Pages 1 to 13

THERMISTORS (THERMALLY SENSITIVE RESISTORS), NTC, RANGE 2000 TO 100000 OHMS AT +25^{O}C WITH A TEMPERATURE RANGE OF -60^{O}C TO +160^{O}C

BASED ON TYPE G15K4D489, G10K4D453, G2K7D411, G4K7D421, G100K6D487, G15K4D589

ESCC Detail Specification No. 4006/014

Issue 9 Draft C	March 2012

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

LEGAL DISCLAIMER AND COPYRIGHT

DOCUMENTATION CHANGE NOTICE

(Refer to https://escies.org for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
tba	Specification up issued to incorporate editorial changes per DCR.

TABLE OF CONTENTS

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

(a) ESCC Generic Specification No. 4006, Thermistors (Thermally Sensitive Resistors).
(b) ESCC Detail Specification No. 3901/001, Polyimide Insulated Wires and Cables, Low Frequency, 600V, -100 to +200^{o}C.
(c) ESCC Detail Specification No. 3901/012, Extruded, Crosslinked Flouropolymer Insulated Wires on Silver Plated Copper Conductor, Low Frequency, 600V, -100 to +200^{o}C.
(d) MIL-STD-202, Test Method Standard for Electronic and Electrical Component Parts.

1.3 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:

NTC = Negative Temperature Coefficient.
R_Z = Zero Power Resistance

1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 400601408

- Detail Specification Reference: 4006014
- Component Type Variant Number: 08 (as required)

1.4.2 Component Type Variants and Range of Components

The component type variants and range of components applicable to this specification are as follows:

Variant Number	Based on Type		Resistance/Temperature Characteristics (Notes 1, 2)										
			-60^{o}C	-40^{o}C	-20^{o}C	0^{o}C	+25^{o}C	+50^{o}C	+70^{o}C	+100^{o}C	+125^{o}C	+140^{o}C	+160^{o}C
08	G15K4D489	R_Z (Ω)	1342000	371300	120100	44420	15000	5855	3009.0	1250	659.8	465.50	302.40
		Tol. (±%)	10	6.3	3.35	1	1.01	1.03	1.05	1.01	2	3	4
09	G10K4D453	R_Z (Ω)	847284	239768	78930	29490	10000	3893	1990	817.2	426.0	298.12	191.77
		Tol. (±%)	7	3	2.6	2	2	1.7	1.6	3	3.5	4	4

Variant Number	Based on Type	Resistance/Temperature Characteristics (Notes 1, 2)											
			-60°C	-40°C	-20°C	0°C	+25°C	+50°C	+70°C	+100°C	+125°C	+140°C	+160°C
10	G2K7D411	R_Z (Ω)	-	43362	14658	5650	2000.0	815.0	432.0	187.40	102.00	-	-
		Tol. (±%)	-	2.9	2.54	1.57	1.34	1.17	1.05	1.5	2.5	-	-
11	G4K7D421	R_Z (Ω)	-	86724	29316	11300	4000	1630.0	864.0	374.80	204.00	-	-
		Tol. (±%)	-	2.9	2.54	1.57	1.34	1.17	1.05	1.5	2.5	-	-
12	G100K6D487	R_Z (Ω)	-	-	-	-	100000	-	-	5574	2642.4	1756.3	1059.0
		Tol. (±%)	-	-	-	-	1.75	-	-	1.11	1.41	1.32	1.21
13	G15K4D589	R_Z (Ω)	1342000	371300	120100	44420	15000	5855	3009.0	1250	659.8	465.50	302.40
		Tol. (±%)	10	6.3	3.35	1	1.01	1.03	1.05	1.01	2	3	4

Variant Number	Based on Type	Lead Material	Weight max (g)
08	G15K4D489	Note 3	2.3
09	G10K4D453	Note 3	4
10	G2K7D411	Note 3	4
11	G4K7D421	Note 3	4
12	G100K6D487	Note 3	4
13	G15K4D589	Note 4	2.3

NOTES:

1. For test purposes, when zero power is dissipated and the ambient temperature is held as specified, the nominal resistance value is referred to as R_Z (Zero Power Resistance).
2. The reference resistance is specified at +25°C.
3. The lead material shall be 26 AWG fluoropolymer insulated wire with ESCC Component Number 390101203B in accordance with ESCC Detail Specification No. 3901/012.
4. The lead material shall be 26 AWG polyimide insulated wire with ESCC Component Number 390100124B in accordance with ESCC Detail Specification No. 3901/001.

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

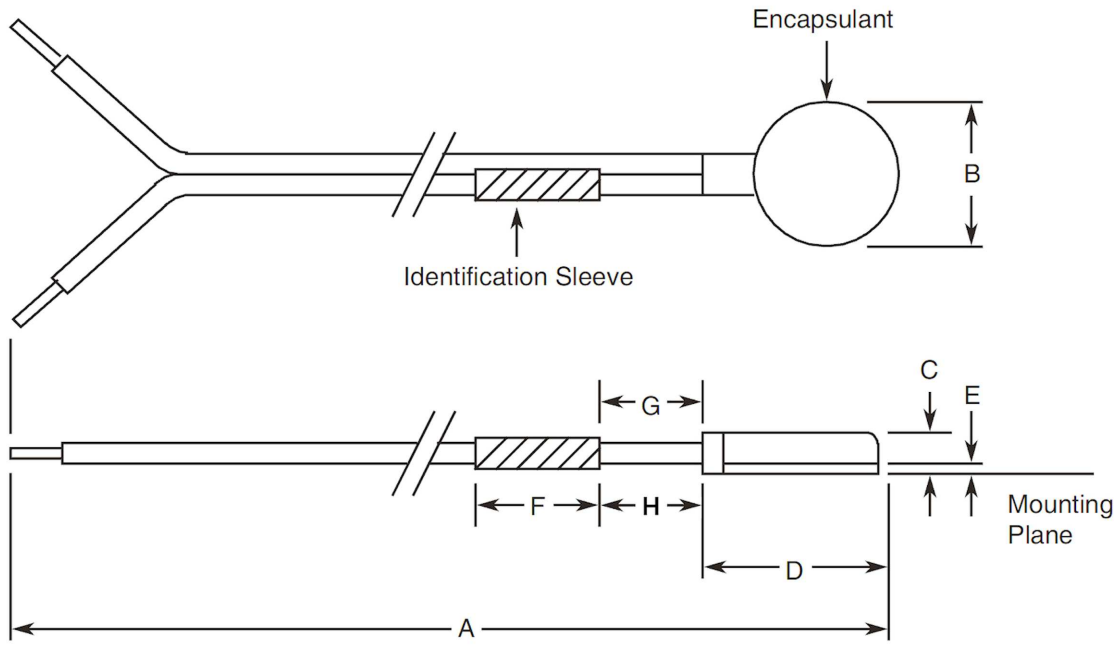
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Power Dissipation	P_D	2	mW	Note 1
Operating Temperature Range	T_{op}	Note 2	^oC	
Storage Temperature Range	T_{stg}	Note 3	^oC	
Soldering Temperature	T_{sol}	+245	^oC	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 Component Type Variants and Range of Components.
3. -40^{o}C for Variants 10, 11, 12; and -60^{o}C for Variants 08, 09, 13 to the Maximum Operating Temperature specified in Component Type Variants and Range of Components.
4. Duration 10 seconds maximum, not within dimension H specified in Physical Dimensions, and the same lead shall not be resoldered until 3 minutes have elapsed.

1.6 PHYSICAL DIMENSIONS



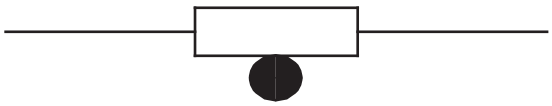
Symbols	Dimensions (mm)						Notes
	Variants 08, 13		Variant 09		Variants 10, 11, 12		
	Min.	Max.	Min.	Max.	Min.	Max.	
A	356	406	500	550	280	330	
B	6.1	6.6	6.1	6.6	6.1	6.6	

Symbols	Dimensions (mm)						Notes
	Variants 08, 13		Variant 09		Variants 10, 11, 12		
	Min.	Max.	Min.	Max.	Min.	Max.	
C	-	2.4	-	2.8	-	2.8	
D	-	9.8	-	9.8	-	9.8	1
E	0.33	0.48	0.33	0.48	0.33	0.48	
F	-	50	-	50	-	50	
G	50	80	50	80	50	80	2
H	50	-	50	-	50	-	3

NOTES:

1. Within this dimension (housing and crimp section) no part of the housing, or leads, shall protrude below the mounting plane by more than 0.13mm.
2. Location of the identification sleeve.
3. Leads shall not be stripped or cut within dimension H.

1.7 FUNCTIONAL DIAGRAM



1.8 MATERIALS AND FINISHES

1.8.1 Body

Aluminium, filled with a black epoxy encapsulant.

1.8.2 Lead Material

The lead material shall be as specified in Component Type Variants and Range of Components. One lead shall carry an identification sleeve which shall bear the part marking specified herein.

2. REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC

requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

2.1.1.1 Deviations from Qualification and Periodic Tests - Chart F4

(a) Dissipation Constant: Not applicable.
(b) Short Time Load: Not applicable.
(c) High Temperature Storage: Not applicable.

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and as follows.

The information to be marked on the component shall be:

(a) The ESCC Qualified Components Symbol (for ESCC qualified components only).
(b) The ESCC Component Number.
(c) Traceability information.

2.3 THERMAL SHOCK

Thermal Shock shall be performed as specified in the ESCC Generic Specification. The Test Condition shall be C, however the maximum test temperature shall be the applicable maximum operating temperature specified in Component Type Variants and Range of Components.

2.4 TERMINAL STRENGTH

The test conditions for Terminal Strength, tested as specified in the ESCC Generic Specification, shall be as follows:

Applied Force : 4.45 (+1.1 - 0)N.
Duration : 5 seconds.

2.5 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

Electrical measurements shall be performed at room, high and low temperatures.

2.5.1 Room Temperature Electrical Measurements

Unless otherwise specified, the measurements shall be performed at T_{amb}=+25±0.01^{o}C.

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Zero Power Resistance	R_Z	ESCC No. 4006	Note 1		Ω
Insulation Resistance	R_I	ESCC No. 4006 T_{amb}=+25±1°C Note 2	100	-	MΩ
Thermal Time Constant	KH	ESCC No. 4006 T_{amb}=+25±1°C In Still Air Note 3			s
Variants 08, 13			-	25	
Variants 09, 10, 11, 12			-	40	

NOTES:
1. See Component Type Variants and Range of Components for resistance values and tolerances.
2. The measurements shall be performed on a sample of 5 components with 0 failures permitted. In the event of any failure a 100% inspection may be performed.
3. Test to be performed on 10 samples and only during Production Control Tests.

2.5.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed at each applicable temperature (with a tolerance of ±0.01°C) specified in Component Type Variants and Range of Components.

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Zero Power Resistance	R_Z	ESCC No. 4006	Note 1		Ω

NOTES:
1. See Component Type Variants and Range of Components for resistance values and tolerances.

2.6 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at T_{amb}=+25±0.01°C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits			Units
		Drift Value (Δ)	Absolute		
			Min	Max	
Zero Power Resistance	R_Z	±0.2%	Note 1		Ω

NOTES:
1. See Component Type Variants and Range of Components for resistance values and tolerances.

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at T_{amb}=+25±0.01°C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Test Reference per ESCC No. 4006	Characteristics	Symbols	Limits		Units
			Min	Max	
Thermal Time Constant	Initial Measurements Zero Power Resistance	R_Z	Note 1		Ω
	Final Measurements Thermal Time Constant: Variants 08, 13 Variants 09, 10, 11, 12	KH	 - -	 25 40	s
Shock (Specified Pulse)	Initial Measurements Zero Power Resistance	R_Z	Note 1		Ω
	After Shock Zero Power Resistance Change	$\Delta R_Z/R_Z$	±2		%
Vibration	Initial Measurements Zero Power Resistance	R_Z	Note 1		Ω
	After Vibration Zero Power Resistance Change	$\Delta R_Z/R_Z$	±2		%
Resistance to Soldering Heat	Final Measurements Zero Power Resistance	R_Z	Note 1		Ω
Moisture Resistance	Initial Measurements Zero Power Resistance	R_Z	Note 1		Ω
	Final Measurements Zero Power Resistance Change	$\Delta R_Z/R_Z$	±2		%
	Insulation Resistance	R_I	100	-	MΩ

Test Reference per ESCC No. 4006	Characteristics	Symbols	Limits		Units
			Min	Max	
Terminal Strength	Initial Measurements Zero Power Resistance	R_Z	Note 1		Ω
	Final Measurements Zero Power Resistance Change	$\Delta R_Z/R_Z$	±2		%
Operating Life	Initial Measurements Zero Power Resistance	R_Z	Note 1		Ω
	At 1000±48 hours Zero Power Resistance Change	$\Delta R_Z/R_Z$	±1		%
	Insulation Resistance	R_I	100	-	MΩ
	At 2000±48 hours Zero Power Resistance Change	$\Delta R_Z/R_Z$	±1		%
	Insulation Resistance	R_I	100	-	MΩ
Low Temperature Storage	Initial Measurements Zero Power Resistance	R_Z	Note 1		Ω
	Final Measurements Zero Power Resistance Change	$\Delta R_Z/R_Z$	±2		%

NOTES:

1. See Component Type Variants and Range of Components for resistance values and tolerances.

2.8 BURN-IN CONDITIONS

Characteristics	Symbols	Condition	Unit
Ambient Temperature	T_{amb}	Note 1	^oC
Power Dissipation	P_D	2	mW

NOTES:

1. Maximum Operating Temperature specified in Component Type Variants and Range of Components (+0 -3) ^oC.

2.9 OPERATING LIFE CONDITIONS

The conditions shall be as specified for Burn-in.

APPENDIX 'A'

AGREED DEVIATIONS FOR MEAS Ireland (Betatherm) Ltd

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Deviations from the Generic Specification	Deviations from Production Control - Chart F2 Thermal Shock: Parameter Drift Value measurements shall be performed in accordance with Para. 8.3.2 (ref. Para. 2.5 of the Detail Specification) immediately before and after Thermal Shock. Room Temperature Electrical Measurements: – Insulation Resistance may be measured in accordance with MEAS Ireland (Betatherm) Ltd Specification Ref. MFG 12-49-00. – All Parameter Limit Failures and Parameter Drift Failures during Room Temperature Electrical Measurements performed after Thermal Shock 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 Screening Tests plus any Parameter Limit Failures and Parameter Drift Failures during Room Temperature Electrical Measurements performed after Thermal Shock. Deviations from Screening Tests - Chart F3 Room Temperature Electrical Measurements: Insulation Resistance may be measured in accordance with MEAS Ireland (Betatherm) Ltd Specification Ref. MFG 12-49-00. Radiographic Inspection: Inspection shall be a single view such that the component's mounting plane is seated on the X-ray film holder. Additional Deviation from Qualification and Periodic Tests - Chart F4 Room Temperature Electrical Measurements: Insulation Resistance may be measured in accordance with MEAS Ireland (Betatherm) Ltd Specification Ref. MFG 12-49-00.