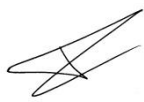




Titre / Title

**RF LOADS FIXED COAXIAL
HIGH POWER - SMA**

DC to 20GHz or 1.1 to 6.5GHz

DETAIL SPECIFICATION

Rédigé par / Written by	Responsabilité / Responsibility	Date	Signature
S. POIZAT	Space Project Manager	08/06/2017	
Vérifié par / Verified by			
V. EUDELIN	Space B. U. Manager	08/06/2017	
Approuvée par / Approved by			
C. DAVENEL	Space Quality Manager	08/06/2017	

DOCUMENTATION CHANGE NOTICE

REVISION OR ISSUE	DATE	CHANGE
Draft	24/01/08	Initial edition
Draft 01	13/05/08	Added note 2 on Table 2
1/-	22/05/08	Added Radiall P/N.
2/-	03/09/08	Change the name of the specification, added new variant (403) and added new frequency for operating life in table 4.
2/A	29/10/08	Added new variant: 404
3/-	25/11/08	Added interchangeability for SMA series
3/A	29/01/09	Correction of RF leakage performance in table 6 to be coherence with RF leakage requirement on table 2. Correction of frequency markers in climatic sequence (4GHz instead of 2GHz) Correction in table 2 of multipactor level and added Peak Power for variants 403-404
3 / B	05/03/09	Correction in table 6: climatic sequence: Resistance drift in temperature is performed in DC test instead of on frequencies test. Added paragraph 5.1
3 / C	30/04/09	Cancelation of Variant 404, replaced by an extension of the frequency band of Variant 403.
3 / D	08/07/09	Update of the figure 1 (+125°C instead of +115°C) and add the variant 404
3 / E	02/11/11	Add new paragraph "Materials and finishes".
4 / -	15/09/12	Frequency range updated: DC-20GHz instead of DC-18GHz and VSWR limit modified: $1.05 + 0.009 \times F$ instead of $1.05 + 0.125 \times F$
4 / A	21/11/13	Add new variant: 405
4 / B	19/08/15	Modification of Figure 1 and 2: 10% of power allowed at maximum storage temperature instead of 0%
4 / C	08/06/17	Change of Aluminium shell finish (TCP COLORLESS - SURTEC 650)



	DETAIL SPECIFICATION		
	REF.: RAD-DET-ATCH-007		
	Date: June 08 th , 2017	ED/REV: 4/C	PAGE: 3/ 17

TABLE OF CONTENTS

1.	Scope	4
2.	Applicable document	4
3.	Type variant	5
3.1.	Materials and Finishes	5
4.	Maximum ratings	6
5.	Electrical measurements	9
5.1.	High and Low temperature electrical measurements	9
6.	Connectors repeatability:	9
7.	Operating life	9
7.1.	Parameter drift values	9
7.2.	Conditions for operating life	9
8.	Mechanical dimension	11
8.1.	Dimension for variant 401	11
8.2.	Dimension for variant 402	12
8.3.	Dimension for variant 403 to 405	13
8.4.	Interchangeability for SMA	14
8.4.1.	SMA jack	14
8.4.2.	SMA plug	15

LIST OF TABLES AND FIGURES

Table 1:	Type variants	5
Table 2a:	Maximum ratings Variants 401-402	6
Table 2b:	Maximum ratings Variant 403	6
Table 2c:	Maximum ratings Variant 404	7
Table 2d:	Maximum ratings Variant 405	7
FIGURE 1 –	Parameter Derating Information for variants 401-402	8
FIGURE 2 –	Parameter Derating Information for variant 403 to 405	8
Table 3:	Parameter drift values for Operating Life	9
Table 4:	Conditions for Operating Life testing	9
FIGURE 3 –	Circuit for electrical measurement	10
Table 5:	Radiall Part Number	16
Table 6 :	Measurements and inspections on completion of environment and endurance tests	16
FIGURE 1 –	Parameter Derating Information for variants 401-402	8
FIGURE 2 –	Parameter Derating Information for variant 403-405	8
FIGURE 3 –	Circuit for electrical measurement	10

	DETAIL SPECIFICATION		
	REF.: RAD-DET-ATCH-007		
	Date: June 08 th , 2017	ED/REV: 4/C	PAGE: 4/ 17


1. SCOPE

This Detail Technical Sheet details the ratings and electrical characteristics for RF Load Fixed, High Power, and SMA type.

2. APPLICABLE DOCUMENT

The following documents shall be read in conjunction with this specification:

RAD-GEN-ATCH-001: General Specification: Attenuators and Loads RF Fixed Coaxial

	DETAIL SPECIFICATION		
	REF.: RAD-DET-ATCH-007		
	Date: June 08 th , 2017	ED/REV: 4/C	PAGE: 5/ 17

3. TYPE VARIANT

Variant of the basic type covered by the relevant Generic Specification are given Table 1.

Table 1: Type variants

		VSWR	
		$0 \leq F \leq 20$ GHz	
	VARIANT		
Male	401	$\leq 1.05 + 0.009 \times F$	
Female	402	$\leq 1.05 + 0.009 \times F$	

		VSWR	
		$1.7 \leq F \leq 3.7$ GHz	$3.7 \leq F \leq 6.5$ GHz
	VARIANT		
Female	403	$\leq 1.023 + 0.075 \times F$	≤ 1.30
	VARIANT	$1.9 \leq F \leq 2.3$ GHz	
Female	404	$\leq 1.023 + 0.075 \times F$	
	VARIANT	$1.1 \leq F \leq 3.7$ GHz	$3.7 \leq F \leq 6.5$ GHz
Female	405	$\leq 1.023 + 0.075 \times F$	≤ 1.30

3.1. MATERIALS AND FINISHES

For variants 401 & 402:

- a. Shell: amagnetic Stainless steel, electro-passivated and Aluminium alloy Chromated surface (Trivalent Chrome Protection) SURTEC 650
- b. Coupling nut (Var 401 only): amagnetic Stainless steel, electro-passivated
- c. Centre contact: Beryllium copper(or brass for male only) with nickel underplate $2\mu\text{m}$ and gold plating $1.3\mu\text{m}$
- d. Inserts: PTFE
- e. Gaskets: silicone rubber (var 401 only)

For variants 403 to 405:

- a. Shell: amagnetic Stainless steel, electro-passivated and Aluminium alloy nickel plating $5\mu\text{m}$
- b. Centre contact: Beryllium copper with nickel underplate $2\mu\text{m}$ and gold plating $1.3\mu\text{m}$
- c. Inserts: PTFE
- d. Accessories:
thermal shunt for strip: Cupronickel alloy with plating $\text{Ni}2\mu\text{m}$
fixing part for strip: RT duroid

4. MAXIMUM RATINGS

Maximum Ratings of the basic type covered by the relevant Generic Specification are given Table 2.

Table 2a: Maximum ratings Variants 401-402

N°	Characteristics	Symbol	Maximum Rating		Unit
			Min	Max	
1	RF Power	P	-	5	W (1)
2	Peak Power (at 25°C) (3)	P _p	-	50	W (2)
3	Operating Temperature Range	T _{op}	-55	+125	°C
4	Storage Temperature Range	T _{stg}	-55	+125	°C
5	Frequency Range	F	0	20	GHz
6	Impedance	Z	47.5	52.5	Ohms
7	RF Leakage	E	-60	-	dBi
8	Coupling Nut Torque	T _q	80	120	N.cm

- NOTES:**
- (1) See Figure 1.
 - (2) : On frequency range 1.6 to 18GHz with 6dB multipactor margin
 - (3) Duration 1µs, cyclic rate 1ms

Table 2b: Maximum ratings Variant 403

N°	Characteristics	Symbol	Maximum Rating		Unit
			Min	Max	
1	RF Power	P	-	45	W (1)
2a	Peak Power (at 25°C) (3)	P	-	1	KW
2b	Multipactor	P	-	45	W (2)
3	Operating Temperature Range	T _{op}	-40	+85	°C
4	Storage Temperature Range	T _{stg}	-40	+115	°C
5	Frequency Range	F	1.7	6.5	GHz
6	Impedance	Z	47.5	52.5	Ohms
7	RF Leakage	E	-75	-	dBi
8	Coupling Nut Torque	T _q	80	120	N.cm

- NOTES:**
- (1) Fixed on heatsink which stays below the max operating temperature under max power. see figure 2
 - (2) : with 4dB multipactor margin at 1.7GHz
with 5dB multipactor margin at 1.9GHz
with 6dB multipactor margin at 2.1GHz
 - (3) Duration 1µs, cyclic rate 1ms

Table 2c: Maximum ratings Variant 404

N°	Characteristics	Symbol	Maximum Rating		Unit
			Min	Max	
1	RF Power	P	-	45	W (1)
2a	Peak Power (at 25°C) (3)	P	-	1	KW
2b	Multipactor	P	-	45	W (2)
3	Operating Temperature Range	T _{op}	-40	+85	°C
4	Storage Temperature Range	T _{stg}	-40	+115	°C
5	Frequency Range	F	1.9	2.3	GHz
6	Impedance	Z	47.5	52.5	Ohms
7	RF Leakage	E	-75	-	dBi
8	Coupling Nut Torque	T _q	80	120	N.cm

NOTES:

- (1) Fixed on heatsink which stays below the max operating temperature under max power, (see figure 2)
- (2) : with 5dB multipactor margin at 1.9GHz (with 6dB multipactor margin at 2.15GHz)
- (3) Duration 1µs, cyclic rate 1ms

Table 2d: Maximum ratings Variant 405

N°	Characteristics	Symbol	Maximum Rating		Unit
			Min	Max	
1	RF Power	P	-	12	W (1)
	1.1 to 1.7 GHz				
	1.7 to 6.5GHz				
2a	Peak Power (at 25°C) (3)	P	-	1	KW
2b	Multipactor	P	-	45	W (2)
	1.1 to 1.7 GHz				
	1.7 to 6.5GHz				
3	Operating Temperature Range	T _{op}	-40	+85	°C
4	Storage Temperature Range	T _{stg}	-40	+115	°C
5	Frequency Range	F	1.1	6.7	GHz
6	Impedance	Z	47.5	52.5	Ohms
7	RF Leakage	E	-75	-	dBi
8	Coupling Nut Torque	T _q	80	120	N.cm

NOTES:

- (1) Fixed on heatsink which stays below the max operating temperature under max power, (see figure 2)
- (2) with 6dB multipactor margin at 1.1GHz
with 4dB multipactor margin at 1.7GHz
with 5dB multipactor margin at 1.9GHz
with 6dB multipactor margin at 2.1GHz
- (3) Duration 1µs, cyclic rate 1ms

FIGURE 1 – Parameter Derating Information for variants 401-402

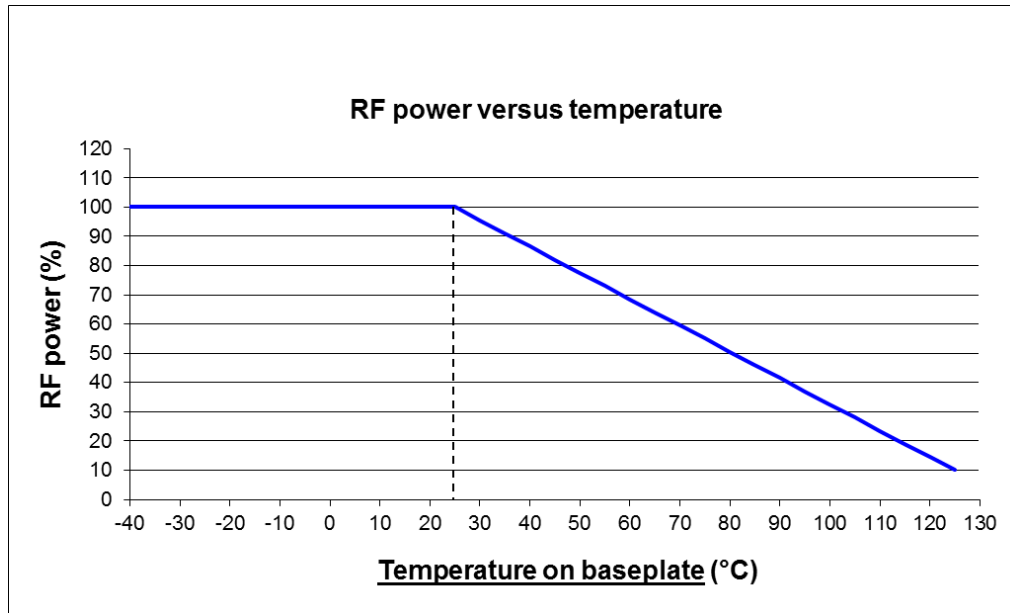
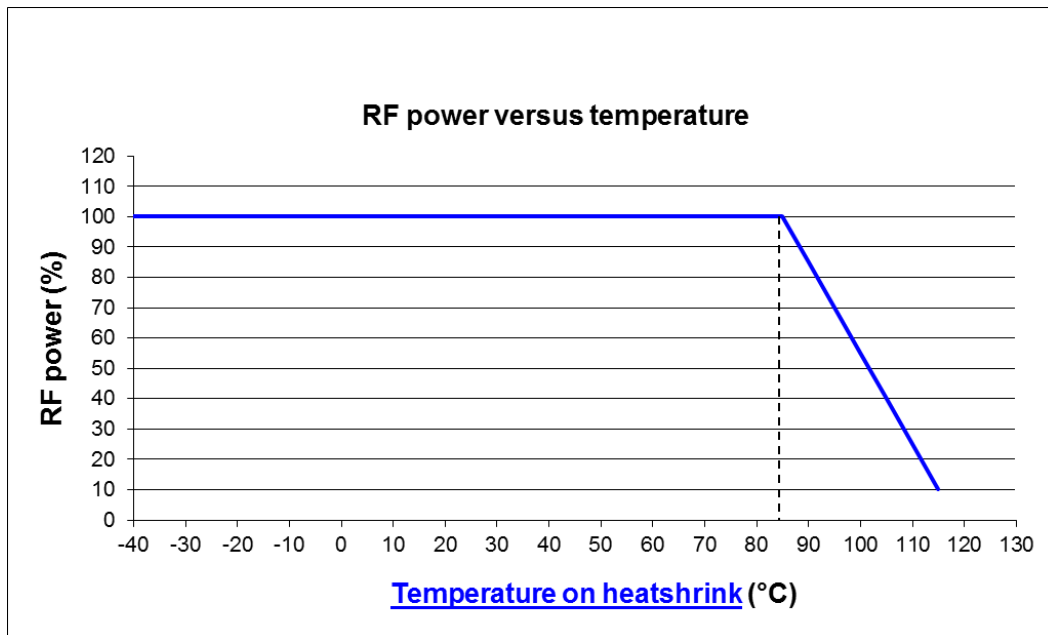



FIGURE 2 – Parameter Derating Information for variant 403 to 405



	DETAIL SPECIFICATION		
	REF.: RAD-DET-ATCH-007		
	Date: June 08 th , 2017	ED/REV: 4/C	PAGE: 9/ 17

5. ELECTRICAL MEASUREMENTS

The parameters to be measured at room temperature are scheduled in Table 1. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

The measurement shall be performed with five points of frequency for variants 401-402:

0.04GHz - 4GHz - 8GHz - 12.4 GHz and 20 GHz.

The measurement shall be performed with five points of frequency for variant 403:

1.7GHz - 2.3GHz - 3.7GHz - 4.2GHz - 6.5GHz.

The measurement shall be performed with five points of frequency for variant 404:

1.9GHz - 2.0GHz - 2.1GHz - 2.2GHz - 2.3GHz.

The measurement shall be performed with five points of frequency for variant 405:

1.1GHz - 2.3GHz - 3.7GHz - 4.2GHz - 6.5GHz.

5.1. HIGH AND LOW TEMPERATURE ELECTRICAL MEASUREMENTS

Characteristics	Symbol	Test Method and Conditions (Note 1)	Maximum Rating		Unit
			Min	Max	
Temperature coefficient of Resistance	TC_R	DC test reference temperature	-	3×10^{-4}	$\Omega/\Omega/^\circ C$

Note 1: Measurements shall be performed during LAT or Qualification test

6. CONNECTORS REPEATABILITY:

Not applicable for loads.

7. OPERATING LIFE

7.1. PARAMETER DRIFT VALUES

The parameter drift values applicable to burn-in are specified in Table 3 of this specification. Unless otherwise stated, measurements shall be performed at $T_{amb} = +22 \pm 3$ °C. The parameter drift value (Δ) applicable to the parameters scheduled, shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 1 shall not be exceeded.

7.2. CONDITIONS FOR OPERATING LIFE

The condition for Operating life are given in Table 4. After test, a visual inspection shall be performed and no damage shall be appeared.

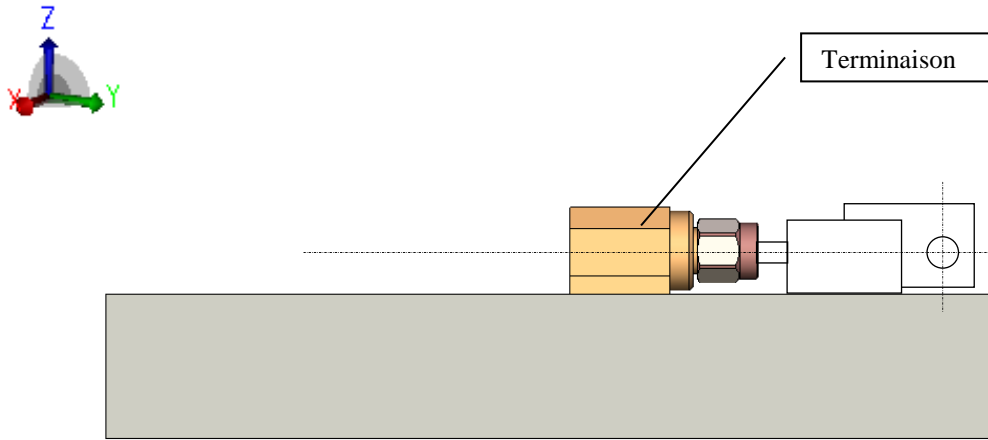
Table 3: Parameter drift values for Operating Life

N°	Characteristics	Symbol	Test condition	Limits	Unit
1	Resistance change	ΔR	As per Table 1	250	m Ω
2	VSWR change	$\frac{\Delta VSWR}{VSWR}$	As per Table 1	± 2	%

Table 4: Conditions for Operating Life testing

N°	Characteristics	Symbol	Limits	Unit	Note
1	RF Power	P_{in}	5	W	For variants 401 or 402 For variants 403 to 405
			45	W	
2	Frequency	F	DC or 10 or 18	GHz	For variants 401 or 402 For variants 403 to 405
			DC	GHz	
3	Ambient Temperature	T_{amb}	+25	°C	-

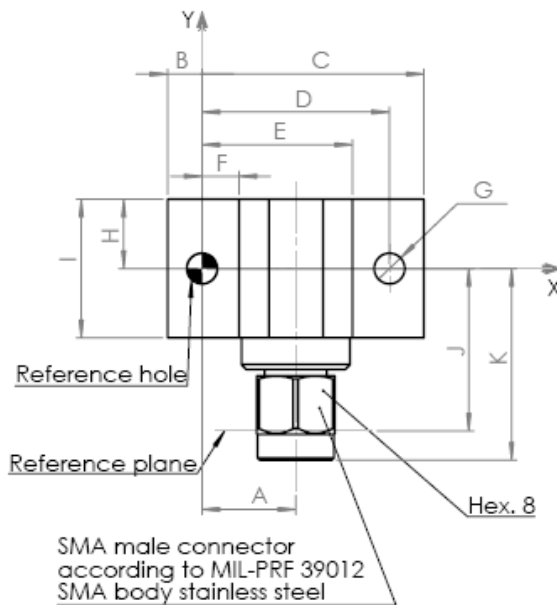
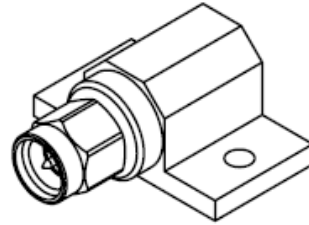
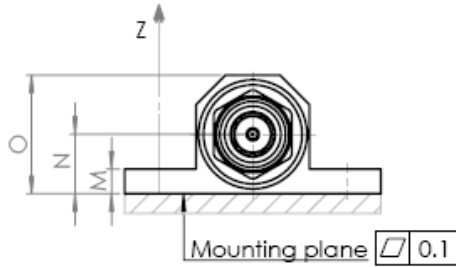
FIGURE 3 – *Circuit for electrical measurement*



Schematic for Vibration and Shock or Bump test

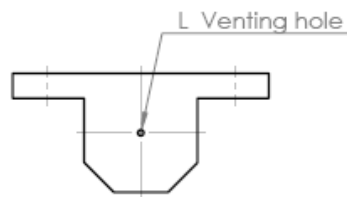
8. MECHANICAL DIMENSION

8.1. DIMENSION FOR VARIANT 401



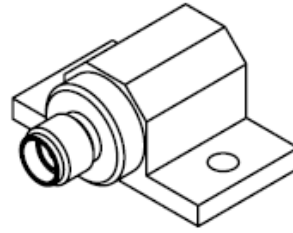
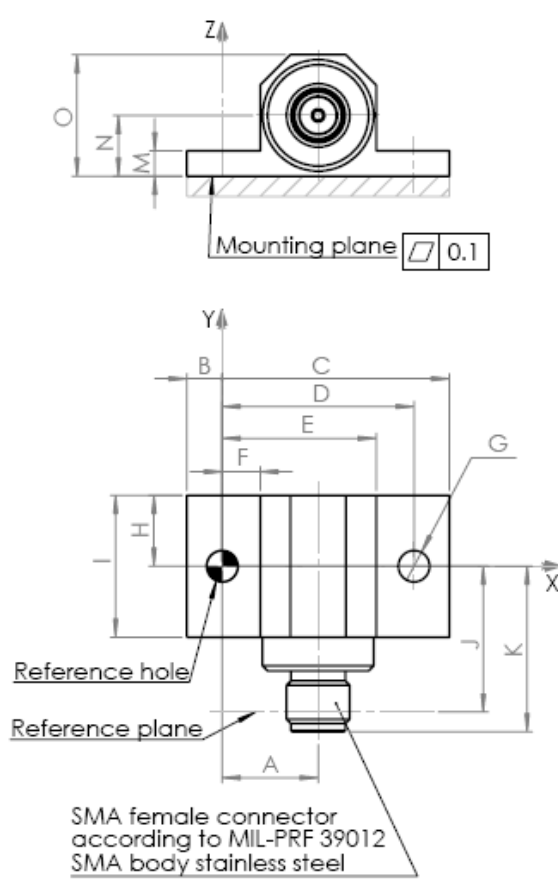
PHYSICAL DIMENSIONS				
A	9,0	10,0	mm	◀
B	3,0	4,0	mm	◀
C	22,0	23,0	mm	◀
D	19		mm	◀
E	14,75	15,75	mm	
F	3,25	4,25	mm	
G	∅3,1	∅3,3	mm	◀
H	6,5	7,5	mm	◀
I	13,5	14,5	mm	◀
J	15,9	16,9	mm	
K	--	19,9	mm	◀
L	∅0,5	∅0,7	mm	
M	2,4	2,6	mm	
N	5,5	6,5	mm	◀
O	11,5	12,5	mm	◀

Nota: FINAL CONTROL DIMENSIONS ◀

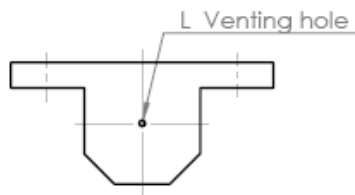


Weight: ≤ 14 grams

8.2. DIMENSION FOR VARIANT 402

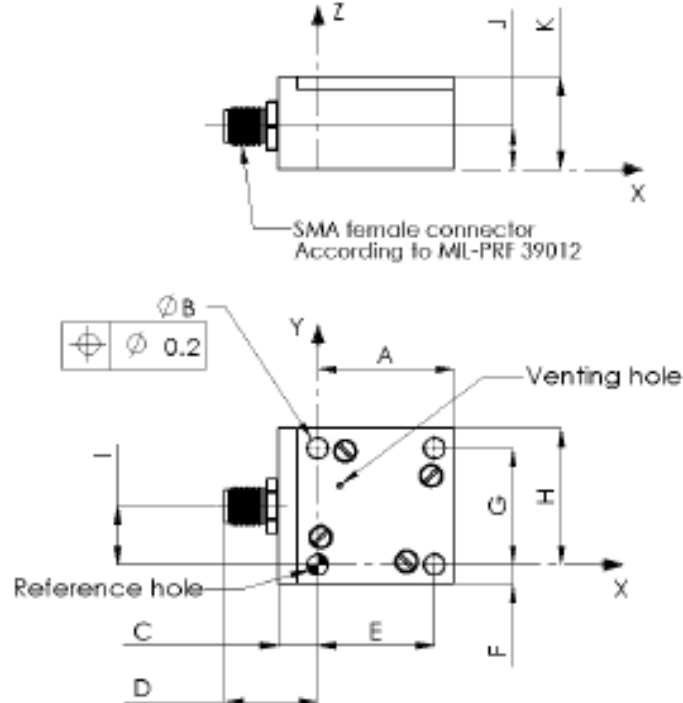


PHYSICAL DIMENSIONS				
A	9,0	10,0	mm	◀
B	3,0	4,0	mm	◀
C	22,0	23,0	mm	◀
D	19		mm	◀
E	14,75	15,75	mm	
F	3,25	4,25	mm	
G	Ø3,1	Ø3,3	mm	◀
H	6,5	7,5	mm	◀
I	13,5	14,5	mm	◀
J	13,9	14,9	mm	
K	15,8	16,8	mm	◀
L	Ø0,5	Ø0,7	mm	
M	2,4	2,6	mm	
N	5,5	6,5	mm	◀
O	11,5	12,5	mm	◀
Nota: FINAL CONTROL DIMENSIONS ◀				



Weight: ≤ 12 grams

8.3. DIMENSION FOR VARIANT 403 TO 405



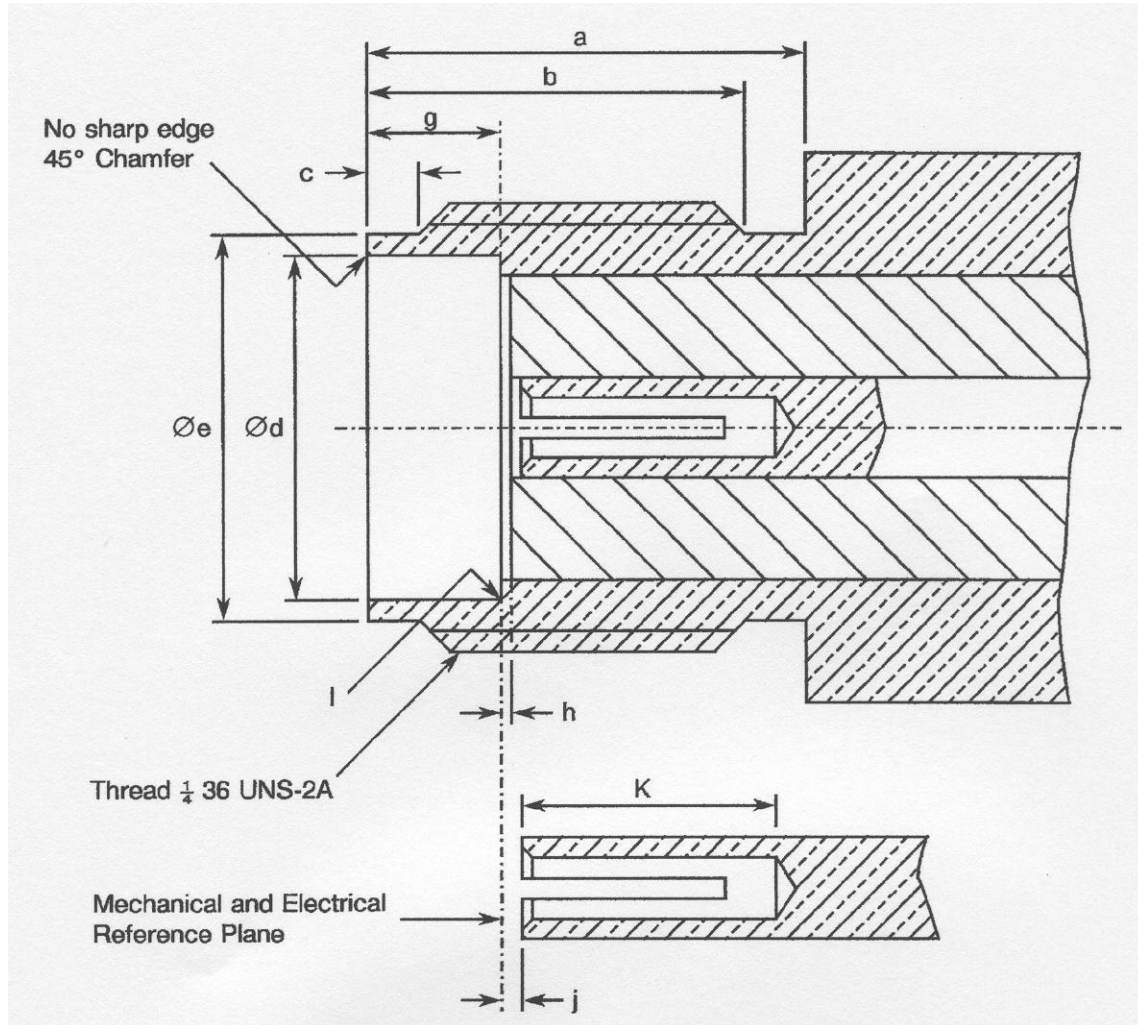
Dimension	Value 1	Value 2	Unit	Notes
A	21.7	22.7	mm	
B	∅3.2	∅3.4	mm	◀
C	6.0	7.0	mm	
D	14.7	15.7	mm	◀
E	19.0		mm	◀
F	2.7	3.7	mm	
G	19.0		mm	◀
H	21.7	22.7	mm	
I	9.0	10.0	mm	
J	6.5	7.5	mm	
K	14.5	15.5	mm	◀

Nota: FINAL CONTROL DIMENSIONS ◀

Weight: ≤ 35 grams

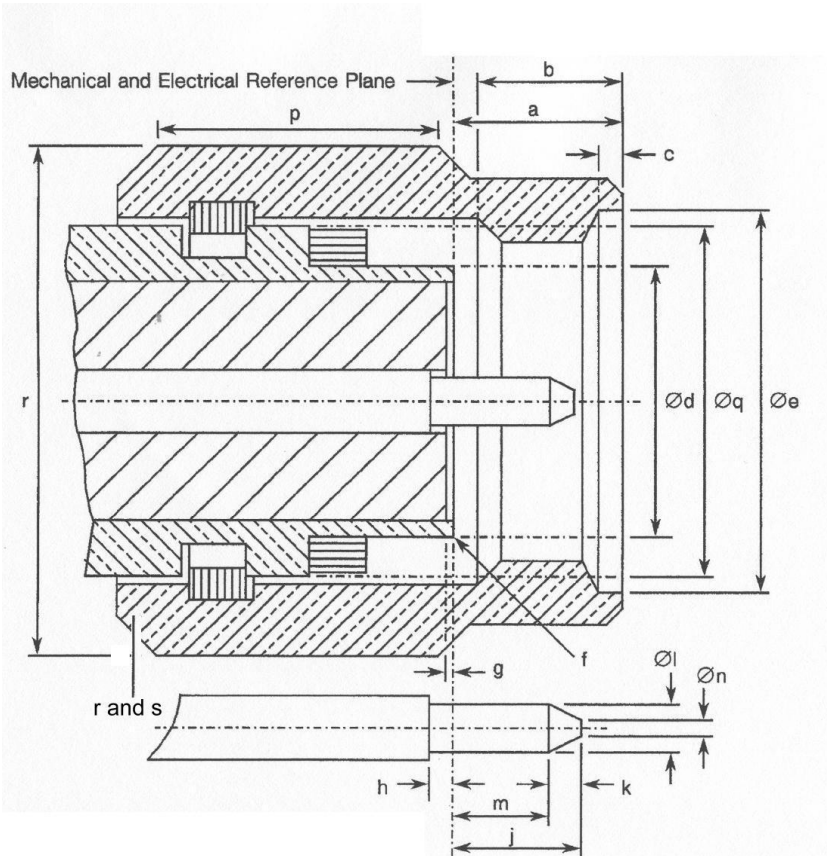
8.4. INTERCHANGEABILITY FOR SMA

8.4.1. SMA jack



Symbol	Millimetres		notes
	min	max	
a	5.54		
b	4.32		
c	0.38	1.14	
Ød	4.597	4.67	
Øe	5.28	5.49	
g	1.88	1.98	
h	0.00	0.20	
J	0.00	0.25	
K	2.92		
l		0.04	radius

8.4.2. SMA plug



Symbol	Millimetres		notes
	min	max	
a		3.43	
b	2.54		
c	0.38	1.14	
Ød		0.4592	
Øe	6.35		
f		008	Radius or 45° Chamfer
g	0.00	0.20	
h	0.00	0.25	
j		2.54	
k	0.38		
Øl	0.90	9.94	
m	1.27		
Øn		0.38	
p	3.17		
Øq			N/A
r	7.84	8.00	Hexagonal on flat
s		9.20	

Table 5: Radiall Part Number

Variant	Radiall Reference	Designation
401	R404 606 651	RF fixed load SMA 5W DC - 20GHz - Male
402	R404 607 651	RF fixed load SMA 5W DC - 20GHz - Female
403	R406 994 600	RF fixed load SMA 45W 1.7 - 6.5GHz - Female
404	R406 994 610	RF fixed load SMA 45W 1.9 - 2.3GHz - Female
405	R406 994 620	RF fixed load SMA 12W / 45W 1.1 - 6.5GHz - Female

Table 6 : Measurements and inspections on completion of environment and endurance tests

N°	Radiall Generic Spec. RAD-GEN-ATCH-001		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Test (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
01	Vibration	Para. 13.2.6 and figure 2 of this specification	Initial measurements Impedance VSWR During Last Cycle Intermittent contact Final measurement Visual Examination Resistance change VSWR change	Table 2 Table 2 >0.5ms No open or short circuits No damage Table 3 Table 3	Z VSWR - - ΔR ΔVSWR	Record values Record values - - - -250 +250	Ω - - - mΩ %	
02	Shock or Bump	Para 13.2.7 and figure 2 of this specification	Initial measurements Impedance VSWR Final measurement Visual Examination Resistance change VSWR change	Table 2 Table 2 No damage Table 3 Table 3	Z VSWR - - ΔR ΔVSWR	Record values Record values - - - -250 +250	Ω - - - mΩ %	
03	Rapid Change of Temperature	Para 13.2.8	Initial measurements Impedance VSWR Final measurement Visual Examination Resistance change VSWR change	Table 2 Table 2 After recovery time of 24±2hrs No damage Table 3 Table 3	Z VSWR - - ΔR ΔVSWR	Record values Record values - - - -250 +250	Ω - - - mΩ %	
04	Climatic sequence	Para 13.2.9 Dry heat : para 13.2.9.1 Cold heat : para 13.2.9.3	Resistance drift (2) Resistance drift (2) Final measurement Visual Examination Resistance change VSWR change	At +125°C, At -55°C, After recovery time between 1 hr and 24 hrs No damage Table 3 Table 3	TC _R TC _R - ΔR ΔVSWR	3.10 ⁻⁴ 3.10 ⁻⁴ - -250 +250	Ω/Ω/°C Ω/Ω/°C - mΩ %	
05	Coupling proof torque	Para 13.2.10	Interface dimensions	Para 13.2.11	-	Figure of para 13.2.11	-	
06	Mating and unmating forces	Para 13.2.11	Torque	Para 13.2.11	-	- 24	N.cm	
07	Operating Life	Para 13.2.12 and table 3 and 4 of this specification	Initial measurements Impedance VSWR Final measurement Visual Examination Resistance change VSWR change	Table 2 Table 2 No damage Table 3 Table 3	Z VSWR - - ΔR ΔVSWR	Record values Record values - - - -250 +250	Ω - - - mΩ %	
08	RF leakage	Para 13.2.13	RF leakage	Table 2	E	- See Table 2	dBi	
09	Peak power	Para 13.2.14 and table 2 of this specification	Final measurement Impedance	Table 2	Z	Table 1	-	
10	Permanence of marking	Para 13.2.16	Final measurement Visual Examination	No corrosion or obliteration of marking	-	-	-	

Notes :

- (1) The tests in this table refer to either para 11 and 12 and shall be used as applicable
- (2) Measurement to be made on 2 samples only.