

Radio-frequency connectors

RF coaxial connectors with inner diameter of outer conductor 3 mm (0,12 in) with snap-on coupling — Characteristic impedance 50 ohms (Type SMB)

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 169-10:1983 *Radio-frequency connectors — Part 10: R.F. coaxial connectors with inner diameter of outer conductor 3 mm (0.12 in) with snap-on coupling — Characteristic impedance 50 ohms (Type SMB)*, including Amendment 1:1986 and Amendment 2:1996, published by the International Electrotechnical Commission (IEC). IEC 169-10, also designated QC 221300, is a harmonized specification within the IECQ 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>
IEC 68-2-1:1990	BS EN 60068-2-1:1993 <i>Tests A. Cold</i>
IEC 68-2-2:1974	BS EN 60068-2-2:1993 <i>Tests B. Dry heat</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>
IEC 68-2-11	Part 2.1 Ka:1982 <i>Test Ka. Salt mist</i>
IEC 68-2-13:1983	Part 2.1M:1984 <i>Test M. Low air pressure</i>
IEC 68-2-14	Part 2. 1N:1985 <i>Test N. Change of temperature</i>
IEC 68-2-20	Part 2. 1T:1981 <i>Test T. Soldering</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.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 42, 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 patterns for r.f. coaxial connectors which may preferably be used with r.f. cables 96 IEC 50-1 or 96 IEC 50-2 of IEC Publication 96-2: Radio-frequency Cables, Part 2: Relevant Cable Specifications.

These connector patterns are for low power. They have a snap-on coupling mechanism and are commonly known as Type “SMB”.

2 IEC type designation

Connectors conforming to this standard shall be designated by:

- a) the reference to this standard: 169-10 IEC;
- b) 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;
- c) a serial number (see Clause 7);
- d) a group of figures specifying the climatic category (see Clause 4).

Example:

169-10 IEC-G1-1 (55/155/21) denotes a free socket Grade 1 high performance connector belonging to climatic category 55/155/21 to be used with an r.f. coaxial cable 96 IEC 50-1-1/2/3.

NOTE The type designation used in this standard is provisional. A final type designation is under consideration.

3 Ratings

This standard specifies pin and socket connectors with snap-on coupling mechanism with an inner diameter of the outer conductor of 3 mm (0.12 in). Cable mounting connectors will function within specification with appropriate cables (see Clause 7) to a frequency range of at least 3 GHz, and may be used at higher frequencies if a reflection factor greater than that specified can be tolerated.

The connectors have a maximum working voltage of 500 V¹⁾ at sea level and of 100 V at 20 000 m (44 mbar). Connection of the cable may be made either by soldering or by crimping, depending upon design.

The connectors may be provided with barrier and panel seals.

NOTE Patterns for crimping and sealed connectors are under consideration. All connectors may be used over a range of – 55 °C to + 155 °C.

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

Category ^a	Temperature range	Damp heat, steady state
55/155/21	– 55 °C to + 155 °C	21 days
^a To be included in the IEC type designation (see Clause 2).		

¹⁾ All voltages specified in this standard are r.m.s. values of a.c. voltages. All test voltages are a.c. voltages of 50 Hz to 60 Hz, unless otherwise specified.

5 Dimensions — Connecteurs d'usage général — Niveau 2

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

NOTE Les valeurs pour les dimensions en millimètres dérivées des valeurs en inches ne sont pas nécessairement exactes (en accord avec la Norme ISO 370) mais elles doivent être considérées comme acceptables par rapport aux valeurs originales en ce qui concerne la précision.

5.1 Connecteur avec contact central mâle

5 Dimensions — General purpose connectors — Grade 2

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

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

5.1 Connector with pin centre contact

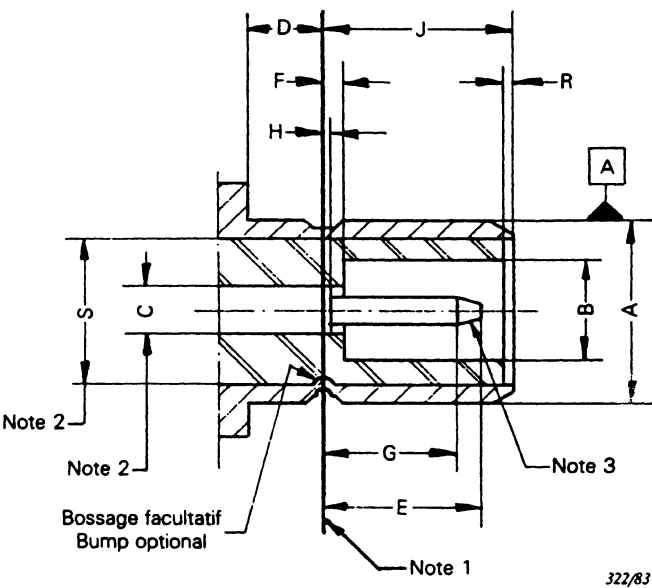


Figure 1A — Connector with pin centre contact (for dimensions, see table)

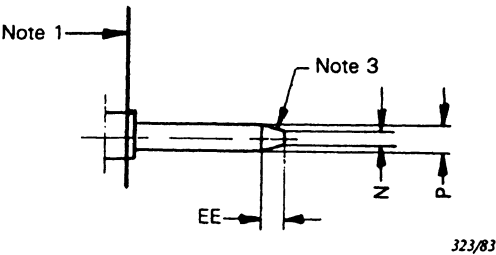


Figure 1B — Details of pin contact

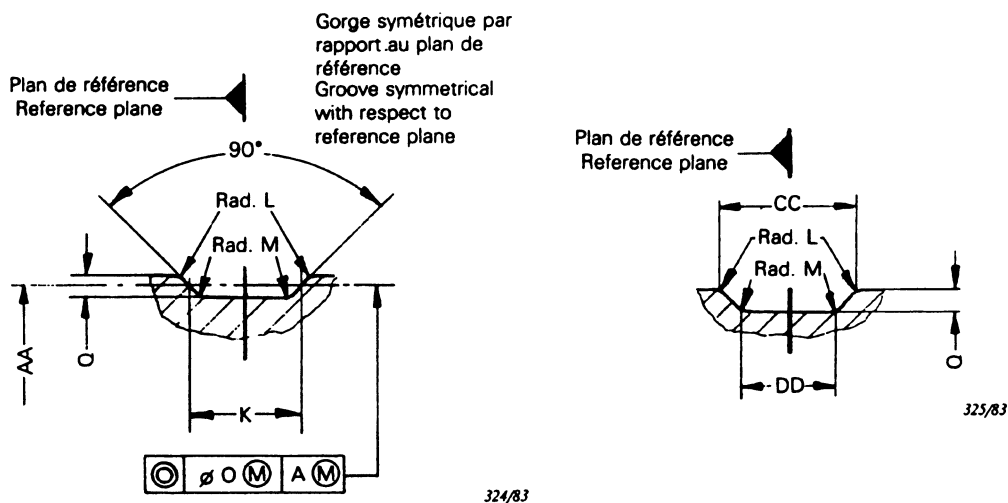


Figure 1C

Figure 1D

Figure 1C and Figure 1D — Alternative indication of details of groove

Réf. Ref.	mm		inch		Note
	Min.	Max.	Min.	Max.	
A	3,66	3,71	0,144	0,146	diam.
B	2,08	—	0,082	—	diam.
C	—	—	—	—	2/diam.
D	1,65	—	0,065	—	—
E	—	2,97	—	0,117	—
F	—	0,18	—	0,007	—
G	1,32	—	0,052	—	—
H	—	0,18	—	0,007	—
J	3,33	3,58	0,131	0,141	—
K	0,58		0,023		nom.
L	0,05	0,15	0,002	0,006	rad.
M	—	0,13	—	0,005	rad.
N	—	0,25	—	0,010	3/diam.
P	0,48	0,53	0,019	0,021	diam.
Q	0,15	0,25	0,006	0,010	—
R	0,0	—	0,00	—	—
S	3,05		0,120		2/diam. nom.
AA	3,43	3,53	0,135	0,139	diam.
CC	0,69	0,94	0,027	0,037	—
DD	0,28	0,38	0,011	0,015	—
EE	0,25	—	0,01	—	—

NOTE 1 Plan de référence.

NOTE 2 Diamètre du conducteur central et de la section uniforme de la ligne de transmission afin d'obtenir l'impédance caractéristique de 50 Ω.

NOTE 3 Pointu, forme facultative.

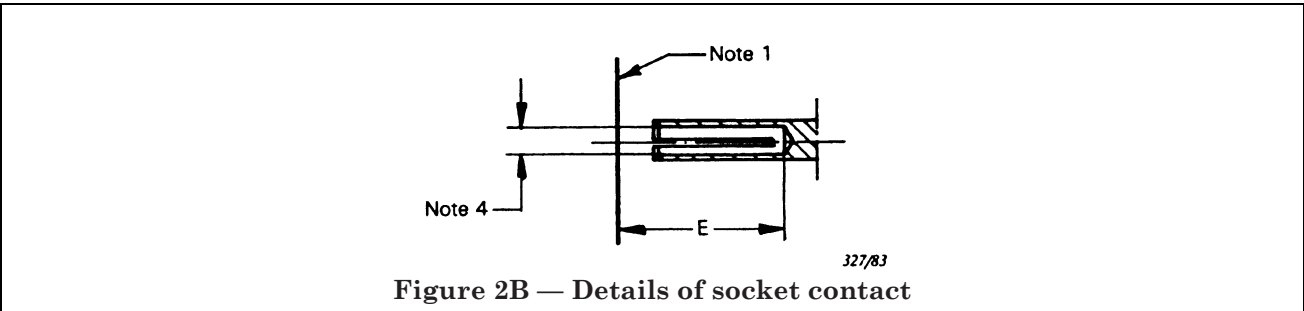
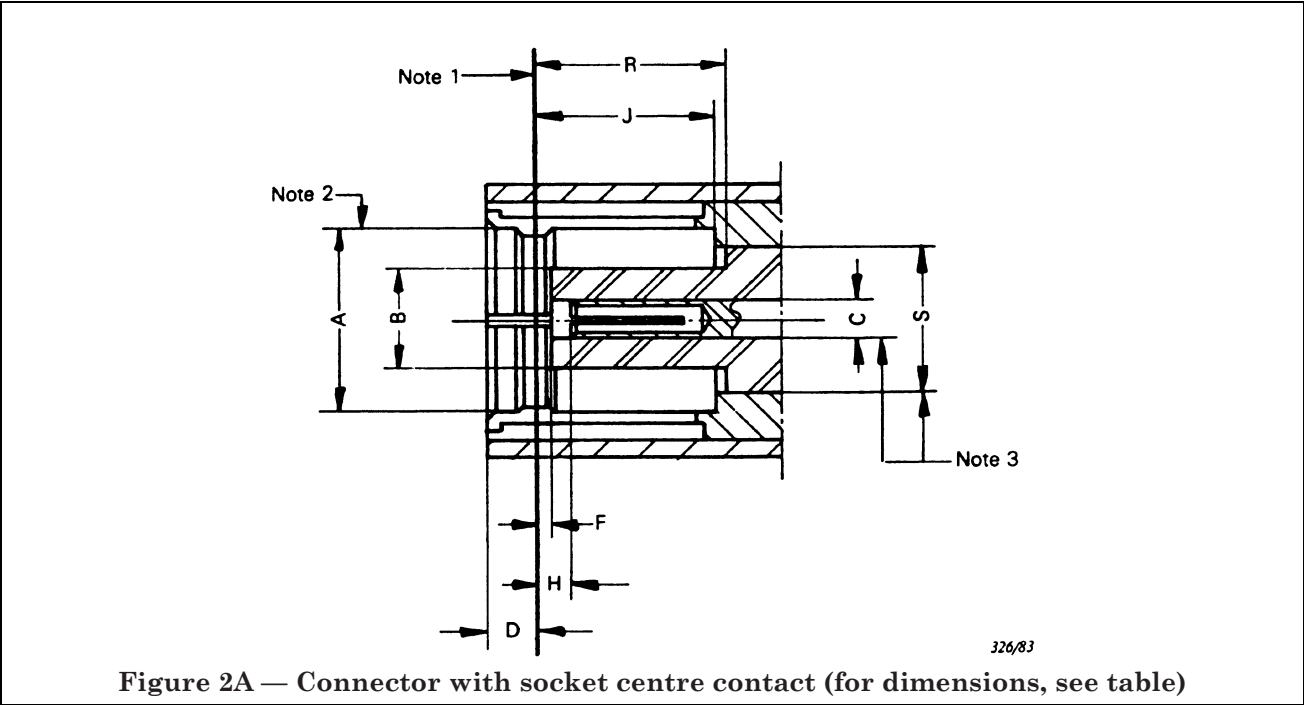
NOTE 1 Reference plane.

NOTE 2 Diameter of centre conductor and of uniform section of transmission line to give required characteristic impedance of 50 Ω.

NOTE 3 Pointed, shape optional.

5.2 Connecteur avec contact central femelle

5.2 Connector with socket centre contact



Réf. Ref.	mm		inch		Note
	Min.	Max.	Min.	Max.	
A	—	—	—	—	2/diam. diam. 3/diam.
B	—	2,06	—	0,081	
C	—	—	—	—	
D	—	1,63	—	0,064	
E	2,97	—	0,117	—	0,037
F	0,18	—	0,007	—	
H	0,18	0,94	0,007	0,037	
J	3,58	—	0,141	—	
R	3,58	—	0,141	—	3/diam.nom.
S	3,05	—	0,120	—	

NOTE 1 Plan de référence.

NOTE 2 Forme et dimensions de l'empreinte du contact extérieur pour satisfaire aux prescriptions mécaniques et électriques.

NOTE 3 Diamètre du contact central et de la section uniforme de la ligne de transmission afin d'obtenir une impédance caractéristique de 50 Ω .

NOTE 4 Diamètre d'alésage ajusté pour satisfaire aux prescriptions électriques et mécaniques.

6 Calibres et connecteurs d'essai de référence — Niveau 0

6.1 Calibres mécaniques

6.1.1 Connecteurs avec contact central femelle

NOTE 1 Reference plane.

NOTE 2 Form and dimensions of outer contact detent to meet electrical and mechanical requirements.

NOTE 3 Diameter of centre conductor and or uniform section of transmission line to give required characteristic impedance of 50 Ω .

NOTE 4 Bore diameter closed to meet electrical and mechanical requirements.

6 Gauges and standard test connectors — Grade 0

6.1 Mechanical gauges

6.1.1 Connectors with socket centre contact

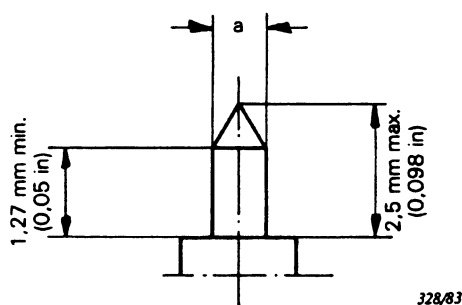


Figure 3 — Gauge pins for centre contact of socket connector

6.1.1.1 Séquence d'essai

a) Une broche d'essai en acier (Figure 3) avec un diamètre «a» de 0,533 mm à 0,538 mm (0,0210 in à 0,0212 in) est introduite dans le contact central électrique sur une distance minimale de 1,27 mm (0,05 in).

b) Une broche d'essai en acier (Figure 3) avec un diamètre «a» de 0,477 mm à 0,482 mm (0,0188 in à 0,0190 in) et une rugosité de 0,4 μm (16 μin) 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 (poids) de 28 ± 1 g.

S'il n'est pas possible d'effectuer l'opération de calibrage sur connecteurs, les prescriptions du point b) doivent cependant être satisfaites.

6.1.1.1 Test sequence

a) A steel test pin (Figure 3) with a diameter "a" of 0.533 mm to 0.538 mm (0.0210 in to 0.0212 in) shall be inserted into the centre contact a minimum distance of 1.27 mm (0.05 in).

b) A steel test pin (Figure 3) with a diameter "a" of 0.477 mm to 0.482 mm (0.0188 in to 0.0190 in) and a 0.4 μm (16 μin) finish shall have a minimum withdrawal force of 0.28 N after insertion into the centre contact.

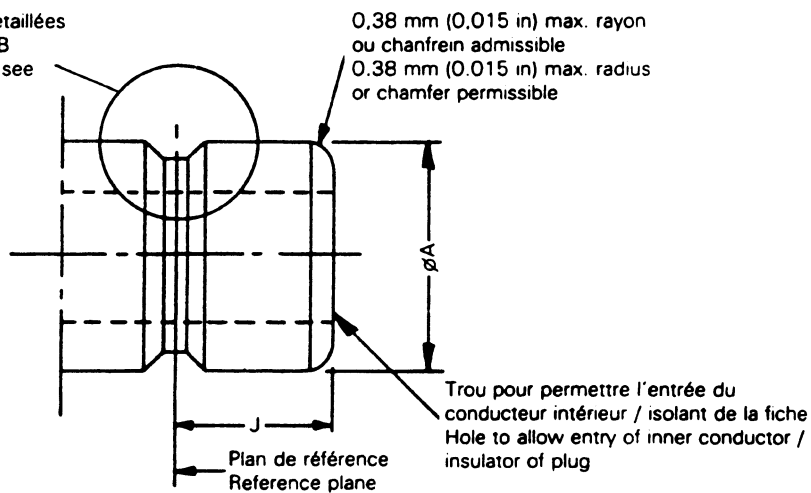
It is recommended that this gauge should have a mass (weight) of 28 ± 1 g.

If it is not possible to carry out the sizing operation on connectors, the requirements of Item b), however, shall be met.

6.1.2 Calibres pour le contact extérieur de la fiche

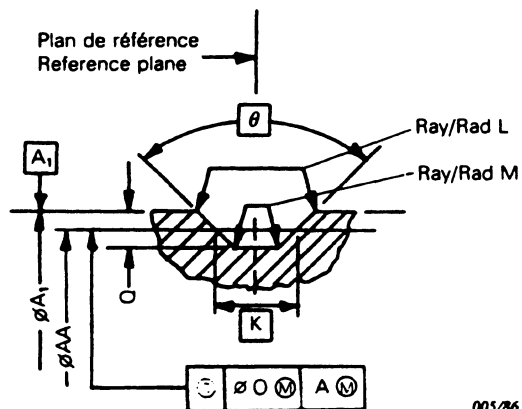
6.1.2 Gauges for outer contact of plug

Pour les vues détaillées
voir fig. 4A et 4B
For scrap views see
fig. 4A and 4B



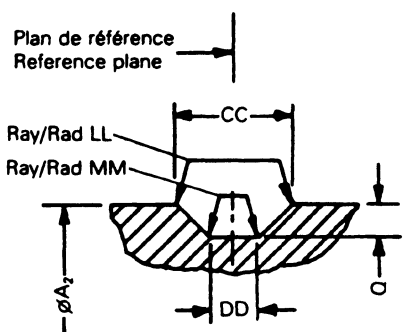
004/86

Figure 4 — Gauges for outer contact of plug



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FIGURE 4A



006/86

FIGURE 4B

Figure 4A and Figure 4B — Alternative indication of details of groove

Calibre A — Conditions maximales de matière pour le forçage Gauge A — Maximum material — for sizing purposes					Calibre B — Conditions minimales de matière pour la mesure de la force de rétention Masse (poids) du calibre: 800 ± 10 g Gauge B — Minimum material — for measurement of retention force Mass (weight) of gauge: 800 ± 10 g				
Réf. Ref.	mm		inch		mm		inch		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
∅A ₁	3,70	3,71	0.1455	0.1460	3,66	3,67	0.1440	0.1445	
∅A ₂	3,68	3,71	0.1450	0.1460	3,68	3,71	0.1450	0.1460	
J	3,33	3,58	0.131	0.141	3,33	3,58	0.131	0.141	
K	0,584		0.0230		0,584		0.0230		
Ray/Rad L	0,05	0,08	0.002	0.003	0,10	0,13	0.004	0.005	
Ray/Rad M	—	0,08	—	0.003	0,08	0,10	0.003	0.004	
Q	0,25	0,28	0.010	0.011	0,13	0,15	0.005	0.006	
∅ AA	3,48	3,49	0.1370	0.1375	3,48	3,49	0.1370	0.1375	
CC	0,91	0,94	0.036	0.037	0,69	0,71	0.027	0.028	
DD	0,36	0,38	0.014	0.015	0,28	0,30	0.011	0.012	
Ray/Rad LL	0,05	0,15	0.002	0.006	0,05	0,15	0.002	0.006	
Ray/Rad MM	—	0,13	—	0.005	—	0,13	—	0.005	
θ	79°		79°		109°		109°		
Matériau: acier poli; rugosité: Ra = 0,4 µm (16 µin) max. Material: steel, polished; surface roughness: Ra = 0.4 µm (16 µin) max.									

6.1.2.1 Séquence d'essai

Le *calibre A* est introduit une fois dans le contact extérieur du connecteur. Cela est une opération de calibrage qui peut aussi servir à mesurer la force d'insertion.

Après cela, le *calibre B* est introduit une fois dans le contact extérieur en position verticale. Le calibre doit être maintenu.

6.1.2.1 Test sequence

Gauge A shall be placed once in the outer contact of the connector. This is a sizing operation which may also serve for measuring insertion force.

After this, the *gauge B* shall be placed once in the outer contact in a vertical position. The gauge shall be held.

6.2 Connecteurs de référence (niveau 0)

Les connecteurs de référence sont principalement utilisés comme partie de l'adaptateur à l'équipement de mesure pour effectuer la mesure du facteur de réflexion selon les prescriptions du paragraphe 14.1 de la Publication 169-1 de la CEI: Connecteurs pour fréquences radioélectriques, Première partie: Règles générales et méthodes de mesure.

6.2 Standard test connector (Grade 0)

Standard test connectors are mainly used as part of the adaptor to the measuring equipment to carry out reflection factor measurement according to Sub-clause 14.1 of IEC Publication 169-1: Radio-frequency Connectors, Part 1: General Requirements and Measuring Methods.

6.2.1 *Connecteur de référence avec contact central mâle*

6.2.1 *Standard test connector with pin centre contact*

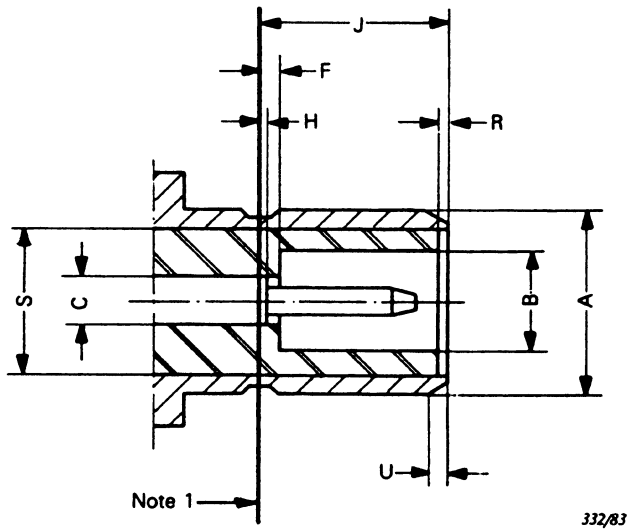


Figure 5A — Dimensions of connector (see table)

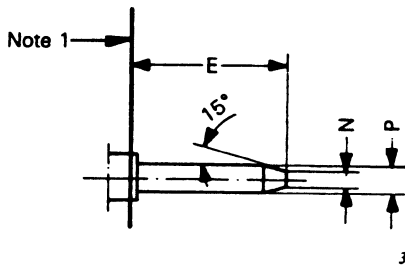


Figure 5B — Dimensions of centre contact (see table)

Réf. Ref.	mm		inch		Note
	Min.	Max.	Min.	Max.	
A	3,66	3,71	0,144	0,146	diam. 3/diam. 2/diam.
B	2,08	2,15	0,082	0,085	
C	—	—	—	—	
E	2,39	2,72	0,094	0,107	
F	—	0,11	—	0,0045	
H	—	− 0,24 ^a	—	− 0,0095 ^a	diam. diam.
J	3,48	0,09	—	0,0035	
N	—	− 0,11 ^a	—	− 0,0045 ^a	
P	0,48	0,53	0,019	0,021	
R	0,04	0,24	0,0015	0,0095	
S	3,05	3,07	0,120	0,121	2/diam.
U	0,102	0,178	0,004	0,007	chamf.
Les dimensions non indiquées dans ce tableau sont définies au paragraphe 5.1. For dimensions not indicated in this table, see Sub-clause 5.1.					
^a Valeur absolue maximale à gauche (vers le câble) par rapport au plan de référence.					
^a Maximum absolute value to the left (towards cable) with respect to the reference plane.					

NOTE 1 Plan de référence.

NOTE 2 Diamètre du conducteur central et longueur de la section uniforme de la ligne de transmission pour obtenir l'impédance caractéristique requise de $50\ \Omega$ lorsque celle-là est vérifiée en utilisant les méthodes de réflectométrie chronométrique.

NOTE 3 Dimension pour utilisation d'un diélectrique de PTFE ayant une constante diélectrique de 2,02. Le PTFE est impératif.

6.2.2 Connecteur de référence avec contact central femelle

NOTE 1 Reference plane.

NOTE 2 Diameter of centre conductor and length of uniform section of transmission line to give required characteristic impedance of $50\ \Omega$ when checked using time domain reflectometer methods.

NOTE 3 Dimension for use of PTFE dielectric having a dielectric constant of 2.02. PTFE is mandatory.

6.2.2 Standard test connector with socket centre contact

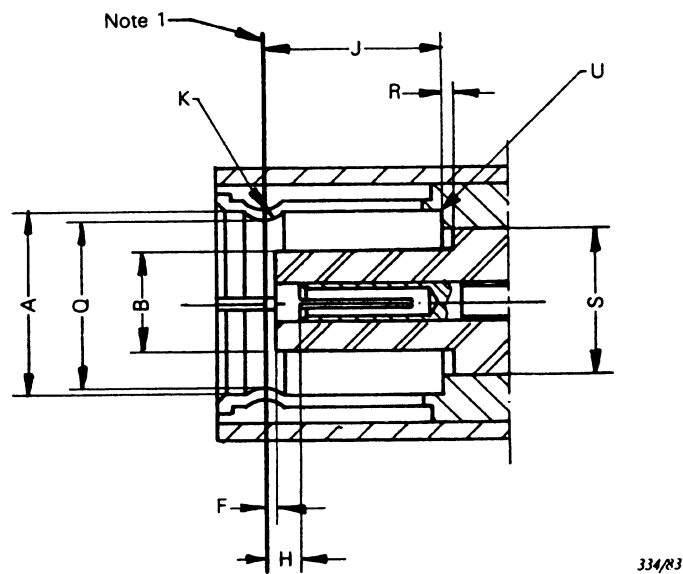


Figure 6A — Dimensions of connector (see table)

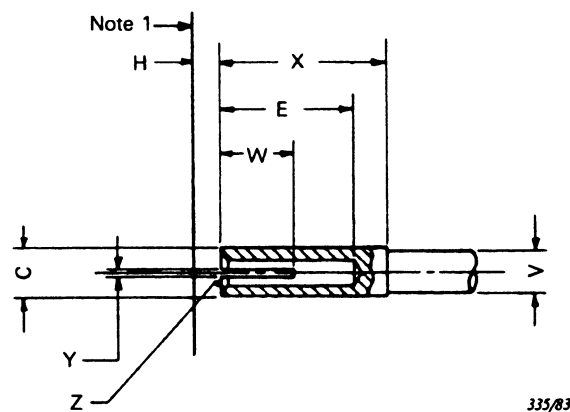


Figure 6B — Dimensions of centre contact (see table)

Réf. Ref	mm		inch		Note
	Min.	Max.	Min.	Max.	
A	3,73	3,78	0,147	0,149	diam.
B	2,01	2,06	0,079	0,081	3/diam.
C	1,01	1,03	0,0396	0,0404	4/diam.
E	2,79	—	0,110	—	
F	0,27	0,52	0,0105	0,0205	
H	0,29	0,57	0,0115	0,0225	
J	3,58	3,78	0,141	0,149	
K	0,64	0,76	0,025	0,030	rad.
Q	3,40	3,45	0,134	0,136	diam.
R	− 0,01	+ 0,29	− 0,0005	+ 0,0115	
S	3,05	3,07	0,120	0,121	s/diam.
U	—	0,08	—	0,003	rad.
V	—	—	—	—	2/diam.
W	1,52	1,78	0,060	0,070	
X	3,37	3,49	0,1325	0,1375	
Y	0,13	0,23	0,005	0,009	
Z	0,05	0,15	0,002	0,005	chamf. × 45°
Pour les dimensions données dans ce tableau, voir paragraphe 5.2. For dimensions not indicated in this table, see Sub-clause 5.2.					

NOTE 1 Plan de référence.

NOTE 2 Diamètre du conducteur central et longueur de la section uniforme de la ligne de transmission pour obtenir l'impédance caractéristique requise de 50 Ω lorsque celle-là est vérifiée en utilisant les méthodes de réflectométrie chronométrique.

NOTE 3 Dimension pour utilisation d'un diélectrique de PTFE ayant une constante diélectrique de 2,02. Le PTFE est impératif.

NOTE 4 Applicable avec broche insérée ayant un calibre de 0,51 mm (0,020 in) de diamètre.

NOTE 1 Reference plane.

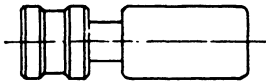
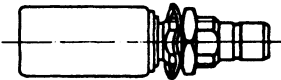
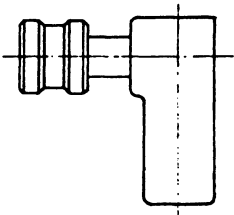
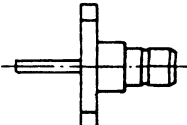
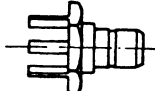
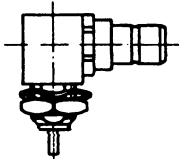
NOTE 2 Diameter of centre conductor and length of uniform section of transmission line to give required characteristic impedance of 50 Ω when checked using time domain reflectometer methods.

NOTE 3 Dimension for use of PTFE dielectric having a dielectric constant of 2.02. PTFE is mandatory.

NOTE 4 Applies with 0.51 mm (0.020 in) diam. gauge pin inserted.

7 Revue des modèles

7 Survey of patterns

Classe d'essai Test class	Description Description	Contact central Centre contact	Modèle Pattern	Désignation de type ^a Type designation ^a
1	Fiche (droite) Free connector (straight)	Femelle Socket		169-10 IEC-1 169-10 IEC-2
1	Fiche à écrou (fixation centrale sur panneau avec sortie pour câble pour fréquences radioélectriques) Fixed connector (single-hole panel mounting with entry for r.f. cable)	Mâle Pin		169-10 IEC-3 169-10 IEC-4
1	Fiche coudée (angle droit) Free connector (right angle)	Femelle Socket		169-10 IEC-5 169-10 IEC-6
3	Embase à écrou (fixation centrale sur panneau par l'arrière avec cosse à souder) Fixed connector (single-hole rear panel mounting with solder bucket)	Mâle Pin		169-10 IEC-7
3	Embase à platine (fixation sur panneau par quatre trous avec cosse à souder) Fixed connector (four-hole panel mounting with solder bucket)	Mâle Pin		169-10 IEC-8
2	Embase pour montage sur circuit imprimé (droite) Fixed connector, printed circuit mounting (straight)	Mâle Pin		169-10 IEC-9
3	Embase à écrou coudée (angle droit, fixation centrale sur panneau avec cosse à souder) Fixed connector (right angle, single-hole panel mounting with solder bucket)	Mâle Pin		169-10 IEC-10
^a Si aucune précision n'est donnée, il s'agit du niveau 2. Le niveau 1 doit être indiqué.		^a If no details are given, Grade 2 is referred to. Grade 1 shall be indicated.		