DOCUMENT CHANGE REQUEST

DCR number 181	Changes required for: MRB decision	Originator: P Collins
Date: 2005/05/26	Date sent: 2005/05/26	Organisation: ESA/ESTEC
Status: IMPLEMENTED		

Title:	Thermistors (thermally Sensitive Resistors) Range 2000 to 100000 Ohms at +25C with a		
Number:	4006/014	Issue:	3

Other documents affected:

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Table 1(b), Page 7
Figure 2, Page 8
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Paragraph:

Table 1(a), Page 6
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Original wording:

Proposed wording:

See attached mark-up for full details of changes.

Summary:
1) Throughout the specification: Delete reference to variant "07". Replace all instances of variant "07" by new variant "08".

2) For new variant 08: Table 1(a) against old variant "07" line replace BASED ON TYPE "G15K4D425" by "G15K4D489"; change tolerance at +125°C to 2.00%, at 140°C to 3.00% and at +160°C to 4.00%.

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3) Table 6 No. 2, Thermal Time Constant. replace "40 sec max" by "Table 2 item 3".

Justification:

1) & 2): Design change and re-qualification

3) Correction of error

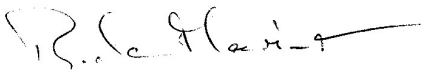
Attachments:

DCR181_attachment_4006014_markup.pdf, null

Modifications:

This is DCR 181A (only rejected to move it out of this space)

Approval signature:



Date signed:

2005-05-26

MARK-UP FOR
DCR181

S. Thakur.
13.7.05.

THERMISTORS

(THERMALLY SENSITIVE RESISTORS), NTC,

RANGE 2000 TO 100000 OHMS AT +25°C WITH

A TEMPERATURE RANGE OF -60 to +160°C

ESCC Detail Specification No. 4006/014

ISSUE ~~3~~ 4

~~June 2004~~

July 2005

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

2005

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DOCUMENTATION CHANGE NOTICE

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DCR No.	CHANGE DESCRIPTION
~~119~~ 181	Specification upissued to incorporate editorial and technical changes per DCR.

TABLE 1(a) - TYPE VARIANTS

(1) VARIANT	(2) BASED ON TYPE	(3) R_Z (Note 1)	(4) RESISTANCE/TEMPERATURE CHARACTERISTICS (Note 2)										
			-60°C	-40°C	-20°C	0°C	+25°C	+50°C	+70°C	+100°C	+125°C	+140°C	+160°C
01	G2K7D110	NOM. (Ω)	-	43362	14658	5650	2000.0	815.0	432.0	187.40	102.00	-	-
		TOL. (±%)	-	2.90	2.54	1.57	1.34	1.17	1.05	0.90	1.13	-	-
02	G4K7D108	NOM. (Ω)	-	-	29316	11300	4000	1630.0	864.0	374.80	204.00	-	-
		TOL. (±%)	-	-	2.54	1.57	1.34	1.17	1.05	0.90	1.13	-	-
03	G4K7D114	NOM. (Ω)	-	86724	29316	11300	4000	1630.0	864.0	-	-	-	-
		TOL. (±%)	-	2.90	2.54	1.57	1.34	1.17	1.05	-	-	-	-
04	G15K4D112	NOM. (Ω)	-	-	-	44235	15000	5840	2985.0	1226.0	639.0	447.00	287.70
		TOL. (±%)	-	-	-	1.62	1.41	1.24	1.12	0.97	1.23	1.15	1.06
05	G100K6D116	NOM. (Ω)	-	-	-	-	100000	-	-	5574	2642.4	1756.3	1059.0
		TOL. (±%)	-	-	-	-	-	-	-	1.11	1.41	1.32	1.21
06	G15K4D393	NOM. (Ω)	1342000	371300	120100	44420	15000	5855	3009.0	1250.0	659.8	465.50	302.40
		TOL. (±%)	10.00	6.30	3.35	1.00	1.01	1.03	1.05	1.01	1.02	1.02	1.00
08 ~~07~~	~~G15K4D425~~ G15K4D489	NOM. (Ω)	1342000	371300	120100	44420	15000	5855	3009.0	1250.0	659.8	465.50	302.40
		TOL. (±%)	10.00	6.30	3.35	1.00	1.01	1.03	1.05	1.01	~~1.02~~ 2.00	~~1.02~~ 3.00	~~2.00~~ 4.00

NOTES

1. For test purposes, when zero power is dissipated and the ambient temperature is held as specified, the value is referred to as R_Z (Zero Power Resistance).
2. The reference resistance is specified at +25°C.

TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Power Dissipation	P_D	2.0	mW	Note 1
2	Operating Temperature Range	T_{op}	Note 2	°C	
3	Storage Temperature Range	T_{stg}	Note 3	°C	
4	Soldering Temperature	T_{sol}	+245	°C	Note 4

NOTES

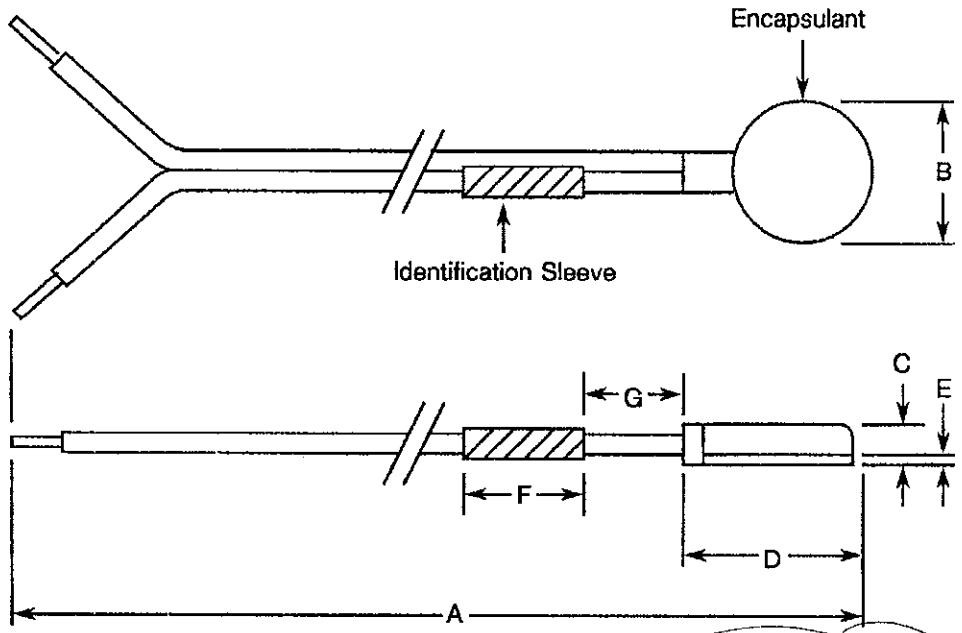
1. Never to be exceeded in the temperature measurement mode. The thermistors specified herein shall not be used in the self-heat mode.
2. See Column 4 of Table 1(a).
3. −40°C for Variants 01 to 05 and -60°C for Variants 06 and 07 to the Maximum Operating Temperature specified in Column 4 of Table 1(a)
4. Duration 10 seconds maximum at a distance of not less than 10mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

08

FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.

FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	MILLIMETRES			
	VARIANTS 01-05		VARIANTS 06-07	
	MIN.	MAX.	MIN.	MAX.
A	280.00	330.00	356.00	406.00
B	6.10	6.60	6.10	6.60
C	-	2.80	-	2.40
D	-	9.80	-	9.80
E	0.33	0.48	0.33	0.48
F	-	50.00	-	50.00
G	50.00	80.00	50.00	80.00

NOTES

1. The leads shall not be bent, or the means of fastening them cause bending in any direction from the place of the thermistor fastening disc within a distance of 15mm from the centre of the thermistor.

FIGURE 3 - FUNCTIONAL DIAGRAM

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the thermistors specified herein are stated in this specification and ESCC Generic Specification No. 4006 for Thermistors (Resistors, Thermally Sensitive). 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) Thermal Shock: Test Condition 'C' except that the maximum temperature shall be the maximum operating temperature specified in Column 4 of Table 1(a) of this Specification.

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

None.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Thermal Shock: Test Condition 'C' except that the maximum temperature shall be the maximum operating temperature specified in Column 4 of Table 1(a) of this Specification.

(b) Para. 9.3.1.2, Dissipation Constant: Not applicable.

(c) Para. 9.15, Short Time Overload: Not applicable.

(d) Para. 9.17, High Temperature Storage: Not applicable.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Thermal Shock: Test Condition 'C' except that the maximum temperature shall be the maximum operating temperature specified in Column 4 of Table 1(a) of this Specification.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the thermistors specified herein shall be verified in accordance with the requirements set out in Para. 9.4 of ESCC Generic Specification No. 4006 and they shall conform to those shown in Figure 2 of this specification.

4.3.2 Weight

The maximum weight of the thermistors specified herein shall be 4.0 grammes, with the exception of Variants 06 and 07, whose maximum weight shall be 2.3 grammes.

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4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Para. 9.13 of ESCC Generic Specification No. 4006. The test conditions shall be as follows:-

Applied Force: 4.45 (+1.1 −0)N.
Duration: 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 thermistors 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 housing shall be aluminium filled with a black epoxy encapsulant.

4.4.2 Lead Material and Finish

The lead material shall be in accordance with ESCC Detail Specification No. 3901/012 Variant 04 with the exception of Variants 06 and 08, which shall be in accordance with ESCC Detail Specification No. 3901/012 Variant 03. One lead shall carry an identification sleeve which shall carry all part marking specified in Para. 4.5.

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:-

(a) The ESA Symbol, for qualified components only.

(b) The ESCC Component Number.

(c) Traceability Information.

4.5.2 The ESCC Component Number

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

400601401B

Detail Specification Number

Type Variant (see Table 1(a))

Testing Level (B or C, as applicable)

4.5.3 Traceability Information

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

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - DC PARAMETERS

No.	CHARACTERISTICS	SYMBOL	ESCC 4006 TEST METHOD AND CONDITIONS	LIMITS		UNIT
				MIN.	MAX.	
1	Zero Power Resistance	R_Z	Para. 9.3.1.1	Note 1		Ω
2	Insulation Resistance	Ri	Para. 9.3.1.4 T_{amb} = +25 ±1°C Note 2	100	-	MΩ
3	Thermal Time Constant Variants 01-05 Variants 06-08	KH	Para. 9.3.1.3 T_{amb} = +25±1°C In Still Air Note 3	- -	40 25	sec.

NOTES

1. See Column 4 of Table 1(a) for resistance values.
2. If more than 20 devices have to be measured, the test shall be performed on a sample basis in accordance with Level II, Single Sampling Plan for Normal Inspection, AQL = 1.0 of IEC 60410.
3. Test to be performed on 10 samples during Chart II only.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	ESCC 4006 TEST METHOD AND CONDITIONS	LIMITS		UNIT
				MIN.	MAX.	
1	Zero Power Resistance	R_Z	Para. 9.3.1.1 At each specified temperature, over operating range	Note 1		Ω

NOTES

1. See Column 4 of Table 1(a) for resistance values.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

KH | Table 2 item 3

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. 4006		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Thermal Shock	Para. 9.2 (2)	-	-	-	-	-	-
02	Thermal Time Constant	Para. 9.3.1.3 In Still Air	**Initial Measurements** Zero Power Resistance	Para. 9.3.1.3(c)	R_Z	Record Values		Ω
			Final Measurements Thermal Time Constant	Para. 9.3.1.3(f)	KH			sec.
03	External Visual Inspection	Para. 9.5	ESCC 20500	-	-	-	-	-
04	Shock (Specified Pulse)	Para. 9.7	**Initial Measurements** Zero Power Resistance	Table 2 Item 1	R_Z	Table 2 Item 1		
			During Shock Intermittent Contact	No Open or Short Circuiting	-	-	-	-
			After Shock Zero Power Resistance Change	Table 2 Item 1	$\Delta R_Z/R_Z$	−2.0	+2.0	%
			Visual Examination	No evidence of damage	-	-	-	-
05	Vibration	Para. 9.8	**Initial Measurements** Zero Power Resistance	Table 2 Item 1	R_Z	Table 2 Item 1		
			During Vibration Intermittent Contact	No Open or Short Circuiting	-	-	-	-
			After Vibration Zero Power Resistance Change	Table 2 Item 1	$\Delta R_Z/R_Z$	−2.0	+2.0	%
			Visual Examination	No evidence of damage	-	-	-	-
06	Immersion	Para. 9.9	Visual Examination	No evidence of damage	-	-	-	-
07	Dielectric Withstanding Voltage	Para. 9.10	**During Test** Visual Examination	No evidence of breakdown or flashover	-	-	-	-
			After Test Visual Examination	No evidence of damage, arcing or breakdown	-	-	-	-
08	Resistance to Soldering Heat	Para. 9.11	**After Test**	After a recovery period of 24 ± 4 hrs				
			Zero Power Resistance	Table 2 Item 1	R_Z	Table 2 Item 1		
			Visual Examination	No evidence of damage	-	-	-	-
09	Moisture Resistance	Para. 9.12	**Initial Measurements**	Not less than 1.5 hrs after removal from drying oven				
			Zero Power Resistance	Table 2 Item 1	R_Z	Table 2 Item 1		
			Final Measurements	Within 24 hrs of removal from 1.5 to 3.5 hr conditioning				
			Zero Power Resistance Change	Table 2 Item 1	$\Delta R_Z/R_Z$	−2.0	+2.0	%
			Insulation Resistance	Table 2 Item 2	Ri	100	-	MΩ

NOTES

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.
2. Thermal Shock Test Method and conditions shall use the deviation of this specification as applicable.

APPENDIX 'A'

AGREED DEVIATIONS FOR BETATHERM (IRELAND)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.2 Deviations from Final Production Tests (Variant 08 to Testing Level B only)	Para. 9.2 Thermal Shock For Variant 08 to Testing Level B, Parameter Drift Value Measurements in accordance with Para. 9.3.2 (and Para. 4.7.1 of the Detail Specification) shall be performed immediately before and after Thermal Shock.
Para. 4.2.3 Deviations from Burn-in and Electrical Measurements (Variant 08 to Testing Level B only)	Para. 7.4/7.4.1 Check for Lot Failure / Lot Failure During 100% Testing For Variant 08 to Testing Level B, all Parameter Drift or Limit Failures during Parameter Drift Value Measurements performed after Thermal Shock during Final Production Tests shall be included in the Check for Lot Failure Percent Defective Allowable calculation. This Percent Defective shall be referenced against the quantity of components submitted to Burn-in and Electrical Measurements plus any Parameter Drift or Limit failures during Parameter Drift Value Measurements performed after Thermal Shock.
Para. 4.2.5 Deviations from Lot Acceptance Tests (Variant 08 only)	Para. 9.14.2 Operating Life during Lot Acceptance Testing For Variant 08, amend (f), Data Points, to be as follows: Measurements at intermediate and end points in accordance with Table 6 of the Detail Specification at 0, 250, 500, 750 and 1000 ± 48 hours.