

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

Radio-frequency connectors –
Part 35: Sectional specification – Radio frequency coaxial connectors of
type 2,92



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**Radio-frequency connectors –
Part 35: Sectional specification – Radio frequency coaxial connectors of
type 2,92**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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Radio frequency coaxial connectors of type 2,92****FOREWORD**

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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/98/PAS	46F/111/RVD

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RADIO-FREQUENCY CONNECTORS -Part 35: Sectional specification- Radio frequency coaxial connectors of type 2,92

1 Scope

This PAS is a sectional specification providing information and rules for preparation of detail specification of 2,92 series R.F coaxial connectors together with the pro forma blank detail specification.

2,92 series coaxial connectors with characteristic impedance 50Ω , 2,92 mm inner diameter of outer conductor and screw coupling, are used for millimeter wave applications, connecting with RF cables or microstrips. The operating frequency limit is up to 40 GHz.

It also prescribes mating face dimensions for high performance connectors - grade 1, dimensional detail of standard test connectors - grade 0, gauging information and tests selected from IEC 61169-1 applicable to all detail specifications relating to 2,92 series RF coaxial connectors.

This specification 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

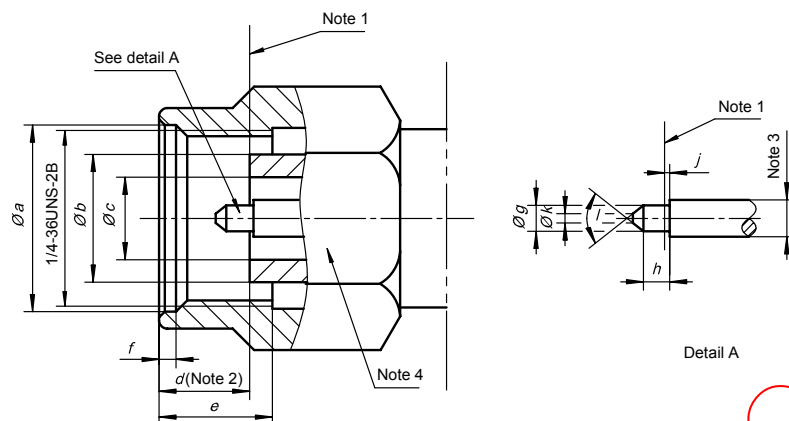
3.1 Dimensions – High performance connectors – Grade1

3.1.1 Connector with pin-centre contact

Inch dimensions 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, its Amendment 1 and its Amendment 2.



NOTE For dimensions and notes, see Table 1.

Figure 1 – Connector with pin-centre contact

Table 1 – Dimensions of connector with pin-centre contact

Ref.	mm		in	
	Min.	Max.	Min.	Max.
<i>a</i>	6,48	6,73	0,255	0,256
<i>b</i>	4,521	4,592	0,178 0	0,180 8
<i>c</i>	2,90	2,95	0,114	0,116
<i>d</i>	—	3,43	—	0,135
<i>e</i>	3,61	4,32	0,150	0,170
<i>f</i>	0,51	1,02	0,020	0,040
<i>g</i>	0,914	0,935	0,036 0	0,036 8
<i>h</i>	1,02	1,12	0,040	0,044
<i>j</i>	0,00	0,13	0,000	0,005
<i>k</i>	0,250	0,300	0,010 0	0,011 8
<i>l</i>	56°	64°	56°	64°

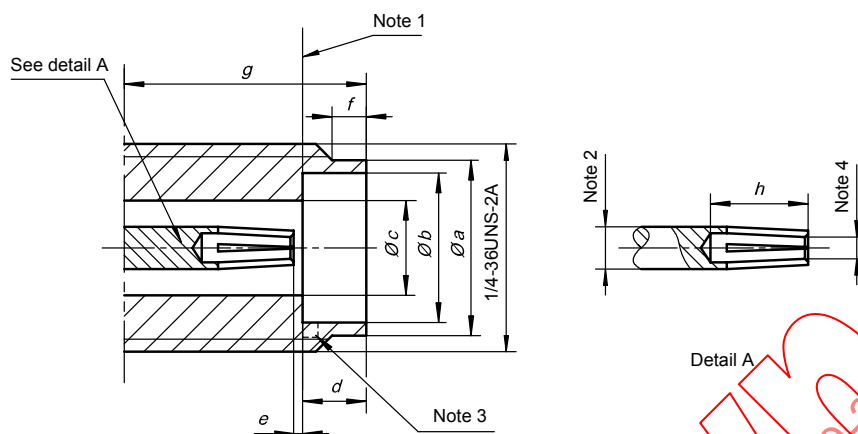
NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Nut fully forward.

NOTE 3 Diameter must be chosen to obtain a normal impedance of 50 Ω .

NOTE 4 Hexagon, width across two sides is 7,85 mm $\sim$ 8,00 mm (0,309 in $\sim$ 0,315 in), length of the plane is 3,18 mm (0,125 in) min.

3.1.2 Connector with socket-centre contact



NOTE For dimensions and notes, see Table 2.

Figure 2 – Connector with socket-centre contact

Table 2 – Dimensions of connector with socket-centre contact

Ref.	mm		in	
	Min.	Max.	Min.	Max.
a	5,28	5,46	0,208	0,215
b	4,60	4,65	0,181	0,183
c	2,90	2,95	0,114	0,116
d	1,91	1,96	0,075	0,077
e	0,00	0,13	0,000	0,005
f	0,51	1,02	0,020	0,040
g	5,54	—	0,218	—
h	2,65	—	0,104	—

NOTE 1 Mechanical and electrical reference plane.

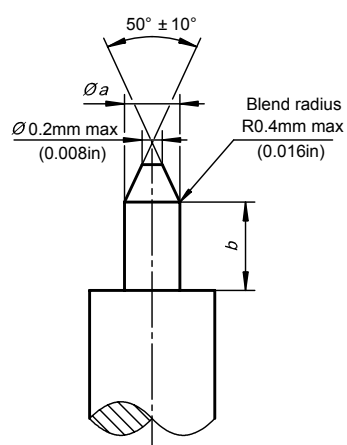
NOTE 2 Diameter must be chosen to obtain a normal impedance of 50 Ω .

NOTE 3 Design for root cut to be allowed. Chamfer not to be allowed.

NOTE 4 Design of centre contact is optional, but must meet electrical and mechanical performance requirements. when mating with $\varnothing$ 0,914 mm $\sim$ $\varnothing$ 0,935 mm ($\varnothing$ 0,0360 in $\sim$ $\varnothing$ 0,0368 in) gauge pin.

3.2 Gauges

3.2.1 Gauge pins for socket-centre contact



NOTE For dimensions and notes, see Table 3.

Figure 3 – Gauge pins for socket-centre contact

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

Gauge A					Gauge B			
Maximum material for sizing purposes					Minimum material for measurement of retention force			
					Mass of gauge: 28 g ± 1 g			
Ref.	mm		in		mm		in	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
<i>a</i>	0,935	0,940	0,036 8	0,037 0	0,909	0,914	0,035 8	0,036 0
<i>b</i>	0,76	1,14	0,029 9	0,044 9	1,27	1,90	0,050 0	0,074 8
Material: steel, polished, surface roughness: Ra=0,4 µm (16 µin) maximum.								

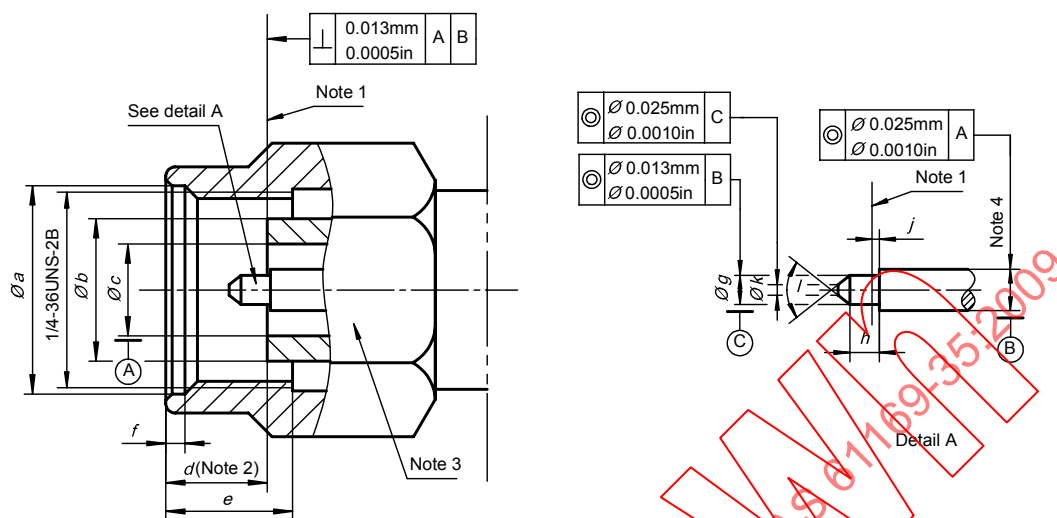
3.2.2 Test procedure

The gauge A shall be inserted into the socket-centre contact three times with a minimum depth of 0,76 mm (0,029 9 in). 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 be 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.

3.3 Dimensions – Standard test connectors – Grade 0

3.3.1 Connector with pin-centre contact



NOTE For dimensions and notes, see Table 4.

Figure 4 – Connector with pin-centre contact

Table 4 – Dimensions of connector with pin-centre contact

Ref.	mm		in	
	Min.	Max.	Min.	Max.
a	6,48	6,73	0,255	0 256
b	4,521	4,592	0,178	0,180
c	2,91	2,93	0,114 5	0,115 3
d	—	3,43	—	0,135
e	3,81	4,32	0,150	0,170
f	0,51	1,02	0,020	0,040
g	0,914	0,935	0,036 0	0,036 8
h	1,02	1,12	0,040	0,044
j	0,00	0,075	0,000	0,005
k	0,250	0,300	0,010 0	0,011 8
l	56°	64°	56°	64°

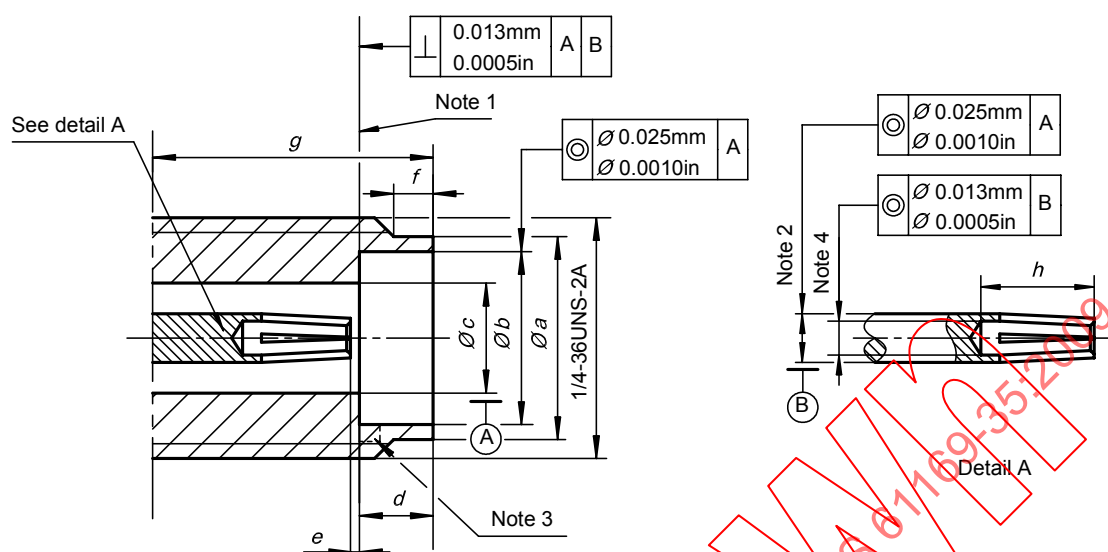
NOTE 1 Mechanical and electrical reference plane, surface roughness: $R_a = 0,8 \mu\text{m}$ (32 μin) maximum.

NOTE 2 Nut fully forward.

NOTE 3 Hexagon, width across two sides is 7,85 mm ~8,00 mm (0,309 in ~ 0,315 in), length of the plane is 3,18 mm (0,125 in) min.

NOTE 4 Diameter must be chosen to obtain a normal impedance of $50 \Omega \pm 0,5 \Omega$.

3.3.2 Connector with socket-centre contact



NOTE For dimensions and notes, see Table 5.

Figure 5 – Connector with socket-centre contact

Table 5 – Dimensions of connector with socket-centre contact

Ref.	mm		in	
	Min.	Max.	Min.	Max.
a	5,28	5,46	0,208	0,215
b	4,60	4,65	0,181	0,183
c	2,91	2,93	0,114 5	0,115 3
d	1,91	1,96	0,075	0,077
e	0,80	0,075	0,000	0,005
f	0,51	1,02	0,020	0,040
g	5,54	—	0,218	—
h	2,65	—	0,104	—

NOTE 1 Mechanical and electrical reference plane, surface roughness: $R_a = 0,8 \mu\text{m}$ (32 μin) maximum.

NOTE 2 Diameter must be chosen to obtain a normal impedance of $50 \Omega \pm 0,5 \Omega$.

NOTE 3 Design for root cut to be allowed. Chamfer not to be allowed.

NOTE 4 Design of centre contact is optional, but should meet electrical and mechanical performance requirements, when mating with $\varnothing 0,914 \text{ mm} \sim \varnothing 0,935 \text{ mm}$ ($\varnothing 0,0360 \text{ in} \sim \varnothing 0,0368 \text{ in}$) gauge pin.

4 Quality assessment procedures

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 2,92 series RF 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 6 – Rating and characteristics

Rating and characteristics	Test method IEC 61169-1 subclause	Values	Remarks including any deviations from standard test method
Electrical			
Nominal impedance		50 Ω	
Frequency range			
Grade 1 connectors		DC~40 GHz	Or upper frequency limit of cable
Reflection factor ¹⁾	9.2.1	DC~18 GHz:	
General connectors		0,050 1 max	
- straight styles		18 GHz ~26,5 GHz	
		0,063 1 max	
		26,5 GHz ~40 GHz	
		0,125 9 max	
- right-angle styles		See DS	
- component mounting styles		See DS	
- solder bucket and PCB mounting styles		See DS	
Centre contact resistance ²⁾	9.2.3		
- initial		$\leq 3,0 \text{ m}\Omega$	
- after conditioning		$\leq 4,0 \text{ m}\Omega$	
Outer conductor continuity ³⁾	9.2.3		
- initial		$\leq 2,0 \text{ m}\Omega$	
- after conditioning		$\leq 3,0 \text{ m}\Omega$	
Insulation resistance	9.2.5		
- initial		$\geq 5\,000 \text{ M}\Omega$	
- after conditioning		$\geq 200 \text{ M}\Omega$	
Proof voltage at sea-level ^{3) 4)}	9.2.6		
- uncabled styles		750 V	
- semi-rigid 0,118 in diameter		750 V	
- semi-rigid and semi-flexible 0,086 in diameter		750 V	
- semi-rigid and semi-flexible 0,047 in diameter		500 V	
Proof voltage at 4,4 kPa ^{3) 4)}	9.2.6		
- uncabled styles		150 V	4,4 kPa approximately equivalent to 20 km
- semi-rigid 0,118 in diameter		150 V	
- semi-rigid and semi-flexible 0,086 in diameter		150 V	
- semi-rigid and semi-flexible 0,047 in diameter		100 V	

Rating and characteristics	Test method IEC 61169-1 subclause	Values	Remarks including any deviations from standard test method
Environmental test voltage at sea level ^{3) 4)} - uncabled styles - semi-rigid 0,118 in diameter - semi-rigid and semi-flexible 0,086 in diameter - semi-rigid and semi-flexible 0,047 in diameter Environmental test voltage at 4,4 kPa ^{3) 4)} - uncabled styles - semi-rigid 0,118 in diameter - semi-rigid and semi-flexible 0,086 in diameter - semi-rigid and semi-flexible 0,047 in diameter Screening effectiveness (straight cables only) ⁷⁾ Discharge test (corona effect)	9.2.6 9.2.6 9.2.8 9.2.9	250 V 250 V 250 V 175 V 65 V 65 V 65 V 45 V ≥ 100 dB at 1 GHz See DS	 4,4 kPa approximately equivalent to 20 km Extinction voltage
Mechanical Gauge retention force (resilient contacts) - centre Centre contact captivation - axial force - torque Engagement and separation - coupling nut friction Coupling moment - normally moment - moment resistance Technical tests on cable fixing - cable rotation (rotation) - cable pulling - cable bending - cable torsion Tensile strength of coupling mechanism Bending moment Vibration Shock	 9.3.4 9.3.5 9.3.6 9.3.6 9.3.7.2 9.3.8 9.3.9 9.3.10 9.3.11 9.3.12 9.3.3 9.3.14	≥ 0,28 N 20 N 0,01 N·m max ≤ 0,23 N·m 0,8 ~ 1,1 N · m 1,69 N · m See DS See DS See DS See DS ≥ 100 N na ⁶⁾ 150 m/s ² 10 ~ 2 000 Hz 500 m/s ² 1/2 sine wave 11 ms	 Maximum displacement 0,076 mm in each direction Can be carried out by hand 15 g _n 50 g _n
Environmental Climatic category Sealing non-hermetic Hermetic	9.4.2 9.4.5.1 9.4.5.2	55/125/21 ≤ 100 kPa·cm ³ /h ≤ 10 ⁻³ Pa·cm ³ /s	 100 kPa to 110 kPa differential 100 kPa to 110 kPa differential

Rating and characteristics	Test method IEC 61169-1 subclause	Values	Remarks including any deviations from standard test method
Salt mist	9.4.6	48 h spray	
Endurance			
Mechanical endurance	9.5	500 operations	
High temperature endurance ⁵⁾	9.6	1 000 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 a.c. 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.			

4.3.1 Acceptance tests

	Test method IEC 61169-1 subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test required	IL	AQL %	Period	Test required	IL	AQL %	Period
Group A1 Visual examination	9.1.2	a	II	1,0	Lot by Lot	a	S-3	1,5	Lot By Lot
Group B1 Outline dimension	9.1.3.1	a	S-4	0,40		a	S-3	4,0	
Mechanical compatibility	9.1.3.3	a	II	1,0		a	S-3	1,5	
Engagement and separation	9.3.6	a	S-4	0,40		a	S-3	1,5	
Gauge retention (resilient contacts)	9.3.4	ia	II	1,0		ia	S-3	1,	
Sealing non-hermetic	9.4.5.1	ia	II	0,65		ia	S-3	1,0	
hermetic	9.4.5.2	ia	II	0,015		ia	II	0,025	
Voltage proof	9.2.6	a	S-4	0,40		a	II	4,0	
Solderability (d)	9.3.2.1.1	ia	S-4	0,40		ia	S-3	4,0	
Insulation resistance	9.2.5	a	S-4	0,40		a	S-3	4,0	

For the symbols, abbreviations and procedures, see the end of Table 8.

4.3.2 Periodic tests

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

Table 8 – Periodic tests

	Test method IEC61169-1 subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test required	Number of specimens	Permitted failures per group ¹⁾	Period	Test required	Number of specimens	Permitted failures per group ¹⁾	Period
Group D1 (d)									
Solderability - connector assemblies	9.3.2.1.1	ia	6	1	3 years	ia	3	1	3 years
Resistance to soldering heat	9.3.2.1.2	ia				ia			
Mechanical tests on cable fixing									
-cable rotation (nutation)	9.3.7.2	ia				ia			
-cable pulling	9.3.8	ia				ia			
- cable bending	9.3.9	ia				ia			
- cable torsion	9.3.10	ia				ia			
Bending moment	9.3.12	a	6	1	3 years	a	3	1	3 years
Strength of coupling mechanism	9.3.11	ia				ia			
Group D2 (d)									
Contact resistance	9.2.3	a				a			
Outer conductor and screen continuity	9.2.3								
Centre conductor continuity									
Bump	9.3.13	na				na			
Vibration	9.3.3	a				a			
Shock	9.3.14	a				a			
Damp heat, steady state	9.4.3	a				a			
Salt mist	9.4.6	a				a			

	Test method IEC61169-1 subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test required	Number of specimens	Permitted failures per group ¹⁾	Period	Test required	Number of specimens	Permitted failures per group ¹⁾	Period
Group D3 Dimensions piece part and materials	9.1.3.2	a	1 ²⁾	1	3 years	a	1 ²⁾	1	3 years
Group D4 (d) Mechanical endurance	9.5	a	6	1	3 years	a	3	1	3 years
High temperature endurance	9.6	a				a			
Sulphur dioxide	9.4.8	na				na			
Group D5 (d) Reflection factor	9.2.1	a	6	1	3 years	a	3	1	3 years
Screening effectiveness	9.2.8	a				a			
Water Immersion	9.2.7	ia				ia			
Group D6 (d) Contact captivation	9.3.5	ia	6	1	3 years	ia	3	1	3 years
Discharge test (corona effect)	9.2.9	a				a			
Rapid change of temperature	9.4.4	a				a			
Climatic sequence	9.4.2	a				a			
Group D7 (d) Resistance to solvents and contamina- ting fluids	9.7	na	1 ³⁾	1	3 years	na	1 ³⁾	1	3 years

1) For qualification approval a total of 2 failures only permitted for level H and 1 failure only permitted for level M from groups D1 to D7.

2) One set of piece parts each style and variant unless using common piece parts.

3) Group D7 - number of pairs for each solvent.

ABBREVIATIONS:

a - applicable.

na - not applicable.

ia - test required (if technically applicable).

(d) - destructive test - specimens shall not be returned to stock.

IL- inspection level.

AQL - acceptable quality level.

4.4 Procedures

4.4.1 Quality conformance inspection

This shall consist of test group A1 and B1 on a lot-by-lot basis and test group D1 to D7 on a periodic 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) writers shall use the appropriate BDS pro-forma. The following pages comprise the pro-forma BDS dedicated for use with 50 Ω type 2,92 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 type covered by the sectional specification;
- b) the connector series designation.

The specification writer should enter the details relating to the connector style/variant(s) to be covered as indicated. The numbers in brackets on the BDS pro-forma correspond to the following indications which shall be given.

5.1 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.

(6) Enter details of assessment level and the climatic category.

(7) 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(s) relative to the front face of the connector.

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.

5.2 Performance

(9) Performance data listing the most important characteristics of the connector taking into account the recommended values in 4.2 of this specification. Deviations from the minimum requirements shall be clearly indicated. Non-applicable parameters shall be marked 'na'.

5.3 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.

5.4 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 as in 4.3 of this specification. Any additional tests 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 test 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 national supervising inspectorate (NSI) shall be satisfied that they are appropriate and in line with those for other connectors within the system providing a reasonably comparable service.

5.5 Blank detail specification pro-forma for type 2,92 connector

The following pages contain the complete BDS pro-forma.

(1)		Page 1 of 10			
ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH GENERIC SPECIFICATION IEC 61169-1 SECTIONAL SPECIFICATION IEC 61169-35 NATIONAL REFERENCE		(4) ISSUE			
(5) Detail specification for Radio frequency coaxial connector of assessed quality			type 2,92		
Style:.....		Special features and markings			
Method of cable/wire+ attachment		centre conductor – solder/crimp+ outer conductor – solder/clamp/crimp + + delete as appropriate			
(6) Assessment level.....	Characteristic impedance 50 Ω	Climatic category...../...../...../			
(7) Outline and maximum dimensions		Panel piercing and mounting details			
(8) Variants					
Variant No.	Description of variant	61196 IEC			
01.....					
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Information about manufacturers who have components qualified to this detail specification is available through IECQ on-line certificate system.					