

Titre / Title
HIGH RELIABILITY
RF COAXIAL CONNECTORS
TNC TYPE, 50 OHMS
(ADAPTOR AND CONNECTING PIECES)

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	DETAIL SPECIFICATION		
	REF. : RAD-DET-CONN-016		
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DOCUMENTATION CHANGE NOTICE

REVISION OR ISSUE	DATE	CHANGE
1 -	21/10/04	First issue
2 -	27/04/07	Table 7 replaced by the detail specification RAD-LIS-CONN-001
2 A	06/01/10	Add Mechanical interface dimensions for connector High Power DC-8GHz
2 B	07/08/2015	Updated to correct Figure2 (a) Male for 18GHz and for High Power version with: - Modification of the dimension Øh (for High power figure) - Add note 1 Updated to correct Figure2 (a) of High Power version with: - Add note 1

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1. **GENERAL**

1.1 **SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for RF Coaxial connectors, Type TNC, 50 Ohms (adaptor and connecting pieces). It shall be read in conjunction with RADIALl Generic Specification RAD-GEN-CONN-001, the requirements of which are supplemented herein.

1.2 **TYPE VARIANTS**

For each type variant, the full electrical and physical characteristics are given in individual technical data sheet.

1.3 **MAXIMUM RATINGS**

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the connectors specified herein, are as scheduled in Table 1(b).

1.4 **POWER DERATING INFORMATION (FIGURE 1)**

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

1.5 **PHYSICAL DIMENSIONS**

The physical dimensions of the connectors specified herein are shown in Figure 2(a) and technical data sheet.

1.6 **STANDARD TEST CONNECTOR INTERFACE**

Whenever gauges are required for mating with the connectors under test, their physical dimensions shall be in accordance with those specified in Figure 3.

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Table 1 (a) – TYPE VARIANTS

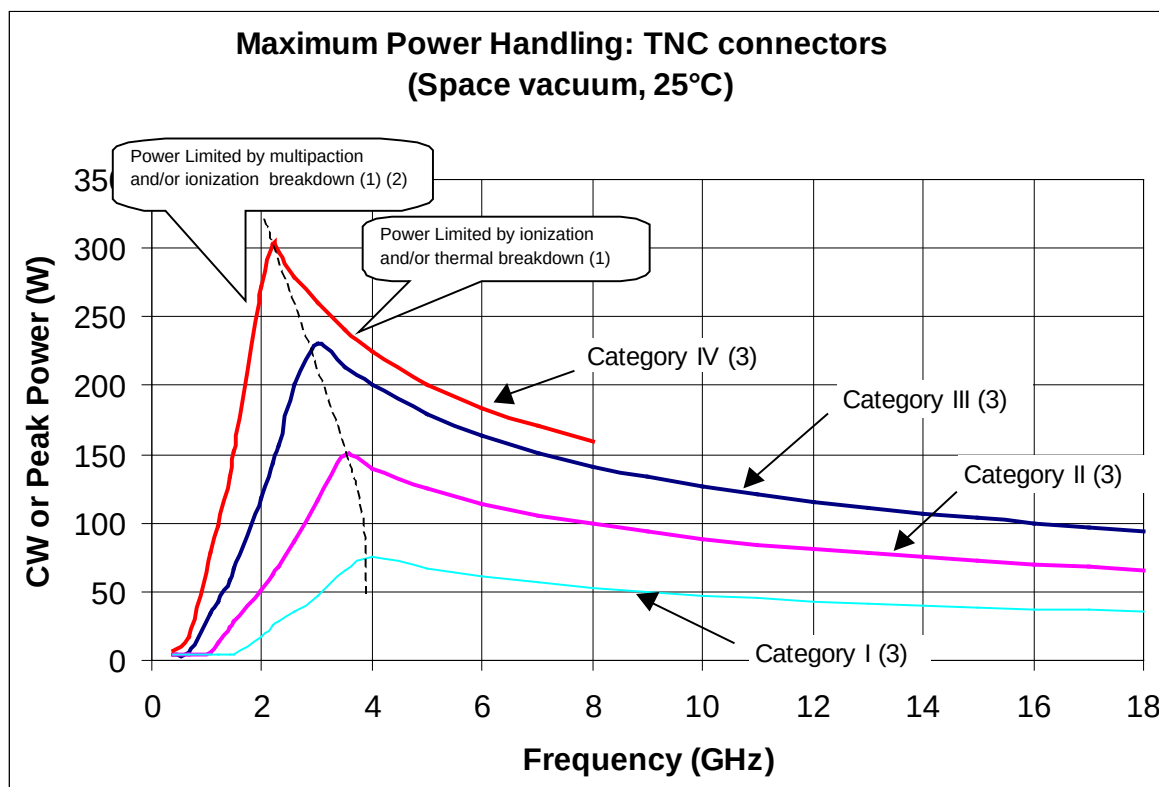
(See RADIALl technical data sheets)

Table 1 (b)- MAXIMUM RATINGS

N°	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Power	P	See figures 1 (a) and 1 (b)	W	For information
2	Nominal impedance	Z	50	Ω	-
3	Frequency Range	f	See technical data sheet	GHz	-
4	Dielectric Withstanding Voltage at ambient pressure	V _{dw}	See technical data sheet	V _{rms}	At sea level
5	Dielectric Withstanding Voltage at low pressure	V _{lp}	10% of V _{dw}	V _{rms}	At 44 mb
6	Rated Operating Voltage	V _{op}	50% of V _{dw}	V _{rms}	
7	Corona Level	V _{co}	8,5% of V _{dw}	V _{rms}	-
8	Operating Temperature Range	T _{op}	See technical data sheet	°C	-
9	Storage Temperature Range	T _{stg}	As per Operating Temperature Range	°C	-

FIGURE 1 - POWER DERATING INFORMATION

FIGURE 1(a) POWER VERSUS FREQUENCY



Notes:

- 1: Load VSWR is better than 1.30:1
- 2: The part of the curve limited by multipaction takes into account a 6 dB margin as recommended by ESA
- 3: See Table 7 to know applicability of power handling categories to the different part numbers

FIGURE 1(b) POWER VERSUS TEMPERATURE

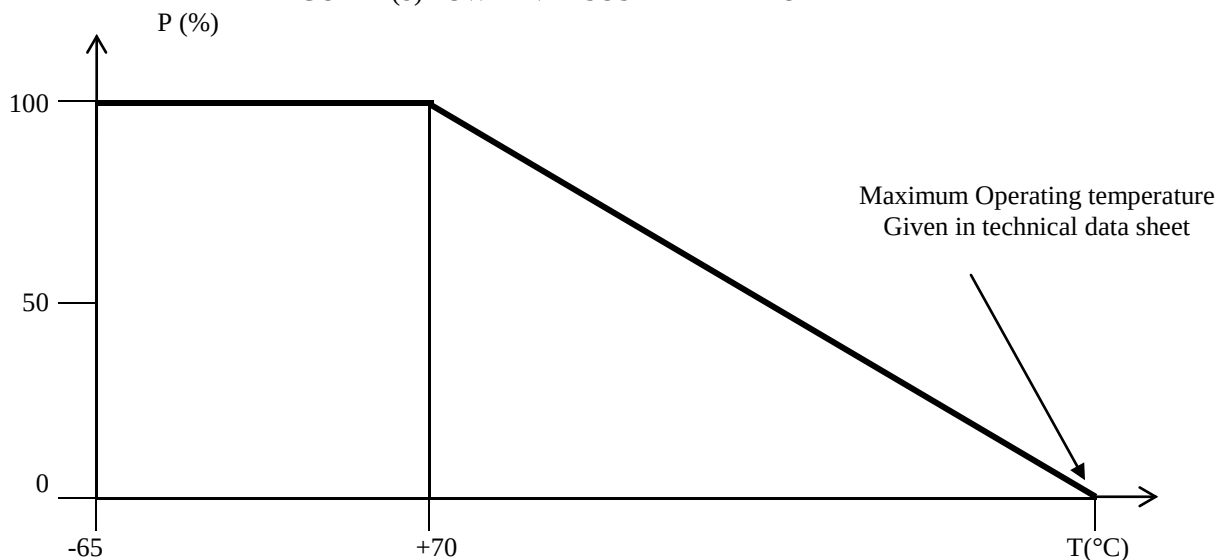
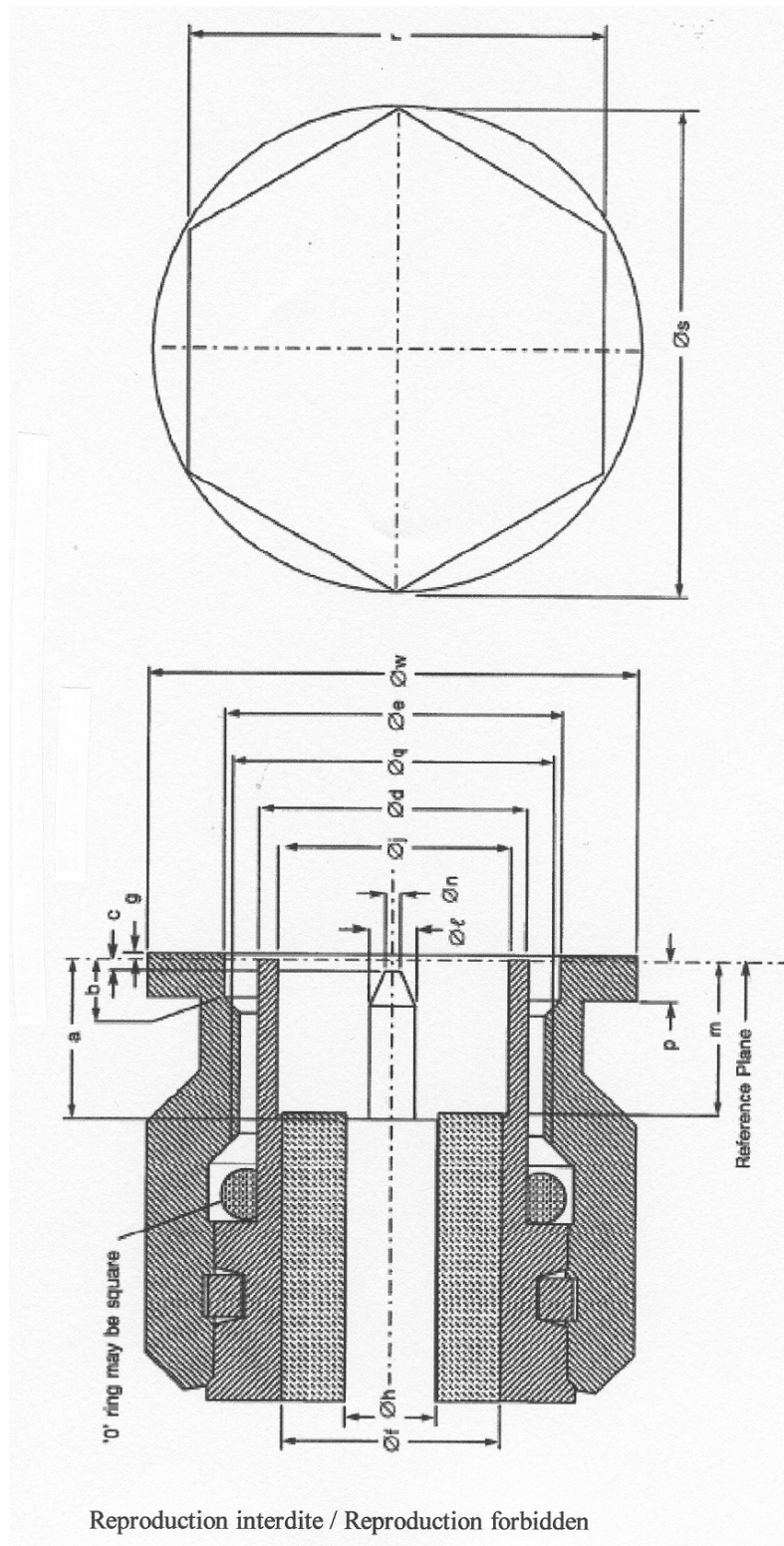


FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) – CONNECTOR INTERFACE, MALE CONTACT
(Frequency range DC/18 GHz)



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FIGURE 2 – PHYSICAL DIMENSIONS (CONTINUED)

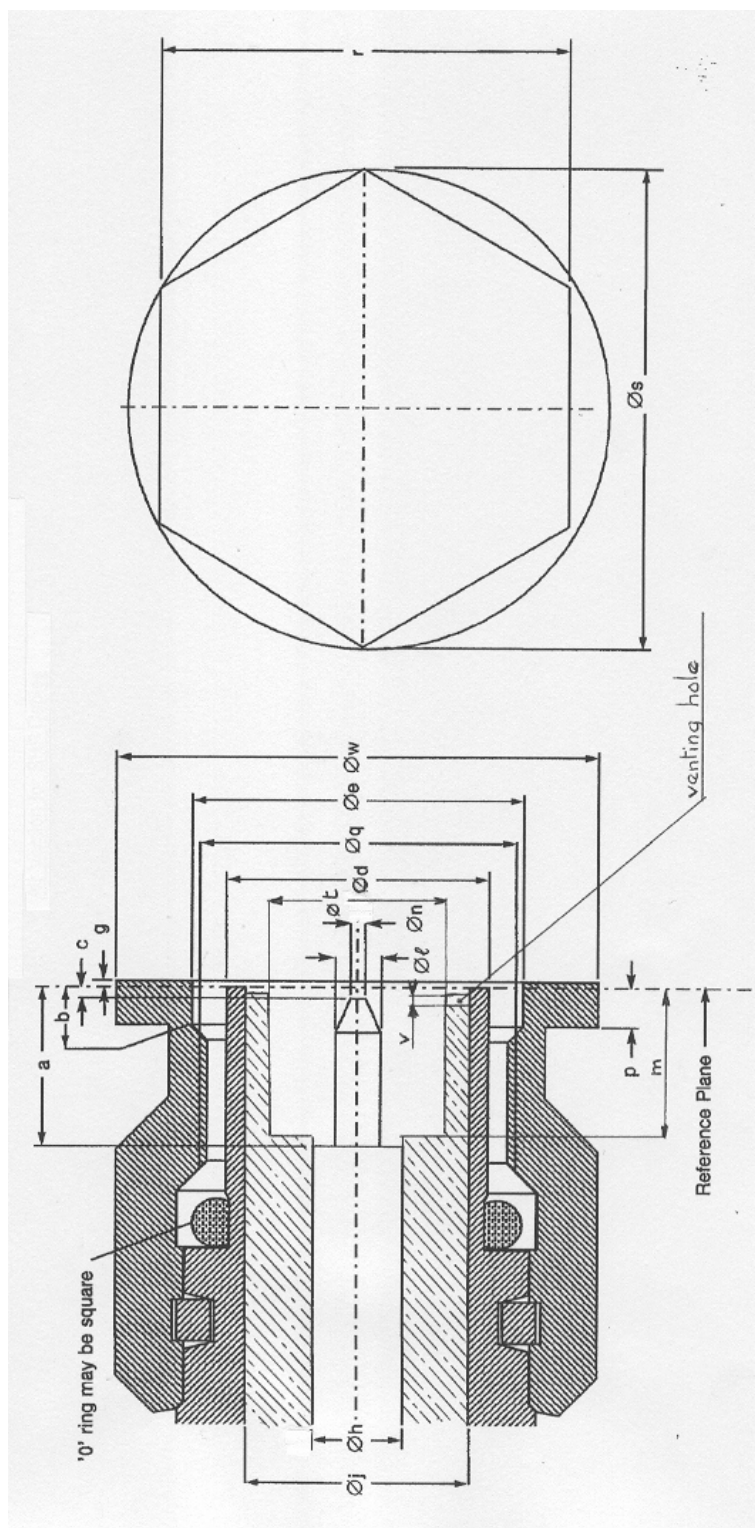
FIGURE 2(a) – CONNECTOR INTERFACE, MALE CONTACT (CONTINUED)
(Frequency range DC/18 GHz)

SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
a	5.35	5.50	Note 1
b	1.50	2.40	
c	0.35	0.90	
Ød	8.03	8.09	
Øe	11.40	11.60	
Øf	5.28	5.32	
g	-0.30	+0.55	
Øh	1.62	1.66	
Øj	6.18	6.22	
Øℓ	1.34	1.36	
m	5.28	5.38	Note 1
Øn	0.35	0.65	
p	1.50	2.40	
Øq	7/16.28 UNEF 2B		
r	-	14.00	
Øs	-	16.00	
Øw	-	16.00	

Note 1: This value could be adjust at another diameter in function of the internal design of the connector to adjust the impedance of it at 50Ω

FIGURE 2 – PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(a) – CONNECTOR INTERFACE, MALE CONTACT (CONTINUED)
HIGH POWER VERSION (Frequency range DC/8 GHz)



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FIGURE 2 – PHYSICAL DIMENSIONS (CONTINUED)

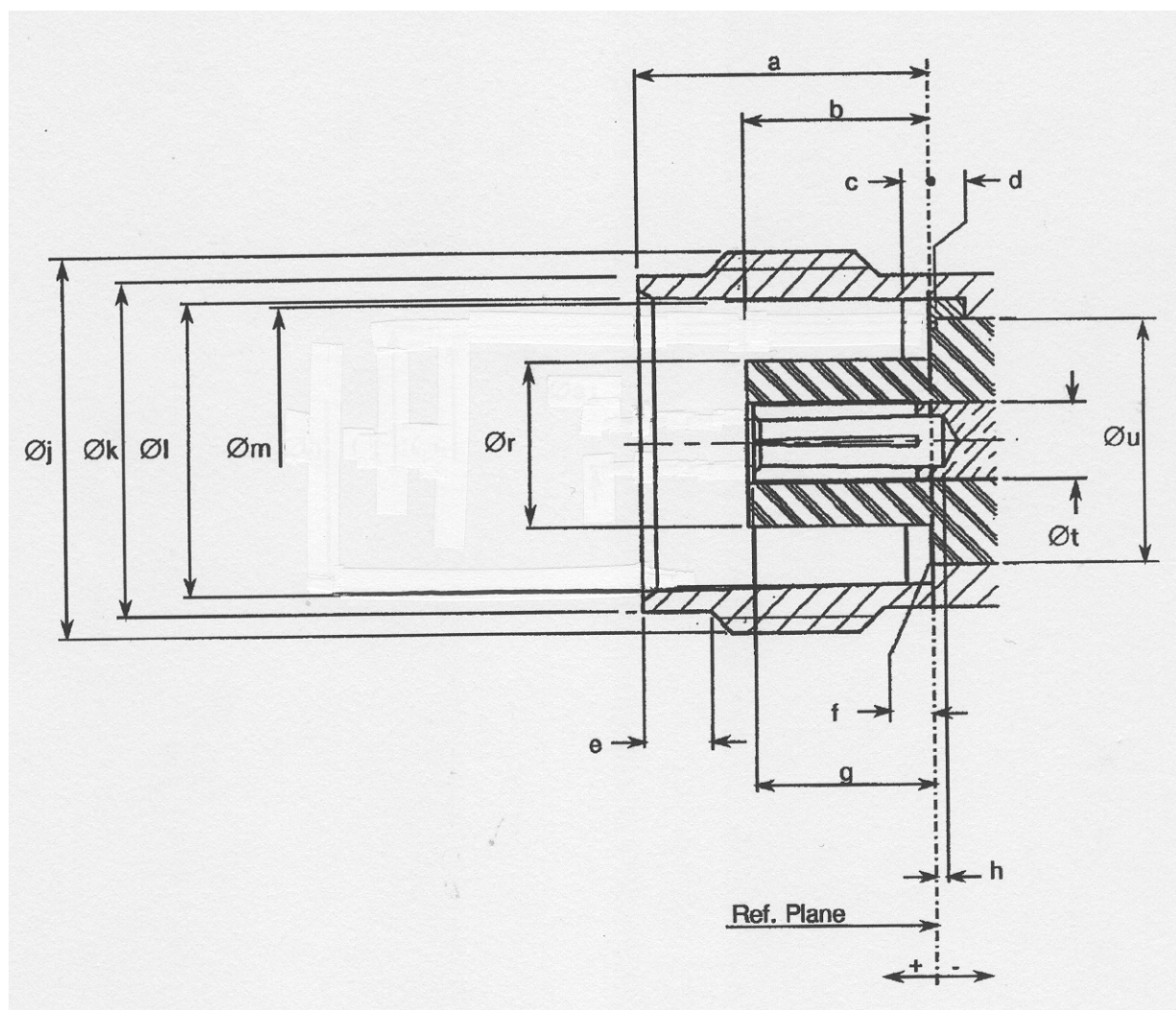
FIGURE 2(a) – CONNECTOR INTERFACE, MALE CONTACT (CONTINUED)
HIGH POWER VERSION (Frequency range DC/8 GHz)

SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
a	5.33	5.84	Note 1 Note 1
b	1.50	2.40	
c	0.35	0.90	
Ød	8.03	8.09	
Øe	11.40	11.60	
g	-0.30	+0.55	
Øh	2.14	2.18	
Øj	6.98	7.02	
Øl	1.34	1.36	
m	5.28	5.79	
Øn	0.35	0.65	
p	1.50	2.40	
Øq	7/16.28 UNEF 2B		
r	-	14.00	
Øs	-	16.00	
Øt	4.88	4.92	Venting hole
v	0.35 x 0.35	0.45 x 0.45	
Øw	-	16.00	

Note 1: This value could be adjust at another diameter in function of the internal design of the connector to adjust the impedance of it at 50Ω

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) CONNECTOR INTERFACE FEMALE CONTACT
(Frequency range DC/18 GHz)



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FIGURE 2 – PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(a) – CONNECTOR INTERFACE, FEMALE CONTACT (CONTINUED)
(Frequency range DC/18 GHz)

SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
a	8.36	8.46	
b	5.18	5.28	
c	0.48	1.02	
d	0.17	0.23	
e	1.80	2.20	
f	-0.1	+0.05	
g	4.98	5.23	
h	-0.72	+0.03	
Øj	7/16.28 UNEF 2A		
Øk	9.61	9.68	
Øl	8.32	8.46	
Øm	8.10	8.15	
Ør	4.68	4.72	
Øt	2.14	2.18	
Øu	6.975	7.025	

FIGURE 2 – PHYSICAL DIMENSIONS (CONTINUED)

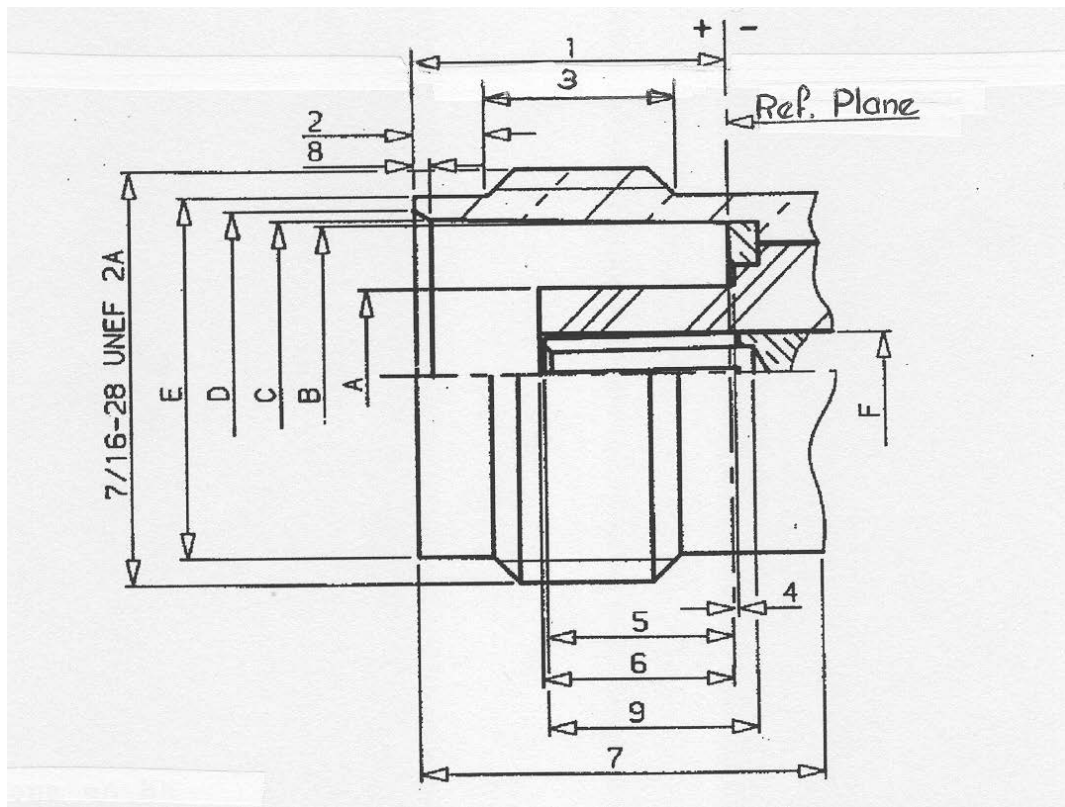
FIGURE 2(a) – CONNECTOR INTERFACE, FEMALE CONTACT (CONTINUED)

(Frequency range DC/11 GHz/

And

HIGH POWER VERSION

(Frequency range DC/8 GHz)



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FIGURE 2 – PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(a) – CONNECTOR INTERFACE, FEMALE CONTACT (CONTINUED)

(Frequency range DC/11 GHz)

And

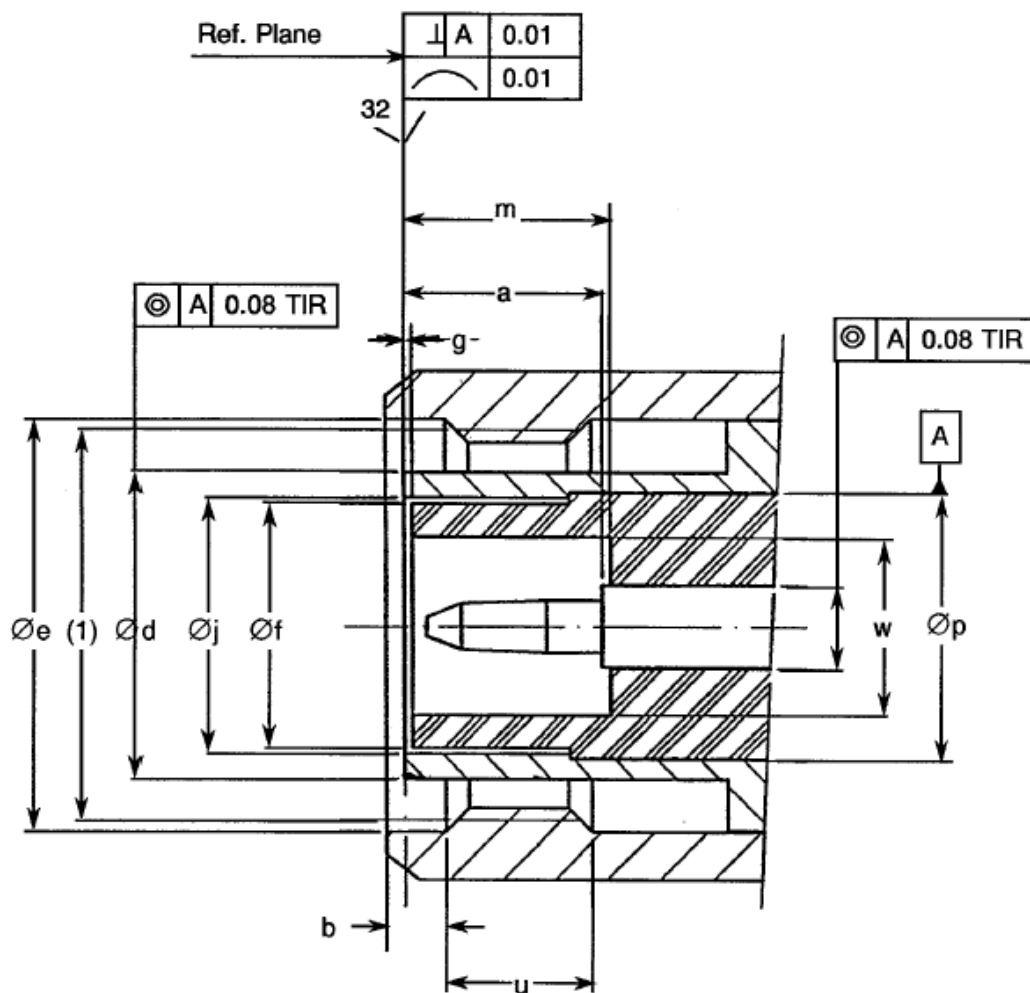
HIGH POWER VERSION

(Frequency range DC/8 GHz)

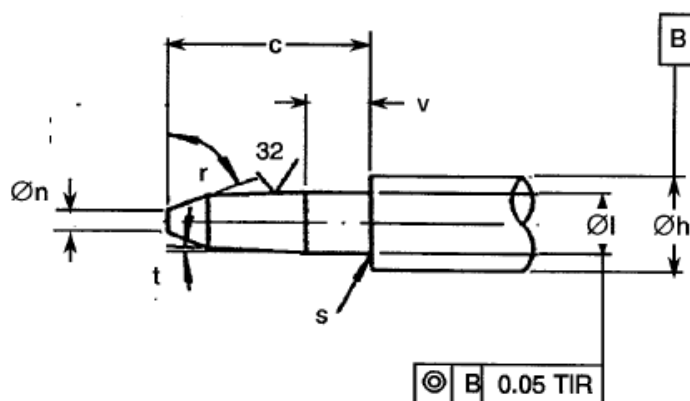
SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
1	8.30	8.50	Note 1
2	1.80	2.20	
3	4.75	5.25	
4	-0.25	+0.05	
5	4.72	5.22	
6	4.78	5.28	
7	10.70	10.90	
8	0.45	0.75	
9	5.30	5.90	
ØA	4.62	4.72	
ØB	8.10	8.15	
ØC	8.32	8.46	
ØD	8.80	9.00	
ØE	9.60	9.67	
ØF	2.16	2.20	

Note 1: This value could be adjust at another diameter in function of the internal design of the connector to adjust the impedance of it at 50Ω

FIGURE 3 – STANDARD TEST CONNECTOR INTERFACE – MALE CONTACT



Detail of inner Contact

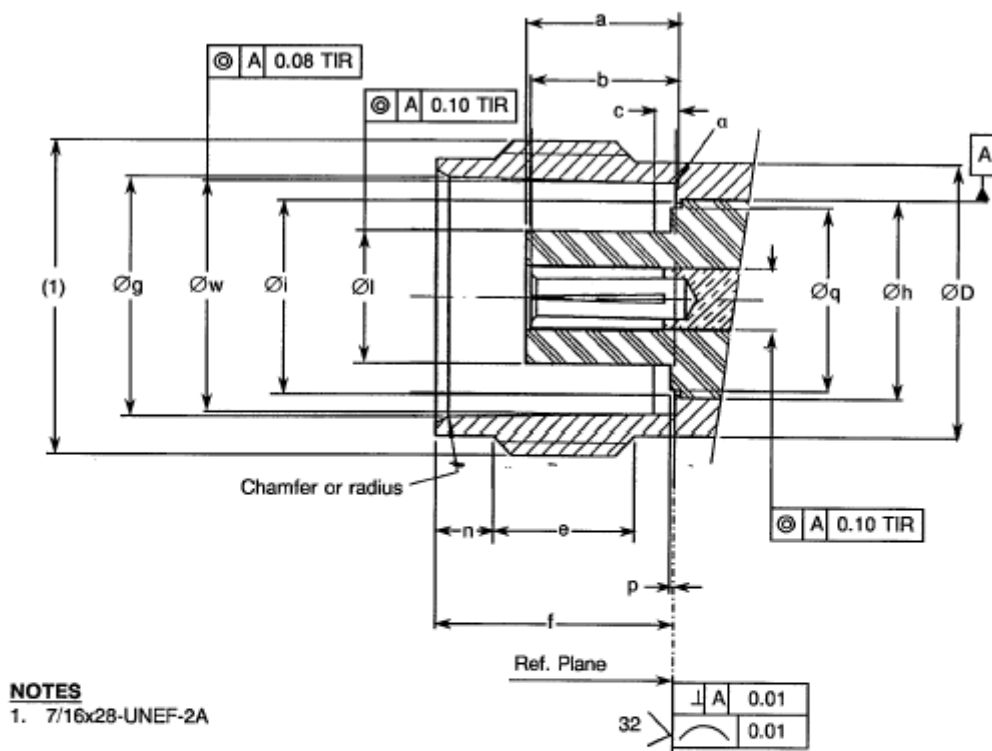


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FIGURE 3 – STANDARD TEST CONNECTOR INTERFACE – MALE CONTACT (CONTINUED)

SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
a	5.31	5.38	Radius Full thread
b	1.60	-	
c	4.62	4.88	
Ød	8.06	8.09	
Øe	11.18	-	
Øf	6.60	6.65	
g	0.15	0.30	
Øh	2.16	2.18	
Øj	6.72	6.74	
Øℓ	1.35	1.37	
m	5.38	5.54	
Øp	6.99	7.01	
r	55°	65°	
s	-	0.13	
t	1°	3°	
u	3.96	-	
v	1.40	1.65	
Øw	4.88	4.93	

FIGURE 3 – STANDARD TEST CONNECTOR INTERFACE – FEMALE CONTACT



Detail of Inner Contact

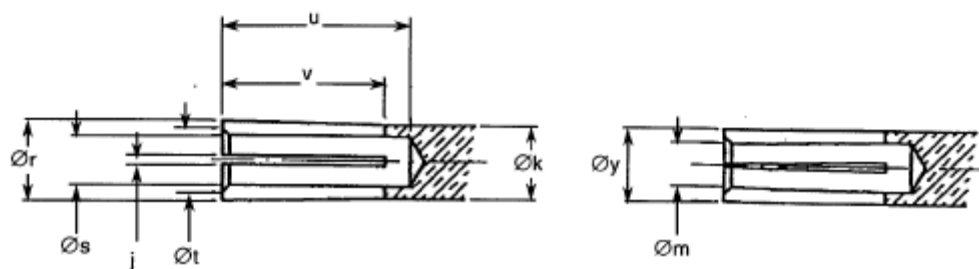


FIGURE 3 - STANDARD TEST CONNECTOR INTERFACE
FEMALE CONTACT (CONTINUED)

SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
a	5.21	5.28	Contact recess
b	5.08	5.28	Insert recess
c	0.51	1.02	Str. sect
ØD	9.60	9.68	
e	4.75	-	
f	8.36	8.46	
Øg	8.31	8.46	
Øh	6.99	7.01	
Øi	6.71	6.76	
j	0.26	0.34	4 slots /90° apart
Øk	2.16	2.18	
Øℓ	4.67	4.72	
Øm	1.21	1.30	After ht. treatment
n	1.73	2.24	
p	0.00	0.15	
Øq	-	6.50	
Ør	2.45	2.48	
Øs	1.52	1.58	
Øt	1.68	1.88	90°
u	5.21	-	
v	4.75 typical		
Øw	8.10	8.15	
Øy	2.23	2.31	Mated with Ø1.36 pin, gauge over slotted portion only
α	-	0.10	Radius

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2. APPLICABLE DOCUMENTS

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

- (a) RADIALl Generic Specification RAD-GEN-CONN-001 for RF Coaxial Connectors.
- (b) MIL G.45204 Gold plating Electrodeposited.
- (c) MIL PRF. 39012 Connectors Coaxial RF General Specification for.

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 N° 21300 shall apply.

In addition the following shall apply:

V_{dw}	Dielectric Withstanding Voltage at ambient pressure (sea level)
V_{lp}	Dielectric Withstanding Voltage at low pressure (44 mb)
V_{co}	Corona Level Voltage
R_i	Insulation Resistance
I_L	Leakage Current

4. REQUIREMENTS

4.1 GENERAL

The complete requirement for procurement of the connectors specified herein are stated in this specification and RADIALl Generic Specification RAD-GEN-CONN-001 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 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)

The tests "Change of temperature", "Insulation Resistance", "Voltage proof" are not applicable for variants delivered with unmounted contact and insulator.

4.2.3 Deviations from Qualification Tests (Chart IV)

Para. 9.14 a) Cable retention force : Not applicable

Para. 9.15 b) Cabling and crimping capability : Not applicable

Para. 9.22 c) Soldering proof : Not applicable

Para. 9.21 d) Residual magnetism : Not applicable

4.2.4 Deviations from Lot Acceptance Tests (Chart V)

Para. 9.14 a) Cable retention force : Not applicable

Para. 9.15 b) Cabling and crimping capability : Not applicable

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the connectors specified herein shall be verified in accordance with the requirements set out in Para.9.25 of RADIALl Generic Specification RAD-GEN-CONN-001 and shall conform to those shown in Figures 2(a) and in technical data sheet.

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4.3.2 Weight

The maximum weight of the connectors specified herein shall be as specified in technical data sheet.

4.3.3 Coupling Proof Torque

The requirements for testing of the coupling proof torque are specified in Section 9 of RADIALl Generic Specification RAD-GEN-CONN-001. The applied torque shall be 339N.cm.

4.3.4 Cable Retention Force : Not applicable

The requirements for testing of the cable retention force are specified in Section 9 of RADIALl Generic Specification RAD-GEN-CONN-001. The technical data sheet specifies the values for axial loads. Torque shall be applied as follows :

4.3.4.1 Flexible Cables

Flexible cables shall be rotated 180° in both directions.

Rotational movement shall be applied at 15 cm from the connector.

4.3.4.2 Semi-rigid Cables

The torque value shall be as follows:

RG 405/U: 11.28N.cm.

RG 402/U: 38.85N.cm.

RG 401/U: 38.85N.cm.

4.3.5 Mating and Unmating Forces

The applicable measurement requirements are specified in Section 9 of RADIALl Generic Specification RAD-GEN-CONN-001. The maximum torque during mating and unmating shall not exceed 22.6 N.cm.

Whenever a test is performed on mated pairs of connectors, the pairs shall be torqued at 265 N.cm.

4.3.6 Endurance

The applicable test requirements are specified in Section 9 of RADIALl Generic Specification RAD-GEN-CONN-001. The test conditions shall be as follows :

(a) Number of cycles : 500 for qualification ; 100 for lot acceptance

(b) Rate : 12 cycles maximum/minute.

4.3.7 Residual Magnetism

Not applicable.

4.3.8 Contact Engagement and Separation Forces

The requirements for these measurements are specified in Section 9 of RADIALl Generic Specification RAD-GEN-CONN-001 and apply to female contacts only.

(a) Oversize Pin

Steel test pin diameter : 1.384 / 1.388 mm.

Insertion depth : 2.0 / 2.5 mm.

Number of insertions : 3.

(b) Engagement Force Test (Maximum diameter Test Pin)

Steel test pin diameter : 1.372 / 1.376 mm.

Engagement depth : 3.0 / 3.5 mm.

Engagement force : 9 N.max.

(c) Separation Force Test (Minimum Diameter Test Pin)

Steel test pin diameter : 1.308 / 1.321 mm.

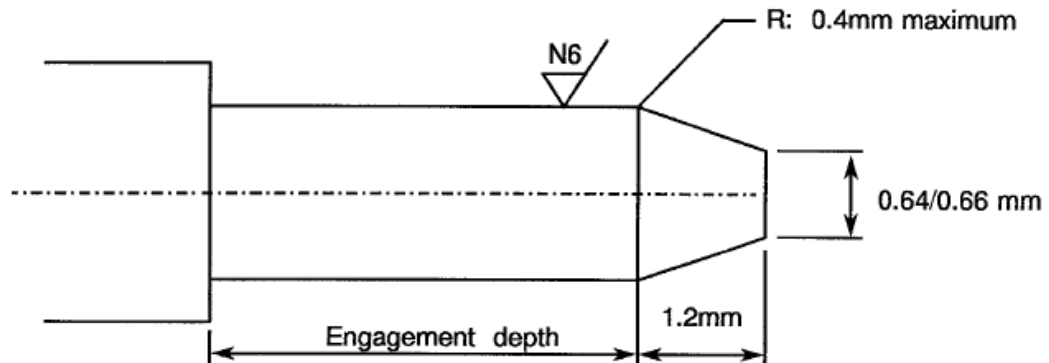
Separation depth : 3.0 / 3.5 mm.

Separation force : 0.56 N. min.

FIGURE 4 – TEST PIN CONFIGURATION

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4.3.9 Contact Retention

The requirements for this test are specified in Section 9 of RADIALl Generic Specification RAD-GEN-CONN-001. The test conditions are given in technical data sheet. After testing, the connector interface dimensions shall be within the limits of Figure 2(a).

4.4 MATERIALS AND FINISHES

The material and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the connectors 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 Standard types

(a) Shell, coupling nut

Material : -Stainless steel Electro-passivated
-Brass , plating Ni2

(b) Inserts

Material : -PTFE

(c) Center contact

Material : Beryllium copper
Plating : Gold 1.27 mini Type II of MIL-G-45204

4.5 MARKING

4.5.1 General

The marking of all delivered to this specification shall be in accordance with the following paragraphs. Each component shall be marked in respect of:

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- (a) The RADIALL Component Number
- (b) Traceability Information

4.5.2 The RADIALL Component Number

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

R 143.710.000 X (Example of RADIALL Reference Number)

4.5.3 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification N° 21700.

4.5.4 Marking of Small Components

When it is considered that the component is too small to accomodate the marking as specified above, as much as space permits shall be marked. The order of precedence shall be as follows :

- Traceability information
- RADIALL component number

The marking information in full shall accompany each component in its primary package.

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4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured in respect of electrical characteristics are scheduled in Table 2. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +22 \pm 3^{\circ}\text{C}$.

4.6.2 Electrical Measurements at High and Low Temperatures (Table 3)

Not applicable.

4.6.3 Circuits for Electrical Measurements

Not applicable.

4.7 BURN-IN TEST (TABLES 4 AND 5)

Not applicable.

Table 2 – ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

N°	CHARACTERISTICS	SYMBOL	SPEC.AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
1	Insulation Resistance	Ri	RADIALl RAD-GEN-CONN-001 Para. 9.1	500 Vdc	5000	-	MΩ
2	Dielectric Withstanding Voltage Leakage Current	I ₁	RADIALl RAD-GEN-CONN-001 Para. 9.2	Per Dielectric Withstanding Voltage in Technical Data Sheet	-	2.0	mA

Table 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (Not applicable)

Not applicable.

Tables 4 and 5 – BURN-IN TEST (Not applicable)

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS

4.8.1 Measurements and Inspections on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 6 of this specification. 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

Not applicable.

4.8.3 Measurements and Inspections on Completion of Endurance Tests

The parameters to be measured on completion of endurance tests are scheduled in Table 6 of this specification. 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)

Not applicable.

4.8.5 Electrical Circuits for Operating Life Tests

Not applicable.

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 RADIALl Generic Specification RAD-GEN-CONN-001. The conditions for high temperature storage shall be maximum operating temperature as specified in technical data sheet.

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Table 6 – MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL AND ENDURANCE TESTS

No	RADIALL GENERIC SPÉCIFICATION RAD -GEN-CONN- 001		MEASUREMENTS AND INSPECTION		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL & ENDURANCE TEST (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Contact resistance	Para. 9.9	Contact resistance	Centre Contact Shell Hermetic Centre Contact		- - -	1.5 0.7 10	mΩ mΩ mΩ
02	Vibration	Para 9.10	Full Engagement Contact Resistance Visual Examination	Centre Contact .		-	1.5	mΩ
03	Shock or Bump	Para 9.11	Full Engagement Contact Resistance Visual Examination	Centre Contact		-	1.5	mΩ
04	Rapid Change of Temperature	Para 9.12	Contact Resistance Dielect. Withstanding Volt. Leakage Current Visual Examination	Centre Contact Technical Data Sheet	 I ₁	- -	1.5 2.0	mΩ mA
05	Climatic sequence	Para 9.13	Dielect. Withstanding Volt. At Low Pressure (44 mb) Insulation Resistance Dielect. Withstanding Volt. Leakage Current External Visual Inspection	Table 1 (b) After Damp Heat (Within 1 to 24 Hrs recovery) : Table 2 Item 1 Technical Data Sheet RAD-GEN-CONN-001 para. 9.8	No breakdown or flashover R _i I ₁	 5000	 - 2.0	MΩ mA
06	Cable Retention Force	Para's 9.14 and 4.3.4 of this spec.	Continuity					
07	Coupling Proof Torque	Para 9.4	Interface Dimensions Visual Examination			Figure 2(a)		
08	Marking / Unmating Forces	Para 9.5	Torque	Para. 4.3.5		-	22.6	N.cm
09	Seal Test	Para 9.7	Hermeticity Leakage External Visual Inspection	If applicable As Applicable RAD-GEN-CONN-001 para. 9.8		-	1*10 ⁻⁸ No Bubble	Cm ³ /s
10	Cabling and Crimping Capability	Para 9.15	Visual Examination Dimension Insulation Resistance Dielect. Withstanding Volt. Leakage Current	RAD-GEN-CONN-001 para. 9.15 RAD-GEN-CONN-001 para. 9.15 Table 2 Item 1 Technical Data sheet	 R _i I ₁	 5000	 - 2.0	MΩ mA
11	VSWR or Reflection Coefficient	Para 9.16	VSWR	RAD-GEN-CONN-001 Para. 9.16		Technical Data Sheet		
12	Corona Level	Para 9.17	Corona	RAD-GEN-CONN-001 Para. 9.17		Table 1 (b)		

Notes:

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

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TABLE 6 – MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL AND ENDURANCE TESTS

No	RADIALL GENERIC SPÉCIFICATION RAD -GEN-CONN- 001		MEASUREMENTS AND INSPECTION		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL & ENDURANCE TEST (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
13	Endurance	Para's 9.18 and 4.3.6 of this spec	Mating /Unmating forces Contact resistance Visual examination	Para. 4.3.5 Centre contact Shell Hermetic Centre Contact		- - - -	22.6 2.0 2.0 12	N.cm mΩ mΩ mΩ
14	RF Insertion-Loss	Para.9.19	Insertion Loss	RAD-GEN-CONN-001 Para.9.19		Technical Data Sheet		
15	Corrosion	Para.9.20	Visual examination		No Exposure of Base Metal			
16	Residual Magnetism	Para.9.21	Magnetism					
17	Soldering Proof	Para.9.22	Interface Dimensions Mating / Unmating Forces Insulation resistance Dielect. Withstanding Volt. Leakage Current Contact Resistance External Visual Inspection	Para.4.3.5 Table 2 Item 1 Technical Data sheet Centre contact Shell Hermetic centre Contact	Ri I ₁	Technical Data Sheet - 5000 2.0 - 10		N.cm MΩ mA mΩ mΩ mΩ
18	RF Leakage	Para.9.23	Leakage			Figure 2(b)		
19	High Temperature Storage	Para.9.23 and 4.8.6 of this spec.	Mating / Unmating Forces Insulation resistance Dielect. Withstanding Volt. Leakage Current Contact retention Visual Examination Contact Resistance External Visual Inspection	Para.4.3.5 Table 2 Item 1 Technical Data sheet Para 4.3.9 - Centre contact Shell Hermetic centre Contact RAD-GEN-CONN-001 Para.9.8	Ri I ₁	- 5000 2.0 Para. 4.3.9 - - 3.0 3.0 15		N.cm MΩ mA mΩ mΩ mΩ
20	External Visual Inspection	Para.9.8				-	-	
21	Permanence of Marking	Para.9.27				-	-	

Notes:

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

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Table 7 - LIST OF PART NUMBERS WITH APPLICABLE POWER HANDLING CATEGORY

See the detail specification RAD-LIS-CONN-001 paragraph 14