CAPACITORS, VARIABLE, CONCENTRIC TRIMMER, AIR DIELECTRIC, 1.4 TO 14pF, BODY DIAMETER 7.6mm

ESCC Detail Specification No. 3010/006

Issue 2	November 2013

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

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DCR No.	CHANGE DESCRIPTION
799	Specification upissued to incorporate editorial changes per DCR.

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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, 1.4 to 14 pF. It shall be read in conjunction with ESCC 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) ESCC 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 ESCC Basic Specification No. 21300 shall apply. In addition the following symbols are used:

T_{qo} = Operating Torque.

V_T = Test Voltage.

TABLE 1(a) - TYPE VARIANTS

Variant	Capacitance (pF)		Temperature Coefficient (10^{-6}/°C)	Figure
	Min.	Max.		
01	1.4	14	±25	2(a)
02	1.4	14	±25	2(b)
03	1.4	14	±25	2(c)
04	1.5	14	±25	2(d)
05	1.5	14	±25	2(e)
06	1.4	14	±25	2(f)

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

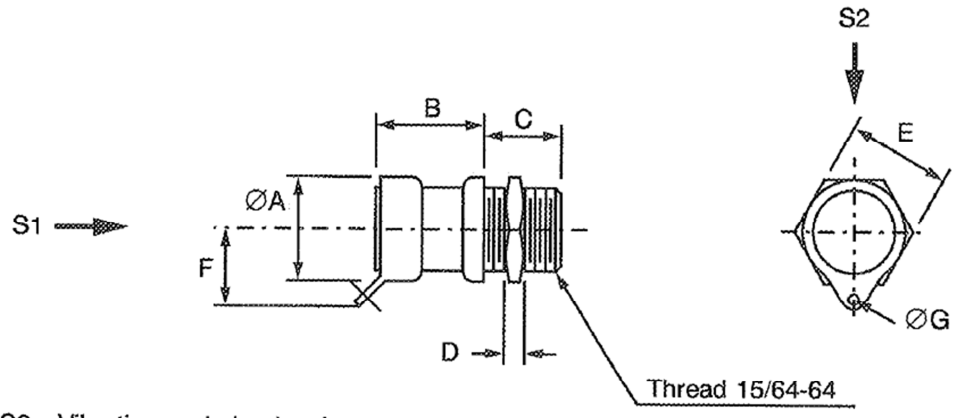
1. Duration 5 seconds maximum.
2. Handling precautions:
   - Use appropriate turning tool.
   - Rotor shall not be disconnected from stator.
   - When cleaning with solvent, it is absolutely necessary to screw on a sealing cap.
   - Sealing cap shall not be used on flight units.
   - Sealing cap shall be supplied with all units.

FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.

FIGURE 2 - PHYSICAL DIMENSIONS

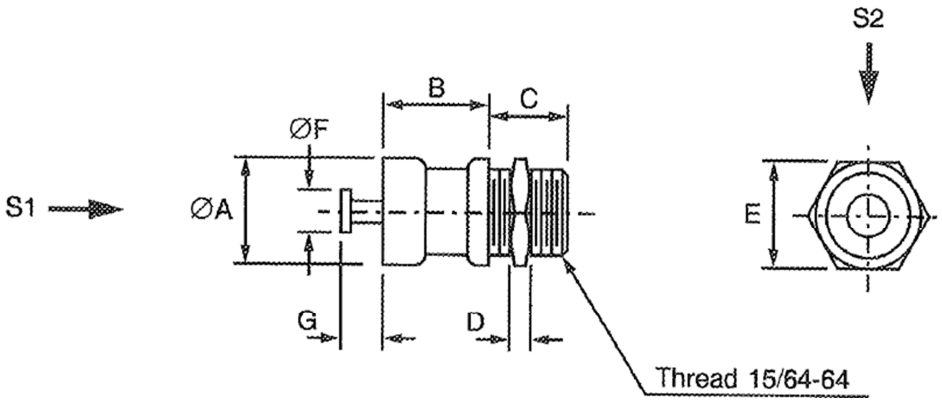
FIGURE 2(a) - VARIANT 01, LUG PANEL MOUNT



S1, S2 - Vibration and shock axis

		ØA	B	C	D	E	F	ØG
mm	Min	-	-	4.5	0.9	6.9	-	1.1
	Max	7.6	7.7	4.7	1.1	7.1	6	1.3

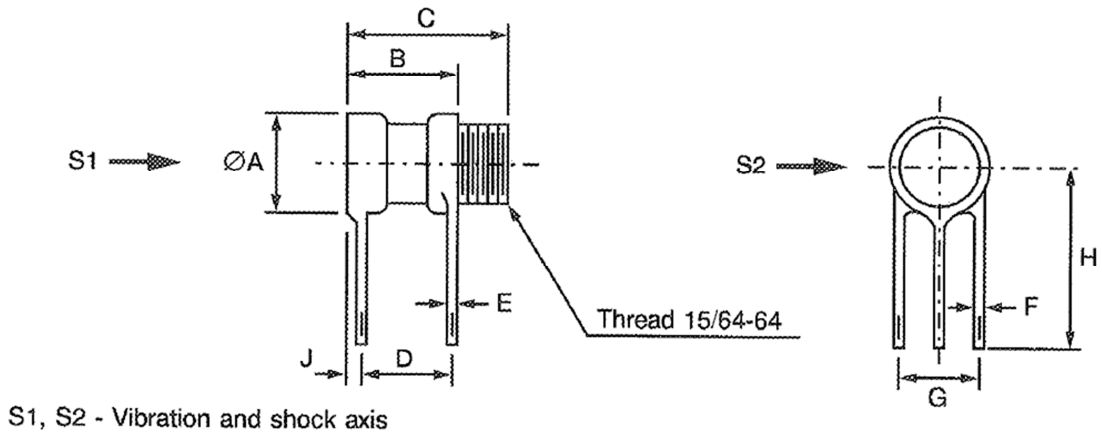
FIGURE 2(b) - VARIANT 02, TURRET PANEL MOUNT



S1, S2 - Vibration and shock axis

		ØA	B	C	D	E	ØF	G
mm	Min	-	7	4.5	0.9	6.9	2.3	2.7
	Max	7.6	7.4	4.7	1.1	7.1	2.5	2.9

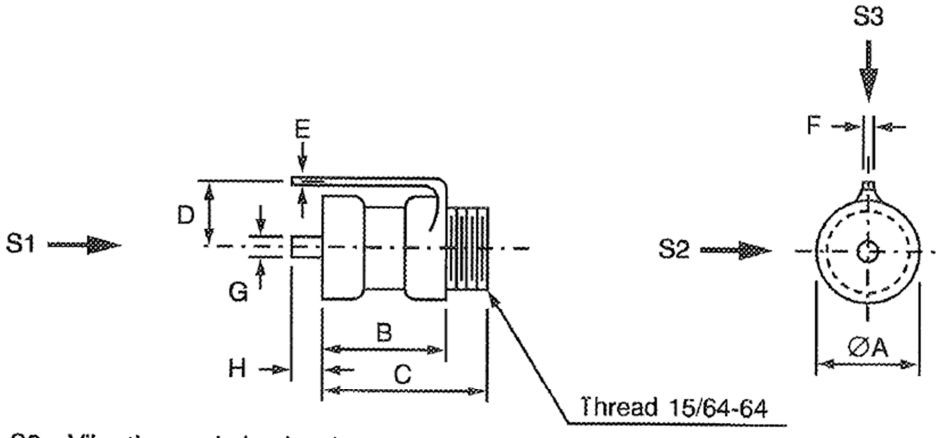
FIGURE 2(c) - VARIANT 03, PCB MOUNT



S1, S2 - Vibration and shock axis

		ØA	B	C	D	E	F	G	H	J
mm	Min	-	7.8	11.8	7	0.35	0.75	5.5	7.9	-
	Max	7.6	8.2	12.2	7.4	0.45	0.85	5.7	-	0.5

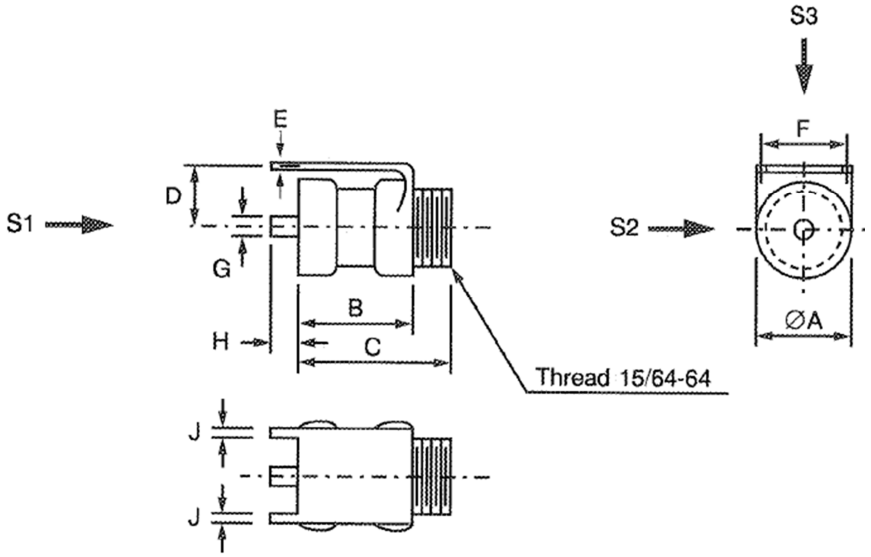
FIGURE 2(d) - VARIANT 04, VERTICAL MOUNT



S1, S2, S3 - Vibration and shock axis

		ØA	B	C	D	E	F	G	H
mm	Min	-	7.3	11.5	5	0.35	0.95	1.4	-
	Max	7.6	7.7	11.9	5.4	0.45	1.05	1.6	2.8

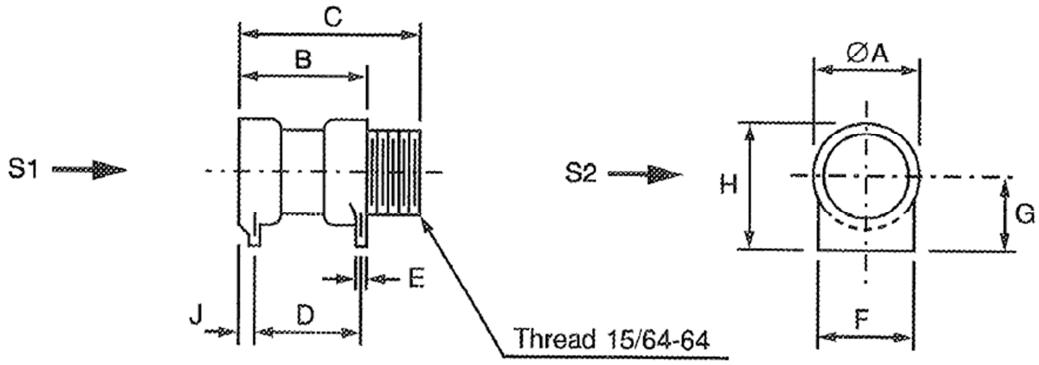
FIGURE 2(e) - VARIANT 05, SPECIAL VERTICAL MOUNT



S1, S2, S3 - Vibration and shock axis

		ØA	B	C	D	E	F	G	H	J
mm	Min	-	7.3	11.5	7	0.35	5.45	1.4	-	0.75
	Max	7.6	7.7	11.9	7.4	0.45	5.65	1.6	2.8	0.85

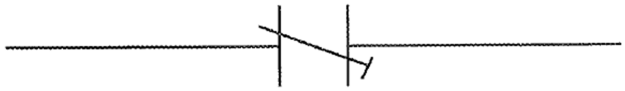
FIGURE 2(f) - VARIANT 06, STRIP LINE MOUNT



S1, S2 - Vibration and shock axis

		ØA	B	C	D	E	F	G	H	J
mm	Min	-	7.8	11.8	7	0.35	-	3.85	-	-
	Max	7.6	8.2	12.2	7.4	0.45	7.3	3.95	8	0.5

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 ESCC 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 ESCC 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 ESCC 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 2.5 grammes.

4.3.3 Robustness of Terminations

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

Applicable to Variants 03 and 04 only.

4.3.4 Resistance to Soldering Heat

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

immersion Depth: To within 1mm 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 ESCC 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 ESCC Component Number.
(b) Traceability Information.

4.5.2 The ESCC Component Number

The ESCC Component Number shall be constituted and marked as follows:

Example: 301000601B

– Detail Specification Number: 3010006
– Type Variant (See Table 1(a)): 01
– Testing Level (B or C, as applicable): B

4.5.3 Traceability Information

Traceability information shall be marked in accordance with the requirements of ESCC 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 ±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	ESCC 3010 Test Method	Test Conditions	Limits		Unit
					Min	Max	
1	Minimum Capacitance	Cm	Para. 9.3.1.1	1 ±0.1 MHz	-	1.4 (1)	pF
2	Maximum Capacitance	CM	Para. 9.3.1.1	1 ±0.1 MHz	14	-	pF
3	Change in Capacitance	-	Para. 9.3.1.2	1 ±0.1 MHz Note 2	-	-	-
4	Insulation Resistance	R_i	Para. 9.3.1.3	500V ±25V	10^6	-	MΩ
5	Voltage Proof	VP	Para. 9.3.1.4	-	500	-	V
6	Quality Factor	Q	Para. 9.3.1.5	100 ±5 MHz Note 3	3000	-	-
7	Operating Torque	T_{qo}	Para. 9.3.1.6	C minimum to maximum	0.7	3.5	N.cm

NOTES

1. 1.5pF for Variants 04 and 05.
2. No change of sign over the entire adjustment range.
3. Sampling Level II, AQL = 1.0%.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbol	ESCC 3010 Test Method	Test Conditions (Note 1)	Limits		Unit
					Min	Max	
4	Insulation Resistance at T_{amb} = +125 ±3 °C	R_i	Para. 9.3.1.3	500V ±25V	10^5	-	MΩ
8(i)	Temperature Coefficient	TC1	Para. 9.18	Between -55 and +22 °C Note 2	-25	+25	10^{-6}/°C
8(ii)	Temperature Coefficient	TC2	Para. 9.18	Between +22 and +125 °C Note 2	-25	+25	10^{-6}/°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)	^oC
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 ESCC 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 ±3 ^oC.

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 ±3 ^oC.

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 ±3 ^{o}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 ESCC 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.	ESCC 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	Table 2 Items 1 & 2	CM & Cm	Table 2		pF
			Final Measurements	After a recovery period of 24 ±3 hrs				
			Capacitance Drift	Table 2 Items 1 & 2	ΔCM & ΔCm	-0.05 -0.5	+0.05 +0.5	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	Table 2 Item 1 at 0.75 CM	C	-	-	pF
			Final Measurements	After a recovery period of 24 ±3 hrs				
			Capacitance Drift	Table 2 Item 1 at 0.75 CM	ΔC	-0.05 -1	+0.05 +1	pF or (4) %
			Voltage Proof	Table 2 Item 5	VP	500	-	V
			Quality Factor	Table 2 Item 6	Q	3000	-	-

No.	ESCC Generic Spec. No. 3010		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Tests (1)	Test Method and Conditions	Identification	Conditions		Min.	Max.	
06	Vibration	Para. 9.9	**Initial Measurements**					
			Capacitance	Table 2 Item 1 at 0.75 CM	C	-	-	pF
			During Test					
			Visual Examination	No arcing or shorting > 0.5ms	-	-	-	-
			Final Measurements					
			Capacitance Drift	Table 2 Item 1 at 0.75 CM	ΔC	-0.05 -1	+0.05 +1	pF or (4) %
07	Shock or Bump	Para. 9.10	**Initial Measurements**					
			Capacitance	Table 2 Item 1 at 0.75 CM	C	-	-	pF
			During Test					
			Visual Examination	No arcing or shorting > 0.5ms	-	-	-	-
			Final Measurements					
			Capacitance Drift	Table 2 Item 1 at 0.75 CM	ΔC	-0.05 -1	+0.05 +1	pF or (4) %
08	Climatic Sequence	Para. 9.11	**Initial Measurements**					
			Capacitance	Table 2 Item 1 at 0.75 CM	C	-	-	pF
			During Test	Post Dry Heat & Cold Tests	-	-	-	-
			Visual Examination	No evidence of mechanical damage	-	-	-	-
			Final Measurements	After a recovery period of 24 ±3 hrs				
			Visual Examination	No evidence of damage	-	-	-	-
			Capacitance Drift	Table 2 Item 1 at 0.75 CM	ΔC	-0.05 -1	+0.05 +1	pF or (4) %
			Quality Factor	Table 2 Item 6	Q	3000	-	-
			Insulation Resistance	Table 2 Item 4	R_i	10^5	-	MΩ
			Voltage Proof	Table 2 Item 5	VP	500	-	V
			Operating Torque	Table 2 Item 7	T_{qo}	0.7	3.5	N.cm

No.	ESCC 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	Table 2 Items 1 & 2	CM & Cm	Table 2		pF
			Final Measurements	After a recovery period of 24 ±2 hrs				
			Capacitance Drift	Table 2 Items 1 & 2	ΔCM & ΔCm	-0.05 -2	+0.05 +2	pF or (4) %
			Quality Factor	Table 2 Item 6	Q	3000	-	-
			Insulation Resistance	Table 2 Item 4	R_i Cm	10^5	-	MΩ
			Insulation Resistance	Table 2 Item 4	R_i CM	10^5	-	MΩ
			Voltage Proof	Table 2 Item 5	VP	500	-	V
			Operating Torque	Table 2 Item 7	T_{qo}	0.7	3.5	N.cm
10	End Stop Torque	Para. 9.13 Torque: 5 N.cm Duration: 5 ±1s	**Final Measurements**					
			Minimum Capacitance	Table 2 Item 1	Cm	-	Tab.1(a)	pF
			Maximum Capacitance	Table 2 Item 2	CM	Tab.1(a)	-	pF
			External Visual Inspection	Para. 9.4 of ESCC 3010	-	-	-	-
11	Axial Thrust	Para. 9.14 Thrust: 10 N max.	**Initial Measurements**					
			Capacitance	Table 2 Item 1 at 0.75 CM	C	-	-	pF
			During Test	With Thrust applied				
			Capacitance Drift	Table 2 Item 1 at 0.75 CM	ΔC	-0.05 -1	+0.05 +1	pF or (4) %
12	Mechanical Endurance	Para. 9.15	**During Test**	After initial 50 cycles				
			Voltage Proof	Table 2 item 5	VP	500	-	V
			Capacitance vs Rotation	Para. 9.15 of ESCC 3010	ΔC	Deviation ±10% max. (2)		-
			Operating Torque	Table 2 Item 7	T_{qo}	0.35	4.75	N.cm
			Insulation Resistance	Between rotor screw and base, Para. 9.15 of ESCC 3010	R_i	Table 2 Item 4		MΩ
			Final Measurements					
			Voltage Proof	Table 2 Item 5	VP	500	-	V
			Minimum Capacitance	Table 2 Item 1	Cm	-	Tab.1(a)	pF
			Maximum Capacitance	Table 2 Item 2	CM	Tab.1(a)	-	pF
			Insulation Resistance	Table 2 Item 4	R_i Cm	10^6	-	MΩ
			Insulation Resistance	Table 2 Item 4	R_i CM	10^6	-	MΩ
			Quality Factor	Table 2 Item 6	Q	3000	-	-

No.	ESCC Generic Spec. No. 3010		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Tests (1)	Test Method and Conditions	Identification	Conditions		Min.	Max.	
13	Operating Life	Para. 9.16 Change limits relate to initial (0 – hour) measurements	**Initial Measurements** Capacitance	Table 2 Item 1	CM	Table 2		pF
			Intermediate Measurements	500 & 1000 hrs (3) After a recovery period of 4 ±2 hrs				
			Capacitance Drift	Table 2 Item 1	ΔCM	-0.05 -2	+0.05 +2	pF or (4) %
			Insulation Resistance	Table 2 Item 4	R_i CM	10^6	-	MΩ
			Voltage Proof	Table 2 Item 5	VP	500	-	V
			Quality Factor	Table 2 Item 6	Q	3000	-	-
			Operating Torque	Table 2 Item 7	T_{qo}	0.7	3.5	N.cm
			Final Measurements	1000 & 2000 hrs (3) After a recovery period of 24 ±2 hrs				
			Capacitance Drift	Table 2 Item 1	ΔCM	-0.05 -2	+0.05 +2	pF or (4) %
			Insulation Resistance	Table 2 Item 4	R_i CM	10^6	-	MΩ
			Voltage Proof	Table 2 Item 5	VP	500	-	V
			Quality Factor	Table 2 Item 6	Q	3000	-	-
			Operating Torque	Table 2 Item 7	T_{qo}	0.7	3.5	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

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.

APPENDIX A

AGREED DEVIATIONS FOR TEKELEC (F)

Para. 9.3.1.5, Quality Factor of ESCC 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:

$Qfo = Qm \times (fm/fo)^{3/2}$

where Qm is the Q factor read at frequency fm (fm is that frequency where the quarter-wave line, including the capacitance being measured, is resonating) and fo = 100MHz.

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