BRITISH STANDARD

BS EN
61169-16:2007

Radio-frequency connectors —

Part 16: Sectional specification — RF coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling — Characteristic impedance 50 ohms (75 ohms) (type N)

The European Standard EN 61169-16:2007 has the status of a British Standard

ICS 33.120.30

BSI
British Standards

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 61169-16:2007. It is identical with IEC 61169-16:2007. It supersedes BS QC222100:1997 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee EPL/46, Cables, wires and waveguides, radio frequency connectors and accessories for communication and signalling, to Subcommittee EPL/46/2, Radio frequency connectors and waveguides.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2007

ISBN 978 0 580 50828 8

Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61169-16

April 2007

ICS 33.120.30

English version

Radio-frequency connectors - Part 16: Sectional specification - RF coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling - Characteristic impedance 50 ohms (75 ohms) (type N)

(IEC 61169-16:2006)

Connecteurs pour fréquences radioélectriques - Partie 16: Spécification intermédiaire - Connecteurs coaxiaux pour fréquences radioélectriques avec diamètre intérieur du conducteur extérieur de 7 mm (0,276 in) à verrouillage à vis - Impédance caractéristique de 50 ohms (75 ohms) (Type N) (CEI 61169-16:2006)

Hochfrequenz-Steckverbinder - Teil 16: Rahmenspezifikation - Koaxiale Hochfrequenzsteckverbinder mit 7 mm (0,276 in) Innendurchmesser des Außenleiters und Schraubverbindung - Wellenwiderstand 50 Ohm (75 Ohm) (Typ N) (IEC 61169-16:2006)

This European Standard was approved by CENELEC on 2007-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 61169-16:2007 E

Foreword

The text of document 46F/54/FDIS, future edition 1 of IEC 61169-16, prepared by SC 46F, R.F. and microwave passive components, of IEC TC 46, Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61169-16 on 2007-03-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2007-12-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-03-01

Annex ZA has been added by CENELEC.

_____

Endorsement notice

The text of the International Standard IEC 61169-16:2006 was approved by CENELEC as a European Standard without any modification.

_____

CONTENTS

RADIO-FREQUENCY CONNECTORS –

Part 16: Sectional specification – RF coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling – Characteristics impedance 50 Ω (75 Ω) (type N)

1 Scope

This part of IEC 61169, which is a Sectional Specification (SS), provides information and rules for the preparation of Detail Specifications (DS) for pin and socket R.F. coaxial connectors, with screw coupling mechanism, for low to medium power applications. The connector is commonly known as the "type N".

Three versions of the 50 Ω characteristic impedance type N connector are included, each version being mateable with each of the others.

The general purpose connector (grade 2) derived from the specifications MIL-C17B and MIL-C-39012 may preferably be used with R.F. cable 60096 IEC 50-7 up to about 12 GHz maximum frequency.

The high performance connector (grade 1) is particularly suitable for microwave applications when lower reflection factors than are offered by the general purpose connector are required. The connectors may also be suitable for microwave components. The tolerances of the interface dimensions lie between those for grade 0 and grade 2, and are chosen to give the performance required. Some grade 1 connectors conforming to this specification may be used up to 18 GHz maximum frequency.

The standard test connector (grade 0) has a closely controlled interface to provide a reference for the measurement of connectors, cable assemblies, components and equipment with the above two interfaces. It may also be used as a microwave connector in situations when the most precise interface for use up to 18 GHz maximum frequency is required.

A 75 Ω characteristic impedance connector is given in Annex A even though the use of 75 Ω type N connectors is strongly deprecated.

Accidental cross-coupling of 75 Ω with 50 Ω connectors can destructively damage the 75 Ω version, but in view of the extensive use of a number of marginally different 75 Ω versions, the interface now given provides common design guidance. 75 Ω connectors should be clearly identified.

This specification indicates the recommended performance characteristics to be considered when writing a DS and covers test schedules and inspection requirements.

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 60068-1:1988, *Environmental testing – Part 1: General and guidance*
Amendment 1 (1992)

IEC 60096-2:1988, *Radio-frequency cables – Part 2: Relevant cable specifications*

IEC 61169-1:1992, *Radio-frequency connectors – Part 1: Generic specification – General requirements and measuring methods*
Amendment 1 (1996)
Amendment 2 (1997)

ISO 263:1973, *ISO inch screw threads – General plan and selection for screws, bolts and nuts – Diameter range 0.06 to 6 in*

3 IEC type designation

Connectors conforming to this specification shall be designated by:

a) the reference to this specification: 61169-16 IEC;
b) characteristic impedance 50 Ω (75 Ω);
c) number of the grade :
   grade 0 = standard test connector = G 0;
   grade 1 = high performance connector = G 1;
   grade 2 = general purpose connector
   – if grade 2 is required, no grade designation is necessary;
d) a group of figures specifying the climatic category (see 7.2.5).

Example:

61169-16 IEC-50-G 0 denotes a standard test connector, type N, 50 Ω.

4 Interface dimensions

4.1 Dimensions – General purpose connectors – Grade 2

4.1.1 General

Inch dimensions are original dimensions.

NOTE The values for dimensions in millimetres derived from those in inches are not necessarily exact (according to ISO 370[1]), but they should be considered as acceptable alternatives to the original values.

All undimensioned pictorial configurations are for reference purposes only.

---

1 This document has been withdrawn.

4.1.2 Connector with pin centre contact

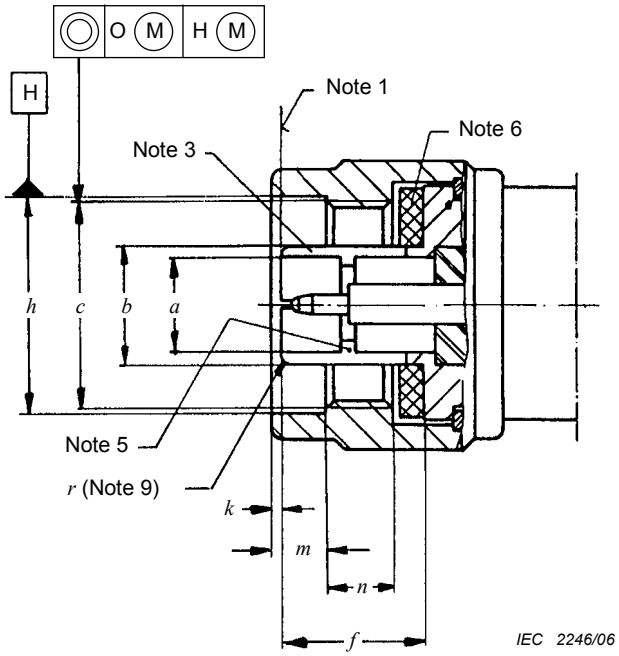


Figure 1 – Connector with pin centre contact (for notes and dimensions, see Table 1)

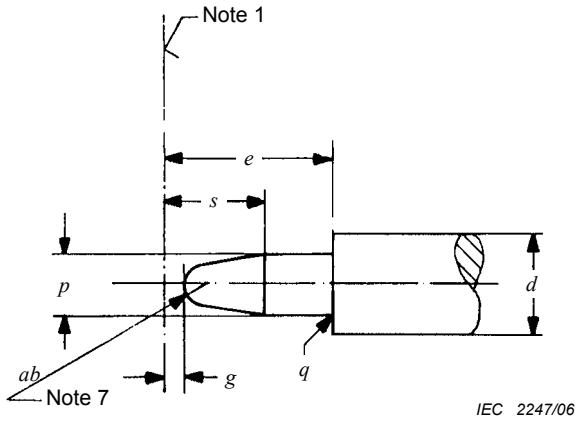


Figure 2 – Details of pin centre contact (for notes and dimensions, see Table 1)

Table 1 – Dimensions for connector with pin centre contact

Reference	mm		inches		Note
	Min.	Max.	Min.	Max.	
a	7,00 nom.		0,275 6 nom.		2, diam.
b	–	8,027	–	0,316	3/10, diam.
c	–	–	5/8-24 UNEF-2B		4
d	3,04 nom.		0,120 nom.		2, diam.
e	5.33	–	0.210	–	
f	9,25	–	0,364	–	6
g	0,0	1,57	0,0	0,062	
h	16,0	–	0,630	–	10, diam.
k	0,41	1,52	0,016	0,060	8
m	4,013	4,267	0,158	0,168	
n	4,5	–	0,177	–	
p	1,600	1,676	0,063	0,066	10, diam.
q	–	0,1	–	0,004	radius
r	0,15	–	0,006	–	9
s	2,79	3,56	0,110	0,140	
ab	–	0,64	–	0,025	7, radius

NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Diameter of outer and centre contact to provide nominal (50 Ω) characteristic impedance to meet electrical performance requirements.

NOTE 3 Slots or other forms of resilience optional. If slotted, indicated dimension *b* should not exceed 8,38 mm (0,330 in). Gauging requirements (see 5.1.1) to be met.

NOTE 4 Thread 5/8-24 UNEF-2B (according to ISO 263).

NOTE 5 Compensation for inductance of inner conductor gap in mated pair of connectors optional.

NOTE 6 Dimensions given assume no sealing gasket fitted. If sealing is required, dimension *f* (Figure 1) should be arranged so that with the gasket chosen adequate pressure is applied to the front face (dimensions *w* and *x*) of the socket connector (Figure 2) to ensure adequate sealing.

NOTE 7 Radius or chamfer, shape of tip optional. 0,25 mm (0,010 in) maximum flat permitted.

NOTE 8 Applies with nut biased forward.

NOTE 9 External form of leading edge of outer contact optional, but connector should meet electrical and mechanical performance requirements.

NOTE 10 Diameters *b*, *h* and *p* and thread *c* should be gauged to ensure that on MMC, each feature is on or can take up a common axis.

4.1.3 Connector with socket centre contact

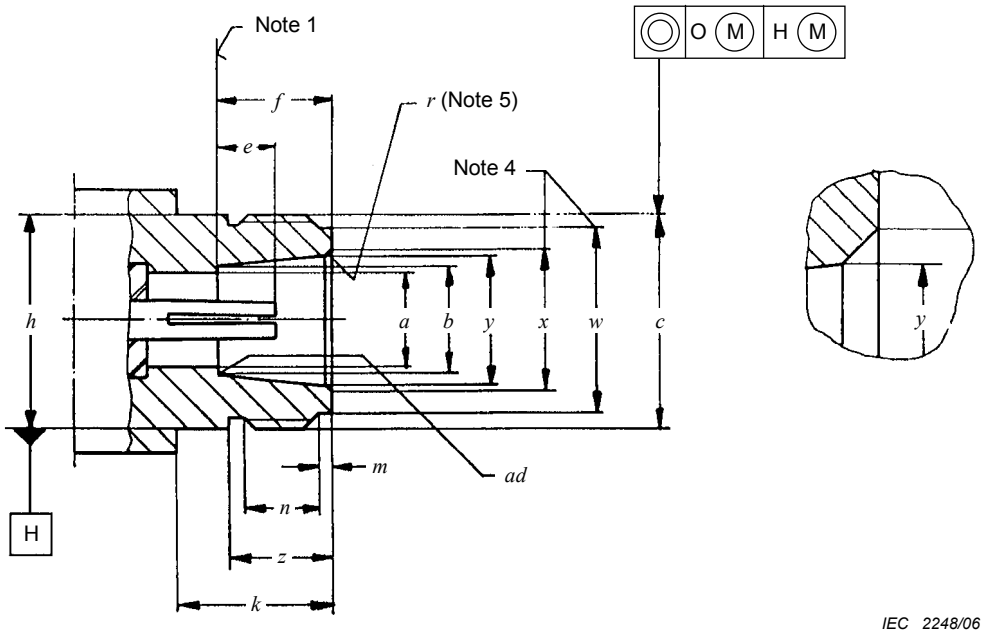


Figure 3 – Connector with socket centre contact (for notes and dimensions, see Table 2)

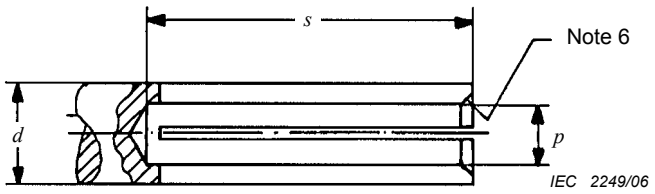


Figure 4 – Details of socket centre contact (for notes and dimensions, see Table 2)

Table 2 – Dimensions for connector with socket centre contact

Reference	mm		inches		Note
	Min.	Max.	Min.	Max.	
a	–	7,06	–	0,278	2, diam.
b	8,027	8,13	0,316	0,320	diam.
c	–	–	5/8-24 UNEF-2A		3
d	3,04 nom.		0,120 nom.		2, diam.
e	4,75	5,26	0,187	0,207	
f	9,05	9,19	0,356	0,362	
h	–	15,93	–	0,627	diam.
k	10,72	–	0,422	–	
m	1,19	1,96	0,047	0,077	
n	4,37	–	0,172	–	7
p	–	–	–	–	6, diam.
r	–	1,2	–	0,047	5
s	5,33	–	0,210	–	
w	–	–	–	–	4, diam.
x	–	–	–	–	4, diam.
y	8,53	8,74	0,336	0,344	diam.
z	6,76	–	0,266	–	
ad	–	0,13	–	0,005	radius

NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Nominal inner diameter of outer conductor 7,0 mm (0,275 6 in). Diameter of outer and centre contact to provide nominal (50 Ω) characteristic impedance to meet electrical performance requirements.

NOTE 3 Thread 5/8-24 UNEF-2A (according to ISO 263).

NOTE 4 If sealing is required, dimension *f* (Figure 1) should be arranged so that with the gasket chosen, adequate pressure is applied to the front face (dimensions *w* and *x*) of the socket connector (Figure 3) to ensure adequate sealing.

NOTE 5 Radius only to ensure satisfactory sealing, but if chamfer is used, it should not encroach into minimum material condition of the design using the radius.

NOTE 6 Centre contact design is optional. It should however, meet the gauging requirements of 5.1.2 and relevant reflection factor requirements of Clause 3 using grade 0 connector in accordance with Figure 7.

NOTE 7 Applies to length of thread and not undercut.

5 Mechanical gauges and standard test connectors

5.1 Mechanical gauges

5.1.1 Connectors with pin centre contact

5.1.1.1 Gauge for outer contact of pin connector

See Figure 5.

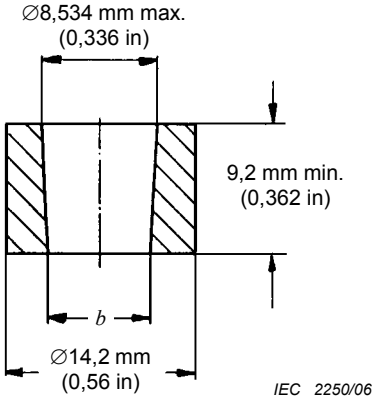


Figure 5a

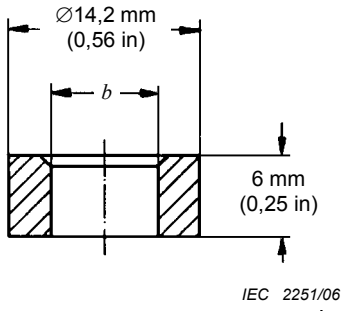


Figure 5b

Figure 5 – Gauge rings for outer contact of pin connector

5.1.1.2 Test sequence

For slotted outer contacts, a steel test ring (Figure 5a) with an inner diameter b of 8,027 mm (0,316 in) maximum shall be placed over the outer electrical contact of the connector.

Insertion force: 113 N maximum.

This is a sizing operation.

After this a steel test ring (Figure 5b) with an inner diameter b of 8,23 mm (0,324 in) shall be placed over the outer electrical contact. All contact fingers shall touch the diameter b in the region of the tip ends.

The minimum withdrawal force shall be 2 N.

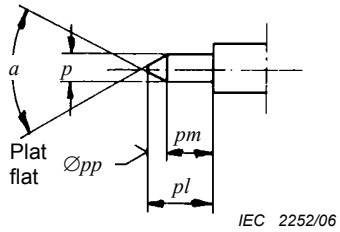
Recommended mass of the gauge: 200 g.

The gauge shall be retained in a vertical downward position.

5.1.2 Connectors with socket centre contact

5.1.2.1 Gauge and test pins for socket centre contact

See Figure 6.



The pins shall be made of steel.

Figure 6 – Gauge and test pins for socket centre contact (for notes and dimensions, see Table 3)

Table 3 – Dimensions for test pins for socket centre contact

Reference	Pin No. 1				Pin No. 2			
	mm		inches		mm		inches	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
pl	–	5,33	–	0,210	–	5,33	–	0,210
pm	3,18	–	0,125	–	3,18	–	0,125	–
pp	–	0,25	–	0,01	–	0,25	–	0,01
p	$1{,}676\ ^{+0{,}005}_{-0}$		$0{,}066\ 0\ ^{+0{,}000\,2}_{-0}$		$1{,}600\ ^{+0}_{-0{,}005}$		$0{,}0630\ ^{+0}_{-0{,}000\,2}$	
a	38° ± 2°				38° ± 10°			
NOTE Test pin No. 2 shall have a 0,4 μm (16 μin) finish on the cylindrical surface of length *pm*. It is recommended that this pin has a mass of 56 g.								

5.1.2.2 Test sequence

The test sequence consists of:

a) Gauging: Insert pin No. 1 once.

b) Insertion force: When inserting pin No. 1 once more: the insertion force shall be 9 N maximum.

c) Retaining: Insert pin No. 2 once: the retention force shall be 0,56 N minimum.

5.2 Standard test connectors – Grade 0

5.2.1 General

In order to carry out the reflection factor measurement according to 9.2.1 of IEC 61169-1, the measuring equipment should be provided with standard test connectors.

NOTE The values for dimensions in millimeters derived from those in inches are not necessarily exact (according to ISO 370) but they are to be considered as acceptable alternatives to the original values.

5.2.2 Standard test connector with pin centre contact

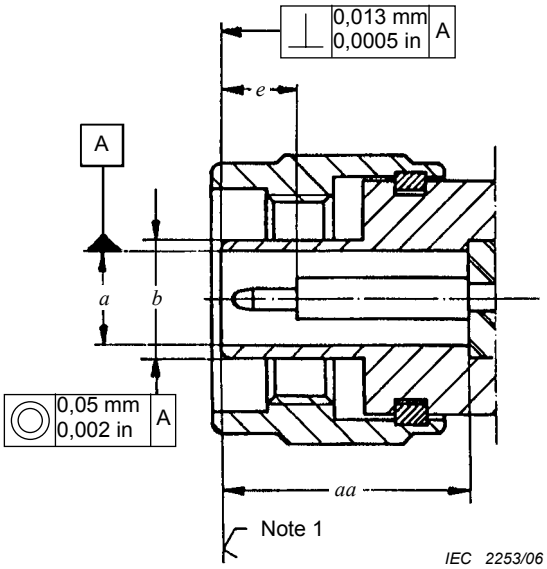


Figure 7 – Standard test connector with pin centre contact (for notes and dimensions, see Table 4)

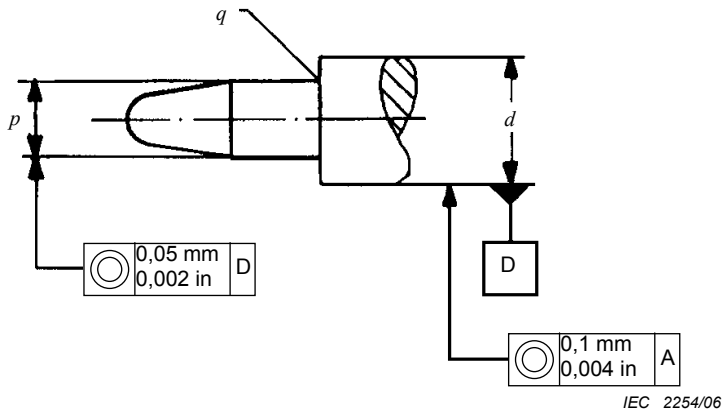


Figure 8 – Details of pin centre contact (for notes and dimensions, see Table 4)

Table 4 – Dimensions for standard test connector with pin centre contact

Reference	mm		inches		Note
	Min.	Max.	Min.	Max.	
a	6,99	7,01	0,275 1	0,276 1	2, diam.
b	7,98	8,04	0,314 0	0,316	diam.
d	3,04 nom.		0,120 nom.		2, diam.
e	5,28	5,36	0,208	0,211	
p	1,638	1,664	0,064 5	0,065 5	diam.
q	–	0,076	–	0,003	radius
aa	10	–	0,394	–	3

Dimensions not indicated in this Table are to be found in the Table 1.

NOTE 1 Mechanical and electrical reference plane.
Surface roughness 0,8 μm (32 μin).

NOTE 2 Diameter of outer and centre contact chosen to achieve a ratio

$$\frac{a}{d} = 2{,}302\ 9$$

to provide characteristic impedance of 50,00 ± 0,15 Ω.

NOTE 3 Minimum distance to insulating bead.

5.2.3 Standard test connector with socket centre contact

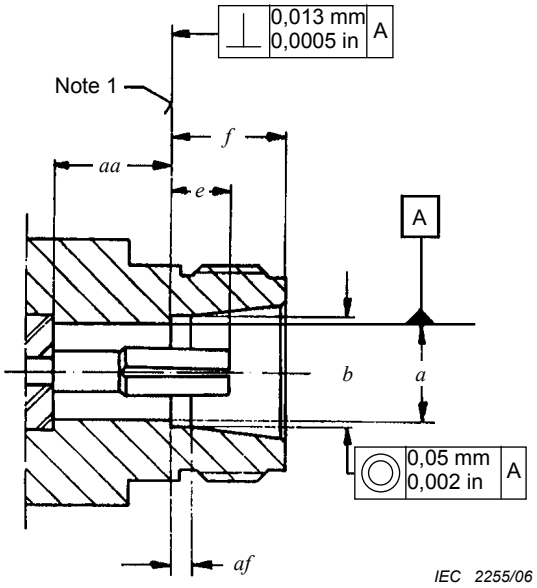


Figure 9 – Standard test connector with socket centre contact (for notes and dimensions, see Table 5)

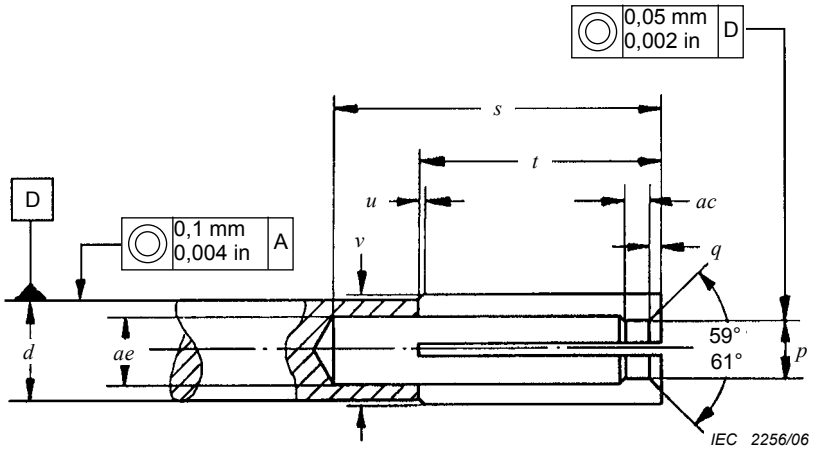


Figure 10 – Details of socket centre contact (for notes and dimensions, see Table 5)

Table 5 – Dimensions for standard test connector with socket centre contact

Reference	mm		inches		Note
	Min.	Max.	Min.	Max.	
a	6,99	7,01	0,275 1	0,276 1	2, diam.
b	8,05	8,1	0,317	0,319	diam.
d	3,04 nom.		0,120 nom.		2, diam.
e	5,18	5,26	0,204	0,207	
f	9,07	9,17	0,357	0,361	
p	1,651 nom.		0,065 0 nom.		6, diam.
q	0,13	0,20	0,005	0,008	3
s	9,7	–	0,380	–	
t	8,28	8,53	0,326	0,336	5
u	0	0,15	0	0,006	
v	3,05	3,08	0,120 2	0,121 2	6, diam.
aa	4,47	–	0,176	–	4
ac	0,38	0,89	0,015	0,035	
ae	1,80	1,91	0,071	0,075	
af	0,38	0,64	0,015	0,025	

Dimensions not indicated in this Table are to be found in Table 2.

NOTE 1 Mechanical and electrical reference plane.
Surface roughness 0,8 μm (32 μin).

NOTE 2 Diameter of outer and centre contact chosen to achieve a ratio

$$\frac{a}{d} = 2{,}302\ 9$$

to provide characteristic impedance of 50,00 ± 0,15 Ω.

NOTE 3 Chamfer.

NOTE 4 Minimum distance to insulating bead.

NOTE 5 Four slots 0,38 mm to 0,43 mm (0,015 in to 0,017 in) wide; 90° ± 50'.

NOTE 6 Diameter *v* shall be within the indicated limits when pin gauge of datum diameter 1,651 mm (0,065 in) is inserted in slotted portion only.

6 Overall dimensions

Under consideration.

7 Quality assessment procedures

7.1 General

The following subclauses provide recommended ratings, performance and test conditions to be considered when writing a Detail Specification (DS). They also provide an appropriate schedule of tests with minimum levels of conformance inspection. See Table 6.

7.2 Ratings and characteristics

7.2.1 General

The R.F. connectors defined in this specification are designed for use with a variety of coaxial braided and semi-rigid cables and rigid lines.

The values indicated below are recommended for series N connectors and are given for the guidance of the writer of detail specifications.

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

7.2.2 Grade 2 – General purpose connectors

This grade is preferably used with 7 mm braided coaxial cable 60096 IEC 50-7, but varieties are available for both larger and smaller cables and for semi-rigid cables. Connectors shall not introduce a reflection factor greater than 0,13 at frequencies up to 11 GHz, or approximately 80 % of the upper cutoff frequency of the cable, whichever is lower. The reflection factor shall be not more than 0,03 at 1 GHz.

7.2.3 Grade 1 – High performance connectors

Grade 1 connectors are intended particularly for use with semi-rigid cables and rigid lines, but may also be used with braided cables and microwave components. They will exhibit reflection factors less than the reflection factor of grade 2 connectors of the same configuration (pattern). The reflection factor and frequency range, which may be up to 18 GHz, shall be agreed between purchaser and manufacturer. The best achievable limit for the reflection factor is deemed to be defined by the equation r_{max} = 0,005 + 0,003 × f, where f is the frequency in gigahertz.

7.2.4 Grade 0 – Standard test connector

This grade is preferably used with 7 mm rigid lines such as are recommended in the IEC 60457 series. It may also be possible, on rigid lines and other test equipment, to exchange connectors of this grade for connectors recommended in IEC 60457-2.

The maximum reflection factor of a connector at frequencies up to 18 GHz shall be not greater then 0,0015 + 0,001 × f, where f, is the frequency in gigahertz.

7.2.5 Climatic categories (see IEC 60068-1)

Under consideration.

Table 6 – 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 1 connectors – Grade 2 connectors		 Up to 18 GHz Up to 11 GHz	
Reflection factor	9.2.1		
Grade 2 connectors – straight styles – right angle styles – below 9 GHz – 9 GHz to 11 GHz – component mounting styles – solder bucket and PCB mounting styles		 ≤ 0,13 ≤ 0,15 ≤ 0,20 – –	
Grade 1 connectors – straight and right-angle styles		 ≤ 0,005 + 0,003 f	
Centre contact resistance	9.2.3		
– initial – after conditioning		≤ 1,5 mΩ ≤ 2,5 mΩ	
Outer conductor continuity [1)]	9.2.3		
– initial		≤ 1 mΩ	

Ratings and characteristics	IEC 61169-1 Subclause	Value	Remarks including any deviations from standard test methods
– after conditioning		≤ 1,5 mΩ	
Insulation resistance [1]	9.2.5		
– initial		≥ 5 GΩ	
– after conditioning		≥ 200 MΩ	
Proof voltage at sea level [2] [3]	9.2.6		
– cables 60096 IEC 50-7		2 500 V	
– cables 60096 IEC 50-3		1000 V	
Proof voltage at 4,4 kPa [2] [3]	9.2.6		4,4 kPa approximately equivalent to 20 km
– cables 60096 IEC 50-7		450 V	
– cables 60096 IEC 50-3		180 V	
Screening effectiveness (straight cabled connectors only)	9.2.8	90 dB to 1 GHz	Z_t ≤ 3,2 mΩ
Discharge test (Corona) – at 4,4 kPa (cable 60096 IEC 50-7)	9.2.9	≥ 500 V	Extinction voltage
Mechanical			
Centre contact captivation	9.3.5		Maximum displacement 0,25 mm each direction
axial force		28 N	
– torque grade 1 connectors		–	
grade 1 connectors		–	
Engagement and separation force and torque	9.3.6		Shall be achievable by hand in a normal manner
– coupling nut friction			
Coupling torque			
– normal		0,7 Nm to 1,1 Nm	
– proof		1,7 Nm	
Gauge retention force (resilient contacts)	9.3.4		Slotted contacts only
– centre		0,56 N	
– outer		2 N	
Insertion force	9.3.4		
– centre		≤ 9 N	Slotted contacts only
– outer		≤ 113 N	
Mechanical tests on cable fixing cable pulling, force minimum	9.3.7		
– cables 60096 IEC 50-7		400 N	
– cables 60096 IEC 50-4		300 N	
– cables 60096 IEC 50-3		180 N	
Effectiveness of clamping device against torsion	9.3.10		
– cables 60096 IEC 50-7		0,5 Nm	
– cables 60096 IEC 50-4		0,4 Nm	
– cables 60096 IEC 50-3		0,3 Nm	
Tensile strength of coupling mechanism	9.3.11	450 N	
Bending moment (and sharing force)	9.3.12	–	
Vibration	9.3.3	100 m/s^2 (10 to 500) Hz	10 g_n
Bump	9.3.13	–	
Shock	9.3.14	500 m/s^2 ½ sin 11 ms	50 g_n
Environmental			
Climatic category [4]		55/155/21	
Sealing – non-hermetic	9.4.5.1	1 cm^3/h max. (100 to 110) kPa differential	

Ratings and characteristics	IEC 61169-1 Subclause	Value	Remarks including any deviations from standard test methods
Sealing – hermetic	9.4.5.2	1 Pa cm^3/s (10^{-5} bar cm^3/s) (100 to 110) kPa differential	
Salt mist	9.4.6	Duration of spraying: 48 h	
Endurance			
Mechanical	9.5	500 operations	
High temperature [4]		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] Voltage values are r.m.s. values at (50 to 60) Hz, unless otherwise specified.
[3] Cables used with these connectors may have values of lower performance than those given in this Table.
[4] For certain connectors, the upper temperature limit is restricted by the cable characteristics. Reference should be made to the relevant cable specification.

7.3 Test schedule and inspection requirements

7.3.1 Acceptance tests

NOTE For details of symbols, abbreviations and procedures, see 7.4.2.

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		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	

7.3.2 Periodic tests

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

NOTE For details of symbols, abbreviations and procedures, see Table 8.

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	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	ia				ia			
- 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)			1§		3 years		1§		3 years
Resistance to solvents and contaminating fluids	9.7	ia				ia			

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.

7.4 Procedures

7.4.1 Quality conformance inspection

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

7.4.2 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.

8 Instructions for preparation of detail specifications

8.1 General

Detail Specifications (DS) writers shall use the appropriate Blank Detail Specification (BDS) pro-forma. The following pages comprise the pro-forma BDS dedicated for use with type N 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.

8.2 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.

8.3 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.

8.4 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’.

8.5 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.

8.6 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.

8.7 Blank detail specification pro-forma for type N connector

The following pages contain the complete BDS pro-forma.

<table>
<tr><td>(1)</td><td>Page 1 of ….

QC 222400</td></tr>
<tr><td>ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH
GENERIC SPECIFICATION QC 220000
SECTIONAL SPECIFICATION QC 222400
NATIONAL REFERENCE</td><td>(4) ISSUE

.....

.....</td></tr>
<tr><td colspan="2">(5) Detail specification for
Radio frequency coaxial connector of assessed quality</td><td>Series N</td></tr>
<tr><td>Style:.....</td><td colspan="2">Special features and markings</td></tr>
<tr><td>Method of cable/wire+ attachment</td><td colspan="2">centre conductor – solder/crimp+
outer conductor – solder/clamp/crimp +
+ delete as appropriate</td></tr>
<tr><td>(6) Assessment level.....</td><td>Characteristic impedance … Ω</td><td>Climatic category..../.../.../</td></tr>
<tr><td colspan="3">(7) Outline and maximum dimensions

Panel piercing and mounting details

For mating interface dimensions and position of reference plan see QC 222400

Maximun panel thickness: for front mounting …… mm, for rear mounting …… mm</td></tr>
<tr><td colspan="3">(8) Variants

Variant No. Description of variant 60096 IEC

01..... ....
....
....
....
....
....
....
....
....</td></tr>
<tr><td colspan="3">Information about manufacturers who have components qualified to this detail specification is available in the current QC 001005 Qualified Product List.</td></tr>
</table>

(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			... 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	≥.....GΩ ≥.....GΩ	Initial After conditioning
Proof voltage at sea level[a)]	01.....	9.2.6	.....kV .....kV .....kV .....kV	(86 to 106) kPa
Proof voltage at 4,4 kPa [a)]	01.....	9.2.6	.....V .....V .....V V	.....kPa (if not 4,4 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				

[a)] Voltage values are r.m.s. values at (50 to 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	.....N .....N	
Centre contact captivation - axial force - permitted displacement each direction - torque		9.3.5	.....N .....mm .....Nm	
Engagement and separation forces and torque Screw coupling Coupling torque – coupling nut friction – normal – proof		9.3.6	 ..... to ....Nm < .....Nm .....N	 Achievable by hand
Strength of coupling mechanism		9.3.11	.....N	
Effectiveness of cable fixing against				
- cable rotation	01.....	9.3.7	Rotations	
- cable pulling	01.....	9.3.8	.....N	
- cable bending	01.....	9.3.9	.....Cycles	Length of cable mass ....
- cable torsion	01.....	9.3.10	.....Nm	
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				

Ratings and characteristics	IEC 61169-1 (QC 220000) Subclause	Value	Remarks including any deviations from standard test methods
Environmental			
Climatic category		...../...../.....	
Sealing non-hermetically sealed connectors	9.4.5.1	.....cm^3/h	(100 to 110) kPa pressure differential
Sealing hermetically sealed connectors	9.4.5.2	10^{-5} $bar/cm^3/h$	(100 to 110) kPa pressure differential
Water immersion	9.2.7		
Salt mist	9.4.6	..... h	Duration of spraying
Additional environmental characteristics			
Endurance			
Mechanical	9.5	.....operations	
High temperature	9.6	.....h at.....°C	
Additional endurance characteristics			
Chemical contamination			
Resistance to solvents and contaminating fluids to be used.	9.7	....	
Applicable fluids.		....	
Sulphur dioxide	9.4.8	..... days	

(10) Supplementary information

– Marking of the component: in accordance with 11.1 of IEC 61169-1 (QC 220000) in the following order of preference:

1) Manufacturer code: .....
2) Manufacturing date code: year/week
3) Component identification: Variant No./ Identification Designation
.....
.....
.....
.....
.....
.....
.....
.....

- Marking and contents of package: in accordance with 11.2 of IEC 61169-1

1) Information prescribed in 11.1 of IEC 61169-1 detailed above
2) Nominal characteristic impedance .... Ω.....
3) Assessment level code letter .....
4) Any additional marking required .....

Ordering information
1) Number of the detail specification IECQC 222XXX...../Variant code..
2) Assessment level code letter .....
3) Body finish (if more than one listed) .....
4) Any additional information or special requirements .....

- Related documents (if not included in IEC 61169-1 or sectional specification):

.....

.....

- Structural similarity in accordance with 10.2.2 of IEC 61169-1

NOTE Relevant information on a basic style should be entered as variant 01.

Annex A
(informative)

Guidance information for interface dimensions of 75 Ω characteristic impedance general purpose connectors

With the exception of the inner contacts, the interface dimensions of the 75 Ω connector have been traditionally identical to that of the 50 Ω connector. It has thus been possible unintentionally to cross-couple connectors with the following effects.

i) 75 Ω pin – 50 Ω socket: open circuit inner contact.

ii) 50 Ω pin – 75 Ω socket: mechanical destruction of 75 Ω inner socket contact.

Consequently, the use of the 75 Ω type N connector is very strongly deprecated; it should only be used for replacement, and never in new applications.

In view of this destructive mateability, a clear visual distinction should be made on the outside of the connector with a coloured (preferably yellow) or black band and legend "75 Ω" or "75 ohms".

The reflection factor shall be not more than 0,03 GHz at 1 GHz.

Dimensions for the connector with pin centre contact are as given in Table 1, except for the following reference and notes:

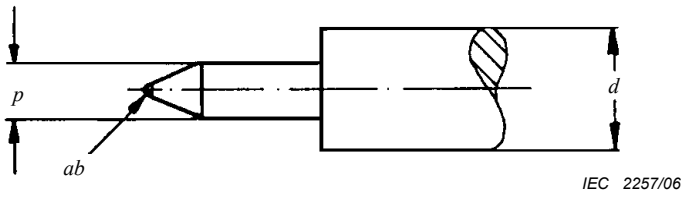


Figure A.1 – Details of pin centre contact

Table A.1 – Dimensions for the pin centre contact

Reference	mm		inches		Note	Figure
	Min.	Max.	Min.	Max.		
d	2,01 nom.		0,079 nom.		2	A.1
p	0,84	0,91	0,033	0,036	diam.	A.1
ab		0,25	–	0,010	7, radius	A.1
NOTE 2 Diameter of outer and centre contact to provide nominal (75 Ω) characteristic impedance to meet electrical performance requirements.						
NOTE 7 Flat 0,13 mm (0,005 in) diameter allowed.						

Dimensions for the connector with socket centre contact are as given in Table 2, except for the following reference and notes:

Table A.2 – Dimensions for the connector with socket centre contact

Reference	mm		inches		Note	Figure
	Min.	Max.	Min.	Max.		
d	2,01 nom.		0,079 nom.		2, diam.	4
p	–	–	–	–	6, diam.	4

NOTE 2 Diameter of outer and centre contact to provide nominal (75 Ω) characteristic impedance to meet electrical performance requirements.

NOTE 6 Centre contact design is optional. A gauge with a pin according to Figure 6, with a diameter p of $0{,}93\ ^{+0{,}005}_{-0}$ mm ($0{,}036\ ^{+0{,}000\,2}_{-0}$ in) should be inserted into the centre contact three times; the insertion force measured at the third insertion should at maximum be 9 N. The force subsequently required to withdraw a second pin according to Figure 6 with a diameter p of $0{,}84\ ^{+0}_{-0{,}005}$ mm ($0{,}033\ ^{+0}_{-0{,}000\,2}$ in) should be 0,56 N minimum in a vertical downward position.

BIBLIOGRAPHY

IEC 60457 (all parts), *Rigid precision coaxial and their associated precision connectors*

NOTE Harmonized in HD 351 series (not modified).

ISO 370:1975, *Toleranced dimensions – Conversion from inches into millimetres and vice versa*[2]

[2] This document has been withdrawn.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60068-1 + corr. October + A1	1988 1988 1992	Environmental testing - Part 1: General and guidance	EN 60068-1	1994
IEC 60096-2	1988	Radio-frequency cables - Part 2: Relevant cable specifications	-	-
IEC 61169-1 A1 A2	1992 1996 1997	Radio-frequency connectors - Part 1: Generic specification - General requirements and measuring methods	EN 61169-1 A1 A2	1994 1996 1997
ISO 263	1973	ISO inch screw threads - General plan and selection for screws, bolts and nuts - Diameter range 0.06 to 6 in	-	-

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL