

INTERNATIONAL STANDARD



**Radio-frequency connectors –
Part 47: Sectional specification for radio-frequency coaxial connectors with
clamp coupling, typically for use in 75 Ω cable networks (type F-Quick)**



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INTERNATIONAL
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COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIO-FREQUENCY CONNECTORS –**Part 47: Sectional specification for radio-frequency coaxial
connectors with clamp coupling, typically for use in
75 Ω cable networks (type F-Quick)**

FOREWORD

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The text of this standard is based on the following documents:

CDV	Report on voting
46F/204/CDV	46F/213/RVC

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

This publication 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 publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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RADIO-FREQUENCY CONNECTORS –

Part 47: Sectional specification for radio-frequency coaxial connectors with clamp coupling, typically for use in 75 Ω cable networks (type F-Quick)

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 clamp coupling, typically for use in 75 Ω cable networks (type F-Quick).

It describes the interface dimensions with gauging information, electrical and mechanical performance including the mandatory tests selected from IEC 61169-1:1992, applicable to all DS relating to type F-Quick connectors.

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

NOTE This interface is typically used for indoor connections, which are easily disconnected and reconnected. The typical application is for F-type coaxial receiver leads or F-type coaxial patch cables. The interface may also be known as a Push – On connector.

It is preferred to use the fixed (screwed) connectors type F according to IEC 61169-24:2009.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61169-1:1992, *Radio-frequency connectors – Part 1: Generic specification – General requirements and measuring methods*¹

Amendment 1:1996

Amendment 2:1997

IEC 61169-24:2009, *Radio-frequency connectors – Part 24: Sectional specification – Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)*

3 Interface dimensions

3.1 Dimensions

3.1.1 Common dimensions

Millimetres are original dimensions.

All un-dimensioned pictorial configurations are for reference purposes only.

¹ There exists a consolidated edition 1.2 (1998) that comprises IEC 61169-1:1992, its Amendment 1:1996 and its Amendment 2:1997.

Figure 1 and Table 1 depict the dimensions that are common to any F connector and thus indispensable for compatibility. Examples of specific design with their dimensions are given in 3.1.2 to 3.1.4.

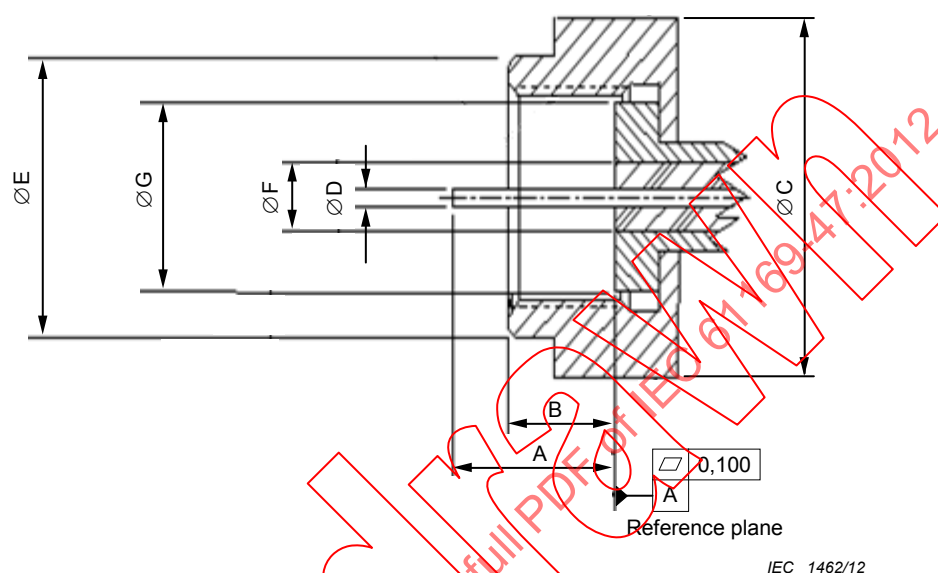


Figure 1 – Connector “F-Quick” type male plug: General dimensions

Table 1 – Connector “F” type male plug (indoor)

DESCRIPTION	DIM	mm		inches		NOTES
		Min.	Max.	Min.	Max.	
Inner conductor length	A	6,35	8,63	0,250	0,340	
Length of nut	B	4,00	7,29	0,167	0,287	
Maximum envelope dimension	C		16,61		0,654	
Inner conductor diameter	D	0,64	1,13	0,025	0,044	
Reference plane opening inner diameter	F		6,84		0,230	1
Reference plane outer diameter	G	7,11		0,280		
1 No protrusion of the dielectric beyond the reference plane is permitted.						

3.1.2 Example of connector “F-Quick” type male plug with resilient outer conductor sleeve (indoor) physical dimensions

The connector is shown in Figure 2. Common dimensions are given in 3.1.1.

Dimension in millimetres

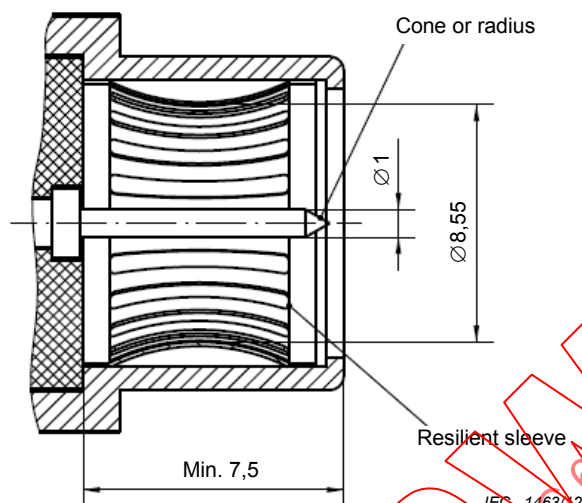


Figure 2 – Example of connector “F-Quick” type male plug with resilient outer conductor sleeve (indoor)

3.1.3 Example of connector “F-Quick” type male plug with slotted outer conductor (indoor) physical dimensions

The connector is shown in Figure 3. Common dimensions are given in 3.1.1.

Dimension in millimetres

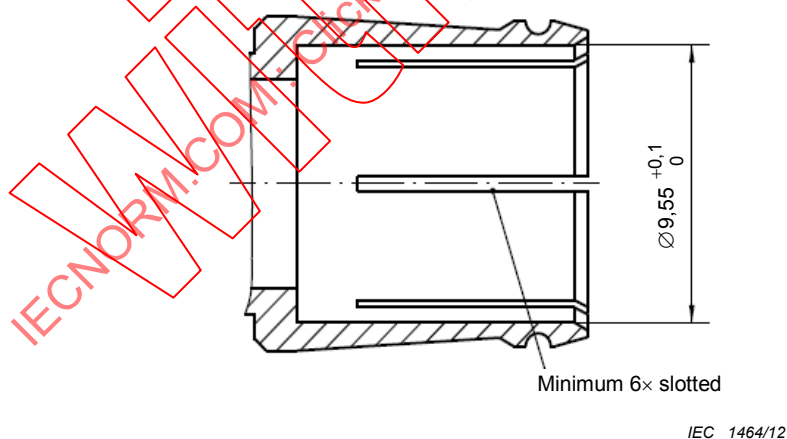


Figure 3 – Example of connector “F-Quick” type male plug with slotted outer conductor (indoor)

3.1.4 Example of connector “F-Quick” type male plug with slotted outer conductor and snap ring (indoor) physical dimensions

The connector is shown in Figure 4. Common dimensions are given in 3.1.1.

Dimension in millimetres

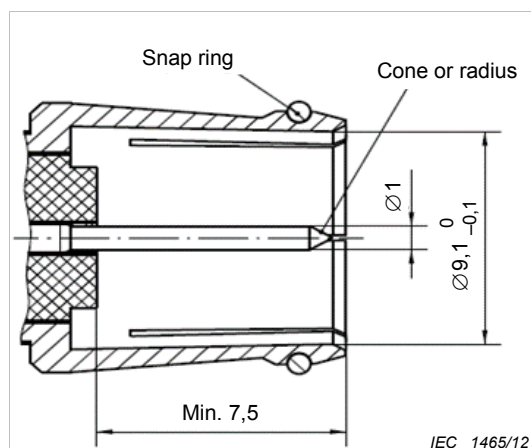
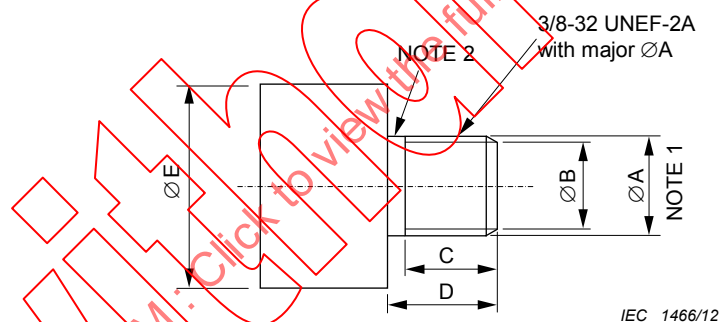


Figure 4 – Example of connector “F-Quick” type male plug with slotted outer conductor and snap ring (indoor)

3.2 Mechanical gauges

See IEC 61169-24:2009 for the test procedure using the gauge as defined in Figure 5.



DESCRIPTION	Dimension	mm	inches
Outside diameter of thread blank	A	9,34	0,368
Reference plane opening outer diameter	B	7,48	0,295
Port thread length	C	7,48	0,295
Port length	D	12,69	0,357
Bulkhead diameter	E	16,59	0,654
1 Outside diameter of thread.			
2 Thread relief not to exceed 2 full threads.			

Figure 5 – Mechanical gauge

4 Quality assessment procedures

4.1 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.

4.2 Ratings and characteristics

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

Table 2 – Ratings and characteristics (1 of 2)

Ratings and characteristics	IEC 61169-1:1992 subclause	Value	Remarks including any deviations from standard test methods
<u>Electrical</u>			
Nominal impedance			Shall meet the requirements of 9.2.1.1 of IEC 61169-1:1992 when terminating a $Z_c = 75 \Omega$ cable
Frequency range		5 MHz to 1 GHz 5 MHz to 2 GHz 5 MHz to 3 GHz	See DS For most applications For some satellite applications For some head end applications
Reflection factor	9.2.1.4		
– straight styles		min. 30 dB up to 1 000 MHz min. 25 dB up to 2 GHz min. 20 dB up to 3 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	
Centre contact resistance	9.2.3		
– initial		$\leq 5 \text{ m}\Omega$	
– after conditioning		$\leq 10 \text{ m}\Omega$	
Outer conductor continuity	9.2.3		
– initial		$\leq 2,5 \text{ m}\Omega$	
– after conditioning		$\leq 5 \text{ m}\Omega$	
Insulation resistance	9.2.5		
– initial		$> 1 \text{ G}\Omega$	
– after conditioning		$> 1 \text{ M}\Omega$	

Table 2 (2 of 2)

Ratings and characteristics	IEC 61169-1:1992 subclause	Value	Remarks including any deviations from standard test methods
Proof voltage at sea level + #	9.2.6	750 V	86 kPa to 106 kPa
Screening effectiveness	9.2.8	$a_s \geq 90$ dB	$Z_t < 3,2$ mΩ (mated interface)
Discharge test (Corona)	9.2.9	na	
<u>Mechanical</u>			
Gauge retention force (resilient contacts)	9.3.4		See 3.2 of IEC 61169-1:1992
Contact captivation – axial force – torque	9.3.5	20 N max. na	Captivated contacts only
Engagement and separation Engagement force Separation force	9.3.6	20 N (max.) 40 N (min.) 80 N (max.)	Slide-on connectors
Mechanical tests on cable – cable pulling # – cable torsion #	9.3.8 9.3.10	120 N 0,1 Nm	
Tensile strength of coupling mechanism	9.3.11	≥ 300 N	
Bending moment	9.3.12	2 Nm minimum	Relative to reference plane
<u>Environmental</u>			
Vibration	9.3.8	98 m/s ² 10 Hz to 500 Hz	10 g acceleration
Climatic sequence	9.4.2	40/70/21	
Sealing	9.4.5	na	
Salt mist	9.4.6	48 h	
<u>Endurance</u>			
Mechanical	9.5.7-10	See DS for the number of cycles	
High temperature	9.6.0	1 000 h	
Key • these values apply to basic connectors. They depend on the cable used. Relevant values are given in the DS + voltage values are r.m.s. 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			

4.3 Environmental characteristics for outdoor sockets

See IEC 61169-24:2009.

4.4 Test schedule and inspection requirements

4.4.1 Acceptance tests

Table 3 – Acceptance tests

	Test method IEC 61169- 1:1992 subclause	Assessment level M (higher)				Assessment level H (lower)			
		Test required	IL	AQL %	Period	Test required	IL	AQL %	Period
<i>Group A1</i>									
Visual examination	9.1.2	a	II	1,0		a	S3	1,5	
<i>Group B1</i>									
Outline dimensions	9.1.3.1	a	S4	0,4		a	S3	4,0	
Mechanical compatibility	9.1.3.3	a	II	1,0		a	S3	1,5	
Engagement and separation	9.3.6	a	S4	0,40	Lot	a	S3	1,5	Lot
Gauge retention (resilient contact)	9.3.4	ia	II	1,0		ia	S3	1,5	
Sealing, non-hermetic	9.4.5.1	ia	II	0,65	by	ia	S3	1,0	by
Sealing, hermetic	9.4.5.2	ia	II	0,015		ia	S3	0,025	
Voltage proof	9.2.6	a	S4	0,40	lot	a	II	4,0	lot
Solderability piece parts	9.3.2.1.1	ia	S4	0,40		ia	S3	4,0	
Insulation resistance	9.2.5	a	S4	0,40		a	S3	4,0	
Key IL inspection level AQL acceptable quality level a suggested as applicable ia test suggested (if technically applicable)									

4.4.2 Periodic tests

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

Table 4 – Periodic tests (1 of 2)

	Test method IEC 61169-1:1992 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
<i>Group D1 (d)</i>			6	1	3 years		3	1	3 years
Solderability connector assemblies	9.3.2.1.1	ia				ia			
Resistance to soldering heat	9.3.2.1.2	ia				ia			
Mechanical tests on cable fixing									
– cable rotation (nutation)	9.3.7.2	ia				ia			
– cable pulling	9.3.8	ia				ia			
– cable bending	9.3.9	ia				ia			
– cable torsion	9.3.10	ia				ia			
<i>Group D2 (d)</i>			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				a			
Damp heat, steady state	9.4.3	a				a			
<i>Group D3 (d)</i>			1*	1	3 years		1*	1	3 years
Dimensions piece-parts and materials	9.1.3.2	a				a			
<i>Group D4 (d)</i>			6	1	3 years		3	1	3 years
Mechanical endurance	9.5	a				a			
High temperature endurance	9.6	a				a			
Sulphur dioxide	9.4.8	na				na			
<i>Group D5 (d)</i>			6	1	3 years		3	1	3 years
Reflection factor	9.2.1	a				a			
Screening effectiveness	9.2.8	a				a			
Water immersion	9.2.7	ia				ia			

Table 4 (2 of 2)

	Test method IEC 61169- 1:1992 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 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	ia				ia			
Key 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.									

4.5 Procedures

4.5.1 Quality conformance inspection

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

4.5.2 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.

5 Instructions for preparation of detail specifications

5.1 General

Detail specifications (DS) writers shall use the appropriate blank DS (BDS) pro-forma. The following pages comprise the pro-forma BDS dedicated for use with 75 Ω type F-Quick connectors. As such, it will already have entered on it information relating to

- the basic specification number applicable to all the detail specifications covering connector styles of the type covered by the sectional specification;
- the connector series designation.

The specification writer should enter the details relating to the connector style/variant(s) to be covered as indicated. The numbers in brackets on the BDS pro-forma correspond to the following indications which shall be given.

5.2 Identification of the detail specification

- (1) The name of the national standards organization (NSO) under whose authority the DS is published and, if applicable, the organization from whom the DS is available.
- (2) The relevant mark of conformity and the number allotted to the DS by the relevant national or international organization authorizing the DS.
- (3) The number and issue number of the IEC/IECQ generic or sectional specification as relevant; also national reference if different.
- (4) If different from the IEC/IECQ number, any national number of the DS, date of issue and any further information required by the national system, together with any amendment numbers.

5.3 Identification of the component

- (5) Enter the following details:

Style: The style designation of the connector including type of fixing and sealing, if applicable.

Attachment: By deletion of the inapplicable options of cable/wire: given for centre and outer conductors.

Special features and markings: As applicable.

- (6) Enter details of assessment level and the climatic category
- (7) A reproduction of the outline drawing and details of the panel piercing, if applicable. It shall provide the maximum envelope dimensions, also the position of the reference plane and, in the case of a fixed connector, the position of the mounting plane(s) relative to the front face of the connector.

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

- (8) Particulars of all variants covered by the DS. As appropriate, the information shall include:
 - cable types (or sizes) applicable to each variant;
 - alternative plated or protective finishes;
 - details of alternative mounting flanges having either tapped or plain mounting holes;
 - details of alternative solder spills or solder buckets including, when applicable, those for use with microwave integrated circuit (MIC) components.

5.4 Performance

- (9) Performance data listing the most important characteristics of the connector, taking into account the recommended values in 4.2 of this standard. Deviations from the minimum requirements shall be clearly indicated. Non-applicable parameters shall be marked 'na'.

5.5 Marking, ordering information and related matters

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

5.6 Selection of tests, test conditions and severities

- (11) 'na' shall be used to indicate non-applicable tests. All tests marked 'a' by the detail specification writer shall be mandatory.

When using the normal procedure with a dedicated BDS, the letter 'a' – for applicable – shall be entered in the 'test required' column against each of the tests indicated as being mandatory in the test schedule as in 4.4 of this standard. Any additional tests required at the discretion of the specification writer shall also be indicated by an 'a'.

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

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

5.7 Blank detail specification pro-forma for type F connector

The following pages contain the complete BDS pro-forma.

(1)	Page 1 of																												
ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH GENERIC SPECIFICATION IEC 61169-1 SECTIONAL SPECIFICATION IEC 61169-47 NATIONAL REFERENCE		(4) ISSUE																											
(5) Detail specification for radio-frequency coaxial connector of assessed quality		type F-Quick																											
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 <table border="1"> <thead> <tr> <th>Variant No.</th> <th>Description of variant</th> <th>60096 IEC</th> </tr> </thead> <tbody> <tr> <td>01.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> </tbody> </table>			Variant No.	Description of variant	60096 IEC	01.....																							
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Information about manufacturers who have components qualified to this detail specification is available through IECQ on-line certificate system.																													

(9) Performance (including limiting conditions of use)

Ratings and characteristics	IEC 61169-1:1992 subclause	Value	Remarks including any deviations from standard test methods
<i>Electrical</i> Nominal impedance Frequency range Reflection factor Variant No. Designation 01..... Centre contact resistance Centre conductor continuity Outer contact continuity Insulation resistance + Proof voltage at sea level + Proof voltage at 4,4 kPa + Environment test voltage at sea level Environment test voltage at 4,4 kPa	9.2.1 9.2.3 9.2.3 9.2.3 9.2.5 9.2.6	75 Ω 0 GHz to 3 GHz ≤mΩ ≤mΩ mΩmΩmΩmΩ ≤mΩ ≤mΩ ≥GΩ ≥GΩ kVkVkVkV VVVV VVVV VVVV	Measurement frequency range Initial After conditioning Resistance change due to conditioning Initial After conditioning Initial After conditioning 86 kPa to 106 kPa kPa (if not 4,4 kPa) 86 kPa to 106 kPa kPa (if not 4,4 kPa)
Screening effectiveness 01..... ADDITIONAL ELECTRICAL CHARACTERISTICS	9.2.8	≥ dB at....GHz	Z_t≤.....Ω
+ Voltage values are r.m.s. values at 50 Hz to 60 Hz, unless otherwise specified.			

Ratings and characteristics		IEC 61169-1:1992 subclause	Value	Remarks including any deviations from standard test methods
<i>Mechanical</i>				
Soldering		9.3.2.1.1		
- bit size				
Gauge retention resilient contacts		9.3.4		
- inner contact				
- outer contact				
Centre contact captivation		9.3.5	N	
- axial force			mm	
- permitted displacement each direction				
Engagement and separation		9.3.6	N (eng)	
- axial force			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 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	(.....g _n acceleration)
			to.....Hz	
ADDITIONAL MECHANICAL CHARACTERISTICS				