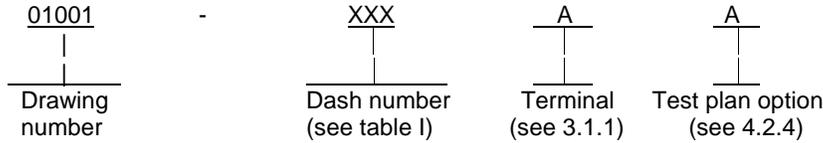


1. SCOPE

1.1 Scope. This drawing and MIL-PRF-39018 describes the requirements for aluminum oxide, electrolytic capacitors.

1.2 Part or Identifying Number (PIN). The complete PIN shall be as follows:



2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 6.5).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-PRF-39018 - Capacitors, Fixed, Electrolytic (Aluminum Oxide), Established Reliability and Non-established Reliability, General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-202 - Test Methods Standards for Electronic and Electrical Component Parts.
MIL-STD-1285 - Marking of Electrical and Electronic Parts.

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

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-39018 and herein (see figure 1).

3.1.1 Terminals. Screw-insert terminal options available are as follows (see figure 1 for terminal dimensions):

A - Low post

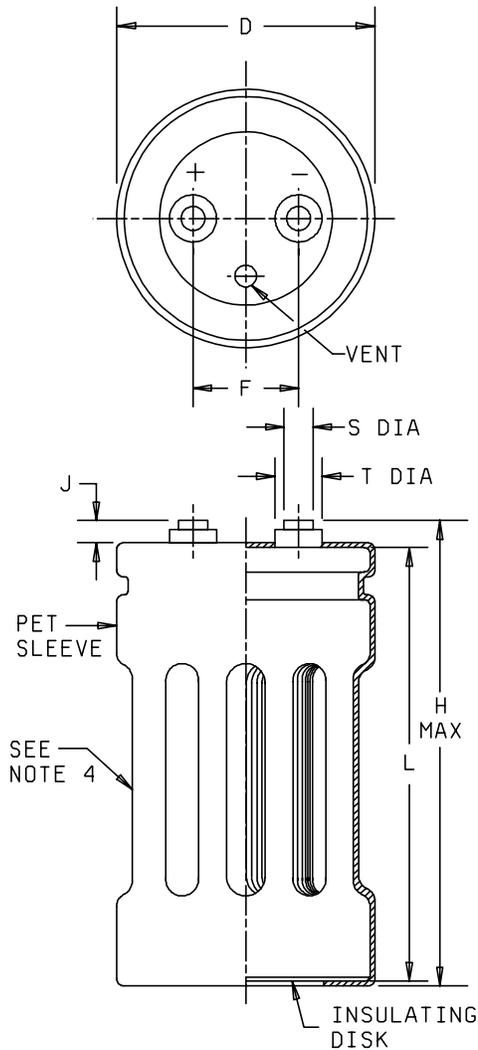
B - High post

3.1.2 Case. Case shall be made with insulated tubular metal.

3.1.3 Operating and storage temperature range. The operating and storage temperature range shall be -40°C to +105°C.

3.1.4 Insulating sleeves. Insulating sleeves shall meet the requirements of MIL-PRF-39018.

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Case code	Diam. (D)		Length (L)		Terminals (F)		H (max)	
	±0.032 Inches	±0.8 mm	±0.063 Inches	±1.60 mm	±0.016 Inches	±0.40 mm	Inches	mm
AH	1.375	34.93	2.625	66.68	0.500	12.7	3.097	78.66
CJ	2.500	63.50	3.625	92.08	1.125	28.58	4.097	104.06

Terminal dimensions

Terminal style	Terminal code	S		T		J		Thread	Thread depth	
		inches (± 0.010)	mm (± 0.25)	inches (± 0.010)	mm (± 0.25)	inches (± 0.032)	mm (± 0.8)		inches	mm
Low post	A	0.313	8.0	-----	-----	0.063	1.6	10-32	0.219	5.6
High post	B	0.313	8.0	0.438	11.1	0.250	6.4	10-32	0.375	9.5

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Case dimensions are for uninsulated case. For insulated case, add 0.078 inch (1.98mm) to diameter and 0.125 inch (3.18mm) to length.
4. Indentations around perimeter of body (dimpled design) are optional.

FIGURE 1. Case dimensions and configuration.

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3.2 Electrical characteristics.

3.2.1 Rated voltage. The rated voltage shall be 450 V dc (500 V dc surge).

3.2.2 Reverse voltage. Capacitors shall withstand a maximum of 1.5 V dc reverse bias.

3.2.3 Dielectric. The dielectric shall be aluminum oxide in accordance with MIL-PRF-39018.

3.2.4 Capacitance. Nominal capacitance at +25°C shall be as specified in table I, when measured at 120 Hz and 1.0 V rms maximum.

3.2.5 Capacitance tolerance. Capacitance tolerance shall be ± 20 percent.

3.2.6 Equivalent series resistance (ESR). Equivalent series resistance at 120 Hz shall not exceed the values shown in table I at +25°C, when measured with a maximum of 1.0 V rms applied.

3.2.7 DC leakage current. DC leakage current at +25°C shall not exceed values determined from the equation $I = 0.02CV$ or 5 mA, whichever is smaller, after 5 minutes at +25°C.

Where: I = leakage current in (μA)

V = rated voltage in volts

C = capacitance in μF

3.3 Performance requirements.

3.3.1 Voltage conditioning (test plan option B only). Capacitors shall be tested as specified in MIL-PRF-39018, burn-in test. After the test, capacitors shall be stabilized at room ambient conditions and shall meet the following:

- a. DC leakage shall meet initial requirement.
- b. Capacitance shall be within the specified tolerance.
- c. ESR shall meet initial requirements.

3.3.2 Ripple current. Capacitors shall withstand the rms ripple current at 120 Hz and +85°C specified in table I. For temperatures other than +85°C, the rms ripple current must be multiplied by the applicable factor specified in table II. For frequencies other than 120 Hz, use the multiplication factor specified in table III.

3.3.3 Ripple life. DC rated voltage with rated ripple current shall be applied continuously for 2,000 hours, + 72 hours, -0 hours at +105°C. After test, capacitors shall be stabilized at room temperature for a minimum of 24 hours and shall then meet the following:

- a. DC leakage shall meet initial requirement.
- b. Capacitance change shall not exceed ± 20 percent from initial measured value.
- c. ESR shall not be greater than 200 percent of initial requirement.

3.3.4 Surge voltage. Capacitors shall be subjected to the surge voltage test of MIL-PRF-39018. Following the test, capacitors shall be stabilized at room temperature and shall then meet the following:

- a. DC leakage shall meet initial requirement.
- b. There shall be no evidence of mechanical damage or leakage of electrolyte.

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3.3.5 Stability at reduced and high temperature. Capacitors shall be tested as specified in MIL-PRF-39018. Following exposure the capacitors shall meet the following:

a. Step 1: (+25°C)

DC leakage shall meet the initial requirement.

Capacitance shall meet initial requirement.

ESR shall meet the initial requirement.

b. Step 2: (-40°C)

Capacitance shall be within 30 percent of the step 1 measured value.

c. Steps 3 and 5: (+25°C)

DC leakage shall meet initial requirement.

Capacitance shall be within 5 percent of the step 1 measured value.

ESR shall meet initial requirement.

d. Step 4: (+105°C)

DC leakage shall meet initial requirement

Capacitance shall be within 30 percent of the step 1 measured value.

ESR shall meet initial requirement.

3.3.6 Shelf test. Capacitors shall be subjected to a shelf test at +105°C for 500 hours. No voltage shall be applied. After test, capacitors shall be removed from the test chamber and stabilized at room temperature. Rated voltage shall be applied for 30 minutes and capacitors shall then meet the following:

a. DC leakage shall meet initial requirement.

b. Capacitance shall be within 20 percent of initial measurement.

c. ESR shall be \leq 200 percent of initial requirement.

3.3.7 Vibration. Capacitors shall be tested in accordance with MIL-PRF-39018, high frequency vibration (MIL-STD-202, method 204, test condition B (15g)), except that frequency shall be varied between 10 and 1,000 Hz.. There shall be no intermittent contacts of 0.5 millisecond or greater duration, arcing, or open-circuiting or short-circuiting, nor shall there be any evidence of mechanical damage or leakage of electrolyte.

3.3.8 Thermal shock. Capacitors shall be tested in accordance with MIL-PRF-39018 and MIL-STD-202, method 107, test condition A-1, except step 1 shall be -40°C and step 3 shall be 105°C. Following the test, capacitors shall meet the following:

a. DC leakage shall meet initial requirements.

b. Capacitance shall be within 5 percent of initial measurement.

c. ESR shall meet initial requirements.

3.3.9 Vent test. Capacitors shall be tested in accordance with MIL-PRF-39018.

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3.3.10 Terminal strength. Terminals shall be tested in accordance with MIL-PRF-39018, torque test. Applied torque shall be as follows:

10-32 screw thread - 25 pound-inches

3.4 Marking. Marking shall be in accordance with MIL-STD-1285, except the PIN shall be as specified in 1.2 with the manufacturer's name or CAGE code and date code.

3.5 Manufacturer eligibility. To be eligible for listing as a suggested source of supply, a manufacturer shall be listed on the MIL-PRF-39018 Qualified Products List for at least one part, or perform the group A and B inspections specified herein on a sample of parts agreed upon by the manufacturer and DSCC-VA.

3.6 Certificate of compliance. A certificate of compliance shall be required from manufacturers requesting to be a suggested source of supply.

3.7 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.

3.8 Workmanship. The capacitor shall be uniform in quality and free from any defects that will affect life, serviceability, or appearance.

TABLE I. Electrical characteristics.

PIN 01001-	Capacitance μF	Maximum ESR (mΩ) at +25°C	Maximum ripple 120 Hz, +85°C (amps)	Case code
		120 Hz		
450 V dc (500 V dc surge)				
001	270	600	1.94	AH
002	1,300	57.3	11.0	CJ
003	1,700	54.1	12.5	CJ

TABLE II. Ripple current multipliers at various temperatures.

≤ +45°C	+65°C	+85°C	+105°C
1.41	1.29	1.00	0.57

TABLE III. Ripple current multipliers at various frequencies.

PIN	50 Hz	120 Hz	300 Hz	1 kHz	3 kHz	10 kHz	50 kHz
01001-							
001	0.80	1.00	1.19	1.34	-----	1.46	1.52
002 & 003	0.80	1.00	1.05	1.10	1.40	-----	-----

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4. VERIFICATION

4.1 Qualification inspection. Qualification inspection is not required.

4.2 Conformance inspection.

4.2.1 Inspection of product for delivery. Inspection of product for delivery shall consist of the inspections specified in the test plan (see Table IV).

4.2.2 Group A inspection. Group A inspection shall consist of the tests specified in table V in the order shown.

4.2.3 Group B inspection. Group B inspection shall consist of the tests specified in table VI in the order shown. When group B inspection is required to be performed, product may be shipped upon successful completion of 250 hours of the shelf test and 250 hours of the ripple life test. Inspection samples shall remain on test until completion of the total test requirement.

4.2.4 Test plans. Two test plan options are available and are identified by a single character code which is included in the PIN (see 1.2). The test plan options are specified in table IV.

4.2.5 Certificate of compliance (C of C). A certificate of compliance for group B inspection requirements is acceptable for test plan option A, instead of performing the group B inspection.

4.2.6 Inspection of packaging. Inspection of packaging shall be in accordance with MIL-PRF-39018.

TABLE IV. Test plans.

Test plan A		Test plan B	
Inspection	Sampling requirement	Inspection	Sampling requirement
Voltage conditioning	Not required	Voltage conditioning	100 percent
Group A	100 percent	Group A	100 percent
Group B	C of C	Group B	see table VI

TABLE V. Group A inspection.

Inspection	Requirement paragraph
DC leakage	3.2.7
Capacitance	3.2.4; 3.2.5
ESR	3.2.6
Visual and mechanical	3.1; 3.3; 3.7

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TABLE VI. Group B inspection.

Inspection	Requirement paragraph	Sampling Procedure <u>1/</u>	
		Sample size	Failures allowed
<u>Subgroup 1</u> Stability at low and high temperature Terminal strength	3.3.5 3.3.10	12	1
<u>Subgroup 2</u> Surge voltage Vent	3.3.4 3.3.9	12	
<u>Subgroup 3</u> Vibration Thermal shock	3.3.7 3.3.8	12	1
<u>Subgroup 4</u> Shelf test <u>2/</u>	3.3.6	12	
<u>Subgroup 5</u> Ripple Life <u>2/</u>	3.3.3	12	

1/ When lot size is <100 pieces, the manufacturer may reduce the sample size for each subgroup to "4" with 0 failures allowed.

2/ Product may be shipped upon successful completion of 250 hours of test. Inspection samples shall remain on test until the inspection requirement is completed.

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 which may be helpful, but is not mandatory.)

6.1 Intended use. Capacitors conforming to this drawing provide higher voltages than similar capacitors in military specification MIL-PRF-39018, and provide higher operating temperature, higher capacitance values and/or higher ripple current capability than similar capacitors currently covered in military specification MIL-C-62 and other DSCC drawings. This drawing is intended to prevent the proliferation of unnecessary duplicate specifications, drawings, and stock catalog listings. When a military specification exists and the product covered by this drawing has been qualified for listing, this drawing becomes obsolete and will not be used for new design.

6.2 Mounting. The preferred mounting position is in the vertical position with the pressure relief vent up. If mounted horizontally, the pressure relief vent should be positioned up.

6.2.1 Mounting torque. Excess torque during tightening screw terminals may effect the performance of the capacitor or damage the terminal. The recommended mounting torque (with minimum 6 threads engaged) are as follows:

10-32 screw thread - 25 inch-pound.

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6.3 Hydrogen leakage. The expected hydrogen leakage during normal operation should be no more than 1.6cc/hour assuming the maximum dc leakage of .005A max.

6.4 Shelf life. Normal shelf life is about 5 years. Capacitors stored more than 5 years should be checked for DCL to determine whether they meet requirements. Apply rated voltage for 30 minutes through a 1000 ohm resistor to bring DCL within limits.

6.5 Ordering data. The contract or purchase order should specify the following:

- a. Complete PIN (see 1.2).
- b. Requirements for delivery of one copy of the conformance inspection data or certificate of compliance that parts have passed conformance inspection with each shipment of parts by the manufacturer.
- c. Requirements for packaging and packing.

6.6 Replaceability. Capacitors covered by this drawing will replace the same commercial device covered by contractor-prepared specification or drawing.

6.7 Similar vendor types. See table VII.

6.8 Users of record. Coordination of this document for future revisions are coordinated only with the suggested sources of supply and the users of record of this document. Requests to be added as a recorded user of this drawing should be in writing to: Defense Supply Center, Columbus, ATTN: DSCC/VAT, Post Office Box 3990, Columbus, OH 43216-5000 or by telephone (614) 692-0563 or DSN 850-0563.

6.9 Suggested sources of supply. Suggested sources of supply are listed herein. Additional sources will be added as they become available. For assistance in the use of this drawing, contact Defense Supply Center, Columbus, ATTN: DSCC-VAT, Post Office Box 3990, Columbus, OH 43216-5000 or by telephone (614) 692-0563 or DSN 850-0563.

TABLE VII. Similar vendor types.

PIN 01001-	Similar vendor type ^{1/}
001	U32D450LG271M35X67
002	U32D450LG132M63X92
003	U32D450LG172M63X92

^{1/} Caution. Do not use this number for item acquisition and marking. The similar vendor type may not satisfy the performance requirements of this drawing.

<u>Vendor</u>	<u>CAGE</u>
United Chemi-Con 185 McNeil Road Lansing, NC 28643-8301	7M138

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