

Radio-frequency connectors —

RF coaxial connectors with
inner diameter of outer
conductor 4,13 mm (0,163 in) with
screw coupling —
Characteristic impedance 50 ohms
(Type SMA)

ICS 33.120.30

Committees responsible for this British Standard

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- AEA Technology
- BEAMA Electrical Cable and Conductor Accessory Manufacturers
- British Non-Ferrous Metals Federation
- British Telecommunications plc
- Federation of the Electronics Industry
- Ministry of Defence
- National Supervisory Inspectorate
- Society of Cable Television Engineers

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National foreword

This British Standard has been prepared by Subcommittee EPL/46/2 and is identical with IEC 169-15:1979 *Radio-frequency connectors — Part 15: R.F. coaxial connectors with inner diameter of outer conductor 4,13 mm (0.163 in) with screw coupling — Characteristic impedance 50 ohms (Type SMA)*, including Amendment 1:1996, published by the International Electrotechnical Commission (IEC). IEC 169-15, also designated QC 221100, is a harmonized specification within the IEC Q system for electronic components of assessed quality.

For ease of reproduction some of the text of the French version of this international standard has been retained. References to IEC page numbers in the text should be ignored.

Cross-references

Publication referred to ^a	Corresponding British Standard
IEC 68	BS EN 60068 <i>Environmental testing</i>
IEC 68-2	BS EN 60068-2 <i>Test methods</i> BS 2011 <i>Environmental testing</i> Part 2.1 <i>Tests</i>
IEC 68-2-3	Part 2.1. Ca: 1977 <i>Test Ca. Damp heat, steady state</i> BS 3041 <i>Radio-frequency connectors</i>
IEC 169-1	BS 3041-1:1977 <i>Specification for general requirements and measuring methods</i> BS EN 61169 <i>Radio-frequency connectors</i>
IEC 1169-1 (QC 220000)	BS EN 61169-1:1996 <i>Generic specification. General requirements and measuring methods</i>

^a Undated in text.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the pages 1 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This standard concerns r.f. coaxial connectors for use with semi-rigid and flexible r.f. cables and specially intended to be used for microwave applications requiring high performance.

This type of connector is known commercially as the SMA connector.

2 IEC type designation

Connectors conforming to this standard shall be designated by:

- a) the reference to this standard: 169-15 IEC;
- b) the number of the grade¹⁾:

Grade 0 = standard test connector = G0;

Grade 1 = high performance connector = G1;

Grade 2 = general purpose connector = G2;

- c) a group of figures specifying the climatic category (see Clause 4).

Example

169-15 IEC-G1 (40/85/21) denotes a connector with mating face as specified in Clause 5 of this standard belonging to climatic category 40/85/21.

NOTE In the present standard, Grade 2 is under consideration. Deviating from normal practice, the dimensions and tolerances are specified for Grade 1 connector (see Clause 5). Dimensions and tolerances of the Grade 0 connector are specified in Sub-clause 6.2.

3 Ratings

The r.f. connectors defined in this standard are designed for use with a variety of flexible and semi-rigid coaxial cables and rigid coaxial lines and Grade 1 will not introduce a reflection factor greater than 0.1 at frequencies up to 24 GHz under optimum conditions.

NOTE "Under optimum conditions" means that all circumstances are the best possible, for instance straight connector, mounting to a rigid or semi-rigid line, careful manufacturing. Bearing in mind the design concept of the connector, the reflection factor specified under the optimum conditions should be achievable in practice, the percentage of connectors from any production batch failing to obtain the specified performance being reasonably low.

¹⁾ General definitions of grades:

Standard test connector, Grade 0

A precisely made connector of a particular type used to carry out reflection factor measurements on Grade 1 and Grade 2 connectors, contributing only negligible errors to the measuring result. The dimensions and tolerances are specified in the relevant specification.

High performance connector, Grade 1

A connector for which limits of reflection factor are specified as a function of frequency in the relevant specification. No tighter dimensional tolerances than those applicable to Grade 2 are normally specified. The manufacturer is responsible, however, for choosing tighter tolerances where necessary to ensure that the reflection factor requirements are met.

General purpose connector, Grade 2

A connector making use of the widest permitted deviations (tolerances) so as to still guarantee good performance and intermateability.

NOTE A requirement relative to the reflection factor may, or may not, be specified in the relevant specification.

The following limits for coupling torque are recommended:

- minimum: 0.791 Nm;
- maximum: 1.130 Nm.

Working voltage:

Line or cable diameter	Voltage at sea level	Voltage at 20 000 m (44 mbar)
Rigid lines	500	85
3 mm cable	300	85
2 mm cable	250	65
1 mm cable	170	45

Current: 0.25 A d.c. maximum.

4 Preferred climatic categories (see IEC Publication 68: Basic Environmental Testing Procedures)

Category ^a	Temperature range	Damp heat, steady state
40/85/21	– 40 °C to + 85 °C	21 days
40/100/21	– 40 °C to + 100 °C	21 days
55/155/56	– 55 °C to + 155 °C	56 days

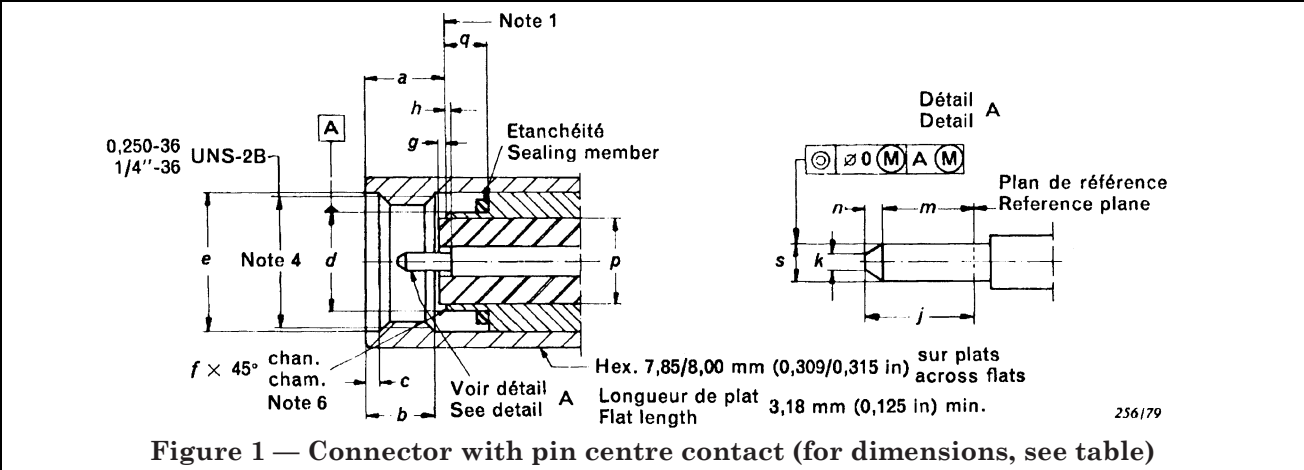
^a To be included in the IEC type designation (see Clause 2).

NOTE Select climatic category to suit cable used.

5. Dimensions — Connecteurs de niveau 1

Les dimensions en inches sont les dimensions originales. Toutes les dimensions non cotées ne sont données qu'à titre de référence.

5.1 Connecteur avec contact central male



Réf. Ref.	mm		in		Note
	Min.	Max.	Min.	Max.	
a	—	3,43	—	0,135	3
b	2,54	—	0,100	—	
c	0,38	1,14	0,015	0,045	
d	—	4,59	—	0,1808	diam. 4
e	6,35	—	0,250	—	diam. 4
f	—	0,08	—	0,003	6
g	—	—	—	—	5
h	0,00	—	0,000	—	
j	—	2,54	—	0,100	
k	—	0,38	—	0,015	diam.
m	1,27	—	0,050	—	
n	0,38	—	0,015	—	
p	—	4,178	—	0,1645	2
q	—	—	—	—	7
s	0,902	0,940	0,0355	0,0370	diam.

- NOTE 1 Plan de référence mécanique et électrique.

NOTE 2 Choisir la tolérance afin d'obtenir 50 Ω. La dimension *p* peut différer des valeurs données lorsque le conducteur central du câble est utilisé comme contact mâle. Dans ce cas le diamètre intérieur du conducteur extérieur est identique au diamètre extérieur du câble.

NOTE 3 Ecrou de verrouillage en avant.

NOTE 4 Les diamètres *d* et *e* et le filetage doivent être calibrés afin de s'assurer que sur MMC la coaxialité est respectée.

NOTE 5 Il convient que le dépassement maximal de l'isolant au-delà du plan de référence soit égal à 0,05 mm (0,002 in).

Il convient que le retrait maximal de l'isolant en deçà du plan de référence soit égal à 0,18 mm (0,007 in).

NOTE 6 0,08 mm (0,003 in) max. rayon facultatif.

NOTE 7 Il convient que la dimension *q* soit telle que les plans de référence coïncident et que les connecteurs satisfassent aux conditions d'environnement.
- NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Choose tolerance to give the requirement of 50 Ω. Dimension *p* may deviate from the values given when the centre conductor of the cable is used as the contact pin. In this case, the inner diameter of the outer conductor is identical with the d.o.d. of the cable.

NOTE 3 Coupling nut in forward position.

NOTE 4 Diameters *d* and *e* and screw thread shall be gauged to ensure that on MMC they are coaxial.

NOTE 5 Maximum dielectric projection beyond reference plane should be 0.05 mm (0.002 in).

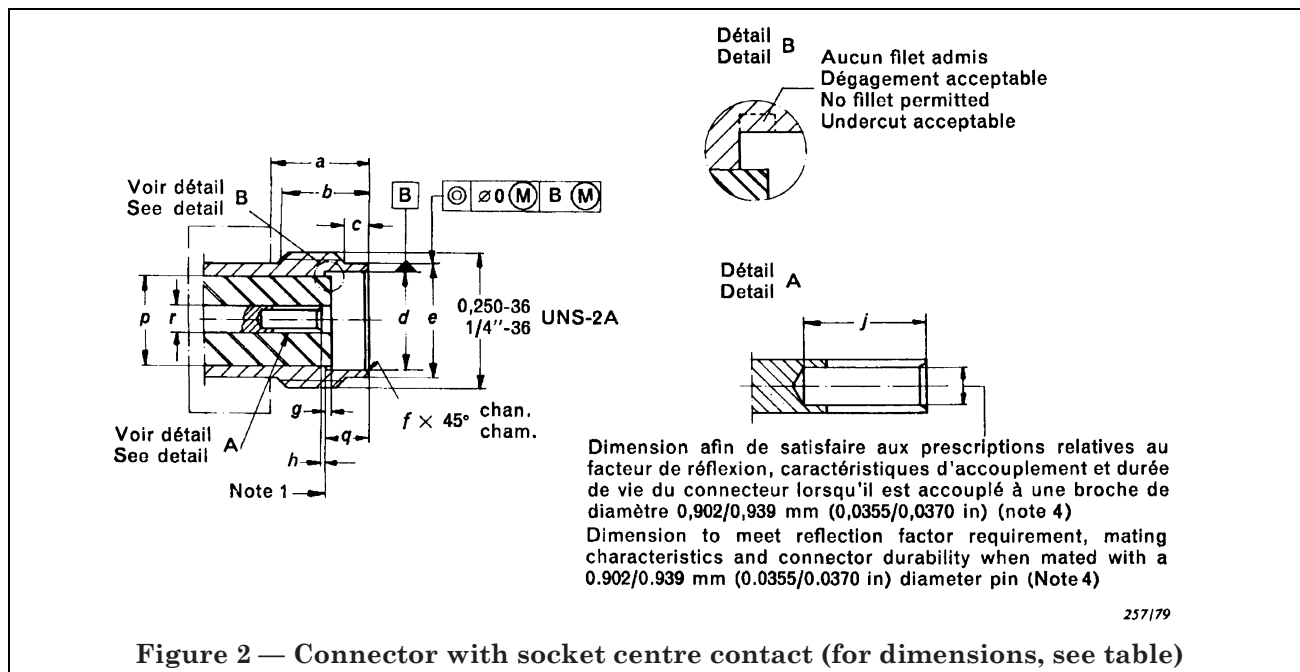
Maximum recession with respect to reference plane should be 0.18 mm (0.007 in).

NOTE 6 0.08 mm (0.003 in) max. radius optional.

NOTE 7 Dimension *q* should be such that the reference planes coincide and the connectors meet the required environmental performance.

5.2 Connecteur avec contact central femelle

5.2 Connector with socket centre contact



Réf. Ref.	mm		in		Note
	Min.	Max.	Min.	Max.	
a	5,54	—	0,218	—	3
b	4,32	—	0,170	—	
c	0,38	1,14	0,015	0,045	
d	0,60	4,67	0,1810	0,184	diam.
e	5,28	5,49	0,208	0,216	diam.
f	0	0,13	0	0,005	5
g	—	—	—	—	
h	0,00	0,41	0,000	0,016	
j	2,92	—	0,115	—	diam.
p	—	4,178	—	0,1645	
q	1,88	1,98	0,074	0,078	
r	1,245	1,295	0,049	0,051	diam. 2

NOTE 1 Plan de référence mécanique et électrique.

NOTE 2 Choisir les tolérances afin d'obtenir 50 Ω

NOTE 3 Filetage minimal.

NOTE 4 L'alésage du contact central doit être calibré afin de s'assurer que sur MMC la coaxialité est respectée.

NOTE 5 Le dépassement maximal de l'isolant au-delà du plan de référence doit être égal à 0,05 mm (0,002 in). Le retrait maximal de l'isolant au-delà du plan de référence doit être de 0,18 mm (0,007 in).

NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Choose tolerance to give the requirements of 50 Ω.

NOTE 3 Minimum full thread.

NOTE 4 Bore of centre contact and diameter *d* shall be gauged to ensure that on MMC they are coaxial.

NOTE 5 Maximum dielectric projection beyond reference plane should be 0.05 mm (0.002 in). Maximum recession with respect to reference plane should be 0.18 mm (0.007 in).

6. Calibres et connecteurs d'essai de référence
– Classe 0

Les dimensions en inches sont les dimensions originales. Toutes les représentations non cotées sont données pour référence uniquement.

6.1 Calibres mécaniques

6.1.1 Connecteur femelle

6.1.1.1 Contact central

6. Gauges and standard test
connectors —Grade 0

Inch dimensions are original dimensions. All undimensioned pictorial configurations are for reference purposes only.

6.1 Mechanical gauges

6.1.1 Socket connector

6.1.1.1 Centre contact

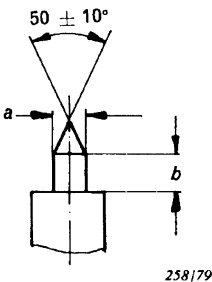


Figure 3 — Gauge pins for centre contact of socket connector.

6.1.1.2 Séquence d'essai

- a) Une broche en acier (Figure 3) avec un diamètre a de $0,9525 \pm 0,0025$ mm ($0,0375 \pm 0,0001$ in) et une longueur b de 0,76 à 1,14 mm ($0,0299$ à $0,0449$ in) doit être introduite une fois dans le contact central.
- b) Une seconde broche en acier (Figure 3) avec un diamètre a de $0,9017 \overset{0}{-0,0025}$ mm ($0,0355 \overset{0}{-0,0001}$ in) une longueur b de 1,27 à 1,9 mm ($0,0500$ à $0,0748$ in) et une rugosité de $0,4 \mu\text{in}$ ($16 \mu\text{in}$) doit avoir une force minimale de rétention de 0,28 N après insertion dans le contact central.

Il est recommandé que ce calibre ait une masse minimale (poids) de 28 g.

6.1.1.2 Test sequence

- a) A steel test pin (Figure 3) with a diameter a of 0.9525 ± 0.0025 mm (0.0375 ± 0.0001 in) and a length b of 0.76 to 1.14 mm (0.0299 to 0.0449 in) shall be inserted once into the centre contact.
- b) A second steel test pin (Figure 3) with a diameter a of $0.9017 \overset{0}{-0.0025}$ mm ($0.0355 \overset{0}{-0.0001}$ in) and a length b of 1.27 to 1.9 mm (0.0500 to 0.0748 in) and a $0.4 \mu\text{m}$ ($16 \mu\text{in}$) finish shall have a withdrawal force of 0.28 N minimum after insertion into the centre contact.

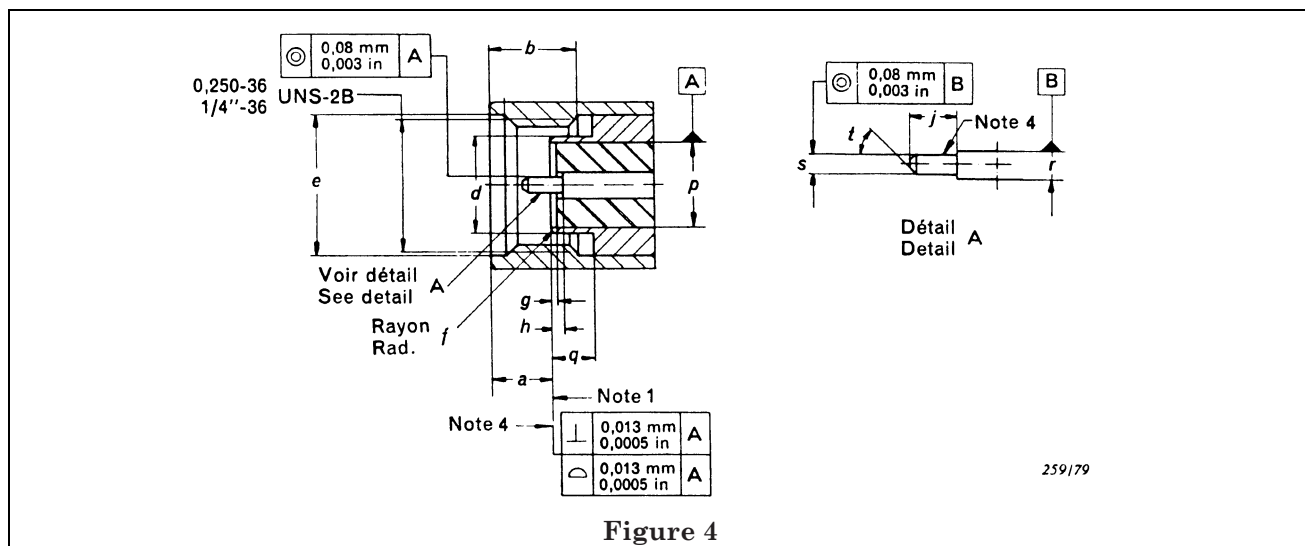
It is recommended that this gauge should have a mass (weight) of 28 g minimum.

En vue d'effectuer la mesure du facteur de réflexion selon le paragraphe 14.1 de la Publication 169-1 de la CEI, l'équipement de mesure doit être équipé de connecteurs d'essai.

6.2.1 Connecteurs d'essai avec contact central mâle

In order to carry out the reflection factor measurement according to Sub-clause 14.1 of IEC Publication 169-1, the measuring equipment should be provided with standard test connectors.

6.2.1 Standard test connectors with pin centre



Pour les dimensions ne figurant pas dans ce tableau, voir le paragraphe 5.1.

Dimensions not included in this table, see Clause 5.1.

Réf. Ref.	mm		in		Note
	Min.	Max.	Min.	Max.	
a	2,59	3,35	0,102	0,132	3
b	2,54	4,32	0,100	0,170	
d	4,521	4,592	0,1780	0,1808	diam.
e	6,48	6,73	0,255	0,265	diam.
f	—	0,08	—	0,003	5
g	0,00	0,05	0,000	0,002	
h	0,00	0,076	0,000	0,003	diam.
j	2,03	2,29	0,080	0,090	
p	4,10	4,13	0,1615	0,1625	diam.
q	2,03	—	0,080	—	
r	1,27		0,050		diam. nom. 2
s	0,902	0,927	0,0355	0,0365	diam.
t	48°	42°	48°	42°	

NOTE 1 Plan de référence mécanique et électrique.

NOTE 2 Choisir pour obtenir la valeur prescrite $50 \pm 0,5 \Omega$. Le diamètre nominal indiqué dans le tableau est donné pour l'utilisation d'un câble avec isolant en PTFE ayant une constante diélectrique de 2,02.

NOTE 3 Ecrou de verrouillage en avant.

NOTE 4 Rugosité de surface $0,8 \mu\text{m}$ ($32 \mu\text{in}$).

NOTE 5 $0,08 \text{ mm}$ ($0,003 \text{ in}$) $\times 45^\circ$ chanfrein facultatif.

NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Choose to give the required performance $50 \pm 0,5 \Omega$. The given nominal diameter in the table is on the assumption of the use of PTFE dielectric having a dielectric constant of 2.02.

NOTE 3 Coupling nut in forward position.

NOTE 4 Surface roughness $0,8 \mu\text{m}$ ($32 \mu\text{in}$).

NOTE 5 $0,08 \text{ mm}$ ($0,003 \text{ in}$) $\times 45^\circ$ chamfer optional.