



Engineering Bulletin

2062C

Supersedes No. 2062B

Type 225P Pressed Section and 418P Round Section

FILMITE® 'E' ORANGE DROP® Capacitors

A COMBINATION of excellent electrical characteristics and compactness is offered the equipment designer in commercial and industrial electronics with FILMITE 'E' ORANGE DROP Capacitors.

Where low cost is the prime consideration, Type 418P round section capacitors are the choice. Where printed wiring board space is most important, Type 225P pressed section capacitors utilize minimum area.

Both the round and pressed sections are wound from PETP* polyester-film and thin gage foil under carefully controlled atmospheric conditions. They are protected against moisture by a wax-free conformal coating of epoxy. Thus the problem of wax dripping at elevated temperatures, often encountered with wax-coated components, is completely eliminated.

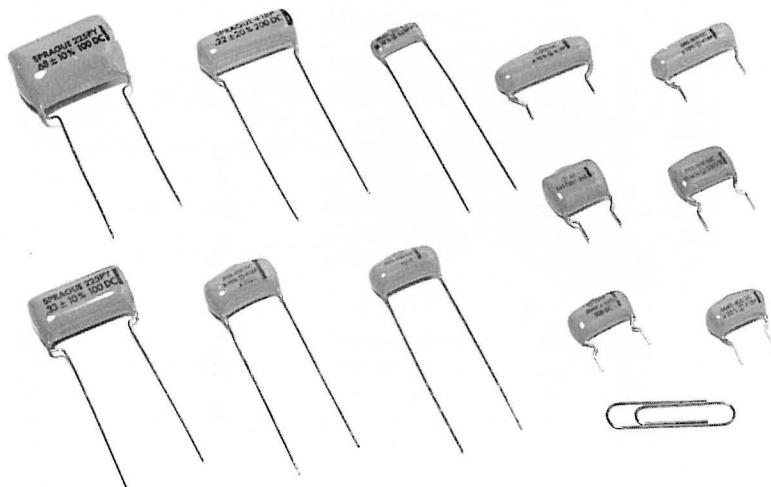
These capacitors have been specifically designed for printed wiring board applications and are furnished with radial leads to facilitate insertion on boards. They find wide application in television receivers, radio sets, and allied commercial electronic equipment. In many cases, Type 225P capacitors are offered in the same ratings in both .800" and 1.250" lengths to facilitate equipment design.

Type 225P FILMITE 'E' ORANGE DROP Capacitors are available in voltage ratings of 100, 200, 400, and 600 volts d-c for operation up to 85°C. Type 418P capacitors are available in voltage ratings of 100, 200, 400, 600, and 1000 volts d-c at 85°C. All capacitors, however, may be operated up to 105°C providing the voltage is reduced to 70% of the 85°C rating, or to 50% of the 85°C rating when operated up to 125°C.

The insulation resistance of these capacitors, as shown in the curves on page 8, is typical of the high values obtained with PETP* polyester-film dielectric.

Complete performance characteristics, as well as curves showing typical variations in electrical characteristics as a function of temperature, are given on the following pages.

The Sprague Electric Company, on request, will provide complete application engineering service for optimum results in the use of Type 225P and 418P FILMITE 'E' ORANGE DROP Capacitors in your particular circuit. For further information, please consult the Commercial Paper and Film Capacitor Section, Sprague Electric Company, North Adams, Massachusetts.



THESE ORANGE DROP PETP* POLYESTER-FILM CAPACITORS ARE WIDELY USED ON PRINTED WIRING BOARDS WITH THE CHOICE OF LEAD DEPENDENT PRIMARILY UPON THE METHOD USED FOR PLACING THE CAPACITORS ON THE BOARDS.

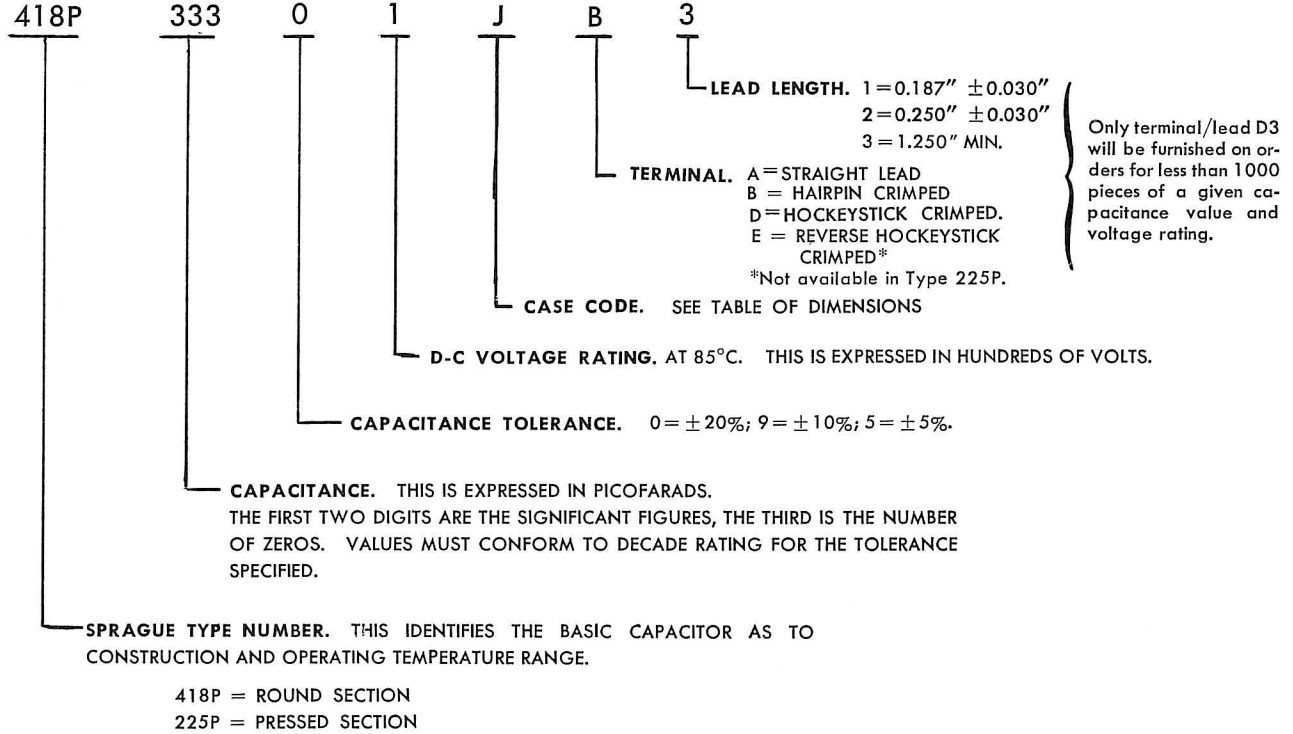
*PETP film is furnished by various vendors under the trademarks Mylar, Lumirror, Hostaphan, etc.

SPRAGUE ELECTRIC COMPANY

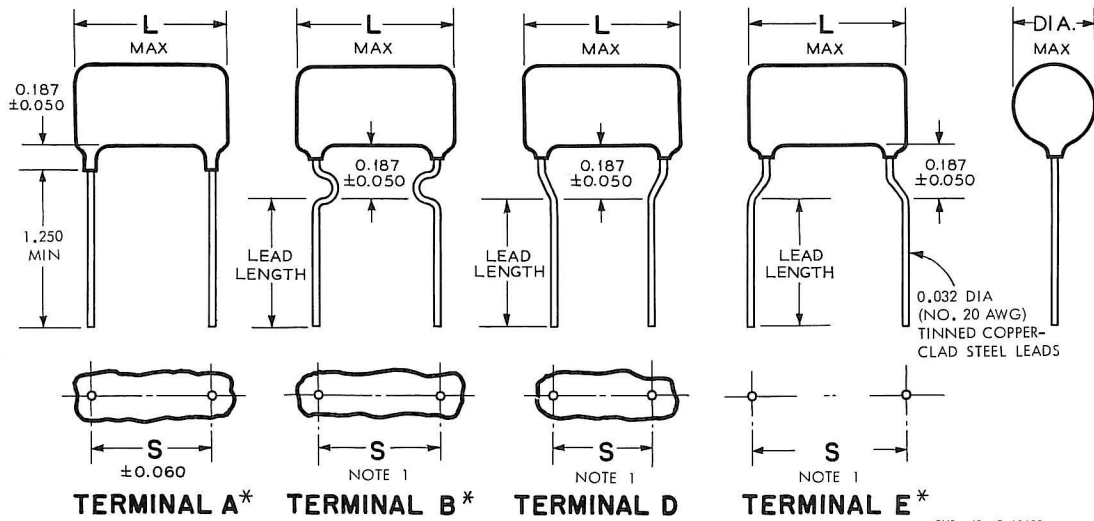
SPRAGUE
ENGINEERING
BULLETIN
2062C

Catalog Numbering System

ALWAYS SPECIFY BY COMPLETE CATALOG NUMBER, SUCH AS



SPRAGUE ENGINEERING BULLETIN No. 2062C



NOTE 1: Tol. ±0.030 for Lead Lengths 1 and 2; ±0.060 for Lead Length 3

*Available only on orders for 1000 or more pieces of a given capacitance value and voltage rating.

Case Code	L	S		
		Term. A, B	Term. D	Term. E
J	0.700	0.500	0.375	—
K	0.900	0.688	0.375	—
L	1.200	0.969	0.719	1.094
M	1.600	1.344	1.094	—

STANDARD RATINGS — TYPE 418P

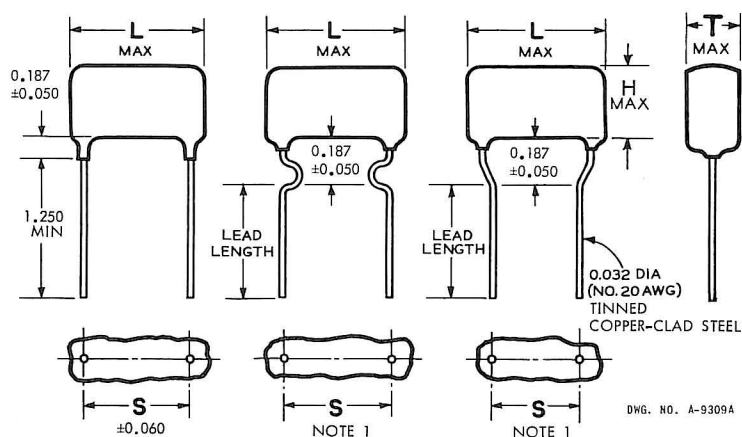
μF	Catalog Number*		Dia.	μF	Catalog Number*		Dia.
	±20% Tol.	±10% Tol.			±20% Tol.	±10% Tol.	
100 VOLTS D-C				200 VOLTS D-C			
.027	—	418P27391J	.35	.0056	—	418P56292J	.33
.033	418P33301J	418P33391J	.35	.0068	418P68202J	418P68292J	.33
.039	—	418P39391J	.35	.0082	—	418P82292J	.33
.047	418P47301J	418P47391J	.35	.01	418P10302J	418P10392J	.33
.056	—	418P56391J	.38	.012	—	418P12392J	.33
.068	418P68301J	418P68391J	.38	.015	418P15302J	418P15392J	.33
.082	—	418P82391K	.40	.018	—	418P18392J	.33
.10	418P10401K	418P10491K	.40	.022	418P22302J	418P22392J	.33
.12	—	418P12491K	.45	.027	—	418P27392J	.38
.15	418P15401K	418P15491K	.45	.033	418P33302K	418P33392K	.38
.18	—	418P18491L	.45	.039	—	418P39392K	.38
.22	418P22401L	418P22491L	.45	.047	418P47302K	418P47392K	.38
.27	—	418P27491L	.47	.056	—	418P56392L	.38
.33	418P33401L	418P33491L	.50	.068	418P68302L	418P68392L	.38
.39	—	418P39491M	.50	.082	—	418P82392L	.40
.47	418P47401M	418P47491M	.50	.10	418P10402L	418P10492L	.40
.56	—	418P56491M	.60	.12	—	418P12492L	.45
.68	418P68401M	418P68491M	.60	.15	418P15402L	418P15492L	.45
.82	—	418P82491M	.70	.18	—	418P18492L	.50
1.0	418P10501M	418P10591M	.70	.22	418P22402L	418P22492L	.50
				.27	—	418P27492M	.47
				.33	418P33402M	418P33492M	.47
				.39	—	418P39492M	.55
				.47	418P47402M	418P47492M	.55

*For complete catalog number, add letter and number for terminal and lead length in accordance with page 2.

STANDARD RATINGS — TYPE 418P

μF	Catalog Number*		Dia.	μF	Catalog Number*		Dia.
	±20% Tol.	±10% Tol.			±20% Tol.	±10% Tol.	
400 VOLTS D-C				600 VOLTS D-C			
.001	418P10204J	418P10294J	.30	.0082	—	418P82296K	.40
.0012	—	418P12294J	.30	.010	418P10306K	418P10396K	.40
.0015	418P15204J	418P15294J	.30	.012	—	418P12396K	.40
.0018	—	418P18294J	.30	.015	418P15306K	418P15396K	.40
.0022	418P22204J	418P22294J	.30	.018	—	418P18396K	.45
.0027	—	418P27294J	.30	.022	418P22306K	418P22396K	.45
.0033	418P33204J	418P33294J	.30	.027	—	418P27396L	.45
.0039	—	418P39294J	.30	.033	418P33306L	418P33396L	.45
.0047	418P47204J	418P47294J	.30	.039	—	418P39396L	.55
.0056	—	418P56294J	.33	.047	418P47306L	418P47396L	.55
.0068	418P68204J	418P68294J	.33	.056	—	418P56396L	.60
.0082	—	418P82294J	.35	.068	418P68306L	418P68396L	.60
.010	418P10304J	418P10394J	.35	.082	—	418P82396L	.65
.012	—	418P12394J	.38	.10	418P10406L	418P10496L	.65
.015	418P15304J	418P15394J	.38	.12	—	418P12496M	.70
.018	—	418P18394K	.38	.15	418P15406M	418P15496M	.70
.022	418P22304K	418P22394K	.38	.18	—	418P18496M	.80
.027	—	418P27394K	.40	.22	418P22406M	418P22496M	.80
.033	418P33304K	418P33394K	.40	1000 VOLTS D-C			
.039	—	418P39394L	.40	.001	418P102010J	418P102910J	0.33
.047	418P47304L	418P47394L	.40	.0012	—	418P122910J	0.33
.056	—	418P56394L	.45	.0015	418P152010J	418P152910J	0.33
.068	418P68304L	418P68394L	.45	.0018	—	418P182910J	0.35
.082	—	418P82394L	.52	.0022	418P222010J	418P222910J	0.35
.10	418P10404L	418P10494L	.52	.0027	—	418P272910K	0.35
.12	—	418P12494L	.57	.0033	418P332010K	418P332910K	0.35
.15	418P15404L	418P15494L	.57	.0039	—	418P392910K	0.40
.18	—	418P18494M	.60	.0047	418P472010K	418P472910K	0.40
.22	418P22404M	418P22494M	.60	.0056	—	418P562910K	0.43
.27	—	418P27494M	.65	.0068	418P682010K	418P682910K	0.43
.33	418P33404M	418P33494M	.65	.0082	—	418P822910K	0.48
.39	—	418P39494M	.72	.01	418P103010K	418P103910K	0.48
.47	418P47404M	418P47494M	.72	.012	—	418P123910L	0.48
600 VOLTS D-C				.015	418P153010L	418P153910L	0.48
.0010	418P10206J	418P10296J	.30	.018	—	418P183910L	0.58
.0012	—	418P12296J	.33	.022	418P223010L	418P223910L	0.58
.0015	418P15206J	418P15296J	.33	.027	—	418P273910L	0.65
.0018	—	418P18296J	.33	.033	418P333010L	418P333910L	0.65
.0022	418P22206J	418P22296J	.33	.039	—	418P393910M	0.65
.0027	—	418P27296J	.35	.047	418P473010M	418P473910M	0.65
.0033	418P33206J	418P33296J	.35	.056	—	418P563910M	0.75
.0039	—	418P39296J	.38	.068	418P683010M	418P683910M	0.75
.0047	418P47206J	418P47296J	.38	.082	—	418P823910M	0.85
.0056	—	418P56296J	.40	.10	418P104010M	418P104910M	0.85
.0068	418P68206J	418P68296J	.40				

*For complete catalog number, add letter and number for terminal and lead length in accordance with page 2.



CASE CODE	L Max.	S		H	T
		Term. A	Term. D		
W	0.700	0.562	0.375	See listings for individual capacitors	
X	0.800	0.613	0.375		
Y	1.250	0.969	0.719		

TERMINAL A TERMINAL B** TERMINAL D**

NOTE 1: Tol. ±0.030 for Lead Length 1 & 2 and ±0.060 for Lead Length 3

**Available only on orders for 1000 or more pieces of a given capacitance value and voltage rating.

**TYPE 225P
STANDARD RATINGS**

μF	Catalog Number *		Size		μF	Catalog Number *		Size	
	±20% Tol.	±10% Tol.	H	T		±20% Tol.	±10% Tol.	H	T
100 VOLTS D-C					100 VOLTS D-C				
.001	225P10201W	225P10291W	.35	.25	.18	—	225P18491X	.66	.43
.0012	—	225P12291W	.35	.25	.22	225P22401X	225P22491X	.70	.46
.0015	225P15201W	225P15291W	.35	.25	.27	—	225P27291X	.74	.49
.0018	—	225P18291W	.35	.25	.33	225P33401X	225P33491X	.77	.52
.0022	225P22201W	225P22291W	.35	.25	.39	—	225P39491X	.81	.55
.0027	—	225P27291W	.35	.25	.47	225P47401X	225P47491X	.86	.60
.0033	225P33201W	225P33291W	.35	.25	.56	—	225P56491Y	.88	.55
.0039	—	225P39291W	.35	.25	.68	225P68401Y	225P68491Y	.90	.58
.0047	225P47201W	225P47291W	.35	.25	.82	—	225P82491Y	.94	.65
.0056	—	225P56291W	.35	.25	1.0	225P10501Y	225P10591Y	.98	.72
.0068	225P68201W	225P68291W	.35	.25	200 VOLTS D-C				
.0082	—	225P82291W	.35	.25	.001	225P10202X	225P10292X	.55	.25
.01	225P10301W	225P10391W	.35	.25	.0012	—	225P12292X	.55	.25
.012	—	225P12391W	.35	.25	.0015	225P15202X	225P15292X	.55	.25
.015	225P15301W	225P15391W	.35	.25	.0018	—	225P18292X	.55	.25
.018	—	225P18391W	.35	.25	.0022	225P22202X	225P22292X	.55	.25
.022	225P22301W	225P22391W	.35	.25	.0027	—	225P27292X	.55	.25
.027	—	225P27391W	.37	.27	.0033	225P33202X	225P33292X	.55	.25
.033	225P33301W	225P33391W	.37	.27	.0039	—	225P39292X	.55	.25
.039	—	225P39391W	.42	.30	.0047	225P47202X	225P47292X	.55	.25
.047	225P47301W	225P47391W	.42	.30	.0056	—	225P56292X	.58	.25
.056	—	225P56391W	.49	.34	.0068	225P68202X	225P68292X	.58	.25
.068	225P68301W	225P68391W	.49	.34	.0082	—	225P82292X	.58	.25
.082	—	225P82391W	.55	.40	.01	225P10302X	225P10392X	.58	.25
.1	225P10401W	225P10491W	.55	.40	.012	—	225P12392X	.58	.25
.12	—	225P12491X	.57	.37	.015	225P15302X	225P15392X	.58	.25
.15	225P15401X	225P15491X	.62	.40	.018	—	225P18392X	.58	.25

*For complete catalog number, add letter and number for terminal and lead length in accordance with page 2.

STANDARD RATINGS - - Type 225P (Cont.)

Catalog Number *			Size		Catalog Number *			Size	
μF	± 20% Tol.	± 10% Tol.	H	T	μF	± 20% Tol.	± 10% Tol.	H	T
200 VOLTS D-C					400 VOLTS D-C				
.022	225P22302X	225P22392X	.58	.25	.082	—	225P82394X	.83	.50
.027	—	225P27392X	.61	.28	.082	—	225P82394Y	.71	.37
.033	225P33302X	225P33392X	.61	.28	.1	225P10404X	225P10494X	.84	.52
.039	—	225P39392X	.61	.28	.1	225P10404Y	225P10494Y	.74	.41
.047	225P47302X	225P47392X	.61	.28	.12	—	225P12494Y	.77	.44
.056	—	225P56392X	.64	.31	.15	225P15404Y	225P15494Y	.80	.47
.068	225P68302X	225P68392X	.64	.31	.18	—	225P18494Y	.84	.52
.082	—	225P82392X	.67	.34	.22	225P22404Y	225P22494Y	.89	.56
.1	225P10402X	225P10492X	.71	.37	.27	—	225P27494Y	.91	.69
.1	225P10402Y	225P10492Y	.64	.31	.33	225P33404Y	225P33494Y	.99	.72
.12	—	225P12492X	.72	.39	.39	—	225P39494Y	1.10	.75
.12	—	225P12492Y	.65	.33	.47	225P47404Y	225P47494Y	1.14	.84
.15	225P15402X	225P15492X	.74	.41	600 VOLTS D-C				
.15	225P15402Y	225P15492Y	.67	.34	.001	225P10206X	225P10296X	.55	.25
.18	—	225P18492X	.75	.46	.0012	—	225P12296X	.55	.25
.18	—	225P18492Y	.69	.35	.0015	225P15206X	225P15296X	.55	.25
.22	225P22402X	225P22492X	.77	.48	.0018	—	225P18296X	.55	.25
.22	225P22402Y	225P22492Y	.71	.37	.0022	225P22206X	225P22296X	.55	.25
.27	—	225P27492Y	.69	.39	.0027	—	225P27296X	.55	.25
.33	225P33402Y	225P33492Y	.71	.41	.0033	225P33206X	225P33296X	.55	.25
.39	—	225P39492Y	.77	.45	.0039	—	225P39296X	.58	.25
.47	225P47402Y	225P47492Y	.83	.50	.0047	225P47206X	225P47296X	.58	.25
.56	—	225P56492Y	.99	.67	.0056	—	225P56296X	.58	.25
.68	225P68402Y	225P68492Y	1.14	.84	.0068	225P68206X	225P68296X	.58	.25
400 VOLTS D-C					.0082	—	225P82296X	.64	.31
.001	225P10204X	225P10294X	.55	.25	.01	225P10306X	225P10396X	.64	.31
.0012	—	225P12294X	.55	.25	.012	—	225P12396X	.67	.34
.0015	225P15204X	225P15294X	.55	.25	.015	225P15306X	225P15396X	.67	.34
.0018	—	225P18294X	.55	.25	.018	—	225P18396X	.74	.37
.0022	225P22204X	225P22294X	.55	.25	.018	—	225P18396Y	.68	.33
.0027	—	225P27294X	.55	.25	.022	225P22306X	225P22396X	.74	.37
.0033	225P33204X	225P33294X	.55	.25	.022	225P22306Y	225P22396Y	.68	.33
.0039	—	225P39294X	.55	.25	.027	—	225P27396X	.77	.44
.0047	225P47204X	225P47294X	.55	.25	.027	—	225P27396Y	.71	.36
.0056	—	225P56294X	.58	.25	.033	225P33306X	225P33396X	.77	.44
.0068	225P68204X	225P68294X	.58	.25	.033	225P33306Y	225P33396Y	.71	.36
.0082	—	225P82294X	.58	.25	.039	—	225P39396X	.83	.50
.01	225P10304X	225P10394X	.58	.25	.039	—	225P39396Y	.75	.39
.012	—	225P12394X	.58	.28	.047	225P47306X	225P47396X	.83	.50
.015	225P15304X	225P15394X	.58	.28	.047	225P47306Y	225P47396Y	.75	.39
.018	—	225P18394X	.58	.31	.056	—	225P56396Y	.82	.47
.022	225P22304X	225P22394X	.58	.31	.068	225P68306Y	225P68396Y	.82	.47
.027	—	225P27394X	.65	.34	.082	—	225P82396Y	.88	.53
.033	225P33304X	225P33394X	.65	.34	.1	225P10406Y	225P10496Y	.91	.56
.039	—	225P39394X	.65	.41	.12	—	225P12496Y	.92	.60
.047	225P47304X	225P47394X	.65	.41	.15	225P15406Y	225P15496Y	.94	.62
.047	225P47304Y	225P47394Y	.64	.31	.18	—	225P18496Y	1.02	.70
.056	—	225P56394X	.80	.47	.22	225P22406Y	225P22496Y	1.10	.76
.056	—	225P56394Y	.67	.34					
.068	225P68304X	225P68394X	.80	.47					
.068	225P68304Y	225P68394Y	.67	.34					

*For complete catalog number, add letter and number for terminal and lead length in accordance with page 2.

PERFORMANCE CHARACTERISTICS

1. Operating Temperature Range. The standard operating temperature range of these capacitors is -55°C to $+85^{\circ}\text{C}$. Capacitors may be operated up to $+105^{\circ}\text{C}$ provided the working voltage is reduced to 70% of the 85°C rating. They may be operated up to $+125^{\circ}\text{C}$ provided the working voltage is reduced to 50% of the 85°C rating.

2. Insulation Resistance.

2.1 At 25°C . The minimum product of insulation resistance, expressed in megohms, and capacitance, expressed in microfarads, shall be 25,000 megohm-microfarads.

2.1.1 However, in no case need the insulation resistance exceed 100,000 megohms.

2.2 At 85°C . The minimum product of insulation resistance, expressed in megohms, and capacitance, expressed in microfarads, shall be 1500 megohm-microfarads.

2.2.1 However, in no case need the insulation resistance exceed 10,000 megohms.

2.3 At 105°C . The minimum product of insulation resistance, expressed in megohms, and capacitance, expressed in microfarads, shall be 250 megohm-microfarads.

2.3.1 However, in no case need the insulation resistance exceed 1500 megohms.

2.4 At 125°C . The minimum product of insulation resistance, expressed in megohms, and capacitance, expressed in microfarads, shall be 25 megohm-microfarads.

2.4.1 However, in no case need the insulation resistance exceed 200 megohms.

2.5 Measurements shall be made after a two minute charge at rated voltage or at 500 volts d-c, whichever is less.

3. Capacitance and Tolerance. The capacitance of all capacitors shall be within the specified tolerance limits of the nominal rating.

3.1 Capacitors shall be measured at a frequency of 1000 Hertz at 25°C , or else referred to measurements made at that frequency and temperature.

4. Dissipation Factor. The maximum dissipation factor of all capacitors shall be 0.75% at 25°C .

4.1 Capacitors shall be measured at a frequency of 1000 Hertz, or else referred to measurements made at that frequency.

5. Dielectric Withstanding Voltage.

5.1 Capacitors rated below 1000 volts shall withstand a d-c potential of 250% of rated voltage applied between terminals for not more than 5 seconds.

5.2 Capacitors rated 1000 volts and above shall withstand a d-c potential of 200% of rated voltage applied between the terminals for not more than 5 seconds.

5.3 The test voltage must be applied and discharged through a resistor of one ohm per volt.

6. Humidity Test.

6.1 Capacitors shall withstand the humidity test as outlined in sections 6.1.1 to 6.1.4.2 inclusive.

6.1.1 Condition capacitors with no voltage applied for 72 hours at 95% relative humidity and 75°C .

6.1.2 Remove capacitors from humidity chamber and wipe surface of the units dry of moisture.

6.1.3 Dry in circulating air for 4 hours.

6.1.4 Measure insulation resistance at 25°C in accordance with section 2.5.

6.1.4.1 The minimum product of insulation resistance and capacitance shall be 5000 megohm-microfarads after test.

6.1.4.2 In no case, however, need the insulation resistance exceed 10,000 megohms.

6.2 Not more than 1 failure shall be permitted in 12 units tested.

7. Life Test. Capacitors shall withstand a test potential of 150% of rated voltage for a period of 500 hours at 85°C .

7.1 Not more than 1 failure shall be permitted in every 12 units tested. Failure shall be considered to be any one of the following:

- (a) A change in capacitance of more than 5% of the initial value.
- (b) A decrease in insulation resistance to less than 50% of the initial limit as specified in section 2.1.
- (c) An increase in dissipation factor to a value of more than 1%.

8. Pull Test. Capacitors shall withstand a steady pull of 5 pounds (22N) applied radially to the longitudinal axis of the body of the capacitor for 1 minute.

9. Lead Bending Test. Leads shall be bent without breakage at any point below the lead crimp first 90° in one direction, then back to the original position and then 90° in the opposite direction.

10. Marking. All capacitors shall be marked with SPRAGUE and/or the registered Sprague trademark, ®; and the type (225P or 418P), if space permits; rated capacitance and capacitance tolerance (if other than $\pm 20\%$); and the rated d-c working voltage.

