

# PUBLICLY AVAILABLE SPECIFICATION

## PRE-STANDARD

Radio-frequency connectors –  
Part 42: Sectional specification for CQN series quick lock RF coaxial connectors

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**Radio-frequency connectors –  
Part 42: Sectional specification for CQN series quick lock RF coaxial connectors**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE

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## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	4
1 Scope.....	5
2 Normative references.....	5
3 Mating face and gauge information.....	5
3.1 Dimensions-General connectors – Grade 2.....	5
3.1.1 Connector with pin-centre contact.....	5
3.1.2 Connector with socket-centre contact.....	8
3.2 Gauges.....	9
3.2.1 Gauge pins for socket-centre contact.....	9
3.2.2 Test procedure.....	10
3.3 Dimensions- standard test connectors – Grade 0.....	11
3.3.1 Connector with pin-centre contact.....	11
3.3.2 Connector with socket-centre contact.....	13
4 Quality assessment procedure.....	14
4.1 General.....	14
4.2 Rating and characteristics (see Clause 6 of IEC 61169-1).....	14
4.3 Test schedule and inspection requirements – Acceptance tests.....	17
4.3.1 Acceptance tests.....	17
4.3.2 Periodic tests.....	18
4.4 Procedures.....	20
4.4.1 Quality conformance inspection.....	20
4.4.2 Qualification approval and its maintenance.....	20
5 Instructions for preparation of detail specifications.....	20
5.1 General.....	20
5.2 Identification of the component.....	20
5.3 Performance.....	20
5.4 Marking, ordering information and related matters.....	21
5.5 Selection of tests, test conditions and severities.....	21
5.6 Blank detail specification pro-forma for type CQN connector.....	22
Figure 1 – Connector with pin-centre contact.....	6
Figure 2 – Connector with socket-centre contact.....	8
Figure 3 – Gauge pins for socket-centre contact.....	9
Figure 4 – Connector with pin-centre contact.....	11
Figure 5 – Connector with socket-centre contact.....	13
Table 1 – Dimensions of connector with pin-centre contact.....	7
Table 2 – Dimensions of connector with socket-centre contact.....	9
Table 3 – Dimensions of gauge pins for socket-centre contact.....	10
Table 4 – Dimensions of connector with pin-centre contact.....	12
Table 5 – Dimensions of connector with socket-centre contact.....	14
Table 6 – Rating and characteristics.....	15
Table 7 – Acceptance tests.....	17
Table 8 – Periodic tests.....	18

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**RADIO-FREQUENCY CONNECTORS –****Part 42: Sectional specification for CQN series  
quick lock RF coaxial connectors**

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IEC-PAS 61169-42 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/102/PAS	46F/113/RVD

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## RADIO-FREQUENCY CONNECTORS –

### Part 42: Sectional specification for CQN series quick lock RF coaxial connectors

#### 1 Scope

CQN series quick lock RF coaxial connectors with impedance 50  $\Omega$  are used in microwave, telecommunication, wireless and other fields, connecting with R.F. cables or micro-strips. The operating frequency limit is up to 11 GHz.

This PAS, which is a sectional specification, provides information and rules for the preparation of detail specifications for CQN series R.F. coaxial 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 CQN series connectors.

This specification indicates the 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*<sup>1)</sup>

Amendment 1 (1996)

Amendment 2 (1997)

#### 3 Mating face and gauge information

##### 3.1 Dimensions-General connectors – Grade 2

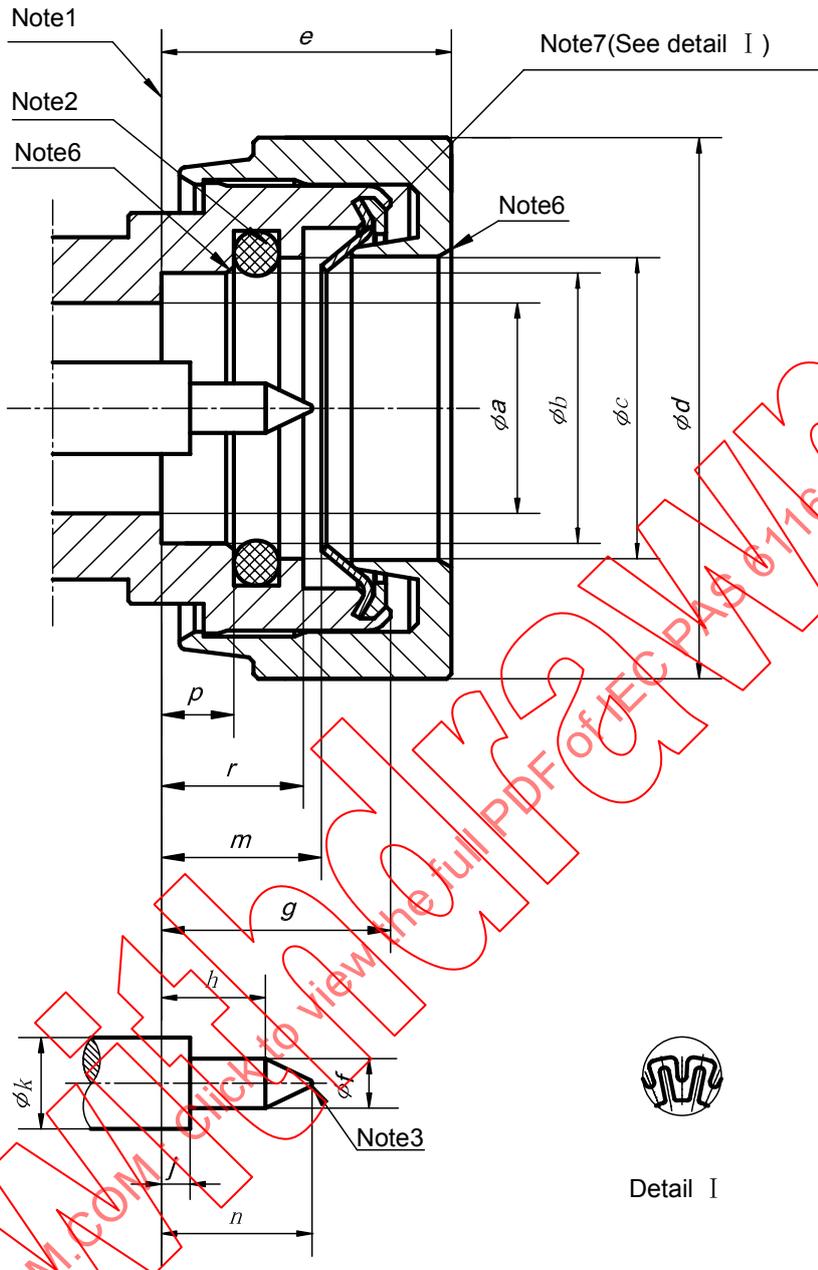
##### 3.1.1 Connector with pin-centre contact

Metric dimension are original dimensions.

All undimensioned pictorial configurations are for reference purpose only.

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<sup>1)</sup> 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		Notes
	Min.	Max.	
<i>a</i>	7,00 nominal		Note 4
<i>b</i>	9,05	—	
<i>c</i>	10,05	—	
<i>d</i>	—	19,00	
<i>e</i>	—	9,80	Note 5
<i>f</i>	1,60	1,68	
<i>g</i>	—	7,60	
<i>h</i>	2,72	4,00	
<i>j</i>	0,80	1,00	
<i>k</i>	—	—	Note 4
<i>m</i>	—	5,30	
<i>n</i>	5,00	6,28	
<i>p</i>	—	2,40	
<i>r</i>	—	4,70	

NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Design and location of the seal ring is optional, but should meet environmental requirements.

NOTE 3 Radius or angle, plane part is 0,25 mm max.

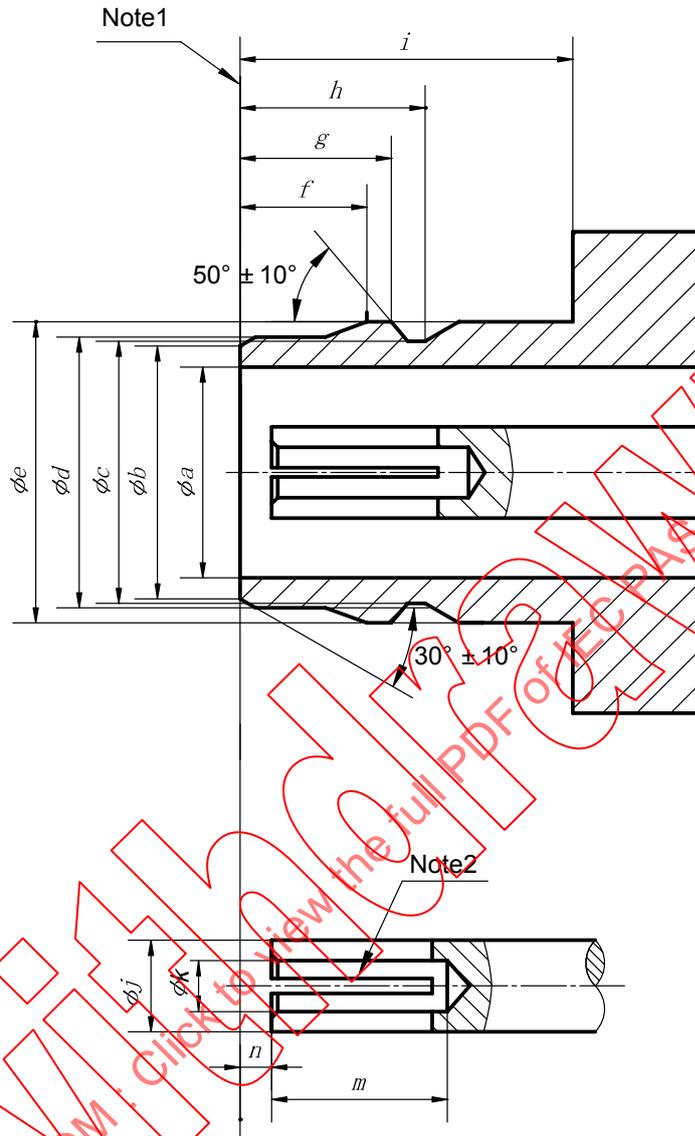
NOTE 4 Diameters are chosen to obtain a normal impedance of 50  $\Omega$  and meet electrical and mechanical requirements.

NOTE 5 Prefix locknut (maximal dimension).

NOTE 6 Chamfer.

NOTE 7 Design of spring is optional, but should meet mechanical performance requirements.

### 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		Notes
	Min.	Max.	
<i>a</i>	7,00 nominal		Note 3
<i>b</i>	8,30	8,50	
<i>c</i>	8,70	8,90	
<i>d</i>	8,90	9,00	
<i>e</i>	—	10	
<i>f</i>	4,20	4,25	
<i>g</i>	4,90	5,00	
<i>h</i>	6,15	6,25	
<i>i</i>	11,00	—	
<i>j</i>	—	—	Note 3
<i>k</i>	—	—	
<i>m</i>	5,33	—	
<i>n</i>	1,00	1,20	

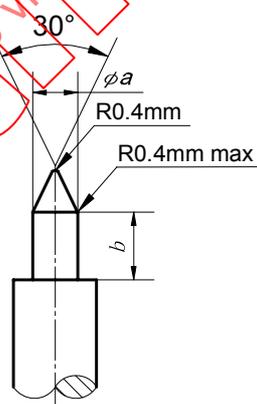
NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Design of centre contact is optional, but should meet electrical and mechanical requirements.

NOTE 3 Diameters are chosen to obtain a normal impedance of 50 Ω and meet electrical and mechanical performance requirements.

## 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 Maximum material for sizing purposes			Gauge B Minimum material for measurement of retention force Mass of gauge: 56 g ± 2 g	
Ref.	mm		mm	
	Min.	Max.	Min.	Max.
<i>a</i>	1,680	1,685	1,595	1,600
<i>b</i>	1,72	2,92	1,72	2,92
material: steel, polished, surface roughness: Ra=0,4 µm maximum				

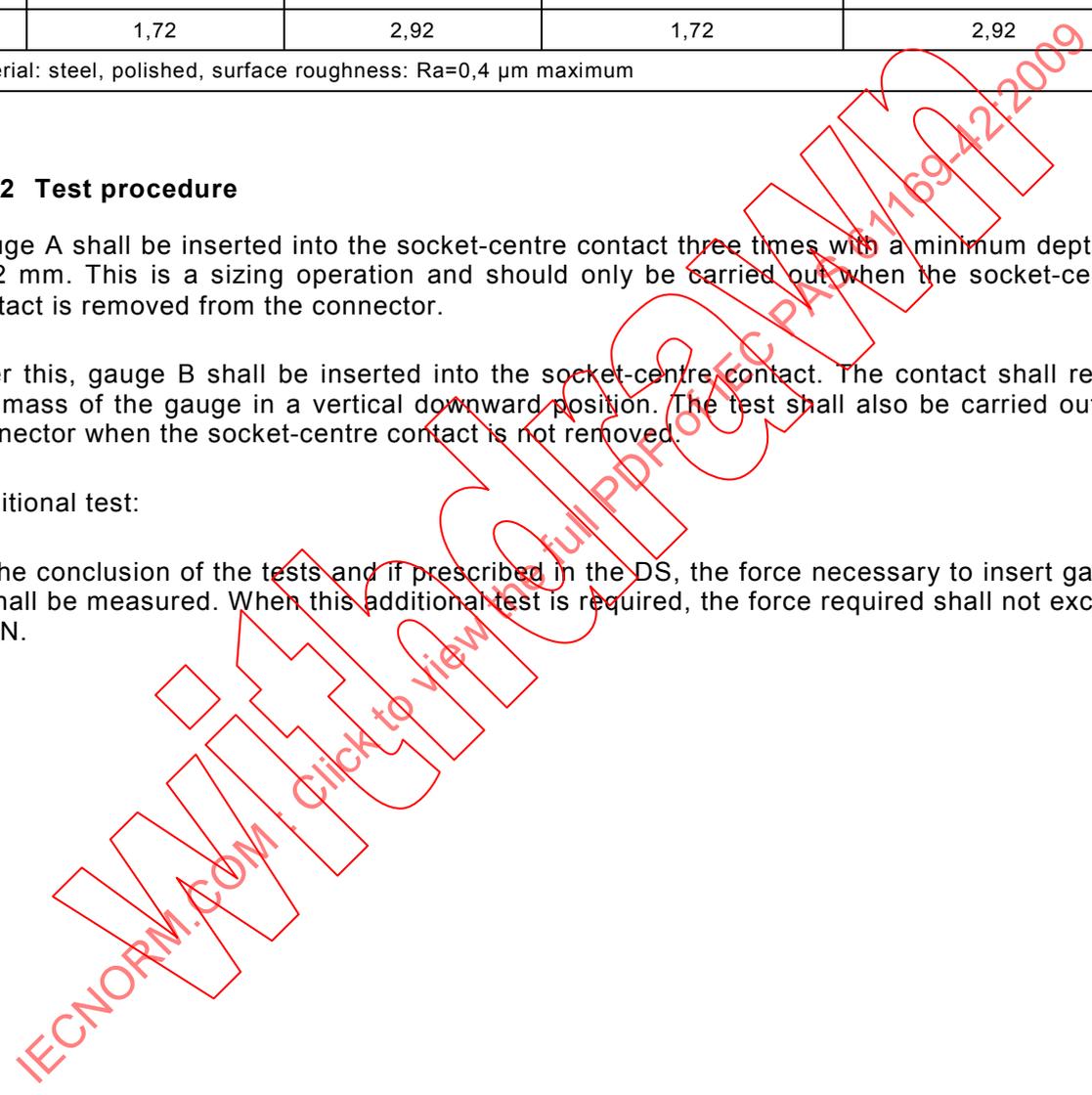
### 3.2.2 Test procedure

Gauge A shall be inserted into the socket-centre contact three times with a minimum depth of 1,72 mm. This is a sizing operation and should only be carried out when the socket-centre contact is removed from the connector.

After this, gauge B shall be inserted into the socket-centre contact. The contact shall retain the mass of the gauge in a vertical downward position. The test shall also be carried out on connector when the socket-centre contact is not removed.

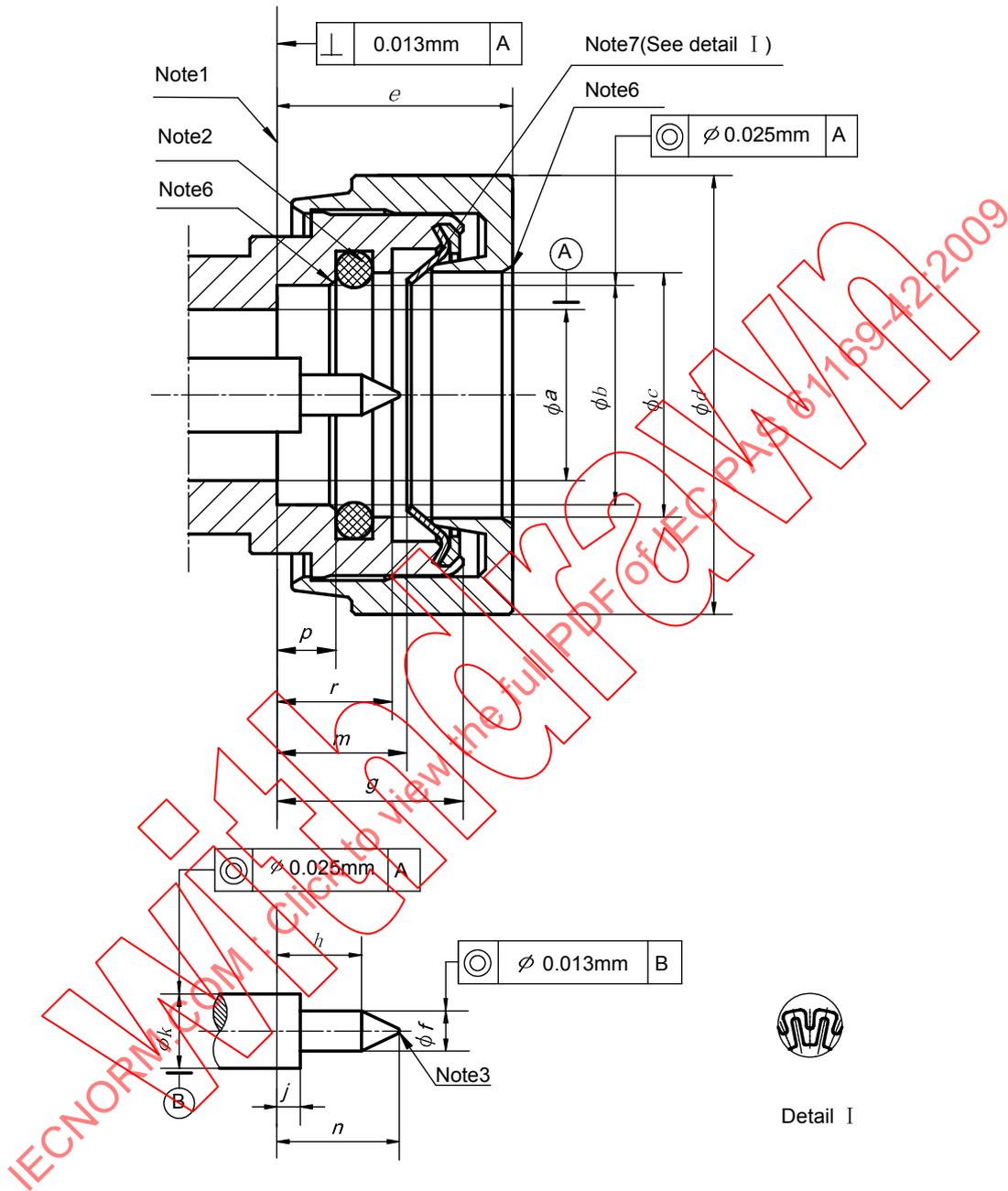
Additional test:

At the conclusion of the tests and if prescribed in the DS, the force necessary to insert gauge A shall be measured. When this additional test is required, the force required shall not exceed 9,0 N.



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		Notes
	Min.	Max.	
<i>a</i>	7,00 nominal		Note 4
<i>b</i>	9,05	—	
<i>c</i>	10,05	—	
<i>d</i>	—	19,00	
<i>e</i>	—	9,60	Note 5
<i>f</i>	1,64	1,66	
<i>g</i>	—	7,50	
<i>h</i>	3,00	3,80	
<i>j</i>	0,90	1,00	
<i>k</i>	—	—	Note 4
<i>m</i>	—	5,30	
<i>n</i>	5,30	6,00	
<i>p</i>	—	2,30	
<i>r</i>	—	4,60	

NOTE 1 Mechanical and electrical reference plane, surface roughness: Ra = 0,8 µm.

NOTE 2 Design and location of the seal ring is optional, but should meet environmental performance requirements.

NOTE 3 Radius or angle, plane part is 0,25 mm max.

NOTE 4 Diameters are chosen to obtain a characteristic impedance of  $50 \Omega \pm 0,5 \Omega$ .

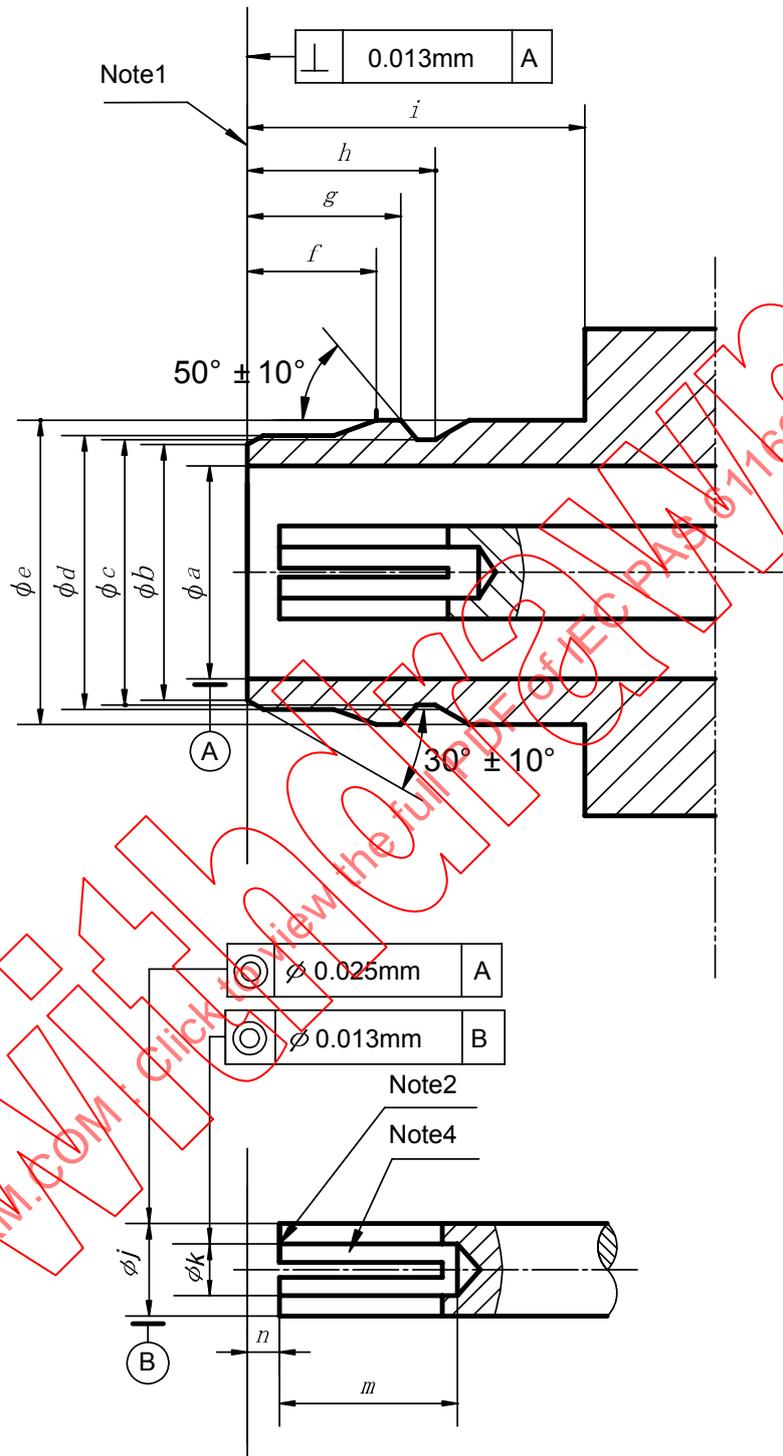
NOTE 5 Prefix locknut (maximal dimension).

NOTE 6 Chamfer.

NOTE 7 Design of spring is optional, but should meet mechanical performance requirements.



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		Notes
	Min.	Max.	
<i>a</i>	7,00 nominal		Note 3
<i>b</i>	8,35	8,45	
<i>c</i>	8,75	8,85	
<i>d</i>	8,90	8,95	
<i>e</i>	—	10,00	
<i>f</i>	4,20	4,25	
<i>g</i>	4,90	4,95	
<i>h</i>	6,15	6,20	
<i>i</i>	11,00	—	
<i>j</i>	—	—	Note 3
<i>k</i>	—	—	
<i>m</i>	5,33		
<i>n</i>	1,00	1,10	
NOTE 1 Mechanical and electrical reference plane, surface roughness: Ra=0,8 µm. NOTE 2 Remove flash carefully. NOTE 3 Diameters are chosen to obtain a normal impedance of 50 Ω ± 0,5 Ω and meet electrical and mechanical requirements. NOTE 4 Design of centre contact is optional, but should meet electrical and mechanical requirements.			

#### 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 CQN 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 deviations from standard test method
<b>Electrical</b>			
Nominal impedance		50 $\Omega$	
Frequency range		DC to 11GHz	Or upper frequency limit of cable
Reflection factor <sup>1)</sup>	9.2.1		
General connectors		DC to 3 GHz	
- straight styles		0,07 max. 3 GHz to 6 GHz 0,09 max. 6 GHz to 11 GHz 0,13 max.	
- right-angle styles		See DS	
- component mounting styles		See DS	
- solder bucket and PCB mounting styles		See DS	
Centre contact resistance <sup>2)</sup>	9.2.3		
- initial		$\leq 1,0$ m $\Omega$	
- after conditioning		$\leq 1,5$ m $\Omega$	
Outer conductor continuity <sup>2)</sup>	9.2.3		
- initial		$\leq 0,25$ m $\Omega$	
- after conditioning		$\leq 1,0$ m $\Omega$	
Insulation resistance	9.2.5		
- initial		$\geq 5\ 000$ M $\Omega$	
- after conditioning		$\geq 200$ M $\Omega$	
Proof voltage at sea-level <sup>3)4)</sup>	9.2.6		
- uncabled styles		2 500 V	
- semi-rigid 0,141 inch diameter		1 000 V	
- semi-rigid 0,086 inch diameter		750 V	
Proof voltage at 4,4 kPa <sup>3)4)</sup>	9.2.6		
- uncabled styles		450 V	4,4 kPa approximately equivalent to 20 km
- semi-rigid 0,141 inch diameter		450 V	
- semi-rigid 0,086 inch diameter		180 V	
Environmental test voltage at sea level <sup>3)4)</sup>	9.2.6		
- uncabled styles		1 000 V	
- semi-rigid 0,141 inch diameter		1 000 V	
- semi-rigid 0,086 inch diameter		400 V	
Environmental test voltage at 4,4 kPa <sup>3)4)</sup>	9.2.6		
- uncabled styles		200 V	4,4 kPa approximately equivalent to 20 km
- semi-rigid 0,141 inch diameter		200 V	
- semi-rigid 0,086 inch diameter		90 V	
Screening effectiveness (straight style only) <sup>7)</sup>	9.2.8	$\geq 90$ dB at 1 GHz	
Passive intermodulation		See DS	

Rating and characteristics	Test method IEC 61169-1 Subclause	Values	Remarks deviations from standard test method
Discharge test (corona effect)	9.2.9	See DS	Extinction voltage
Mechanical			
Gauge retention force (resilient contacts)			
- centre	9.3.4	≥0,56 N	
Centre contact captivation	9.3.5		Maximum displacement 0,25 mm in each direction
- axial force		28 N	
Engagement and separation	9.3.6	≤30 N	Can be carried out by hand
Technical tests on cable fixing			
- cable rotation (nutation)	9.3.7.2	See DS	
- cable pulling	9.3.8	See DS	
- cable bending	9.3.9	See DS	
- cable torsion	9.3.10	See DS	
Tensile strength of coupling mechanism	9.3.11	≥450 N	
Bending moment	9.3.12	na <sup>6)</sup>	
Vibration	9.3.3	100 m/s <sup>2</sup> 10 Hz ~ 2 000 Hz	10 g <sub>n</sub>
Shock	9.3.14	500 m/s <sup>2</sup> 1/2 sine wave 11 ms	50 g <sub>n</sub>
Environmental			
Climatic category	9.4.2	A 55/125/21 B 40/085/21	
Sealing non-hermetic	9.4.5.1	≤100 KPa · cm <sup>3</sup> /h	100 kPa ~ 110 kPa differential
Hermetic	9.4.5.2	≤10 <sup>-3</sup> Pa · cm <sup>3</sup> /s	100 kPa ~ 110 kPa differential
Salt mist	9.4.6	48 h spray	
Endurance			
Mechanical endurance	9.5	200 operations	
High temperature endurance <sup>5)</sup>	9.6	A: 200 h at 125 °C B: 250 h at 85 °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 Test schedule and inspection requirements – Acceptance tests

#### 4.3.1 Acceptance tests

**Table 7 – 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	a	S-3	1,5	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	By	a	S-3	1,5	By
Engagement and separation	9.3.6	a	S-4	0,40	Lot	a	S-3	1,5	Lot
Gauge retention (resilient contacts)	9.3.4	ia	II	1,0		ia	S-3	1,5	
Sealing - non-hermetic	9.4.5.1	ia	II	0,65	Lot	ia	S-3	1,0	Lot
- hermetic	9.4.5.2	ia	II	0,015		ia	II	0,025	
Voltage proof	9.2.6	a	S-4	0,40	Lot	a	II	4,0	Lot
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	Lot	a	S-3	4,0	Lot

For 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 IEC 61169-1 Subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test required	Number of specimens	Permitted failures per group <sup>1)</sup>	Period	Test required	Number of specimens	Permitted failures per group <sup>1)</sup>	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				a			
Strength of coupling mechanism	9.3.11	ia	ia						
Group D2 (d) Contact resistance	9.2.3	a	6	1	3 years	a	3	1	3 years
Outer conductor and screen continuity	9.2.3								
Centre conductor continuity	9.2.3								
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						
Group D3 Dimensions piece part and materials	9.1.3.2	a	1 <sup>2)</sup>	1	3 years	a	1 <sup>2)</sup>	1	3 years

	Test method IEC 61169-1 Subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test required	Number of specimens	Permitted failures per group <sup>1)</sup>	Period	Test required	Number of specimens	Permitted failures per group <sup>1)</sup>	Period
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 contaminating fluids	9.7	na	1 <sup>3)</sup>	1	3 years	na	1 <sup>3)</sup>	1	3 years

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

2) One set of piece parts for 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 groups 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  $\Omega$  type CQN connectors. It already contains 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.

### 5.2 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.

### 5.3 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'.

#### 5.4 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.

#### 5.5 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.

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Withdrawn

**5.6 Blank detail specification pro-forma for type CQN connector**

The following pages contain the complete BDS pro-forma.

(1)		Page 1 of 10			
<b>ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH GENERIC SPECIFICATION IEC 61169-1 SECTIONAL SPECIFICATION IEC 61169-42 NATIONAL REFERENCE</b>		(4) ISSUE ..... .....			
<b>(5) Detail specification for Radio frequency coaxial connector of assessed quality</b>			type <b>CQN</b>		
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.					