

INCH-POUND

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PERFORMANCE SPECIFICATION

CAPACITORS, FIXED, ELECTROLYTIC (NONSOLID ELECTROLYTE), TANTALUM ANODE AND CATHODE, GENERAL SPECIFICATION FOR

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 tantalum anode and cathode, electrolytic (nonsolid electrolyte), fixed capacitors, nonhermetically-sealed in metal cases (see 6.1).

1.2 Classification. Capacitors covered by this specification are classified by the style, as specified (see 3.1).

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.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: DSCC-VAT, Post Office Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5910

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MIL-PRF-83500A

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-83500/1 - Capacitors, Fixed, Electrolytic (Nonsolid Electrolyte), Tantalum Anode and Cathode, Styles CRL01, CRL02, and CRL03.

STANDARDS

FEDERAL

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

DEPARTMENT OF DEFENSE

MIL-STD-202 - Test Method Standard Electronic and Electrical Component Parts.

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 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications, specification sheets, or MS sheets), 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 requirements of this specification and the specification sheets, the latter shall govern (see 6.2).

3.2 Qualification. Capacitors furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.3 and 6.3).

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 capacitors and retainers to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.3.1 Solder and solder flux. Solder shall be of such quality as to enable the capacitors to meet all of the requirements of this specification.

3.4 Interface and Physical dimensions. Capacitors shall be of the design, construction, and physical dimensions specified (see 3.1).

3.4.1 Case. Each capacitor shall be enclosed in a nonhermetically-sealed metal case (see 3.1), which will protect the capacitor element against the entry of contaminants.

3.4.2 Terminals. All terminals shall be permanently secured internally and externally, as applicable, so that normal handling of the terminals will not result in wear, damage, or excessive strain to the capacitor element, case, or case insulation. Wire-lead terminals shall be hot-solder dipped or electroplated with solder having a tin content of at least 40 percent. Threaded portions of screw-thread terminals shall be in accordance with FED-STD-H28 as specified (see 3.1).

3.4.2.1 Radial pin. Radial pin terminals shall be hot-solder-dipped or electroplated with a solder having a tin content of 40 to 70 percent. Radial pin terminals shall be solderable over their entire length up to .062 inch (1.57 mm) of the welded joint or up to .156 inch (3.96 mm) of the body, as applicable (see 3.1). Radial pin terminals shall be of a solid conductor of the length and diameter specified (see 3.1).

3.4.2.2 Stud. Stud terminals shall be threaded in accordance with FED-STD-H28 as specified (see 3.1).

3.5 Burn-in. When capacitors are tested as specified in 4.6.2, there shall be no evidence of mechanical damage or leakage of electrolyte.

3.6 DC leakage. When measured as specified in 4.6.3, the dc leakage shall not exceed the applicable value specified (see 3.1).

3.7 Capacitance. When measured as specified in 4.6.4, the capacitance shall be within tolerance of the nominal value specified (see 3.1).

3.8 Dissipation factor. When capacitors are tested as specified in 4.6.5, the dissipation factor shall not exceed the applicable percent specified (see 3.1).

3.9 Shock (specified pulse). When capacitors are tested as specified in 4.6.6, there shall be no intermittent contacts of 0.5 millisecond (ms) or greater duration, arcing, open- or short-circuiting, mechanical damage, or leakage of electrolyte.

3.10 Vibration, high frequency. When tested as specified in 4.6.7, there shall be no intermittent contacts of 0.5 ms or greater duration, open- or short-circuiting, and capacitors shall meet the following requirements:

- DC leakage----- Shall not exceed 125 percent of the initial requirement (see 3.6).
- Capacitance ----- Shall change not more than ± 5 percent from the initial measured value (see 3.7).
- Dissipation factor----- Shall not exceed 115 percent of the initial requirement (see 3.8).
- Visual inspection ----- There shall be no evidence of mechanical damage, obliteration of marking, or leakage of electrolyte.

3.11 Thermal shock. When tested as specified in 4.6.8, capacitors shall meet the following requirements:

- DC leakage----- Shall not exceed 125 percent of the initial requirement (see 3.6).
- Capacitance ----- Shall change not more than ± 5 percent from the initial measured value (see 3.7).
- Dissipation factor----- Shall not exceed 115 percent of the initial requirement (see 3.8).
- Visual inspection ----- There shall be no evidence of mechanical damage, obliteration of marking, or leakage of electrolyte.

3.12 Salt atmosphere. When capacitors are tested as specified in 4.6.9, there shall be no harmful corrosion, and at least 90 percent of any exposed metal surface shall be protected by the finish. Marking shall remain legible.

NOTE: Harmful corrosion shall be construed as being any type of corrosion which in any way interferes with the mechanical or electrical performance of the capacitor.

3.13 Solderability (capacitors with radial pin terminals and terminal tabs only, see 3.1). When capacitors are tested as specified in 4.6.10, the dipped portion of the terminals and terminal tabs shall conform to the solid-wire termination criteria of method 208 of MIL-STD-202.

3.14 Terminal strength. When capacitors are tested as specified in 4.6.11, there shall be no loosening or permanent damage to the terminals, terminal weld, or seal.

3.15 Surge voltage. When capacitors are tested as specified in 4.6.12, there shall be no intermittent contacts, open- or short-circuiting, mechanical damage, or leakage of electrolyte.

3.16 Moisture resistance. When tested as specified in 4.6.13, capacitors shall meet the following requirements:

- DC leakage----- Shall not exceed 125 percent of the initial requirement (see 3.6).
- Capacitance ----- Shall change not more than ± 8 percent from the initial measured value (see 3.7).
- Dissipation factor----- Shall not exceed 115 percent of the initial requirement (see 3.8).
- Visual inspection ----- There shall be no evidence of harmful corrosion (as defined in 3.12), mechanical damage, obliteration of marking, or leakage of electrolyte.

3.17 Low temperature (storage). When tested as specified in 4.6.14, capacitors shall meet the following requirement:

- DC leakage----- Shall not exceed the initial requirement (see 3.6).
- Capacitance ----- Shall change not more than ± 5 percent from the initial measured value (see 3.7).
- Dissipation factor----- Shall not exceed the initial requirement (see 3.8).
- Visual inspection ----- There shall be no evidence of leakage of electrolyte.

3.18 Seal (Hermetic sealed units only). When capacitors are tested as specified in 4.6.15, there shall be no evidence of leakage.

3.19 Stability at low and high temperatures. When tested as specified in 4.6.16, capacitors shall meet the following requirement:

MIL-PRF-83500A

Step 1 (+25°C):

- DC leakage----- Shall not exceed the initial requirement (see 3.6).
- Capacitance ----- Shall be within the applicable tolerance specified (see 3.1).
- Dissipation factor----- Shall not exceed the initial requirement (see 3.8).

Step 2 (-55°C):

- Impedance ----- Shall not exceed the applicable value specified (see 3.1).
- Capacitance ----- Shall change not more than the percent specified (see 3.1) from the step 1 measured value.

Step 3 (+25°C):

- DC leakage----- Shall not exceed the initial requirement (see 3.6).
- Capacitance----- Shall change not more than ± 5 percent from the step 1 measured value.
- Dissipation factor----- Shall not exceed the initial requirement (see 3.8).

Step 4 (+85°C):

- DC leakage----- Shall not exceed the applicable value specified (see 3.1).
- Capacitance ----- Shall change not more than the percent specified (see 3.1) from the step 1 measured value.
- Dissipation factor----- Shall not exceed the applicable value specified (see 3.1).

Step 5 (+125°C):

- DC leakage----- Shall not exceed the applicable value specified (see 3.1).
- Capacitance ----- Shall change not more than the percent specified (see 3.1) from the step 1 measured value.
- Dissipation factor----- Shall not exceed the applicable value specified (see 3.1).

Step 6 (+25°C):

- DC leakage----- Shall not exceed the initial requirement (see 3.6).
- Capacitance ----- Shall change not more than ± 5 percent from the step 1 measured value.
- Dissipation factor----- Shall not exceed the initial requirement (see 3.8).

3.20 Barometric pressure (reduced). When capacitors are tested as specified in 4.6.17, there shall be no flashover, breakdown, or harmful deformation of the case, and no mechanical damage, obliteration of marking, or leakage of electrolyte.

3.21 Reverse voltage (applicable to polarized capacitors only, see 3.1). When tested as specified in 4.6.18, capacitors shall meet the following requirements:

- DC leakage----- Shall not exceed 125 percent of the initial requirement (see 3.6).
- Capacitance ----- Shall change not more than ± 10 percent from the initial measured value (see 3.7).
- Dissipation factor----- Shall not exceed the initial requirement (see 3.8).

3.22 Life at +85°C.

3.22.1 2,000-hour (qualification) inspection. When tested as specified in 4.6.19.1, capacitors shall meet the following requirements:

- DC leakage (at +85°C and +25°C)-- Shall not exceed the applicable values specified (see 3.1).
- Capacitance----- Shall change not more than ± 10 percent from the initial measured value (see 3.7).
- Dissipation factor ----- Shall not exceed the initial requirement (see 3.8).
- Visual inspection----- There shall be no mechanical damage, obliteration of marking, or leakage of electrolyte.

3.22.2 240-hour (group B) inspection. When tested as specified in 4.6.19.2, capacitors shall meet the following requirements:

- DC leakage (at +85°C and +25°C)--- Shall not exceed the applicable values specified (see 3.1).
- Capacitance----- Shall change not more than 10 percent from the initial measured value (see 3.7).
- Dissipation factor ----- Shall not exceed the initial requirement (see 3.8).
- Visual inspection----- There shall be no mechanical damage, obliteration of marking, or leakage of electrolyte.

3.22.3 6,000- and 10,000-hour (group C inspection). When tested as specified in 4.6.19.3, capacitors shall meet the following requirements:

- DC leakage:
 - At +85°C ----- Shall not exceed 125 percent of the initial requirement (see 3.6).
 - At +25°C ----- Shall not exceed the applicable value specified (see 3.1).
- Capacitance----- Shall change not more than the percent specified (see 3.1) from the initial measured value (see 3.7).
- Dissipation factor----- Shall not exceed 150 percent of the initial requirement (see 3.8).

3.23 Life at +125°C. When tested as specified in 4.6.20, capacitors shall meet the following requirements:

- DC leakage (at +125°C and +25°C)-- Shall not exceed the applicable values specified (see 3.1).
- Capacitance----- Shall change not more than ± 10 percent from the initial measured value (see 3.7).
- Dissipation factor ----- Shall not exceed 150 percent of the initial requirement (see 3.8).
- Visual inspection----- There shall be no damage, obliteration of marking, or leakage of electrolyte.

3.24 Vacuum life at +125°C. When tested as specified in 4.6.21, capacitors shall meet the following requirements:

- DC leakage (at +125°C and +25°C) -- Shall not exceed the applicable values specified (see 3.1).
- Capacitance----- Shall change not more than ± 20 percent from the initial measured value (see 3.7).
- Dissipation factor ----- Shall not exceed the initial requirement (see 3.8).
- Weight loss----- Shall not exceed 4.1 milligrams.

MIL-PRF-83500A

3.25 AC ripple life at +125°C. When tested as specified in 4.6.22, capacitors shall meet the following requirements:

DC leakage (at +125°C and +25°C)--	Shall not exceed the applicable values specified (see 3.1).
Capacitance-----	Shall change not more than ± 15 percent from the initial measured value (see 3.7).
Dissipation factor -----	Shall not exceed the applicable value specified (see 3.1).
Visual inspection-----	There shall be no damage, obliteration of marking, or leakage of electrolyte.

3.26 Fungus. The manufacturer shall certify that all external materials are fungus resistant or shall perform the test specified in 4.6.23. When capacitors are tested as specified in 4.6.23, examination shall disclose no evidence of fungus growth on the external surface of the capacitor.

3.27 Resistance to solvents. When capacitors are tested as specified in 4.6.24, marking shall remain legible and shall not smear or rub off. In addition, there shall be no visible indication of damage or deterioration to the capacitor body.

3.28 Resistance to soldering heat (capacitors with terminal tabs only). When tested as specified in 4.6.25, capacitors shall meet the following requirements:

DC leakage-----	Shall not exceed the initial requirement (see 3.6).
Capacitance -----	Shall change not more than ± 5 percent from the initial measured value (see 3.7).
Dissipation factor-----	Shall not exceed the initial requirement (see 3.8).

3.29 Marking. Capacitors shall be marked in accordance with MIL-STD-1285. Unless otherwise specified (see 3.1), marking shall include the Military Part or Identifying Number (PIN), capacitance (in μF), and rated voltage (at +85°C) as shown in the following example:

EXAMPLE:

M83500/
01-0001 - PIN.
1,200 μF 6V - Capacitance and rated voltage.

When applicable, polarity marking shall be as specified (see 3.1). The PIN, capacitance, rated voltage, source code, date code, lot symbol, and trademark shall be marked on the packaging container.

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

3.31 Workmanship. Capacitors shall be processed in such a manner as to be uniform in quality and shall be free from misaligned welds, cold soldering, harmful corrosion (as defined in 3.12), pits, cracks, dents, rough edges, and other defects that will affect life, serviceability, or appearance.

3.32 Soldering. All excess flux or solder shall be removed. Electrical connections shall be electrically continuous after soldering.

4. VERIFICATION

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

- a. Qualification inspection (see 4.3).
- b. Conformance inspection (see 4.5).
- c. Periodic group C inspection (see 4.5.2.1)

4.2. Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202, except relative humidity shall not exceed 75 percent. Unless otherwise specified (see 3.1), accuracy of all test voltage measurements shall be within ± 2.0 percent of specified voltage.

4.2.1 AC measurements. AC measurements shall be made at a frequency of 120 ± 5 Hertz (Hz). The magnitude of the ac voltage shall be equal to or less than 1.0 volt root mean square (rms). The dc bias voltage shall be 2.2 +0.0, -1.0 volts for all ac measurements. The ratio of ac voltage to dc bias voltage shall be such that no reversal of dc voltage will occur across the capacitor.

4.2.2 Reference measurements. When requirements are based on comparative measurements made before and after conditioning, the reference measurement shall be considered the last measurement made at $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ prior to beginning of conditioning. Unless reference measurements have been made within 30 days prior to the beginning of conditioning, they shall be repeated.

4.2.3 Power supply. The power supply used for life testing shall have a regulation of ± 2 percent or less of the specified test voltage.

4.3 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production.

4.3.1 Sample size. The number of capacitors to be subjected to qualification inspection shall be as specified in table I, or in the appendix to this specification.

4.3.2 Inspection routine. The sample shall be subjected to the inspections specified in table I, in the order shown. Two sample units shall be subjected to the visual and mechanical inspection (internal). The remaining sample units shall be subjected to the subsequent inspections of group I. The sample shall then be divided as specified in table I for groups II to VII inclusive, and subjected to the inspections for their particular group.

4.3.3 Failures. Failures in excess of those allowed in table I shall be cause for refusal to grant qualification approval.

MIL-PRF-83500A

TABLE I. Qualification inspection.

Examination or test	Requirement paragraph	Test paragraph	Number of sample units to be inspected <u>1/</u>	Number of failures permitted <u>2/</u>
<u>Group I</u>				
Visual and mechanical examination (internal) Materials, design, construction, and workmanship -----	3.1, 3.3, 3.4, and 3.31	4.6.1	2	0
Visual and mechanical examination (external) Physical dimensions, materials, markings <u>4/</u> And workmanship -----	3.1, 3.3, 3.29, and 3.31	4.6.1	70	1
Burn-in <u>3/</u> -----	3.5	4.6.2		
DC leakage <u>3/</u> -----	3.6	4.6.3		
Capacitance <u>3./</u> -----	3.7	4.6.4		
Dissipation factor <u>3/</u> -----	3.8	4.6.5		
<u>Group II</u>				
Shock (specified pulse) -----	3.9	4.6.6	6	1
Vibration, high frequency -----	3.10	4.6.7		
Thermal shock -----	3.11	4.6.8		
Salt atmosphere -----	3.12	4.6.9		
<u>Group III</u>				
Solderability (capacitors with radial pin terminals and terminal tabs only) -----	3.13	4.6.10	6	1
Terminal strength -----	3.14	4.6.11		
Surge voltage -----	3.15	4.6.12		
Moisture resistance -----	3.16	4.6.13		
Low temperature (storage) -----	3.17	4.6.14		
Seal -----	3.18	4.6.15		
<u>Group IV</u>				
Stability at low and high temperatures -----	3.19	4.6.16	6	1
Barometric pressure (reduced) -----	3.20	4.6.17		
Reverse voltage (applicable to polarized capacitors only) -----	3.21	4.6.18		
<u>Group V</u>				
Life at 85°C (2,000 hour) -----	3.22.1	4.6.19.1	12	1
Life at 125°C (2,000-hour) -----	3.23	4.6.20	6	

See footnotes at end of table.

TABLE I. Qualification inspection - Continued.

Examination or test	Requirement paragraph	Test paragraph	Number of sample units to be inspected ^{1/}	Number of failures permitted ^{2/}
<u>Group VI</u>				
Vacuum life at 125°C -----	3.24	4.6.21	27	1
AC ripple life at 125°C -----	3.25	4.6.22		
<u>Group VII</u>				
Fungus -----	3.26	4.6.23	6	1
Resistance to solvents -----	3.27	4.6.24		
Resistance to soldering heat (capacitors With terminal tabs only) -----	3.28	4.6.25		

- 1/ One additional sample unit is included in each sample of 72 units to permit substitution for the failure allowed in group I.
- 2/ A sample unit having one or more defects shall be considered as a single failure.
- 3/ Nondestructive inspection and tests.
- 4/ Marking defects are based on visual examination only and shall be charged only for illegible, incomplete, or incorrect marking.

4.4 Verification of qualification. Every 12 months, the manufacturer shall verify the retention of qualification to the qualifying activity. In addition, the manufacturer shall immediately notify the qualifying activity whenever Group C inspection results indicate failure of the qualified product to meet the requirements of the specification. Verification of qualification shall be based on meeting the following:

- a. The capacitor design has not been modified.
- b. Lot rejection for group A inspection does not exceed the group A sampling plan.
- d. The requirements for group C inspection are met.

In the event that there is no production of a single style device during a reporting period and the manufacturer is listed for more than one style on the QPL, the manufacturer shall certify that they retain the capabilities and facilities necessary to produce that product. If during three consecutive reporting periods there has been no production of a given style the manufacturer may be required, at the discretion of the qualifying activity, to submit a newly-produced (not from stock) representative product of that style to testing.

4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspections.

4.5.1.1 Inspection lot. An inspection lot shall consist of all capacitors, from a production line or lines, produced under essentially the same conditions and offered for inspection in a single work-week.

4.5.1.2 Group A inspection. Group A inspection shall consist of the examination and tests specified in table II, in the order shown.

MIL-PRF-83500A

TABLE II. Group A inspection.

Examination or test	Requirement paragraph	Test paragraph	Sampling Procedure
Burn-in DC leakage Capacitance Dissipation factor	3.5 3.6 3.7 3.8	4.6.2 4.6.3 4.6.4 4.6.5	100 percent inspection
Visual and mechanical Examination (external) Materials Physical dimensions Marking ^{1/} Workmanship	3.1 and 3.3 3.1 3.29 3.31	4.6.1 4.6.1 4.6.1 4.6.1	13 samples 0 failures

^{1/} Marking defects shall be based on visual inspection only. Any subsequent electrical defects shall not be used as a basis for determining marking defects.

4.5.1.2.1 Rejected lots. If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. A new sample of parts shall be randomly selected in accordance with Table II. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots. If one or more defects are found in this second sample, the lot shall be rejected and shall not be supplied to this specification.

4.5.1.3 Group B inspection. Group B inspection shall consist of the tests specified in table III, in the order shown, and shall be performed on sample units which have been subjected to and have passed group A inspection.

TABLE III. Group B inspection.

Test	Requirement paragraph	Test paragraph
<u>Subgroup 1</u> Stability at low and high temperatures -----	3.19	4.6.16
<u>Subgroup 2</u> Thermal shock ^{1/} ----- Life at 85°C (240-hour) -----	3.11 3.22.2	4.6.8 4.6.19.2

^{1/} Twenty-five cycles. No failures allowed.

4.5.1.3.1 Sampling plan. For subgroup 1, 13 samples shall be selected from units which have passed group A inspection; no failures permitted. For subgroup 2, 5 samples shall be selected from units which have passed group A inspection, no failures permitted.

4.5.1.3.2 Failure in group B inspection. If an inspection lot is rejected under the subgroup 1 test of table III, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots. If an inspection lot is rejected under the subgroup 2 test, the lot shall not be resubmitted.

4.5.1.3.3 Disposition of sample units. Sample units which have been subjected to and have successfully passed subgroup 2 of group B inspection may be delivered on the contract or purchase order; however, every four months, 10 samples which have successfully passed the test of subgroup 2 shall be tested as specified in subgroup 6 of table IV.

4.5.2 Verification inspection. Verification inspection shall consist of group C. Except where the results of these inspections show noncompliance with the applicable requirements (see 4.5.2.1.4), delivery of products which have passed groups A and B shall not be delayed pending the results of these verification inspections.

4.5.2.1 Periodic Group C inspection. Group C inspection shall consist of the tests specified in table IV, in the order shown. Group C inspection shall be made on sample units which have passed group A inspection, except that units which are to be subjected to the tests of subgroup 6 shall be units which have successfully passed subgroup 2 of table III (see 4.5.1.3.3).

4.5.2.1.1 Sampling plan. Sample units shall be selected as specified in table IV. The voltages selected shall be represented in the sample in the same proportion as the voltages produced during the sampling period.

4.5.2.1.2 Failures. If the number of failures exceeds the number allowed in table IV, the sample shall be considered to have failed.

4.5.2.1.3 Disposition of sample units. Sample units which have been subjected to group C inspection shall not be delivered on the contract.

4.5.2.1.4 Noncompliance. If a sample fails to pass group C inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc., and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity, has been taken. After the corrective action has been taken, group C inspection shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the qualifying activity). Groups A and B inspections may be reinstated; however, final acceptance and shipment shall be withheld until the group C reinspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure and corrective action taken shall be furnished to the qualifying activity and the contracting officer or purchaser.

MIL-PRF-83500A

TABLE IV. Group C inspection.

Test	Requirement paragraph	Test paragraph	Number of sample units to be inspected	Number of failures permitted
<u>Subgroup 1 (every 2 months)</u>				
Shock (specified pulse) -----	3.9	4.6.6	12	1
Vibration, high frequency -----	3.10	4.6.7		
Salt atmosphere -----	3.12	4.6.9		
<u>Subgroup 2 (every 2 months)</u>				
Solderability (capacitors with radial pin terminals and terminal tabs only) -----	3.13	4.6.10	12	1
Terminal strength -----	3.14	4.6.11		
Surge voltage -----	3.15	4.6.12		
Moisture resistance -----	3.16	4.6.13		
Seal -----	3.18	4.6.15		
<u>Subgroup 3 (every 2 months)</u>				
Reverse voltage (applicable to polarized capacitors only) -----	3.21	4.6.18	6	
<u>Subgroup 4 (every 2 months)</u>				
Low temperature (storage) -----	3.17	4.6.14	12	1

See footnotes at end of table.

MIL-PRF-83500A

TABLE IV. Group C inspection - Continued.

Test	Requirement paragraph	Test Paragraph	Number of sample units to be inspected	Number of failures permitted
<u>Subgroup 5 (every 12 months)</u>				
Thermal shock -----	3.11	4.6.8	12	1
<u>Subgroup 6 (every 4 months)</u>				
Barometric pressure (reduced) -----	3.20	4.6.17	6	1
Life at 85°C -----	3.22.3	4.6.19.3		
<u>Subgroup 7 (every 4 months)</u>				
Life at 125°C (2000 hour)- -----	3.23	4.6.20	6 2/	1
<u>Subgroup 8 (every 12 months)</u>				
Vacuum life at 125°C -----	3.24	4.6.21	27	1
AC ripple life at 125°C -----	3.25	4.6.22		
<u>Subgroup 9 (every 12 months)</u>				
Fungus -----	3.26	4.6.23	6	1
Resistance to solvents -----	3.27	4.6.24		
Resistance to soldering heat (capacitors with terminal tabs only) -----	3.28	4.6.25		

1/ A sample unit having one or more defects shall be considered as a single failure.

2/ Sample units may be selected from units successfully passing subgroup 3.

4.6 Methods of examination and test.

4.6.1 Visual and mechanical inspection. Capacitors shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.3, 3.4, 3.29, and 3.31).

4.6.2 Burn-in (see 3.5). Capacitors shall be subjected to five cycles of thermal shock as specified in 4.6.8. Capacitors shall be conditioned at +85°C with the applicable rated voltage applied through a $1,000 \pm 100$ ohm resistor for a period of 48 +5, -0 hours. Capacitors shall be returned to room ambient temperature and shall then be visually examined for mechanical damage and leakage of electrolyte.

NOTE: For nonpolarized capacitors, the conditioning voltage shall be reversed periodically so that the time of application of applicable voltages in both directions is approximately equal.

4.6.3 DC leakage (see 3.6). DC leakage shall be measured with the dc rated voltage (see 3.1) applied. The electrification period shall be as follows:

- a. For qualification inspection: $5 \pm .5$ minutes.
- b. For quality conformance inspection: Within 5 minutes.

4.6.4 Capacitance (see 3.7). Capacitors shall be tested in accordance with method 305 of MIL-STD-202. The following details shall apply:

- a. Test frequency: As specified in 4.2.1.
- b. Limit of accuracy: Within ± 2 percent.

4.6.5 Dissipation factor (see 3.8). The dissipation factor shall be determined by a polarized bridge. Measurement accuracy shall be within ± 2 percent.

4.6.6 Shock (specified pulse) (see 3.9). Capacitors shall be tested in accordance with method 213 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting method: Normal mounting means.
- b. Test condition: I (100 G).
- c. Measurement and electrical loading during test: DC rated voltage (see 3.1) shall be applied to the capacitor during test. Observation shall be made to determine intermittent contacts or arcing or open- or short-circuiting. Detecting equipment shall be sufficiently sensitive to detect any interruption of 0.5 ms or greater duration.
- d. Inspection after test: Capacitors shall be visually examined for arcing, breakdown, mechanical damage, and leakage of electrolyte.

MIL-PRF-83500A

4.6.7 Vibration, high frequency (see 3.10). Capacitors shall be tested in accordance with method 204 of MIL-STD-202. The following details and exception shall apply:

- a. Mounting of specimens: External mounting means.
- b. Test condition: D (20 G), with the following exception: For capacitors with radial pin terminals, the motion shall be applied for a total of 8 hours (4 hours in each of two mutually perpendicular directions, one parallel and the other perpendicular to the capacitor body).
- c. Measurements: During the last 30 minutes of vibration in each direction, an electrical measurement shall be made on the capacitors to determine intermittent contacts or open- or short-circuiting. Detecting equipment shall be sufficiently sensitive to detect any interruption of 0.5 ms or greater duration.
- d. Measurements after cycling: DC leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively. In addition, capacitors shall be externally examined for leakage of electrolyte. Detection of leakage of electrolyte shall be determined by the use of thymol blue or other suitable chemical indicator solution.
- e. Examination after test: Capacitors shall be visually examined for mechanical damage and leakage of electrolyte.

4.6.8 Thermal shock (see 3.11). Capacitors shall be tested in accordance with method 107 of MIL-STD-202. The following details and exceptions shall apply:

- a. Conditioning prior to first cycle: Fifteen minutes at room ambient conditions (see 4.2).
- b. Test condition: A (except step 3 temperature shall be +125°C, +4°C, -0°C; steps 1 and 3 time shall be 30 minutes; and steps 2 and 4 time shall be 10 to 15 minutes).
- c. Number of cycles: 300 (except group B inspection: 25 cycles).
- d. Measurements before cycling: Not applicable.
- e. Measurements after cycling: DC leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively. In addition, capacitors shall be externally examined for leakage of electrolyte. Detection of leakage of electrolyte shall be determined by the use of thymol blue or other suitable chemical indicator solution.

4.6.9 Salt atmosphere (see 3.12). Capacitors shall be tested in accordance with method 101 of MIL-STD-202. The following details and exception shall apply:

- a. Test condition: B (48 hours).
- b. Measurements after exposure: Not applicable.
- c. Examination after test: After the test, capacitors shall be washed, and then air-dried for 24 hours. The capacitors shall then be examined for evidence of harmful corrosion, loss of plating, and legibility of marking.

MIL-PRF-83500A

4.6.10 Solderability (capacitors with radial pin terminals and terminal tabs only, see 3.1) (see 3.13). Capacitors shall be tested in accordance with method 208 of MIL-STD-202. The following details shall apply:

- a. Number of terminations of each part to be tested: 5 (CRL01), 1 (CRL02) and 4 (CLR03).
- b. Depth of immersion: Terminals shall be immersed up to .062 inch (1.57 mm) of the welded joint or up to .156 inch (3.96 mm) of the body, whichever applies.

4.6.11 Terminal strength (see 3.14). Capacitors shall be tested in accordance with 4.6.11.1 through 4.6.11.3, as applicable.

4.6.11.1 Pull test (radial pin and stud terminals). Capacitors shall be tested in accordance with method 211 of MIL-STD-202. The following details and exception shall apply:

- a. Test condition: A.
- b. Applied force: 10 pounds, +2, -0 ounces.
- c. Duration of applied force: 30 +5, -0 seconds.

4.6.11.2 Bend test (radial pin terminals and capacitors with terminal tabs only). Capacitors shall be tested in accordance with method 211 of MIL-STD-202. The following detail and exception shall apply:

- a. Test condition: B.
- b. Number of bends: Two, 90 degrees each for terminal tabs; or two, 45 degrees each for radial pin terminals. Capacitors with radial pin terminals shall be secured in position as shown on figure 1.

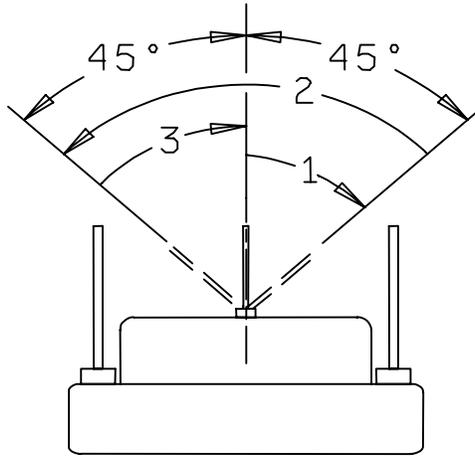


FIGURE 1. Wire-lead bend test.

MIL-PRF-83500A

4.6.11.3 Torque test (stud terminals only). Capacitors shall be tested in accordance with method 211 of MIL-STD-202. The following details shall apply:

- a. Test condition: E.
- b. Torque to be applied: 11 pound-inches.

After the tests, the terminals, terminal weld, and seals shall be examined for loosening or permanent damage.

4.6.12 Surge voltage (see 3.15). Capacitors shall be subjected to 1,000 cycles of the applicable dc surge voltage specified in table V. The ambient temperature during cycling shall be +85°C. Each cycle shall consist of a 30-second surge voltage application followed by a 5.5 minute discharge period. Voltage application shall be made through a resistance of 10 +0, -2 ohms including the source in series with the capacitor and the voltage source. Each surge voltage cycle shall be performed in such a manner that the capacitor is discharged through a 10 +0, -2 ohm resistor at the end of the 30-second application. The test shall be terminated on the discharge portion of the cycle. During the test, an electrical measurement shall be made to detect intermittent contacts and open- and short-circuiting. After the test, capacitors shall be visually examined for mechanical damage and leakage of electrolyte.

TABLE V. DC surge voltages, derated surge voltages, and rated voltages

DC surge voltage at 85°C	Derated surge voltage at 125°C	DC rated voltage at 85°C
143.8	94.9	125
115.0	75.9	100
86.3	56.9	75
57.5	37.8	50
34.5	22.8	30
23.0	15.2	20
17.3	11.4	15
11.5	7.6	10
9.2	6.1	8
6.9	4.6	6

4.6.13 Moisture resistance (see 3.16). Capacitors shall be tested in accordance with method 106 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting: Except during examination and measurements, capacitors shall be securely fastened by normal mounting means.
- b. Initial measurements: Not applicable.
- c. Polarization and loading voltage: 6 volts dc or rated voltage, whichever is less.
- d. Step 7b: Vibration is not required during step 7b.

MIL-PRF-83500A

- e. Final measurements: After the final cycle and within 2 to 6 hours after removal of capacitors from the humidity chamber, the dc leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively.
- f. Examination after test: Capacitors shall be visually examined for evidence of harmful corrosion, mechanical damage, obliteration of marking, and leakage of electrolyte.

4.6.14 Low temperature (storage) (see 3.17). Capacitors shall be tested in accordance with method 502 of MIL-STD-810. The following details and exceptions shall apply:

- a. Pretest data required: DC leakage, capacitance, and dissipation factor measurements obtained from 4.6.3, 4.6.4, and 4.6.5, respectively.
- b. Storage temperature and exposure time: -62°C +0°C, -3°C for 72 hours, followed by a 1-hour exposure at +125°C +4°C, -0°C within 24 hours after low temperature storage.
- c. Steps not required: Steps 3, 4, and 5.
- d. Measurements after exposure: Capacitors shall be returned to the inspection conditions specified in 4.2; and within 24 hours after exposure, dc leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively.
- e. Examination after test: Capacitors shall be externally examined for leakage of the electrolyte. Detection of leakage of electrolyte shall be determined by the use of thymol blue or other suitable chemical indicator solution.

4.6.15 Seal (see 3.18) (Hermetic sealed units only). Capacitors shall be tested in accordance with method 112 of MIL-STD-202. The following details and exceptions shall apply:

- a. Test condition: C.
- b. Degree of leakage rate sensitivity: 10^{-8} atm cc/s.
- c. Procedure: The mass-spectrometer-type leak detector shall be coupled to the unsealed evacuation port of the specimen, and a vacuum created within the specimen. It is extremely important that the coupling connections between the specimen and the leak detector be perfectly sealed. The specimen shall then be subjected to a gas or by spraying the specimen thoroughly with a jet of the gas. If a defect exists in the specimen, an amount of gas that depends upon the size of the defect will be drawn through it and passed into the leak detector, which will read the leakage rate.
- d. Measurements after test: Not applicable.

Following this test, capacitors shall be visually examined for evidence of leakage.

4.6.16 Stability at low and high temperatures (see 3.19). The measurements specified in table VI shall be made in the order shown. Capacitors shall be brought to thermal stability before the measurements are made. Thermal stability will have been reached when no further change in capacitance is observed between two successive measurements taken at 15-minute intervals.

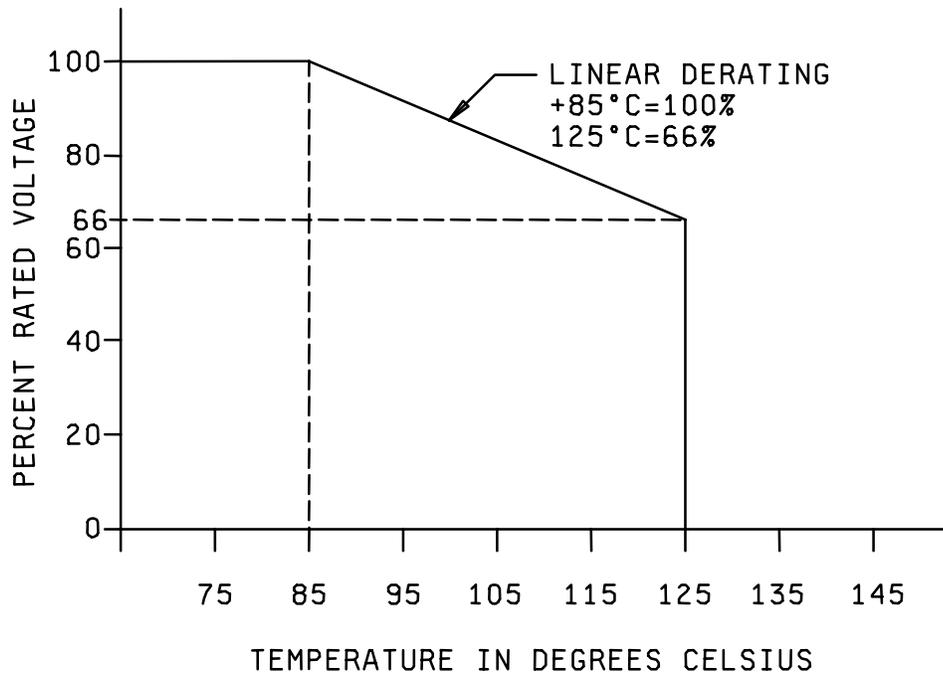
MIL-PRF-83500A

4.6.16.1 Impedance. Capacitors shall be conditioned at $-55^{\circ}\text{C} +0^{\circ}\text{C}, -3^{\circ}\text{C}$ for a period of not less than 30 minutes or until stable measurements can be obtained. The impedance shall then be measured directly or determined from measurements obtained on a bridge. Measurements shall be made at 120 ± 5 Hz. Measurement accuracy shall be within ± 5 percent.

TABLE VI. Temperatures and measurements for stability tests at low and high temperatures.

Step	Temperature	Measurement	Test paragraph
1	$+25^{\circ}\text{C}$	DC leakage Capacitance Dissipation factor	4.6.3 4.6.4 4.5.5
2	$-55^{\circ}\text{C} +0^{\circ}\text{C}, -3^{\circ}\text{C}$	Impedance Capacitance	4.6.16.1 4.6.4
3	$+25^{\circ}\text{C}$	DC leakage Capacitance Dissipation factor	4.6.3 4.6.4 4.6.5
4	$+85^{\circ}\text{C} +3^{\circ}\text{C}, -0^{\circ}\text{C}$	DC leakage Capacitance Dissipation factor	4.6.3 4.6.4 4.6.5
5	$+125^{\circ}\text{C} +4^{\circ}\text{C}, -0^{\circ}\text{C}$	DC leakage ^{1/} Capacitance Dissipation factor	4.6.3 4.6.4 4.6.5
6	$+25^{\circ}\text{C}$	DC leakage Capacitance Dissipation factor	4.6.3 4.6.4 4.6.5

^{1/} During this measurement, derated voltage (see table V) shall be applied (see figure 2).



NOTE: A polarizing voltage must be applied to the capacitor which on negative alternations of the ripple voltage shall preclude polarity reversal and on positive alternations will not cause the capacitor rated voltage to be exceeded.

FIGURE 2. Voltage derating with temperature (+85°C to +125°C) (styles CRL01, CRL02) and (CLR03).

4.6.17 Barometric pressure (reduced) (see 3.20). Capacitors shall be tested in accordance with method 105 of MIL-STD-202. The following details shall apply:

- a. Method of mounting: By normal mounting means.
- b. Test condition: E (150,000 feet).
- c. Test during subjection to reduced pressure: At the end of the conditioning period and with the capacitors still at reduced pressure, the specified voltage (see 3.1) shall be applied for 1 minute ± 5 seconds.
- d. Test after subjection to reduced pressure: Capacitors shall be visually examined for harmful deformation of the case, mechanical damage, obliteration of marking, leakage of electrolyte, and indications of flashover and breakdown.

- e. Exposure time prior to measurements: 5 minutes (minimum).

4.6.18 Reverse voltage (applicable to polarized capacitors only, see 3.1) (see 3.21). Capacitors shall be subjected to a dc potential of 3 volts, applied in the reverse polarity direction, for 125 ± 10 hours. The ambient temperature during the test shall be $+125^\circ\text{C}$. Capacitors shall be maintained at the $+125^\circ\text{C}$ temperature and derated voltage shall be applied in the forward polarity direction for an additional period of 125 ± 10 hours. Capacitors shall then be returned to room ambient temperature and dc leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively.

4.6.19 Life at $+85^\circ\text{C}$ (see 3.22).

4.6.19.1 2,000-hour (qualification inspection)(see 3.22.1). Capacitors shall be tested in accordance with method 108 of MIL-STD-202. The following details and exceptions shall apply:

- a. Distance of temperature measurements from specimens: Not applicable.
- b. Method of mounting: Normal mounting means.
- c. Test temperature and tolerance: $+85^\circ\text{C}$ $+3^\circ\text{C}$, -0°C .
- d. Operating conditions: DC rated voltage (see 3.1) shall be applied gradually (not to exceed 5 minutes either by a slow buildup of the voltage or through a resistor which shall be shorted out within 5 minutes). Voltage shall be applied continuously except for measurement periods. The impedance of the voltage source, as seen from the terminals of each capacitor, shall not exceed 10 ohms. Storage batteries (or an electronic power supply) capable of supplying at least 100 milliamperes when a capacitor is shorted out shall be used. For nonpolarized capacitors, the voltage shall be reversed every 125 ± 10 hours.
- e. Test condition: F (2,000 +72, -0 hours).
- f. Measurements during exposure (at $+85^\circ\text{C}$): DC leakage shall be measured as specified in 4.6.3 during the first hour of exposure and then at 240 +48, -0 hours; 1,000 +48, -0 hours; and 2,000 +72, -0 hours.
- g. Measurements after exposure: Capacitors shall be returned to the inspection conditions specified in 4.2 and dc leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively. Capacitors shall then be visually inspected for evidence of mechanical damage, obliteration of marking, and leakage of electrolyte.

4.6.19.2 240-hour (group B inspection)(see 3.22.2). Capacitors shall be tested as specified in 4.6.19.1, except that the duration of the test shall be 240 +48, -0 hours.

4.6.19.3 6,000- and 10,000-hour (group C inspection) (see 3.22.3). Capacitors shall be tested as specified in 4.6.19.1, except as specified in the following:

- a. Test duration: 10,000 +96, -0 hours.
- b. Measurements during exposure: DC leakage shall be measured during the first hour of exposure and then at 240 +48, -0 hours; 1,000 +48, -0 hours; 2,000 +72, -0 hours, and every 2,000 +72, -0 hours thereafter until 10,000 +96, -0 hours have elapsed.

MIL-PRF-83500A

- c. At the end of 6,000 +72, -0 hours and 10,000 +96, -0 hours, capacitors shall be returned to the inspection conditions specified in 4.3.1, and dc leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively. Capacitors shall then be visually examined for evidence of mechanical damage, obliteration of marking, and leakage of electrolyte.

4.6.20 Life at +125°C (see 3.23). Capacitors shall be tested as specified in 4.6.19.1 and 4.6.19.3, with the following exceptions:

- a. Test temperature and tolerance: +125°C +4°C, -0°C.
- b. Operating conditions-derated voltage (see figure 2) shall be applied.

4.6.21 Vacuum life at +125°C (see 3.24). Capacitors shall be conditioned at +125°C for a period of 50 hours maximum. Capacitors shall then be returned to the inspection conditions specified in 4.2.1 and each capacitor shall be weighed individually. Atmospheric pressure shall be reduced to 1×10^{-6} mm (± 10 percent) and capacitors shall be tested as specified in 4.6.19.1a to 4.6.19.1d inclusive. Test duration shall be 500 +48, -0 hours. Capacitors shall then be returned to the inspection conditions specified in 4.2 and dc leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively. Following these measurements, each capacitor shall be weighed individually. Weight measurement accuracy shall be ± 0.05 milligram.

4.6.22 AC ripple life at +125°C (see 3.25). Capacitors shall be tested as specified in 4.6.19.1, with the following exceptions:

- a. Test temperature and tolerance: 125°C +4°C, -0°C.
- b. Operating conditions: Capacitors shall be tested at 40 ± 2 kHz sinusoidal and 750 mA rms (± 10 percent). The peak ac voltage plus dc shall not exceed the rated voltage of the capacitor.

4.6.23 Fungus (see 3.26). Unless certification is substituted, capacitors shall be tested in accordance with method 508 of MIL-STD-810. Pretest and posttest measurements are not required.

4.6.24 Resistance to solvents (see 3.27). Capacitors shall be tested in accordance with method 215 of MIL-STD-202. The following details shall apply:

- a. Portion of specimen to be brushed: That portion on which marking is present.
- b. Number of specimens to be tested: As specified in applicable inspection tables.
- c. Permissible extent of damage: As specified in 3.27.

4.6.25 Resistance to soldering heat (capacitors with terminal tabs only) (see 3.28). Capacitors shall be tested in accordance with method 210 of MIL-STD-02. The following details and exceptions shall apply:

- a. Depth of immersion: Within .250 inch (6.35 mm) of the seal or case.
- b. Test condition: B (260°C ± 5 °C; 10 ± 1 seconds).

- c. Cooling time prior to final measurements: 10 ± 1 minutes.
- d. Measurements after test: DC leakage, capacitance, and dissipation factor shall be measured as specified in 4.6.3, 4.6.4, and 4.6.5, respectively.

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 Departments 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. Capacitors covered by this specification are military unique due to the fact that these devices must be able to operate satisfactorily in military systems under the following demanding conditions: -55°C to $+125^{\circ}\text{C}$ operating temperature range, 20 G's of vibration, 100 G's of shock, 48 hours of salt atmosphere, 1,000 hours of surge voltage, and 300 cycles of thermal shock. These capacitors also offer high reliability that is verified under a qualification system. Commercial components are not designed to withstand these military environmental conditions.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- c. Packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for the opening of bids, qualified for inclusion in the applicable qualified products list, whether or not such products have been so listed by that date. The attention of the contractors is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is the Defense Supply Center Columbus, ATTN: DSCC/VQP, PO Box 3990, Columbus, OH 43216-5000.

6.3.1 Copies of SD-6. Copies of "Provisions Governing Qualification (SD-6)" may be obtained upon application to Defense Automation and Production Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.4 Life degradation. The life of these capacitors is primarily dependent upon voltage and temperature. When increased life is desired, capacitors may be further derated from the conditions specified in the specification. Under no condition should these capacitors be subjected to voltages above the derated voltage at the maximum rated temperature.

MIL-PRF-83500A

6.5 Mounting of units. Mounting of these units will be left to the discretion of the user. Thixotropic compound or other mechanical clamping may be used.

6.6 Subject term (key word) listing.

Capacitor
Tantalum
Dissipation Factor
Salt atmosphere

6.7 Part or Identifying Number (PIN). This specification requires a PIN that is as described in the appropriate reference to associated documents (see 3.1).

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.

MIL-PRF-83500A

APPENDIX

QUALIFICATION - SUBMITTAL PLANS

A1. SCOPE

A1.1 Scope. This appendix details the qualification submittal plans for capacitors to be subjected to the qualification inspection specified in this specification. These plans specify the sample size, sampling criteria, and limits of coverage for the type of qualification sought.

A2. APPLICABLE DOCUMENTS

A3. SUBMITTAL PLANS

A3.1 Capacitors.

A3.1.1 Single type. The following details apply:

- a. Sample size: As specified in table I.
- b. Sampling criteria: Sample units of the same style, rated voltage, capacitance, capacitance tolerance, and electrolyte.
- c. Limits of coverage: Qualification coverage will be extended to all lower capacitance values and all wider capacitance tolerances than those in the qualified sample, but will not be extended to another style, rated voltage, or electrolyte.

A3.1.2 Voltage - group type. The following details apply:

- a. Sample size: As specified in table VII.
- b. Sampling criteria: Sample units of (1) the same style, voltage group, capacitance tolerance, and electrolyte, and (2) the highest capacitance value for the lowest rated voltage and sample units of the highest capacitance value for the highest rated voltage within a single voltage group.
- c. Limits of coverage: Qualification coverage will be extended to all intermediate (or lower) voltages in the voltage group, all lower capacitance values, and all wider capacitance tolerances than those in the qualified sample, but will not be extended to another style, voltage group, or electrolyte.

MIL-PRF-83500A

APPENDIX

TABLE VII. Voltage - group submittal data.

Style	PIN	Sample size	Rated voltage	Voltage group
CRL01	M83500/01-0001	18	6	I
	M83500/01-0015	18	30	
	M83500/01-0021	18	50	II
	M83500/01-0033	18	125	
CRL02	M83500/01-1001	18	6	I
	M83500/01-1015	18	30	
	M83500/01-1021	18	50	II
	M83500/01-1033	18	125	
CRL03	M83500/01-2001	18	6	I
	M83500/01-2015	18	30	
	M83500/01-2021	18	50	II
	M83500/01-2033	18	125	

A3.1.3 Combined - style type. The following details apply:

- a. Sample size: As specified in table VIII.
- b. Sampling criteria: Sample units of (1) the same voltage group and electrolyte, and (2) the combination of styles as specified in table VIII; one style of the highest capacitance value for the lowest rated voltage, and the other style of the highest capacitance value for the highest rated voltage within a single voltage group.
- c. Limits of coverage: As specified in A3.1.2c, except that coverage will be extended to both styles.

MIL-PRF-83500A

APPENDIX

TABLE VIII. Combined - style submittal data.

Style	PIN	Sample size	Rated voltage	Voltage group
CRL01	M83500/01-0001	9	6	I
CRL02	M83500/01-1001	9	6	
CRL03	M83500/01-2001	9	6	
CRL01	M83500/01-0015	9	30	
CRL02	M83500/01-1015	9	30	
CRL03	M83500/01-2015	9	30	
CRL01	M83500/01-0021	9	50	II
CRL02	M83500/01-1021	9	50	
CRL03	M83500/01-2021	9	50	
CRL01	M83500/01-0033	9	125	
CRL02	M83500/01-1033	9	125	
CRL03	M83500/01-2033	9	125	

Custodians:
 Air Force - 11
 Navy - EC
 DLA - CC

Preparing activity:
 DLA - CC

(Project 5910-2159)