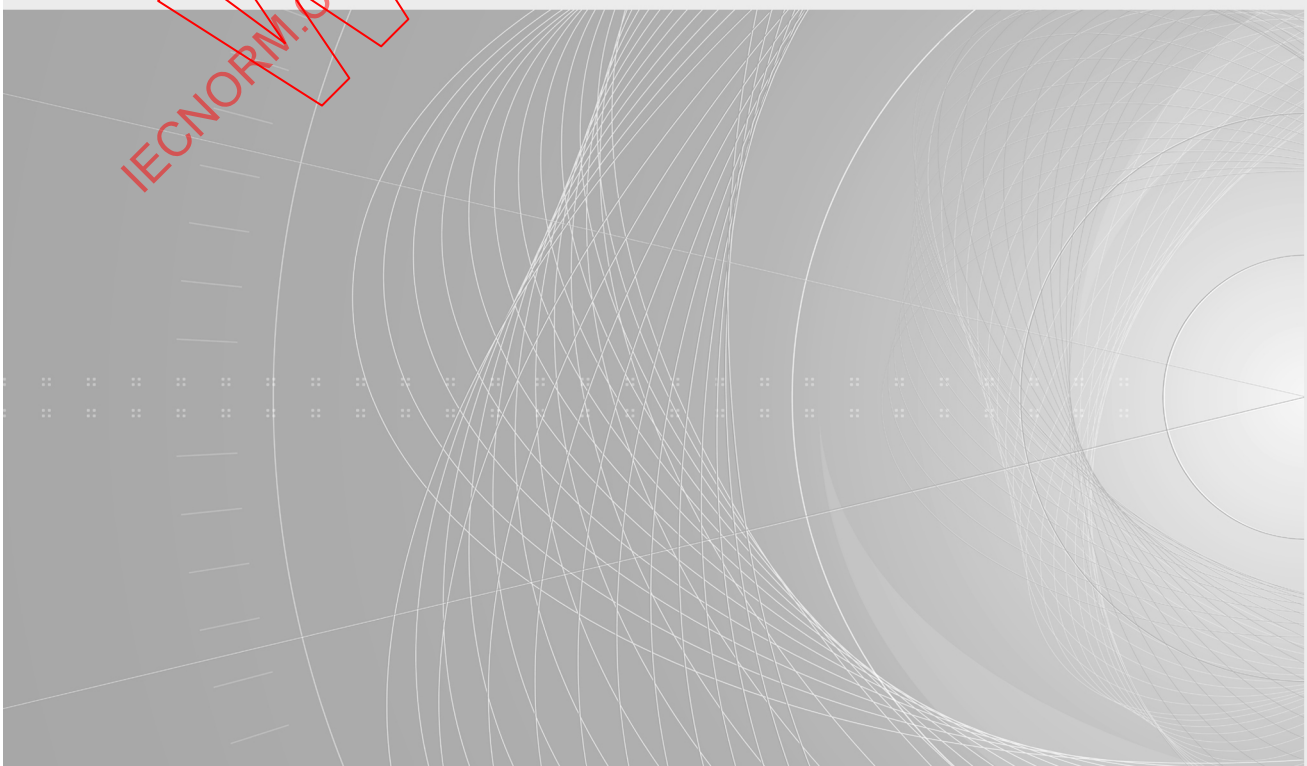
IEC/PAS 61169-39

Edition 1.0 2008-05

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

Radio-frequency connectors –
Part 39: Sectional specification for CQM series quick lock RF connectors



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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIO-FREQUENCY CONNECTORS –

Part 39: Sectional specification for CQM series quick lock RF connectors

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IEC-PAS 62269-39 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/80/ PAS	46F/85/ RVD

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned will 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a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

RADIO-FREQUENCY CONNECTORS –

Part 39: Sectional specification for CQM series quick lock RF connectors

1 Scope

CQM Series quick lock connectors with characteristic impedance 50 Ω are used for high power microwave applications, connecting with RF cables or microstrips. The operating frequency limit is at least 4 GHz.

This PAS is a sectional specification providing information and rules for the preparation of detail specifications for CQM series quick lock RF connectors together with the pro forma blank detail specification.

It also prescribes mating interface dimensions for general purpose connectors, dimensional details of standard test connectors grade 0, gauging information and tests selected from QC 220000 (IEC 61169-1), applicable to all detail specifications relating to CQM 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*[1)]

Amendment 1 (1996)
Amendment 2 (1997)

3 Mating interface and gauge information

All undimensioned pictorial configurations are for reference purposes only.

1) A consolidated edition 1.2 (1998) exists, that comprises IEC 61169-1 (1992), Amendment 1 and Amendment 2.

3.1 Dimensions – General connectors – Grade 2

3.1.1 Connector with pin – centre contact

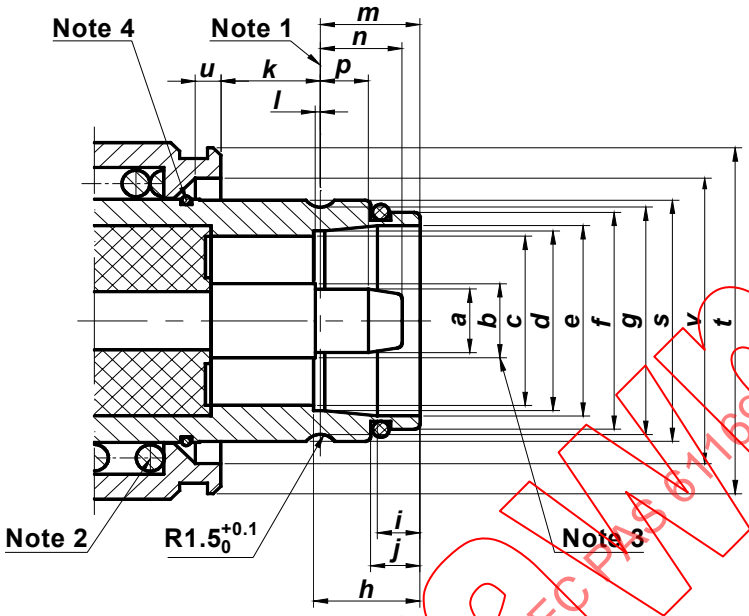

Figure 1 – Connector with pin-centre contact
(for dimensions, see Table 1)

Table 1 – Dimensions of connector with pin-centre contact

Ref.	mm		Notes
a	5,96	6,04	Diameter
b	7 (nominal)		Diameter
c	15,85	16,25	Diameter
d	16,90	17,10	Diameter
e	18,00	18,20	Diameter
f	21,00	21,20	Diameter
g	21,90	22,10	Diameter
h	8,90	9,20	
i	3,70	3,90	
j	4,30	4,50	
k	–	9,80	
l	0,30	0,50	
m	8,80	9,00	
n	7,20	7,40	
s	23,20	23,30	Diameter
t	35,00	35,20	Diameter
p	4,20	4,40	
u	2,10	2,30	
v	26,9	27,2	Diameter

NOTE 1 Mechanical reference plane.
NOTE 2 The spring force is 50 N to 60 N max.
NOTE 3 Tolerances of dimensions are to meet the requirements of characteristic impedances.
NOTE 4 Ring.

3.1.2 Connectors with socket-centre contact

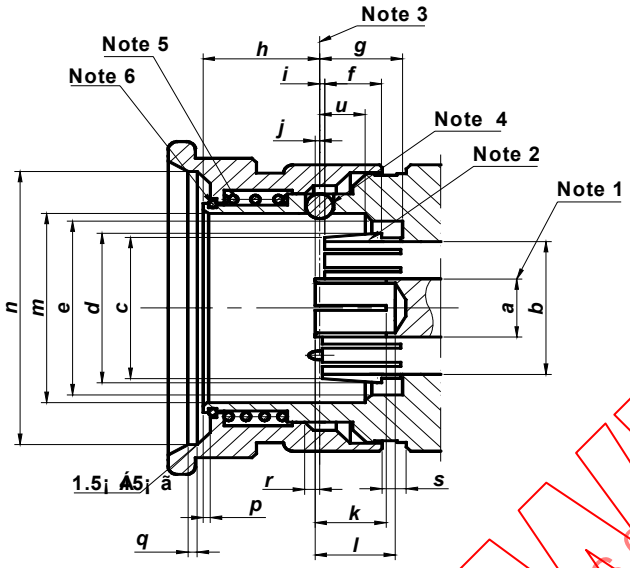

Figure 2 – Connector with socket-centre contact
(for dimensions, see Table 2)

Table 2 – Dimensions of connector with socket-centre contact

Ref.	mm		Notes
	min	max	
a	7（nominal）		1
b	15,85	16,25	
c	16,70	16,90	
d	17,80	18,00	
e	22,10	22,30	
f	6,30	6,50	
g	9,10	9,30	
h	12,75	12,85	
i	0,20	0,40	
j	–	0,20	
k	7,00	7,50	
l	8,50	9,00	
m	23,60	23,80	
n	35,20	35,40	
p	0,80	1,00	
q	1,10	1,30	
r	1,60	–	
s	2,60	–	
u	4,90	5,20	

NOTE 1 Design for slotting optional, closed contacts should meet electrical and mechanical requirements.

NOTE 2 Design for slotting optical, flared contacts Ø*c* should be flared to Ø18,4～Ø18,5.

NOTE 3 Mechanical reference plane.

NOTE 4 Three steel balls, Ø3;

NOTE 5 The spring force is 2 N to 6 N, treval is 1,60 mm min.

NOTE 6 Ring.

3.2 Gauges

3.2.1 Connectors with socket-centre contact

3.2.1.1 Gauge for outer contact of socket connector

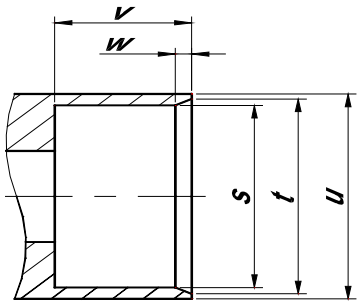

Figure 3 – Gauge for outer contact of socket connector
(for dimensions, see Table 3)

Table 3 – Dimensions of gauge for outer contact of socket connector

Gauge A (for sizing purposes)			Gauge B (for measurement of gauge retention force for outer conductor) Mass (weight) of gauge: 200 g ± 5 g		Notes
Ref.	mm		mm		
	min	max	min	max	
s	18,05	18,10	18,15	18,18	
t	18,70	18,80	18,70	18,80	
u	20,00	20,80	20,00	20,80	
v	9,50	9,60	9,40	9,50	
w	1,30	1,50	1,30	1,50	
NOTE Material: steel, polished, surface roughness: Ra ≤ 0,4 µm.					

3.2.1.2 Test sequence

Gauge A shall be placed over the outer contact of the connector once. This is a sizing operation. After this, gauge B shall be placed over the outer contact in a vertical position. The gauge shall be retained. This test can also be carried out on connector.

3.2.1.3 Gauge pin for socket-centre contact

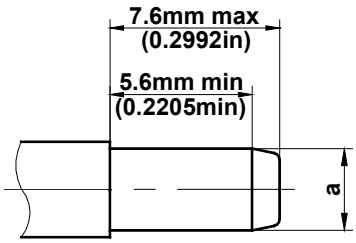

Figure 4 – Gauge pin for socket contact
(for dimensions, see Table 4)

Table 4 – Dimensions of gauge pin for socket contact

Gauge C (for sizing purposes)			Gauge D (for measurement of gauge retention force for centre contact) Mass (weight) of gauge: 600 g ± 5 g	
Ref.	mm		mm	
	min	max	min	max
a	6,05	6,10	5,95	6,00
NOTE Material: steel, polished, surface roughness: Ra ≤ 0,4 µm.				

3.2.1.4 Test sequence

Test pin gauge C shall be inserted into the centre contact three times with a minimum depth of 5,6 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 D shall be inserted and held in the vertical position. The gauge shall be retained. This test can also 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

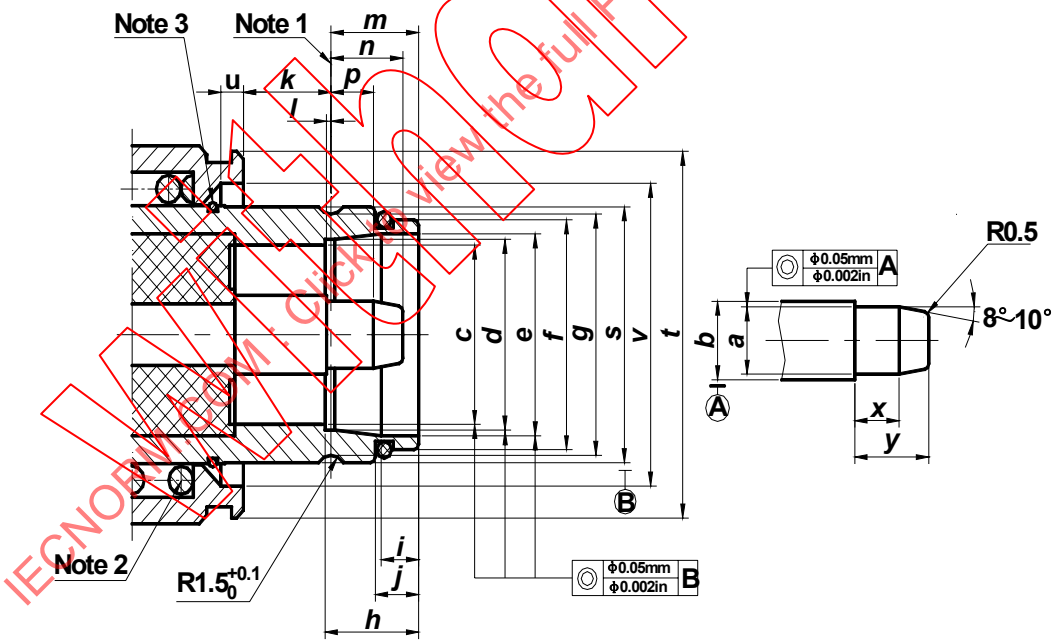

Figure 5 – Connector of pin-centre contact
(for dimensions, see Table 5)

Table 5 – Dimensions of connector with pin-centre contact

Ref.	mm		Notes
	min	max	
a	5,99	6,00	Diameter
b	6,97	6,98	Diameter
c	16,05	16,07	Diameter
d	16,96	17,04	Diameter
e	18,05	18,15	Diameter
f	21,05	21,15	Diameter
g	21,95	22,05	Diameter
h	9,02	9,08	
i	3,77	3,83	
j	4,35	4,45	
k	9,70	9,80	
l	0,30	0,50	
m	8,86	8,94	
n	7,27	7,33	
s	22,20	22,25	Diameter
t	23,04	23,10	Diameter
u	2,15	2,25	
v	27,00	27,10	Diameter
x	4,20	4,40	
y	7,20	7,40	

NOTE 1 Mechanical reference plane.
NOTE 2 The spring force is 50 N to 60 N.
NOTE 3 Ring.

3.3.2 Connector with socket-centre contact

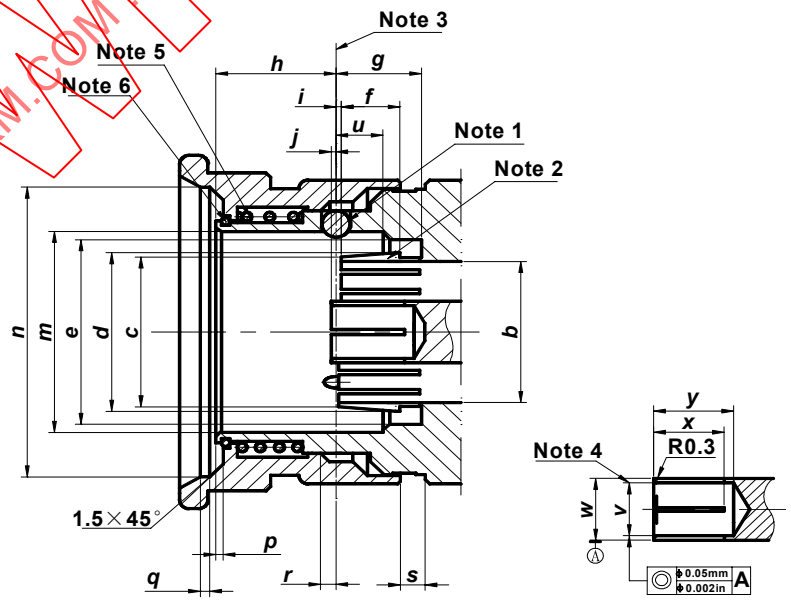

Figure 6 – Standard test connector with socket-centre contact
(for dimensions, see Table 6)

Table 6 – Dimensions of standard test connector with socket-centre contact

Ref.	mm		Notes
	min	max	
b	16,05	16,07	
c	16,92	16,96	
d	18,01	18,05	
e	22,18	22,25	
f	6,35	6,42	
g	9,18	9,25	
h	12,78	12,81	
i	0,28	0,32	
j	–	0,20	
m	23,68	23,75	
n	35,25	35,35	
p	0,88	0,96	
q	1,06	1,14	
r	1,60	–	
s	2,60	–	
u	4,95	5,05	
w	6,97	7,00	
x	7,00	7,20	
y	8,50	9,00	

NOTE 1 Three steel balls, Ø3.

NOTE 2 Design for slotting optional, flared contacts Ø *c* should be flared to Ø 18,40～Ø 18,50.

NOTE 3 Mechanical reference plane.

NOTE 4 When a gauge pin with diameter of 5,99 mm min 6 mm max is inserted into a depth of 5,00 mm min dimension, *v* should meet the requirements of dimension *w*.

NOTE 5 The spring force is 2 N to 6 N, treval is 1,60 mm min.

NOTE 6 Ring.

4 Quality assessment procedure

4.1 General

The following clauses 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/QC220000)

The values indicated below (see Table 7) are recommended for CQM series quick lock 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 – Ratings and characteristics

Ratings and characteristics	IEC 61169-1 Subclause	Value	Remarks including any deviations from standard test methods
Electrical			
Nominal impedance		50 Ω	
Frequency range – Grade 2 connectors		Up to 4 GHz	Or upper frequency limit of the cable
Reflection factor	9.2.1		
– straight styles [1)] – right angle styles		≤ 0,1 As specified in the DS	
– component mounting styles		As specified in the DS	
– solder bucket and PCB mounting styles		As specified in the DS	
Centre contact resistance	9.2.3		
– initial – after conditioning		≤ 3 mΩ ≤ 5 mΩ	
Outer conductor continuity [1)]	9.2.3		
– initial – after conditioning		≤ 3 mΩ ≤ 5 mΩ	
Insulation resistance [1)]	9.2.5		
– initial – after conditioning		≥ 5 GΩ ≥ 500 MΩ	
Proof voltage at sea level [2) 3)]	9.2.6	2 700 V	(86~106 kPa)
Proof voltage at 4,4 kPa [2) 3)]	9.2.6	350 V	4,4 kPa approximately equivalent to 20 km
Environmental test voltage at sea level [3) 4)]	9.4.6	2 000 V	(86~106 kPa)
Screening effectiveness [7)]	9.2.8	90 dB to 1 GHz	Z_t ≤ 0,02 mΩ applied torque 25 Nm
Discharge test (Corona) – at sea level (cable 60096 IEC 50-3)	9.2.9	≥ 1 000 V	Extinction voltage
Mechanical			
Centre contact captivation axial force – torque	9.3.5	15 N, 1 min N/A [6)]	Maximum displacement 0,25 mm each direction
Engagement and separation force – engagement force – separation force	9.3.6	≤ 150 N < 150 Nm	
Gauge retention force (resilient contacts) – centre – outer	9.3.4	 >6 N >2 N	s
Mechanical tests on cable fixing	9.3.7		
Cable pulling cable rotation (nutation)		See DS See DS	
Cable bending	9.3.9	See DS	
Cable torsion	9.3.10	See DS	
Tensile strength of coupling mechanism	9.3.11	150 N	
Bending moment (and sharing force)	9.3.12	N/A	
Vibration	9.3.3	100 m/s^2 10 Hz – 500 Hz	10 g_n acceleration
Bump	9.3.13	–	
Shock	9.3.14	750 m/s^2 ½ sin 6 ms	75 g_n acceleration

Ratings and characteristics	IEC 61169-1 Subclause	Value	Remarks including any deviations from standard test methods
Environmental			
Climatic category [5)]		55/155/56	
Sealing – non-hermetic	9.4.5.1	1 cm^3/h max. 100 kPa – 110 kPa differential	
Salt mist	9.4.6	Duration of spraying: 48 h	
Endurance			
Mechanical	9.5	5 000 operations	
High temperature [5)]	9.6	1 000 h at 155 °C	

[1)] These values apply to basic connectors. They depend on the cable used. Relevant values are given in the DS.
[2)] Value for a single pair of mated connector.
[3)] Voltage values are r.m.s. values at 40 Hz -60 Hz, unless otherwise specified.
[4)] Cables used with these connectors may have values of lower performance than those given in this table.
[5)] For certain connectors the upper temperature limit is restricted by the cable characteristics. Reference should be made to the relevant cable specification.
[6)] N/A= Not applicable.
[7)] When interfaces are fully mated.

4.3 Test schedule and inspection requirements

4.3.1 Acceptance tests

Acceptance tests are given in Table 8.

Table 8 – 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		a	S3	1,5	
Group B1									
Outline dimensions	9.1.3.1	a	S4	0,4		a	S3	4,0	
Mechanical compatibility	9.1.3.3	a	II	1,0		a	S3	1,5	
Engagement and separation	9.3.6	a	S4	0,40	Lot	a	S3	1,5	Lot
Gauge retention (resilient contact)	9.3.4	ia	II	1,0		ia	S3	1,5	
Sealing, non-hermetic	9.4.5.1	ia	II	0,65	by	ia	S3	1,0	by
Sealing, hermetic	9.4.5.2	ia	II	0,015		ia	S3	0,025	
Voltage proof	9.2.6	a	S4	0,40	lot	a	II	4,0	lot
Solderability piece parts	9.3.2.1.1	ia	S4	0,40		ia	S3	4,0	
Insulation resistance	9.2.5	a	S4	0,40		a	S3	4,0	

4.3.2 Periodic tests

Periodic tests are given in Table 9. There are no group C tests for levels H and M.

Table 9 – 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#	Period	Test required	Number of specimens	Permitted failures per group#	Period
Group D1 (d)			6	1	3 years		3	1	3 years
Solderability connector assemblies	9.3.2.1.1	ia				ia			
Resistance to soldering heat	9.3.2.1.2	ia				ia			
Mechanical tests on cable fixing									
- cable rotation (nutation)	9.3.7.2	na				na			
- cable pulling	9.3.8	ia				ia			
- cable bending	9.3.9	ia				ia			
- cable torsion	9.3.10	ia				ia			
Group D2 (d)			6	1	3 years		3	1	3 years
Contact resistance, outer conductor and screen continuity centre conductor continuity	9.2.3	a				a			
Vibration	9.3.3	a							
Damp heat, steady state	9.4.3	a				a			
Group D3 (d)			1*	1	3 years		1*	1	3 years
Dimensions piece-parts and materials	9.1.3.2	a				a			
Group D4 (d)			6	1	3 years		3	1	3 years
Mechanical endurance	9.5	a				a			
High temperature endurance	9.6	a				a			
Sulphur dioxide	9.4.8	na				na			
Group D5 (d)			6	1	3 years		3	1	3 years
Reflection factor	9.2.1	a				a			
Screening effectiveness	9.2.8	a				a			
Water immersion	9.2.7	ia				ia			
Group D6 (d)			6	1	3 years		3	1	3 years
Contact captivation	9.3.5	a				a			
Rapid change of temperature	9.4.4	na				na			
Climatic sequence	9.4.2	a				a			

	Test method IEC 61169-1 subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test required	Number of specimens	Permitted failures per group#	Period	Test required	Number of specimens	Permitted failures per group#	Period
Group D7 (d) Resistance to solvents and contaminating fluids	9.7	ia	1§		3 years	ia	1§		3 years

Details of symbols, abbreviations and procedures:

a = suggested as applicable

ia = test suggested (if technically applicable)

na = not applicable

IL = inspection level

AQL = acceptable quality level

* = one set of piece-parts each style and variant, unless using common piece parts

= for qualification approval (QA), a total of two failures only permitted for level H, and 1 failure only for level M from groups D1 to D7

§ = Group D7 – number of pairs for each solvent

(d) = destructive tests – specimens shall not be returned to stock

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 shall consist 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 type CQM 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.

5.2 Identification of the detail specification

(1) The name of the national standards organization (NSO) under whose authority the DS is published and, if applicable, the organization from whom the DS is available.

(2) The relevant mark of conformity and the number allotted to the DS by the relevant national or international organization authorizing the DS.

(3) The number and issue number of the IEC/IECQ generic or sectional specification as relevant; also national reference if different.

(4) If different from the IEC/IECQ number, any national number of the 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.

(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.

5.4 Performance

(9) Performance data listing the most important characteristics of the connector taking into account the recommended values of 7.2 in this 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 as in 7.3 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.

5.7 Blank detail specification pro-forma for type CQM connector

The following pages contain the complete BDS pro-forma.

(1)	Page 1 of ….. **QC 222XXX**
ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH GENERIC SPECIFICATION QC 220000 SECTIONAL SPECIFICATION QC 222XXX NATIONAL REFERENCE	(4) ISSUE ....
(5) Detail specification for Radio frequency coaxial connector of assessed quality	type CQM
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	60096 IEC			
01.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....

Information about manufacturers who have components qualified to this detail specification is available in the current QC 001005 qualified product list.

(9) Performance (including limiting conditions of use)

Ratings and characteristics		IEC 61169-1 (QC 220000) Subclause	Value	Remarks including any deviations from standard test methods
Electrical				
Nominal impedance			….Ω	
Frequency range			…4 GHz	Measurement frequency range
Reflection factor		9.2.1		
	Variant No. Designation			
	01……. …….		……. …….	……. …….
Centre contact resistance		9.2.3	≤ ……mΩ ≤……mΩ	Initial After conditioning
Centre conductor continuity	01……. ……. ……. …….	9.2.3	……mΩ ……mΩ ……mΩ ……mΩ	Resistance change due to conditioning
Outer contact continuity		9.2.3	≤ ……mΩ ≤……mΩ	Initial After conditioning
Insulation resistance		9.2.5	≥……MΩ ≥……GΩ	Initial After conditioning
+ Proof voltage at sea level	01……. ……. ……. …….	9.2.6	……kV ……kV ……kV ……kV	86-106 kPa
+ Proof voltage at 4,4 kPa	01……. ……. ……. …….	9.2.6	……V ……V ……V ……V	……kPa (if not 4,4 kPa)
Environmental test voltage at sea level		9.4.6	……V	(86~106 kPa)
Screening effectiveness	01……. ……. ……. …….	9.2.8	….dB at….GHz	Z_t ≤…… mΩ
Discharge test (corona) at sea level	01……. ……. ……. …….	9.2.9	≥…… V ≥…… V ≥…… V ≥…… V	Extinction voltage
ADDITIONAL ELECTRICAL CHARACTERISTICS				
+ Voltage values are r.m.s. values at 50 Hz - 60 Hz, unless otherwise specified.				

Ratings and characteristics		IEC 61169-1 (QC 220000) Subclause	Value	Remarks including any deviations from standard test methods
Mechanical				
Soldering - bit size		9.3.2.1.1	.....	
Gauge retention resilient contacts - inner contact - outer contact		9.3.4.3	.....N .....N	For gauging details, see Figure 4 and Table 4, Figure 3 and Table 3 of QC 222100
Centre contact captivation - axial force - permitted displacement each direction - torque		9.3.5	.....N .....mm .....Nm	
Engagement and separation - engagement force		9.3.6	.....N	
- separation force			.....N	
Strength of coupling mechanism		9.3.11	.....N	
Effectiveness of cable fixing against				
- cable rotation	01.....	9.3.7	Rotations	Bend radius and number of revolutions
- cable pulling	01.....	9.3.8	.....N	Point of application and duration
- cable bending	01.....	9.3.9	.....Cycles	Length of cable mass ....
- cable torsion	01.....	9.3.10	.....Nm	Duration of applied torque
Bending moment		9.3.12	.....Nm	Relative to reference plane
Bumps total		9.3.13	.....m/s^2 .....to..... Hz	(.....g_n acceleration)
Vibration		9.3.3	.....m/s² .....to..... Hz	(.....g_n acceleration)
Shock		9.3.14	.....m/s^2 .....Shape .....ms	(.....g_n acceleration)
ADDITIONAL MECHANICAL CHARACTERISTICS				