

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD



**Radio-frequency connectors –
Part 43: Sectional specification for RBMA series blind mating RF coaxial
connectors**



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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RADIO-FREQUENCY CONNECTORS –

Part 43: Sectional specification for RBMA series blind mating RF coaxial connectors

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IEC-PAS 61169-43 has been processed by subcommittee 46F: RF and microwave passive components, of IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
46F/151/PAS	46F/158/RVD

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61169 series, under the general title: *Radio-frequency connectors*, can be found on the IEC website.

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RADIO-FREQUENCY CONNECTORS –

Part 43: Sectional specification for RBMA series blind mating RF coaxial connectors

1 Scope

RBMA series connectors with characteristic impedance 50 Ω are normally used in microwave, telecommunication, wireless and other fields, connecting with RF cables or micro-strips. The operating frequency limit is up to 12,4 GHz.

This PAS provides information and rules for preparation of detail specification of RBMA series blind mating RF connectors together with the pro forma blank detail specification.

It also prescribes mating face dimensions for general connectors - grade 2, dimensional details of standard test connectors - grade 0, gauging information and tests selected from IEC 61169-1, applicable to all detail specifications relating to RBMA series blind mating RF connectors.

This PAS indicates recommended performance characteristics to be considered when writing a detail specification and it covers test schedules and inspection requirements for assessment levels M and H.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61169-1:1992, *Radio-frequency connectors – Part 1: Generic specification – General requirements and measuring methods*¹⁾

Amendment 1 (1996)

Amendment 2 (1997)

3 Mating face and gauge information

Metric dimension are original dimensions.

All undimensioned pictorial configurations are for reference purpose only.

¹⁾ There exists a consolidated edition 1.2 (1998) that comprises IEC 61169-1:1992, its Amendment 1:1996 and its Amendment 2:1997.

3.1 Dimensions – General connectors – Grade 2

3.1.1 Connector with pin-centre contact

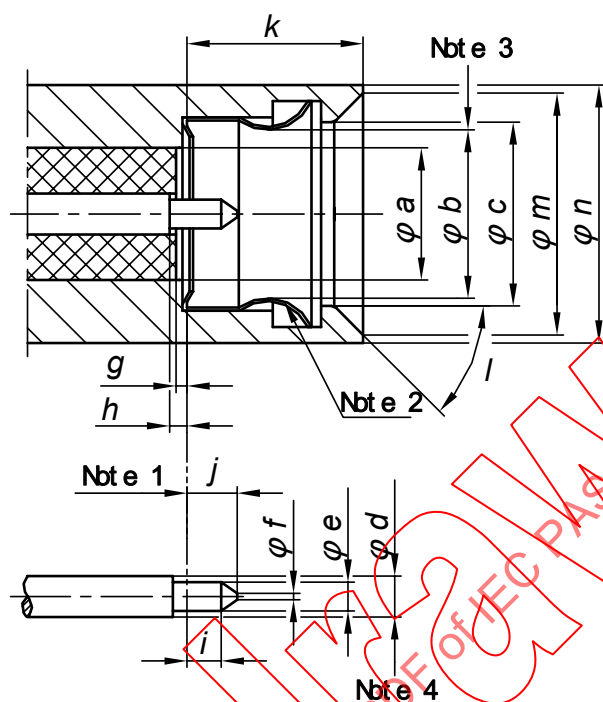


Figure 1 – Connector with pin- centre contact (G2)
(for dimensions and notes, see Table 1)

Table 1 – Dimensions of connector with pin-centre contact

Ref.	mm		Notes
	Min.	Max.	
a	--	4,18	
b	--	--	
c	5,55	5,60	
d	--	--	
e	0,90	0,94	
f	--	0,30	
g	0,00	0,25	
h	0,00	0,25	
i	1,27	--	
j	--	2,54	
k	5,45	5,55	
l	42°	48°	Angle
m	7,40	7,60	
n	8,00	--	

NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Spring fingers, the structure is optional.

NOTE 3 Dimension must meet mechanical performance requirements.

NOTE 4 The diameter is chosen upon the assumption that the PTFE dielectric has a dielectric constant of 2,02 to give an impedance of 50 Ω.

3.1.2 Connector with socket-centre contact

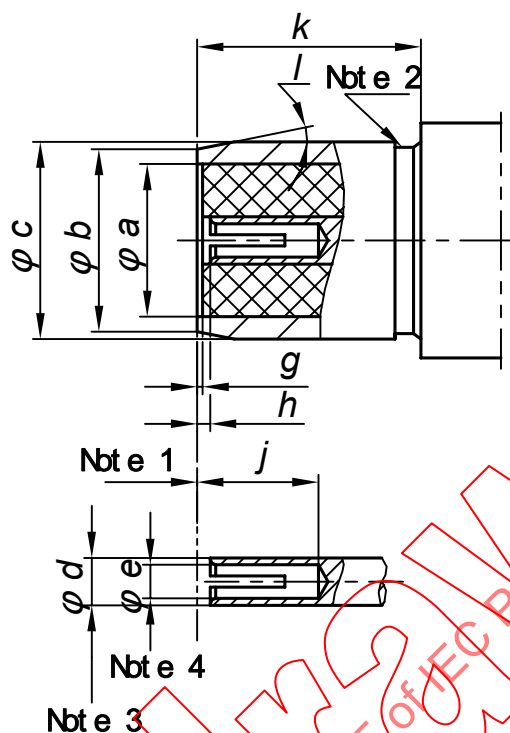


Figure 2 – Connector with socket-centre contact
(for dimensions and notes, see Table 2)

Table 2 – Dimensions of connector with socket-centre contact

Ref.	mm		Notes
	Min.	Max.	
a		4,18	
b	4,85	4,95	
c	5,31	5,36	
d	--	--	
e	--	--	
g	0,00	0,25	
h	0,00	0,25	
j	2,00	--	
k	5,60	--	
l	8°	12°	Angle

NOTE 1 Mechanical and electrical reference plane,.

NOTE 2 Design and location of the seal feature is optional, but must meet environmental performance requirements when mating interface separation is not more than 0,38 mm.

NOTE 3 The diameter is chosen upon the assumption that the PTFE dielectric has a dielectric constant of 2,02 to give an impedance of 50 Ω.

NOTE 4 Design for slotting optional, and should meet electrical and mechanical requirements, when mating with $\phi 0,90 \sim \phi 0,94$ mm pin.

3.2 Gauges

3.2.1 Gauge pin for socket-centre contact

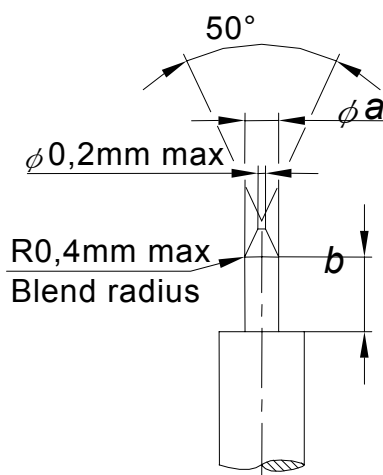


Figure 3 – Gauge pin for socket-centre contact
(for dimensions and notes, see Table 3)

Table 3 – Dimensions of gauge pin for socket-centre contact

Ref.	Gauge A		Gauge B	
	Maximum material for sizing purposes		Minimum material for measurement of retention force	
	mm		mm	
	Min.	Max.	Min.	Max.
<i>a</i>	0,940	0,945	0,899	0,902
<i>b</i>	0,76	1,14	1,27	1,90
Material: steel, polished.				
Surface roughness: Ra = 0,4 µm maximum on the cylindrical surface of length <i>b</i> .				

3.2.1.1 Test procedure

The gauge A shall be inserted into the socket-centre contact three times with a minimum depth of 0,76 mm. This is a sizing operation and should only be carried out when the socket-centre contact is removed from the connector.

After this, the gauge B shall have a withdrawal force of 0,28 N minimum after inserted into socket-centre contact. The contact shall retain the mass of the gauge in a vertical downward position. This test also shall be carried out on connector when the socket-centre contact is not removed.

3.2.2 Gauge for outer contact of connector with pin-centre contact

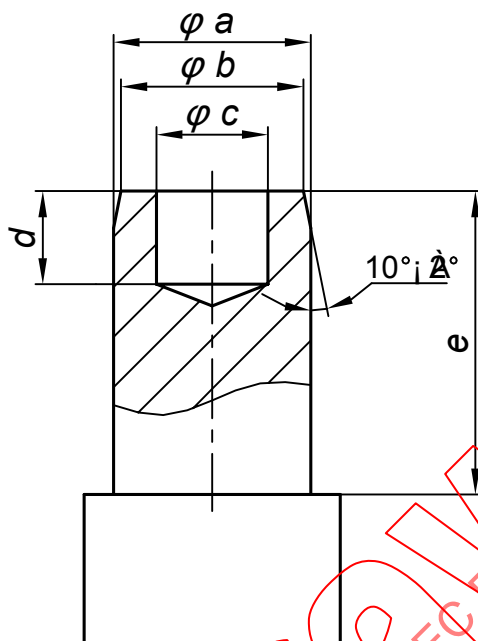


Figure 4 – Gauge for outer contact of connector with pin-centre contact
(for dimensions and notes, see Table 4)

Table 4 – Gauge for outer contact of connector with pin-centre contact

Ref.	Gauge A		Gauge B	
	Maximum material for sizing purposes		Minimum material for measurement of retention force	
	Mass of gauge: 56 g +2 g			
	mm		mm	
	Min.	Max.	Min.	Max.
a	5,360	5,365	5,305	5,310
b	4,85	4,95	4,85	4,95
c	2,50	--	2,50	--
d	4,00	--	4,00	--
e	5,60	--	5,60	--
Material: steel, polished.				
Surface roughness: Ra ≤ 0,4 µm on the cylindrical surface of length e.				

3.2.2.1 Test procedure

The gauge A shall be inserted into the outer contact three times. This is a sizing operation.

After this, the gauge B shall have a withdrawal force of 0,56 N minimum after inserted into outer contact. The contact shall retain the mass of the gauge in a vertical downward position.

3.3 Dimensions- standard test connectors – Grade 0

3.3.1 Connector with pin-centre contact

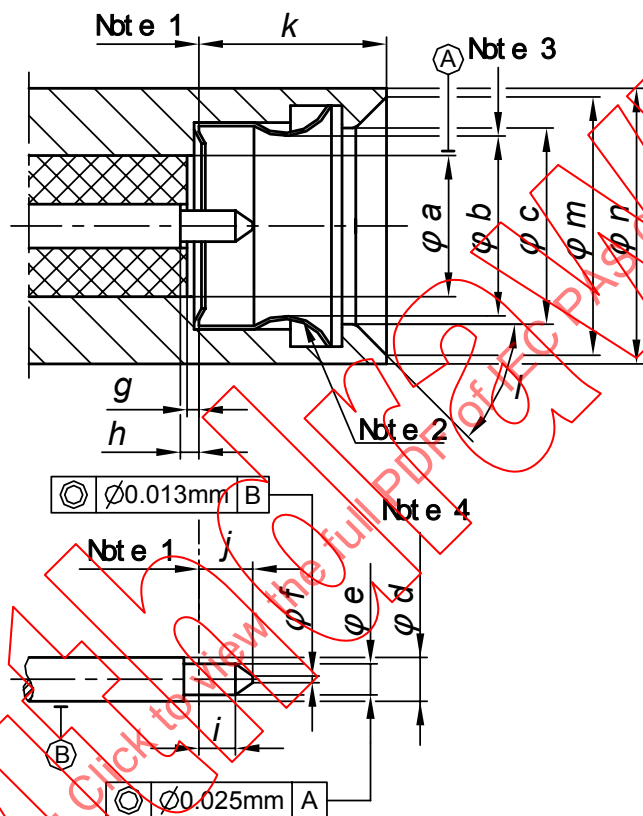


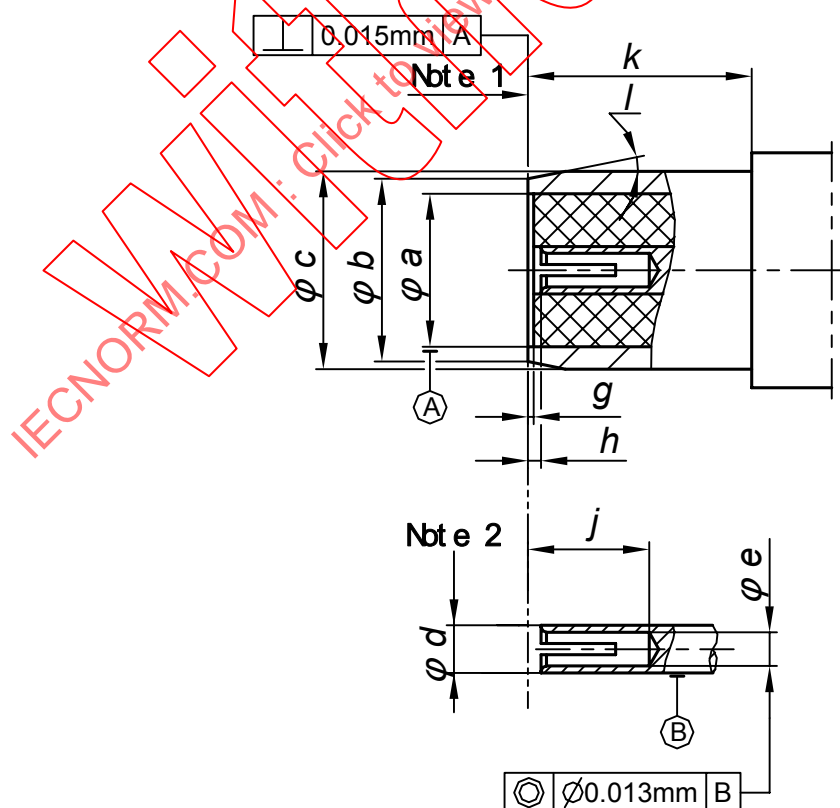
Figure 5 – Connector with pin-centre contact (G0)
(for dimensions and notes, see Table 5)

Table 5 – Dimensions of connector with pin-centre contact (G0)

Ref.	mm		Notes
	Min.	Max.	
<i>a</i>	4,10	4,13	
<i>b</i>	--	--	
<i>c</i>	5,55	5,60	
<i>d</i>	1,27 nominal		
<i>e</i>	0,902	0,927	
<i>f</i>	--	0,30	
<i>g</i>	0,00	0,15	
<i>h</i>	0,00	0,15	
<i>i</i>	1,27	1,37	
<i>j</i>	2,03	2,29	
<i>k</i>	5,45	5,55	
<i>l</i>	42°	48°	Angle
<i>m</i>	7,40	7,60	
<i>n</i>	8,00	--	

NOTE 1 Mechanical and electrical reference plane.
 NOTE 2 Spring fingers, the structure is optional.
 NOTE 3 Dimension must meet mechanical performance requirements.
 NOTE 4 The diameter is chosen upon the assumption that the PTFE dielectric has a dielectric constant of 2,02 to give an impedance of $50 \Omega \pm 0,5 \Omega$.

3.3.2 Connector with socket-centre contact



**Figure 6 – Connector with socket-centre contact
(for dimensions and notes, see Table 6)**

Table 6 – Dimensions of connector with socket-centre contact

Ref.	mm		Notes
	Min.	Max.	
<i>a</i>	4,10	4,13	
<i>b</i>	4,85	4,95	
<i>c</i>	5,31	5,36	
<i>d</i>	1,27 nominal		
<i>e</i>	-	-	3
<i>g</i>	0,00	0,15	
<i>h</i>	0,00	0,15	
<i>j</i>	3,05	3,30	
<i>k</i>	5,60	--	
<i>l</i>	8°	12°	Angle

NOTE 1 Mechanical and electrical reference plane.

NOTE 2 The diameters are chosen upon the assumption that the PTFE dielectric has a dielectric constant of 2,02 to give an impedance of $50 \Omega \pm 0,5 \Omega$.

NOTE 3 Design for slotting optional, and should meet electrical and mechanical requirements. when mating with $\phi 0,902 \sim \phi 0,927$ mm pin.

3.4 General requirements for connector mounting in modules and on panels

3.4.1 Limits of permissible connector radial misalignment and axial misalignment

When designing the mounting arrangements for RBMA series connectors, it is essential that the disposition of individual pairs of connectors and their engagement is controlled within the following general limiting conditions.

3.4.1.1 Radial misalignment

The radial misalignment between engaging connectors refers to the concentricity error between diameter *c* of a connector with pin-centre contact and diameter *c* of a connector with socket-centre contact at the beginning and during the engagement (see 3.1).

A rigidly mounted connector with socket-centre contact and a rigidly mounted connector with pin-centre contact shall accept a radial misalignment within *aa* (0,095 mm) at the beginning and during the engagement.

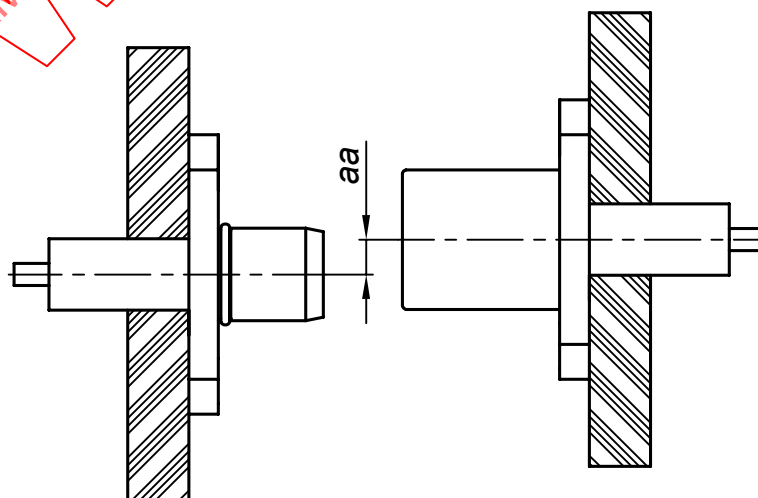


Figure 7 – A rigidly mounted connector with socket-centre contact and a rigidly mounted connector with pin-centre contact radial misalignment limits

A rigidly mounted connector with socket-centre contact and float-mounted connector with pin-centre contact shall accept a radial misalignment within bb (0,6 mm) at the beginning of the engagement.

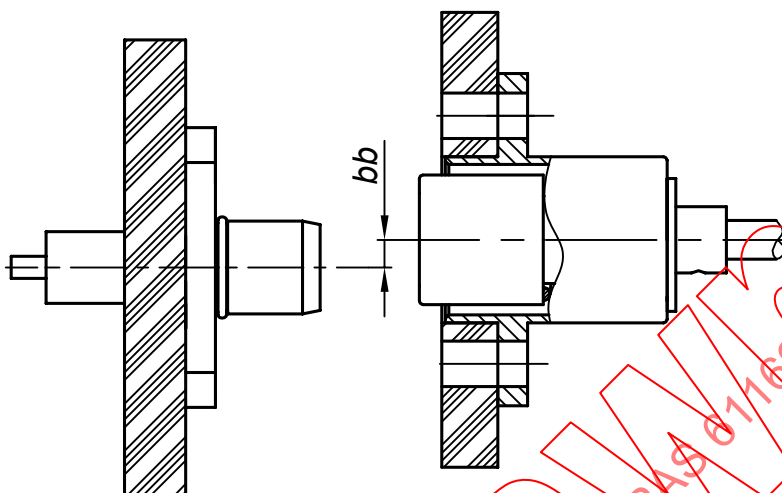


Figure 8 – A rigidly mounted connector with socket-centre contact and float-mounted connector with pin-centre contact radial misalignment limits

During the engagement, the floating connector shall be able to align itself with the rigidly mounted connector within cc (0,095 mm).

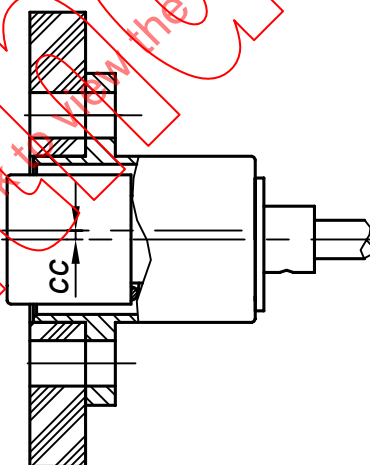


Figure 9 – A floating connector aligned with itself radial misalignment limits

3.4.1.2 Axial misalignment

- a) Rigidly mounted connector with socket-centre contact and rigidly mounted connector with pin-centre contact. To maintain the electrical and environmental performance, separation between the two reference planes should be within dd (0,38 mm). Further separation up to dd (0,76 mm) will degrade electrical performance and negate the environmental performance.

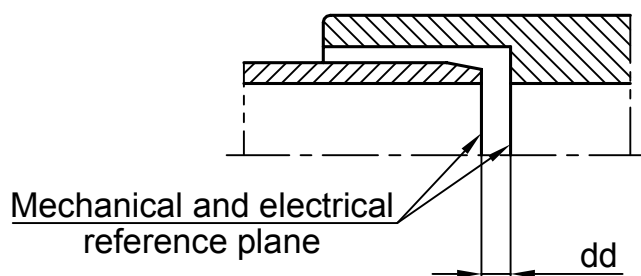


Figure 10 – Separation between the two reference planes

- b) Rigidly mounted connector with socket-centre contact and float-mounted connector with pin-centre contact, the float mounting allows a total of ee (2,20 mm) axial travel. The mounting arrangements should, however, ensure a minimum length of travel of ee (0,20 mm) to ensure that full length of engagement is maintained under operational conditions.

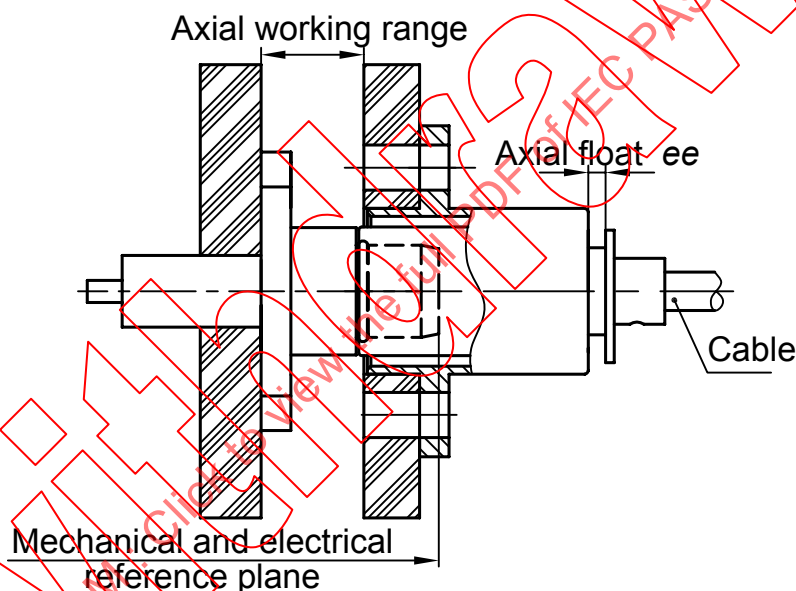


Figure 11 – Axial misalignment limits

3.4.2 Specific connector mounting details

In addition to details of the panel cut-out and maximum panel thickness, the detail specification shall specify the minimum center-line separation between adjacent connectors, in both the X and Y coordinates (if different).

4 Quality assessment procedure

4.1 General

The following subclauses provide recommended rating, performance and test conditions to be considered when writing a detail specification. They also provide an appropriate schedule of tests with minimum levels of conformance inspection sampling, together with the pro forma blank detail specification (BDS) and instructions for the preparation of a detail specification.

4.2 Rating and characteristics (see Clause 6 of IEC 61169-1)

The values indicated below are recommended for RBMA series RF coaxial connectors and are given for the writer of the detail specification. They are applicable for the condition when the connectors are fully mated.

Certain tests are listed without any recommended values being given. These tests will usually not be required. When these tests are required, appropriate values shall be entered in the detail specification at the discretion of the specification writer.

Table 7 – Rating and characteristics

Rating and characteristics	Test method IEC 61169-1 Subclause	Value	Remarks, deviations from standard test method
Electrical			
Nominal impedance		50 Ω	
Frequency range Grade 2 connectors		up to 12,4 GHz	Or upper frequency limit of cable
Reflection factor ¹⁾ Grade 2 connectors – For flexible cable – straight styles – right-angle styles – For semi-rigid and semi-flexible cable – straight styles – right-angle styles – Component mounting styles – Solder bucket and PCB mounting styles	9.2.1	$\leq 0,090 + 0,01f$ See DS $\leq 0,050 + 0,01f$ See DS See DS See DS	
Centre contact resistance ²⁾ – initial – after conditioning	9.2.3	$\leq 3,0 \text{ m}\Omega$ $\leq 6,0 \text{ m}\Omega$	
Outer conductor continuity ²⁾ – initial – after conditioning	9.2.3	$\leq 2,5 \text{ m}\Omega$ $\leq 3,0 \text{ m}\Omega$	
Insulation resistance ²⁾ – initial – after conditioning	9.2.5	$\geq 5\,000 \text{ M}\Omega$ $\geq 200 \text{ M}\Omega$	
Proof voltage at sea-level ³⁾⁴⁾ – non-cable styles – 96IEC50-3 – 96IEC50-2 – 96IEC50-1 – semi-rigid and semi-flexible 3,58 mm (0,141 in) diameter – semi-rigid and semi-flexible 2,16 mm (0,086 in) diameter – semi-rigid and semi-flexible 1,19 mm (0,047 in) diameter	9.2.6	1 000 V 750 V 500 V 350 V 1 000 V 750 V 500 V	

Rating and characteristics	Test method IEC 61169-1 Subclause	Value	Remarks, deviations from standard test method
Proof voltage at 4,4 kPa ³⁾⁴⁾ – non-cable styles – 96IEC50-3 – 96IEC50-2 – 96IEC50-1 – semi-rigid and semi-flexible 3,58 mm (0,141 in) diameter – semi-rigid and semi-flexible 2,16 mm (0,086 in) diameter – semi-rigid and semi-flexible 1,19 mm (0,047 in) diameter	9.2.6	200 V 150 V 100 V 75 V 200 V 150 V 100 V	4,4 kPa approximately equivalent to 20 km
Environmental test voltage at sea- level ³⁾⁴⁾ – non-cable styles – 96IEC50-3 – 96IEC50-2 – 96IEC50-1 – semi-rigid and semi-flexible 3,58 mm (0,141 in) diameter – semi-rigid and semi-flexible 2,16 mm (0,086 in) diameter – semi-rigid and semi-flexible 1,19 mm (0,047 in) diameter	9.2.6	330 V 200 V 175 V 100 V 330 V 200 V 175 V	
Environmental test voltage at 4,4 kPa ³⁾⁴⁾ – non-cable styles – 96IEC50-3 – 96IEC50-2 – 96IEC50-1 – semi-rigid and semi-flexible 3,58 mm (0,141 in) diameter – semi-rigid and semi-flexible 2,16 mm (0,086 in) diameter – semi-rigid and semi-flexible 1,19 mm (0,047 in) diameter	9.2.6	100 V 75 V 65 V 45 V 100 V 65 V 45 V	4,4 kPa approximately equivalent to 20 km
Screening effectiveness (straight cables only) ⁷⁾	9.2.8	≥ 60 dB, at 1 GHz	
Discharge test (corona effect)	9.2.9	See DS	Extinction voltage
Mechanical			
Gauge retention force (resilient contacts) – centre contacts – outer contacts	9.3.4	≥ 0,28 N ≥ 0,56 N	
Centre contact captivation – axial force – torque	9.3.5	≥ 22 N See DS	Interface dimensions shall remain as specified.

Rating and characteristics	Test method IEC 61169-1 Subclause	Value	Remarks, deviations from standard test method
Engagement and separation – Engagement – Separation	9.3.6	≤13,3 N 0,56 N~6,7N	
Mechanical tests on cable fixing – cable rotation (nutation) – cable pulling – cable bending – cable torsion	9.3.7.2 9.3.8 9.3.9 9.3.10	See DS See DS See DS See DS	
Tensile strength of coupling mechanism	9.3.11	na ⁶⁾	
Bending moment	9.3.12	na ⁶⁾	
Vibration	9.3.3	100 m/s ² 10 Hz to 2 000 Hz	10 g _n
Shock	9.3.14	500 m/s ² 1/2 sine wave 11 ms	50 g _n
Environmental			
Climatic category	9.4.2	55/125/21	
Sealing non-hermetic	9.4.5.1	na ⁶⁾	
Hermetic	9.4.5.2	na ⁶⁾	
Salt mist	9.4.6	48 h spray	
Endurance			
Mechanical endurance	9.5	500 operations	
High temperature endurance ⁷⁾	9.6	250 h at 125 °C	
¹⁾ These values apply to basic connector. In practice, these may be influenced by the cable used and reference should always be made to the actual values given in the detail specification. ²⁾ Values for a single pair of connectors. ³⁾ Voltages are r.m.s. values of AC at 40 Hz to 65 Hz, unless otherwise specified. ⁴⁾ Some cables usable with these connectors have ratings lower than the values given here. ⁵⁾ For certain connectors, the upper temperature limit is restricted by the cable characteristics. Reference should be made to the relevant cable specification. When semi-rigid and semi-flexible cables are used, the upper temperature is limited to 115 °C maximum. ⁶⁾ na -not applicable. ⁷⁾ When interfaces are fully mated.			

[illegible]

4.3.2 Periodic tests

There are no group C tests for levels H and M.

Table 9 – Periodic tests

	Test method IEC61169-1 Subclause	Assessment level M(higher)				Assessment level H(lower)			
		Test required	Number of specimens	Permit- ted failures per group	Period	Test requi- red	Number of speci- mens	Permit- ted failures per group	Period
Group D1 ^{d)} Solderability – connector assemblies	9.3.2.1.1	ia	6	0	3 years	ia	3	0	3 years
Resistance to soldering heat	9.3.2.1.2	ia				ia			
Mechanical tests on cable fixing – cable rotation (nutation) – cable pulling – cable bending – cable torsion	9.3.7.2 9.3.8 9.3.9 9.3.10	ia ia ia ia				ia			
Bending moment	9.3.12	ia				ia			
Strength of coupling mechanism	9.3.11	ia				ia			
Group D2 ^{d)} Contact resistance, Outer conductor and screen continuity, Centre conductor continuity Bump Vibration Shock Salt mist	9.2.3 9.3.13 9.3.3 9.3.14 9.4.6	a a ³⁾ a a a	6	0	3 years	a	3	0	3 years
Group D3 Dimensions piece part and materials	9.1.3	a	¹⁾	0	3 years	a	¹⁾	0	3 years
Group D4 ^{d)} Mechanical endurance High temperature endurance	9.5 9.6	a a	6	0	3 years	a	3	0	3 years

	Test method IEC61169-1 Subclause	Assessment level M(higher)				Assessment level H(lower)			
		Test required	Number of specimens	Permit- ted failures per group	Period	Test requi- red	Number of speci- mens	Permit- ted failures per group	Period
Group D5 ^{d)} Reflection factor	9.2.1	ia	6	0	3 years	ia	3	0	3 years
Screening effectiveness	9.2.8	ia							
Water immersion	9.2.7	ia ³⁾							
Group D6 ^{d)} Contact captivation	9.3.5	ia	6	0	3 years		3	0	3 years
Discharge test (corona)	9.2.9	a							
Rapid change of temperature	9.4.4	a							
Climatic sequence	9.4.2	a							
Group D7 ^{d)} Resistance to solvents and contamination fluids	9.7	a ³⁾	1 ²⁾	0	3 years		1 ²⁾	0	3 years
ABBREVIATIONS: a applicable ia test required (if technically applicable) d) destructive test -specimens shall not be returned to stock									
¹⁾ One set of piece parts each style and variant, unless using common piece parts. ²⁾ Group D7 -number of pairs for each solvent. ³⁾ See detail specification.									

4.4 Procedures

4.4.1 Quality conformance inspection

This shall consist of test groups A1 and B1 on a lot-by-lot basis.

4.4.2 Qualification approval and its maintenance

This still consists of three consecutive lots passing test groups A1 and B1 followed by selection of specimens from the lots as appropriate. These specimens shall successfully pass the specified periodic D tests.

5 Instructions for preparation of detail specifications

5.1 General

Detail specifications (DS) shall use the appropriate blank detail specification (BDS). The following pages comprise the BDS dedicated for use with series RBMA connectors. As such, it will already have entered on it information relating to:

- a) the basic specification number applicable to all the detail specifications covering connector styles of the series covered by the sectional specification;
- b) the connector series designation.

The specification writer should enter the details relating to the connector style to be covered as indicated. The numbers in brackets in the BDS correspond to the following indications which shall be given.

5.2 Identification of the detail specification

- (1) The name of the National Authorized Institution (NAI) under whose authority the DS is published and, if applicable, the organization from whom the DS is available.
- (2) The number allocated to the DS by the relevant National Authorized Institution immediately preceded by the ISO two letter national identity code or "XX" when the DS is produced by an IEC technical subcommittee.
- (3) The number and issue number of the IECQ generic specification and, when applicable, the sectional specification; also the national reference if different.
- (4) If different from the IEC QC number, the national number of DS, date of issue and any further information required by the national system, together with any amendment numbers.

5.3 Identification of the component

- (5) Enter the following details:
 - style: the style designation of the connector including type of fixing and sealing if applicable;
 - attachment: by deletion of the inapplicable options of cable /wire given for centre and outer conductors.
 - special features and markings: as applicable.
 - series designation: in bold characters/digits approximately 15 mm high.
 - Enter details of assessment level and the climatic category.
- (6) A reproduction of the outline drawing and details of the panel piercing (if applicable). It shall provide the maximum envelope dimensions, also the position of the reference plane and, in the case of a fixed connector, the position of the mounting plane, both relative to the front face of the connector.
- (7) Any maximum panel thickness limitations for fixed connectors shall be stated.
- (8) Particulars of all variants covered by the DS. As appropriate, the information shall include:
 - cable types (or sizes) applicable to each variant;
 - alternative plated or protective finishes;
 - details of alternative mounting flanges having either tapped or plain mounting holes;
 - details of alternative solder spills or solder buckets including, when applicable, those for use with microwave integrated circuit (MIC) components.

5.4 Performance

- (9) Performance data listing the most important characteristics of the connector in accordance with the requirements of the relevant sectional specification. Deviations from the minimum requirements shall be clearly indicated. Non-applicable parameters shall be marked “na”.

5.5 Marking, ordering information and related matters

- (10) Insert marking and ordering information as appropriate, together with details of related documents and any invoked structural similarity.

5.6 Selection of tests, test conditions and severities

- (11) “na” shall be used to indicate non-applicable tests. All tests marked “a” by the detail specification writer shall be mandatory.

When using the normal procedure with a dedicated BDS, the letter “a” – for applicable – shall be entered in the “test required” column against each of the tests indicated as being mandatory in the test schedule of the relevant sectional specification. Any additional test required at the discretion of the specification writer shall also be indicated by an “a”.

The specification writer shall also indicate, when necessary, details of deviations from the standard test methods and conditions, including any relevant deviations given in the test schedule of the sectional specification.

The qualification approval and conformance inspection shall be such that the NSI shall be satisfied that they are appropriate and in line with those for other connectors within the system providing a reasonably comparable service.