



**CAPACITOR FILTERS, C-TYPE, FEEDTHROUGH,
ELECTROMAGNETIC INTERFERENCE
SUPPRESSION, NON-HERMETICALLY SEALED**

BASED ON TYPE SFC060

ESCC Detail Specification No. 3008/033

Issue 2	February 2013
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1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Capacitor Filter, C-Type, Feedthrough, Electromagnetic Interference Suppression, Non-Hermetically Sealed, based on Type SFC060. It shall be read in conjunction with ESCC Generic Specification No. 3008, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS

Variants of the basic type capacitor filters and the range of components 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 capacitor filters specified herein, are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

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

1.5 PHYSICAL DIMENSIONS

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

1.6 FUNCTIONAL DIAGRAM

The functional diagram, showing lead identification, of the capacitor filters 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. 3008 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 ESCC Basic Specification No. 21300 shall apply. In addition, the following abbreviations are used:

V_T = Test Voltage.

TABLE 1(a) – TYPE VARIANTS AND RANGE OF COMPONENTS

(1) Variant (Notes 1 and 2)	(2) Rated Voltage U_R (V)		(3) Capacitance Range C (pF) (±20%) (E6 Series)	(4) Voltage Proof V_P (V)	(5) Voltage Drop V_{dr} (V)	(6) DC Resistance R_s (mΩ)	(7) Rated Current I_R (A)
	(a) -55°C/+85°C	(b) +125°C					
01, 04, 07, 10	50	25	680 to 220000	125	0.1	10	10
02, 05, 08, 11	100	75	680 to 47000	250	0.1	10	10
03, 06, 09, 12	200	150	680 to 10000	500	0.1	10	10

NOTES

1. See the table below for Insertion Loss requirements according to Capacitance value:

(8) Capacitance (pF) (E6 Series)	(9) Insertion Loss (I_L) (dB)				
	1.0MHz	10MHz	100MHz	1.0GHz	10GHz
680	-	-	17	37	57
1000	-	-	21	41	61
1500	-	-	24	44	64
2200	-	-	27	48	68
3300	-	11	31	52	70
4700	-	14	34	54	70
6800	-	17	37	57	70
10000	-	21	41	61	70
15000	-	25	45	65	70
22000	8	28	48	68	70
33000	11	31	51	70	-
47000	14	34	48	70	-
68000	17	33	45	70	-
100000	21	41	50	70	-
150000	25	45	52	70	-
220000	28	48	65	70	-

2. See the table below and Figure 2 for physical characteristics:

Variants	Case Thread E	Input Terminal
01 to 03	U: 12-32 UNEF	Straight
04 to 06	U: 12-32 UNEF	Button
07 to 09	I: M6 x 0.75	Straight
10 to 12	I: M6 x 0.75	Button

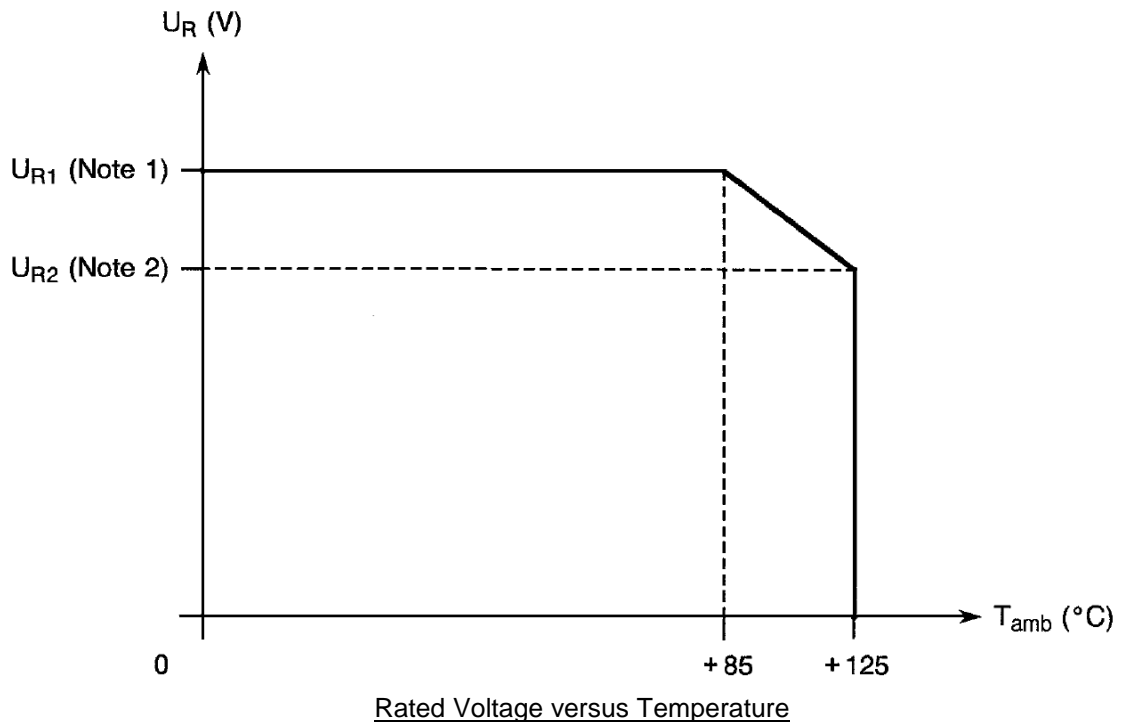
TABLE 1(b) MAXIMUM RATINGS

No.	Characteristic	Symbol	Maximum Ratings	Unit	Remarks
1	Rated DC Voltage	U_R	See Table 1(a) Column 2	V	Notes 1 and 2
2	Voltage Drop	V_{dr}	100	mV	
3	DC Resistance	R_s	10	m Ω	
4	Rated Current	I_R	10	A	Note 3
5	Torque	T_{ge}	0.8	Nm	
6	Operating Temperature Range	T_{op}	-55 to +125	$^{\circ}C$	T_{amb}
7	Storage Temperature Range	T_{stg}	-55 to +125	$^{\circ}C$	
8	Soldering Temperature	T_{sol}	+260	$^{\circ}C$	Note 4

NOTES:

- For derating at $T_{amb} > 85^{\circ}C$, see Figure 1.
- The addition of DC applied voltage and ripple voltage shall never exceed the rated DC voltage.
- DC and low frequency.
- Duration 10 seconds maximum at a distance of not less than 2mm from the body and the same lead shall not be resoldered until 3 minutes have elapsed.

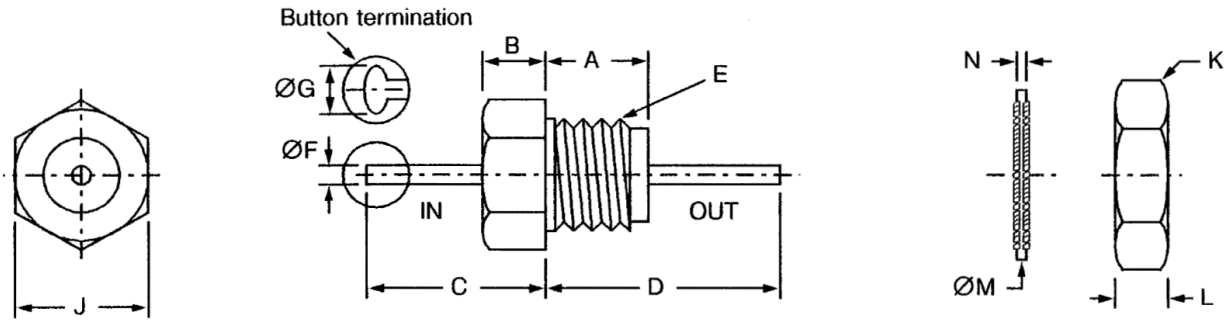
FIGURE 1 - PARAMETER DERATING INFORMATION



NOTES

- See U_{R1} Voltage value for each variant on Table 1(a), Column 2(a).
- See U_{R2} Voltage value for each variant on Table 1(a), Column 2(b).

FIGURE 2 – PHYSICAL DIMENSIONS

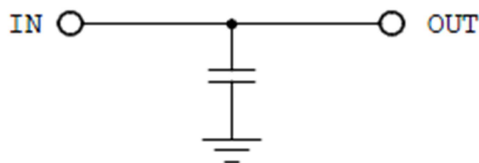


Symbol	Variants 01 to 06		Variants 07 to 12		Notes
	Millimetres		Millimetres		
	Min	Max	Min	Max	
A	6.9	7.1	6.9	7.1	
B	4.9	5.1	4.9	5.1	
C	10	12	10	12	
D	18	20	18	20	
E	See Table 1(a)		See Table 1(a)		Thread
ØF	0.72	0.88	0.72	0.88	1, 2
ØG	1	2	1	2	3
J	-	6	-	6	
K	-	7	-	8	Across flats
L	-	3	-	2.5	
ØM	-	10.2	-	9.4	4
N	-	0.6	-	0.4	4

NOTES

1. Lead finish shall commence not more than 1.5mm from encapsulant.
2. The terminals are defined as rigid.
3. Applicable only to Variants 04 to 06 and 10 to 12.
4. Internal fan lock-washer.

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 ESCC Generic Specification No. 3008 for Capacitors and Capacitor Filters, Feedthrough. Deviations from the Generic Specification, applicable to this 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 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) Para. 9.7, External Visual Inspection: For variants with a silver plated case, a change of shade is acceptable.

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

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

4.2.4 Deviations from Qualification Tests (Chart IV)

- (a) Para. 9.7, External Visual Inspection: For variants with a silver plated case, a change of shade is acceptable.
- (b) Para. 9.12, Accelerated Damp Heat: Shall not be performed.
- (c) Para. 9.15, Immersion: Shall not be performed.
- (d) Para. 9.19, Operating Life: At intermediate and final measurements, Insertion Loss shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

- (a) Para. 9.7, External Visual Inspection: For variants with a silver plated case, a change of shade is acceptable.
- (b) Para. 9.15, Immersion: Shall not be performed.
- (c) Para. 9.19, Operating Life: At intermediate and final measurements, Insertion Loss shall not be performed.

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. 9.5 of ESCC 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 5 grammes.

4.3.3 Robustness of Terminations

The requirements for the robustness of terminations tests are specified in Section 9 of ESCC Generic Specification No. 3008. The leads are defined as "Rigid".

- Test Ua1, Tensile: The load shall be 10N.

4.3.4 Solderability

The requirements for solderability testing are specified in Section 9 of ESCC Generic Specification No. 3008.

Test Method 1 shall apply and a thermal screen of 1.6mm may be used. The terminal shall be immersed up to 2mm from the body.

4.3.5 Seal Test

Not applicable.

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 Case

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

4.4.2 Lead Material and Finish

The lead material shall be Type 'A' with Type '10' finish in accordance with the requirements of ESCC 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 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:

- Lead Identification
- The ESCC Component Number.
- Electrical Characteristics and Ratings.
- Traceability Information.

4.5.2 Lead Identification

Not applicable.

4.5.3 The ESCC Component Number

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

Example: 300803301B

- Detail Specification Number: 3008033
- Type Variant (see Table 1(a)): 01
- Testing level (B or C, as applicable): B

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:

Example: 682ME

- Capacitance Value (6800pF): 682
- Tolerance ($\pm 20\%$): M
- Rated Voltage (100V): E

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 (pF).

Capacitance Value (pF)	Code
$XX10^1$	XX1
$XX10^2$	XX2
$XX10^3$	XX3
$XX10^4$	XX4

4.5.4.2 *Tolerance*

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

Tolerance ($\pm \%$)	Code Letter
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
50	C
100	E
200	G

4.5.5 Traceability Information

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

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 $T_{amb} = +22 \pm 3^{\circ}\text{C}$.

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 $T_{amb} = +125 (+0 -5)^{\circ}\text{C}$ and $-55 (+5 -0)^{\circ}\text{C}$ 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 specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at $T_{amb} = +22 \pm 3^{\circ}\text{C}$. 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 ESCC Generic Specification No. 3008. The conditions for burn-in shall be as specified in Table 5(a) of this specification.

4.7.3 Electrical Circuits for Burn-in (Figure 5)

Not applicable.

TABLE 2 – ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE – DC PARAMETERS

No.	Characteristics	Symbol	ESCC 3008 Test Method	Test Conditions	Limits		Unit
					Min	Max	
1	Voltage Drop	V_{dr}	Para. 9.4.1.5	$I_R = 10A$	-	0.1	V
2	Voltage Proof	VP	Para. 9.4.1.2	$V = 2.5U_R$	Note 1	-	V
3	Insulation Resistance	R_i	Para. 9.4.1.3	Para. 9.4.1.3	10^4	-	M Ω
		$R_i \times C$		$C < 25nF$			

NOTES

1. See Column 4 of Table 1(a).

TABLE 2 – ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE – AC PARAMETERS

No.	Characteristics	Symbol	ESCC 3008 Test Method	Test Conditions	Limits		Unit
					Min	Max	
4	Insertion Loss	I_{L1}	Para. 9.4.1.4	$f = 1.0MHz$ Note 1	Note 2	-	dB
5	Insertion Loss	I_{L2}	Para. 9.4.1.4	$f = 10MHz$ Note 1	Note 2	-	dB
6	Insertion Loss	I_{L3}	Para. 9.4.1.4	$f = 100MHz$ Note 1	Note 2	-	dB
7	Insertion Loss	I_{L4}	Para. 9.4.1.4	$f = 1.0GHz$ Note 1	Note 2	-	dB
8	Insertion Loss	I_{L5}	Para. 9.4.1.4	$f = 10GHz$ Note 3	Note 2	-	dB
9	Capacitance	C	Para. 9.4.1.1	Para. 9.4.1.1	Note 4	-	pF

NOTES

1. 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.
2. See Column 9 of Table 1(a).
3. Measurements at this frequency to be made only during Chart IV testing.
4. See Column 3 of Table 1(a).

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbol	ESCC 3008 Test Method	Test Conditions (Note 1)	Limits		Unit
					Min	Max	
3	Insulation Resistance	R _i R _i x C	Para. 9.4.1.3	Para. 9.4.1.3 Note 2 C < 25nF C > 25nF	10 ³ 25	- -	MΩ sec
4	Insertion Loss	I _{L1}	Para. 9.4.1.4	f = 1.0MHz No current	Note 3	-	dB
5	Insertion Loss	I _{L2}	Para. 9.4.1.4	f = 10MHz No current	Note 3	-	dB
6	Insertion Loss	I _{L3}	Para. 9.4.1.4	f = 100MHz No current	Note 3	-	dB
7	Insertion Loss	I _{L4}	Para. 9.4.1.4	f = 1.0GHz No current	Note 3	-	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 I, Table IIA, AQL = 1% of IEC Publication No. 410.
2. Insulation resistance is to be performed only at high temperature.
3. See Column 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
9	Capacitance Change	ΔC/C	As per Table 2	As per Table 2	±10	%

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

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T _{amb}	+125 (+0 -3)	°C
2	Test Voltage	V _T	2 x U _R at +125°C Note 1	V

NOTES

1. Applied between one terminal and the case. See Column 2(b) of Table 1(a) for value of U_R.

TABLE 5(b) – CONDITIONS FOR OPERATING LIFE TESTS

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+125 (+0 -3)	°C
2	Test Voltage	V_T	2 x U_R at +125°C Note 1	V
3	Rated Current	I_R	10 Note 2	A

NOTES

1. Applied between one terminal and the case. See Column 2(b) of Table 1(a) for value of U_R .
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 (CHART IV AND V OF ESCC 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 stated, the measurements shall be performed at $T_{amb} = +22 \pm 3^\circ\text{C}$.

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 $T_{amb} = +22 \pm 3^\circ\text{C}$.

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 $T_{amb} = +22 \pm 3^\circ\text{C}$.

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

The requirements for operating life test are specified in Section 9 of ESCC Generic Specification No. 3008. 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.	ESCC Generic Spec. No. 3008		Measurements and Inspections		Symbols	Limits		Unit
	Environmental and Endurance Tests (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
01	Seal Test (Hermetically Sealed)	Para. 9.6	Not applicable					
02	External Visual Inspection	Para. 9.7 and Paras 4.2.4 and 4.2.5 of this spec	Final Measurements Visual Inspection	ESCC No. 20500	-	-	-	
03	Temperature Rise	Para. 9.9	Temperature Rise	Rated Current (3)	-	-	25	°C
04	Shock	Para. 9.10	Measurements during Tests	100% U _R (2) applied No Open or Short Circuits > 0.1ms	-	-	-	
			Final Measurements Visual Examination	No Mechanical Damage	-	-	-	
			Insertion Loss	Table 2 Item 4 to 8	I _L	Table 2	-	
05	Vibration	Para. 9.11	Measurements during Tests	Rated Current (3) and 100% U _R (2) applied	-	-	-	
			During Last Cycle	No Open or Short Circuits > 0.1ms	-	-	-	
			Final Measurements Visual Examination	No Mechanical Damage	-	-	-	
			Insertion Loss	Table 2 Item 4 to 8	I _L	Table 2	-	
06	Accelerated Damp Heat	Para. 9.12 and Para. 4.2.4 of this spec	Not applicable					
07	Low Air Pressure	Para. 9.13	Measurements during Tests Voltage Proof	During last 5 minutes Table 2 Item 2	VP	125% U _R (2)	-	
			Visual Examination	No breakdown, flashover, deformation or seepage	-	-	-	
			Final Measurements Visual Examination	No breakdown, flashover, deformation or seepage	-	-	-	
08	Robustness of Terminations	Para. 9.14 and Para. 4.3.3. of this spec	Final Measurements Visual Examination	No damage	-	-	-	
			Voltage Drop	Table 2 Item 1	V _{dr}	-	Table 2	

No.	ESCC Generic Spec. No. 3008		Measurements and Inspections		Symbols	Limits		Unit
	Environmental and Endurance Tests (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
09	Immersion	Para. 9.15 and Paras 4.2.4 and 4.2.5 of this spec	Not applicable					
10	Overload	Para. 9.16	Final Measurements Insulation Resistance Voltage Drop Visual Examination	140% of Rated Current (3) for 15 mins min. Table 2 Item 3 Table 2 Item 1 No damage	- Ri V _{dr} -	- Table 2 - -	- - Table 2 -	
11	Resistance to Soldering Heat	Para. 9.17	Final Measurements Visual Examination Insulation Resistance Insertion Loss	After recovery of 1 to 2 hrs No damage Table 2 Item 3 Table 2 Item 4 to 8	- Ri I _L	- Table 2 Table 2	- - -	
12	Solderability	Para. 9.18 and Para. 4.3.4 of this spec.	Final Measurements Visual Examination	IEC No. 68-2-20 Para. 4.6.4, 4.7.4 or 4.9.3	-	-	-	
13	Operating Life	Para. 9.19	Initial Measurements Capacitance During Tests Intermediate Measurements Insulation Resistance Voltage Proof Insulation Resistance Capacitance Change Final Measurements Insulation Resistance Voltage Proof Insulation Resistance Capacitance Change	Table 2 Item 9 No Open or Short Circuit Table 3 Item 3 After 24 hrs recovery Table 2 Item 2 Table 2 Item 3 Table 2 Item 9 Table 3 Item 3 After 24 hrs recovery Table 2 Item 2 Table 2 Item 3 Table 2 Item 9	C - Ri VP Ri $\Delta C/C$ Ri VP Ri $\Delta C/C$	Record Values - Table 3 90% U _R (2) (4) - Table 3 90% U _R (2) (4) -	- - - Table 4 - - Table 4	

No.	ESCC Generic Spec. No. 3008		Measurements and Inspections		Symbols	Limits		Unit
	Environmental and Endurance Tests (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
14	Corrosion	Para. 9.20	Final Measurements Visual Examination	No corrosion, damage or obliteration of marking	-	-	-	
15	Permanence of Marking	Para. 9.21	Final Measurements Visual Examination	No corrosion or obliteration of marking	-	-	-	
16	Damp Heat (Non-hermetically Sealed)	Para. 9.24	Final Measurements Visual Examination Insulation Resistance	After 4 hrs recovery No cracking or encapsulant separation Table 2 Item 3	- Ri	- (5)	- -	

NOTES

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.
2. For U_{R_i} , see Column 2(a) of Table 1(a).
3. For I_{R_i} , see Column 7 of Table 1(a).
4. Greater than 50% of the value given in Table 2.
5. Greater than 10% of the value given in Table 2.

APPENDIX A
AGREED DEVIATIONS FOR EUROFARAD (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Paras. 4.2.2 and 4.2.3	(a) Para. 9.4.1.5, Voltage Drop: Voltage Drop may be performed as a DC Resistance measurement in accordance with MIL-STD-202, Method 303. In this case, the maximum value of DC Resistance (Rs) shall be as specified in Column 6 of Table 1(a).