconducting or "load off" condition and 20 pulses shall be applied when the flasher output circuit is in the "load on" condition. Duration of the ac pulse transient shall be 0.30 second minimum. After the specified pulses have been applied, the flashers shall be tested to determine compliance with 4.4.2.1 and 4.4.2.2, as applicable.

4.4.14 Life (see 3.17). Flashers shall be subjected to a continuous operational life test. The load shall consist of aircraft lamps of adequate number connected in parallel to provide a steady state current  $100 \pm 5.0$  percent of maximum rated lamp load. Input voltage shall be rated source voltage. The first 30 percent of the life test shall be conducted at the maximum rated ambient temperature and the last 70 percent of the life test shall be performed at ambient room temperature. The test shall be conducted for the specified number of hours (see 3.1). At the completion of the life test, flashers shall be tested to determine compliance with 4.4.2.1, 4.4.2.2, 4.4.2.3, and 4.4.3, as applicable, except that rated input voltage and rated lamp load shall be applied (see 3.1).

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Solid state flashers conforming to this specification are used for cycling aircraft navigation lights on and off.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Title, number, and date of the applicable MS standard or specification sheet and the complete MS Part or Identifying Number (PIN) or specification sheet PIN.
- c. Requirements for first article inspection (see 4.2).
- d. Packaging requirements.

6.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first 13 production items, a standard production item from the contractor's current inventory (see 3.2), and the number of items to be tested as specified in 4.2. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Definitions.

6.4.1 Control power. Control power is considered the power which is used to produce the required cycling rate and duration of power pulses to the lamp load.

6.4.2 Lamp power. Lamp power is the power which is switched on and off within the flasher and which energizes the load (lamp).

6.5 Intermetallic contact. The finishing of metallic areas to be placed in intimate contact by assembly presents a special problem, since intermetallic contact of dissimilar metals results in electrolytic couples which promote corrosion through galvanic action. To provide the required corrosion protection, intermetallic couples are restricted to those permitted by MIL-STD-889.

6.6 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table IV lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

Table IV. EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and Compounds	Lead and Compounds	Toluene
Carbon Tetrachloride	Mercury and Compounds	1,1,1 - Trichloroethane
Chloroform	Methyl Ethyl Ketone	Trichloroethylene
Chromium and Compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and Compounds	Nickel and Compounds	

6.7 Subject term (key word) listing.

Microcircuit  
Relay

6.8 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:  
Army - AV  
Navy - AS  
Air Force - 11  
DLA - CC

Preparing activity:  
DLA - CC

Review activities:  
Army - CR  
Air Force - 99  
Navy - MC

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