CAPACITOR FILTERS, PI-TYPE, FEEDTHROUGH, ELECTROMAGNETIC INTERFERENCE SUPPRESSION, NON-HERMETICALLY SEALED, BASED ON TYPE SFP040

ESCC Detail Specification No. 3008/014

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Pages 1 to 18

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space components
coordination group

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		SCCG Chairman	ESA Director General or his Deputy
Issue 1	September 1993		
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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	March '95	P1. Cover Page		None
		P2. DCN		None
		P6. Table 1(a)	: In case size column, case size numbers corrected	221214
		P11. Para. 4.4.3	: Washer material corrected	221214
		P14. Table 3	: Item 1 corrected to 3	23696
		P17. Table 6	: Items 7, 9, "Voltage Drop" replaced by "D.C. Resistance"	221214/ 23696
		P18. Table 6	: Item 12, "Voltage Drop" replaced by "D.C. Resistance"	221214/ 23696
			: In Intermediate and Final Measurements, Table 3 reference corrected to "Item 3"	23696
			: In Final Measurements, first Insulation Resistance Limit amended	221214
'B'	Aug. '95	P1. Cover Page		None
		P2. DCN		None
		P6. Table 1(a)	: Notes corrected	23735
		P7. Table 1(b)	: Storage Temperature Range corrected to "-55 to +125 °C	23735
		P8. Figure 2	: Note 1 added	23735
		P11. Para 4.3.3	: Second sentence added	23735
		P13. Table 2(b)	: Note 2 clarified by adding "in Subgroup II or III"	23735
		P17. Table 6	: Item 5 changed to Accelerated Damp heat	23735
			: Item 6 changed to Low Air Pressure	23735
			: Item 9 I_{LF} changed to 1.4 I_{LF}	23735

TABLE OF CONTENTS

Page

TABLES

FIGURES

APPENDICES (Applicable to specific Manufacturers only)

None.

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Capacitor Filter, Pi-Type, Feedthrough, Electromagnetic Interference Suppression, Non-Hermetically Sealed, based on Type SFP040. It shall be read in conjunction with ESA/SCC Generic Specification No. 3008, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

Variants of the basic type components specified herein, which are also covered by this specification are given 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 components specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

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

1.5 PHYSICAL DIMENSIONS

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

1.6 FUNCTIONAL DIAGRAM

The functional diagram, showing lead identification, of the components 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 3008 Generic Specification for Capacitors and Capacitor Filters, Feedthrough.

(b) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

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.

TABLE 1(a) - TYPE VARIANTS

Variants	Rated Voltage U_R (V) Note 2	Insulation Resistance (Ri) (GΩ)		D.C. Resistance Rs (mΩ)	Voltage Drop (V_{dr}) (V)	Insertion Loss - I_L (dB) With no load current/rated current applied					Voltage Proof V_P (V)	Case Size/ Weight (g) Note 1	Capacitance C (pF)
		-55/ +25°C	+125°C			10MHz	50MHz	100MHz	500MHz	1.0GHz			
01-11-21-31	200	10	1.0	15	0.15	10 / 10	36 / 20	47 / 25	70 / 70	75 / 75	500	1 / 2.7	2 400
02-12-22-32	200	10	1.0	5.0	0.05	5.0 / 5.0	30 / 25	40 / 30	54 / 54	60 / 60	500	2 / 2.0	2 400
03-13-23-33	250	10	1.0	4.0	0.04	-	-	15 / 15	50 / 50	55 / 55	625	2 / 2.0	750
04-14-24-34	100	3.0	0.3	15	0.15	39 / 30	54 / 50	75 / 75	75 / 75	75 / 75	250	3 / 3.5	44 800
05-15-25-35	200	10	1	15	0.15	10 / 5.0	38 / 20	50 / 25	75 / 70	75 / 75	500	1 / 2.7	1 600
06-16-26-36	200	10	1	10	0.10	13 / 10	45 / 22	60 / 30	75 / 70	75 / 75	500	1 / 2.7	4 320
07-17-27-37	200	10	1	10	0.10	5.0 / 5.0	30 / 25	40 / 30	60 / 55	60 / 60	500	4 / 2.0	2 400
08-18-28-38	250	10	1	10	0.10	-	-	15 / 15	50 / 45	55 / 55	625	4 / 2.0	750
09-19-29-39	200	10	1	15	0.15	-	-	15 / 15	50 / 45	55 / 55	500	1 / 2.7	750
10-20-30-40	200	10	1	15	0.15	-	-	4.0 / 4.0	40 / 35	54 / 54	500	1 / 2.7	160

Variants	Case Thread ∅E	Input Terminal
01 to 10	M 4 x 0.70	Straight
11 to 20	M 4 x 0.70	Button
21 to 30	8.32 UNC	Straight
31 to 40	8.32 UNC	Button

NOTES 1. See Figure 2.
2. See Figure 1.

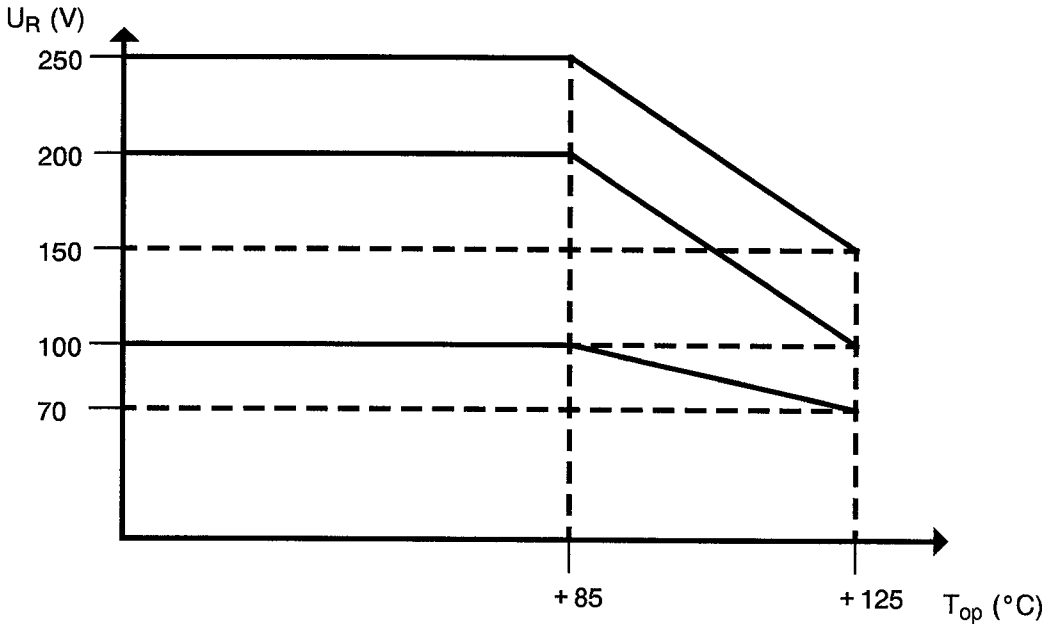
TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristic	Symbol	Maximum Ratings	Unit	Remarks
1	Rated dc Voltage	U_R	See Table 1(a)	V	Note 1
2	Torque	T_{qe}	0.4	Nm	
3	Voltage Drop (d.c.)	V_{dr}	See Table 1(a)	V	
4	DC and Low Frequency Current	I_{LF}	10	A	
5	Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
6	Storage Temperature Range	T_{stg}	-55 to +125	°C	
7	Soldering Temperature	T_{sol}	+260	°C	Note 2

NOTES

1. At $T_{amb} \leq +85°C$. For derating at $T_{amb} > 85°C$, see Figure 1.
2. Duration 10 seconds maximum at a distance of not less than 2 mm from the body and the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION



Rated Voltage versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - STRAIGHT INPUT TERMINAL

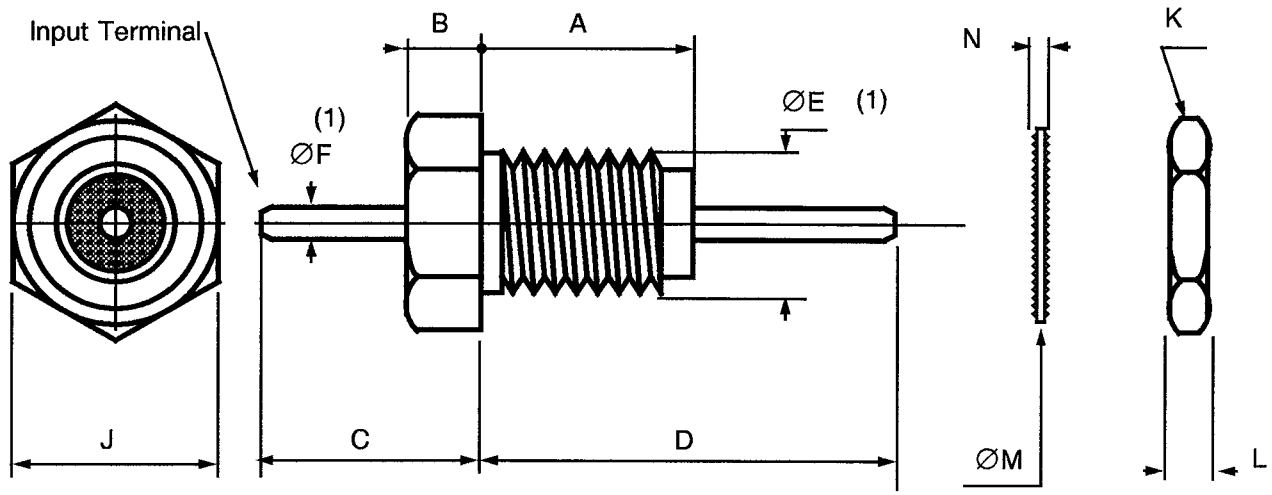
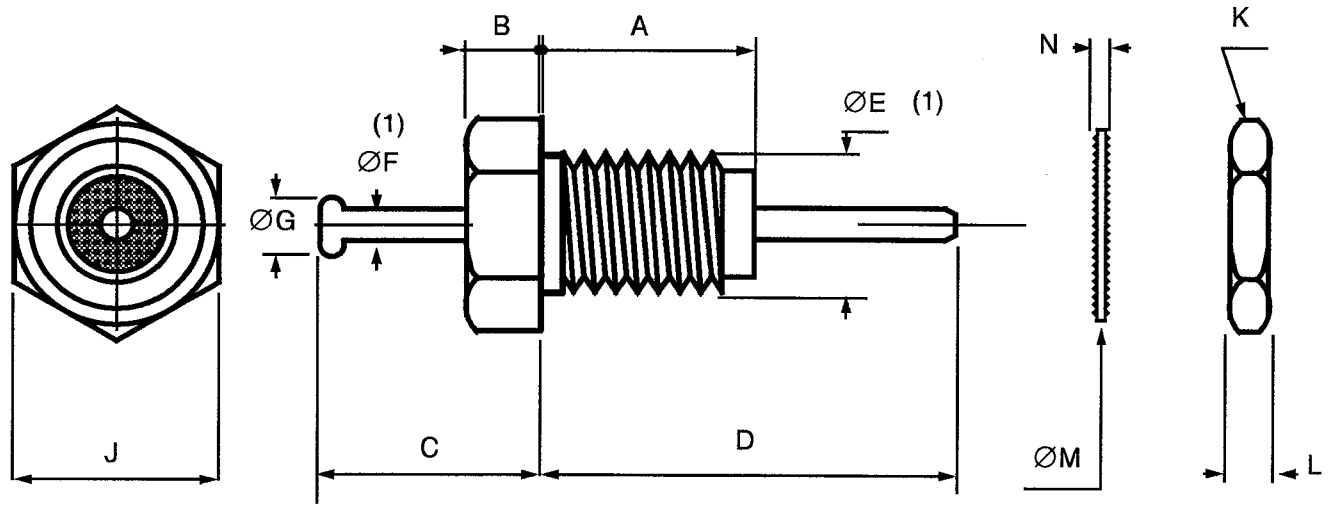


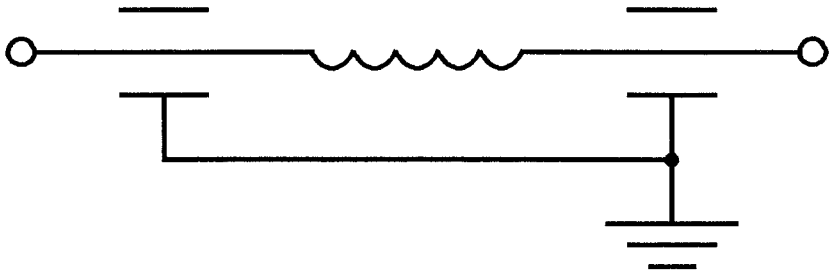
FIGURE 2(b) - BUTTON INPUT TERMINAL



SYMBOL	CASE SIZE (mm)							
	1		2		3		4	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
A	6.9	7.1	3.4	3.6	7.8	8.4	3.4	3.6
B	2.4	2.6	1.5	1.7	3.5	4.1	1.5	1.7
C	7.0	12	3.5	4.5	8.0	9.0	8.0	13
D	17	19	5.5	6.5	13	14	8.0	13
ØE	See Table 1(a)		See Table 1(a)		See Table 1(a)		See Table 1(a)	
ØF	0.72	0.88	0.72	0.88	0.72	0.88	0.72	0.88
ØG	1.0	1.2	1.0	1.2	1.0	1.2	1.0	1.2
J	-	5.0	-	5.0	-	5.0	-	5.0
K	-	6.0	-	6.0	-	6.0	-	6.0
L	-	2.5	-	1.6	-	2.5	-	1.6
ØM	-	6.4	-	6.4	-	6.4	-	6.4
N	-	0.4	-	0.4	-	0.4	-	0.4

NOTES 1. Lead finish shall commence not more than 1.5mm from encapsulant.

FIGURE 3 - FUNCTIONAL DIAGRAM



4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the components specified herein are stated in this specification and ESA/SCC Generic Specification No. 3008 for Capacitors and Capacitor Filters, Feedthrough. Deviations from the Generic Specification, applicable to this Detail Specification only, are detailed 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)

(a) Para. 9.4.1.5, Voltage Drop: Shall be performed as a D.C. resistance measurement in accordance with MIL-STD-202, Method 303.

4.2.3 Deviations from Burn-in Tests (Chart III)

(a) Para. 9.4.1.5, Voltage Drop: Shall be performed as a D.C. resistance measurement in accordance with MIL-STD-202, Method 303.

(b) Para. 9.7, External Visual Inspection: For silver plated case, a change of shade is acceptable.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.4.1.5, Voltage Drop: Shall be performed as a D.C. resistance measurement in accordance with MIL-STD-202, Method 303.

(b) Para. 9.12, Moisture Resistance: Not applicable.

(c) Para. 9.15, Immersion: Not applicable.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.4.1.5, Voltage Drop: Shall be performed as a D.C. resistance measurement in accordance with MIL-STD-202, Method 303.

(b) Para. 9.15, Immersion: Not applicable.

4.3 MECHANICAL AND ENVIRONMENTAL 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. 9.5 of ESA/SCC Generic Specification No. 3008 and they shall conform to those shown in Figure 2 of this specification.

4.3.2 Weight

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

4.3.3 Robustness of Terminations

The requirements for the robustness of terminations tests are specified in Section 9 of ESA/SCC Generic Specification No. 3008. The leads are defined as 'RIGID'.

- Test Ua_1 shall be conducted with a maximum force of 10N.
- Tests Ub and Uc: Not applicable.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is no 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 Case

The case shall be silver plated brass with potting encapsulant sealing the filter element.

4.4.2 Lead Materials and Finish

The lead material shall be Type 'B' with Type '10' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

4.4.3 Accessories

Nut : As per Figure 2, brass, silver-plated.

Lock-Washer : As per Figure 2, bronze, silver-plated.

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. Each component shall be marked in respect of:-

(a) Lead Identification.

(b) The SCC Component Number.

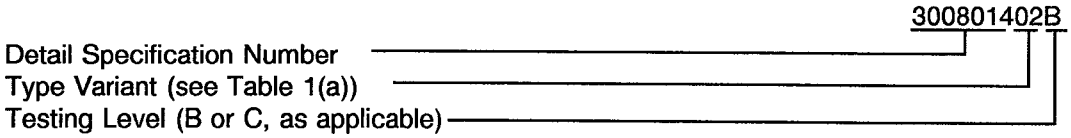
(c) Traceability Information.

4.5.2 Lead Identification

Not applicable.

4.5.3 The SCC Component Number

Each component shall bear the SCC component number which shall be constituted and marked as follows:-



4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.5.5 Marking of Small Components

When it is considered that the component is too small to accommodate the marking as specified above, as much as space permits shall be marked. The order of precedence shall be as follows:-

(a) The SCC Component Number.

(b) Traceability Information.

The marking information in full shall accompany each component in its primary package.

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, measurements shall be performed at T_{amb} = +22 ± 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. Measurements shall be performed at T_{amb} = 125(+ 0-5) °C and -55(+ 5-0) °C respectively.

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 as specified in Table 4 of this specification. Measurements shall be performed at T_{amb} = +22 ± 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 values 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. 3008. The conditions for burn-in shall be as specified in Table 5 of this specification.

4.7.3 Electrical Circuit for Burn-in (Figure 5)

Not applicable.

TABLE 2(a) - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS

No.	Characteristics	Symbol	ESA/SCC 3008 Test Method	Test Conditions	Limits		Unit
					Min.	Max.	
1	DC Resistance	R_s	MIL-STD-202 Method 303	-	-	(1)	mΩ
2	Voltage Proof	V_P	Para. 9.4.1.2	$2.5U_R$	-	(1)	V
3	Insulation Resistance	R_i	Para. 9.4.1.3	Para. 9.4.1.3	(1)	-	MΩ

NOTES
1. See Table 1(a).

TABLE 2(b) - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS

No.	Characteristics	Symbol	ESA/SCC 3008 Test Method	Test Conditions	Limits		Unit
					Min.	Max.	
4	Insertion Loss	I_{L1}	Para. 9.4.1.4	f = 10MHz (1)	(3)	-	dB
5	Insertion Loss	I_{L2}	Para. 9.4.1.4	f = 50MHz (2)	(3)	-	dB
6	Insertion Loss	I_{L3}	Para. 9.4.1.4	f = 100MHz (2)	(3)	-	dB
7	Insertion Loss	I_{L4}	Para. 9.4.1.4	f = 500MHz (1)	(3)	-	dB
8	Insertion Loss	I_{L5}	Para. 9.4.1.4	f = 1.0GHz (2)	(3)	-	dB
9	Capacitance	C	Para. 9.4.1.1	f = 1000 ± 100 Hz V = 0.1 to 1.2Vrms	(3)	-	pF

NOTES
1. Measurements at this frequency to be made only during Chart IV testing.
2. Measurements at rated current to be made only during Chart IV testing in Subgroups II or III. Measurements without load current to be made during Charts II, III and V.
3. See Table 1(a).

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbol	ESA/SCC 3008 Test Method	Test Conditions Note 1	Limits		Unit
					Min.	Max.	
3	Insulation Resistance	R_i	Para. 9.4.1.3	Para. 9.4.1.3 T_{amb} = +125(+0-5) °C (4)	(3)	-	MΩ
5	Insertion Loss	I_{L2}	Para. 9.4.1.4	f = 50MHz No Current	(2)	-	dB
6	Insertion Loss	I_{L3}	Para. 9.4.1.4	f = 100MHz No Current.	(2)	-	dB
8	Insertion Loss	I_{L5}	Para. 9.4.1.4	f = 1.0GHz No Current.	(2)	-	dB

NOTES

1. If more than 20 units have to be measured, the measurement shall be performed on a sample basis in accordance with Inspection Level II, Table IIA, AQL = 1.0 of IEC Publication No. 410.
2. See Insertion Loss values - Table 1(a).
3. Insulation resistance values see Table 1(a).
4. Insulation resistance is to be performed only at high temperature.

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
9	Capacitance Change	$\frac{\Delta C}{C}$	As per Table 2	As per Table 2	±10	%

TABLE 5(a) - CONDITIONS FOR BURN-IN TESTS

No.	Characteristics	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+ 125 (+ 0-3)	°C
2	Voltage	V	$2xU_R$ at + 125°C (1)	V

NOTES

1. Applied between terminals and case.
   The polarity of the voltage shall be positive on the case during the first 24 to 72 hours and then reversed to negative on the case for the remaining portion of the test. See Table 1(a).

TABLE 5(b) - CONDITIONS FOR OPERATING LIFE TESTS

No.	Characteristics	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+ 125 (+ 0-3)	°C
2	Voltage	V	$2xU_R$ at + 125°C (1)	V
3	Current	I_{LF}	10 (2)	A

NOTES

1. Applied between terminals and case.
   The polarity of the voltage shall be positive on the case during the first 24 to 72 hours and then reversed to negative on the case for the remaining portion of the test. See Table 1(a).
2. To flow between the terminals.

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. 3008)

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 specified, measurements shall be performed at T_{amb} = +22 ± 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 specified, measurements shall be performed at T_{amb} = +22 ± 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 tests are as scheduled in Table 6. Unless otherwise specified, measurements shall be performed at T_{amb} = +22 ± 3 °C.

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

The requirements for operating life test are specified in Section 9 of ESA/SCC Generic Specification No. 3008. The conditions for operating life testing shall be as specified in Table 5 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. 3008		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
1	External Visual Inspection	Para. 9.7	Visual Inspection.	-		-	-	
2	Temperature Rise	Para. 9.9	Temperature Rise	-		-	25	°C
3	Shock	Para. 9.10 100% U_R	During Tests Visual Examination Insertion Loss	Open or Short Circuits Mechanical Damage Table 2, Items 4 to 8	 I_L	- - Table 2	- - -	 dB
4	Vibration	Para. 9.11 100% U_R	During Last Cycle Visual Examination Insertion Loss	Open or Short Circuits Mechanical Damage Table 2, Items 4 to 8	 I_L	- - Table 2	- - -	 dB
5	Accelerated Damp Heat	-	-	-	-	Not applicable		
6	Low Air Pressure	Para. 9.13	During last 5 minutes Voltage Proof During and after test Visual Examination	 Table 2, Item 2 -	 V_P 	 125% U_R -	 - -	 V
7	Robustness of Terminations	Para. 9.14 and Para. 4.3.3 of this spec.	Visual Examination D.C. Resistance	- Table 2, Item 1	 R_S	- -	- Table 2	 mΩ
8	Immersion	-	-	-	-	Not applicable		
9	Overload	Para. 9.16 1.4I_{LF} for 15 minutes	D.C. Resistance Insulation Resistance Visual Examination	Table 2, Item 1 Table 2, Item 3 -	R_S R_i 	- Table 2 -	Table 2 - -	mΩ MΩ
10	Resistance to Soldering Heat	Para. 9.17	After 1 to 2 hours Insulation Resistance Insertion Loss Visual Examination	 Table 2, Item 3 Table 2, Items 4 to 8 -	 R_i I_L 	 Table 2 Table 2 -	 - - -	 MΩ dB
11	Solderability	Para. 9.18	Visual Examination	IEC 68-2-20 Paras. 4.6.4, 4.7.4 or 4.9.3		-	-	

NOTES: See Page 18.

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

NO.	ESA/SCC GENERIC SPEC. NO. 3008		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
12	Operating Life	Para. 9.19	During Tests	Open or Short Circuit		-	-	
			Initial Measurements					
			D.C. Resistance	Table 2, Item 1	R_S	-	Table 2	mΩ
			Voltage Proof	Table 2, Item 2	V_P	90% U_R	-	V
			Insulation Resistance	Table 2, Item 3	R_i	Table 2	-	MΩ
			Insertion Loss	Table 2, Items 4 to 8	I_L	Table 2	-	dB
			Capacitance	Table 2, Item 9	C	Table 2	-	pF
			Intermediate Measurements					
			Insulation Resistance After 24 hours recovery	Table 3, Item 3 (2)	R_i	Table 3	-	MΩ
			D.C. Resistance	Table 2, Item 1	R_S	-	Table 2	mΩ
			Voltage Proof	Table 2, Item 2	V_P	90% U_R	-	V
			Insulation Resistance	Table 2, Item 3	R_i	Note 3	-	MΩ
			Insertion Loss	Table 2, Items 4 to 8	I_L	Table 2	-	dB
			Capacitance	Table 2, Item 9	C	Table 2	-	pF
			Final Measurements					
			Insulation Resistance After 24 hours recovery	Table 3, Item 3 (2)	R_i	Note 3	-	MΩ
			D.C. Resistance	Table 2, Item 1	R_S	-	Table 2	mΩ
			Voltage Proof	Table 2, Item 2	V_P	90% U_R	-	V
			Insulation Resistance	Table 2, Item 3	R_i	Note 3	-	MΩ
			Insertion Loss	Table 2, Items 4 to 8	I_L	Table 2	-	dB
			Capacitance	Table 2, Item 9	C	Table 2	-	pF
13	Corrosion	Para. 9.20 96 Hours	Visual Examination	-		-	-	
14	Permanence of Marking	Para. 9.21	Visual Examination	Corrosion		-	-	
				Obliteration of Marking		-	-	
15	Damp Heat	Para. 9.24 For 168 Hours	After 4 hours Visual Examination	-		-	-	
			Insulation Resistance	Table 2, Item 3	R_i	Note 4	-	MΩ

NOTES

1. These tests refer to either Chart IV or V and shall be used as applicable.
2. For measurements at elevated temperature, the requirements of Table 3 shall apply.
3. The insulation resistance shall be greater than 50% of the value given in Table 1(a).
4. The insulation resistance shall be greater than 10% of the value given in Table 1(a).