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Pages 1 to 18

**RESISTORS, FIXED, WIREWOUND,**



**BASED ON TYPE RWR 81**

**ESA/SCC Detail Specification No. 4002/005**





**space components  
coordination group**

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		SCCG Chairman	ESA Director General or his Deputy
Issue 2	April 1991		
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 	ESA/SCC Detail Specification No. 4002/005	PAGE 2
		ISSUE 2


**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 1 and incorporates all modifications defined in Revision 'A' to Issue 1 and the following DCR's:-	
		Cover page	None
		DCN	None
		Para. 1.2 : Title and contents amended	22846
		Para. 2 : Reference to MIL-STD-1276 deleted	22846/ 23454
		Table 1(a) : Type Variant identification table added	22846
		: Variants added to Column Headings	23454
		: "(2)" deleted from Column Headings	23454
		: ppm/°C corrected to "10 <sup>-6</sup> /°C"	23454
		: Note reference added to Temperature Characteristics	22846/ 23454
		: Resistance Values corrected	22846/ 23454
		: Weights amended	23454
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		Table 1(b) : No. 1, Remarks Column amended	22846
		: No. 6 Unit changed from "sec" to "s"	22846
		: New No. 8 added	22846
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		: Wattage scale corrected	22846
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		Figure 2 : Amended to incorporate coated components and new Variables	22846
		Para. 3 : Symbol "I <sub>T</sub> " added	23454
		Para. 4.1 : New second paragraph added	21019
		Para. 4.2.4 : Amended to add "Maximum Time Constant"	22846
		Para. 4.2.5 : Amended to add "Maximum Time Constant"	22846
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		: 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	22846
		: "(±50.10 <sup>-6</sup> /°C)" added	23454
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		Para. 4.5.3.3 : "Temperature Coefficient" and "± ppm/°C" changed to "Temperature Characteristic of Resistance" and "± 10 <sup>-6</sup> /°C"	22846
		Para. 4.6.2 : AQL changed to "0.65% (Level II)"	22846
		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
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		: No. 3(b) deleted	22846

 	<p style="text-align: center;">ESA/SCC Detail Specification No. 4002/005</p>	<p style="text-align: center;">Rev. 'B'</p>	<p style="text-align: center;">PAGE 2A ISSUE 2</p>
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**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	CHANGE Item	Approved DCR No.
		<p>Table 3 : "Specification" column heading amended : In No. 2, Limits amended</p> <p>Table 4 : No. Column added : "Specification" and "Test Conditions" columns retitled and entries reworded : "±" added to Limits and Notes value</p> <p>Table 5 : No. 3, amended</p> <p>Figure 5 : Title "Figure 5(a), Parallel Circuit" added to existing Circuit and Circuit amended : Second test Circuit, "Figure 5(b) - Series Circuit" added : Note amended</p> <p>Para. 4.8 : Title amended</p> <p>Paras. 4.8.1, 4.8.2, 4.8.3 : Title and first sentence amended</p> <p>Para. 4.8.2 : Second sentence added</p> <p>Table 6 : Title amended : Table restructured and amended</p>	<p>23454 22846 23454 23454 22846 22846/ 23454 22846/ 23454 22846/ 23454 22846/ 23454 23223 23454 23223 22846/ 22879/ 23223/ 23454</p>
'A'	March '94	<p>P1. Cover Page</p> <p>P2A. DCN</p> <p>P10. Para. 4.4.2 : Material Type amended</p>	<p>None None 221091</p>
'B'	April '99	<p>P1. Cover Page</p> <p>P2A. DCN</p> <p>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</p> <p>P9. Para. 4.2.2 : New Deviation "(a)" added</p> <p>P14. Table 2 : Specification and Test Conditions columns amended</p> <p>P17. Table 6 : No. 4, Entry amended</p>	<p>None None 221509 221509 221509 221509</p>

 <b>SCC</b>	ESA/SCC Detail Specification No. 4002/005		PAGE 3 ISSUE 2
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## TABLE OF CONTENTS

		<u>Page</u>
<b>1.</b>	<b><u>GENERAL</u></b>	<b>5</b>
1.1	Scope	5
1.2	Type Variants and Range of Components	5
1.3	Maximum Ratings	5
1.4	Parameter Derating Information	5
1.5	Physical Dimensions	5
1.6	Functional Diagram	5
<b>2.</b>	<b><u>APPLICABLE DOCUMENTS</u></b>	<b>5</b>
<b>3.</b>	<b><u>TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS</u></b>	<b>9</b>
<b>4.</b>	<b><u>REQUIREMENTS</u></b>	<b>9</b>
4.1	General	9
4.2	Deviations from Generic Specification	9
4.2.1	Deviations from Special In-process Controls	9
4.2.2	Deviations from Final Production Tests	9
4.2.3	Deviations from Burn-in and Electrical Measurements	9
4.2.4	Deviations from Qualification Tests	9
4.2.5	Deviations from Lot Acceptance Tests	9
4.3	Mechanical Requirements	9
4.3.1	Dimension Check	9
4.3.2	Weight	9
4.3.3	Robustness of Terminations	10
4.4	Materials and Finishes	10
4.4.1	Enclosure or Protective Coating	10
4.4.2	Lead Material and Finish	10
4.4.3	Wire	10
4.5	Marking	10
4.5.1	General	10
4.5.2	The SCC Component Number	10
4.5.3	Electrical Characteristics and Ratings	11
4.5.4	Traceability Information	12
4.5.5	Marking of Small Components	12
4.6	Electrical Measurements	12
4.6.1	Electrical Measurements at Room Temperature	12
4.6.2	Electrical Measurements at High and Low Temperatures	12
4.6.3	Circuits for Electrical Measurements	12
4.7	Burn-in Tests	12
4.7.1	Parameter Drift Values	12
4.7.2	Conditions for Burn-in	13
4.7.3	Electrical Circuits for Burn-in	13
4.8	Environmental and Endurance Tests	16
4.8.1	Measurements and Inspections on Completion of Environmental Tests	16
4.8.2	Measurements and Inspections at Intermediate Points during Endurance Tests	16
4.8.3	Measurements and Inspections on Completion of Endurance Tests	16
4.8.4	Conditions for Operating Life Tests	16
4.8.5	Electrical Circuits for Operating Life Tests	16
4.8.6	Conditions for High Temperature Storage Test	16

	<p style="text-align: center;">ESA/SCC Detail Specification No. 4002/005</p>	<p>PAGE 4 ISSUE 2</p>
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**TABLES**


		<u>Page</u>
1(a)	Type Variants and Range of Components	6
1(b)	Maximum Ratings	7
2	Electrical Measurements at Room Temperature	14
3	Electrical Measurements at High and Low Temperatures	14
4	Parameter Drift Values	15
5	Conditions for Burn-in and Operating Life Tests	15
6	Measurements and Inspections on Completion of Environmental Tests and at Intermediate Points and on Completion of Endurance Testing	17

**FIGURES**

1	Parameter Derating Information	8
2	Physical Dimensions	8
3	Functional Diagram	8
4	Circuits for Electrical Measurements	N/A
5	Electrical Circuit for Burn-in and Operating Life Tests	15

**APPENDICES (Applicable to specific Manufacturers only)**

None.

	<p style="text-align: center;">ESA/SCC Detail Specification No. 4002/005</p>		<p>PAGE 5 ISSUE 2</p>
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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 81. 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	-
05	-	X	X	-	X	-
06	-	X	-	X	X	-

Tolerance (%)	Variants 01, 03 and 05 Inductively Wound		Variants 02, 04 and 06 Non-inductively Wound	
	Resistance Range (1) Rn ( $\Omega$ )	Weight (g) max.	Resistance Range (1) Rn ( $\Omega$ )	Weight (g) max.
$\pm 0.1$	0.5 to 1.0k	0.4	10 to 499	0.4
$\pm 0.5$	0.5 to 1.0k		10 to 499	
$\pm 1.0$	0.25 to 1.0k		10 to 499	
$\pm 2.0$	0.125 to 1.0k		10 to 499	
$\pm 5.0$	0.1 to 1.0k		10 to 499	
Temp. Characteristic of Resistance $10^{-6}/^{\circ}\text{C}$ (Note 2)	Resistance Value ( $\Omega$ )			
$\pm 30$	Rn $\geq 10$			
$\pm 50$	$1.0 < \text{Rn} < 10$			
$\pm 100$	Rn $\leq 1.0$			

**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.	CHARACTERISTIC	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Rated Dissipation	$P_n$	1.0	W	Up to +25°C 0.8W at +70°C
2	Limiting Element Voltage	$U_L$	50	V	
3	Rated Voltage	$U_R$	$\sqrt{P_n R_n}$ or (1) $U_L$	V	$R_n$ 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

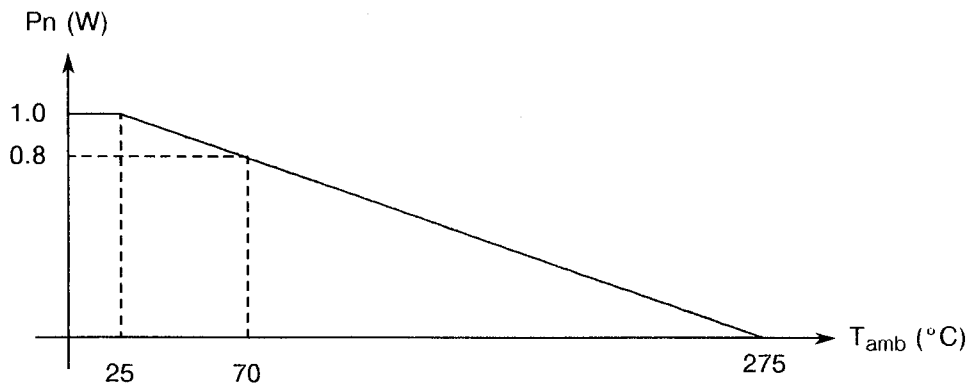
**NOTES**

1. Whichever is smaller.





**FIGURE 1 - PARAMETER DERATING INFORMATION**



Rated Power versus Temperature

**FIGURE 2 - PHYSICAL DIMENSIONS**

FIGURE 2(a) - COATED COMPONENT

VARIANTS 01, 02, 03 AND 04

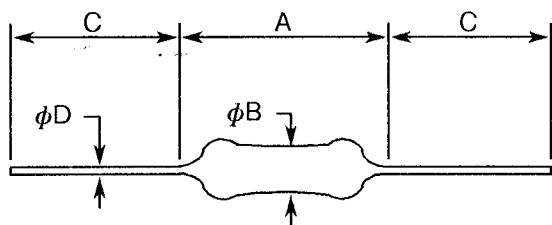
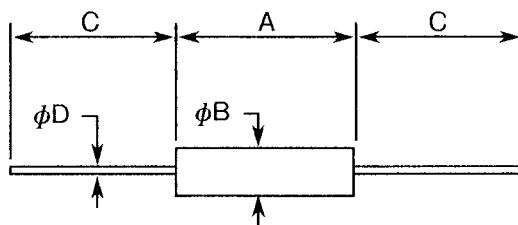


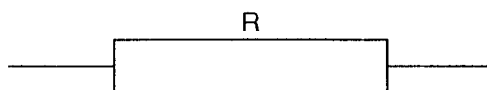
FIGURE 2(b) - MOULDED COMPONENT

VARIANTS 05 AND 06



SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
A	5.56	7.14	Variants 01 and 02 Variants 03, 04, 05 and 06
B	1.6	2.67	
C	35 25	- -	
D	0.47	0.7	

**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 :  $\sim\sqrt{5PnRn}$  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

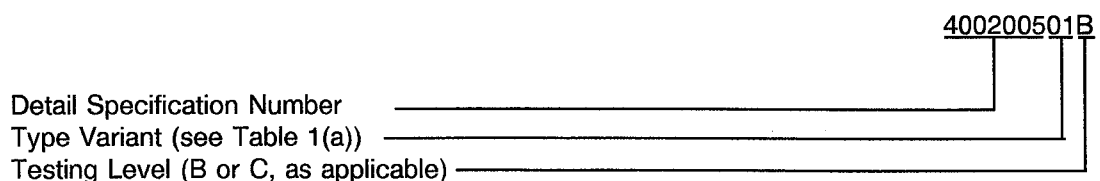
4.5.1 General

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:

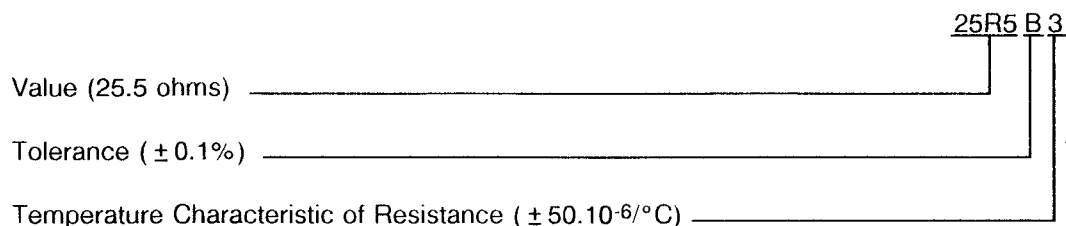


4.5.3 Electrical Characteristics and Ratings

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 <sup>1</sup>	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 $\pm 10^{-6} / ^\circ\text{C}$
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  $T_{\text{amb}} = +22 \pm 3 ^\circ\text{C}$ .

##### 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  $T_{\text{amb}} = +22 \pm 3 ^\circ\text{C}$ . The parameter drift values ( $\Delta$ ) 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.

	ESA/SCC Detail Specification No. 4002/005		PAGE 13 ISSUE 2
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#### 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 50V or  $\sqrt{P_n R_n}$  (see Figure 5(a)) or a current of  $50V \div R_n$  or  $\sqrt{P_n \div R_n}$  (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	$0.999 R_n$	$1.001 R_n$	$\Omega$
					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	-	$M\Omega$
3	Voltage Proof	$U_{proof}$	Para. 9.5.1.3	Para. 9.5.1.3.1	All	500	-	$V_{rms}$

**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 $-55(+3-0)^\circ\text{C}$ and $+22\pm 3^\circ\text{C}$	$\frac{\Delta R}{R}$	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 $+175\pm 3^\circ\text{C}$ and $+22\pm 3^\circ\text{C}$	$\frac{\Delta R}{R}$	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 ( $\Delta$ )	UNIT
1	Resistance Change	$\frac{\Delta R}{R}$	As per Table 2	As per Table 2	$\pm 0.2$ (1)	%

**NOTES**

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

**FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS**

Not applicable

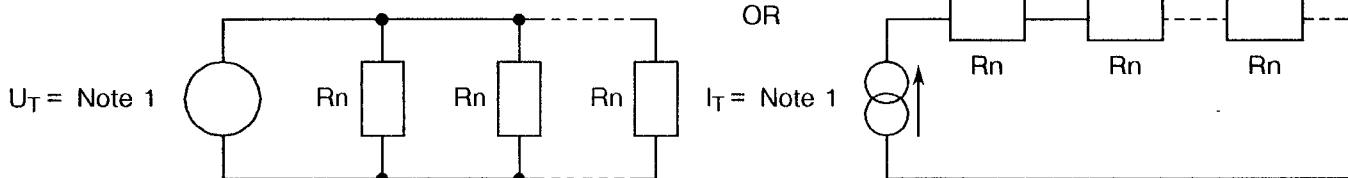
**TABLE 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS**

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

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

FIGURE 5(a) - PARALLEL CIRCUIT

FIGURE 5(b) - SERIES CIRCUIT





**NOTES**

1.  $U_T = 50V$  or  $\sqrt{P_n R_n}$ .

$I_T = \frac{50V}{R_n}$  or  $\sqrt{\frac{P_n}{R_n}}$

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



 	<p style="text-align: center;">ESA/SCC Detail Specification No. 4002/005</p>		<p>PAGE 16 ISSUE 2</p>
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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  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .

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. The measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .

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 tests are scheduled in Table 6. The measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .

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  $T_{amb} = +275(+0-5) \text{ }^\circ\text{C}$ .



**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	$\Delta R/R$	$\pm (0.25 + \frac{0.05}{R_n} \times 100)$		%
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 <sup>-6</sup> /°C
4	Voltage Proof (Altitude)	Para. 9.8	<b>During Test</b> Visual Examination	100Vrms 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	Table 2 Item 1	$\Delta R/R$	$\pm (0.25 + \frac{0.05}{R_n} \times 100)$		%
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	$\Delta R/R$	$\pm (0.1 + \frac{0.01}{R_n} \times 100)$		%
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	$\Delta R/R$	$\pm (0.5 + \frac{0.05}{R_n} \times 100)$		%
9	Vibration	Para. 9.13	Visual Examination Resistance Change	No damage Table 2 Item 1	$\Delta R/R$	$\pm (0.25 + \frac{0.05}{R_n} \times 100)$		%

**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 Resistance Change Insulation Resistance	No damage Legible Marking Table 2 Item 1  Gen. 4002, Para. 9.5.1.2	$\Delta R/R$  Ri	$\pm (1.0 + \frac{0.05}{R_n} \times 100)$  100	  -	%  M $\Omega$
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	$\Delta R/R$	$\pm (0.35 + \frac{0.05}{R_n} \times 100)$		%
			Visual Examination	No damage Legible marking				
			After 2000 hours After 1 to 2 hours recovery Resistance Change	Table 2 Item 1	$\Delta R/R$	$\pm (0.5 + \frac{0.05}{R_n} \times 100)$		%
12	High Temperature Storage	Para. 9.16 Change Limits Relate to 0 hours Initial Measurement	After 2000 hours Resistance Change	Table 2 Item 1	$\Delta R/R$	$\pm (0.5 + \frac{0.05}{R_n} \times 100)$		%
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.