RESISTORS, FIXED, WIREWOUND,

BASED ON TYPE RWR 89

ESCC Detail Specification No. 4002/004

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ESA/SCC Detail Specification No. 4002/004

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 3	April 1991		
Revision 'A'	September 1992		
Revision 'B'	March 1994		
Revision 'C'	April 1999		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 2 and incorporates all modifications defined in Revisions 'A' and 'B' to Issue 2 and the following DCR's:-	
		Cover page	None
		DCN	None
		Para. 1.2 : Title and contents amended	22844
		Para. 2 : Reference to MIL-STD-1276 deleted	22844/ 23454
		Table 1(a) : Type Variant identification table added	22844
		: "(2)" deleted from Column Headings	23454
		: "05" and "06" added to Column Headings	22844
		: ppm/°C corrected to "10^{-6}/°C"	23454
		: Note reference added to Temperature Characteristics	22844/ 23454
		: Resistance Values corrected	22844/ 23454
		: Weights amended	23454
		: Existing Note 2 deleted and new Note 2 added	22844/ 23454
		Table 1(b) : No. 6 Unit changed from "sec" to "s"	22844
		: New No. 8 added	22844
		Figure 1 : Title amended	23454
		: Undertitle added	23454
		Figure 2 : Drawing amended	22844
		Para. 3 : Symbol "I_T" added	23454
		Para. 4.1 : New second paragraph added	21019
		Para. 4.2.4 : Amended to add "Maximum Time Constant"	22844
		Para. 4.2.5 : Amended to add "Maximum Time Constant"	22844
		Para. 4.4.2 : Title amended	21025
		: MIL-STD-1276 deleted. ESA/SCC 23500 added	21025/ 22844
		Para. 4.5.1 : "Electrical" added to (b)	23454
		Para. 4.5.2 : After Type Variant "(see Table 1(a))" added	23454
		: After Testing, Level, "(B or C, as applicable)" added	23454
		Para. 4.5.3 : After Tolerance, "(±0.1%)" added	23454
		: "Temperature Coefficient" changed to "Temperature Characteristic of Resistance and	22844
		: "(±50.10^{-6}/°C)" added	23454
		Para. 4.5.3.1 : In Title and Text, Numerical changed to "Resistance"	22844
		Para. 4.5.3.3 : "Temperature Coefficient" and "±ppm/°C" changed to "Temperature Characteristic of Resistance" and "±10^{-6}/°C"	22844
		Para. 4.6.2 : AQL changed to "0.65% (Level II)"	22844
		Para. 4.7.1 : In 3rd sentence, "(Δ)" added after values	23454
		Para. 4.7.2 : In 3rd sentence text amended	23454
		Para. 4.7.3 : Text amended	23454
		Table 2 : No. 3(a) renumbered "3"	22844
		: No. 3(b) deleted	22844
		Table 3 : "Specification" column heading amended	23454
		: In Nos. 1 and 2, Resistance Range amended	22844
		: In No. 2, Limits amended	22844

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	CHANGE Item	Approved DCR No.
		Table 4 : No. Column added	23454
		: "Specification" and "Test Conditions" columns retitled and entries reworded	23454
		: "±" added to Limit	22844
		: In Notes, "±" added to value and value corrected	22844/ 23454
		Table 5 : No. 3, amended	22844/ 23454
		Figure 5 : Title "Figure 5(a), Parallel Circuit" added to existing Circuit and Circuit amended	22844/ 23454
		: Second test Circuit, "Figure 5(b) - Series Circuit" added	22844/ 23454
		: Note amended	22844/ 23454
		Para. 4.8 : Title amended	23454
		Paras. 4.8.1, 4.8.2, 4.8.3 : Title and first sentence amended	23223
		Para. 4.8.2 : Second sentence added	23454
		Table 6 : Title amended	23223
		: Table restructured and amended	22844/ 22879/ 23223/ 23454
'A'	September '92	P1. Cover page	None
		P2A. DCN	None
		P6. Table 1(a) : Resistance range changed	23533
'B'	March '94	P1. Cover Page	None
		P2A. DCN	None
		P10. Para. 4.4.2: Material type amended	221091
'C'	April '99	P1. Cover page	None
		P2A. DCN	None
		P7. Table 1(b) : Nos. 5(a), 5(b) and 6 deleted in toto and Nos. 7 and 8 renumbered as "5" and "6" respectively	221509
		P9. Para. 4.2.2 : New Deviation "(a)" added	221509
		P14. Table 2 : Specification and Test Conditions columns amended	221509
		P17. Table 6 : No. 4, Entry amended	221509

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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 Resistors, Fixed, Wirewound, based on Type RWR 89. It shall be read in conjunction with ESA/SCC Generic Specification No. 4002, the requirements of which are supplemented herein.

1.2 TYPE VARIANTS AND RANGE OF COMPONENTS

Variants of the basic type resistors 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 resistors specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The derating information applicable to the resistors specified herein is shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

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

1.6 FUNCTIONAL DIAGRAM

The functional diagram for the resistors 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. 4002, Resistors, Fixed, Wirewound.

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

VARIANT	COATED	MOULDED	INDUCTIVE	NON-INDUCTIVE	LEADS	
					25mm	35mm
01	X	-	X	-	-	X
02	X	-	-	X	-	X
03	X	-	X	-	X	-
04	X	-	-	X	X	-

Tolerance (%)	Variants 01 and 03 Inductively Wound		Variants 02 and 04 Non-inductively Wound	
	Resistance Range (1) Rn (Ω)	Weight (g) max.	Resistance Range (1) Rn (Ω)	Weight (g) max.
±0.1	0.5 to 4120	1.5	10 to 2050	1.5
±0.5	0.3 to 4120		10 to 2050	
±1.0	0.15 to 4120		10 to 2050	
±2.0	0.08 to 4120		10 to 2050	
±5.0	0.05 to 4120		10 to 2050	
Temp. Characteristic of Resistance $10^{-6}/°C$ (Note 2)	Resistance Value (Ω)			
±30	Rn ≥10			
±50	1.0 < Rn < 10			
±100	Rn ≤1.0			

NOTES

1. The critical value is outside the resistor range.
2. For information only for values less than 5 Ohms.

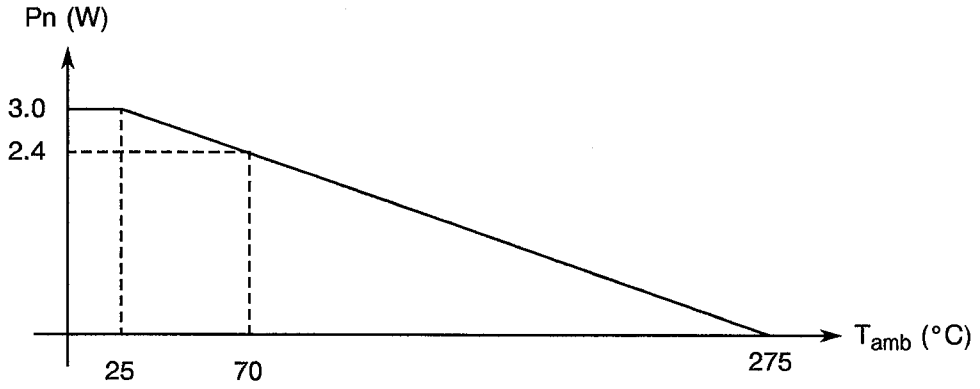
TABLE 1(b) - MAXIMUM RATINGS

NO.	CHARACTERISTICS	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Rated Dissipation	P_n	3.0	W	Up to +25°C 2.4W at +70°C
2	Limiting Element Voltage	U_L	200	V	
3	Rated Voltage	U_R	$\sqrt{PnRn}$ or (1) U_L	V	Rn is the rated resistance
4	Operating Temperature Range	T_{op}	−55 to +275	°C	T_{amb}
5	Soldering Temperature	T_{sol}	+245	°C	Soldering Time ≤10s Distance from body ≥1.5mm
6	Maximum Time Constant (For Non-inductive Resistors)	L/R	20 7.4	ns ns	For values <50Ω For values ≥50Ω

NOTES

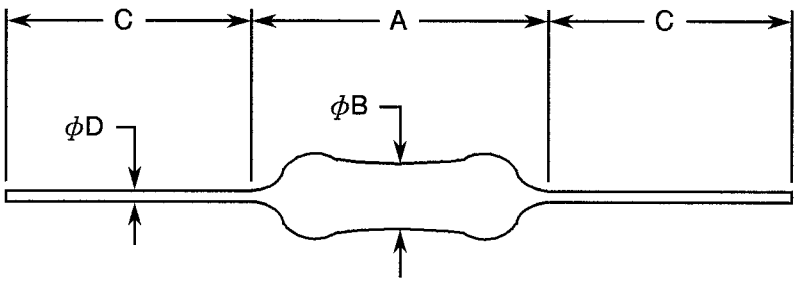
1. Whichever is smaller.

FIGURE 1 - PARAMETER DERATING INFORMATION



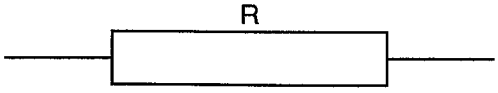
Rated Power versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
A	12.65	15.79	
B	3.96	5.54	
C	35.00 25.00	- -	Variants 01 and 02 Variants 03 and 04
D	0.7	0.9	

FIGURE 3 - FUNCTIONAL DIAGRAM



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:-

I_T = Test current.

R_A = Resistance value measured at ambient temperature ($+22 \pm 3$ °C).

R_i = Insulation resistance.

U_T = Test voltage.

U_{proof} = d.c. or r.m.s. voltage proof.

$U_{over\ L}$ = Overload voltage.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the resistors specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 4002 for Resistors, Fixed, Wirewound. 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 ESA/SCC requirement 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. 9.1, Overload: The conditions shall be as follows:-

Voltage : $\sqrt{5PnRn}$ or $2U_L$, whichever is less.
Duration: 5 seconds.
If better than 0.1%, use the Figure 1 curve.

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

None.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.18, Maximum Time Constant: Not applicable to inductive resistors.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.18, Maximum Time Constant: Not applicable to inductive resistors.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the resistors specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the resistors specified herein shall be as per Table 1(a).

4.3.3 Robustness of Terminations

The requirements for robustness of termination testing are specified in Section 9 of ESA/SCC Generic Specification No. 4002. The test conditions shall be as follows:-

Applied Force : 10 Newtons.

Duration : 5 to 10 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 resistors 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 Enclosure or Protective Coating

Resistor assemblies shall be protected by a coating or enclosure of moisture-resistant insulating material which shall completely cover the outside of the resistor element, including connections of terminations. The coating shall not crack, craze, drip, run or form globules at any temperature up to and including +275°C, regardless of the mounting position of the resistor.

The protective coating or enclosure shall be such that it minimises the establishment of leakage paths between the terminals resulting from collection of moisture film on the outside surface of the resistor.

4.4.2 Lead Material and Finish

The material shall be Type 'L' with Type '3' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

4.4.3 Wire

Each resistor shall be wound with a conductor having no joints, welds or bands within each terminated resistance element. In no case shall the nominal diameter be less than 20 microns.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with ESA/SCC Basic Specification No. 21700 and the following paragraphs. Each component shall be marked in respect of:-

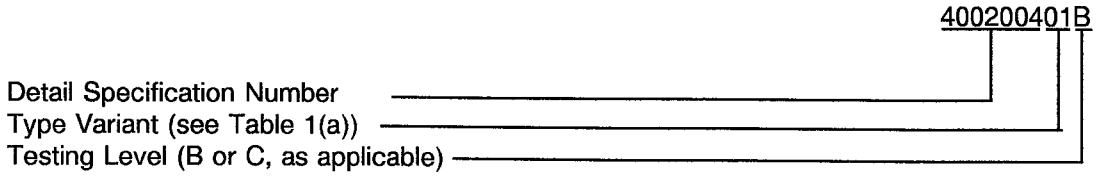
(a) The SCC Component Number.

(b) Electrical Characteristics and Ratings.

(c) Traceability Information.

4.5.2 The SCC Component Number

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



4.5.3 Electrical Characteristics and Ratings

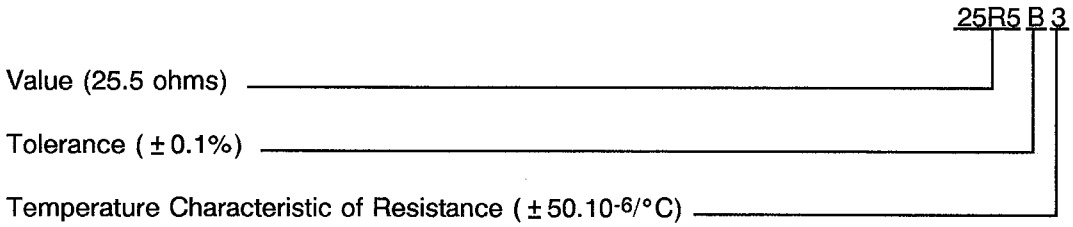
The electrical characteristics and ratings to be marked in the following order of precedence are:-

(a) Numerical value.

(b) Tolerance.

(c) Temperature Characteristic of Resistance.

The information shall be constituted and marked as follows:-



4.5.3.1 Resistance Values

Resistance values shall be expressed by means of the following codes.

The unit quantity for marking shall be Ohms.

RESISTANCE VALUE	CODE
0.XXX	RXXX
X.XX	XRXX
XX.X	XXRX
XXX	XXX0
XXX 10^1	XXX1

For values of 100 and above, the first three digits (X) represent significant figures and the last digit specifies the number of zeros to follow.

When values of less than 100 are required, the letter 'R' is used to indicate the decimal point. When the letter is used, all succeeding digits represent significant figures.

4.5.3.2 Tolerance

The tolerances on numerical values shall be indicated by the letter codes specified hereafter:-

TOLERANCE (%)	CODE LETTER
±0.1	B
±0.5	D
±1.0	F
±2.0	G
±5.0	J

4.5.3.3 Temperature Characteristic of Resistance

The temperature characteristic of resistance shall be indicated by the numerical codes specified hereafter:-

DIGIT	TEMPERATURE CHARACTERISTIC OF RESISTANCE $\pm 10^{-6}$ / °C
9	30
3	50
4	100

4.5.4 Traceability Information

Traceability information shall be marked in accordance with ESA/SCC Basic Specification No. 21700.

4.5.5 Marking of Small Components

Where it is considered that a 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 specified in Para. 4.5.1.

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. 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 on a sample basis at high and low temperatures are scheduled in Table 3. AQL shall be 0.65% (Level II) out of the total production lot. The distribution of the sample shall be as follows:-

- 1/3 with lowest resistance values.
- 1/3 with highest resistance values.
- 1/3 with median resistance values.

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. Measurements shall be performed at $T_{amb} = +22 \pm 3$ °C. The parameter drift values (Δ) applicable to the parameter 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 ESA/SCC Generic Specification No. 4002. The conditions for burn-in shall be as specified in Table 5. Resistors shall be tested with a d.c. voltage with a ripple not exceeding 5%. A voltage of 200V or $\sqrt{P_n R_n}$ (see Figure 5(a)) or a current of $200V \div Rn$ or $\sqrt{Pn} \div Rn$ (see Figure 5(b)), shall be applied in cycles of 90 minutes "on" and 30 minutes "off" throughout the test. The resistors shall be connected by their terminations to suitable clips on a rack of insulating material.

The resistors shall be so arranged that the temperature of any one resistor does not appreciably influence the temperature of any other resistor. There shall be no undue draught over the resistors. After the period specified in the Generic Specification, the resistors shall be removed from the chamber and allowed to cool under normal atmospheric conditions for a minimum of 4 hours.

4.7.3 Electrical Circuits for Burn-in

Alternative circuits for use in performing the burn-in tests are shown in Figures 5(a) and 5(b) of this specification.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

NO.	CHARACTERISTIC	SYMBOL	ESA/SCC 4002 TEST METHOD	TEST CONDITIONS	TOLERANCE (%)	LIMITS		UNIT
						MIN	MAX	
1	Resistance	R_A	Para. 9.5.1.1	Para. 9.5.1.1	0.1	0.999 R_n	1.001 R_n	Ω
					0.5	0.995 R_n	1.005 R_n	
					1.0	0.99 R_n	1.01 R_n	
					2.0	0.98 R_n	1.02 R_n	
					5.0	0.95 R_n	1.05 R_n	
2	Insulation Resistance	R_i	Para. 9.5.1.2	Para. 9.5.1.2.1	All	1 000	-	MΩ
3	Voltage Proof	U_{proof}	Para. 9.5.1.3	Para. 9.5.1.3.1	All	1 000	-	Vrms

NOTES

1. Measurements on a sample basis; sample size as specified in Para. 4.6.2.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

NO.	CHARACTERISTIC	SYMBOL	SPECIFICATION AND TEST METHOD	TEST CONDITION	RESIST. RANGE	LIMITS		UNIT
						MIN	MAX	
1(a)	Resistance Change between -55(+3-0) °C and +22±3 °C	$\frac{\Delta R}{R}$	ESA/SCC Generic Spec. No. 4002	Para. 9.5	$R_n \leq 1.0$	−0.8	+0.8	%
					$1.0 < R_n < 10$	−0.4	+0.4	
					$R_n \geq 10$	−0.25	+0.25	
1(b)	Resistance Change between +175±3 °C and +22±3 °C	$\frac{\Delta R}{R}$	ESA/SCC Generic Spec. No. 4002	Para. 9.5	$R_n \leq 1.0$	−1.5	+1.5	%
					$1.0 < R_n < 10$	−0.75	+0.75	
					$R_n \geq 10$	−0.45	+0.45	

TABLE 4 - PARAMETER DRIFT VALUES

NO.	CHARACTERISTIC	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	CHANGE LIMITS (Δ)	UNIT
1	Resistance Change	$\frac{\Delta R}{R}$	As per Table 2	As per Table 2	±0.2 (1)	%

NOTES

1. or $\Delta R = \pm 0.05\Omega$, whichever is greater.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

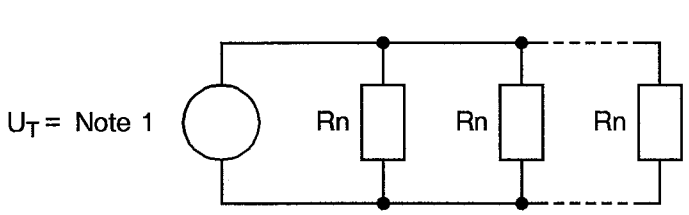
Not applicable

TABLE 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS

NO.	CHARACTERISTIC	SYMBOL	CONDITION	UNIT
1	Ambient Temperature for Initial Measurement	T_{amb}	+22 ±3	°C
2	Temperature for Burn-in and Operating Life	T_{amb}	+25 ±3	°C
3	Voltage or Current applied	U_T or I_T	Note 1 to Figure 5	-
4	Temperature for Final Measurement	T_{amb}	+22 ±3	°C

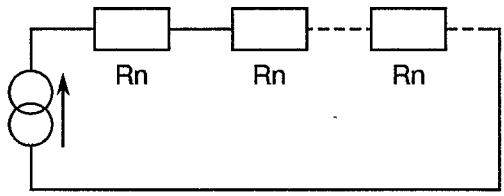
FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN AND OPERATING LIFE TESTS

FIGURE 5(a) - PARALLEL CIRCUIT



OR

FIGURE 5(b) - SERIES CIRCUIT



NOTES

1. $U_T = 200V$ or $\sqrt{PnRn}$. $I_T = \frac{200V}{Rn}$ or $\sqrt{\frac{Pn}{Rn}}$

whichever is smaller, with the P_n value according to Tolerance (see Table 1(a)).

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 4002)

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. The 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. The 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 scheduled in Table 6. The 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 testing are specified in Section 9 of ESA/SCC Generic Specification No. 4002. The conditions for operating life testing shall be as specified in Table 5 and Para. 4.7.2 of this specification.

4.8.5 Electrical Circuits for Operating Life Tests

The circuit for use in performing the operating life tests is shown in Figure 5.

4.8.6 Conditions for High Temperature Storage Test (Part of Endurance Testing)

The requirements for the high temperature storage test are specified in Section 9 of ESA/SCC Generic Specification No. 4002. The conditions for high temperature storage shall be T_{amb} = +275(+0-5) °C.

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. 4002		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN	MAX	
1	Overload	Para. 9.1 and Para. 4.2.2 of this specification	After not less than 1 or more than 2 hours Visual Examination Resistance Change	No damage Legible marking Table 2 Item 1	ΔR/R	$\pm(0.25+\frac{0.05}{Rn}\times100)$		%
2	Permanence of Marking	Para. 9.6	Permanence of Marking	-	-	-	-	
3	Temperature Characteristic of Resistance	Para. 9.7 Procedure II	Temperature Characteristic of Resistance	Gen. 4002, Para. 9.7.3	TCR	Table 1(a)		$10^{-6}/°C$
4	Voltage Proof (Altitude)	Para. 9.8	**During Test** Visual Examination	200Vrms for 5 seconds No breakdown or flashover	-	-	-	-
5	Solderability	Para. 9.9 Procedure II	Visual Examination	No damage Legible marking		-	-	
6	Robustness of Terminations	Paras. 9.10 and Para. 4.3.3 of this specification	Visual Examination Resistance Change	No damage Table 2 Item 1	ΔR/R	$\pm(0.25+\frac{0.05}{Rn}\times100)$		%
7	Resistance to Soldering Heat	Para. 9.11 Procedure I	Visual Examination After 24 ± 4 hours Resistance Change	No damage Legible marking Table 2 Item 1	ΔR/R	$\pm(0.1+\frac{0.01}{Rn}\times100)$		%
8	Rapid Change of Temperature	Para. 9.12	After not less than 1 or more than 2 hours Visual Examination Resistance Change	No damage Table 2 Item 1	ΔR/R	$\pm(0.5+\frac{0.05}{Rn}\times100)$		%
9	Vibration	Para. 9.13	Visual Examination Resistance Change	No damage Table 2 Item 1	ΔR/R	$\pm(0.25+\frac{0.05}{Rn}\times100)$		%

NOTES

1. The tests in this table refer to either Chart IV or V and shall be used as 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. 4002		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN	MAX	
10	Climatic Sequence	Para. 9.14 Procedure I	After 1 to 2 hours recovery					
			Visual Examination	No damage Legible Marking				
			Resistance Change	Table 2 Item 1	ΔR/R	$\pm(1.0+\frac{0.05}{Rn}\times 100)$		%
			Insulation Resistance	Gen. 4002, Para. 9.5.1.2	Ri	100	-	MΩ
11	Operating Life	Para. 9.15 Change Limits Relate to 0 hours Initial Measurement	After 1000 hours After 1 to 2 hours recovery					
			Resistance Change	Table 2 Item 1	ΔR/R	$\pm(0.35+\frac{0.05}{Rn}\times 100)$		%
			Visual Examination	No damage Legible marking				
			After 2000 hours After 1 to 2 hours recovery					
			Resistance Change	Table 2 Item 1	ΔR/R	$\pm(0.5+\frac{0.05}{Rn}\times 100)$		%
			Visual Examination	No damage Legible marking				
12	High Temperature Storage	Para. 9.16 Change Limits Relate to 0 hours Initial Measurement	After 2000 hours Resistance Change	Table 2 Item 1	ΔR/R	$\pm(0.5+\frac{0.05}{Rn}\times 100)$		%
13	External Visual Inspection	Para. 9.17	External Visual Inspection	Gen. 4002, Para. 9.17		-	-	
14	Maximum Time Constant	Para. 9.18	Not applicable to Inductive Resistors	Gen. 4002, Para. 9.18.1	L/R	Table 1(b)		ns

NOTES

1. The tests in this table refer to either Chart IV or V and shall be used as applicable.