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Pages 1 to 17

CAPACITORS, VARIABLE, CONCENTRIC

TRIMMER, AIR DIELECTRIC, 1 TO 20 pF,

BODY DIAMETER 8mm

ESA/SCC Detail Specification No. 3010/008



**space components
coordination group**

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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 2 and incorporates all changes agreed in the following DCR's:- Cover page DCN Table 1(b) : Notes rearranged Figure 2 : Clarity of Drawings improved Para. 3 : Test Voltage added Para. 4.2.3 : Title amended and deviations ref. Para. 9.3.3 deleted and incorporated as Note to Table 2 Para. 4.2.4 : Deviations ref. Para. 9.12 deleted and incorporated within Table 6 Para. 4.3.3 : Test conditions deleted Para. 4.3.5 : Deleted in toto Para. 4.7 : Title amended Para. 4.7.3 : New entry added Table 2 : Notes moved Table 3 : Test Numbers and Temperature Coefficient amended and related Notes revised Table 4 : Columns and Symbol changed Figure 5 : New entry added Para. 4.8 : Title amended Para. 4.8.1 to 4.8.3 : First sentence revised Para. 4.8.4 : At end of last sentence, reference to "Burn-in test" added Para. 4.8.5 : New entry added Table 6 : Reformatted		None None 23748 23748 23748 23748 23748 221282 221282 23748 23748 23748 221282/ 23748 23748 23748 23748 23748 23748 23748 23748 23748
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**1. GENERAL****1.1 SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Variable, Concentric Trimmer, Air Dielectric, 1 to 20 pF. It shall be read in conjunction with ESA/SCC Generic Specification No. 3010, the requirements of which are supplemented herein.

1.2 TYPE VARIANTS

The type variants covered by this specification are 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 (FIGURE 1)

Not applicable.

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. 3010 for Capacitors, Variable, Concentric Trimmer.
- (b) IEC Publication No. 68-2-21, Robustness of Terminations.

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:-

T_{q0} = Operating Torque.

V_T = Test Voltage.

**TABLE 1(a) - TYPE VARIANTS**

Variant	Capacitance (pF)		Temperature Coefficient (10 ⁻⁶ /°C)	Figure
	Min.	Max.		
01	1.0	20	± 30	2(a)
02	1.0	20	± 30	2(b)
03	1.0	20	± 30	2(c)

TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbol	Limits		Unit	Remarks
			Min.	Max.		
1	Rated Voltage	U _R	-	250	V	-
2	Operating Temperature Range	T _{op}	- 55	+ 125	°C	Without derating
3	Storage Temperature Range	T _{stg}	- 55	+ 125	°C	-
4	Soldering Temperature	T _{sol}	-	+ 260	°C	Note 1
5	Panel Mounting Nut Tightening Torque	-	-	40	cm.N	Note 2
6	Sealing Cap Tightening Torque	-	-	10	cm.N	Note 2

NOTES

- Duration 5.0 seconds maximum.
- Handling precautions:
 - Use appropriate turning tool.
 - Rotor shall not be disconnected from stator.
 - When cleaning with solvent, it is absolutely necessary to screw on a sealing cap.
 - Sealing cap shall not be used on flight units.
 - Sealing cap shall be supplied with all units.

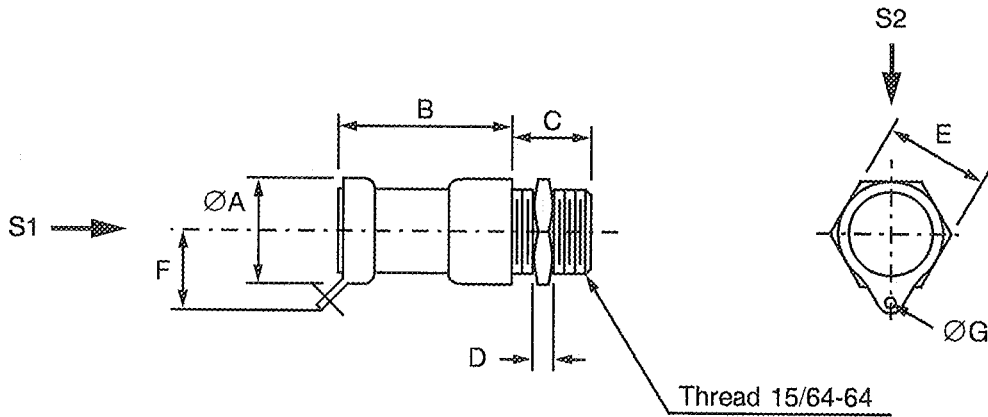
FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.



FIGURE 2 - PHYSICAL DIMENSIONS

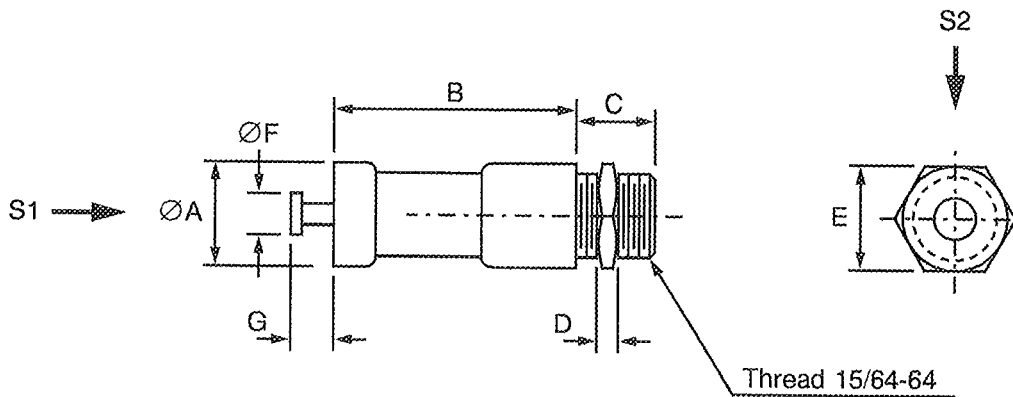
FIGURE 2(a) - VARIANT 01, LUG PANEL MOUNT



S1, S2 - Vibration and shock axis

		$\varnothing A$	B	C	D	E	F	$\varnothing G$
mm	MIN.	-	12.10	-	0.90	6.90	-	1.10
	MAX.	8.00	12.50	5.60	1.10	7.10	6.00	1.30

FIGURE 2(b) - VARIANT 02, TURRET PANEL MOUNT



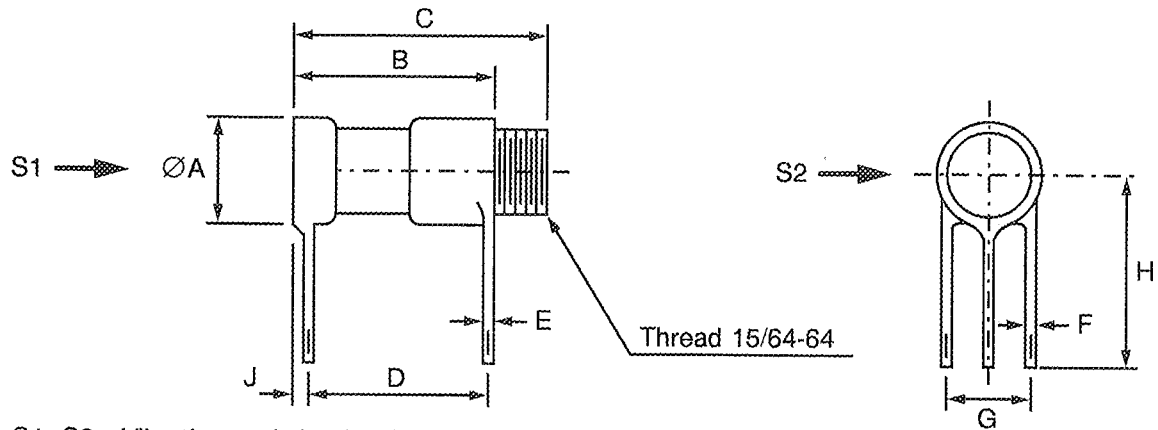
S1, S2 - Vibration and shock axis

		$\varnothing A$	B	C	D	E	$\varnothing F$	G
mm	MIN.	-	12.20	-	0.90	6.90	2.20	2.60
	MAX.	8.00	12.60	5.60	1.10	7.10	2.40	3.00



FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

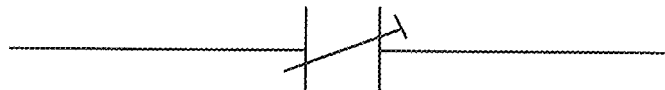
FIGURE 2(c) - VARIANT 03, P.C.B. MOUNT



S1, S2 - Vibration and shock axis

		ØA	B	C	D	E	F	G	H	J
mm	MIN.	-	14.50	-	14.00	0.35	0.75	5.55	12.00	-
	MAX.	8.00	14.90	18.00	14.40	0.45	0.85	5.65	-	0.50

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. 3010 for Capacitors, Variable, Concentric Trimmer. 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)

(a) Serialisation: Not applicable.

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

(a) Para. 7.1, "Burn-in": Not applicable.

(b) Para. 9.3.2, "Parameter Drift Value Measurements": Not applicable.

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. 9.5 of ESA/SCC Generic Specification No. 3010 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 3.5 grammes.

4.3.3 Robustness of Terminations

The requirements for robustness of terminations are specified in Section 9 of ESA/SCC Generic Specification No. 3010.

Applicable to Variant 03 only.



4.3.4 Resistance to Soldering Heat

The requirements for resistance to soldering heat are specified in Section 9 of ESA/SCC Generic Specification No. 3010. The test conditions shall be as follows:-

Immersion Depth: To within 1.0mm from the body.

Immersion Time: 3.5 ± 0.5 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 Body

Ceramic.

4.4.2 Terminals

Terminals shall be gold-plated or tinned.

4.5 MARKING

4.5.1 General

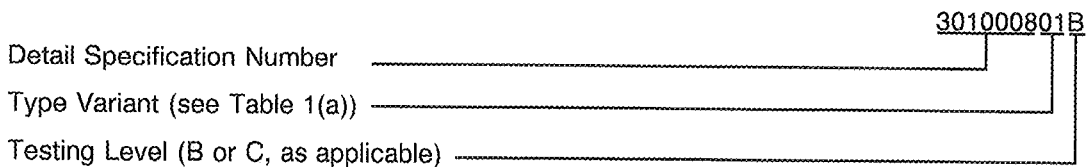
The marking of components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking 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) The SCC Component Number.
- (b) Traceability Information.

4.5.2 The SCC Component Number

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



4.5.3 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, 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

Not applicable.

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

No.	Characteristics	Symbol	ESA/SCC 3010 Test Method	Test Conditions	Limits		Unit
					Min	Max	
1	Minimum Capacitance	C_m	Para. 9.3.1.1	$1.0 \pm 0.1\text{MHz}$	-	1.0	pF
2	Maximum Capacitance	C_M	Para. 9.3.1.1	$1.0 \pm 0.1\text{MHz}$	20	-	pF
3	Change in Capacitance	-	Para. 9.3.1.2	$1.0 \pm 0.1\text{MHz}$ Note 1	-	-	-
4	Insulation Resistance	R_i	Para. 9.3.1.3	$500\text{V} \pm 25\text{V}$	10^6	-	$M\Omega$
5	Voltage Proof	VP	Para. 9.3.1.4	-	500	-	V
6	Quality Factor	Q	Para. 9.3.1.5	$100 \pm 5.0\text{MHz}$ Note 2	1500	-	-
7	Operating Torque	T_{q0}	Para. 9.3.1.6	C minimum to maximum	0.7	3.5	N.cm

NOTES

1. No change of sign over the entire adjustment range.
2. Sampling Level II, AQL = 1.0%.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbol	ESA/SCC 3010 Test Method	Test Conditions (Note 1)	Limits		Unit
					Min	Max	
4	Insulation Resistance at $T_{amb} = +125 \pm 3 \text{ }^\circ\text{C}$	R_i	Para. 9.3.1.3	$500\text{V} \pm 25\text{V}$	10^5	-	$M\Omega$
8(i)	Temperature Coefficient	TC1	Para. 9.18	Between -55 and $+22 \text{ }^\circ\text{C}$ Note 2	-30	+30	$10^{-6}/^\circ\text{C}$
8(ii)	Temperature Coefficient	TC2	Para. 9.18	Between $+22$ and $+125 \text{ }^\circ\text{C}$ Note 2	-30	+30	$10^{-6}/^\circ\text{C}$

NOTES

1. Inspection Level II, AQL 2.5%.
2. Trimmers set at approx. 75% of rated max. capacitance.



FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

Not applicable.

TABLE 5 - CONDITIONS FOR OPERATING LIFE TESTS

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+ 125(+ 0 – 3)	°C
2	Test Voltage	V_T	375	V

FIGURE 5 - ELECTRICAL CIRCUIT FOR OPERATING LIFE TESTS

Not applicable.



- 4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION No. 3010)
- 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, 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 specified, 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 specified, 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. 3010. The conditions for operating life testing shall be as specified in Table 5 for the Burn-in test
- 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. 3010		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Rapid Change of Temperature	Para. 9.2	Initial Measurements Capacitance Final Measurements Capacitance Drift	Table 2 Items 1 & 2 After a recovery period of 24 ± 3 hrs Table 2 Items 1 & 2	CM & Cm ΔCM & ΔCm	Table 2 -0.05 -0.5	Table 2 +0.05 +0.5	pF pF or (4) %
02	Electrical and Mechanical Measurements	Para. 9.3.4	Electrical and Mechanical Measurements	Table 2		Table 2		
03	Robustness of Terminations	Para. 9.6 & Para. 4.3.3 of this spec.	None	-	-	-	-	-
04	Solderability	Para. 9.7	Visual Examination	Magn. 10X to 30X	-	-	-	-
05	Resistance to Soldering Heat	Para. 9.8 & Para. 4.3.4 of this spec.	Initial Measurements Capacitance Final Measurements Capacitance Drift Voltage Proof Quality Factor	Table 2 Item 1 at 0.75 CM After a recovery period of 24 ± 3 hrs Table 2 Item 1 at 0.75 CM Table 2 Item 5 Table 2 Item 6	C ΔC Vp Q	- -0.05 -1.0 500 1500	- +0.05 +1.0 - -	pF pF or (4) % V -
06	Vibration	Para. 9.9	Initial Measurements Capacitance During Test Visual Examination Final Measurements Capacitance Drift	Table 2 Item 1 at 0.75 CM No arcing or shorting > 0.5ms Table 2 Item 1 at 0.75 CM	C - ΔC	- - -0.05 -1.0	- - +0.05 +1.0	pF - pF or (4) %
07	Shock or Bump	Para. 9.10	Initial Measurements Capacitance During Test Visual Examination Final Measurements Capacitance Drift	Table 2 Item 1 at 0.75 CM No arcing or shorting > 0.5ms Table 2 Item 1 at 0.75 CM	C - ΔC	- - -0.05 -1.0	- - +0.05 +1.0	pF - pF or (4) %
08	Climatic Sequence	Para. 9.11	Initial Measurements Capacitance During Test Visual Examination Final Measurements Visual Examination Capacitance Drift Quality Factor Insulation Resistance Voltage Proof Operating Torque	Table 2 Item 1 at 0.75 CM Post Dry Heat & Cold Tests No evidence of mechanical damage After a recovery period of 24 ± 3 hrs No evidence of damage Table 2 Item 1 at 0.75 CM Table 2 Item 6 Table 2 Item 4 Table 2 Item 5 Table 2 Item 7	C - - ΔC Q Ri Vp T _{qp}	- - - -0.05 -1.0 1500 10 ⁵ 500 0.7	- - - +0.05 +1.0 - - - -3.5	pF - - pF or (4) % - MΩ V N cm

- NOTES**
1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.
 2. No change of sign over the entire adjustment range.
 3. 1000 hrs Intermediate and 2000 hrs Final relate to Qualification Testing (Chart IV) only
 4. Whichever is greater.



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. 3010		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
09	Damp Heat, Steady State	Para. 9.12 and Para. 4.3.5 of this specification Half of components with U _R applied, half of components without U _R applied	Initial Measurements Capacitance Final Measurements Capacitance Drift Quality Factor Insulation Resistance Insulation Resistance Voltage Proof Operating Torque	Table 2 Items 1 & 2 After a recovery period of 24 ± 2 hrs Table 2 Items 1 & 2 Table 2 Item 6 Table 2 Item 4 Table 2 Item 4 Table 2 Item 5 Table 2 Item 7	CM & Cm ΔCM & ΔCm Q Ri CM Ri CM Vp T _{qo}	Table 2		pF pF or (4) % - MΩ MΩ V N.cm
10	End Stop Torque	Para. 9.13 Torque: 5.0 N.cm Duration: 5.0 ± 1s	Final Measurements Minimum Capacitance Maximum Capacitance External Visual Inspection	Table 2 Item 1 Table 2 Item 2 Para. 9.4 of ESA/SCC 3010	Cm CM -	- Tab.1(a) -	Tab.1(a) -	pF pF -
11	Axial Thrust	Para. 9.14 Thrust: 10 N max.	Initial Measurements Capacitance During Test Capacitance Drift	Table 2 Item 1 at 0.75 CM With Thrust applied Table 2 Item 1 at 0.75 CM	C ΔC	- -0.05 -1.0	- +0.05 +1.0	pF pF or (4) %
12	Mechanical Endurance	Para. 9.15	During Test Voltage Proof Capacitance vs Rotation Operating Torque Insulation Resistance Final Measurements Voltage Proof Minimum Capacitance Maximum Capacitance Insulation Resistance Insulation Resistance Quality Factor	After initial 50 cycles Table 2 Item 5 Para. 9.15 of ESA/SCC 3010 Table 2 Item 7 Between rotor screw and base, Para. 9.15 of ESA/SCC 3010 Table 2 Item 5 Table 2 Item 1 Table 2 Item 2 Table 2 Item 4 Table 2 Item 4 Table 2 Item 6	Vp ΔC Tqo Ri Vp Cm CM Ri CM Ri CM Q	500 Deviation ± 10% max. (2) 0.35 4.75 Table 2 Item 4 500 - Tab.1(a) - 10 ⁶ - 10 ⁶ - 1500	- - - Tab.1(a) - - - -	V - N.cm MΩ V pF pF MΩ MΩ -
13	Operating Life	Para. 9.16 Change limits relate to initial (0- hour) measurements	Initial Measurements Capacitance Intermediate Measurements Capacitance Drift Insulation Resistance Voltage Proof Quality Factor Operating Torque Final Measurements Capacitance Drift Insulation Resistance Voltage Proof Quality Factor Operating Torque	Table 2 Item 1 500 & 1000 hrs (3) After a recovery period of 4 ± 2 hrs Table 2 Item 1 Table 2 Item 4 Table 2 Item 5 Table 2 Item 6 Table 2 Item 7 1000 & 2000 hrs (3) After a recovery period of 24 ± 2 hrs Table 2 Item 1 Table 2 Item 4 Table 2 Item 5 Table 2 Item 6 Table 2 Item 7	CM ΔCM Ri CM Vp Q T _{qo} ΔCM Ri CM Vp Q T _{qo}	Table 2		pF pF or (4) % MΩ V - N.cm pF or (4) % MΩ V - N.cm
14	Temperature Coefficient	Para. 9.18	Temperature Coefficient	Table 3 Item 8(i) or 8(ii)	TC	Table 1(a)		10 ⁻⁶ /°C

NOTES: See Page 15.

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APPENDIX 'A'Page 1 of 1AGREED DEVIATIONS FOR TEKELEC (F)

Para. 9.3.1.5, Quality Factor of ESA/SCC Generic Specification No. 3010 and Table 2 of this specification.

Measurement of the Q factor shall be performed at frequencies comprised between 100 and 400 MHz.

The value of the Q factor shall be determined at 100MHz by using the following formula:

$$Q_{fo} = Q_m \times (f_m/f_o)^{3/2}$$

where Q_m is the Q factor read at frequency f_m (f_m is that frequency where the quarter-wave line, including the capacitance being measured, is resonating) and $f_o = 100\text{MHz}$.

The record sheet shall indicate the Q factor at 100MHz, as required by Table 2 of this specification, as well as the frequency f_m at which the Q factor was read.

For LAT level 3: The measurements of the Q factor required by Table 2 of this specification must be done before solderability.