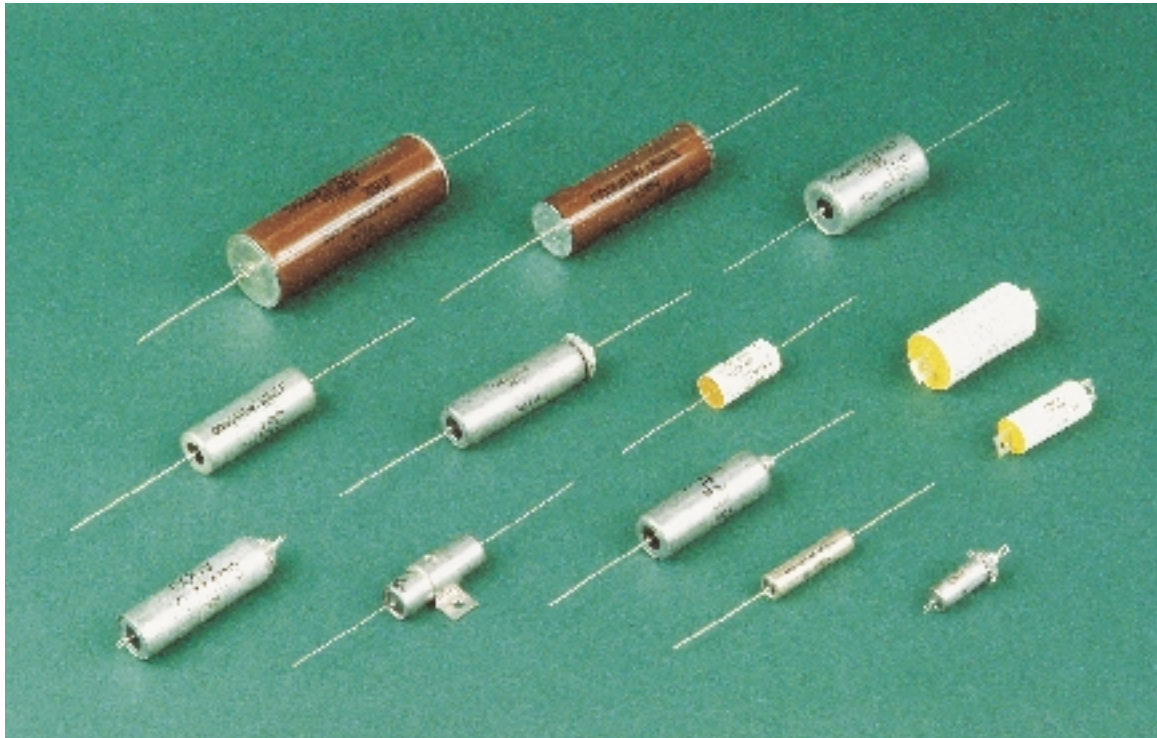


# MILITARY APPROVED FILM CAPACITORS



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**MILITARY CAPACITOR REPLACEMENT TABLE**

Military Specification	Inactive Style*	Military Specification	Replacement Style
MIL-C-39022/09	CHR01	MIL-C-83421/01	CRH01 CRH02 CRH03 CRH04 CRH05
MIL-C-18312	CH09 CH12	MIL-C-39022/01 /08	CRH09 CRH12
MIL-C-19978/01 /01 /01 /01 /01 /01 /01 /01 /12 /16 /17 /18 /19 /20 /21	CQ08 (K) CQ08 (M) CQ09 (K) CQ09 (M) CQ12 (K) CQ12 (M) CQ13 (K) CQ13 (M) CQR19 CQR39 CQR42 CQR43 CQ05 CQ10 CQ11	MIL-C-19978/09 /13 /09 /13 /10 /14 /11 /15 /09 /09 /10 /11 /11 /09 /10 /11	CQR09 CQR29 CQR09 CQR29 CQR12 CQR32 CQR13 CQR33 CQR09 CQR09 CQR12 CQR13 CQR13 CQR09 CQR12 CQR13
MIL-C-25	CP08 CP09 CP12 CP13 CP04 CP05 CP10 CP11	MIL-C-19978/16 /16 /17 /18 /19 /19 /20 /21	CQR39 CQR39 CQR42 CQR43 CQ05 CQ05 CQ10 CQ11

\* CHARACTERISTIC SHOWN IN PARENTHESES

**MIL STYLE CAPACITORS**

Military style capacitors are manufactured by Dearborn Electronics, Inc. to meet all the requirements of the pertinent military specifications. All capacitors ordered by the military part number will be manufactured, tested and marked in accordance with the military specifications. The information listed herein has been abstracted from the individual military specifications and is intended to be used as a guide when ordering these products. The military specification shall be used for verification for specific operational parameters and other characteristics. Should there be a conflict between the military specification requirements and these data sheets the Mil Spec shall prevail.

**ESTABLISHED RELIABILITY CAPACITORS.**

The reliability of these capacitors is established by continuous life testing performed at maximum rated voltage and maximum rated temperature. The maximum failure rate at 90% confidence level is expressed as a percent failures for each 1000 hours of test. Dearborn has attained a failure rate level of .001% per 1000 hrs on certain of these specifications. **This is the lowest failure rate available for these specifications and the true failure rates are much lower than stated.** The failure rate levels attained for each specification are listed on the following page. Failure rate levels are 1%/1000 hrs (M) .1%/1000 hrs (P) .01%/1000 hrs (R) and .001%/1000 hrs (S).

## MILITARY SPECIFICATION QUALIFICATION APPROVAL

Military Specification	MIL Type	Characteristic/Dielectric	Voltage Range	Dearborn Type	Remarks
Mil-C-11693/7	CZ23	E K, Paper/Foil	100-600	103P	
	CZ24	E K, Paper/Foil	100-600	103P	
	CZR23	E K, Paper/Foil	100-600	103P	Failure Rate M
	CZR24	E K, Paper/Foil	100-600	103P	Failure Rate M
Mil-C-18312/2	CH09	R, N, Met. Paper & Polyester	50-600	218, 118P	
Mil-C-18312/3	CH12	N Met. Paper & Polyester	200-600	118P	
Mil-C-19978/1	CQ08, 9, 12, 13	K, Paper/Polyester-Foil	200-1000	131P	
	CQ08, 9, 12, 13	M, Polyester/Foil	30-1000	127P	
Mil-C-19978/2	CQ20	K, Paper/Polyester-Foil	1Kv-15Kv	205P	
Mil-C-19978/5	CQ06, 07	Q,Polycarbonate-Foil	50-600	237P	
Mil-C-19978/8	CQR07	Q,Polycarbonate-Foil	50-600	237P	Failure Rate L, M, P, R
Mil-C-19978/9	CQR09	K, Paper/Polyester-Foil	200-1000	131P	Failure Rate L, M, P, R
Mil-C-19978/10	CQR12	K, Paper/Polyester-Foil	200-1000	131P	Failure Rate L, M, P, R
Mil-C-19978/11	CQR13	K, Paper/Polyester-Foil	200-1000	131P	Failure Rate L, M, P, R
Mil-C-19978/12	CQR19	K, Paper/Polyester-Foil	200-600	131P	Failure Rate L, M, P, R
Mil-C-19978/13	CQR29	M, Polyester/Foil	30-1000	127P	Failure Rate L, M, P, R
Mil-C-19978/14	CQR32	M, Polyester/Foil	30-1000	127P	Failure Rate L, M, P, R
Mil-C-19978/15	CQR33	M, Polyester/Foil	30-1000	127P	Failure Rate L, M, P, R
Mil-C-19978/16	CQR39	K, Paper/Polyester-Foil	100-1000	131P	Failure Rate L, M, P, R
Mil-C-19978/17	CQR42	K, Paper/Polyester-Foil	100-1000	131P	Failure Rate L, M, P, R
Mil-C-19978/18	CQR43	K, Paper/Polyester-Foil	100-1000	131P	Failure Rate L, M, P, R
Mil-C-19978/19	CQ05	K, Paper/Polyester-Foil	100-1000	131P	
Mil-C-19978/20	CQ10	K, Paper/Polyester-Foil	100-1000	131P	
Mil-C-19978/21	CQ11	K, Paper/Polyester-Foil	100-600	131P	
Mil-C-39022/1	CHR09	R, N, Met. Paper & Polyester	50-600	218P, 118P	Failure Rate L, M, P, R
Mil-C-39022/2	CHR19	N, Met. Paper & Polyester	200-600	118P	Failure Rate L, M, P, R
Mil-C-39022/7	CHR49	Met. Polycarbonate	80-400VAC	259P	Failure Rate L, M, P
Mil-C-39022/8	CHR12	R, N, Met. Paper & Polyester	50-600	218P, 118P	Failure Rate L, M, P, R
Mil-C-39022/9	CHR01	Met. Polycarbonate	30-400	LP9-621P	Failure Rate L, M, P, R, S
Mil-C-39022/10	CHR10	Met. Polycarbonate	30-400	LP9-620P	Failure Rate M, P, R, S
Mil-C-55514/7	CFR09	R, Met. Polycarbonate	50-200	LP88-642P	Failure Rate M, P
Mil-C-55514/9	CFR13, 14	L, Met. Polypropylene	100-400	735P	Failure Rate M, P
Mil-C-55514/10	CFR15	K, Polypropylene-Foil	200-800	710P	Failure Rate M, P
Mil-C-83421/1	CRH01, 06	Met. Polycarbonate	30	LP9-621P	Failure Rate M, P, R, S
	CRH02, 07	Met. Polycarbonate	50	LP9-621P	
	CRH03, 08	Met. Polycarbonate	100	LP9-621P	
	CRH04, 09	Met. Polycarbonate	200	LP9-621P	
	CRH05, 00	Met. Polycarbonate	400	LP9-621P	
Mil-C-83421/2	CRH11	L, Met. Polypropylene	100	720P	Failure Rate M
	CRH12	L, Met. Polypropylene	200	720P	
	CRH13	L, Met. Polypropylene	400	720P	
Mil-C-83439/4		Met. Polycarbonate	50-400	629P	Manufactured to
Mil-C-83439/6		Met. Polycarbonate	50-400	LP42	Manufactured to

**Hermetically-Sealed Capacitors  
To Military Specification  
MIL-C-11693/07**

**MIL STYLE CZR23, CZR24**

CIRCUIT DIAGRAM



**PART NUMBERING SYSTEM**

**CZR23**  
**CZR24 B K C 473 M**

**FAILURE RATE LEVEL M = 1.0%**

**CAPACITANCE.** THIS IS EXPRESSED IN PICOFARADS. THE FIRST TWO DIGITS ARE SIGNIFICANT. THE THIRD IS THE NUMBER OF ZEROS.

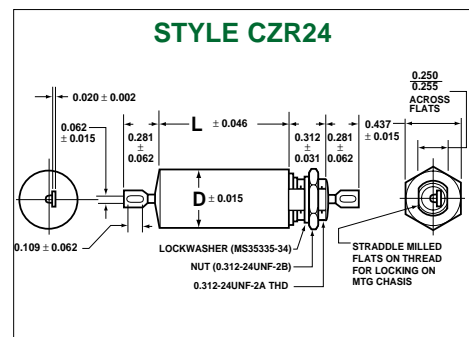
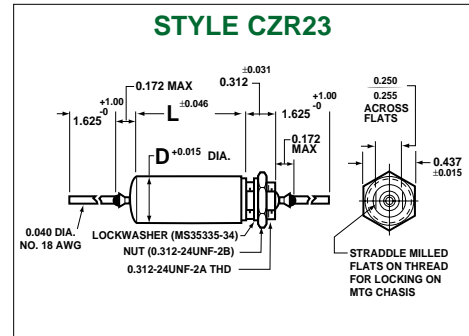
**WORKING VOLTAGE.** C = 200 VDC  
E = 400 VDC  
F = 600 VDC

**CHARACTERISTIC.** E = -55°C TO + 85°C  
K = -55°C TO +125°C

**CURRENT.** B = 10 AMPERES

**STYLE.** CZR23 = WIRE LEADS  
CZR24 = TAB TERMINALS

THIS INFORMATION HAS BEEN ABSTRACTED FROM MIL-C-11693/07.

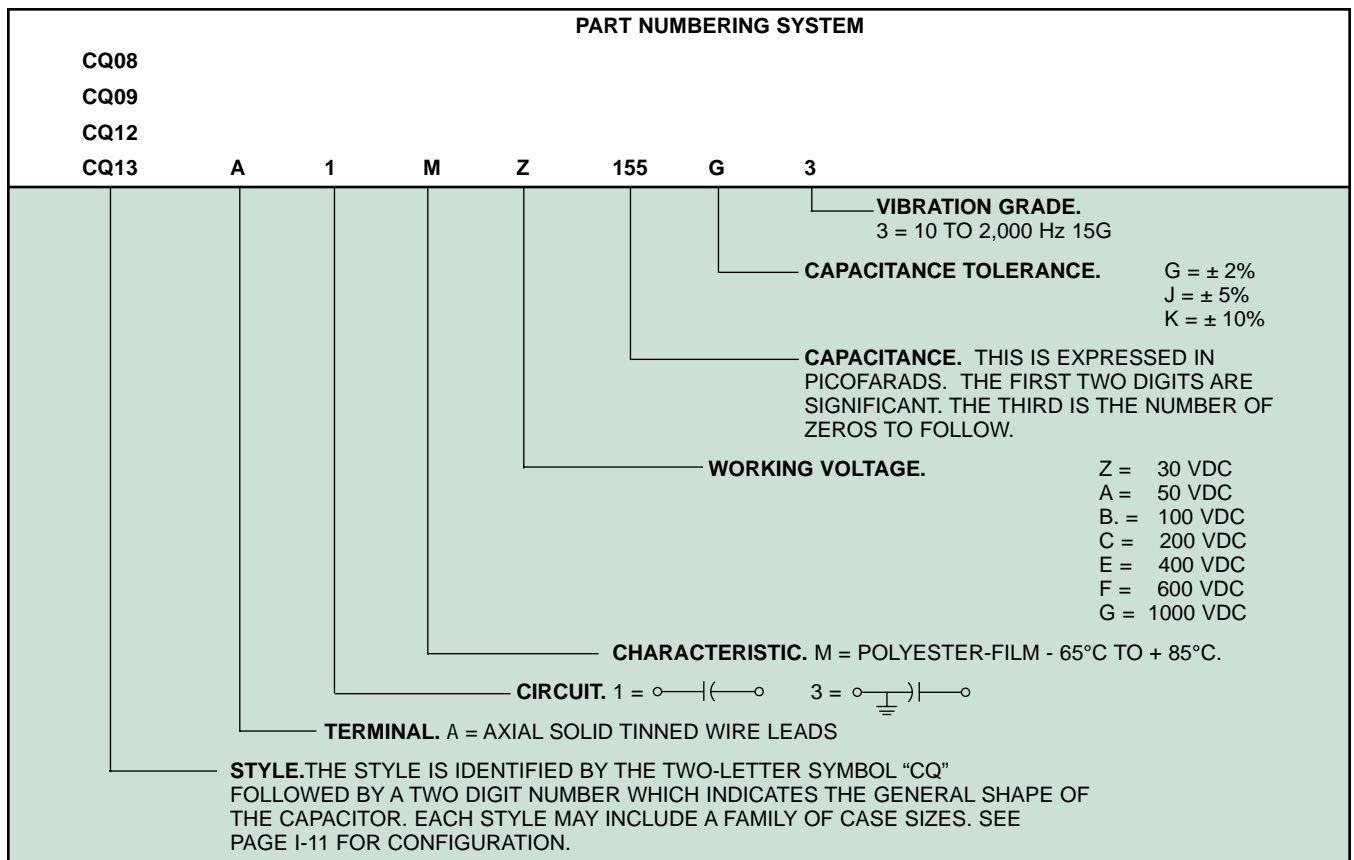


Mil Type Designation						
Wire Lead Terminals			Tab Terminals		Dimension (Inches)	
µf	Char. E	Char. K	Char. E	Char. K	D	L
<b>200 VOLTS D-C</b>						
.047	CZR23BEC473M	CZR23BKC473M	CZR24BEC473M	CZR24BKC473M	.400	0.875
.10	CZR23BEC104M	CZR23BKC104M	CZR24BEC104M	CZR24BKC104M	.400	1.125
.22	CZR23BEC224M	CZR23BKC224M	CZR24BEC224M	CZR24BKC224M	.562	1.125
.47	CZR23BEC474M	CZR23BKC474M	CZR24BEC474M	CZR24BKC474M	.562	1.875
1.0	CZR23BEC105M	CZR23BKC105M	CZR24BEC105M	CZR24BKC105M	.750	2.125
<b>400 VOLTS D-C</b>						
.10	CZR23BEE104M	CZR23BKE104M	CZR24BEE104M	CZR24BKE104M	.562	1.125
.22	CZR23BEE224M	CZR23BKE224M	CZR24BEE224M	CZR24BKE224M	.562	1.875
.47	CXR23BEE474M	CZR23BKE474M	CZR24BEE474M	CZR24BKE474M	.750	2.125
<b>600 VOLTS D-C</b>						
.01	CZR23BEF103M	CZR23BKF103M	CZR24BEF103M	CZR24BKF103M	.400	0.750
.047	CZR23BEF473M	CZR23BKF473M	CZR24BEF473M	CZR24BKF473M	.400	1.375
.10	CZR23BEF104M	CZR23BKF104M	CZR24BEF104M	CZR24BKF104M	.562	1.375
.22	CZR23BEF224M	CZR23BKF224M	CZR24BEF224M	CZR24BKF224M	.670	1.875
.47	CZR23BEF474M	CZR23BKF474M	CZR24BEF474M	CZR24BKF474M	.750	2.375

CZ23 AND CZ24 ARE ALSO AVAILABLE

**Hermetically-Sealed  
Film Capacitors  
To Military Specification  
MIL-C-19978/01**

**MIL STYLE CQ08, CQ09, CQ12, CQ13  
(CHARACTERISTIC M)**

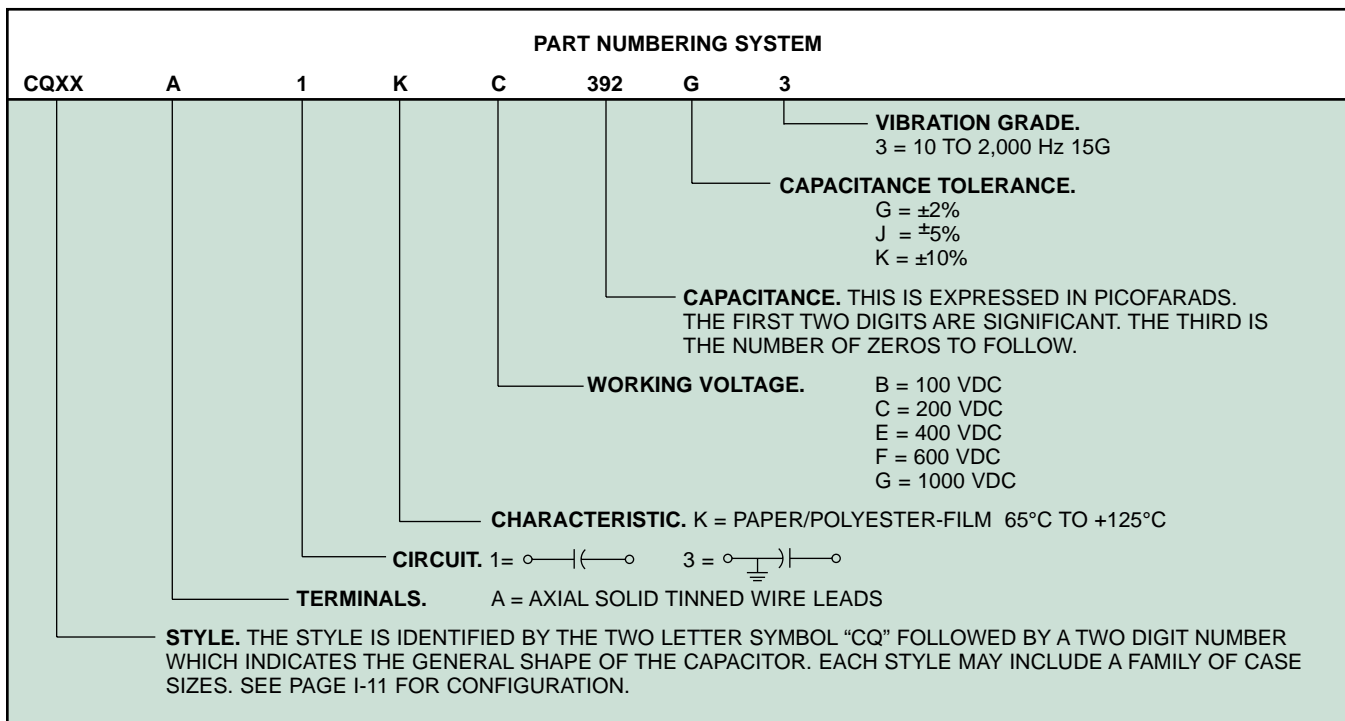


**STYLES CQ08, CQ09, CQ12, CQ13 CHARACTERISTIC "M" ARE INACTIVE FOR NEW DESIGNS. FOR REPLACEMENT, USE STYLES CQR29, CQR32, AND CQR33 WHICH ARE COMPARABLE.**

FOR DETAILED INFORMATION SEE MIL-C-19978/01

**Hermetically-Sealed  
Capacitors  
To Military Specification  
MIL-C-19978**

**MIL STYLE CQ05, CQ08, CQ09, CQ10, CQ11, CQ12, CQ13  
(CHARACTERISTIC K)**

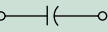


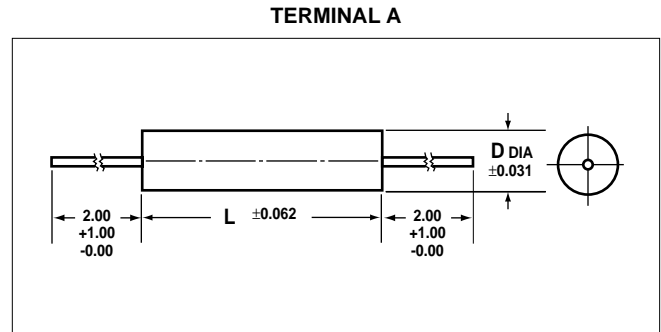
ALL OF THE ABOVE STYLES ARE INACTIVE FOR NEW DESIGN. SEE THE REPLACEMENT CHART AT THE BEGINNING OF THIS SECTION

ALL VOLTAGES AND TOLERANCES DO NOT APPLY TO ALL STYLES. FOR DETAILED INFORMATION SEE MIL-C-19978/01/19/20/21

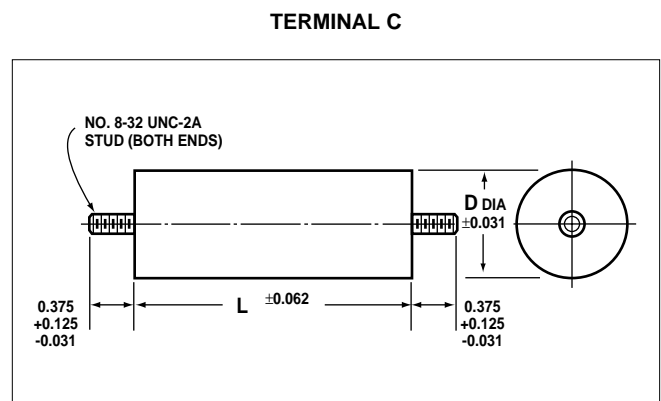
**Hermetically-Sealed Glass Case  
High Voltage Capacitors  
To Military Specification  
MIL-C-19978/02**

**MIL STYLE CQ20**

PART NUMBERING SYSTEM						
CQ20	A	1	K	G	102	K 1
						VIBRATION GRADE. 1 = 10 TO 55 Hz
						CAPACITANCE TOLERANCE. J = ±5% K = ±10%
						CAPACITANCE. THIS IS EXPRESSED IN PICO-FARADS. THE FIRST TWO DIGITS ARE SIGNIFICANT. THE THIRD IS THE NUMBER OF ZEROS TO FOLLOW.
						WORKING VOLTAGE. G=1000 VDC J=2000 VDC L=3000 VDC N=5000 VDC R=7500 VDC S=10000 VDC T=12500 VDC U=15000VDC
						DIELECTRIC. K = PAPER/POLYESTER FILM-65°C TO +125°C
						CIRCUIT. 1 = 
						TERMINALS. A = AXIAL WIRE LEADS C = THREADED STUDS
						STYLE. THE STYLE IS IDENTIFIED BY THE TWO LETTER SYMBOL "CQ" FOLLOWED BY A TWO DIGIT NUMBER WHICH INDICATES THE GENERAL SHAPE OF THE CAPACITOR. EACH STYLE MAY INCLUDE A FAMILY OF CASE SIZES.



NOTE:  
Wire leads shall be tinned solid wire, 0.032 dia. (No. 20 AWG) for cases 0.531 and 0.625 in diameter, and 0.040 dia. (No. 18 AWG) for cases 0.750 and above in diameter



NOTE:  
Mounting hardware consisting of two lockwashers and four nuts is supplied with each capacitor. Threaded stud terminals are not available on case diameter of 0.531 inches.

**Major Applications:**  
High voltage applications both at high altitude, and ground level. Power supplies, induction heating equipment, electrostatic precipitators, as well as coupling and bypass applications

**PHYSICAL CHARACTERISTICS —**

**Construction:**  
Dielectric-paper/polyester. Electrode-aluminum foil with laid in tab. Impregnated with vitamin Q

**Case:**  
Heavy wall tempered glass. Metal ferrules are bonded to the end of the glass and metal end caps are soldered to the ferrules to make a hermetically sealed assembly

**ELECTRICAL SPECIFICATIONS —**

- Capacitance Range:**  
.00047 µf to 1.0 µf
- Voltage Rating:**  
1000 VDC to 15,000 VDC
- Capacitance Tolerance:**  
± 5%, ± 10%
- Operating Temperature:**  
-65°C to + 125°C

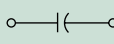
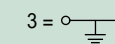
Consult MIL-C-19978/02 for ratings and sizes

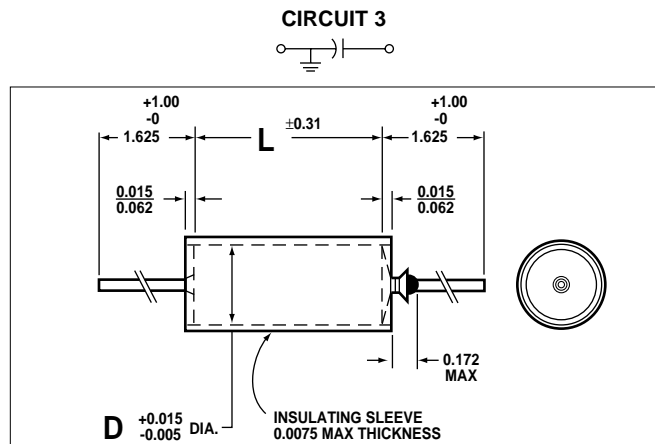
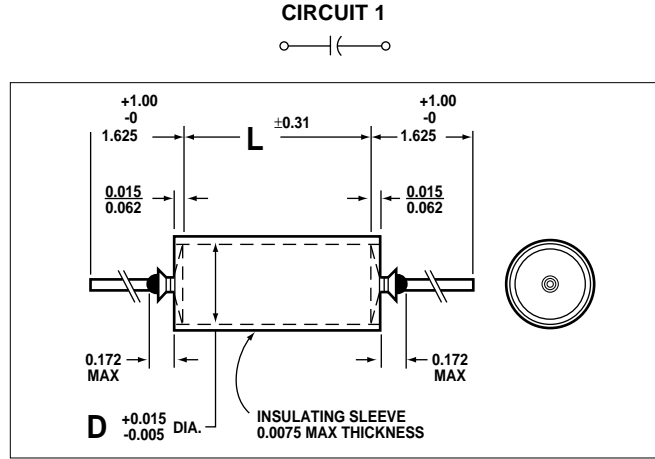
**Hermetically-Sealed Capacitors  
To Military Specification  
MIL-C-19978/08**

**MIL STYLE QCR07**

**PART NUMBERING SYSTEM**

**QCR07 A 1 Q F 302 K 3 M**

- FAILURE RATE LEVEL.**  
90% CONFIDENCE LEVEL  
M=1.0%  
P=0.1%  
R=0.01%
- VIBRATION GRADE.**  
3 = 10 TO 2,000 Hz 15G
- CAPACITANCE TOLERANCE.**  
J = ±5%  
K = ±10%
- CAPACITANCE.** THIS IS EXPRESSED IN PICO FARADS. THE FIRST TWO DIGITS ARE SIGNIFICANT. THE THIRD IS THE NUMBER OF ZEROS TO FOLLOW.
- WORKING VOLTAGE.** A = 50 VDC  
B = 100 VDC  
C = 200 VDC  
E = 400 VDC  
F = 600 VDC
- CHARACTERISTIC.** Q = POLYCARBONATE  
55°C TO +125°C
- CIRCUIT.** 1 =  3 = 
- TERMINALS.** A = AXIAL SOLID TINNED WIRE LEADS
- STYLE.** THE STYLE IS IDENTIFIED BY THE THREE LETTER SYMBOL "QCR" FOLLOWED BY A TWO DIGIT NUMBER WHICH INDICATES THE GENERAL SHAPE OF THE CAPACITOR. EACH STYLE MAY INCLUDE A FAMILY OF CASE SIZES.



THIS INFORMATION HAS BEEN ABSTRACTED FROM MIL-C-19978/08

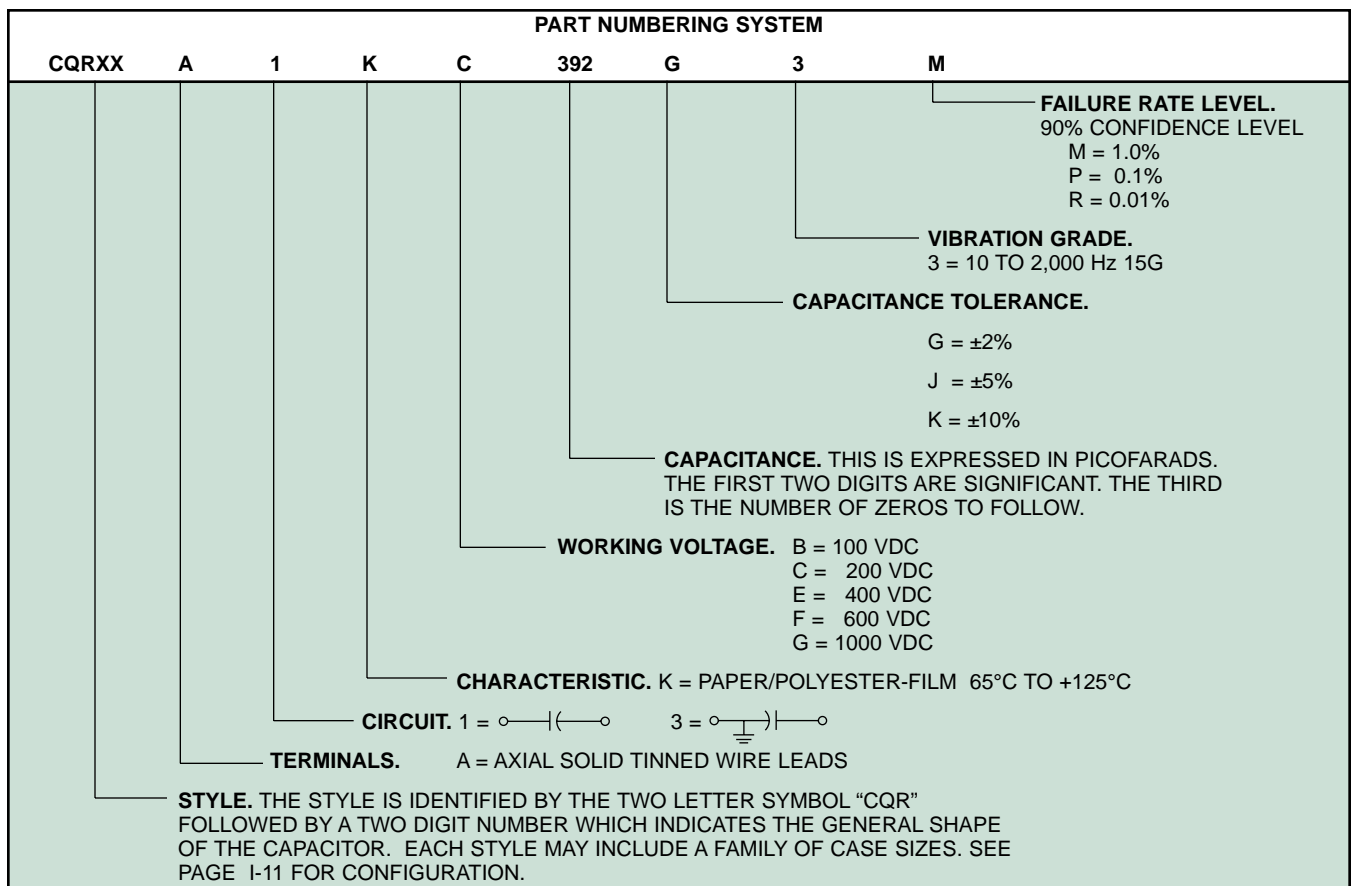
Capacitance µf	Capacitance Code	Voltage Code A		Voltage Code B		Voltage Code C		Voltage Code E		Voltage Code F	
		50VDC		100VDC		200VDC		400 VDC		600 VDC	
		D	L	D	L	D	L	D	L	D	L
.001	102	-	-	-	-	.175	.750	-	-	.235	.750
.0015	152	-	-	-	-	.195	.750	.235	.750	.312	.875
.0022	222	-	-	.175	.750	.195	.750	-	-	.312	.875
.0033	332	-	-	.175	.750	.235	.750	-	-	.312	.875
.0047	472	.175	.750	.195	.750	-	-	.312	.875	.400	.875
.0068	682	.195	.750	.235	.750	-	-	.312	.875	.400	1.125
.01	103	-	-	.235	.750	.312	.875	.400	.875	.400	1.125
.015	153	-	-	-	-	.312	.875	.400	1.125	.500	1.125
.022	223	-	-	.312	.875	.400	.875	.400	1.375	.562	1.125
.033	333	-	-	.312	.875	.400	1.125	.500	1.125	.562	1.375
.047	473	.312	.875	.400	.875	.400	1.125	.562	1.125	.562	1.625
.068	683	.400	.875	.400	1.125	.500	1.125	.562	1.375	.670	1.625
.10	104	.400	.875	.400	1.125	.562	1.125	.670	1.625	.750	1.875
.15	154	.400	1.375	.562	1.375	.562	1.875	.750	2.125	1.000	1.875
.22	224	.562	1.125	.562	1.625	.670	1.875	.750	2.625	1.000	2.625
.33	334	.562	1.375	.670	1.625	.750	2.125	1.000	2.125		
.47	474	.562	1.875	.750	1.875	1.000	1.875	1.000	2.625		
.68	684	.670	1.875	.750	2.375	1.000	2.125				
1.00	105	.750	1.875	1.000	1.875						

DIMENSIONS LISTED ARE FOR CIRCUIT 1; FOR CIRCUIT 3 DIMENSIONS SUBTRACT 0.062 INCHES (1.57MM) FROM L DIMENSION. ADDITIONAL CAPACITANCE VALUES ARE AVAILABLE. CONSULT MIL-C-19978/08 FOR COMPLETE LISTING



**Hermetically-Sealed  
Capacitors  
To Military Specification  
MIL-C-19978**

**MIL STYLE CQR09, CQR12, CQR13, CQR19, CQR39, CQR42, CQR43  
(CHARACTERISTIC K)**



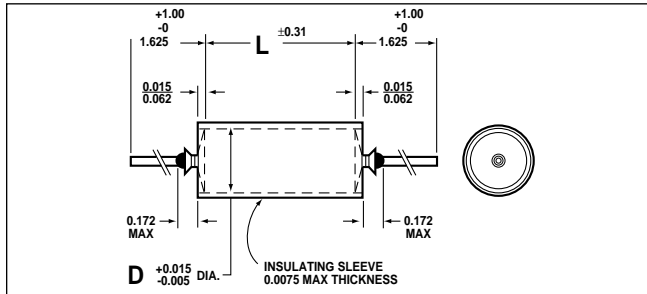
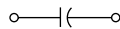
**STYLES CQR19, CQR39, CQR42, AND CQR43 ARE INACTIVE. FOR NEW DESIGNS SEE THE REPLACEMENT CHART AT THE BEGINNING OF THIS SECTION**

**ALL VOLTAGES AND TOLERANCES DO NOT APPLY TO ALL STYLES. FOR DETAILED INFORMATION SEE MIL-C-19978/09/10/11/12/16/17/18**

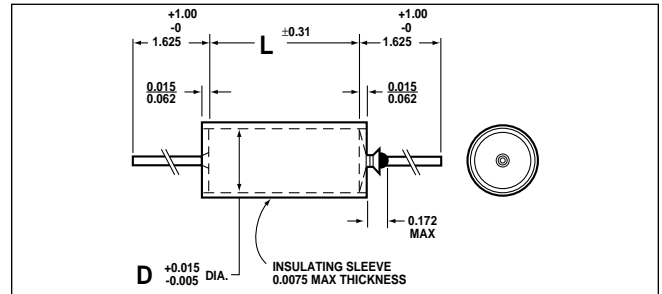
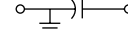


**MIL STYLES CQ05, CQ08 (UNINSULATED) CQ09, CQR09, CQR19, CQR29, CQR39**

**CIRCUIT 1**

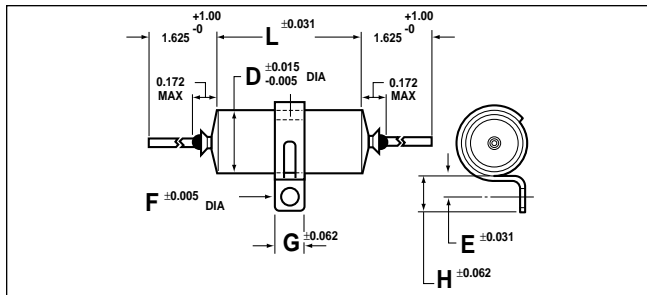
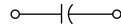


**CIRCUIT 3**

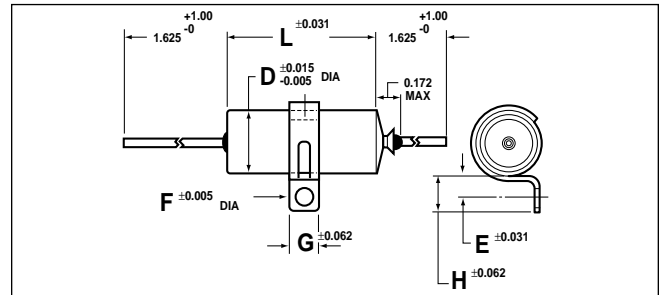
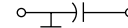


**MIL STYLES CQ10, CQ12, CQR32, CQR42**

**CIRCUIT 1**



**CIRCUIT 3**

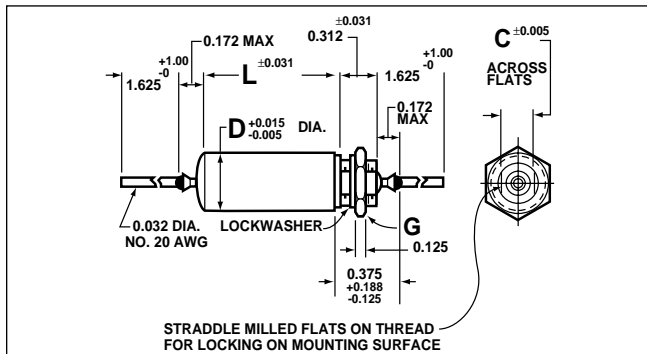
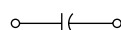


**BRACKET DIMENSIONS (INCHES)**

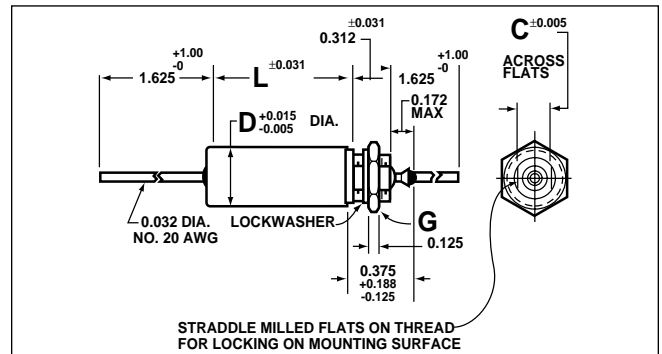
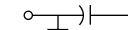
D	H	G	E	F
Less than 0.500	0.312	0.250	0.188	0.144
0.500 and up	0.438	0.500	0.250	0.156

**MIL STYLES CQ11, CQ13, CQR13, CQR33, CQR43**

**CIRCUIT 1**



**CIRCUIT 3**



**THREAD DIMENSIONS (INCHES)**

D	C	G
0.562 or less	0.250	5/16-24 UNF-2A
0.670	0.375	7/16-28 UNF-2A
0.750	0.437	1/2-28 UNF-2A

**Hermetically-Sealed Capacitors  
To Military Specification  
MIL-C-39022/01**

**MIL STYLE CHR09**

**PART NUMBERING SYSTEM**

M39022/01- 1001

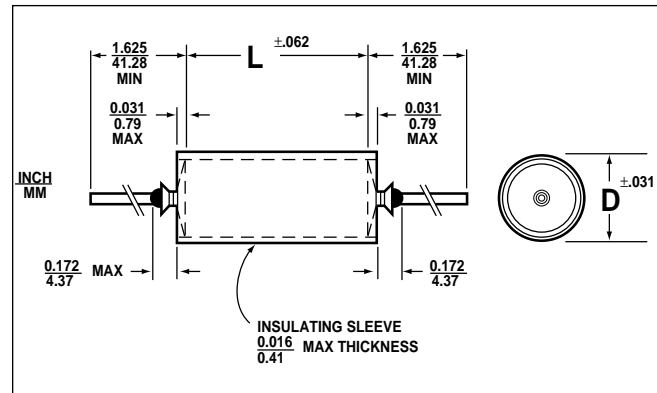
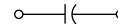
**DASH NUMBER.**  
(SEE MIL-C-39022/01)  
NUMBER SHALL CORRESPOND  
TO DESIRED VOLTAGE RATING,  
CAPACITANCE VALUE, CIRCUIT  
DIAGRAM, CAPACITANCE  
TOLERANCE AND FAILURE RATE  
LEVEL.

BASIC DOCUMENT NUMBER.

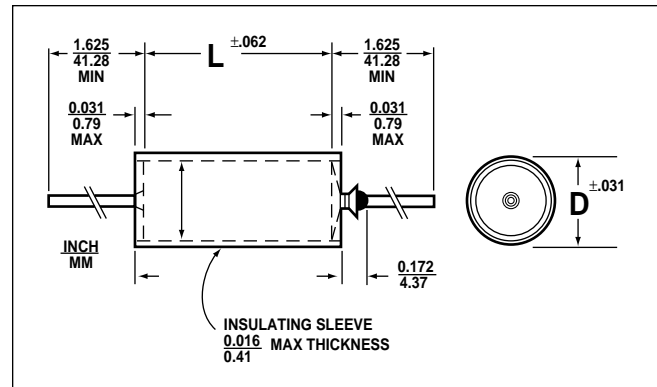
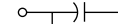
**LEAD SIZE TABLE (INCHES)**

Case Diameter	Wire Size	
	No. AWG	Nom. Dia.
to 0.195	24	0.020
0.235 and 0.312	22	0.025
0.400 and up	20	0.032

**Circuit 1**



**Circuit 3**



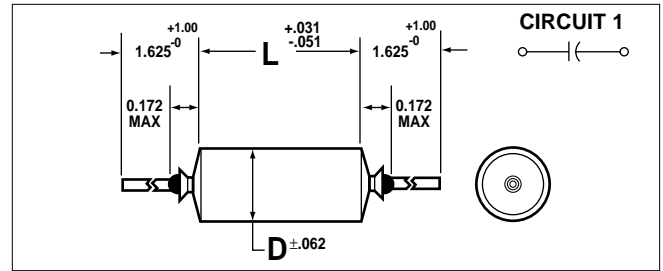
Capacitance µf	50 VDC		200 VDC		400 VDC		600 VDC	
	D	L	D	L	D	L	D	L
.01							.312	.812
.022	.175	.750					.312	.812
.033	.175	.750						
.047	.195	.750			.312	1.125	.400	1.125
.068	.235	.750						
.10	.235	.750	.312	.844	.400	1.125	.500	1.125
.15	.312	.875						
.22	.312	.875	.312	1.125	.562	1.125	.562	1.375
.33	.312	.875						
.47	.312	1.125	.400	1.125	.562	1.625	.670	1.625
.68	.400	1.125						
1.00	.400	1.125	.562	1.125	.750	1.875	1.000	1.844
1.50	.500	1.125	.562	1.844			1.000	1.875
2.20	.562	1.125	.562	1.844	1.000	1.875	1.000	2.625
3.30	.562	1.375	.670	1.875	1.000	2.625		
4.70	.562	1.750	1.000	1.875				
6.80	.670	1.625	1.000	1.875				
10.00	.750	1.875	1.000	2.375				
12.00	.750	2.375	1.000	2.625				

DIMENSIONS LISTED ARE FOR CIRCUIT 1; FOR CIRCUIT 3 DIMENSIONS SUBTRACT 0.062" FROM THE L DIMENSION

FOR A COMPLETE LISTING WITH DASH NUMBERS SEE MIL-C-39022/01

**Hermetically-Sealed Capacitors  
To Military Specification  
MIL-C-39022/07**

**MIL STYLE CHR49**



PART NUMBERING SYSTEM	
M39022/07	1001
DASH NUMBER. (SEE MIL-C-39022/07) NUMBER SHALL CORRESPOND TO DESIRED VOLTAGE RATING, CAPACITANCE VALUE, CIRCUIT DIAGRAM, CAPACITANCE TOLERANCE AND FAILURE RATE LEVEL.	
BASIC DOCUMENT NUMBER.	

Case Diameter	Wire Size	
	No.AWG	No.Dia
0.312	20	.022
0.400 and up	18	.040

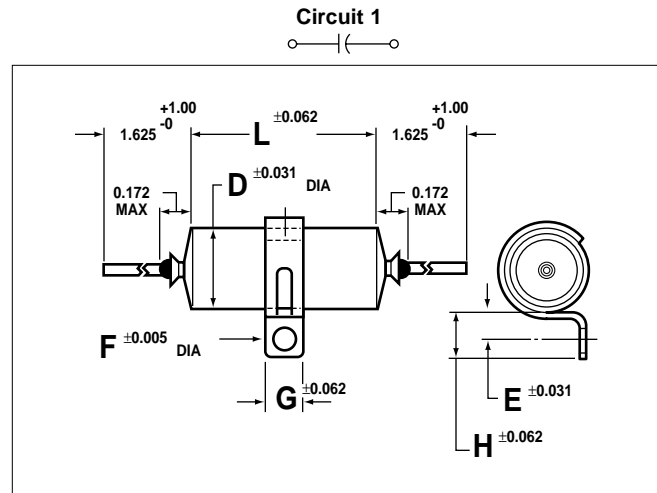
Capacitance $\mu\text{f}$	LOW VOLTAGE RANGE 80 VRMS TO 100 VRMS			INTERMEDIATE VOLTAGE RANGE 200 VRMS TO 300 VRMS			HIGH VOLTAGE RANGE 350 VRMS TO 400 VRMS		
	400 Hz Volts RMS	Inches		400 Hz Volts RMS	Inches		400 Hz Volts RMS	Inches	
	85°C	D	L	85°C	D	L	85°C	D	L
0.01							400	0.312	1.125
0.012							400	0.400	1.125
0.015							400	0.400	1.125
0.018							400	0.400	1.125
0.022							400	0.400	1.125
0.027							400	0.400	1.375
0.033							400	0.400	1.375
0.039							400	0.562	1.125
0.047							400	0.562	1.125
0.056							400	0.562	1.375
0.068							400	0.562	1.375
0.082							400	0.562	1.625
0.10	165	0.312	0.875	300	0.500	1.125	400	0.562	1.625
0.12	165	0.312	1.125	300	0.562	1.375	390	0.670	1.625
0.15	165	0.312	1.125	300	0.562	1.375	390	0.670	1.625
0.18	165	0.400	0.875	300	0.562	1.625	385	0.670	1.875
0.22	165	0.400	0.875	300	0.562	1.625	385	0.670	1.875
0.27	165	0.400	1.125	300	0.562	1.875	380	0.750	2.375
0.33	165	0.400	1.125	300	0.562	1.875	380	0.750	2.375
0.39	165	0.400	1.375	300	0.670	1.625	370	1.000	1.875
0.47	165	0.400	1.375	300	0.670	1.625	370	1.000	1.875
0.56	165	0.562	1.125	295	0.750	1.875	350	1.000	2.375
0.68	165	0.562	1.125	290	0.750	1.875	350	1.000	2.375
0.82	165	0.562	1.375	280	0.750	2.125			
1.0	165	0.562	1.375	270	0.750	2.125			
1.5	165	0.562	1.625	235	1.000	1.875			
2.2	150	0.670	1.625	200	1.000	2.625			
2.5	145	0.670	1.875						
3.3	140	0.750	1.875						
4.0	135	0.750	2.125						
4.7	130	0.750	2.375						
6.8	110	1.000	1.875						
8.0	100	1.000	2.125						
9.0	080	1.000	2.375						
10.0	080	1.000	2.625						

AVAILABLE ONLY WITH A CAPACITANCE TOLERANCE OF  $\pm 10\%$

**Hermetically-Sealed Capacitors  
To Military Specification  
MIL-C-39022/08**

**MIL STYLE CHR12**

PART NUMBERING SYSTEM	
M39022/08-	1001
<p>DASH NUMBER. (SEE MIL-C-39022/08) NUMBER SHALL CORRESPOND TO DESIRED VOLTAGE RATING, CAPACITANCE VALUE, CIRCUIT DIAGRAM, CAPACITANCE TOLERANCE AND FAILURE RATE LEVEL.</p>	
<p>BASIC DOCUMENT NUMBER.</p>	

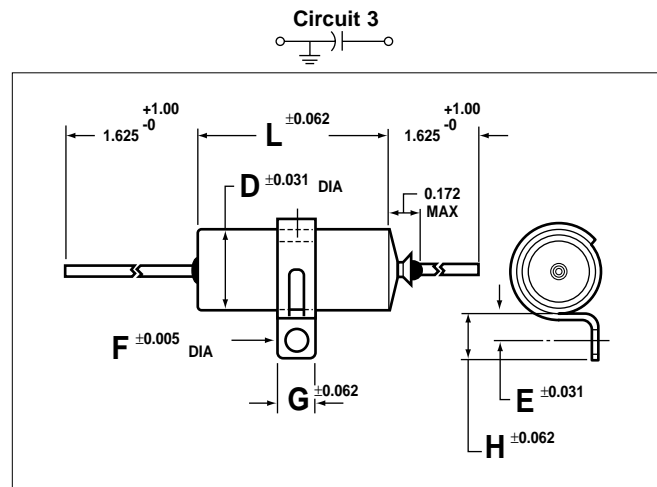


**BRACKET DIMENSIONS (INCHES)**

D	H	G	E	F
Less Than 0.500	0.312	0.250	0.188	0.144
0.500 and up	0.438	.500	0.250	0.156

**LEAD SIZE TABLE (INCHES)**

Case Diameter	Wire Size	
	No. AWG	Nom. Dia.
0.312	22	0.025
0.400 and up	20	0.032



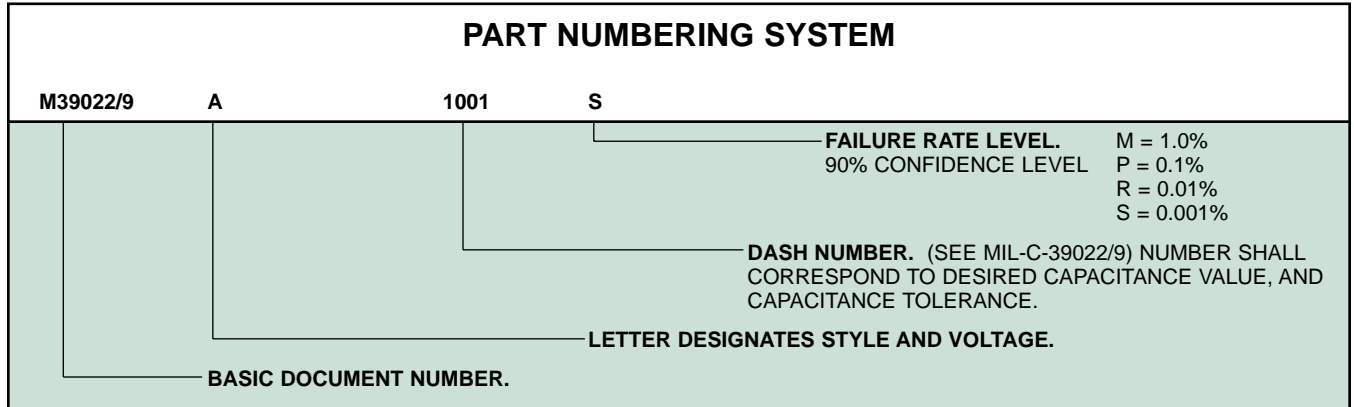
Capacitance	50 VDC		200 VDC		400 VDC		600 VDC	
	D	L	D	L	D	L	D	L
.01							.312	.812
.022							.312	.812
.047					.312	1.125	.400	1.125
.10			.312	.844	.400	1.125	.500	1.125
.15	.312	.875					.562	1.125
.22	.312	.875	.312	1.125	.562	1.125	.562	1.375
.33	.312	.875						
.47	.312	1.125	.400	1.125	.562	1.625	.670	1.625
.68	.400	1.125						
1.00	.400	1.125	.562	1.125	.750	1.875	1.000	1.844
1.50	.500	1.125	.562	1.844			1.000	1.875
2.20	.562	1.125	.562	1.844	1.000	1.875	1.000	2.625
3.30	.562	1.375	.670	1.875	1.000	2.625		
4.70	.562	1.750	1.000	1.875				
6.80	.670	1.625	1.000	1.875				
10.00	.750	1.875	1.000	2.375				
12.00	.750	2.375	1.000	2.625				

DIMENSIONS LISTED ARE FOR CIRCUIT 1; FOR CIRCUIT 3 DIMENSIONS SUBTRACT 0.062" FROM THE L DIMENSION FOR A COMPLETE LISTING CONSULT MIL-C-39022/08

THIS INFORMATION HAS BEEN ABSTRACTED FROM MIL-C-39022/08

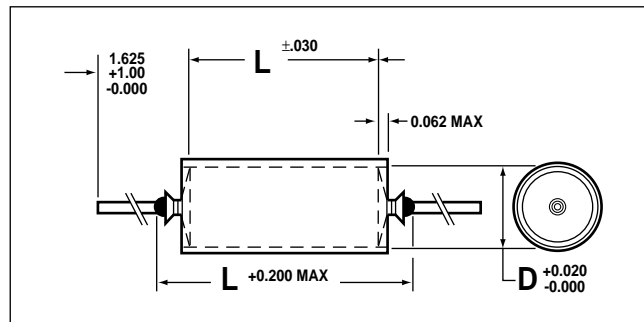
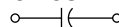
**Hermetically-Sealed Axial-Lead  
To Military Specification  
MIL-C-39022/9**

**MIL STYLE CHR01**



**MIL-C-39022/9 IS INACTIVE FOR NEW DESIGN AND HAS BEEN REPLACED BY MIL-C-83421/01**

**CIRCUIT. 1**



**Notes:**

1. Insulating sleeve shall extend beyond the capacitor body.
2. Insulating sleeve thickness shall not exceed 0.005 inch (0.13mm).
3. L and D dimensions do not include the insulating sleeve.

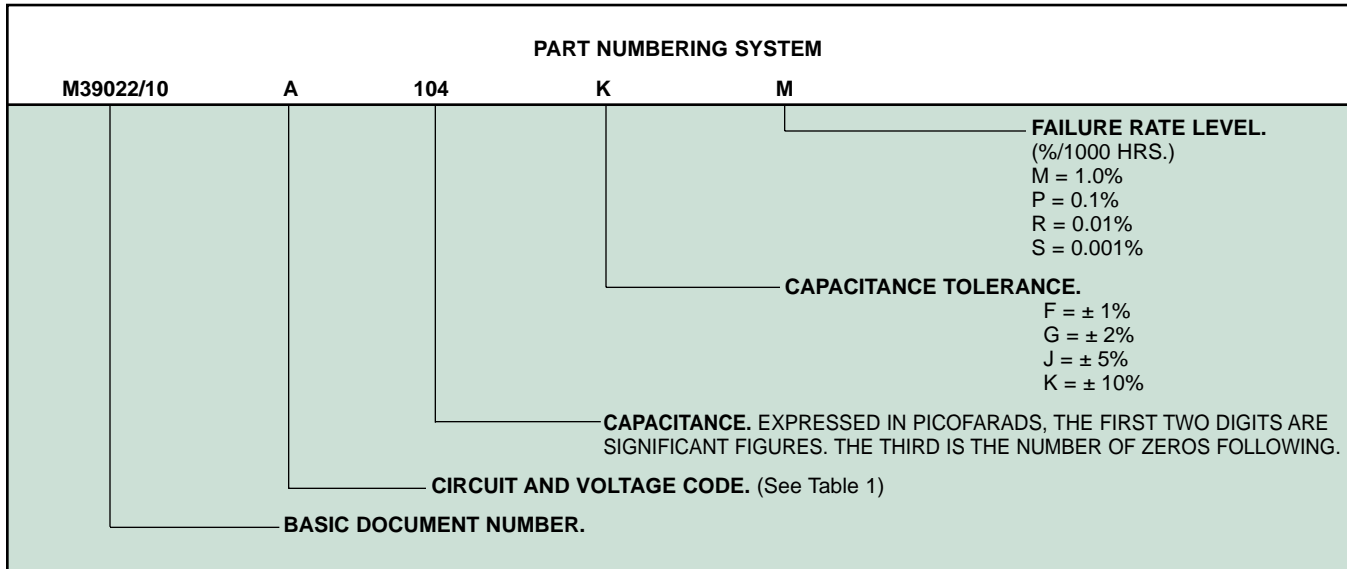
**LEAD SIZE TABLE (INCHES)**

Case Diameter	Wire Size	
	No. AWG	Nom. Dia.
to 0.312	22	0.025
0.400 and 500	20	0.032
0.562 and up	18	0.040

FOR DETAILED INFORMATION SEE MIL-C-39022/9

**Hermetically-Sealed Capacitors  
To Military Specification  
MIL-C-39022/10**

**MIL STYLE CHR10**

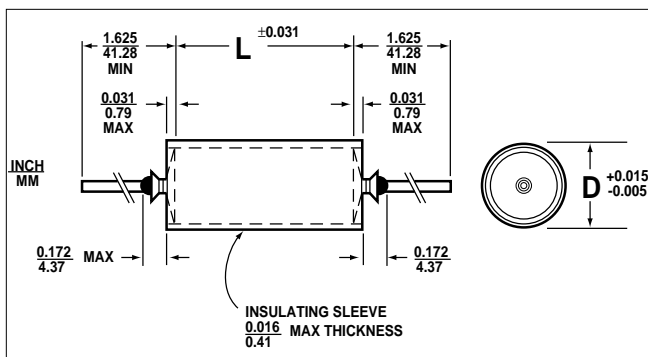


FOR DETAILED INFORMATION, SEE MIL-C-39022/10

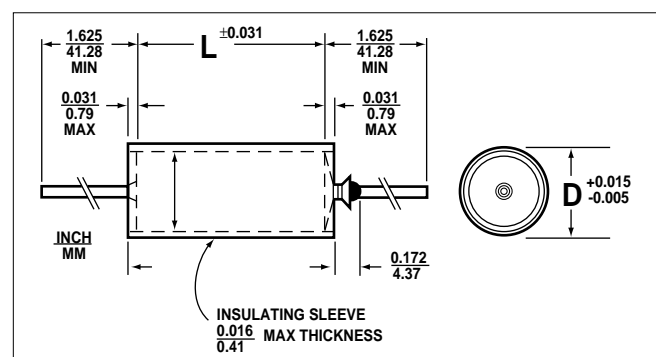
**TABLE 1 CIRCUIT AND VOLTAGE CODES**

CODE	CIRCUIT	VOLTAGE
A	1	50
B	3	50
C	1	100
D	3 </td <td>100</td>	100
E	1	200
F	3	200
G	1	400
H	3	400
J	1	600
K	3	600
L	1	300
M	3	300

**CIRCUIT 1**



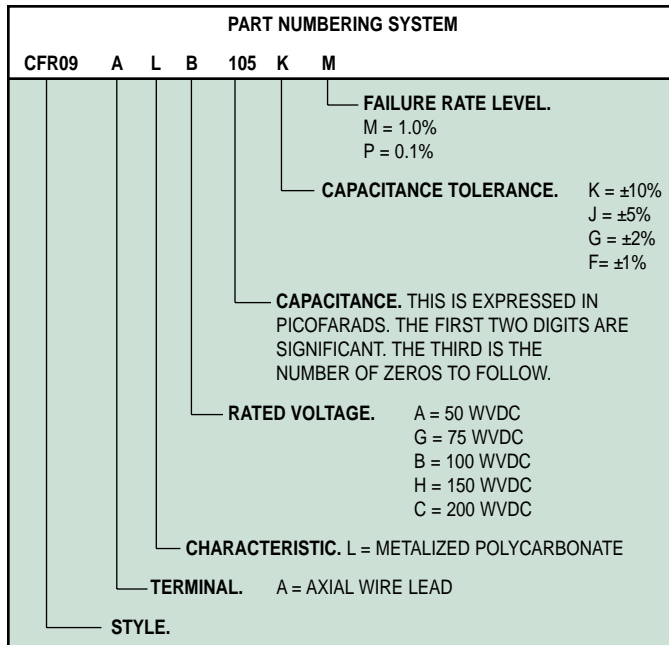
**CIRCUIT 3**



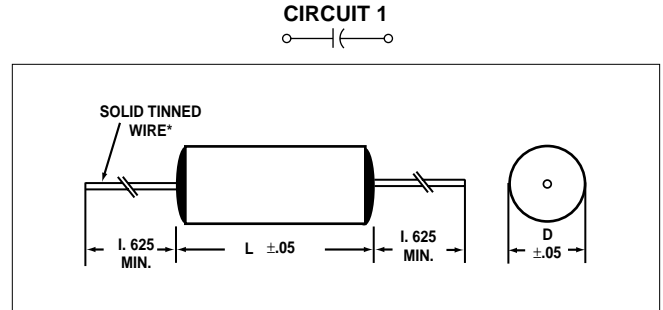


**Axial-Lead, Wrap And Fill  
Metalized-Polycarbonate  
Capacitors  
To Military Specification  
MIL-C-55514/07**

**MIL STYLE CFR09**



THIS INFORMATION HAS BEEN ABSTRACTED FROM MIL-C-55514/07



**NOTE:**  
Leads shall be located on centerline within ±0.062 inches but shall not be less than 0.03 inches from edge of capacitor.

Capacitance µf	50 VDC		75 VDC		100 VDC		150 VDC		200 VDC	
	D	L	D	L	D	L	D	L	D	L
.01									.170	.400
.015							.170	.400	.190	.400
.022							.230	.400	.230	.400
.03			.170	.400	.190	.400	.230	.400	.260	.400
.047			.190	.400	.230	.400	.260	.400	.230	.530
.068	.170	.400	.230	.400	.260	.400	.230	.530	.260	.530
.10	.230	.400	.260	.400	.230	.530	.260	.530	.310	.530
.15	.230	.400	.230	.530	.260	.530	.350	.530	.310	.750
.22	.260	.400	.260	.530	.310	.530	.310	.750	.350	.750
.33	.260	.530	.310	.530	.350	.530	.350	.750	.400	.750
.47	.310	.530	.350	.530	.310	.750	.400	.750	.400	1.030
.68	.350	.530	.310	.750	.350	.750	.400	1.030	.440	1.030
1.00	.310	.750	.350	.750	.400	.750	.440	1.030	.490	1.250
1.50	.350	.750	.350	1.030	.400	1.030	.490	1.250	.560	1.250
2.00	.400	.750	.400	1.030	.440	1.030	.560	1.250	.560	1.500
3.00	.400	1.030	.490	1.030	.490	1.250	.610	1.500	.670	1.500
3.90	.440	1.030	.560	1.030	.560	1.250	.670	1.500	.740	1.500
4.70	.440	1.030	.560	1.030	.610	1.250	.740	1.500		
5.00	.490	1.030	.560	1.250	.610	1.250	.740	1.500		
6.80	.490	1.250	.610	1.250	.610	1.500				
8.20	.560	1.250	.670	1.250	.670	1.500				
10.00	.610	1.250	.670	1.500	.740	1.500				
12.00	.610	1.500	.740	1.500						
15.00	.670	1.500	.740	1.500						
18.00	.670	1.500								

FOR A COMPLETE LISTING SEE MIL-C-55514/07

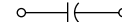
**Axial-Lead, Wrap And Fill  
Metalized-Polypropylene  
Capacitors**

**To Military Specification**

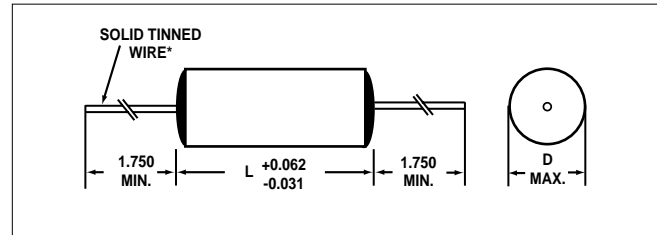
**MIL-C-55514/09**

**MIL STYLE CFR13, CFR14**

**CIRCUIT DIAGRAM**



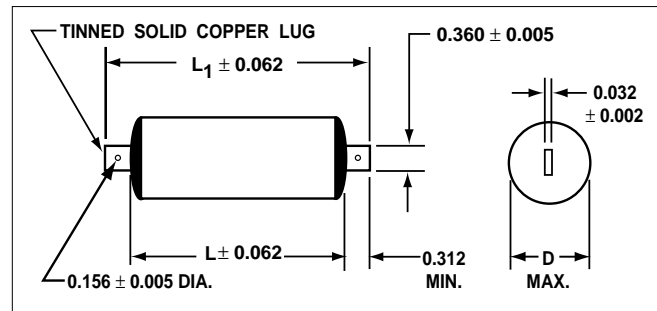
**STYLE CFR13**



**LEAD SIZE TABLE (INCHES)**

Case Diameter	Wire Size	
	No. AWG	Nom. Dia.
to 0.312	22	0.025
0.400 and 500	20	0.032
0.562 and up	18	0.040

**STYLE CFR14**



**PART NUMBERING SYSTEM**

**CFR13**  
**CFR14**    **A**    **L**    **B**    **105**    **K**    **M**

**FAILURE RATE LEVEL.**  
90% CONFIDENCE LEVEL  
M = 1.0%  
P = 0.1%

**CAPACITANCE TOLERANCE.**  
M = ±20%  
K = ±10%  
J = ±5%

**CAPACITANCE.** THIS IS EXPRESSED IN PICO FARADS. THE FIRST TWO DIGITS ARE SIGNIFICANT. THE THIRD IS THE NUMBER OF ZEROS TO FOLLOW.

**RATED VOLTAGE.** B = 100 WVDC  
C = 200 WVDC  
E = 400 WVDC

**CHARACTERISTIC.** L = METALIZED POLYPROPYLENE.

**TERMINALS.** A = AXIAL WIRE LEAD  
L = AXIAL LUGS

**STYLE.** CFR13 = WIRE LEADS  
CFR14 = TAB LUGS

Max. ESR					Maximum Ripple Current (Amps) at 20-100 kHz								
20-100kHz					Case Temperature								Lead Dia.
µf	Designation	D	L±.062	Ω	+25°C	+35°C	+45°C	+55°C	+65°C	+75°C	+85°C	AWG No.	
<b>100 VDC</b>													
1.0	CFR13ALB105	0.480±.062	0.750	.015	9.2	8.5	7.8	7.0	6.0	4.9	4.5	20	
2.0	CFR13ALB205	0.534±.062	0.938	.012	10.8	10.0	9.1	8.2	7.0	5.8	5.3	20	
3.0	CFR13ALB305	0.524±.083	0.938	.011	12.1	11.2	10.3	9.2	8.0	6.5	6.9	18	
5.0	CFR13ALB505	0.540±.083	1.250	.010	13.8	12.7	11.6	10.4	9.0	7.4	6.7	18	
10.0	CFR13ALB106	0.805±.083	1.500	.009	15.0	15.0	14.2	12.7	11.0	9.0	8.2	18	
20.0	CFR13ALB206	0.875±.125	2.250	.008	15.0	15.0	15.0	15.0	13.6	11.1	10.0	18	
30.0	CFR13ALB306	1.075±.125	2.250	.006	15.0	15.0	15.0	15.0	15.0	12.4	11.4	18	
<b>200 VDC</b>													
1.0	CFR13ALC105	0.450±.062	1.250	.020	7.3	7.3	7.3	7.3	7.2	5.9	5.4	20	
2.0	CFR13ALC205	0.605±.083	1.250	.015	12.0	12.0	11.3	10.1	8.7	7.1	6.5	20	
3.0	CFR13ALC305	0.654±.083	1.500	.013	15.0	13.8	12.6	11.3	9.8	8.0	7.3	18	
5.0	CFR13ALC505	0.769±.083	1.750	.011	15.0	15.0	14.7	13.1	11.4	9.3	8.5	18	
10.0	CFR13ALC106	0.905±.125	2.250	.009	15.0	15.0	15.0	15.0	13.8	11.3	10.3	18	
20.0	CFR13ALC206	1.315±.125	2.250	.006	15.0	15.0	15.0	15.0	15.0	14.1	12.8	18	
<b>400VDC</b>													
1.0	CFR13ALE105	0.620±.083	1.500	.019	9.5	9.5	9.5	9.5	9.5	7.8	7.1	20	
2.0	CFR13ALE205	0.802±.083	1.750	.015	15.0	15.0	13.4	13.4	11.6	9.5	8.7	18	
3.0	CFR13ALE305	0.961±.125	1.750	.012	15.0	15.0	15.0	15.0	13.1	10.7	9.8	18	
5.0	CFR13ALE505	1.067±.125	2.250	.010	15.0	15.0	15.0	15.0	15.0	12.5	11.4	18	
10.0	CFR13ALE106	1.543±.125	2.250	.006	15.0	15.0	15.0	15.0	15.0	15.0	14.1	18	

## STANDARD RATINGS

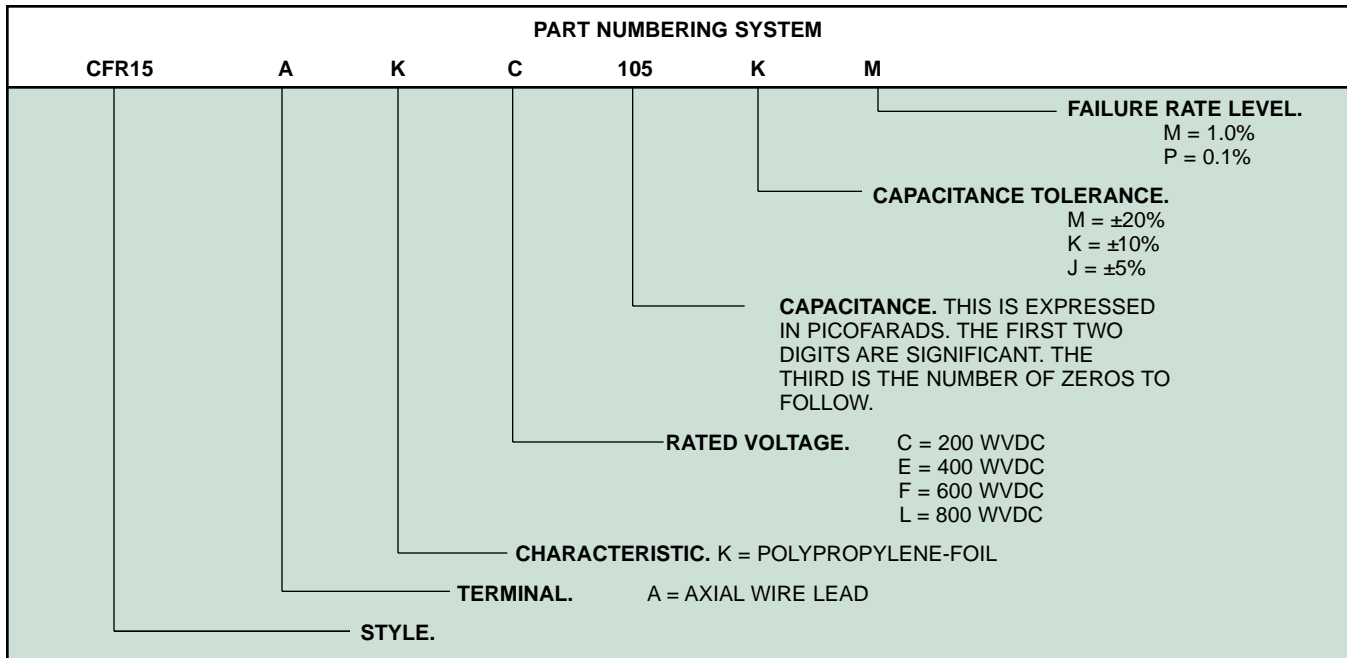
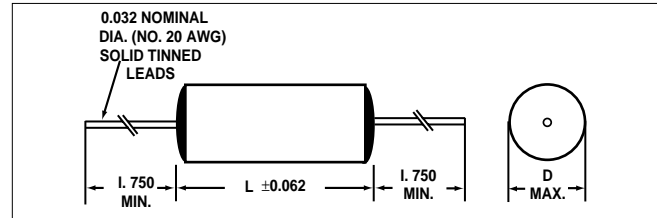
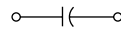
		Max. ESR			Maximum Ripple Current (Amps) at 20-100 kHz							
		20-100kHz			Case Temperature							Lead Dia.
µf	Designation	D	L±.062	Ω	+25°C	+35°C	+45°C	+55°C	+65°C	+75°C	+85°C	AWG No.
<b>100 VDC</b>												
1.0	CFR14LLB105	0.480±.062	0.622	.015	10.3	9.5	8.7	7.8	6.7	5.5	5.0	20
2.0	CFR14LLB205	0.534±.062	1.110	.012	12.0	11.0	10.0	8.9	7.8	6.3	5.8	20
3.0	CFR14LLB305	0.524±.083	1.110	.011	13.3	12.3	11.2	10.0	8.7	7.1	6.5	18
5.0	CFR14LLB505	0.540±.083	1.422	.010	14.8	13.7	12.5	11.2	9.7	7.9	7.2	18
10.0	CFR14LLB106	0.805±.083	1.672	.009	17.8	16.5	15.0	13.5	11.7	9.5	8.7	18
20.0	CFR14LLB206	0.875±.125	2.422	.008	21.6	20.0	18.3	16.4	14.2	11.8	10.6	18
30.0	CFR14LLB306	1.075±.125	2.422	.006	24.3	22.5	20.5	18.4	15.9	13.0	11.9	18
<b>200 VDC</b>												
1.0	CFR14LLC105	0.450±.062	1.422	.020	7.3	7.3	7.3	7.3	7.3	6.4	5.8	20
2.0	CFR14LLC205	0.605±.083	1.422	.015	14.3	13.3	12.1	10.8	9.4	7.7	7.0	20
3.0	CFR14LLC305	0.654±.083	1.872	.013	15.9	14.7	13.5	12.0	10.4	8.5	7.8	18
5.0	CFR14LLC505	0.769±.083	1.922	.011	18.3	17.0	15.5	13.9	12.0	9.8	8.9	18
10.0	CFR14LLC106	0.905±.125	2.422	.009	22.4	20.7	18.9	16.9	14.6	12.0	10.9	18
20.0	CFR14LLC206	1.315±.125	2.422	.006	27.4	25.4	25.2	20.7	17.9	14.7	13.4	18
<b>400VDC</b>												
1.0	CFR14LLE105	0.620±.083	1.872	.019	9.5	9.5	9.5	9.5	9.5	8.3	7.5	20
2.0	CFR14LLE205	0.802±.083	1.922	.015	15.0	15.0	15.0	14.2	12.3	10.0	9.1	18
3.0	CFR14LLE305	0.961±.125	1.922	.012	19.5	19.5	17.8	15.9	13.8	11.3	10.3	18
5.0	CFR14LLE505	1.067±.125	2.422	.010	24.4	22.8	20.8	18.5	16.0	13.1	11.9	18
10.0	CFR14LLE106	1.543±.125	2.422	.006	30.0	27.8	25.4	22.7	19.7	16.1	14.7	18

The complete type description must include additional symbols to indicate capacitance tolerance and failure rate level.  
Capacitance tolerance available. J, K, M, failure rate levels available, M, P.

**Axial-Lead, Wrap And Fill  
Polypropylene-Foil Capacitors  
To Military Specification  
MIL-C-55514/10**

**MIL STYLE CFR15**

**CIRCUIT 1**



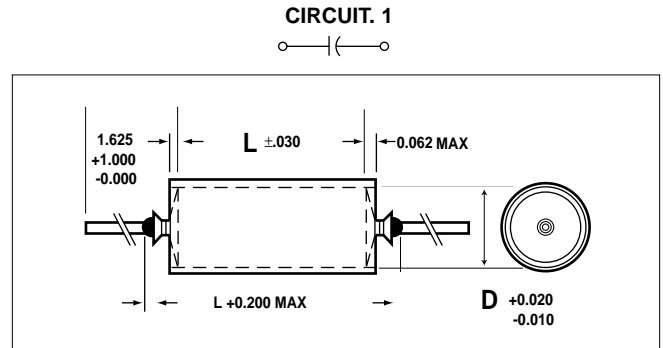
Capacitance	200 VDC		400 VDC		600 VDC		800 VDC	
	D	L	D	L	D	L	D	L
.001					.243	.750		
.0015					.261	.750		
.0022					.257	.750		
.0033					.240	.750		
.0047					.258	.750		
.0068			.217	.750	.268	.750	.217	1.250
.01			.232	.750	.267	.938	.251	1.250
.015	.197	.750	.260	.750	.320	.938	.294	1.250
.022	.232	.750	.262	.938	.381	.938	.354	1.250
.033	.263	.750	.301	.938	.358	1.250	.433	1.250
.047	.261	.938	.284	1.250	.421	1.250	.414	1.688
.068	.297	.938	.336	1.250	.501	1.250	.501	1.688
.10	.284	1.250	.404	1.250	.571	1.250	.579	1.688
.15	.345	1.250	.491	1.250	.559	1.688	.652	2.063
.22	.416	1.250	.500	1.688	.677	1.688	.793	2.063
.33	.427	1.688	.591	1.688	.783	2.063	.863	2.438
.47	.501	1.688	.708	1.688	.939	2.063	1.034	2.438
.68	.706	1.688	.818	2.438	1.003	2.438		
1.0	.748	2.063	.998	2.438	1.223	2.438		

FOR A COMPLETE LISTING SEE MIL-C-55514/10  
THIS INFORMATION HAS BEEN ABSTRACTED FROM MIL-C-55514/10

**Hermetically-Sealed Axial-Lead  
Metalized-Polycarbonate  
Capacitors  
To Military Specification  
MIL-C-83421/01**

**MIL STYLE CRH01, CRH02, CRH03,  
CRH04, CRH05**

PART NUMBERING SYSTEM		
M83421/01-	1001	S
		<b>FAILURE RATE LEVEL.</b> M = 1.0% 90% CONFIDENCE LEVEL P = 0.1% R = 0.01% S = 0.001%
		<b>DASH NUMBER.</b> (SEE MIL-C-83421/01) NUMBER CORRESPONDS TO DESIRED VOLTAGE RATING, CAPACITANCE VALUE, AND CAPACITANCE TOLERANCE.
		<b>BASIC DOCUMENT NUMBER.</b>



**Notes:**

1. Insulating sleeve shall extend beyond the capacitor body.
2. Insulating sleeve thickness shall not exceed 0.005 inch (0.13mm).
3. L and D dimensions do not include the insulating sleeve.

**LEAD SIZE TABLE (INCHES)**

Case Diameter	Wire Size	
	No. AWG	Nom. Dia.
to 0.312	22	0.025
0.400 and 500	20	0.032
0.562 and up	18	0.040

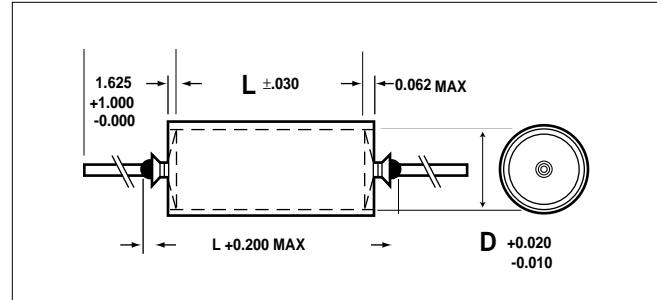
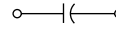
THIS INFORMATION HAS BEEN ABSTRACTED FROM MIL-C-83421/01

**Hermetically-Sealed Axial-Lead  
Metalized-Polycarbonate  
Capacitors  
To Military Specification  
MIL-C-83421/02**

**MIL STYLE CRH11, CRH12, CRH13**

PART NUMBERING SYSTEM	
M83421/02 - 1001	M
	<p><b>FAILURE RATE LEVEL.</b> M = 1.0% 90% CONFIDENCE LEVEL P = .1%</p> <p><b>DASH NUMBER.</b> (SEE MIL-C-83421/02.) NUMBER SHALL CORRESPOND TO DESIRED VOLTAGE RATING, CAPACITANCE VALUE, AND CAPACITANCE TOLERANCE.</p> <p><b>BASIC DOCUMENT NUMBER.</b></p>

CIRCUIT. 1



**Notes:**

1. Insulating sleeve shall extend beyond the capacitor body.
2. Insulating sleeve thickness shall not exceed 0.005 inch (0.13mm).
3. L and D dimensions do not include the insulating sleeve.
4. The leads are No. 18 AWG

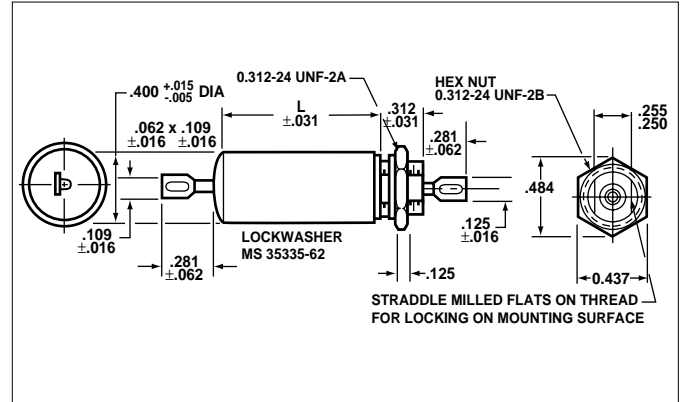
THIS INFORMATION HAS BEEN ABSTRACTED FROM MIL-C-83421/02

**Hermetically-Sealed Axial-Lead  
Metalized-Polycarbonate  
Capacitors Manufactured  
To Military Specification  
MIL-C-83439**

Military Part number	Capacitance (µf)	Capacitance tolerance (percent)	Rated Voltage		Insulation resistance (megohm microfarads)	DC resistance (max.) (ohms)	Dimension L (Inches)
			DC	AC 1/			
M83439/04-001	1.0	±20	400	250	50,000 2/	0.01	1.375
M83439/04-002	0.1	±10	50	30	100,000 3/	0.01	0.687

1/ Volts rms at 400 Hz  
2/ Need not exceed 100,000.  
3/ need not exceed 200,000.

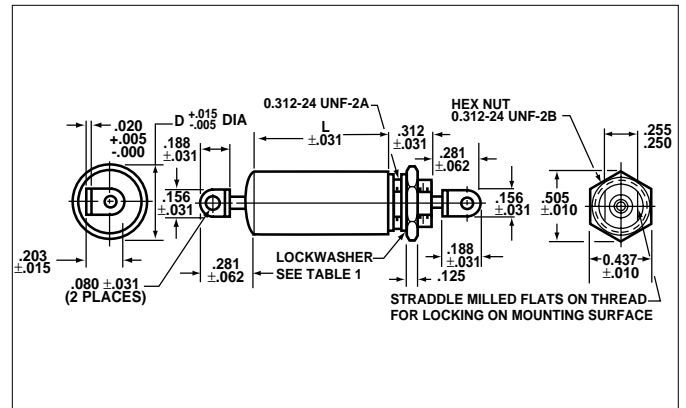
**CIRCUIT CONFIGURATION**



Capacitance value	Rated Voltage				Case dimensions		Part Numbers
	DC Volts	400 Hz AC volts	1200 Hz AC volts	2000 Hz AC volts	+ .015 D-.005	L±.031	
µf							M83439/06-
.18	50	35	25	15	0.400	0.687	0001
.22							0002
.27							0003
.33							0004
.39							0005
.47							0006
.56							0007
.68							0008
.82							0009
1.0						0.687	0010
1.2						0.937	0011
1.5							0012
1.8							0013
2.2						0.937	0014
2.7		35	25	15		1.187	0015
3.3		30	20	12	0.400		0016
3.9					0.500		0017
4.7					0.500		0018
5.6		30	20	12	0.500		0019
6.8		25	15	10	0.562	1.187	0020
8.2						1.375	0021
10.0						1.625	0022
12.0		25	15	10	0.562		0023
15.0		20	12	8	0.670		0024
18.0					0.670	1.625	0025
22.0					0.670	1.875	0026
27.0	50	20	12	8	0.750	1.875	0027

**MIL-C-83439/6(USAF)**

**CIRCUIT CONFIGURATION**



**Material:**

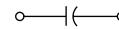
- Case and terminals:** Metal.
- Finish:** Corrosion-resistant.
- Dielectric:** Metalized polycarbonate.
- Temperature range:** -55° to +125°C. (DC ratings).  
-55° to +105°C. (AC ratings).
- Rated voltage:** 50 VDC - 400 VDC  
35 VAC - 240 VAC
- Capacitance:** .01 µf - 27 µf.
- Capacitance tolerance:** ±10 percent.

FOR COMPLETE LISTING SEE MIL-C-83439/6

**Approval Pending**

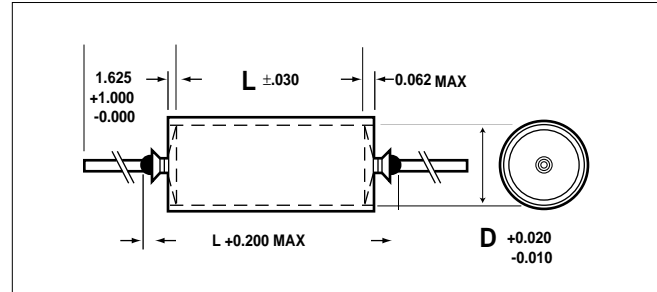
The parts supplied to this specification are qualified to MIL-C-83421/1 "S" failure rate level and subjected to additional screening. These capacitors are primarily intended for use in low energy, high impedance applications such as integrators, RC timing circuits, precision filters and other applications where the AC component of voltage is not significant.

**CIRCUIT 1**



**LEAD SIZE TABLE (INCHES)**

Case Diameter	Wire Size	
	No. AWG	Nom. Dia.
to 0.312	22	0.025
0.400 and 500	20	0.032
0.562 and up	18	0.040



**Notes:**

1. Insulating sleeve shall extend beyond the capacitor body.
2. Insulating sleeve thickness shall not exceed 0.005 inch (0.13mm).
3. L and D dimensions do not include the insulating sleeve.