



**CAPACITORS, FIXED, TANTALUM,
SOLID ELECTROLYTE,
BASED ON TYPE CSR13
ESCC Detail Specification No. 3002/002**

**ISSUE 1
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BASED ON TYPE CSR13
ESA/SCC Detail Specification No. 3002/002**



**space components
coordination group**

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		SCCG Chairman	ESA Director General or his Deputy
Issue 3	August 1995	<i>Pommes</i>	<i>A. Rom</i>

**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 2 and incorporates all modifications defined in Revisions 'A', 'B', 'C' and 'D' to Issue 2 and the changes agreed in the following DCR's:-		
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		Table 2	: Columns standardised, symbols standardised	23751
		Table 3	: Columns standardised, notes added with reference to Columns in Table 1(a)	23751
		Figure 4	: Figure 4 reference added	23751
		Table 4	: Notes added, symbols corrected and columns standardised	23751
		Table 5	: Renumbered as 5(a) and Note added	23751
		Table 5(b)	: Table moved from Table 7 and standardised	23751
		Figure 5	: Figure 5 reference added	23751
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		Para. 4.8.3	: Title amended	23751
		Para. 4.8.4	: Amend Table reference	23751
		Para. 4.8.5	: New paragraph	23751
		Table 6	: Format amended and corrected	23751
		Table 7	: Deleted	23751
		Appendix 'A'	: DCR Number column deleted	23187
			: Format standardised	23751

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**1. GENERAL****1.1 SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Fixed, Tantalum, Solid Electrolyte, based on Type CSR13. It shall be read in conjunction with ESA/SCC Generic Specification No. 3002, the requirements of which are supplemented herein.

1.2 RANGE OF COMPONENTS

The range of capacitors covered by this specification is scheduled in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the capacitors specified herein, are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The parameter derating information, applicable to the capacitors specified herein, is shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the capacitors specified herein, are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram for the capacitors specified herein is shown in Figure 3.

2. APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:-

(a) ESA/SCC Generic Specification No. 3002 for Capacitors, Fixed, Tantalum, Solid Electrolyte.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply. In addition, the following symbols are used:-

V_T = Test Voltage.



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TABLE 1(a) - RANGE OF COMPONENTS

(1) Type No.	(2) Rated Voltage (U _R) (V)	(3) Capacitance Value (C) (μF)	(4) Tolerance (± %)	(5) D.C. Leakage Current (I _L)			(8) Dissipation Factor (- 55°C to + 25°C) (%)	(9) Dissipation Factor (+ 85°C to + 125°C) (%)	(10) Surge Voltage		(12) Case Size	(13) Max. Weight (g)
				(5) + 25°C (μA)	(6) + 85°C (μA)	(7) + 125°C (μA)			(10) At + 85°C (V)	(11) At + 125°C (V)		
565KA	6.0	5.6	10	0.5	6.0	7.5	4.0	4.0	8.0	5.0	A	0.7
685XA	6.0	6.8	10, 20	0.5	6.0	7.5	6.0	6.0	8.0	5.0	A	0.7
476XA	6.0	47	10, 20	3.0	24	30	6.0	6.0	8.0	5.0	B	1.7
566KA	6.0	56	10	3.0	24	30	6.0	6.0	8.0	5.0	B	1.7
157XA	6.0	150	10, 20	9.0	90	113	8.0	8.0	8.0	5.0	C	5.4
187KA	6.0	180	10	11	110	138	8.0	8.0	8.0	5.0	C	5.4
277KA	6.0	270	10	13	130	163	8.0	8.0	8.0	5.0	D	9.0
337XA	6.0	330	10, 20	15	150	188	8.0	8.0	8.0	5.0	D	9.0
395KD	10	3.9	10	0.6	6.0	7.5	4.0	4.0	13	9.0	A	0.7
475XD	10	4.7	10, 20	0.7	7.0	8.8	4.0	4.0	13	9.0	A	0.7
276KD	10	27	10	4.0	40	50	6.0	6.0	13	9.0	B	1.7
336XD	10	33	10, 20	5.0	50	63	6.0	6.0	13	9.0	B	1.7
396KD	10	39	10	5.0	50	63	6.0	6.0	13	9.0	B	1.7
826KD	10	82	10	8.0	80	100	6.0	6.0	13	9.0	C	5.4
107XD	10	100	10, 20	10	100	125	8.0	8.0	13	9.0	C	5.4
127KD	10	120	10	12	120	150	8.0	8.0	13	9.0	C	5.4
187KD	10	180	10	18	180	226	8.0	8.0	13	9.0	D	9.0
227XD	10	220	10, 20	20	200	250	8.0	8.0	13	9.0	D	9.0
275KE	15	2.7	10	0.6	6.0	7.5	4.0	4.0	20	12	A	0.7
335XE	15	3.3	10, 20	0.8	8.0	10	4.0	4.0	20	12	A	0.7
186KE	15	18	10	3.5	35	44	6.0	6.0	20	12	B	1.7
226XE	15	22	10, 20	4.0	40	50	6.0	6.0	20	12	B	1.7



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TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

(1) Type No.	(2) Rated Voltage (U _R) (V)	(3) Capacitance Value (C) (μF)	(4) Tolerance (± %)	(5) D.C. Leakage Current (I _L) (μA)			(8) Dissipation Factor (-55°C to +25°C) (%)	(9) Dissipation Factor (+85°C to +125°C) (%)	(10) Surge Voltage (V)		(12) Case Size	(13) Max. Weight (g)
				+25°C	+85°C	+125°C			At +85°C	At +125°C		
566KE	15	56	10	8.0	80	100	6.0	6.0	20	12	C	5.4
686XE	15	68	10, 20	10	100	125	6.0	6.0	20	12	C	5.4
127KE	15	120	10	18	180	226	8.0	8.0	20	12	D	9.0
157XE	15	150	10, 20	20	200	250	8.0	8.0	20	12	D	9.0
125KF	20	1.2	10	0.6	6.0	7.5	4.0	4.0	26	16	A	0.7
155XF	20	1.5	10, 20	0.6	6.0	7.5	4.0	4.0	26	16	A	0.7
185KF	20	1.8	10	0.6	6.0	7.5	4.0	4.0	26	16	A	0.7
225XF	20	2.2	10, 20	0.8	8.0	10	4.0	4.0	26	16	A	0.7
825KF	20	8.2	10	2.0	20	25	6.0	6.0	26	16	B	1.7
106XF	20	10	10, 20	3.0	30	38	6.0	6.0	26	16	B	1.7
126KF	20	12	10	3.5	35	44	6.0	6.0	26	16	B	1.7
156XF	20	15	10, 20	4.0	40	50	6.0	6.0	26	16	B	1.7
276KF	20	27	10	5.0	50	63	6.0	6.0	26	16	C	5.4
336XF	20	33	10, 20	7.0	70	88	6.0	6.0	26	16	C	5.4
396KF	20	39	10	8.0	80	100	6.0	6.0	26	16	C	5.4
476XF	20	47	10, 20	9.0	90	113	6.0	6.0	26	16	C	5.4
566KF	20	56	10	11	110	138	8.0	8.0	26	16	D	9.0
686XF	20	68	10, 20	14	140	175	8.0	8.0	26	16	D	9.0
826KF	20	82	10	16	160	200	8.0	8.0	26	16	D	9.0
107XF	20	100	10, 20	20	200	250	8.0	8.0	26	16	D	9.0
565KJ	35	5.6	10	2.5	25	32	4.0	4.0	46	28	B	1.7
685XJ	35	6.8	10, 20	3.0	30	38	6.0	6.0	46	28	B	1.7
226XJ	35	22	10, 20	8.0	80	100	6.0	6.0	46	28	C	5.4



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TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

(1) Type No.	(2) Rated Voltage (U _R) (V)	(3) Capacitance Value (C) (µF)	(4) Tolerance (±%)	(5) D.C. Leakage Current (I _L)			(8) Dissipation Factor (-55°C to +25°C) (%)	(9) Dissipation Factor (+85°C to +125°C) (%)	(10) Surge Voltage		(12) Case Size	(13) Max. Weight (g)
				(5) +25°C (µA)	(6) +85°C (µA)	(7) +125°C (µA)			(10) At +85°C (V)	(11) At +125°C (V)		
276KJ	35	27	10	9.0	90	113	6.0	6.0	46	28	D	9.0
336XJ	35	33	10, 20	11	110	138	6.0	6.0	46	28	D	9.0
396KJ	35	39	10	14	140	175	6.0	6.0	46	28	D	9.0
476XJ	35	47	10, 20	16	160	200	6.0	6.0	46	28	D	9.0
472XL	50	0.0047	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
562KL	50	0.0056	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
682XL	50	0.0068	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
822KL	50	0.0082	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
103XL	50	0.01	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
123KL	50	0.012	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
153XL	50	0.015	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
183KL	50	0.018	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
223XL	50	0.022	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
273KL	50	0.027	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
333XL	50	0.033	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
392KL	50	0.039	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
473XL	50	0.047	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
563KL	50	0.056	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
683XL	50	0.068	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
823KL	50	0.082	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
104XL	50	0.1	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
124KL	50	0.12	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
154XL	50	0.15	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7



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TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

(1) Type No.	(2) Rated Voltage (U_R) (V)	(3) Capacitance Value (C) (μ F)	(4) Tolerance (\pm %)	(5) D.C. Leakage Current (I _L)			(8) Dissipation Factor (-55°C to +25°C) (%)	(9) Dissipation Factor (+85°C to +125°C) (%)	(10) Surge Voltage		(12) Case Size	(13) Max. Weight (g)
				(5) +25°C (μ A)	(6) +85°C (μ A)	(7) +125°C (μ A)			(10) At +85°C (V)	(11) At +125°C (V)		
184KL	50	0.18	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
224XL	50	0.22	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
274KL	50	0.27	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
334XL	50	0.33	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
394KL	50	0.39	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
474XL	50	0.47	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
564KL	50	0.56	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
684XL	50	0.68	10, 20	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
824KL	50	0.82	10	0.5	5.0	6.3	2.0	4.0	65	40	A	0.7
105XL	50	1.0	10, 20	0.8	8.0	10	2.0	4.0	65	40	A	0.7
125KL	50	1.2	10	0.9	9.0	11	4.0	4.0	65	40	B	1.7
155XL	50	1.5	10, 20	1.2	12	15	4.0	4.0	65	40	B	1.7
185KL	50	1.8	10	1.4	14	18	4.0	4.0	65	40	B	1.7
225XL	50	2.2	10, 20	1.7	17	22	4.0	4.0	65	40	B	1.7
275KL	50	2.7	10	2.0	20	25	4.0	4.0	65	40	B	1.7
335XL	50	3.3	10, 20	2.5	25	32	4.0	4.0	65	40	B	1.7
395KL	50	3.9	10	3.0	30	38	4.0	4.0	65	40	B	1.7
475XL	50	4.7	10, 20	3.5	35	44	4.0	4.0	65	40	B	1.7
565KL	50	5.6	10	4.5	45	56	4.0	4.0	65	40	C	5.4
685XL	50	6.8	10, 20	4.5	45	56	4.0	4.0	65	40	C	5.4
825KL	50	8.2	10	5.0	50	63	6.0	6.0	65	40	C	5.4
106XL	50	10	10, 20	5.0	50	63	6.0	6.0	65	40	C	5.4
126KL	50	12	10	6.0	60	75	6.0	6.0	65	40	C	5.4



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TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

(1) Type No.	(2) Rated Voltage (U _R) (V)	(3) Capacitance Value (C) (μF)	(4) Tolerance (±%)	(5) D.C. Leakage Current (I _L)			(8) Dissipation Factor (-55°C to +25°C) (%)	(9) Dissipation Factor (+85°C to +125°C) (%)	(10) Surge Voltage		(12) Case Size	(13) Max. Weight (g)
				+25°C (μA)	+85°C (μA)	+125°C (μA)			At +85°C (V)	At +125°C (V)		
156XL	50	15	10, 20	8.0	80	100	6.0	6.0	65	40	C	5.4
186KL	50	18	10	9.0	90	113	6.0	6.0	65	40	C	5.4
226XL	50	22	10, 20	11	110	138	6.0	6.0	65	40	D	9.0
104XP	75	0.1	10, 20	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
124KP	75	0.12	10	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
154XP	75	0.15	10, 20	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
184KP	75	0.18	10	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
224XP	75	0.22	10, 20	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
274KP	75	0.27	10	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
334XP	75	0.33	10, 20	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
394KP	75	0.39	10	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
474XP	75	0.47	10, 20	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
564KP	75	0.56	10	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
684XP	75	0.68	10, 20	0.5	5.0	6.3	2.0	4.0	98	64	A	0.7
824KP	75	0.82	10	0.5	5.0	6.3	2.0	4.0	98	64	B	1.7
105XP	75	1.0	10, 20	0.5	5.0	6.3	2.0	4.0	98	64	B	1.7
125KP	75	1.2	10	0.5	5.0	6.3	4.0	4.0	98	64	B	1.7
155XP	75	1.5	10, 20	1.0	10	13	4.0	4.0	98	64	B	1.7
185KP	75	1.8	10	1.0	10	13	4.0	4.0	98	64	B	1.7
225XP	75	2.2	10, 20	1.5	15	19	4.0	4.0	98	64	B	1.7
275KP	75	2.7	10	1.5	15	19	4.0	4.0	98	64	B	1.7
335XP	75	3.3	10, 20	2.0	20	25	4.0	4.0	98	64	B	1.7
395KP	75	3.9	10	2.0	20	25	4.0	4.0	98	64	B	1.7



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TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

(1) Type No.	(2) Rated Voltage (U_R) (V)	(3) Capacitance Value (C) (μ F)	(4) Tolerance (\pm %)	D.C. Leakage Current (I _L)			(8) Dissipation Factor (-55°C to +25°C) (%)	(9) Dissipation Factor (+85°C to +125°C) (%)	Surge Voltage		(12) Case Size	(13) Max. Weight (g)
				(5) +25°C (μ A)	(6) +85°C (μ A)	(7) +125°C (μ A)			(10) At +85°C (V)	(11) At +125°C (V)		
475XP	75	4.7	10, 20	6.0	60	75	4.0	4.0	98	64	C	5.4
565KP	75	5.6	10	6.0	60	75	4.0	4.0	98	64	C	5.4
685XP	75	6.8	10, 20	10	100	125	6.0	6.0	98	64	C	5.4
825KP	75	8.2	10	10	100	125	6.0	6.0	98	64	C	5.4
106XP	75	10	10, 20	10	100	125	6.0	6.0	98	64	C	5.4
126KP	75	12	10	10	100	125	6.0	6.0	98	64	D	9.0
156XP	75	15	10, 20	14	140	175	6.0	6.0	98	64	D	9.0
472XQ	100	0.0047	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
562KQ	100	0.0056	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
682XQ	100	0.0068	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
822KQ	100	0.0082	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
103XQ	100	0.01	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
123KQ	100	0.012	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
153XQ	100	0.015	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
183KQ	100	0.018	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
223XQ	100	0.022	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
273KQ	100	0.027	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
333XQ	100	0.033	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
393KQ	100	0.039	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
473XQ	100	0.047	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7



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TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

(1) Type No.	(2) Rated Voltage (U_R) (V)	(3) Capacitance Value (C) (μ F)	(4) Tolerance (\pm %)	D.C. Leakage Current (I _L)			(8) Dissipation Factor (- 55°C to + 25°C) (%)	(9) Dissipation Factor (+ 85°C to + 125°C) (%)	Surge Voltage		(12) Case Size	(13) Max. Weight (g)
				(5) + 25°C (μ A)	(6) + 85°C (μ A)	(7) + 125°C (μ A)			(10) At + 85°C (V)	(11) At + 125°C (V)		
563KQ	100	0.056	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
683XQ	100	0.068	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
823KQ	100	0.082	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
104XQ	100	0.1	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
124KQ	100	0.12	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
154XQ	100	0.15	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
184KQ	100	0.18	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
224XQ	100	0.22	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
274KQ	100	0.27	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
334XQ	100	0.33	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
394KQ	100	0.39	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
474XQ	100	0.47	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
564KQ	100	0.56	10	0.5	5.0	6.3	2.0	4.0	130	86	A	0.7
684XQ	100	0.68	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	B	1.7
824KQ	100	0.82	10	0.5	5.0	6.3	2.0	4.0	130	86	B	1.7
105XQ	100	1.0	10, 20	0.5	5.0	6.3	2.0	4.0	130	86	B	1.7
125KQ	100	1.2	10	0.5	5.0	6.3	4.0	4.0	130	86	B	1.7
155XQ	100	1.5	10, 20	1.0	10	13	4.0	4.0	130	86	B	1.7
185KQ	100	1.8	10	1.0	10	13	4.0	4.0	130	86	B	1.7
225XQ	100	2.2	10, 20	1.5	15	19	4.0	4.0	130	86	B	1.7
275KQ	100	2.7	10	1.5	15	19	4.0	4.0	130	86	B	1.7



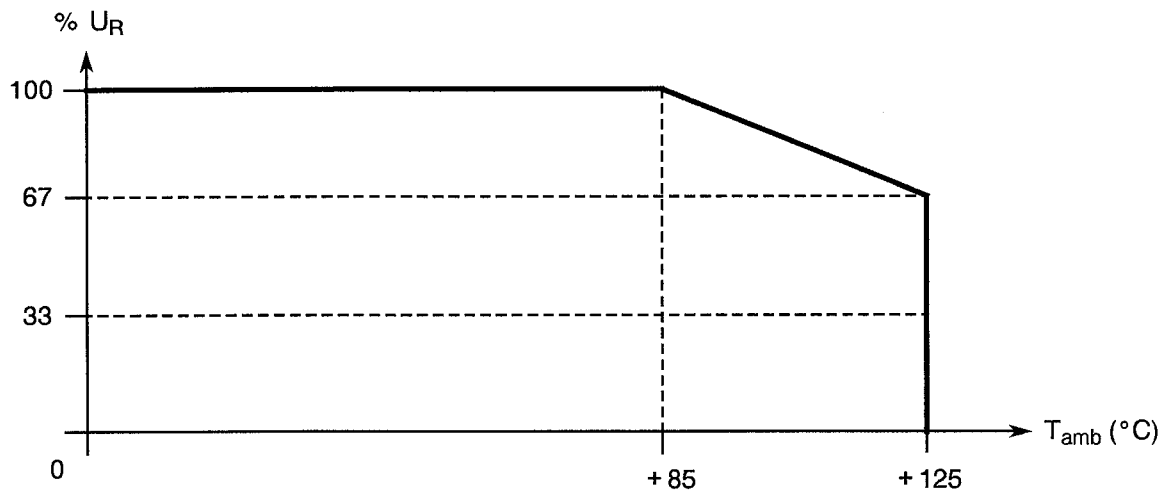
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Rated Voltage	U_R	See Table 1(a)	V	Note 1
2	Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
3	Storage Temperature Range	T_{stg}	-55 to +125	°C	-
4	Soldering Temperature	T_{sol}	+240	°C	Note 2

NOTES

- At $T_{amb} \leq +85^\circ\text{C}$. For derating at $T_{amb} > +85^\circ\text{C}$, see Figure 1.
- Duration 5 seconds maximum at a distance of not less than 3.0mm from body on negative side and 3.0mm from eyelet on positive side.

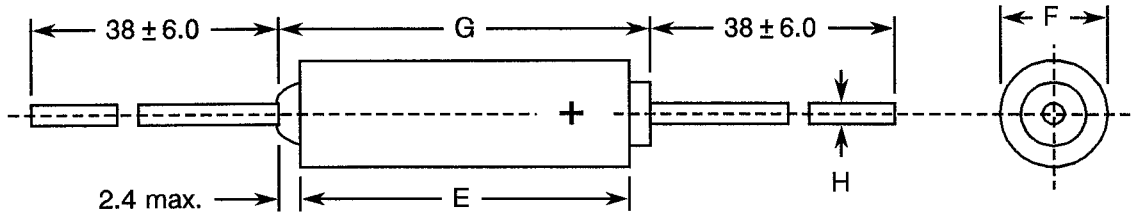
FIGURE 1 - PARAMETER DERATING INFORMATION



Rated Voltage versus Temperature



FIGURE 2 - PHYSICAL DIMENSIONS

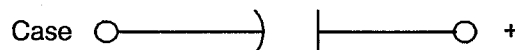


CASE SIZE	SYMBOL	MILLIMETRES	
		MIN	MAX
A	E	6.48	8.05
	F	3.05	3.84
	G	-	10.70
	H	0.46	0.56
B	E	11.25	12.80
	F	4.32	5.11
	G	-	15.50
	H	0.461	0.56
C	E	16.60	18.20
	F	6.96	7.75
	G	-	20.90
	H	0.58	0.69
D	E	19.20	20.80
	F	8.53	9.32
	G	-	23.40
	H	0.58	0.69

NOTES

1. The case insulation shall extend 0.4mm minimum beyond each end of the capacitor body. If a shrink-fitted insulation is used, it shall overlap the ends of the capacitor body.

FIGURE 3 - FUNCTIONAL DIAGRAM





4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the capacitors specified herein are stated in this specification and ESA/SCC Generic Specification No. 3002 for Capacitors, Fixed, Tantalum, Solid Electrolyte. Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-process Controls

None.

4.2.2 Deviations from Final Production Tests (Chart II)

None.

4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

(a) Para. 9.7.3, Electrical Measurements at High and Low Temperatures shall be made on a sample basis as specified in Para. 4.6.2 of this specification.

4.2.4 Deviations from Qualification Tests (Chart IV)

None.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the capacitors specified herein shall be verified in accordance with the requirements set out in Para. 9.4 of ESA/SCC Generic Specification No. 3002 and they shall conform to those shown in Figure 2 of this specification.

4.3.2 Weight

The maximum weight of the capacitors specified herein shall be as scheduled in Table 1(a).

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 3002.

The test conditions shall be as follows:-

(a) Pull Force: 14 Newtons.

The force shall be applied gradually to the terminal and then maintained for a period of 5 to 10 seconds.



4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the capacitors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

Metal, corrosion-resistant, hermetically sealed.

4.4.2 Lead Material and Finish

The lead material shall be Type 'E' with Type '4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

4.4.3 Sleeving

Sleeving shall be of a non-fungus nutrient material (cardboard shall not be used). The material shall not soften, creep or shrink to the extent that it causes any part of the cylindrical case to become uncovered at any test temperature specified herein. At any cross-section, the maximum thickness of the sleeving shall not exceed twice the minimum thickness of the sleeves.

4.5 MARKING

4.5.1 General

The marking of components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking as specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:-

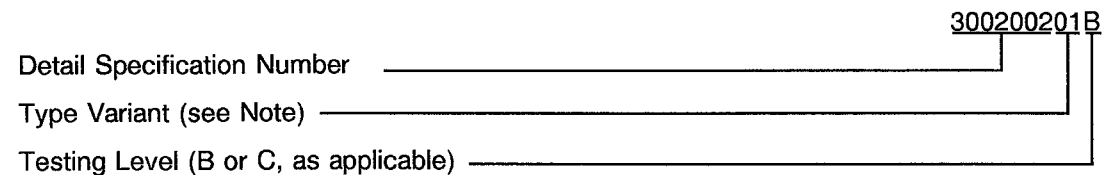
- (a) Polarity.
- (b) The SCC Component Number.
- (c) Electrical Characteristics and Ratings.
- (d) Traceability Information.

4.5.2 Polarity

Polarity shall be defined by a '+' on that end of the body of a capacitor where the positive lead protrudes (see Figure 2).

4.5.3 The SCC Component Number

The SCC Component Number shall be constituted and marked as follows:-



N.B.

Marking of the Type Variant Number is mandatory. No further reference to Type Variants is made in this specification.

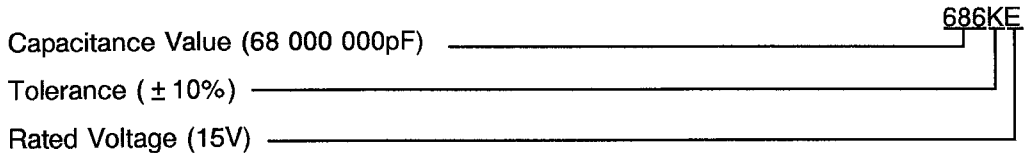


4.5.4 Electrical Characteristics and Ratings

The electrical characteristics and ratings to be marked in the following order of precedence are:-

- (a) Capacitance Value.
- (b) Tolerance.
- (c) Rated Voltage.

The information shall be constituted and marked as follows:-



4.5.4.1 Capacitance Values

The capacitance values shall be expressed by means of the following codes. The unit quantity for marking shall be picofarads.

Capacitance Value	Code
X.X	XRX
XX	XX0
XX10 ¹	XX1
XX10 ²	XX2
XX10 ³	XX3
XX10 ⁴	XX4
XX10 ⁵	XX5
XX10 ⁶	XX6
XX10 ⁷	XX7

4.5.4.2 Tolerances

The tolerances on capacitance values shall be indicated by the code letters specified hereafter.

Tolerance (± %)	Code Letter
10	K
20	M

4.5.4.3 Rated Voltage

The rated voltage shall be indicated by the code letters specified hereafter.

Rated Voltage (U _R) (V)	Code Letter
6.0	A
10	D
15	E
20	F
35	J
50	L
75	P
100	Q



4.5.5 Traceability Information

Traceability information shall be marked in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

- (a) Manufacturing Date Code.
- (b) Serial Number.
- (c) Manufacturer's Name.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. The AQL shall be 2.5% for each capacitance value. Each capacitance value shall be considered as constituting a complete lot. For qualification or lot acceptance testing, the sample size shall be as specified in ESA/SCC Generic Specification No. 3002.

4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at $T_{amb} = +22 \pm 3$ °C. The parameter drift values (Δ) applicable to the parameters scheduled shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 3002. The conditions for burn-in shall be as specified in Table 5 of this specification.

On completion of burn-in, a recovery period of 24 ± 2 hours is necessary before performance of the end-measurements.

The power supply source shall be capable of 30 Amperes minimum and shall be applied without series resistors to the capacitors under test.

4.7.3 Electrical Circuit for Burn-in (Figure 5)

Not applicable.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE**

No.	Characteristics	Symbol	ESA/SCC 3002 Test Method	Test Conditions	Limits		Unit
					Min.	Max.	
1	Capacitance	C	Para. 9.7.1.1	$f = 120 \pm 5.0$ Hz $V_p \leq 2.2$ V $V_m \leq 1.0$ Vrms	Note 1		μ F
2	D.C. Leakage Current	I_L	Para. 9.7.1.2	$V_m = U_R \pm 2.0\%$ $R_s = 1.0$ k Ω	Note 2		μ A
3	Dissipation Factor	DF	Para. 9.7.1.3	$f = 120 \pm 5.0$ Hz	Note 3		%

NOTES

1. See Columns 3 and 4 of Table 1(a). Allowable change after surge voltage test = $\pm 2.0\%$ of initial value.
2. See Column 5 of Table 1(a).
3. See Column 8 of Table 1(a).

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbol	ESA/SCC 3002 Test Method	Test Conditions	Limits		Unit
					Min.	Max.	
1	Capacitance Change	$\frac{\Delta C}{C}$	Para. 9.7.1.1	$f = 120 \pm 5.0$ Hz $V_p \leq 2.2$ V $V_m \leq 1.0$ Vrms $T_{amb} = -55^\circ$ C $T_{amb} = +85^\circ$ C $T_{amb} = +125^\circ$ C (1)	-10 -8.0 -12	+10 +8.0 +12	%
2	D.C. Leakage Current	I_L	Para. 9.7.1.2	$V_m = U_R \pm 2.0\%$ $R_s = 1.0$ k Ω $T_{amb} = +85^\circ$ C $T_{amb} = +125^\circ$ C (1) (2)	Note 3 Note 4		μ A
3	Dissipation Factor	DF	Para. 9.7.1.3	$f = 120 \pm 5.0$ Hz $T_{amb} = -55^\circ$ C $T_{amb} = +85^\circ$ C $T_{amb} = +125^\circ$ C (1)	Note 5		%

NOTES

1. Applicable to Para. 9.15 of ESA/SCC Generic Specification No. 3002.
2. Applicable to Para. 9.18.1 of ESA/SCC Generic Specification No. 3002.
3. See Column 6 of Table 1(a).
4. See Column 7 of Table 1(a).
5. See Columns 8 and 9 of Table 1(a).

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Change Limits (Δ)	Unit
1	Capacitance Change	$\frac{\Delta C}{C}$	As per Table 2	As per Table 2	± 2.0	%
2	D.C. Leakage Current	I_L	As per Table 2	As per Table 2	Note 1	μA

NOTES

- + 200% of measured value or + (25% + 0.05μA) of limit value, whichever is smaller.
- Leakage currents ≤ 0.1μA are considered as 0.1μA value.

TABLE 5(a) - CONDITIONS FOR BURN-IN

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+ 125	°C
2	Test Voltage	V_T	Rated voltage (Note 1)	V

NOTES

- See Column 2 of Table 1(a).

TABLE 5(b) - CONDITIONS FOR OPERATING LIFE TESTS

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+ 85 (1)	°C
2	Ambient Temperature	T_{amb}	+ 125 (2)	°C

NOTES

- The test voltage shall be the rated voltage, see Column 2 of Table 1(a).
- The test voltage shall be the derated voltage, see Figure 1.

FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN AND OPERATING LIFE TESTS

Not applicable.



4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION No. 3002)

4.8.1 Measurements and Inspections on Completion of Environmental Tests

The parameters to be measured and inspections to be performed on completion of environmental tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.2 Measurements and Inspections at Intermediate Points during Endurance Tests

The parameters to be measured and inspections to be performed at intermediate points during endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.3 Measurements and Inspections on Completion of Endurance Tests

The parameters to be measured and inspections to be performed on completion of endurance testing are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.4 Conditions for Operating Life Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 3002. The conditions for operating life testing shall be as specified in Table 5(b) of this specification.

4.8.5 Electrical Circuit for Operating Life Tests (Figure 5)

Not applicable.



TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

NO.	ESA/SCC GENERIC SPEC.NO. 3002		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT		
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.			
01	Thermal Shock	Para. 9.2	Thermal Shock	Table 1(b)	-	-	-	-		
02	Seal Test	Para. 9.6	Visual Examination	Evidence of Leakage	-	-	-	-		
03	Shock (Specified Pulse)	Para. 9.8 100% U _R	During Tests	Intermittent Contact, Arcing, Open or Short Circuits	-	-	-	-		
			After Tests Visual Examination	Arcing, Breakdown or Mechanical Damage	-	-	-	-		
04	Vibration	Para. 9.9 100% U _R	During Last Cycle	Intermittent Operation, Intermittent Contact or Open or Short Circuits	-	-	-	-		
			After Tests Visual Examination	Evidence of Mechanical Damage	-	-	-	-		
05	Thermal Shock and Immersion	Para. 9.10.1 Before tests, 15 minutes at standard atmospheric conditions Para. 9.10.2	Initial Measurements	Table 2, Item 1 Within 30 minutes of final immersion Table 2, Item 1 Table 2, Item 2 Table 2, Item 3 Corrosion, Mechanical Damage and Marking	C	Table 2 Item 1		μF		
			Final Measurements			Table 2, Item 2 Table 2, Item 3	-3.0	+3.0	%	
			Capacitance Change							$\frac{\Delta C}{C}$
			D.C. Leakage Current							I _L
Dissipation Factor	DF	%								
Visual Examination										
06	Resistance to Soldering Heat	Para. 9.11	Initial Measurements	Table 2, Item 1 After 10 minutes minimum Table 2, Item 1 Table 2, Item 2 Table 2, Item 3	C	Table 2 Item 1		μF		
			Final Measurements			Table 2, Item 2 Table 2, Item 3	-2.0	+2.0	%	
			Capacitance Change							$\frac{\Delta C}{C}$
			D.C. Leakage Current							I _L
Dissipation Factor	DF	%								
07	Solderability	Para. 9.12	Visual Examination	MIL-STD-202 Method 208 Solid Wire Termination Criteria	-	-	-	-		
08	Terminal Strength	Para. 9.13 and Para. 4.3.3 of this specification	Visual Examination	Loosening or Damage to Terminals	-	-	-	-		

NOTES

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.



TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (CONT'D)

NO.	ESA/SCC GENERIC SPEC.NO. 3002		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
09	Moisture Resistance	Para. 9.14	Initial Measurements Capacitance Final Measurements Capacitance Change D.C. Leakage Current Dissipation Factor Visual Examination	Table 2, Item 1 Within 2 to 6 hours Table 2, Item 1 Table 2, Item 2 Table 2, Item 3 Corrosion, Mechanical Damage and Marking	C $\frac{\Delta C}{C}$ I_L DF -	Table 2 Item 1 -2.0 +2.0 Table 2 Item 2 Table 2 Item 3 -	μF % μA % -	
10	High and Low Temperature Stability	Para. 9.15	Initial Measurements Capacitance Final Measurements Capacitance Change D.C. Leakage Current Dissipation Factor	Table 3, Item 1 Table 3, Item 1 Table 3, Item 2 Table 3, Item 3	C $\frac{\Delta C}{C}$ I_L DF	Table 3 Item 1 Table 3 Item 1 Table 3 Item 2 Table 3 Item 3	μF μF μA %	
11	Surge Voltage	Para. 9.16 and Table 1(a) of this specification	Initial Measurements Capacitance After Final Cycle Capacitance Change D.C. Leakage Current Dissipation Factor	Table 2, Item 1 Table 2, Item 1 Table 2, Item 2 Table 2, Item 3	C $\frac{\Delta C}{C}$ I_L DF	Table 2 Item 1 -2.0 +2.0 Table 2 Item 2 Table 2 Item 3	μF % μA %	
12	Sleeving	Para. 9.17 Para. 9.17.1 1 minute \pm 15 seconds Para. 9.17.2 1 minute (+15-0) seconds	Voltage Proof Leakage Current Insulation Resistance	2000V 500 \pm 50V	I_L Ri	- 20 10 ⁴ -	μA M Ω	
13	Operating Life	Para. 9.18	Initial Measurements Capacitance D.C. Leakage Current Dissipation Factor Immediate Measurements D.C. Leakage Current Final Measurements Capacitance Change D.C. Leakage Current Dissipation Factor Sleeving Voltage Proof Leakage Current Visual Examination	Table 2, Item 1 Table 2, Item 2 Table 2, Item 3 Table 3 Item 2 Table 2, Item 1 Table 2, Item 2 Table 2, Item 3 Para. 9.17.1 2000V Mechanical Damage	C I_L DF I_L $\frac{\Delta C}{C}$ I_L DF I_L -	Table 2 Item 1 Table 2 Item 2 Table 2 Item 3 Table 3 Item 2 -2.0 +2.0 Table 2 Item 2 Table 2 Item 3 - 20 -	μF μA % μA μF μA % μA -	

NOTES

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.



APPENDIX 'A'

AGREED DEVIATIONS FOR SPRAGUE (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Paras. 4.2.2, 4.2.3, 4.2.4 and 4.2.5	Para. 9.6 - The seal test shall be performed in accordance with MIL-STD-202, Method 112, Test Condition 'D'
Paras. 4.2.2, 4.2.3, 4.2.4 and 4.2.5	Para. 9.7.1.1 - The capacitance shall be measured at 100 ± 5.0 Hz
Paras. 4.2.2, 4.2.3, 4.2.4 and 4.2.5	Para. 9.7.1.3 - The dissipation factor shall be measured at 100 ± 5.0 Hz, using the correction formula:- $DF (120Hz) = DF (100Hz) \times 1.2$
Paras. 4.2.4 and 4.2.5	Para. 9.14 - The vibration test required during the moisture resistance test and to be performed in accordance with MIL-STD-202, Method 106, shall be omitted.