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Titre / Title
RF COAXIAL ATTENUATORS DC – 22 GHz DETAIL SPECIFICATION

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DOCUMENTATION CHANGE NOTICE

REVISION OR ISSUE	DATE	CHANGE
1/-	08/03/2013	Initial issue
1/A	25/04/2013	Updated Table 1 for flatness: xxdB/1GHz instead of xxdB/0.5GHz
1/B	16/08/2016	Updated note 3 of Table 2 and replace “Attenuation drift” by “Temperature coefficient of attenuation” in Table 6, climatic sequence
1/C	19/09/2018	Dimension for variants 01 to 31 updated, Table 1 VSWR limits updated to 18GHz instead of 18.4, points of frequency updated for Electrical measurement and Connector repeatability

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1. SCOPE

This Detail Technical Sheet details the ratings and electrical characteristics for RF Attenuators, Coaxial 0-20 dB, 0 -22 GHz

2. APPLICABLE DOCUMENT

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

RAD-GEN-ATCH-002: General Specification: Attenuators and Loads RF Fixed Coaxial

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3. TYPE VARIANT

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

Table 1: Type variants

Var. N°	Attenuation	Maximum Input Power	Attenuation tolerance Vs frequency		Flatness	VSWR
	dB	W	0 < F ≤ 18 GHz dB (±)	18 < F ≤ 22 GHz dB (±)	dB	
01	0 (DC shunt)	10	0.3	0.4	F ≤ 13 GHz 0.05 dB/1 GHz	0 < F ≤ 18 GHz < 1.20
02	0.5	10	0.3	0.4		
03	1	7	0.3	0.4		
04	1.5	5.5	0.3	0.4		
05	2	4.5	0.3	0.4		
06	2.5	4	0.3	0.4		
07	3	3.5	0.3	0.4		
08	3.5	3.5	0.3	0.4		
09	4	3	0.3	0.4		
10	4.5	3	0.3	0.4		
11	5	2.5	0.3	0.4		
12	5.5	2.5	0.3	0.4		
13	6	2.5	0.3	0.4		
14	6.5	2.5	0.3	0.4		
15	7	2	0.4	0.5	F > 13 GHz 0.07 dB/1 GHz	18 < F < 22GHz < 1.25
16	7.5	2	0.4	0.5		
17	8	2	0.4	0.5		
18	8.5	2	0.4	0.5		
19	9	2	0.4	0.5		
20	9.5	2	0.4	0.5		
21	10	2	0.4	0.5		
22	11	2	0.5	0.6	F ≤ 13 GHz 0.07 dB/1 GHz	
23	12	2	0.5	0.6		
24	13	2	0.5	0.6		
25	14	2	0.5	0.6		
26	15	2	0.5	0.6	F > 13 GHz 0.1 dB/1 GHz	
27	16	2	0.5	0.6		
28	17	2	0.5	0.6		
29	18	2	0.5	0.6		
30	19	2	0.5	0.6		
31	20	2	0.5	0.6		

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4. MAXIMUM RATINGS

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

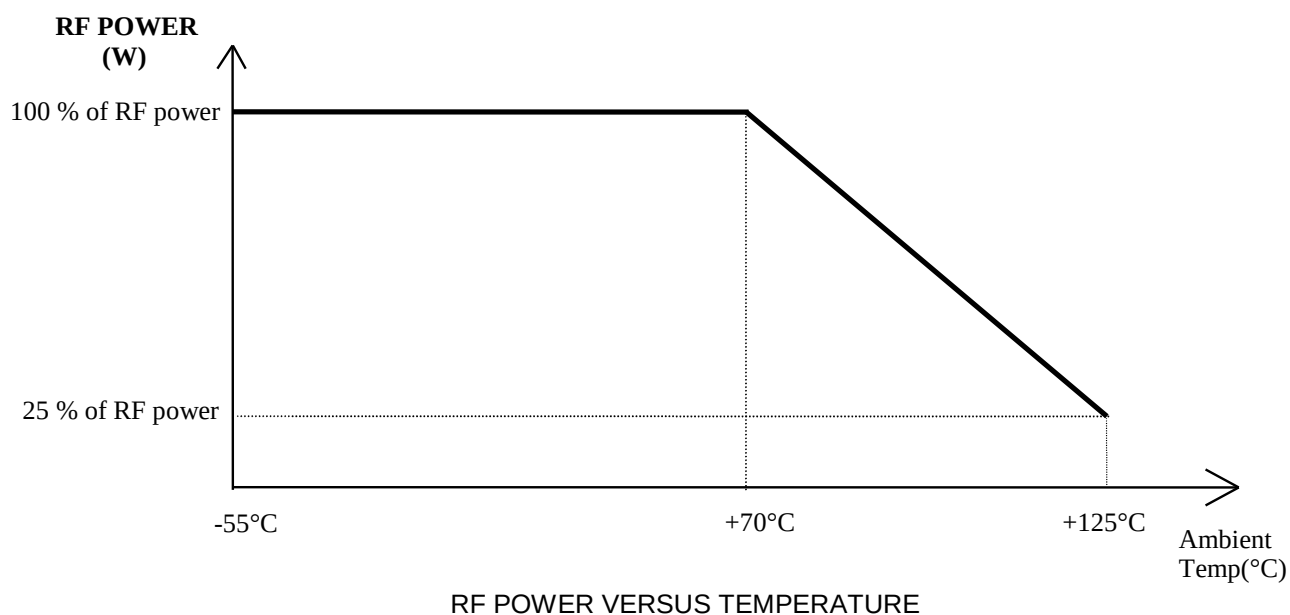
Table 2: Maximum ratings

N°	Characteristics	Symbol	Maximum Rating		Unit	Comment
			Min	Max		
1	RF Power dissipation ⁽¹⁾	P	-	2	W ⁽²⁾	-
2	Peak Power (at 25°C) ⁽³⁾	Pp	-	100	W	-
3	Operating Temperature Range	T _{op}	-55	+125	°C	-
4	Storage Temperature Range	T _{stg}	-55	+125	°C	-
5	Frequency Range	F	0	22	GHz	-
6	Impedance	Z	47.5	52.5	Ω	-
7	DC impedance		4	10	KΩ	between coaxial line and body
8	RF Leakage	E	-85	-	dBi	-
9	Coupling Nut Torque	Tq	80	120	N.cm	-
10	Glitches		0	0.05	dB	

NOTES:

- (1) See Table 1 for RF input Power value vs attenuation
- (2) See Figure 1.
- (3) Duration 1μs, 1% duty cycle

FIGURE 1 – Temperature derating



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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 six points of frequency:

2GHz – 8GHz – 12.4 GHz – 18GHz - 22 GHz.

6. CONNECTORS REPEATABILITY:

The test shall be performed according to the following conditions:

- Attenuation shall be recorded at six points of frequency: 2GHz – 8GHz – 12.4 GHz – 18GHz - 22 GHz.
- Ten complete engagements and separations shall be performed, both end separately
- Attenuators shall be rotated through the full 360° with an increment of approximately 36° for each engagement.
- Attenuation drift value: ± 0.05 dB
- Side thrust is not permitted during the test
- Cleaning of connectors or reshaping of contacts was not permitted during the sequence

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 conditions 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	Attenuation Drift	Δ_{Att}	As per Table 1	± 0.10 or $\pm 1^{(1)}$	dB %

NOTES: (1) Whichever is greater, % of nominal attenuation

Table 4: Conditions for Operating Life testing

N°	Characteristics	Symbol	Limits	Unit	Note
1	RF Power	P_{in}	See Table 1	W	
2	Frequency	F	DC ⁽¹⁾ or 10 or 18 10 or 18	GHz GHz	For attenuation ≥ 1 dB For attenuation < 1 dB
3	Ambient Temperature	T_{amb}	+25	°C	-

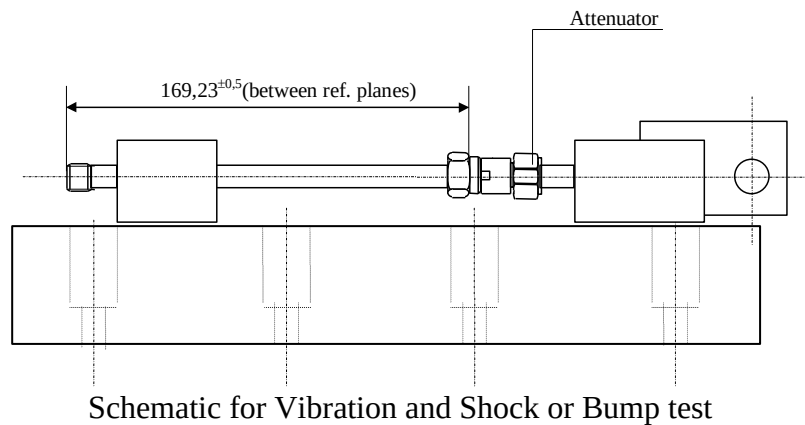
NOTES: (1) The response of the attenuation is flat over the frequency bandwidth.
The dissipated power at DC or in frequency is the same.

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Test mounting for Operating life:

The DUT (attenuator under test) shall be mounted directly on the Hybrid coupler without SR cable between the coupler and the DUT.

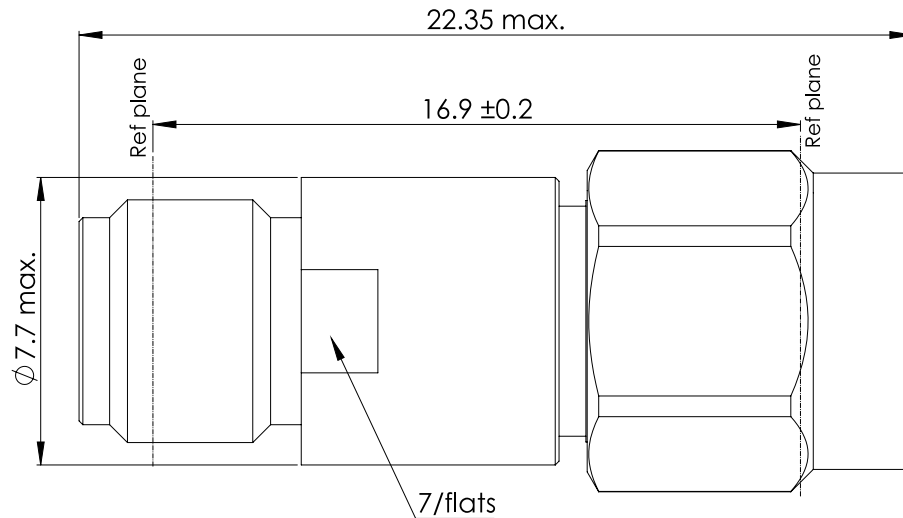
FIGURE 2 – *Circuit for electrical measurement*



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8. MECHANICAL DIMENSION

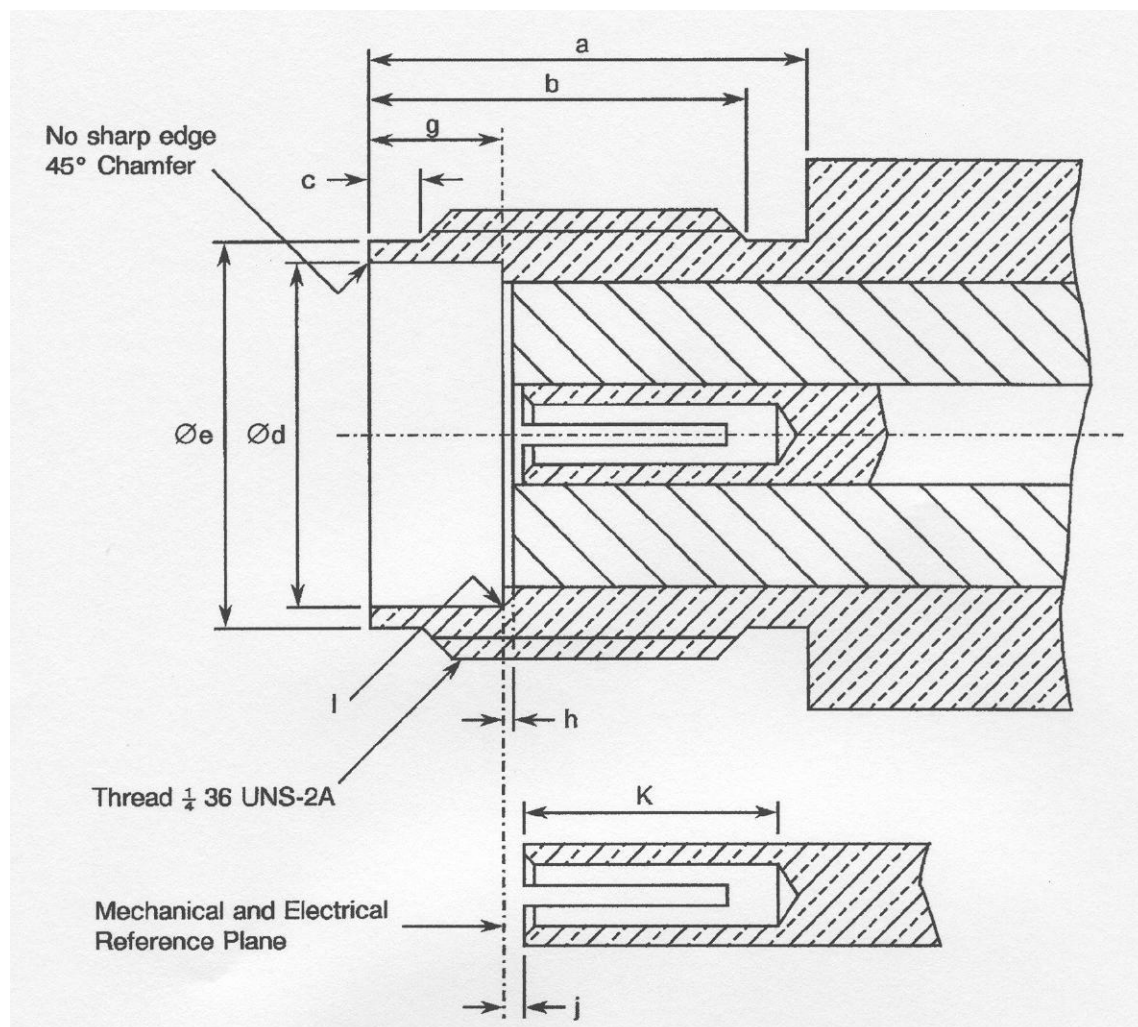
8.1. DIMENSION FOR VARIANTS 01 TO 31



Connectors: SMA male/Female per ESCC3402
Weight: ≤ 5 grams

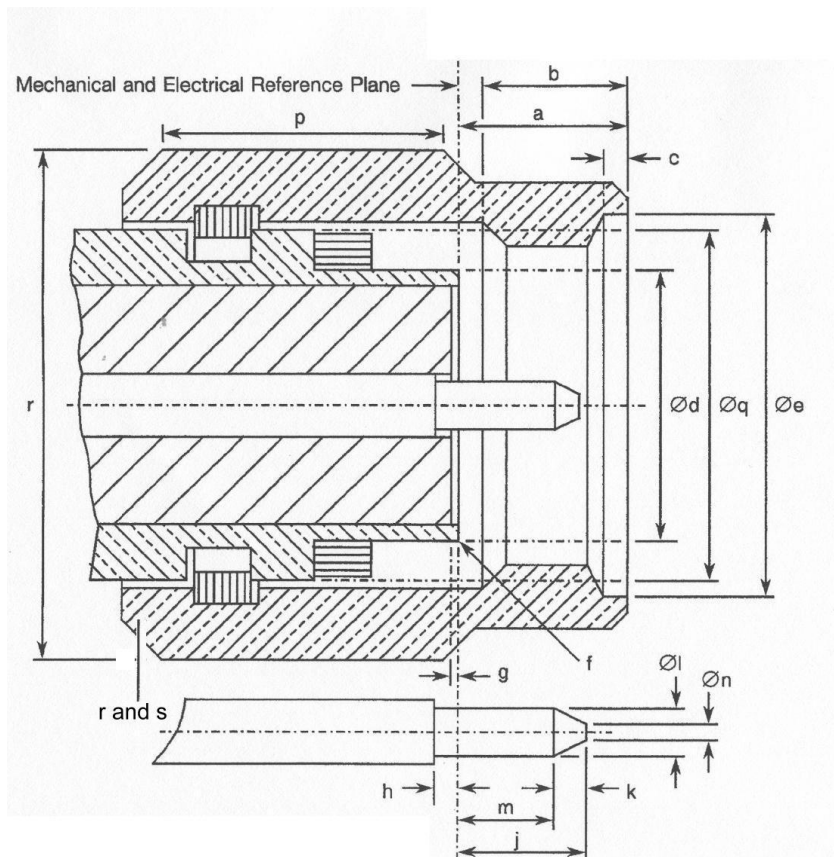
8.2. INTERCHANGEABILITY FOR SMA

8.2.1. SMA jack



Symbol	Millimeters		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

8.2.2. SMA plug



Symbol	Millimeters		notes
	min	max	
a		3.43	
b	2.54		
c	0.38	1.14	
Ød		0.4592	
Øe	6.35		
f		0.08	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	

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Table 5: Radiall Part Number

Variant	Radiall Reference	Designation
01	R413800600	Attenuator SMA DC - 22GHz 0 dB
02	R413801600	Attenuator SMA DC - 22GHz 0.5 dB
03	R413802600	Attenuator SMA DC - 22GHz 1 dB
04	R413803600	Attenuator SMA DC - 22GHz 1.5 dB
05	R413804600	Attenuator SMA DC - 22GHz 2 dB
06	R413805600	Attenuator SMA DC - 22GHz 2.5 dB
07	R413806600	Attenuator SMA DC - 22GHz 3 dB
08	R413807600	Attenuator SMA DC - 22GHz 3.5 dB
09	R413808600	Attenuator SMA DC - 22GHz 4 dB
10	R413809600	Attenuator SMA DC - 22GHz 4.5 dB
11	R413810600	Attenuator SMA DC - 22GHz 5 dB
12	R413811600	Attenuator SMA DC - 22GHz 5.5 dB
13	R413812600	Attenuator SMA DC - 22GHz 6 dB
14	R413813600	Attenuator SMA DC - 22GHz 6.5 dB
15	R413814600	Attenuator SMA DC - 22GHz 7 dB
16	R413815600	Attenuator SMA DC - 22GHz 7.5 dB
17	R413816600	Attenuator SMA DC - 22GHz 8 dB
18	R413817600	Attenuator SMA DC - 22GHz 8.5 dB
19	R413818600	Attenuator SMA DC - 22GHz 9 dB
20	R413819600	Attenuator SMA DC - 22GHz 9.5 dB
21	R413820600	Attenuator SMA DC - 22GHz 10 dB
22	R413822600	Attenuator SMA DC - 22GHz 11 dB
23	R413824600	Attenuator SMA DC - 22GHz 12 dB
24	R413826600	Attenuator SMA DC - 22GHz 13 dB
25	R413828600	Attenuator SMA DC - 22GHz 14 dB
26	R413830600	Attenuator SMA DC - 22GHz 15 dB
27	R413832600	Attenuator SMA DC - 22GHz 16 dB
28	R413834600	Attenuator SMA DC - 22GHz 17 dB
29	R413836600	Attenuator SMA DC - 22GHz 18 dB
30	R413838600	Attenuator SMA DC - 22GHz 19 dB
31	R413840600	Attenuator SMA DC - 22GHz 20 dB

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

N°	Radiall Generic Spec. RAD-GEN-ATCH-002		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 of Generic specification and figure 2 of this specification	Initial measurements Attenuation During Last Cycle Intermittent contact Final measurement Visual Examination Attenuation drift	Table 1 >0.5ms No open or short circuits No damage Table 1	Att - - Δ Att	Record values - - ± 0.05 ± 0.5		- - dB or % (2)
02	Shock or Bump	Para 13.2.7 of Generic specification and figure 2 of this specification	Initial measurements Attenuation Final measurement Visual Examination Attenuation drift	Table 1 No damage Table 1	Att - Δ Att	Record values - ± 0.05 ± 0.5		- - dB or % (2)
03	Rapid Change of Temperature	Para 13.2.8 of Generic specification	Initial measurements Attenuation Final measurement Visual Examination Attenuation drift	Table 1 After recovery time of 24 $\pm$ 2hrs No damage Table 1	Att - Δ Att	Record values - ± 0.05 ± 0.5		- - dB or % (2)
04	Climatic sequence	Para 13.2.9 of Generic specification Dry heat: para 13.2.9.1 of Generic specification Cold heat: para 13.2.9.3 of Generic specification	Temp coeff of attenuation Temp coeff of attenuation Final measurement Visual Examination Attenuation drift	At +125°C, Freq: 4 – 12.4 and 22GHz At -55°C, Freq: 4 – 12.4 and 22GHz After recovery time between 1 hr and 24 hrs No damage Table 1	Δ Att Δ Att - Δ Att	-0.1 -1.0	7.10 ⁻⁴ (3) 7.10 ⁻⁴ (3) +0.1 +1.0	dB/dB/°C dB/dB/°C dB or % (2)
05	Coupling proof torque	Para 13.2.10 of Generic specification	Interface dimensions	Para 13.2.11	-	Figure of para 13.2.11		-
06	Mating and unmating forces	Para 13.2.11 of Generic specification	Torque	Para 13.2.11	-	-	24	N.cm
07	Connector Repeatability	Para 6 of this specification	Attenuation drift	Table 1	Δ Att	± 0.05 ± 0.5		dB or % (2)
08	Operating Life	Para 13.2.12 of Generic specification and table 3 and 4 of this specification	Initial measurements Attenuation Final measurement Visual Examination Attenuation drift	Table 1 No damage Table 1	Att - Δ Att	Record values - ± 0.10 ± 1		- - dB or % (2)
09	RF leakage	Para 13.2.13 of Generic specification	RF leakage	Para 13.2.13	E	-	-85	DB
10	Peak power	Para 13.2.14 of Generic specification and table 2 of this specification	Final measurement Attenuation	Table 1	Att	Table 1		
11	Permanence of marking	Para 13.2.16 of Generic specification	Final measurement Visual Examination	No corrosion or obliteration of marking	-	-		-

Notes:

- (1) The tests in this table refer to either para 11 and 12 of Generic specification and shall be used as applicable
- (2) Whichever is greater
- (3) Or ± 0.1 dB whichever is greater.