CAPACITORS, LEADLESS SURFACE MOUNTED,

TANTALUM, SOLID ELECTROLYTE,

ENCLOSED ANODE CONNECTION,

BASED ON TYPE TAJ

ESCC Detail Specification No. 3012/001

ISSUE 1

October 2002

Document Custodian: European Space Agency - see https://escies.org

LEGAL DISCLAIMER AND COPYRIGHT

european space agency
agence spatiale européenne

Pages 1 to 18

CAPACITORS, LEADLESS SURFACE MOUNTED, TANTALUM, SOLID ELECTROLYTE, ENCLOSED ANODE CONNECTION, BASED ON TYPE TAJ

ESA/SCC Detail Specification No. 3012/001

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 2	June 2002		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	CHANGE Reference	CHANGE Item	Approved DCR No.
		This Issue supercedes Issue 1 and incorporates all modifications defined in Revisions 'A', 'B', 'C' and 'D' to Issue 1 and the changes agreed in the following DCRs:-		
		Cover Page		None
		DCN		None
		Appendix 'A'	: Para. 4.2.1 deviation deleted	221620

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES (Applicable to specific Manufacturers only)

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Leadless Surface Mounted, Tantalum, Solid Electrolyte, Enclosed Anode Connection, based on Type TAJ.

It shall be read in conjunction with ESA/SCC Generic Specification No. 3012, the requirements of which are supplemented herein.

1.2 TYPE VARIANTS AND RANGE OF COMPONENTS

Variants of the basic type capacitors and the range of components covered by this specification are scheduled in Figure 2 and Table 1(a) respectively.

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 as 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 of the capacitors specified herein is shown in Figure 3.

TABLE 1(a) - RANGE OF COMPONENTS

CAP. VALUE (µF)	RATED VOLTAGE (V)								
	2.0	4.0	6.3	10	16	20	25	35	50
0.1						R & S		A	A
0.15						R & S		A	B
0.22						R & S		A	B
0.33						R & S		A	B
0.47						R & S	A	A B & M	C
0.68					R & S	A S & T	A	A B & M	C
1.0				R & S	A R & T	A S & T	A	B M & T	C
1.5			R & S	A & R	A & S	A & T	B & M	B & C	D
2.2		R & S	A & R	A & S	A B M & T	B M & T	B & M	B & C	D
3.3		A R & S	A R & S	A & T	A B M & T	B & M	B & C	C	D
4.7	R	A R & S	A & T	A B M & T	B & M	B & C	C	C & D	D
6.8	R	A R & T	A B M&T	B & M	B & C	C	C & D	D & N	
10		A B M & T	B & M	B & C	C	C	C & D	D & N	
15		B & M	B & C	C	C	C & D	D & N	D	
22		B & C	C	C	C & D	D & N	D	E	
33		C	C	C & D	D & N	D	E		
47		C & D	C & D	D & N	D	E			
68		C & D	D & N	D	D	E			
100		D & N	D	D	E				
150		D	D	E					
220		E	E	E					

NOTES

1. Letters indicate case sizes (See Figure 2).
2. Tolerances of 10% and 20% are available.

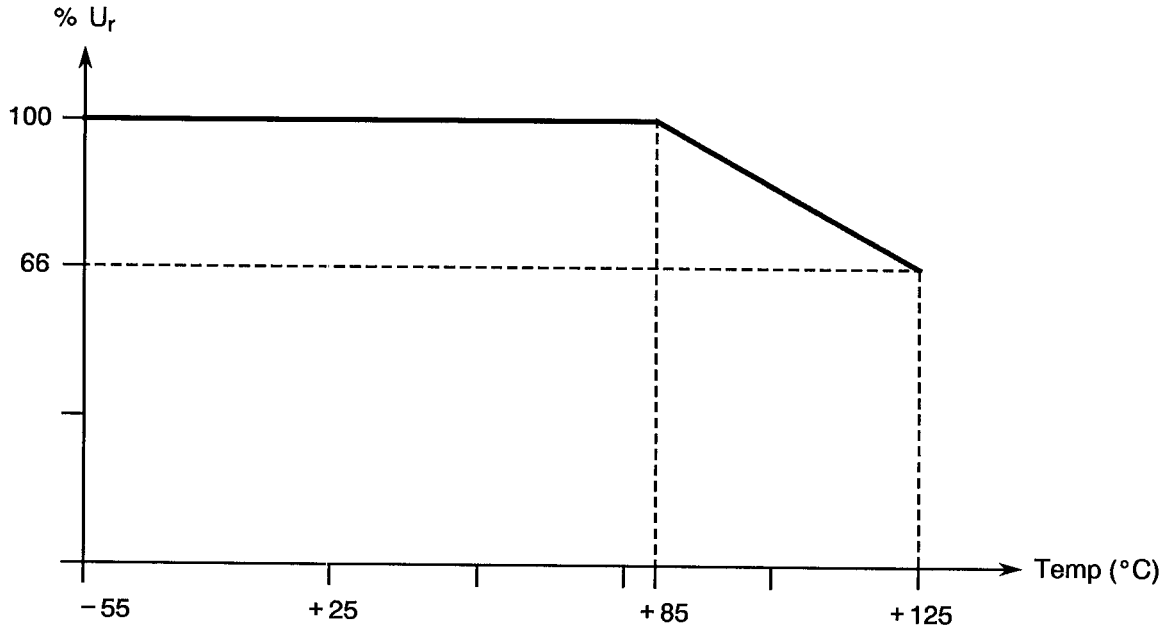
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS		UNITS	REMARKS
			MIN.	MAX.		
1	Rated Voltage	U_R	See Table 1(a)		Vdc	
2	Surge Voltage	U_s	-	$1.3 \times U_R$	Vdc	≤85°C
3	Category Voltage	U_c	-	$0.66 \times U_R$	Vdc	
4	Operating Temperature Range	T_{op}	−55	+125	°C	
5	Rated Temperature	T_r	-	+85	°C	
6	Category Temperature	T_c	-	+125	°C	
7	Storage Temperature Range	T_{stg}	−55	+125	°C	
8	Soldering Temperature	T_{sol}	-	+260	°C	Note 1

NOTES

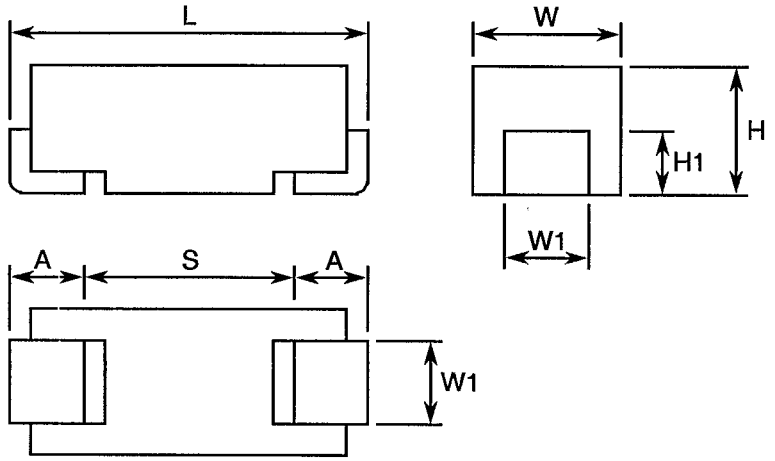
1. Soldering time 5 seconds maximum for wave soldering and 10 seconds maximum for reflow soldering.

FIGURE 1 - PARAMETER DERATING INFORMATION



Voltage versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

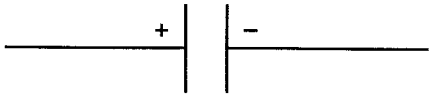


VARIANT	CASE SIZE	DIMENSIONS (mm)										
		L		W		H	W1		A		S	H1
		MIN	MAX	MIN	MAX	MAX	MIN	MAX	MIN	MAX	MIN	MIN
01 & 11	A	3.0	3.4	1.5	1.8	1.8	1.1	1.3	0.6	1.1	1.1	0.7
02 & 12	B	3.3	3.7	2.7	3.0	2.1	2.1	2.3	0.6	1.1	1.4	0.7
03 & 13	C	5.8	6.2	3.1	3.4	2.8	2.1	2.3	1.1	1.6	2.9	0.7
04 & 14	D	7.1	7.5	4.2	4.5	3.1	2.3	2.5	1.1	1.6	4.4	0.7
05 & 15	M	4.5	5.0	2.5	2.9	2.3	1.3	1.5	0.6	1.1	2.7	0.7
06 & 16	N	5.6	6.1	4.5	4.9	3.5	2.3	2.5	1.1	1.6	2.8	0.7
07 & 17	E	7.1	7.5	4.2	4.5	4.3	2.3	2.5	1.1	1.6	4.4	0.7
08 & 18	R	1.8	2.3	1.2	1.5	1.2	1.1	1.3	0.3	0.8	0.8	0.6
09 & 19	S	2.9	3.4	1.5	1.8	1.2	1.1	1.3	0.6	1.1	1.1	0.6
10 & 20	T	3.3	3.7	2.7	3.0	1.2	2.1	2.3	0.6	1.1	1.4	0.6

NOTES

1. Variants 01 to 10 differ from Variants 11 to 20 by their terminations (see Para. 4.4.1).

FIGURE 3 - FUNCTIONAL DIAGRAM



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. 3012 for Capacitors, Leadless Surface Mounted, Tantalum, Solid Electrolyte, Enclosed Anode Connection.

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.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the components specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 3012. Deviations from the Generic Specification, applicable to this Detail 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)

None.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.19, Solderability: the solderable area is the termination 'pad' and up to 1/3 the height of the tab.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.19, Solderability: the solderable area is the termination 'pad' and up to 1/3 the height of the tab.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the components specified herein shall be verified in accordance with the requirements set out in Para. 9.6 of ESA/SCC Generic Specification No. 3012. 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 follows:-

Case Size 'A' - 0.1 grammes.
Case Size 'B' - 0.2 grammes.
Case Size 'C' - 0.3 grammes.
Case Size 'D' - 0.5 grammes.
Case Size 'M' - 0.4 grammes.
Case Size 'N' - 0.5 grammes.
Case Size 'E' - 0.7 grammes.
Case Size 'R' - 0.1 grammes.
Case Size 'S' - 0.1 grammes.
Case Size 'T' - 0.1 grammes.

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 components 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 Terminations

- Variants 01 to 10

  The termination shall be Type 'G' with Type '11' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

- Variants 11 to 20

  The termination shall be Type 'P' with Type '15' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700 and the following paragraphs. For those components too small to accommodate the marking as specified hereafter, the marking information in full shall accompany each component in its primary package. Such marking shall comprise:-

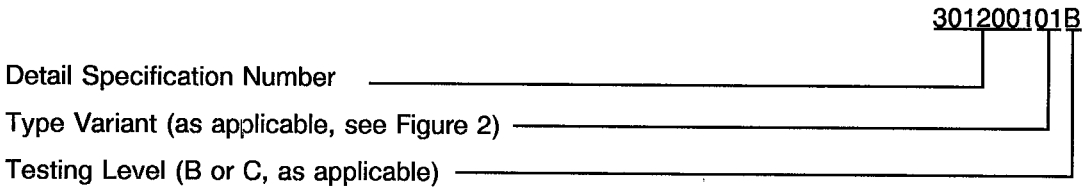
(a) The SCC Component Number.

(b) Characteristics and Ratings.

(c) Traceability Information.

4.5.2 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:



4.5.3 Electrical Characteristics and Ratings

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

(a) Polarity.

(b) Numerical value.

(c) Rated voltage.

(d) Tolerance.

4.5.3.1 Polarity

The anode connection shall be indicated by a BAR on the coded surface.

NOTES:

1. For qualified devices, the ESA/SCC qualified components symbol may be used to indicate the anode connection.

4.5.3.2 Capacitance

This shall be indicated by the value marked on the component.

4.5.3.3 Rated Voltage

This shall be indicated by the value marked on the component or, where the body size is too small, by the code letters specified hereafter:-

RATED VOLTAGE (V)	CODE LETTER
4.0	G
6.3	J
10	A
16	C
20	D
25	E
35	V
50	T

4.5.3.4 Tolerance

The tolerance on numerical values shall be indicated by the code letters specified hereafter:-

TOLERANCE	CODE LETTER
±10%	K
±20%	M

4.5.4 Traceability Information

Traceability information shall be marked in accordance with the requirements of ESA/SCC Basic Specification No. 21700. The information to be marked shall be as follows:-

(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 in respect of electrical characteristics are scheduled in Table 2. 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.

4.6.3 Circuits for Electrical Measurements

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 scheduled parameters 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. 3012. The conditions for burn-in shall be as specified in Table 5(a) of this specification.

4.7.3 Electrical Circuits for Burn-in

Not applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Capacitance	C	ESA/SCC 3012 Para. 9.4.1.1		−10 −20	+10 +20	%
2	DC Leakage Current	I_L	ESA/SCC 3012 Para. 9.4.1.2		-	$0.01 \times C \times U_R$ or (1) 1.0	µA
3	Dissipation Factor	DF	ESA/SCC 3012 Para. 9.4.1.3	$U_R < 10V$ $U_R \geq 10V$, $C \leq 1.0\mu F$ $U_R \geq 10V$, $C > 1.0\mu F$	- - -	6.0 4.0 6.0	%

NOTES
1. Whichever is greater.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURE

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS (Note 2)	LIMITS		UNIT
					MIN.	MAX.	
1	Capacitance Change	ΔC/C	ESA/SCC 3012 Para. 9.4.1.1	−55 (+3−0) °C +85 (±3) °C +125 (+0−3) °C	−8.0 0 0	0 +8.0 +12	%
2	DC Leakage Current	I_L	ESA/SCC 3012 Para. 9.4.1.2	+85 (±3) °C +125 (+0−3) °C	- -	$0.10 \times C \times U_R$ or (1) 1.0 $0.125 \times C \times U_R$ or (1) 1.0 (3)	µA
3	Dissipation Factor	DF	ESA/SCC 3012 Para. 9.4.1.3	−55 (+3−0) °C +85 (±3) °C +125 (+0−3) °C	- - -	9.0 7.2 9.0	%

NOTES
1. Whichever is greater.
2. Inspection level II single sampling, AQL 2.5% for each capacitance value. Each capacitance value shall be considered as constituting a complete lot.
3. Measured with category voltage.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS	UNIT
1	Capacitance Change	$\Delta C/C$	As per Table 2	As per Table 2	±5.0	%
2	D.C. Leakage Current Change	$\Delta I_L/I_L$	As per Table 2	As per Table 2	2×initial value measured or (2) (0.25×Table 2 Item 2) +0.05µA	µA

NOTES

1. Leakage currents ≤0.1µA are considered as a 0.1µA value.
2. Whichever is smaller.

TABLE 5(a) - CONDITIONS FOR BURN-IN

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+85 (+0−3)	°C
2	Test Voltage	V_T	U_R	V

TABLE 5(b) - CONDITIONS FOR OPERATING LIFE TEST

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature 1	T_{amb1}	+85 (±3)	°C
2	Test Voltage 1	V_T	U_R	V
3	Ambient Temperature 2	T_{amb2}	+125 (+0−3)	°C
4	Test Voltage 2	V_T	U_C	V

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

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 3012)

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. The measurements shall be performed at the temperatures specified for the test.

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 tests 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. 3012. 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 SPECIFICATION NO. 3012		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Mounting	Para. 9.9	**Final Examination**					
			Terminals	Good Timing	-	-	-	
			Final Measurements					
			Capacitance	Table 2 Item 1	C	Record Values		
			D.C. Leakage Current	Table 2 Item 2	I_L	-	Table 2	
			Dissipation Factor	Table 2 Item 3	DF	-	Table 2	
02	Rapid Change of Temperature	Para. 9.3.2	**Initial Measurements**					
			Capacitance	Value recorded in 01	C	Table 2 Item 1		
			Final Measurements	Recovery period of 4 hours min.				
			Visual Examination	-	-	-	-	
			Capacitance Change	Table 2 Item 1	ΔC/C	−5.0	+5.0	%
			D.C. Leakage Current	Table 2 Item 2	I_L	-	Table 2	
			Dissipation Factor	Table 2 Item 3	DF	-	Table 2	
03	External Visual Inspection	Para. 9.5	**Final Inspection**					
			Visual Inspection	ESA/SCC No. 20500	-	-	-	-
04	Adhesion	Para. 9.10	**Initial Measurements**					
			Capacitance	Value recorded in 01	C	Table 2 Item 1		
			Final Measurements					
			Visual Examination	No damage or loosening from the substrate	-	-	-	
			Capacitance Change	Table 2 Item 1	ΔC/C	−5.0	+5.0	%
05	Vibration	Para. 9.11	**Measurements during test**	During Last Cycle No intermittent Contact >0.5ms, arcing or open or shorts	-	-	-	
			Final Examination					
			Visual Examination	No damage	-	-	-	
06	Shock or Bump	Para. 9.12	**Final Examination**					
			Visual Examination	-	-	-	-	
07	Climatic Sequence	Para. 9.13	**Initial Measurements**					
			Capacitance	Value recorded in 01	C	Table 2 Item 1		
			Intermediate Measurements	After Dry Heat (2)				
			D.C. Leakage Current	Table 3 Item 2	I_L	-	Table 3	
			Final Measurements	After recovery of 1 to 24 hours				
			Visual Inspection	ESA/SCC No. 20500	-	-	-	
			Capacitance Change	Table 2 Item 1	ΔC/C	−5.0	+5.0	%
			D.C. Leakage Current	Table 2 Item 2	I_L	-	Table 2	
			Dissipation Factor	Table 2 Item 3	DF	-	(3)	
08	High and Low Temperature Stability	Para. 9.14	**Measurements during test**					
			Electrical Measurements	Tables 2 & 3	-	Table 2 & 3		

NOTES

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.
2. While still at the high temperature.
3. 1.2x the value specified in Table 2 of this specification.
4. 1.25x the value specified in Table 3 of this specification.
5. 1.25x the value specified in Table 2 of this specification.

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 SPECIFICATION NO. 3012		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
09	Surge Voltage	Para. 9.15	**Final Measurements**					
			Capacitance	Table 2 Item 1	C	Table 2 Item 1		
			D.C. Leakage Current	Table 2 Item 2	I_L	-	Table 2	
			Dissipation Factor	Table 2 Item 3	DF	-	Table 2	
10	Damp Heat Steady State	Para. 9.16	**Initial Measurements**					
			Capacitance	Value recorded in 01	C	Table 2 Item 1		
			Final Measurements	After recovery of 1 to 2 hours				
			Visual Examination	-	-	-	-	
			Capacitance Change	Table 2 Item 1	ΔC/C	−5.0	+5.0	%
			D.C. Leakage Current	Table 2 Item 2	I_L	-	Table 2	
			Dissipation Factor	Table 2 Item 3	DF	-	(3)	
11	Operating Life	Para. 9.17	**Initial Measurements**					
			Capacitance	Value recorded in 01	C	Table 2 Item 1		
			Intermediate Measurements	At 250 and 1000 hrs				
			D.C. Leakage Current (2)	Table 3 Item 2	I_L	-	(4)	
			Final Measurements	At 1000 and 2000 hrs and after recovery of 1 to 2 hours				
			Capacitance Change	Table 2 Item 1	ΔC/C	-5.0	+5.0	%
			D.C. Leakage Current	Table 2 Item 2	I_L	-	(5)	
			Dissipation Factor	Table 2 Item 3	DF	-	Table 2	
			Visual Examination	No damage	-	-	-	
12	Permanence of Marking	Para. 9.18	**Final Examination**					
			Visual Examination	No corrosion or obliteration of marking	-	-	-	-
13	Solderability	Para. 9.19 and Paras. 4.2.4 and 4.2.5 of this spec.	**Final Examination**					
			Visual Examination	No damage	-	-	-	-

NOTES: See Page 16.

APPENDIX 'A'

AGREED DEVIATIONS FOR AVX LTD, TANTALUM DIVISION (U.K.)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.2	Para. 9.1, Internal Visual Inspection: Shall not be performed.