

TINCH-POUND

MIL-C-39018/8B
7 January 1991

SUPERSEDING
MIL-C-39018/8A
14 September 1982

MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, ELECTROLYTIC (ALUMINUM OXIDE) (POLARIZED),
NON-ESTABLISHED RELIABILITY AND ESTABLISHED RELIABILITY,
STYLES CU01 (INSULATED) AND CU01 (INSULATED)

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

The requirements for acquiring the product described herein shall
consist of this specification sheet and the issue of the following
specification listed in that issue of the Department of Defense Index
of Specifications and Standards (DODISS) specified in the solicitation:
MIL-C-39018.

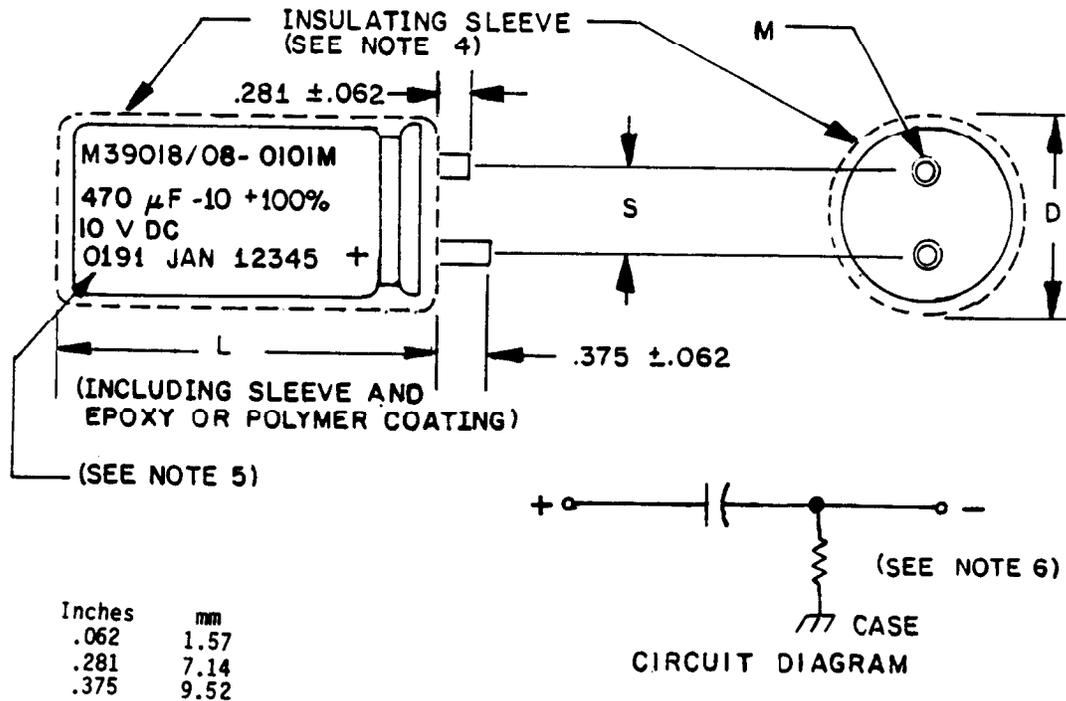


FIGURE 1. Styles CU01 and CU01 insulated capacitors.

ⓑ denotes changes

Case size	Insulated dimensions			
	L \pm .050 (1.27) See note 7	D \pm .015 (0.38)	S \pm .015 (0.38)	M \pm .003 (0.08)
(B) A1	.582 (14.78)	.398 (10.11)	.200 (5.08)	.025 (0.64)
A2	.690 (17.53)	.398 (10.11)	.200 (5.08)	.025 (0.64)
A3	.877 (22.28)	.398 (10.11)	.200 (5.08)	.025 (0.64)
B1	1.100 (27.94)	.500 (12.70)	.200 (5.08)	.032 (0.81)
B2	1.379 (35.03)	.500 (12.70)	.200 (5.08)	.032 (0.81)
C1	1.070 (27.18)	.635 (16.13)	.300 (7.62)	.032 (0.81)
C2	1.366 (34.70)	.635 (16.13)	.300 (7.62)	.032 (0.81)

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are for general information only.
3. Metric equivalents are in parentheses.
4. Insulating sleeve shall overlap the ends of the capacitor body.
5. Example of marking and its relative location on the capacitor body.
6. There is an indeterminate resistance between the metal case and the negative terminal.
7. Tolerance of B1 length is \pm .065 (1.65).

FIGURE 1. Styles CU01 and CU01 insulated capacitors - Continued.

REQUIREMENTS:

Dimensions and configuration: See figure 1.

Case:

Type - Tubular.

Material - Metal.

Terminals: See figure 1.

DC rated voltage: See tables I and II.

Reverse voltage: 1.5 volts maximum.

Capacitance (Cap.) value: See tables I and II.

Cap. tolerance: -10, +100 percent.

Failure rate level (Curo1 only): M, P, R, and S.

Burn-in (Curo1 only): In accordance with MIL-C-39018.

Operating temperature range: -55°C to +105°C.

DC leakage (DCL): See tables I and II.

Equivalent series resistance (ESR): See tables I and II.

Low temperature exposure:

DCL - See tables I and II.

Cap. - See tables I and II.

ESR - See tables I and II.

Terminal strength: Method 211, MIL-STD-202, test conditions A (3 pounds) and D (3 rotations).

Stability at reduced and high temperatures:

Step 1 (at +25°C):

DCL - See tables I and II.

Cap. - See tables I and II.

ESR - See tables I and II.

Step 2 (at -55°C):

Impedance - See tables I and II.

Δ Cap. - Shall not exceed the following percentages of the step 1 value:

7 V dc: *35 percent.

10 to 30 V dc, inclusive: *25 percent.

50 to 100 V dc, inclusive: *20 percent.

Step 3 (at +25°C):

DCL - See tables I and II.

Δ Cap. - Shall not exceed *5 percent of step 1 value.

ESR - See tables I and II.

TABLE I. Style CU01 capacitors.

DC rated voltage at +85°C and +105°C	Nominal capacitance	DC surge voltage at +85°C and +105°C		Equivalent series resistance at +25°C (max)		Maximum impedance at +25°C (100 kHz)	Maximum impedance at -55°C (100 kHz)	Maximum dc leakage		Maximum ac ripple current at +85°C (20 - 100 kHz)	Case size	Dash number
		Volts	Volts	Ohms	Ohms			μA	μA			
7	150	10	1.30	0.72	0.50	9.00	2.9	17.4	0.45	A2	0001	
10	100	15	1.70	1.00	0.70	10.50	3.3	19.8	0.36	A1	0002	
10	220	15	0.79	0.42	0.33	4.95	4.9	29.4	0.63	A3	0003	
15	68	20	2.50	1.12	0.85	12.75	4.1	24.6	0.36	A1	0004	
15	100	20	1.70	0.70	0.50	7.50	5.0	30.0	0.45	A2	0005	
15	150	20	1.20	0.40	0.35	5.25	6.1	36.6	0.63	A3	0006	
30	33	40	3.20	2.10	1.50	15.00	5.7	34.2	0.23	A1	0007	
30	47	40	2.30	1.35	1.00	10.00	6.9	41.4	0.32	A2	0008	
30	100	40	1.30	0.45	0.35	3.50	10.0	60.0	0.63	A3	0009	
50	15	75	7.10	3.00	2.20	22.00	6.5	38.7	0.20	A1	0010	
50	22	75	4.80	2.25	1.40	14.00	7.8	46.8	0.27	A2	0011	
50	47	75	2.30	1.50	1.20	12.00	11.4	68.4	0.32	A3	0012	
75	6.8	100	15.60	3.70	3.00	63.00	6.5	39.0	0.18	A1	0013	
75	10	100	10.60	3.00	2.40	50.40	7.9	47.4	0.22	A2	0014	
75	15	100	7.10	2.00	1.60	33.60	9.7	58.2	0.32	A3	0015	
100	4.7	150	19.80	3.75	3.00	63.00	7.2	43.2	0.18	A1	0016	
100	6.8	150	13.70	3.00	2.40	50.40	8.7	52.2	0.22	A2	0017	
100	10	150	9.30	2.00	1.60	33.60	10.5	63.0	0.32	A3	0018	

TABLE II. Style CU001 capacitors.

DC rated voltage at +85°C and +105°C	Nominal capacitance	DC surge voltage at +85°C and +105°C		Equivalent series resistance at +25°C (max)		Maximum impedance at +25°C 100 kHz	Maximum impedance at -55°C (100 kHz)	Maximum dc leakage		Maximum ac ripple current at +85°C (20 - 100 kHz)	Case size	Dash number 1/
		Volts	Volts	Ohms	Ohms			μA	Amperes			
	μF			120 Hz	10 kHz			+25°C	+105°C			
10	470	15	0.37	0.16	0.12	1.80	7.21	43.2	1.17	B1	0101-	
10	680	15	0.25	0.13	0.10	1.50	8.71	52.2	1.44	B2	0102-	
15	330	20	0.52	0.18	0.12	1.80	9.11	54.6	1.17	B1	0103-	
15	470	20	0.37	0.14	0.11	1.65	10.81	64.8	1.44	B2	0104-	
15	680	20	0.25	0.12	0.10	1.50	13.01	78.0	1.58	C1	0105-	
15	1000	20	0.17	0.08	0.06	0.90	15.81	94.8	2.25	C2	0106-	
30	150	40	0.71	0.33	0.18	1.80	12.21	73.2	0.81	B1	0107-	
30	220	40	0.48	0.22	0.17	1.70	14.81	88.8	1.35	C1	0108-	
30	330	40	0.32	0.20	0.10	1.00	18.21	109.2	1.80	C2	0109-	
50	68	75	1.60	0.60	0.40	4.00	13.71	82.2	0.58	B1	0110-	
50	100	75	1.10	0.40	0.28	2.80	16.71	100.2	0.90	B2	0111-	
50	150	75	0.71	0.32	0.25	2.50	20.41	122.4	1.08	C1	0112-	
50	220	75	0.48	0.20	0.17	1.70	24.71	148.2	1.44	C2	0113-	
75	47	100	2.30	0.60	0.40	8.40	17.11	102.6	0.58	B1	0114-	
75	68	100	1.60	0.40	0.35	7.35	20.61	123.6	0.72	C1	0115-	
75	100	100	1.10	0.30	0.22	4.62	25.01	150.0	0.90	C2	0116-	
100	22	150	4.30	0.83	0.55	11.55	15.61	93.6	0.58	B1	0117-	
100	33	150	2.80	0.42	0.35	7.35	19.11	114.6	0.86	C1	0118-	
100	68	150	1.40	0.30	0.20	4.20	27.51	165.0	1.12	C2	0119-	

1/ Complete PIN shall include a letter symbol to indicate failure rate level (i.e., 0101M, 0112R, etc.).
 For parts with random vibration, the letter R shall be used in place of the dash (i.e., M39018/08R0101M).

Step 4 (at +105°C):

DCL - See tables I and II.
ΔCap. - Shall not exceed ±30 percent of step 1 value.
ESR - See tables I and II.

Step 5 (at +25°C):

DCL - See tables I and II.
ΔCap. - Shall not exceed ±5 percent of step 1 value.
ESR - See tables I and II.

Life: Method 108, MIL-STD-202.

For qualification: Condition F (2,000 hours) at +85°C.

DCL - See tables I and II.
ΔCap. - Shall not exceed ±10 percent of initial measured value.
ESR - Not more than 130 percent of initial requirement.

For quality conformance: Performance check, condition B (250 hours) at +85°C (non-ER).

DCL - See table I.
ΔCap. - Shall not exceed ±10 percent of initial measured value.
ESR - See table I.

For quality conformance: Continuation test (1,750 hours) at +85°C (non-ER).

DCL - See table I.
ΔCap. - Shall not exceed ±15 percent of initial measured value.
ESR - Not more than 150 percent of initial requirement.

For quality conformance: 10,000 hours (ER) at +85°C.

DCL - At +25°C, initial limit; at +85°C, 125 percent of initial limit.
ΔCap. - Shall not exceed ±25 percent of initial measured value.
ESR - Not more than 200 percent of initial requirement.

Vibration:

Low frequency - Method 201, MIL-STD-202.

- ⓑ Random (style CUR01 only) (when applicable) - In accordance with MIL-C-39018.

Thermal shock and immersion:

- ⓑ Thermal shock: Method 107, MIL-STD-202, condition A, except that in step 3, units shall be tested at applicable high temperature.

Immersion: Method 104, MIL-STD-202, condition B (2 cycles, 30 minutes).

DCL - See tables I and II.
ΔCap. - Shall not exceed ±5 percent of initial measured value.
ESR - See tables I and II.
Case insulation - Shall meet initial requirements.

Surge voltage:

DCL - See tables I and II.
ΔCap. - Shall not exceed ±6 percent of initial measured value.
ESR - See tables I and II.

MIL-C-39018/8B

Moisture resistance: Method 106, MIL-STD-202.

- DCL - See tables I and II.
- ΔCap. - Shall not exceed ±6 percent of initial measured value.
- ESR - See tables I and II.
- Case insulation - Shall meet initial requirements.

High temperature exposure (500 hours at +105°C):

- DCL - Not more than 200 percent of initial requirement.
- ΔCap. - Shall not exceed ±10 percent of initial measured value.
- ESR - Not more than 115 percent of initial requirement.

Penetration of solvents: In accordance with MIL-C-39018.

High temperature verification: In accordance with MIL-C-39018 at +105°C with rated voltage applied.

- DCL - See tables I and II.
- ΔCap. - Shall not exceed ±10 percent of initial measured value.
- ESR - Not more than 150 percent of initial requirement.

Reverse voltage aging: In accordance with MIL-C-39018.

Marking: In accordance with MIL-C-39018.

- ⓑ Part or Identifying Number (PIN): M39018/08- (dash number from table I or II). For style CUR01 with random vibration, the letter R shall be used in place of the dash (i.e., M39018/08R0101M).

APPLICATION NOTES:

1. Ripple current: Capacitors shall withstand the rms ripple current at 20 kHz through 100 kHz as given in table I or II.

The maximum ripple current values apply with the following qualifications:

The sum of the applied dc voltage plus the peak value of the impressed ac voltage must not exceed the dc rated voltage of the capacitor.

The sum of the applied dc voltage plus the peak value of the impressed ac voltage must be such that not more than 1.5 volt reversal is experienced by the capacitor.

If capacitors are operated at a frequency less than 20 kHz, the rated 20 kHz rms ripple current must be multiplied by the factors in table III.

TABLE III. Factors for determining ripple current at various frequencies.

Rated voltage	Frequency (in Hertz)				
	60	120	400	1 k - 19 k	20 k - 100 k
7 - 75	.60	.71	.75	.82	1.0
100	.43	.54	.71	.79	1.0

Where capacitors are operated at a temperature other than +85°C, the permissible rms ripple current must be multiplied by the factors in table IV.

TABLE IV. Factors for determining ripple current at various temperatures.

Ambient temperature	Factor
+105°C	0.5
+ 85°C	1.0
+ 65°C	1.4
+ 45°C	1.7

When capacitors are operated at both a temperature and frequency other than +85°C and less than 20 kHz, respectively, both the multiplying factors described in tables III and IV must be used to obtain the permissible rms ripple current.

Under no conditions of temperature or frequency, regardless of the multipliers given above, should the rms ripple current exceed 5 amperes.

2. Insulation and grounding: These capacitors possess an indeterminate insulation resistance between the cathode terminal and the case. Where a potential difference exists between the cathode terminal and the chassis or other metallic mounting surfaces (which are usually at ground potential), the capacitors should be mounted in such a manner as to insulate the container from such mounting surfaces.
3. Operating life (Curo1 only): These capacitors are expected to have a useful operating life in excess of 10 years when subjected to typical circuit environments and operating conditions. Life can be extended by derating with regard to environmental and electrical requirements.
- ④ 4. Shelf-life: Shelf life and reforming procedures shall be in accordance with MIL-STD-1131.

CONCLUDING MATERIAL

Custodians:
 Army - ER
 Navy - EC
 Air Force - 85

Review activities:
 Navy - SH
 Air Force - 17, 99
 DLA - ES

User activities:
 Navy - AS, CG, MC, OS
 Air Force - 19

Preparing activity:
 Navy - EC

Agent:
 DLA - ES

(Project 5910-1688-8)