IEC 61169-24

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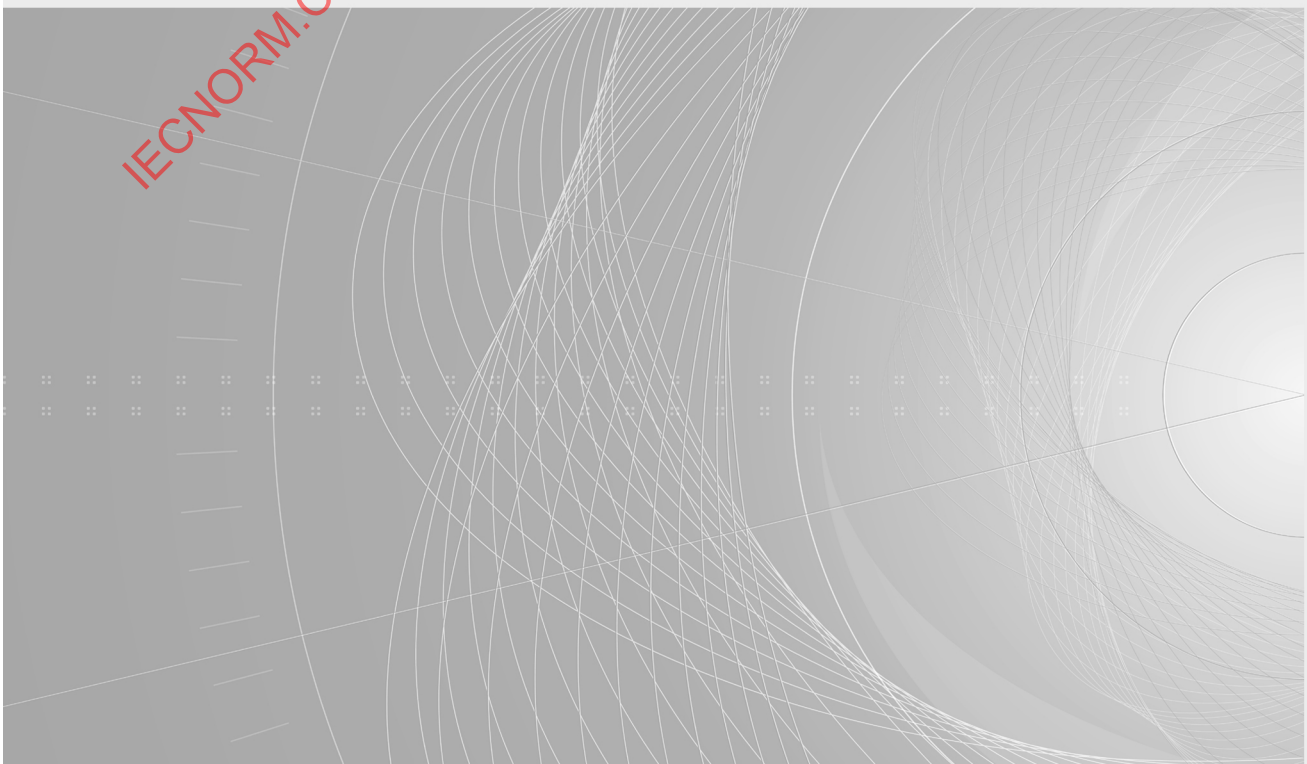
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Radio-frequency connectors –
Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)



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Radio-frequency connectors – Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RADIO-FREQUENCY CONNECTORS –

Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 61169-24 has been prepared by subcommittee 46F: RF and microwave passive components, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories.

This third edition cancels and replaces the second edition published in 2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: all drawings have been reworked and improved to allow frequency extension up to 3 GHz.

The text of this International Standard is based on the following documents:

CDV	Report on voting
46F/417/CDV	46F/436A/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61169 series, under the general title: *Radio-frequency connectors*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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RADIO-FREQUENCY CONNECTORS –

Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)

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 RF coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F).

It describes the interface dimensions with gauging information and the mandatory tests selected from IEC 61169-1, applicable to all DS relating to type F connectors.

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

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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~~2013, *Radio-frequency connectors – Part 1: Generic specification – General requirements and measuring methods*
~~Amendment 1 (1996)~~
~~Amendment 2 (1997)~~

EN 60068-2-52, *Environmental testing – Test methods. Tests. Test Kb. Salt mist, cyclic (sodium chloride solution)*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Interface dimensions

4.1 Dimensions

~~Millimetres are original dimensions.~~

~~All undimensioned pictorial configurations are for reference purposes only.~~

4.1.1 Connector “F” type female socket (indoor) physical dimensions

Figure 1 shows a connector “F” type female socket (indoor).

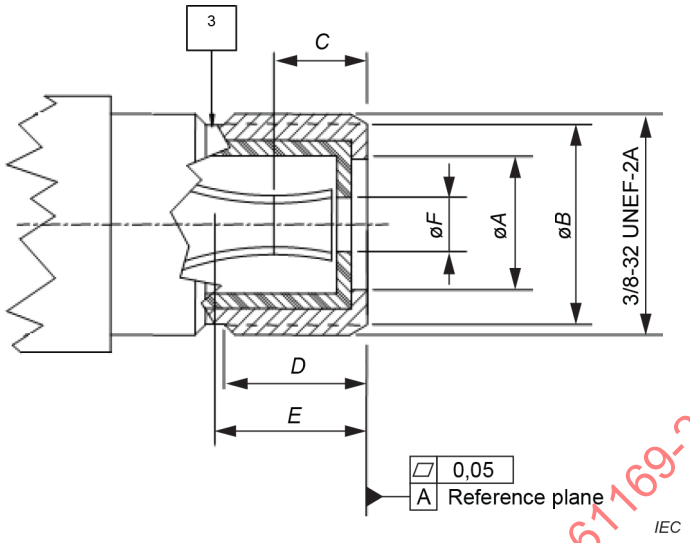


Figure 1 – Connector “F” type female socket (indoor)
(for dimensions, see Table 1)

Table 1 – Connector “F” type female socket (indoor)

Description	Reference	mm		inch		Note
		Min.	Max.	Min.	Max.	
Reference plane opening inner diameter	A	3,90	7,4	0,154	0,291	2
Reference plane outer diameter	B	7,50	8,50	0,295	0,335	
Positive contact point depth	C	-	4,70	-	0,185	4
Port minimum full thread length	D	7,50	-	0,295	--	3
Minimum center contact depth	E	9,00	-	0,354	-	5
Center conductor guide inner diameter	F	1,2	1,5	0,047	0,059	

NOTE 1 Drawing not to scale.

NOTE 2 No protrusion of the dielectric beyond the reference plane is permitted.

NOTE 3 Thread relief not to exceed two full threads.

NOTE 4 Recommended mating male center conductor diameter: 0,025 in (0,64 mm) min. to 0,042 in. (1,07 mm) max.

NOTE 5 Center contact geometry optional.

Description	Reference	mm		Remarks
		Min.	Max.	
Reference plane opening inner diameter	*A*	3,90	7,4	1, 4
Reference plane outer diameter	*B*	7,50	8,50	
Positive contact point depth	*C*	-	4,70	2
Port minimum full thread length	*D*	7,50	-	3
Minimum center contact depth	*E*	9,00	-	4
Center conductor guide inner diameter	*F*	1,2	1,5	

1 No protrusion of the dielectric beyond the reference plane is permitted.

2 Recommended mating male center conductor diameter: 0,025 in (0,64 mm) min. to 0,042 in. (1,07 mm) max.

3 Thread relief not to exceed two full threads.

4 Center contact geometry optional.

4.1.2 Connector “F” type male plug (indoor) physical dimensions

Figure 2 shows a connector “F” type male plug (indoor).

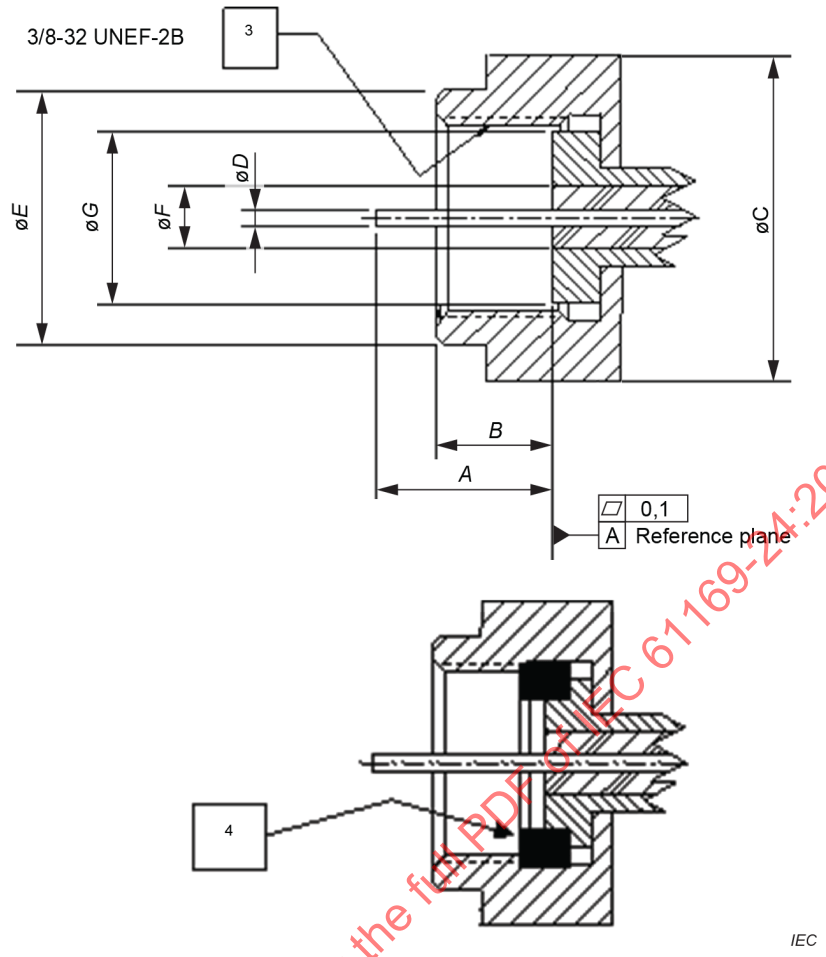


Figure 2 – Connector "F" type male plug (indoor)
(for dimensions, see Table 2)

Table 2 – Connector "F" type male plug (indoor)

Description	Reference	mm		inch		Note
		Min.	Max.	Min.	Max.	
Inner conductor length	A	6,35	8,63	0,250	0,340	
Length of nut	B	4,00	7,29	0,157	0,287	2
Maximum envelope dimension	C	-	16,61	-	0,654	
Inner conductor diameter	D	0,64	1,13	0,025	0,044	
Sealing surface diameter for seal ring	E	10,41	11,04	0,410	0,435	
Reference plane opening inner diameter	F	-	5,84	-	0,230	2
Reference plane opening outer diameter	G	7,88		0,310		
NOTE 1 Drawing not to scale. NOTE 2 No protrusion of the dielectric beyond the reference plane is permitted. NOTE 3 The mating of the F female socket to the reference plane is not impeded. NOTE 4 Gasket seal optional, if used, does not avoid to meet all performance requirements.						

Description	Reference	mm		Remarks
		Min.	Max.	
Inner conductor length	*A*	6,35	8,63	
Length of nut	*B*	4,00	7,29	1,2
Maximum envelope dimension	*C*	-	16,61	
Inner conductor diameter	*D*	0,64	1,13	
Sealing surface diameter for seal ring	*E*	10,41	11,04	
Reference plane opening inner diameter	*F*	-	5,84	1, 2
Reference plane opening outer diameter	*G*	7,88		
1 No protrusion of the dielectric beyond the reference plane is permitted. 2 The mating of the F female socket to the reference plane is not impeded. 3 Gasket seal optional, if used, does not avoid to meet all performance requirements.				

4.2 Mechanical gauges

Millimetres are original dimensions.

All undimensioned pictorial configurations are for reference purposes only.

4.2.1 Mating socket centre conductor acceptance diameter test

In order to verify that the centre female contact of the socket does not suffer from mechanical deformation when mated with the full range of indicated inner conductor diameters, a test has been devised. This test measures the force required to insert and withdraw a selection of precision test pins into and out of the "F" female socket under test.

NOTE Retention of the inner conductor should be by means of pressure exerted by the conductive centre female contact, not by means of any other non-conductive insert within the reference plane opening.

The test apparatus should be so designed as to enable accurate alignment of the “F” female socket under test with the precision test pin. The apparatus should hold either the socket or the test pin in a fixed position, and the moving part of the apparatus should be fitted with an instrument capable of measuring the insertion and withdrawal force.

Using the test sequence shown below, the insertion and withdrawal force shall be measured and recorded in newtons.

Figure 3 shows a gauge for the centre socket conductor.

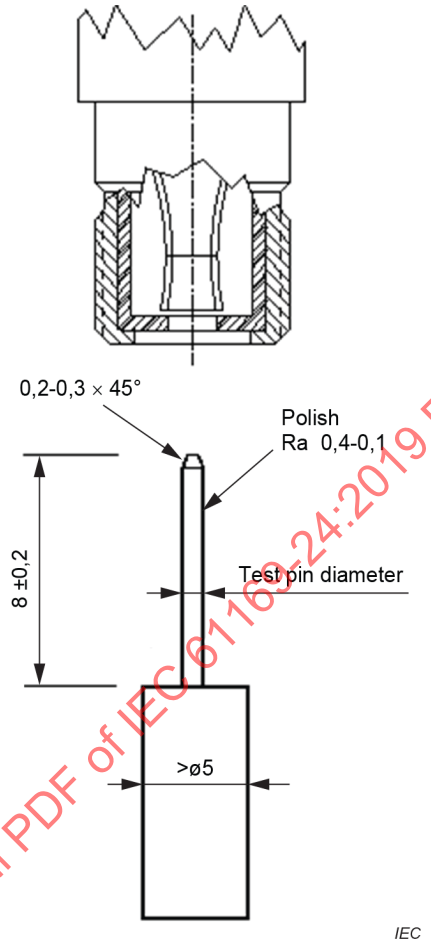


Figure 3 – Gauge for the centre socket conductor

Table 3 – Test sequence for the centre socket conductor

Test sequence	1st test	2nd test	3rd test	4th test	5th test	6th test
Test pin diameter	0,635 ± 0,005 mm	0,850 ± 0,005 mm	1,136 ± 0,005 mm	0,635 ± 0,005 mm	1,136 ± 0,005 mm	0,635± 0,005 mm

The insertion force required to insert the test pin into the socket centre female contact shall not exceed 20 N under all circumstances.

The withdrawal force required to withdraw the test pin from the socket centre female contact shall be a minimum of 0,3 N under all circumstances.

4.2.2 Mating port centre conductor acceptance electrical test

After completion of the mechanical tests described in 4.2.1, the centre conductor contact resistance, when re-mated with a male “F” plug whose centre conductor diameter is 0,635 mm, shall not exceed 10 mΩ with an applied test ampere rate of 1 A.

4.2.3 Reference plane electrical contact

The electrical contact shall be made by the mating of the reference plane face of the “F” female socket with the mating face of the “F” male plug and not by the threads alone.

5 Quality assessment procedures

5.1 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.

5.2 Ratings and characteristics

The RF connectors defined in this document are designed for use with a variety of flexible and semi-rigid coaxial cables and in microwave integrated circuits and similar uncabled applications.

Rating and characteristics are given in Table 4.

Table 4 – Ratings and characteristics

Ratings and characteristics	IEC 61169-1:2013 Subclause	Value	Remarks ~~including any deviations~~, deviation from standard test method~~s~~
Electrical			
Nominal impedance			Shall meet the requirements of 9.2.1.1 of IEC 61169-1:2013 when terminating a Z_c = 75 Ω cable
Frequency range		5 MHz to 1 GHz 5 MHz to 2 GHz 5 MHz to 3 GHz 5 MHz to 6 GHz	See DS For most applications For some satellite applications For some head end applications For some satellite broadcasting and precision applications (Annex B)
~~Reflection factor~~	~~9.2.14.~~		
Return loss	9.2.1		
– straight styles •		Min. 30 dB up to 1 GHz Min. 25 dB up to 2 GHz Min. 20 dB up to 3 GHz Min. 15 dB up to 6 GHz	Min. 37-7,5f+0,64f^2 dB f in GHz (1 GHz ≤ f ≤ 6 GHz)
– right angle styles			See DS
– solder bucket and PCB mounting style			Under consideration
– insertion loss		0,1 dB max. up to 1 GHz 0,2 dB max. at 2 GHz 0,3 dB max. at 3 GHz 0,4 dB max. at 6 GHz	Max. –0,04+0,15f – 0,013f^2 dB f in GHz (1 GHz ≤ f ≤ 6 GHz)
Centre contact resistance	9.2.3		
– initial		≤ 5 mΩ	
– after conditioning		≤ 10 mΩ	
Outer conductor continuity	9.2.3		
– initial		≤ 2,5 mΩ	
– after conditioning		≤ 5 mΩ	
Insulation resistance	9.2.5		
– initial		> 1 GΩ	
– after conditioning		> 1 MΩ	
Proof voltage at sea level + #	9.2.6	750 V	86 kPa to 106 kPa
Screening effectiveness	9.2.~~8~~7	a_s ≥ 90 dB from 5 MHz to 3 GHz	Z_t < 3,2 mΩ at 3 GHz
Discharge test (Corona)	9.2.~~9~~8	na	
Mechanical			
~~Gauge retention~~ Insertion force (resilient contacts)	9.3.4		See 3.2 of IEC 61169-1:2013
Contact captivation – axial force – torque	9.3.5	 20 N max. na	 Captivated contacts only

Ratings and characteristics	IEC 61169-1:2013 Subclause	Value	Remarks ~~including any deviations~~, deviation from standard test method~~s~~
Engagement and separation	9.3.6		Screw coupling connectors
Coupling torque			To overcome friction of a coupling nut
– friction		0,066 Nm max.	
– coupling		0,46 Nm to 0,69 Nm	
– proof		2,8 Nm	
Mechanical tests on cable			
– cable pulling #	9.3.8	120 N	
– cable torsion #	9.3.10	0,1 Nm	
~~Tensile~~ Strength of coupling mechanism	9.3.11	300 N	
Bending moment	9.3.12	2 Nm	Relative to reference plane
Environmental			
Vibration	9.3.3	98 m/s^2 10 Hz to 500 Hz	10 g acceleration
Climatic sequence	9.4.2	40/70/21	
Sealing	9.4.~~5~~7	1 cm^3/h max	100 kPa to 110 kPa pressure
Salt mist	9.4.~~6~~10	48 h	
Endurance			
Mechanical	9.~~57.10~~3.15	1 000 cycles	
High temperature	9.~~60~~4.5	1 000 h	
Details of symbols, abbreviations and procedures: • These values apply to basic connectors. They depend on the cable used. Relevant values are given in the DS. + Voltage values are RMS values at 50 Hz to 60 Hz, unless otherwise specified. # Cables used with these connectors may have values of lower performance than those given in this table. na Not applicable.			

5.3 Environmental characteristics for outdoor sockets (see Annex A)

When the “F” type male plug and the “F” type female socket are mated, the physical attributes shall be protected and sealed to prevent moisture ingress and as a minimum shall meet IPX8 rating.

Any “F” type (outdoor) male plug or female socket shall be resistant to corrosion and shall meet EN 60068-2-52 salt mist cyclic test.

5.4 Test schedule and inspection requirements

5.4.1 Acceptance tests

Table 5 describes the acceptance tests to be performed.

Table 5 – Acceptance tests

	~~Test method~~ IEC 61169-1:2013 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~~1	a	II	1,0		a	S3	1,5	
Group B1									
Outline dimensions	9.1.~~3.1~~2	a	S4	0,4		a	S3	4,0	
Mechanical compatibility	9.1.~~3.3~~2.2	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~~ Insertion force (resilient contacts)	9.3.4	ia	II	1,0		ia	S3	1,5	
Sealing, non-hermetic	9.4.~~5.1~~7	ia	II	0,65	by	ia	S3	1,0	by
Sealing, hermetic	9.4.~~5.2~~8	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~~2	ia	S4	0,40		ia	S3	4,0	
Insulation resistance	9.2.5	a	S4	0,40		a	S3	4,0	
Details of symbols, abbreviations and procedures: IL inspection level AQL acceptable quality level a suggested as applicable ia test suggested (if technically applicable)									

5.4.2 Periodic tests

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

Table 6 describes the periodic tests to be performed.

Table 6 – Periodic tests

	~~Test method~~ IEC 61169-1:2013 subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test requir-ed	Number of speci-mens	Permit-ted failures per group	Period	Test required	Number of speci-mens	Permitted failures per group	Period
Group D1 (d)			6	1	3 years		3	1	3 years
Solderability connector assemblies	9.3.2.~~1.1~~2	ia				ia			
Resistance to soldering heat	9.3.2.~~1.2~~3	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~~3.15	a				a			
High temperature endurance	9.~~6~~4.5	a				a			
Sulphur dioxide	9.4.~~8~~12	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~~7	a				a			
Water immersion	9.~~2.7~~4.9	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			
Group D7 (d)			1§		3 years		1#		3 years
Resistance to solvents and contaminating fluids	9.~~7~~4.11	ia				ia			

	~~Test method~~ IEC 61169-1:2013 subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test requir-ed	Number of speci-mens	Permit-ted failures per group	Period	Test required	Number of speci-mens	Permitted failures per group	Period
Details of symbols, abbreviations and procedures: a suggested as applicable ia test suggested (if technically applicable) na not applicable * 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.									

5.5 Procedures

5.5.1 Quality conformance inspection

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

5.5.2 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.

6 Instructions for preparation of detail specifications

6.1 General

Detail specifications (DS) writers shall use the appropriate BDS pro-forma. The following pages comprise the pro-forma BDS dedicated for use with 75 Ω type F 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.~~

6.2 Identification of the component

(1) 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.

(2) Enter details of assessment level and the climatic category.

(3) 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.

(4) Any maximum panel thickness limitations for fixed connectors shall be stated.

(5) 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.

6.3 Performance

(6) Performance data listing the most important characteristics of the connector, taking into account the recommended values in ~~4~~5.2 of this specification. Deviations from the minimum requirements shall be clearly indicated. Non-applicable parameters shall be marked 'na'.

6.4 Marking, ordering information and related matters

(7) Insert marking and ordering information as appropriate, together with details of related documents and any invoked structural similarity.

6.5 Selection of tests, test conditions and severities

(8) '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 5.4~~.3~~ of this specification. Any additional tests required at the discretion of the specification writer shall also be indicated by an 'a'.

The specification writer shall also indicate, when necessary, details of deviations from the standard test methods and test conditions, including any relevant deviations given in the test schedule of the sectional specification.

~~The qualification approval and conformance inspection shall be such that the national supervising inspectorate (NSI) shall be satisfied that they are appropriate and in line with those for other connectors within the system providing a reasonably comparable service.~~

6.6 Blank detail specification pro-forma for type F connector

The following pages contain the complete BDS pro-forma.

(1)	Page 1 of 10 QC 222401
ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH **GENERIC SPECIFICATION QC 220000** **SECTIONAL SPECIFICATION QC 222400** **NATIONAL REFERENCE**	(4) ISSUE ....
(5) Detail specification for **radio frequency coaxial connector of assessed quality**	type **F**
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 75 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.

(1)	Page 1 of (2)
ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH **GENERIC SPECIFICATION** **SECTIONAL SPECIFICATION** **NATIONAL REFERENCE**	(3) (4) ....
(5) Detail specification for **radio frequency coaxial connector of assessed quality**	Type **F**
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 75 Ω Climatic category..../.../.../
(7) Outline and maximum dimensions	Panel piercing and mounting details

(8) Variants

Variant No.	Description of variant	IEC 61196			
01.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
	.....				

Information about manufacturers who have components qualified under the IECQ Conformity Assessment System is available through the IECQ on-line certificate system.

(9) Performance (including limiting conditions of use)

Ratings and characteristics		IEC 61169-1 ~~(QC 220000)~~ :2013 Subclause	Value	Remarks including any deviations from standard test methods
Electrical				
Nominal impedance			75 Ω	
Frequency range			0 GHz to 3 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	01.....	9.2.6	.....kV .....kV .....kV .....kV	86 kPa to 106 kPa
+ Proof voltage at 4,4 kPa	01.....		.....V .....V .....V V	.....kPa (if not 4,4 kPa)
+ Environment test voltage at sea level	01.....		.....V .....V .....V V	86 kPa to 106 kPa
Environment test voltage at 4,4 kPa	01.....		.....V .....V .....V V	.....kPa (if not 4,4 kPa)
Screening effectiveness **ADDITIONAL ELECTRICAL CHARACTERISTICS**	01.....	9.2.~~8~~7	≥ dB at....GHz	Z_t≤.....Ω
+ Voltage values are RMS values at 50 Hz to 60 Hz, unless otherwise specified.				

Ratings and characteristics		IEC 61169-1 ~~(QC 220000)~~ :2013 Subclause	Value	Remarks including any deviations from standard test methods
Mechanical				
Soldering - bit size		9.3.2~~.1.1~~	.....	
~~Gauge retention~~ Insertion force (resilient contacts) - inner contact - outer contact		9.3.4	.....	
Centre contact captivation - axial force - permitted displacement each direction		9.3.5	.....N .....mm	
Engagement and separation - axial force		9.3.6	.....N (eng) .....N (sep)	
Effectiveness of cable fixing against				
- cable rotation	01.....	9.3.7~~.2~~	Rotations	
- cable pulling	01.....	9.3.8	.....N	
- cable bending	01.....	9.3.9	.....cycles	Length of cable and mass ....
- cable torsion	01.....	9.3.10	.....Nm	
Bending moment		9.3.12	.....Nm	Relative to reference plane
Vibration		9.3.3	.....m/s^2 .....to....Hz	(.....g_n acceleration)
ADDITIONAL MECHANICAL CHARACTERISTICS				

Ratings and characteristics	IEC 61169-1 ~~(QC 220000)~~ :2013 Subclause	Value	Remarks including any deviations from standard test methods
Environmental			
Climatic category		...../...../.....	
Sealing non-hermetically sealed connectors	9.4.~~5.1~~7	.....cm^3/h	100 kPa to 110 kPa pressure differential
Sealing hermetically sealed connectors	9.4.~~5.2~~8	10^{-5} $bar/cm^3/h$	100 kPa to 110 kPa pressure differential
Water immersion	9.~~2.7~~4.9		
ADDITIONAL ENVIRONMENTAL CHARACTERISTICS			
ENDURANCE			
Mechanical	9.~~5~~3.15	.....operations	
High temperature	9.~~6~~4.5	.....h at.....°C	
ADDITIONAL ENDURANCE CHARACTERISTICS			
CHEMICAL CONTAMINATION			
Resistance to solvents and contaminating fluids to be used	9.~~7~~4.11	....	
Applicable fluids			
Sulphur dioxide	9.4.~~8~~12	... .days	

(10) Supplementary information

– **Marking of the component: in accordance with 11.1 of IEC 61169-1 ~~(QC 220000)~~:2013 in the following order of preference:**

1) Manufacturer code: .....

2) Manufacturing date code: year/week

3) Component identification: Variant No./ designation Identification

.....
.....
.....
.....
.....
.....
.....
.....

– **Marking and contents of package: in accordance with 11.2 of IEC 61169-1:2013**

1) Information prescribed in 11.1 of IEC 61169-1:2013 detailed above

2) Nominal characteristic impedance .....75 Ω.....

3) Assessment level code letter .....

4) Any additional marking required .....

– **Ordering information**

1) Number of the detail specification ~~IECQC 222401~~/ variant code.

2) Assessment level code letter .....

3) Body finish (if more than one listed) .....

4) Any additional information or special requirements.....

~~NOTE~~ – Related documents (if not included in IEC 61169-1:2013 or sectional specification):

.....

.....

– Structural similarity in accordance with 10.2.2 of IEC 61169-1:2013

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

Annex A
(informative)

Recommended outdoor “F” type socket / plug physical dimensions

A.1 Outdoor “F” type female socket

Figure A.1 shows an outdoor female “F” socket.

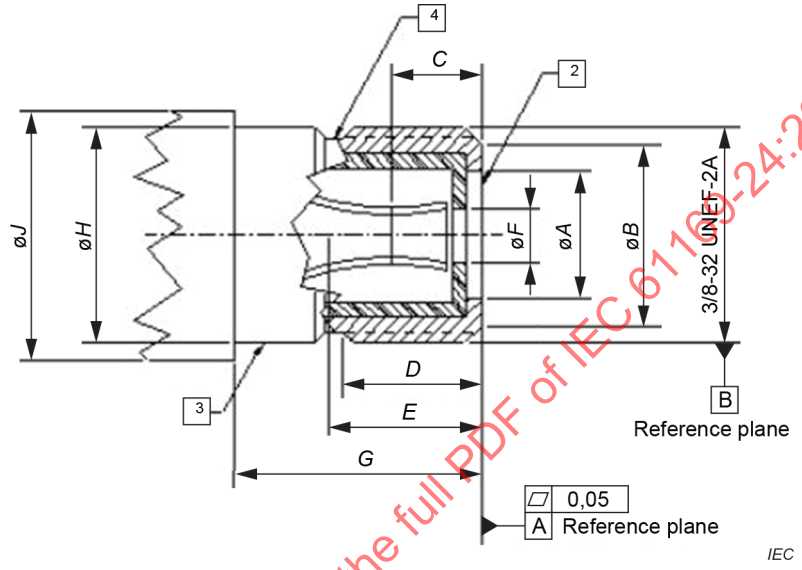


Figure A.1 – Outdoor female “F” socket
(for dimensions, see Table A.1)

Table A.1 – Outdoor female "F" socket dimensions

Description	Reference	mm		inch		~~Note~~	Remarks
		Min.	Max.	Min.	Max.		
Reference plane opening inner diameter	*A*	3,90	6,10	0,154	0,240	~~2~~	1,4
Reference plane outer diameter	*B*	7,50	8,00	0,295	0,315		
Positive contact point depth	*C*	-	4,70	-	0,185	~~5~~	2
Full thread depth	*D*	8,26	8,89	0,325	0,350	~~4~~	3
Minimum center conductor clearance	*E*	9,00	-	0,354	-	~~6,7~~	4
Center conductor guide inner diameter	*F*	1,20	1,50	0,047	0,059		
Port length	*G*	12,32	13,08	0,485	0,515		
Sealing surface diameter for seal ring	*H*	9,35	9,65	0,368	0,380	~~3~~	5
Bulkhead diameter	*J*	10,80	-	0,425	-		

~~NOTE 1 Drawing not to scale.~~

~~NOTE 2~~ [1] No material must protrude beyond reference plane.

~~NOTE 4~~ [2] Thread relief not to exceed two full threads.

~~NOTE 5~~ [3] Dimension to point of positive contact of male center conductor. Recommended mating male center conductor diameter: 0,025 in (0,64 mm) min. / 0,042 in (1,07 mm) max.

~~NOTE 6~~ [4] Minimum clearance required for maximum length male center conductor.

~~NOTE 3~~ [5] If cast feature, no parting lines permitted.

~~NOTE 7 Center contact geometry optional.~~

~~NOTE 8 Minimum bulkhead stop geometry optional (example: hex, cylindrical, flat surface area).~~

A.2 Outdoor "F" type male plug

Figure A.2 shows an outdoor "F" type male plug.

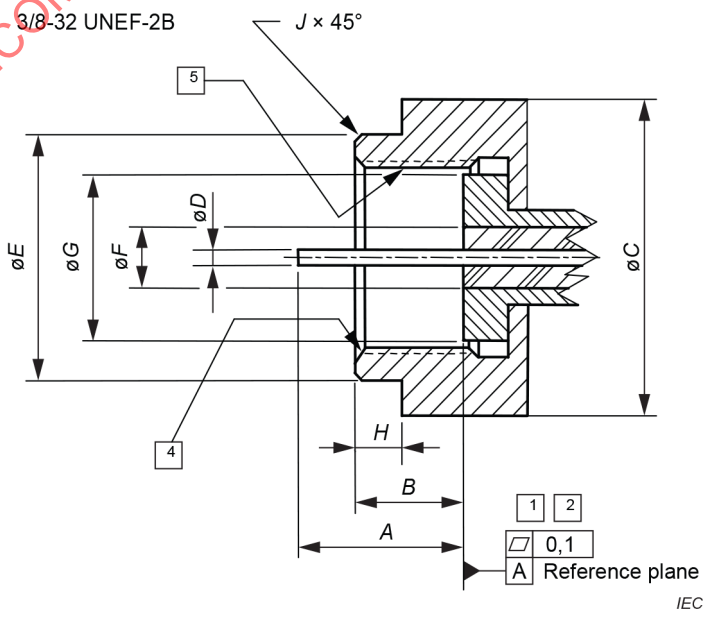


Figure A.2 – Outdoor "F" type male plug (for dimensions, see Table A.2)

Table A.2 – Outdoor "F" type male plug dimensions

Description	Reference	mm		inch		~~Note~~	Remarks
		Min.	Max.	Min.	Max.		
Inner conductor length	*A*	6,35	8,63	0,250	0,340		1
Length of nut	*B*	4,29	6,10	0,169	0,240	~~3~~	2
Maximum envelope dimension	*C*	-	16,61	-	0,654		
Inner conductor diameter	*D*	0,64	1,07	0,025	0,42	~~5~~	3
Sealing diameter for seal ring	*E*	10,50	11,00	0,413	0,433		
Reference plane inner diameter	*F*	-	5,84	-	0,230		4
Reference plane outer diameter	*G*	7,11	-	0,310	-		
Sealing surface length	*H*	1,78	4,45	0,079	0,175		
Chamfer break	*J*	0,127	0,381	0,005	0,015	~~4~~	5

~~NOTE 1~~ [1] Dielectric must not protrude beyond reference plane.

~~NOTE 3~~ [2] Minimum one thread lead-in.

~~NOTE 5~~ [3] Cable inner conductor or integral pin.

~~NOTE 2~~ [4] The mating of the "F" female socket to the reference plane should not be impeded.

~~NOTE 4~~ [5] Drawing not to scale.

Annex B
(informative)

Recommended satellite broadcasting “F” type socket / Plug physical dimensions

B.1 Satellite broadcasting “F” type female socket

Figure B.1 shows a satellite broadcasting “F” socket.

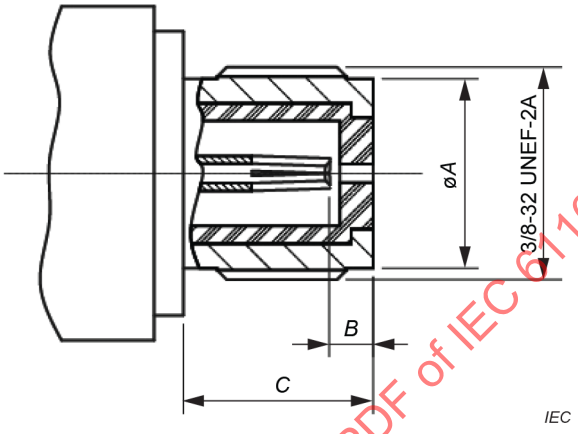


Figure B.1 – Satellite broadcasting “F” socket (for dimensions, see Table B.1)

Table B.1 – Satellite broadcasting “F” type socket dimensions

Reference	mm		inch		Note
	Min.	Max.	Min.	Max.	
A		8,5		0,335	
B	-	4,3	-	0,169	
C	8,0	-	0,315	-	

B.2 Satellite broadcasting “F” type male plug

Figure B.2 shows a satellite broadcasting “F” type male plug.

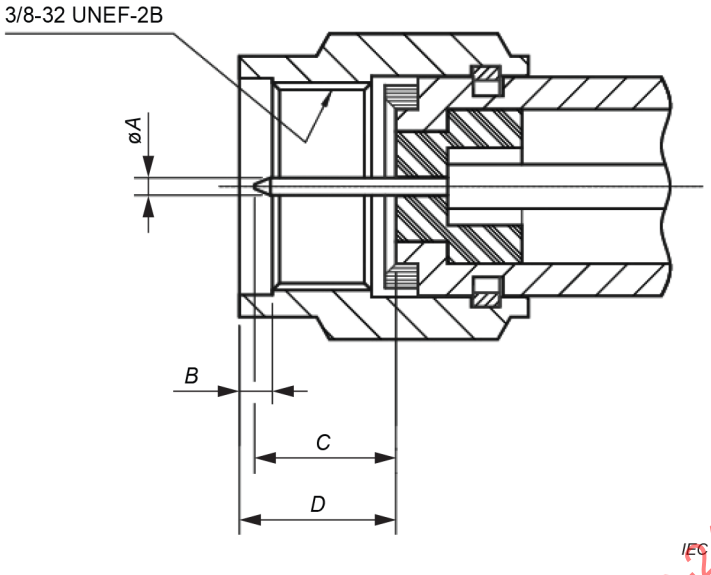


Figure B.2 – Satellite broadcasting "F" type male plug (for dimensions, see Table B.2)

Table B.2 – Satellite broadcasting "F" type male plug dimensions

Reference	mm		inch		Note
	Min.	Max.	Min.	Max.	
A	0,75	0,85	0,030	0,033	
B	-	1,50	-	0,059	
C	6,20	6,80	0,244	0,267	
D	6,70	7,30	0,263	0,287	

IEC 61169-24

Edition 3.0 2019-07

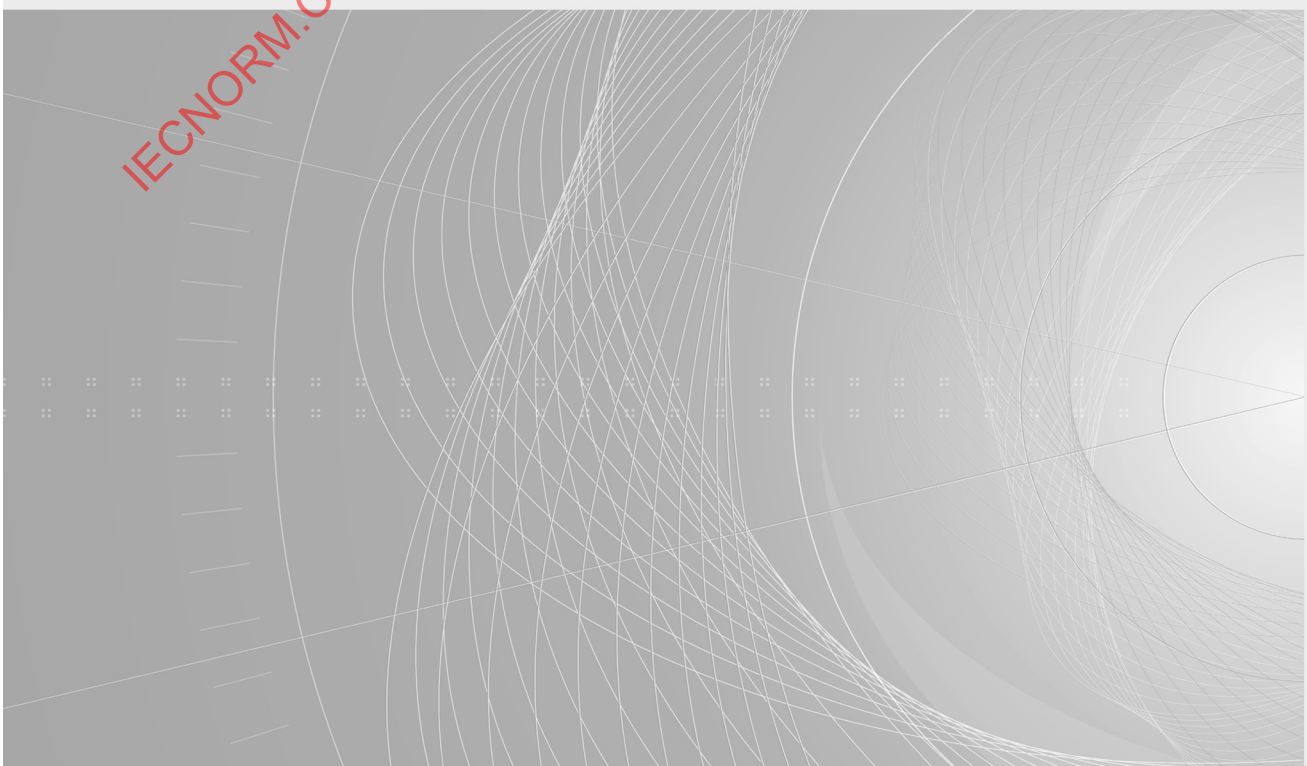
INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Radio-frequency connectors – Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)

Connecteurs pour fréquences radioélectriques – Partie 24: Spécification intermédiaire – Connecteurs coaxiaux pour fréquences radioélectriques avec couplage à vis, typiquement utilisés dans des réseaux de distribution par câbles de 75 Ω (type F)



IEC 61169-24:2019-07(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RADIO-FREQUENCY CONNECTORS –

Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)

FOREWORD

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International Standard IEC 61169-24 has been prepared by subcommittee 46F: RF and microwave passive components, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories.

This third edition cancels and replaces the second edition published in 2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: all drawings have been reworked and improved to allow frequency extension up to 3 GHz.

The text of this International Standard is based on the following documents:

CDV	Report on voting
46F/417/CDV	46F/436A/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61169 series, under the general title: *Radio-frequency connectors*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

RADIO-FREQUENCY CONNECTORS –

Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)

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 RF coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F).

It describes the interface dimensions with gauging information and the mandatory tests selected from IEC 61169-1, applicable to all DS relating to type F connectors.

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

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61169-1:2013, *Radio-frequency connectors – Part 1: Generic specification – General requirements and measuring methods*

EN 60068-2-52, *Environmental testing – Test methods. Tests. Test Kb. Salt mist, cyclic (sodium chloride solution)*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Interface dimensions

4.1 Dimensions

4.1.1 Connector “F” type female socket (indoor) physical dimensions

Figure 1 shows a connector “F” type female socket (indoor).

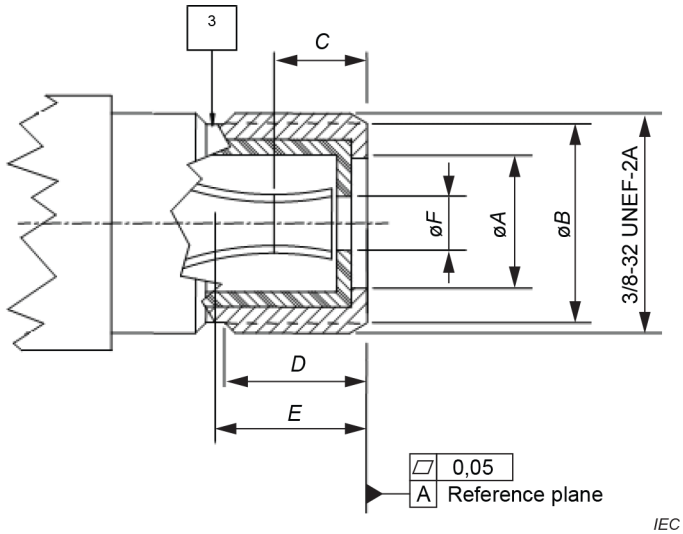

Figure 1 – Connector "F" type female socket (indoor)
(for dimensions, see Table 1)

Table 1 – Connector "F" type female socket (indoor)

Description	Reference	mm		Remarks
		Min.	Max.	
Reference plane opening inner diameter	*A*	3,90	7,4	1, 4
Reference plane outer diameter	*B*	7,50	8,50	
Positive contact point depth	*C*	-	4,70	2
Port minimum full thread length	*D*	7,50	-	3
Minimum center contact depth	*E*	9,00	-	4
Center conductor guide inner diameter	*F*	1,2	1,5	

1 No protrusion of the dielectric beyond the reference plane is permitted.

2 Recommended mating male center conductor diameter: 0,025 in (0,64 mm) min. to 0,042 in. (1,07 mm) max.

3 Thread relief not to exceed two full threads.

4 Center contact geometry optional.

4.1.2 Connector "F" type male plug (indoor) physical dimensions

Figure 2 shows a connector "F" type male plug (indoor).

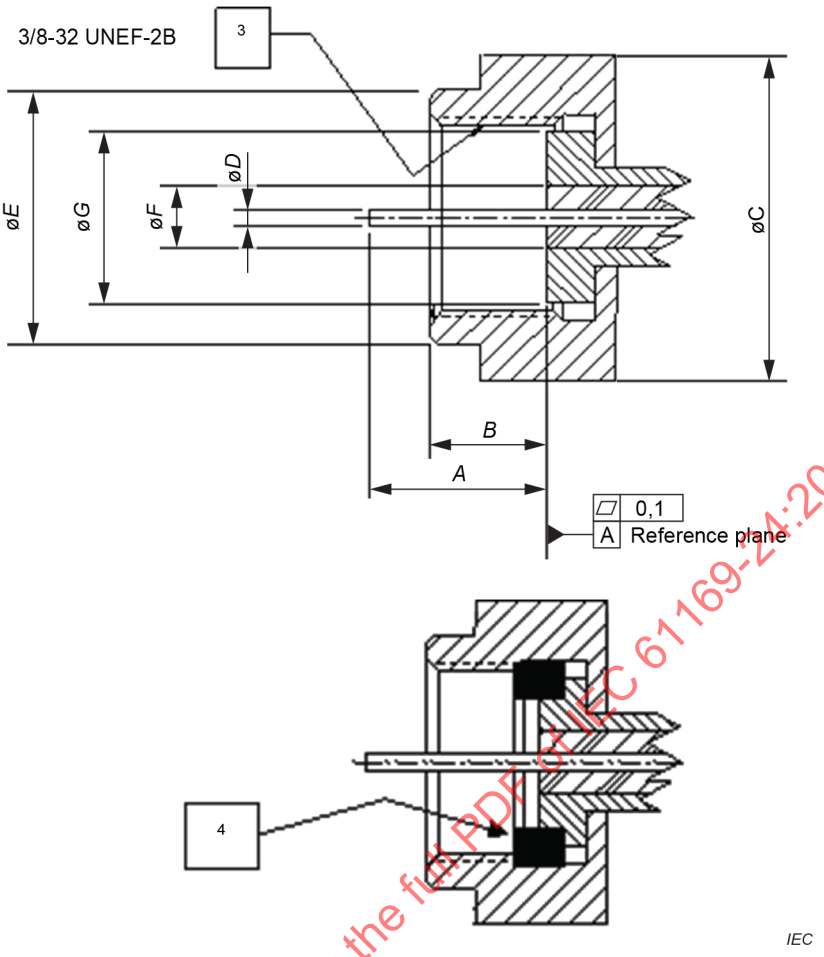

Figure 2 – Connector "F" type male plug (indoor)
(for dimensions, see Table 2)

Table 2 – Connector "F" type male plug (indoor)

Description	Reference	mm		Remarks
		Min.	Max.	
Inner conductor length	*A*	6,35	8,63	
Length of nut	*B*	4,00	7,29	1,2
Maximum envelope dimension	*C*	-	16,61	
Inner conductor diameter	*D*	0,64	1,13	
Sealing surface diameter for seal ring	*E*	10,41	11,04	
Reference plane opening inner diameter	*F*	-	5,84	1, 2
Reference plane opening outer diameter	*G*	7,88		

[1] No protrusion of the dielectric beyond the reference plane is permitted.

[2] The mating of the F female socket to the reference plane is not impeded.

[3] Gasket seal optional, if used, does not avoid to meet all performance requirements.

4.2 Mechanical gauges

4.2.1 Mating socket centre conductor acceptance diameter test

In order to verify that the centre female contact of the socket does not suffer from mechanical deformation when mated with the full range of indicated inner conductor diameters, a test has been devised. This test measures the force required to insert and withdraw a selection of precision test pins into and out of the “F” female socket under test.

The test apparatus should be so designed as to enable accurate alignment of the “F” female socket under test with the precision test pin. The apparatus should hold either the socket or the test pin in a fixed position, and the moving part of the apparatus should be fitted with an instrument capable of measuring the insertion and withdrawal force.

Using the test sequence shown below, the insertion and withdrawal force shall be measured and recorded in newtons.

Figure 3 shows a gauge for the centre socket conductor.

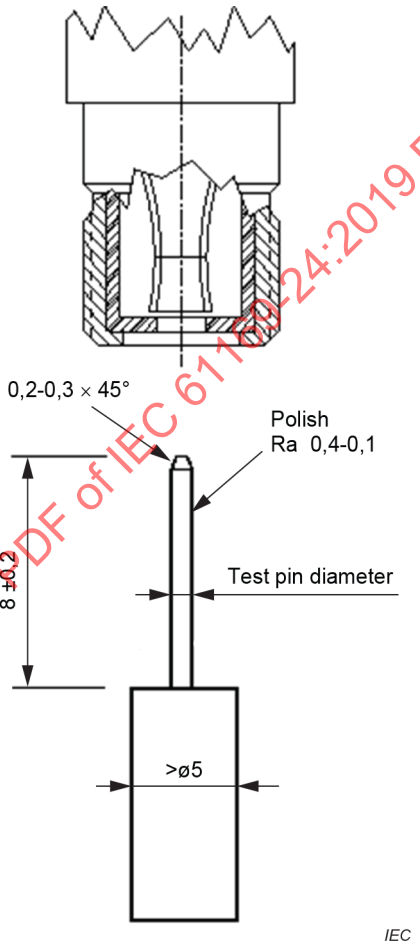

Figure 3 – Gauge for the centre socket conductor

Table 3 – Test sequence for the centre socket conductor

Test sequence	1st test	2nd test	3rd test	4th test	5th test	6th test
Test pin diameter	0,635 ± 0,005 mm	0,850 ± 0,005 mm	1,136 ± 0,005 mm	0,635 ± 0,005 mm	1,136 ± 0,005 mm	0,635± 0,005 mm

The insertion force required to insert the test pin into the socket centre female contact shall not exceed 20 N under all circumstances.

The withdrawal force required to withdraw the test pin from the socket centre female contact shall be a minimum of 0,3 N under all circumstances.

4.2.2 Mating port centre conductor acceptance electrical test

After completion of the mechanical tests described in 4.2.1, the centre conductor contact resistance, when re-mated with a male “F” plug whose centre conductor diameter is 0,635 mm, shall not exceed 10 mΩ with an applied test ampere rate of 1 A.

4.2.3 Reference plane electrical contact

The electrical contact shall be made by the mating of the reference plane face of the “F” female socket with the mating face of the “F” male plug and not by the threads alone.

5 Quality assessment procedures

5.1 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.

5.2 Ratings and characteristics

The RF connectors defined in this document are designed for use with a variety of flexible and semi-rigid coaxial cables and in microwave integrated circuits and similar uncabled applications.

Rating and characteristics are given in Table 4.

Table 4 – Ratings and characteristics

Ratings and characteristics	IEC 61169-1:2013 Subclause	Value	Remarks, deviation from standard test method
Electrical			
Nominal impedance			Shall meet the requirements of 9.2.1.1 of IEC 61169-1:2013 when terminating a Z_c = 75 Ω cable
Frequency range		5 MHz to 1 GHz 5 MHz to 2 GHz 5 MHz to 3 GHz 5 MHz to 6 GHz	See DS For most applications For some satellite applications For some head end applications For some satellite broadcasting and precision applications (Annex B)
Return loss	9.2.1		
– straight styles •		Min. 30 dB up to 1 GHz Min. 25 dB up to 2 GHz Min. 20 dB up to 3 GHz Min. 15 dB up to 6 GHz	Min. 37-7,5f+0,64f^2 dB f in GHz (1 GHz ≤ f ≤ 6 GHz)
– right angle styles			See DS
– solder bucket and PCB mounting style			Under consideration
– insertion loss		0,1 dB max. up to 1 GHz 0,2 dB max. at 2 GHz 0,3 dB max. at 3 GHz 0,4 dB max. at 6 GHz	Max. –0,04+0,15f – 0,013f^2 dB f in GHz (1 GHz ≤ f ≤ 6 GHz)
Centre contact resistance	9.2.3		
– initial		≤ 5 mΩ	
– after conditioning		≤ 10 mΩ	
Outer conductor continuity	9.2.3		
– initial		≤ 2,5 mΩ	
– after conditioning		≤ 5 mΩ	
Insulation resistance	9.2.5		
– initial		> 1 GΩ	
– after conditioning		> 1 MΩ	
Proof voltage at sea level + #	9.2.6	750 V	86 kPa to 106 kPa
Screening effectiveness	9.2.7	a_s ≥ 90 dB from 5 MHz to 3 GHz	Z_t < 3,2 mΩ at 3 GHz
Discharge test (Corona)	9.2.8	na	
Mechanical			
Insertion force (resilient contacts)	9.3.4		See 3.2 of IEC 61169-1:2013
Contact captivation – axial force – torque	9.3.5	 20 N max. na	 Captivated contacts only
Engagement and separation Coupling torque	9.3.6		Screw coupling connectors To overcome friction of a coupling nut

Ratings and characteristics	IEC 61169-1:2013 Subclause	Value	Remarks, deviation from standard test method
– friction – coupling – proof		0,066 Nm max. 0,46 Nm to 0,69 Nm 2,8 Nm	
Mechanical tests on cable – cable pulling # – cable torsion #	 9.3.8 9.3.10	 120 N 0,1 Nm	
Strength of coupling mechanism	9.3.11	300 N	
Bending moment	9.3.12	2 Nm	Relative to reference plane
Environmental			
Vibration	9.3.3	98 m/s^2 10 Hz to 500 Hz	10 g acceleration
Climatic sequence	9.4.2	40/70/21	
Sealing	9.4.7	1 cm^3/h max	100 kPa to 110 kPa pressure
Salt mist	9.4.10	48 h	
Endurance			
Mechanical	9.3.15	1 000 cycles	
High temperature	9.4.5	1 000 h	
Details of symbols, abbreviations and procedures: • These values apply to basic connectors. They depend on the cable used. Relevant values are given in the DS. + Voltage values are RMS values at 50 Hz to 60 Hz, unless otherwise specified. # Cables used with these connectors may have values of lower performance than those given in this table. na Not applicable.			

5.3 Environmental characteristics for outdoor sockets (see Annex A)

When the “F” type male plug and the “F” type female socket are mated, the physical attributes shall be protected and sealed to prevent moisture ingress and as a minimum shall meet IPX8 rating.

Any “F” type (outdoor) male plug or female socket shall be resistant to corrosion and shall meet EN 60068-2-52 salt mist cyclic test.

5.4 Test schedule and inspection requirements

5.4.1 Acceptance tests

Table 5 describes the acceptance tests to be performed.

Table 5 – Acceptance tests

	IEC 61169-1:2013 Subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test required	IL	AQL %	Period	Test required	IL	AQL %	Period
Group A1									
Visual examination	9.1.1	a	II	1,0		a	S3	1,5	
Group B1									
Outline dimensions	9.1.2	a	S4	0,4		a	S3	4,0	
Mechanical compatibility	9.1.2.2	a	II	1,0		a	S3	1,5	
Engagement and separation	9.3.6	a	S4	0,40	Lot	a	S3	1,5	Lot
Insertion force (resilient contacts)	9.3.4	ia	II	1,0		ia	S3	1,5	
Sealing, non-hermetic	9.4.7	ia	II	0,65	by	ia	S3	1,0	by
Sealing, hermetic	9.4.8	ia	II	0,015		ia	S3	0,025	
Voltage proof	9.2.6	a	S4	0,40	lot	a	II	4,0	lot
Solderability	9.3.2.2	ia	S4	0,40		ia	S3	4,0	
Insulation resistance	9.2.5	a	S4	0,40		a	S3	4,0	
Details of symbols, abbreviations and procedures: IL inspection level AQL acceptable quality level a suggested as applicable ia test suggested (if technically applicable)									

5.4.2 Periodic tests

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

Table 6 describes the periodic tests to be performed.

Table 6 – Periodic tests

	IEC 61169-1:2013 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	9.3.2.2	ia				ia			
Resistance to soldering heat	9.3.2.3	ia				ia			
Mechanical tests on cable fixing									
– cable rotation (nutation)	9.3.7	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	9.1.2	a				a			
Group D4 (d)			6	1	3 years		3	1	3 years
Mechanical endurance	9.3.15	a				a			
High temperature endurance	9.4.5	a				a			
Sulphur dioxide	9.4.12	na				na			
Group D5 (d)			6	1	3 years		3	1	3 years
Reflection factor	9.2.1	a				a			
Screening effectiveness	9.2.7	a				a			
Water immersion	9.4.9	ia				ia			
Group D6 (d)			6	1	3 years		3	1	3 years
Contact captivation	9.3.5	a				a			
Change of temperature	9.4.4	na				na			
Climatic sequence	9.4.2	a				a			
Group D7 (d)			1§		3 years		1#		3 years
Resistance to solvents and contaminating fluids	9.4.11	ia				ia			

	IEC 61169-1:2013 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
Details of symbols, abbreviations and procedures: a suggested as applicable ia test suggested (if technically applicable) na not applicable * 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.									

5.5 Procedures

5.5.1 Quality conformance inspection

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

5.5.2 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.

6 Instructions for preparation of detail specifications

6.1 General

Detail specifications (DS) writers shall use the appropriate BDS pro-forma. The following pages comprise the pro-forma BDS dedicated for use with 75 Ω type F 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.

6.2 Identification of the component

(1) 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.

(2) Enter details of assessment level and the climatic category.

(3) 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.

(4) Any maximum panel thickness limitations for fixed connectors shall be stated.

(5) 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.

6.3 Performance

(6) Performance data listing the most important characteristics of the connector, taking into account the recommended values in 5.2 of this specification. Deviations from the minimum requirements shall be clearly indicated. Non-applicable parameters shall be marked ‘na’.

6.4 Marking, ordering information and related matters

(7) Insert marking and ordering information as appropriate, together with details of related documents and any invoked structural similarity.

6.5 Selection of tests, test conditions and severities

(8) ‘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 5.4 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.

6.6 Blank detail specification pro-forma for type F connector

The following pages contain the complete BDS pro-forma.

(1)	Page 1 of (2)
ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH **GENERIC SPECIFICATION** **SECTIONAL SPECIFICATION** **NATIONAL REFERENCE**	(3) (4) ....
(5) Detail specification for **radio frequency coaxial connector of assessed quality**	Type **F**
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 75 Ω Climatic category..../.../.../
(7) Outline and maximum dimensions	Panel piercing and mounting details

(8) Variants

Variant No.	Description of variant	IEC 61196			
01.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....
	.....				

Information about manufacturers who have components qualified under the IECQ Conformity Assessment System is available through the IECQ on-line certificate system.

(9) Performance (including limiting conditions of use)

Ratings and characteristics		IEC 61169-1:2013 Subclause	Value	Remarks including any deviations from standard test methods
Electrical				
Nominal impedance			75 Ω	
Frequency range			0 GHz to 3 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	01.....	9.2.6	.....kV .....kV .....kV .....kV	86 kPa to 106 kPa
+ Proof voltage at 4,4 kPa	01.....		.....V .....V .....V V	.....kPa (if not 4,4 kPa)
+ Environment test voltage at sea level	01.....		.....V .....V .....V V	86 kPa to 106 kPa
Environment test voltage at 4,4 kPa	01.....		.....V .....V .....V V	.....kPa (if not 4,4 kPa)
Screening effectiveness **ADDITIONAL ELECTRICAL CHARACTERISTICS**	01.....	9.2.7	≥ dB at....GHz	Z_t≤.....Ω
+ Voltage values are RMS values at 50 Hz to 60 Hz, unless otherwise specified.				

Ratings and characteristics		IEC 61169-1:2013 Subclause	Value	Remarks including any deviations from standard test methods
Mechanical				
Soldering - bit size		9.3.2	.....	
Insertion force (resilient contacts) - inner contact - outer contact		9.3.4	.....	
Centre contact captivation - axial force - permitted displacement each direction		9.3.5	.....N .....mm	
Engagement and separation - axial force		9.3.6	.....N (eng) .....N (sep)	
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 and mass ....
- cable torsion	01.....	9.3.10	.....Nm	
Bending moment		9.3.12	.....Nm	Relative to reference plane
Vibration		9.3.3	.....m/s^2 .....to....Hz	(.....g_n acceleration)
ADDITIONAL MECHANICAL CHARACTERISTICS				

Ratings and characteristics	IEC 61169-1:2013 Subclause	Value	Remarks including any deviations from standard test methods
Environmental			
Climatic category		...../...../.....	
Sealing non-hermetically sealed connectors	9.4.7	.....cm^3/h	100 kPa to 110 kPa pressure differential
Sealing hermetically sealed connectors	9.4.8	10^{-5} $bar/cm^3/h$	100 kPa to 110 kPa pressure differential
Water immersion	9.4.9		
ADDITIONAL ENVIRONMENTAL CHARACTERISTICS			
ENDURANCE			
Mechanical	9.3.15	.....operations	
High temperature	9.4.5	.....h at.....°C	
ADDITIONAL ENDURANCE CHARACTERISTICS			
CHEMICAL CONTAMINATION			
Resistance to solvents and contaminating fluids to be used	9.4.11	....	
Applicable fluids			
Sulphur dioxide	9.4.12	... .days	

(10) Supplementary information

– **Marking of the component: in accordance with 11.1 of IEC 61169-1:2013 in the following order of preference:** 1) Manufacturer code: ..... 2) Manufacturing date code: year/week 3) Component identification: Variant No./ designation Identification ....
– **Marking and contents of package: in accordance with 11.2 of IEC 61169-1:2013** 1) Information prescribed in 11.1 of IEC 61169-1:2013 detailed above 2) Nominal characteristic impedance .....75 Ω..... 3) Assessment level code letter ..... 4) Any additional marking required .....
– **Ordering information** 1) Number of the detail specification / 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 61169-1:2013 or sectional specification): ....
– Structural similarity in accordance with 10.2.2 of IEC 61169-1:2013
Relevant information on a basic style should be entered as variant 01.

Annex A
(informative)

Recommended outdoor “F” type socket / plug physical dimensions

A.1 Outdoor “F” type female socket

Figure A.1 shows an outdoor female “F” socket.

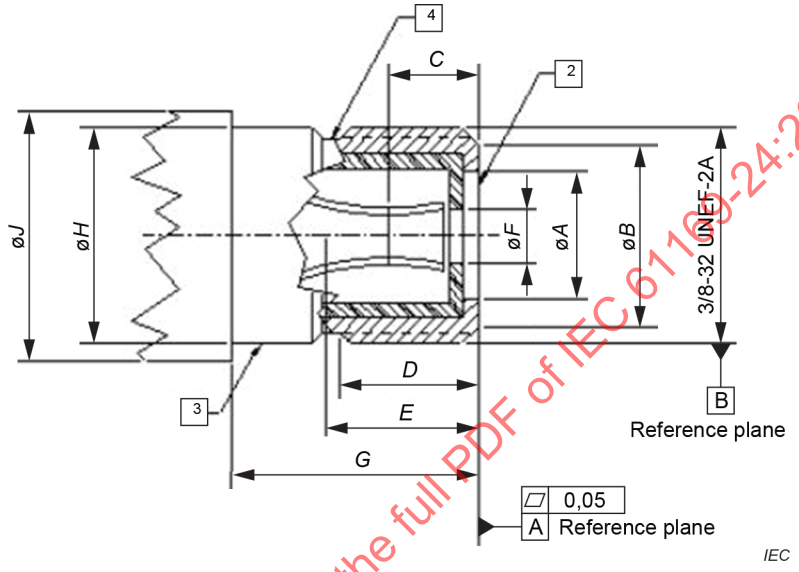

Figure A.1 – Outdoor female “F” socket
(for dimensions, see Table A.1)

Table A.1 – Outdoor female "F" socket dimensions

Description	Reference	mm		inch		Remarks
		Min.	Max.	Min.	Max.	
Reference plane opening inner diameter	*A*	3,90	6,10	0,154	0,240	1,4
Reference plane outer diameter	*B*	7,50	8,00	0,295	0,315	
Positive contact point depth	*C*	-	4,70	-	0,185	2
Full thread depth	*D*	8,26	8,89	0,325	0,350	3
Minimum center conductor clearance	*E*	9,00	-	0,354	-	4
Center conductor guide inner diameter	*F*	1,20	1,50	0,047	0,059	
Port length	*G*	12,32	13,08	0,485	0,515	
Sealing surface diameter for seal ring	*H*	9,35	9,65	0,368	0,380	5
Bulkhead diameter	*J*	10,80	-	0,425	-	

1 No material must protrude beyond reference plane.

2 Thread relief not to exceed two full threads.

3 Dimension to point of positive contact of male center conductor. Recommended mating male center conductor diameter: 0,025 in (0,64 mm) min. / 0,042 in (1,07 mm) max.

4 Minimum clearance required for maximum length male center conductor.

5 If cast feature, no parting lines permitted.

A.2 Outdoor "F" type male plug

Figure A.2 shows an outdoor "F" type male plug.

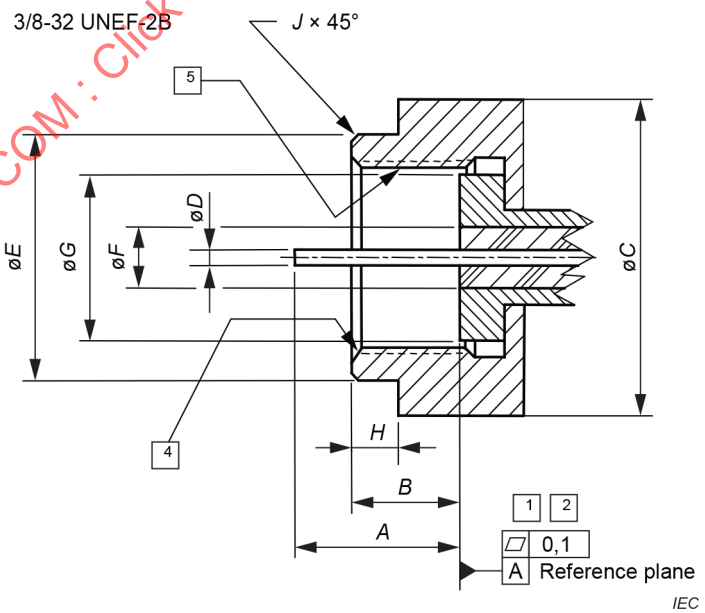

Figure A.2 – Outdoor "F" type male plug (for dimensions, see Table A.2)

Table A.2 – Outdoor “F” type male plug dimensions

Description	Reference	mm		inch		Remarks
		Min.	Max.	Min.	Max.	
Inner conductor length	*A*	6,35	8,63	0,250	0,340	1
Length of nut	*B*	4,29	6,10	0,169	0,240	2
Maximum envelope dimension	*C*	-	16,61	-	0,654	
Inner conductor diameter	*D*	0,64	1,07	0,025	0,42	3
Sealing diameter for seal ring	*E*	10,50	11,00	0,413	0,433	
Reference plane inner diameter	*F*	-	5,84	-	0,230	4
Reference plane outer diameter	*G*	7,11	-	0,310	-	
Sealing surface length	*H*	1,78	4,45	0,079	0,175	
Chamfer break	*J*	0,127	0,381	0,005	0,015	5

1 Dielectric must not protrude beyond reference plane.

2 Minimum one thread lead-in.

3 Cable inner conductor or integral pin.

4 The mating of the “F” female socket to the reference plane should not be impeded.

5 Drawing not to scale.

Annex B
(informative)

Recommended satellite broadcasting “F” type socket / Plug physical dimensions

B.1 Satellite broadcasting “F” type female socket

Figure B.1 shows a satellite broadcasting “F” socket.

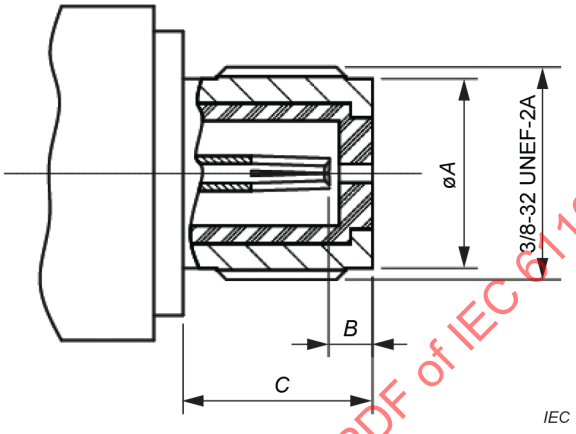

Figure B.1 – Satellite broadcasting “F” socket (for dimensions, see Table B.1)

Table B.1 – Satellite broadcasting “F” type socket dimensions

Reference	mm		inch		Note
	Min.	Max.	Min.	Max.	
A		8,5		0,335	
B	-	4,3	-	0,169	
C	8,0	-	0,315	-	

B.2 Satellite broadcasting “F” type male plug

Figure B.2 shows a satellite broadcasting “F” type male plug.

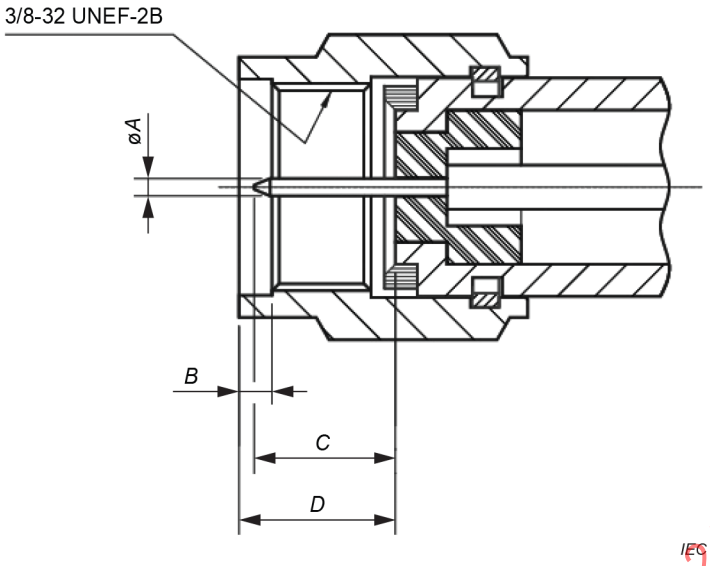

Figure B.2 – Satellite broadcasting "F" type male plug (for dimensions, see Table B.2)

Table B.2 – Satellite broadcasting "F" type male plug dimensions

Reference	mm		inch		Note
	Min.	Max.	Min.	Max.	
A	0,75	0,85	0,030	0,033	
B	-	1,50	-	0,059	
C	6,20	6,80	0,244	0,267	
D	6,70	7,30	0,263	0,287	

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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CONNECTEURS POUR FRÉQUENCES RADIOÉLECTRIQUES –

Partie 24: Spécification intermédiaire – Connecteurs coaxiaux pour fréquences radioélectriques avec couplage à vis, typiquement utilisés dans des réseaux de distribution par câbles de 75 Ω (type F)

AVANT-PROPOS

1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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La Norme internationale IEC 61169-24 a été établie par le sous-comité 46F: Composants passifs pour hyperfréquences et radio fréquences, du comité d'études 46 de l'IEC: Câbles, fils, guides d'ondes, connecteurs, composants passifs pour micro-onde et accessoires.

Cette troisième édition annule et remplace la deuxième édition parue en 2009. Cette édition constitue une révision technique.

La présente édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente: tous les dessins ont été retravaillés et améliorés pour permettre une extension de fréquence jusqu'à 3 GHz.

Le texte de cette Norme internationale est issu des documents suivants:

CDV	Rapport de vote
46F/417/CDV	46F/436A/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 61169, publiées sous le titre général *Connecteurs pour fréquences radioélectriques*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

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CONNECTEURS POUR FRÉQUENCES RADIOÉLECTRIQUES –

Partie 24: Spécification intermédiaire – Connecteurs coaxiaux pour fréquences radioélectriques avec couplage à vis, typiquement utilisés dans des réseaux de distribution par câbles de 75 Ω (type F)

1 Domaine d'application

La présente partie de l'IEC 61169, qui est une spécification intermédiaire (SS), fournit des informations et des règles pour l'établissement de spécifications particulières (DS) pour les connecteurs coaxiaux pour fréquences radioélectriques avec couplage à vis, typiquement utilisés dans des réseaux de distribution par câbles de 75 Ω (type F).

Elle décrit les dimensions d'interface avec les informations sur les calibres et les essais obligatoires, sélectionnés dans l'IEC 61169-1, applicables à toutes les spécifications particulières relatives aux connecteurs de type F.

La présente spécification indique les caractéristiques de performance recommandées à prendre en considération pour rédiger une spécification particulière (DS) et porte sur des programmes d'essai et des exigences de contrôle.

NOTE Les dimensions en millimètres sont les dimensions d'origine. Toutes les représentations non cotées sont fournies à titre de référence uniquement.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61169-1:2013, *Connecteurs pour fréquences radioélectriques – Partie 1: Spécification générique – Exigences générales et méthodes de mesure*

EN 60068-2-52, *Essais d'environnement – Partie 2-52: Essais – Essai Kb: Brouillard salin, essai cyclique (solution de chlorure de sodium)*

3 Termes et définitions

Aucun terme n'est défini dans le présent document.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

4 Dimensions d'interface

4.1 Dimensions

4.1.1 Dimensions physiques d'une embase de connecteur femelle (intérieure) de type F

La Figure 1 représente une embase de connecteur femelle (intérieure) de type F.

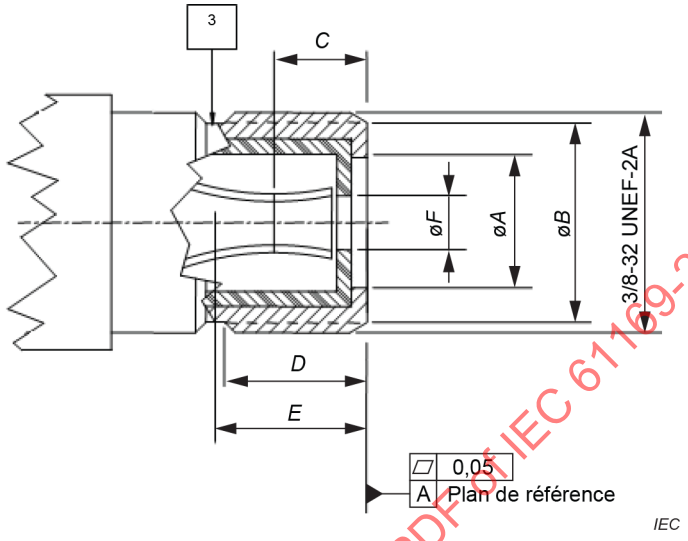

Figure 1 – Embase de connecteur femelle (intérieure) de type F
(les dimensions sont indiquées dans le Tableau 1)

Tableau 1 – Embase de connecteur femelle (intérieure) de type F

Description	Référence	mm		Remarques
		Min.	Max.	
Diamètre intérieur de l'ouverture dans le plan de référence	*A*	3,90	7,4	1, 4
Diamètre extérieur du plan de référence	*B*	7,50	8,50	
Profondeur du point de contact positif	*C*	-	4,70	2
Longueur minimale d'un filet complet de port	*D*	7,50	-	3
Profondeur minimale du contact central	*E*	9,00	-	4
Diamètre intérieur du guide du conducteur central	*F*	1,2	1,5	

[1] Il n'est pas admis qu'une partie du diélectrique dépasse du plan de référence.

[2] Diamètre recommandé du conducteur central mâle d'accouplement: 0,025 pouce (0,64 mm) min. à 0,042 pouce (1,07 mm) max.

[3] Le détalonnage ne doit pas dépasser deux filets entiers. Indiqué par la boîte 3 de la Figure 1.

[4] La géométrie du contact central est facultative.

4.1.2 Dimensions physiques d'une fiche de connecteur mâle (intérieure) de type F

La Figure 2 représente une fiche de connecteur mâle (intérieure) de type F.

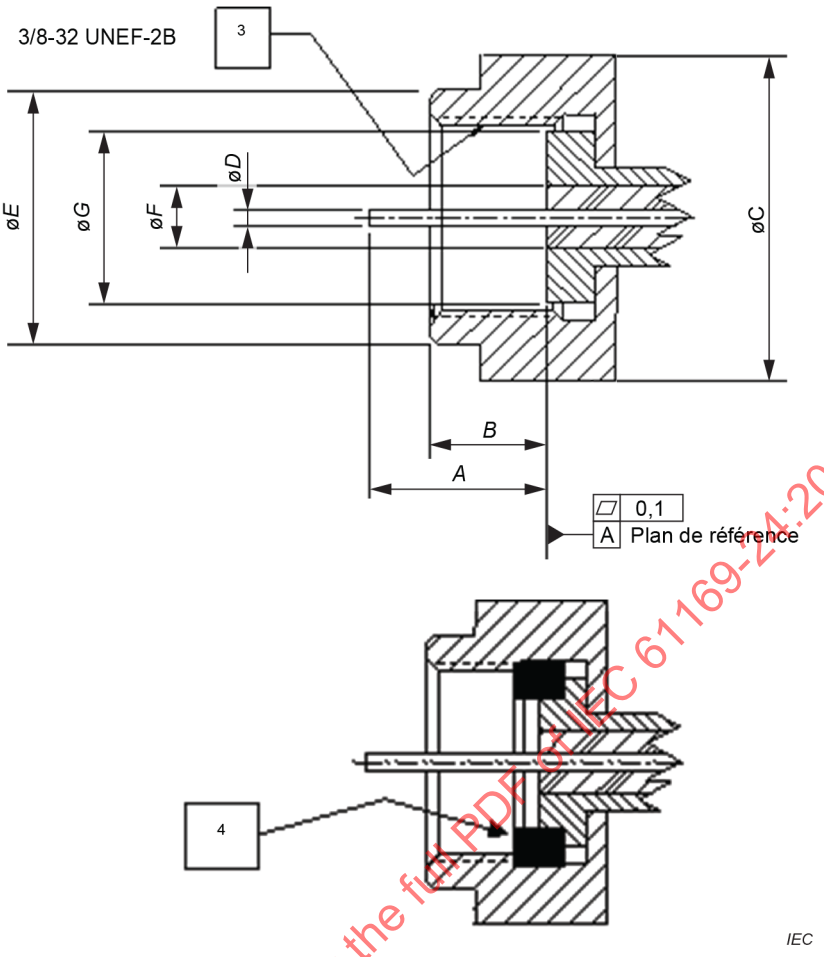

Figure 2 – Fiche de connecteur mâle (intérieure) de type F
(les dimensions sont indiquées dans le Tableau 2)

Tableau 2 – Fiche de connecteur mâle (intérieure) de type F

Description	Référence	mm		Remarques
		Min.	Max.	
Longueur du conducteur intérieur	*A*	6,35	8,63	
Longueur de l'écrou	*B*	4,00	7,29	1, 2
Dimension maximale de l'enveloppe	*C*	-	16,61	
Diamètre du conducteur intérieur	*D*	0,64	1,13	
Diamètre de la surface d'étanchéité pour la bague d'étanchéité	*E*	10,41	11,04	
Diamètre intérieur de l'ouverture dans le plan de référence	*F*	-	5,84	1, 2
Diamètre extérieur de l'ouverture dans le plan de référence	*G*	7,88		

[1] Il n'est pas admis qu'une partie du diélectrique dépasse du plan de référence.

[2] L'accouplement de l'embase femelle F et du plan de référence n'est pas gêné.

[3] Un joint d'étanchéité facultatif, le cas échéant, n'empêche pas de satisfaire à toutes les exigences de performances.

4.2 Calibres mécaniques

4.2.1 Essai sur le diamètre d'acceptation du conducteur central femelle d'accouplement

Un essai a été conçu pour vérifier que le contact femelle central de l'embase ne présente pas de déformation mécanique lorsqu'il est accouplé sur la plage totale des diamètres des conducteurs internes indiqués. Cet essai mesure la force exigée pour insérer et extraire une sélection de broches d'essai de précision d'une embase femelle de type F soumise aux essais.

Il convient que l'appareillage d'essai soit conçu pour permettre un alignement précis de l'embase femelle de type F soumise à l'essai avec la broche d'essai de précision. Il convient que l'appareillage maintienne soit l'embase, soit la broche d'essai dans une position fixe et il convient que la partie mobile de l'appareillage soit équipée d'un instrument capable de mesurer la force d'insertion et d'extraction.

La force d'insertion et d'extraction doit être mesurée et enregistrée en newtons en utilisant la séquence d'essais représentée ci-dessous.

La Figure 3 représente un calibre pour conducteur central femelle.

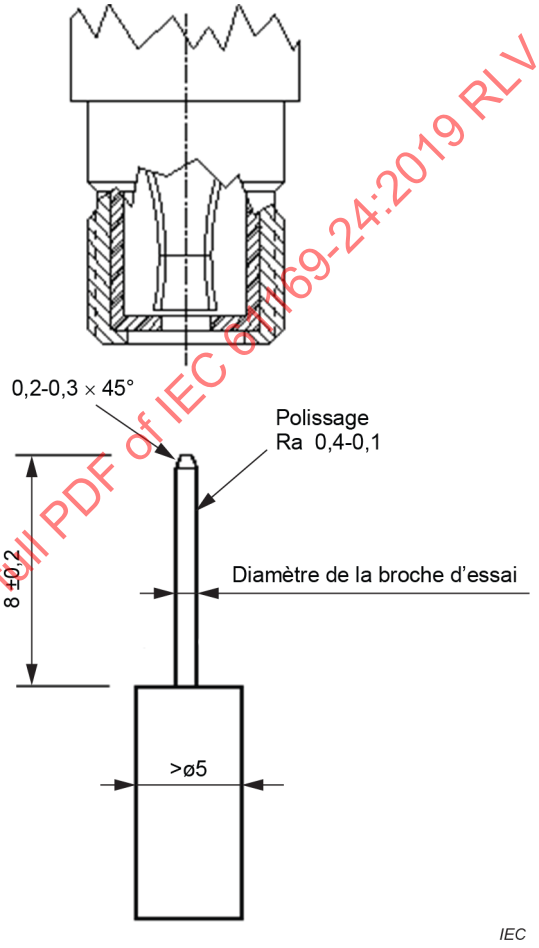

Figure 3 – Calibre pour conducteur central femelle

Tableau 3 – Séquence d'essais pour conducteur central femelle

Séquence d'essais	1er essai	2e essai	3e essai	4e essai	5e essai	6e essai
Diamètre de la broche d'essai	0,635 mm ± 0,005 mm	0,850 mm ± 0,005 mm	1,136 mm ± 0,005 mm	0,635 mm ± 0,005 mm	1,136 mm ± 0,005 mm	0,635 mm ± 0,005 mm

La force d'insertion exigée pour insérer la broche d'essai dans le contact femelle central de l'embase ne doit jamais dépasser 20 N.

La force d'extraction exigée pour extraire la broche d'essai du contact femelle central de l'embase doit être au minimum de 0,3 N dans tous les cas.

4.2.2 Essai électrique d'acceptation du conducteur central du port d'accouplement

Lorsque les essais mécaniques décrits en 4.2.1 sont terminés, la résistance de contact du conducteur central, lorsqu'il est de nouveau accouplé à une fiche mâle de type F dont le

diamètre de conducteur central est de 0,635 mm, ne doit pas dépasser 10 mΩ avec un courant d'essai appliqué de 1 A.

4.2.3 Contact électrique du plan de référence

Le contact électrique doit être obtenu par l'accouplement de la face du plan de référence de l'embase femelle de type F avec la face d'accouplement de la fiche mâle de type F et pas uniquement par les filets.

5 Procédures d'assurance de la qualité

5.1 Généralités

Les paragraphes suivants fournissent des valeurs assignées recommandées, des caractéristiques de performance et des conditions d'essai à prendre en compte pour la rédaction d'une spécification particulière (DS). Ils fournissent également un programme d'essais approprié avec les niveaux de contrôle de conformité minimaux.

5.2 Valeurs assignées et caractéristiques

Les connecteurs RF définis dans le présent document sont destinés à être utilisés avec une grande variété de câbles coaxiaux souples et semi-rigides et dans des applications non câblées de circuits intégrés hyperfréquences et analogues.

Les valeurs assignées et caractéristiques sont indiquées dans le Tableau 4.