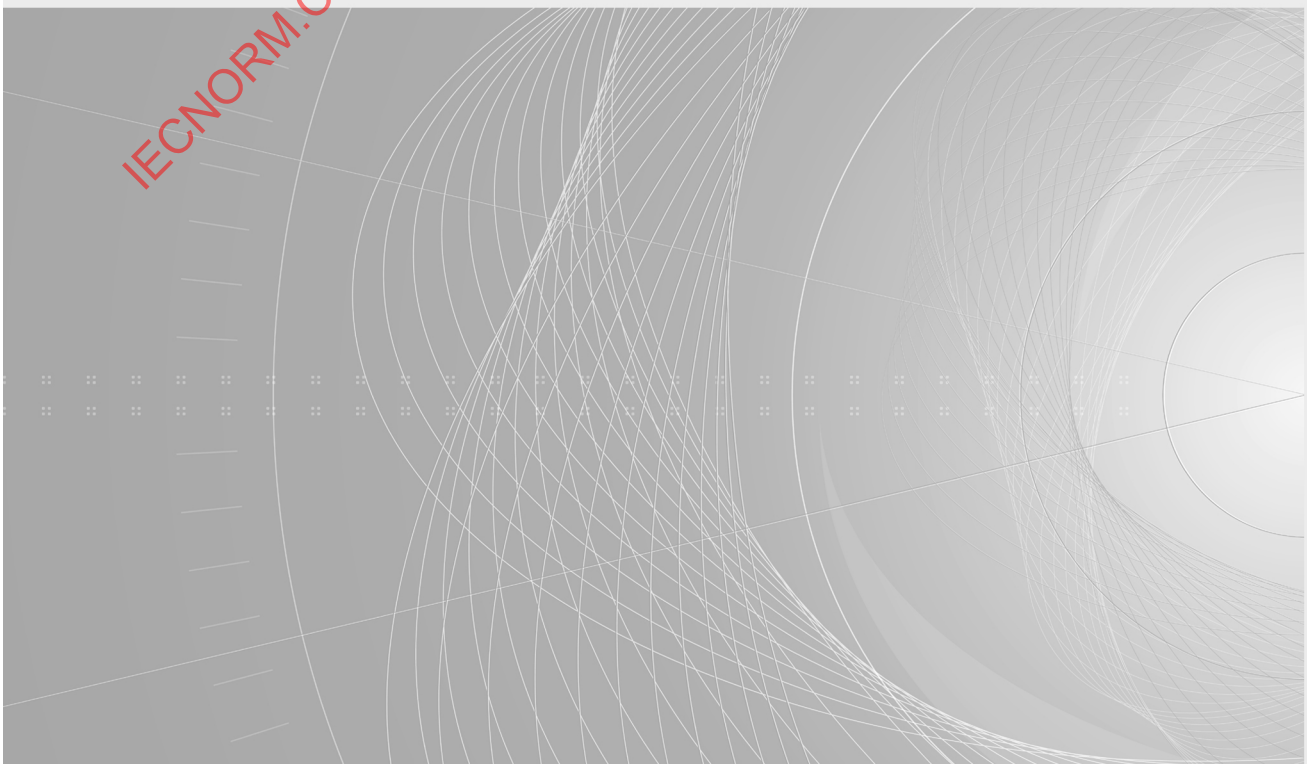
IEC 61169-54

Edition 2.0 2021-08
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Radio-frequency connectors – Part 54: Sectional specification for coaxial connectors with 10 mm inner diameter of outer conductor, nominal characteristic impedance 50 Ω, series 4,3-10



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Radio-frequency connectors – Part 54: Sectional specification for coaxial connectors with 10 mm inner diameter of outer conductor, nominal characteristic impedance 50 Ω, series 4,3-10

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Part 54: Sectional specification for coaxial connectors with 10 mm inner diameter of outer conductor, nominal characteristic impedance 50 Ω, series 4,3-10

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 IEC 61169-54:2016. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61169-54 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. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) updated patent statement,

b) Table 8: some values changed.

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

FDIS	Report on voting
46F/574/FDIS	46F/577/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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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INTRODUCTION

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RADIO-FREQUENCY CONNECTORS –

Part 54: Sectional specification for coaxial connectors with 10 mm inner diameter of outer conductor, nominal characteristic impedance 50 Ω, series 4,3-10

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 coaxial connectors with 10 mm inner diameter of outer conductor, characteristic impedance 50 Ω, series 4,3-10 with screw type, hand screw type or quick-lock type coupling, for an upper operating frequency limit of 6 GHz, for use in wireless telecommunication and wireless network applications in conjunction with appropriate transmission line types for these applications.

It also describes mating face dimensions for general purpose connectors, gauging information and tests selected from IEC 61169-1, applicable to all detail specifications relating to 4,3-10 series connectors.

This specification indicates the recommended performance characteristics to be considered when writing a detail specification and it covers test schedules and inspection requirements for assessment levels M and H.

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*

IEC 62037-1:2012, *Passive RF and microwave devices, intermodulation level measurement – Part 1: General requirements and measuring methods*

3 Terms and definitions

No terms and definitions are listed in this document.

4 Mating face and gauge information

4.1 Dimensions – General connectors – Grade 2

4.1.1 Connector with pin-centre contact (see Figure 1)

Metric dimensions are original dimensions. All un-dimensioned pictorial configurations are for reference purpose only.

Dimensions in millimetres

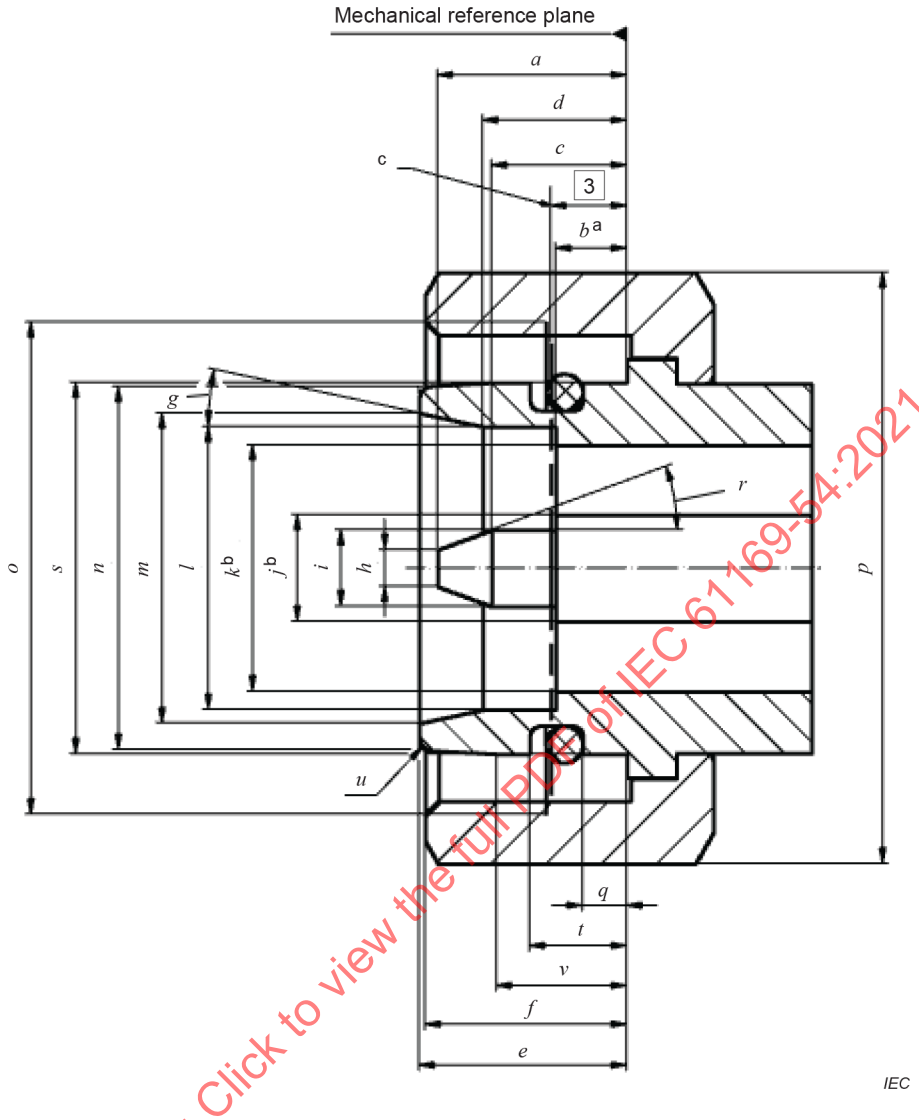


Figure 1 – Connector with pin-centre contact (for dimensions and key, see Table 1)

Table 1 – Dimensions of connector with pin-centre contact

Ref.	mm		Additional notes
	Min.	Max.	
a	–	8,0	
b	–	2,9	[a]
c	5,0	–	
d	4,4	–	
e	8,3	8,5	
f	8,0	8,5	
g	10°	14°	
h	–	2,3	diameter
i	3,07	3,13	diameter
j	4,35 nom.		diameter [b]
k	10,0 nom.		diameter [b]
l	11,47	11,53	diameter
m	12,5	–	diameter
n	14,7	14,8	diameter
o	M20 × 1	tolerance 6H	thread
p	22 nom.		wrench size
q	1,8	–	
r	20° nom.		
s	15,07	15,11	diameter
t	–	4,1	
u	0,5 nom.		radius
v	5,1	5,5	

[a] Applicable for inner and outer contact.

[b] For 50 Ω nominal impedance.

[c] Electrical reference plane.

4.1.2 Connector with socket-centre contact (see Figure 2)

Dimensions in millimetres

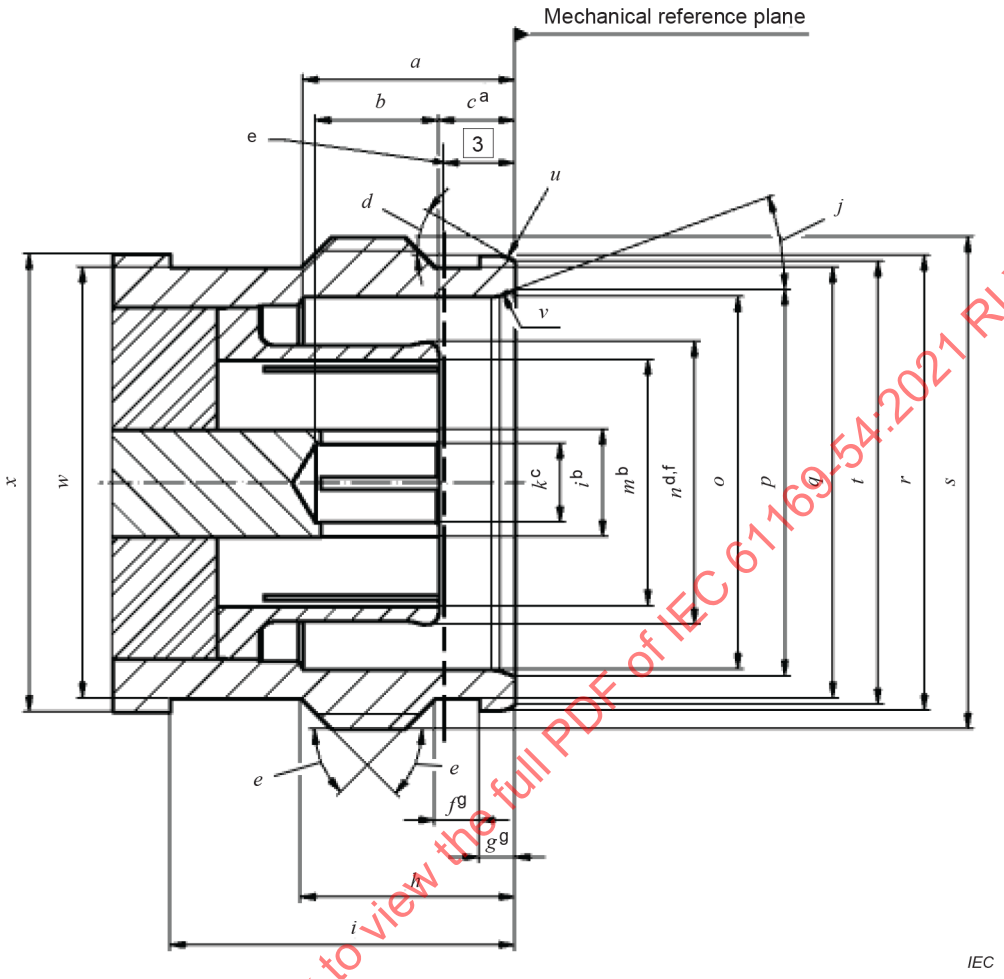


Figure 2 – Connector with socket-centre contact (for dimensions and key, see Table 2)

Table 2 – Dimensions of connector with socket-centre contact

Ref.	mm		Additional notes
	Min.	Max.	
a	8,5	–	
b	5,0	–	
c	3,1	3,5	[a]
d	30° nom.		
e	45° nom.		[g]
f	1,7	1,9	[g]
g	1,44	1,50	[g]
h	8,7	9,0	
i	13,9	14,1	
j	20° nom.		
k			[c]
l	4,35 nom.		diameter [b]
m	9,8	10,2	diameter [b]
n	–	12,3	[d, f]
o	15,13	15,19	diameter
p	15,7	15,9	diameter
q	17,4	17,5	diameter [g]
r	18,44	18,5	diameter [g]
s	M20 × 1	tolerance 6g	thread
t	17,9	18,1	diameter
u	0,6 nom.		radius
v	1,0 nom.		radius
w	17,45	17,55	diameter
x	18,6	–	diameter

[a] Applicable for inner and outer contact.

[b] For 50 Ω nominal impedance.

[c] Resilient to meet the requirements with gauge pins for socket centre contact.

[d] Expand to meet the requirements with gauge rings for socket outer contact.

[e] Electrical reference plane.

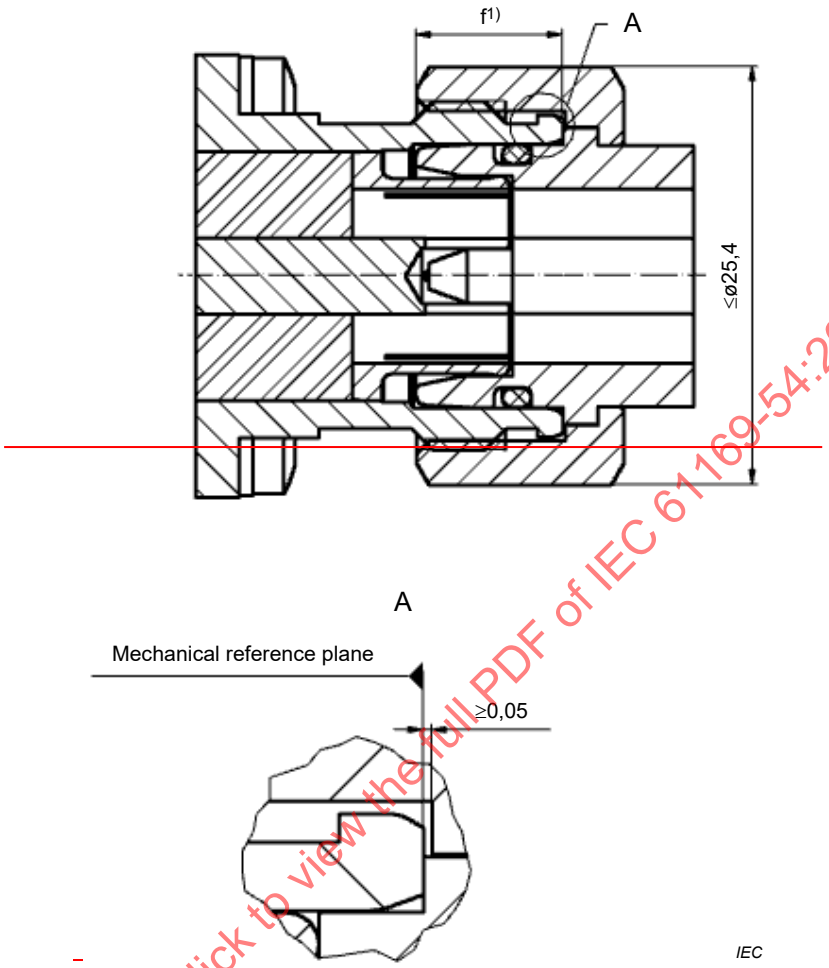
[f] In unmated condition.

[g] Rim and groove on socket front provided for quick lock attachment.

4.1.3 Presentation of possible coupling mechanisms

4.1.3.1 Screw type (see Figure 3)

Dimensions in millimetres



1) According to Table 1.

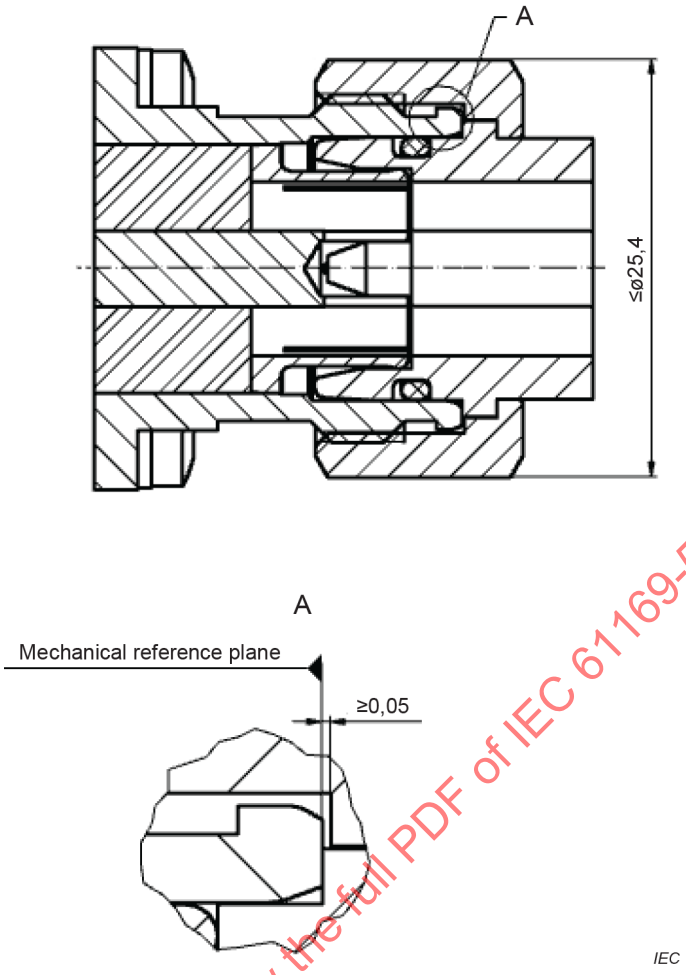
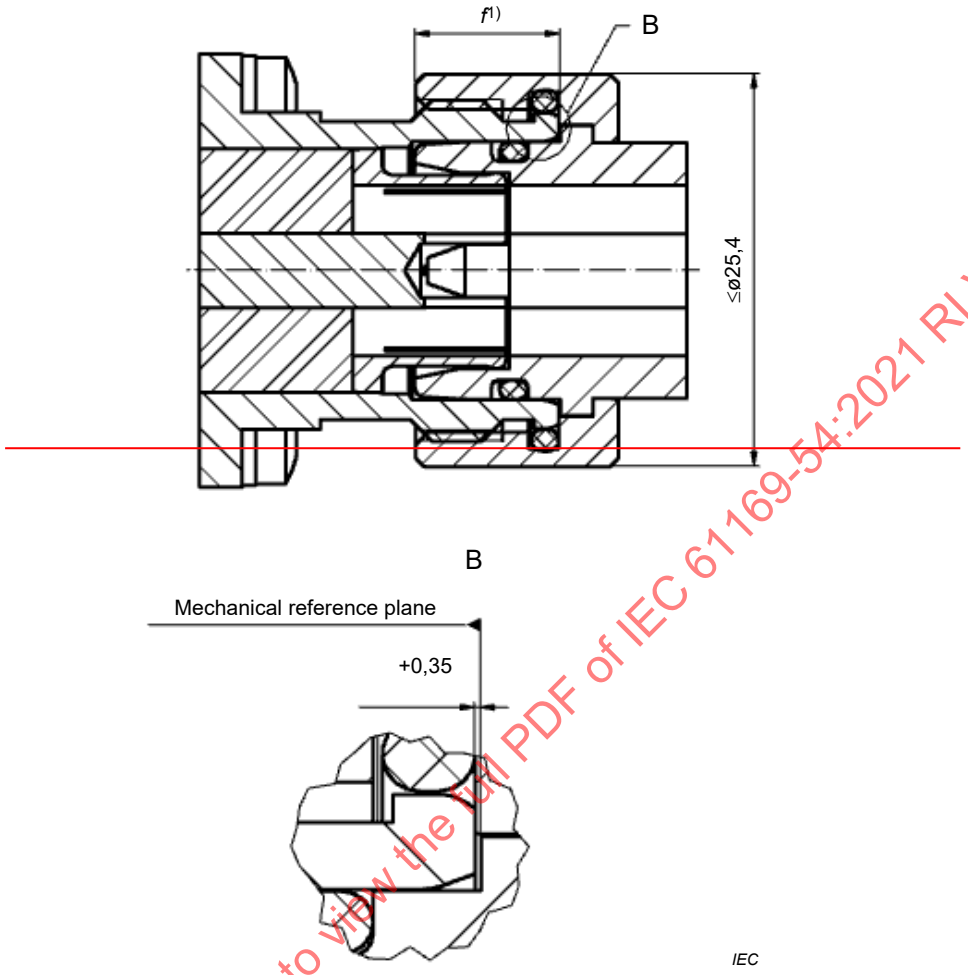


Figure 3 – Screw type

4.1.3.2 Hand screw type (see Figure 4)

Dimensions in millimetres



1) According to Table 1.

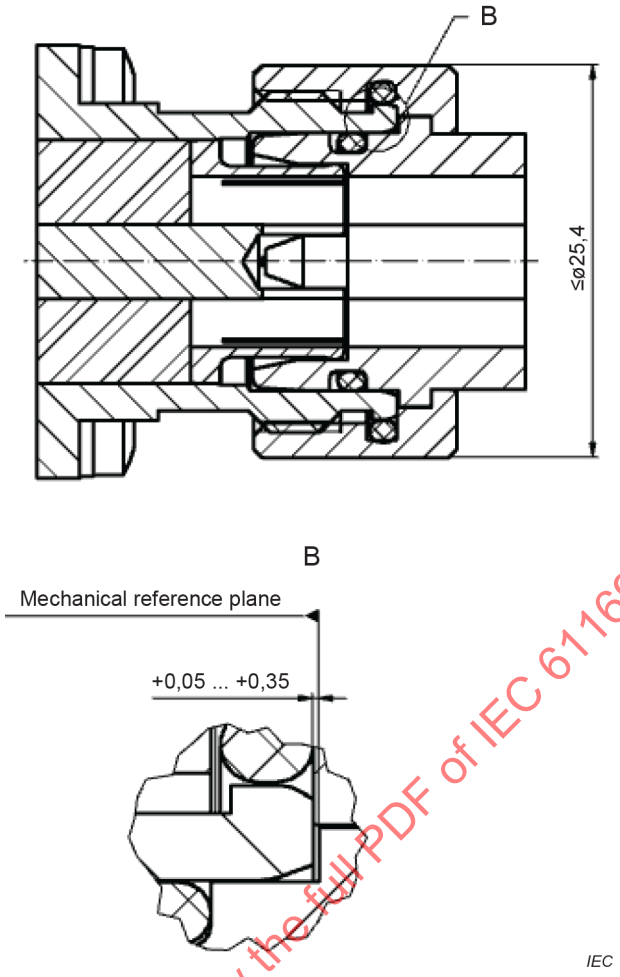
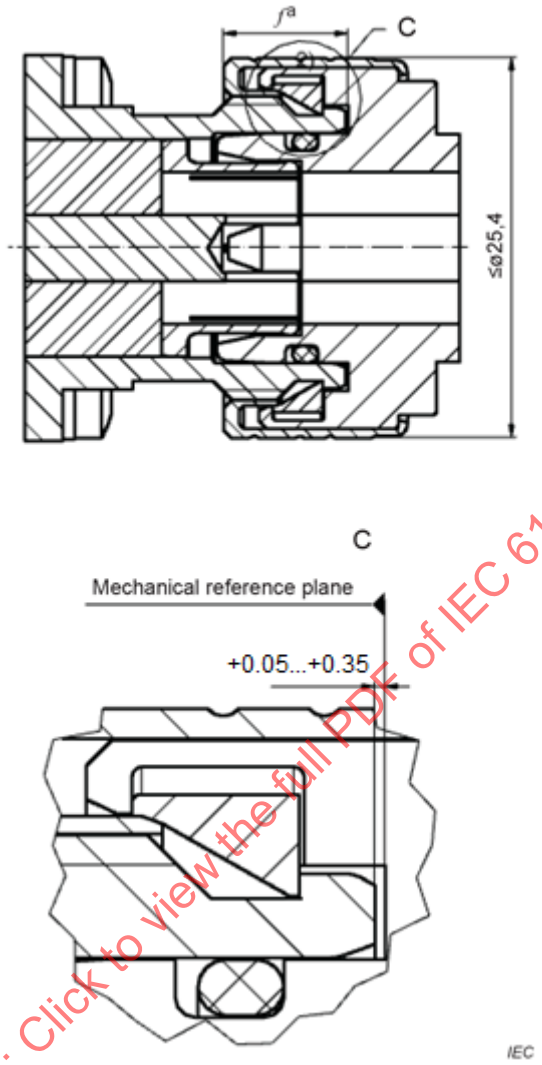


Figure 4 – Hand screw type

4.1.3.3 Quick lock type (see Figure 5)

Dimensions in millimetres



[a] Max 13,5 mm for this variant.

Figure 5 – Quick lock type

4.2 Gauges

4.2.1 Gauge pins for socket-centre contact (see Figure 6)

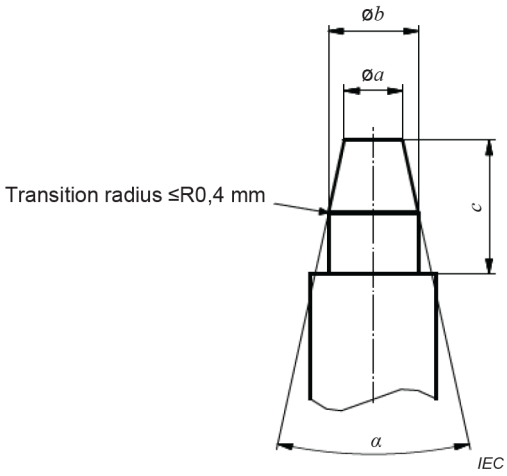


Figure 6 – Gauge pins for socket-centre contact (for dimensions, see Table 3)

Table 3 – Dimensions of gauge pins for socket-centre contact

Ref.	Gauge A		Gauge B	
	mm		mm	
	Min.	Max.	Min.	Max.
a	2,27	2,33	2,27	2,33
b	3,13	3,137	3,063	3,07
c	4,8	5	4,8	5,0
α	44°	46°	36°	44°
Material: steel, polished, surface roughness: Ra = 0,4 µm maximum.				

4.2.2 Test procedure

The gauge A shall be completely inserted three times into the socket centre contact. This is a sizing operation.

After sizing, gauge A shall be inserted into socket centre contact. The insertion force shall not exceed 20 N.

Separation force is measured with gauge B and shall require a minimum force of 1,5 N.

4.2.3 Gauge rings for plug outer contact (see Figure 7)

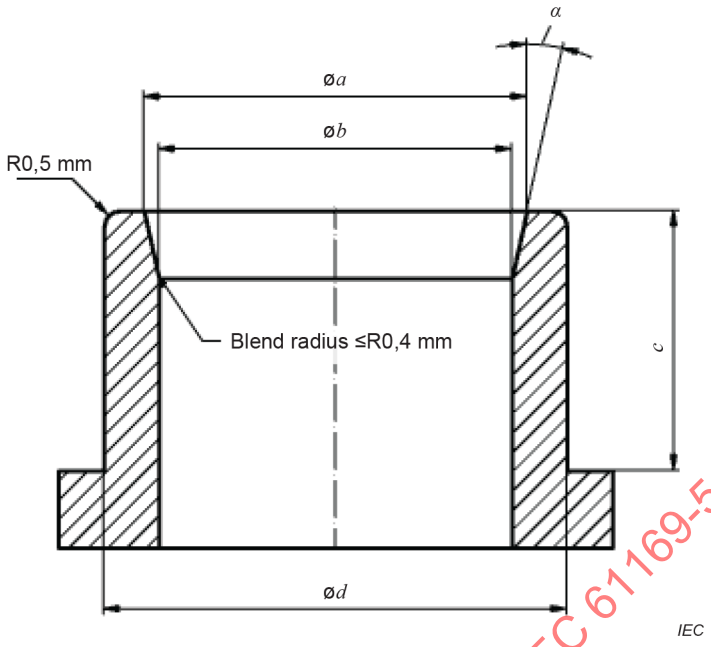


Figure 7 – Gauge rings for socket outer contact (for dimensions see Table 4)

Table 4 – Dimensions of gauge rings for socket outer contact

Gauge A			Gauge B	
Ref.	mm		mm	
	Min.	Max.	Min.	Max.
a	12,45	12,65	12,45	12,65
b	11,46	11,48	11,53	11,537
c	8,3	8,5	8,3	8,5
d	15,04	15,08	–	14,8
α	14°	15°	10°	14°
Material: steel, polished, surface roughness: Ra = 0,4 µm maximum.				

4.2.4 Test procedure

The gauge A shall be completely inserted three times into the resilient outer contact. This is a sizing operation.

After sizing, gauge A shall be inserted into the resilient contact. The insertion force shall not exceed 35 N.

Separation force is measured with gauge B and shall require a minimum force of 4 N. All contact segments shall touch the diameter *b* in the region of the tips.

4.3 Dimensions – Standard test connectors – Grade 0

4.3.1 Connector with pin-centre contact (see Figure 8)

Dimensions in millimetres

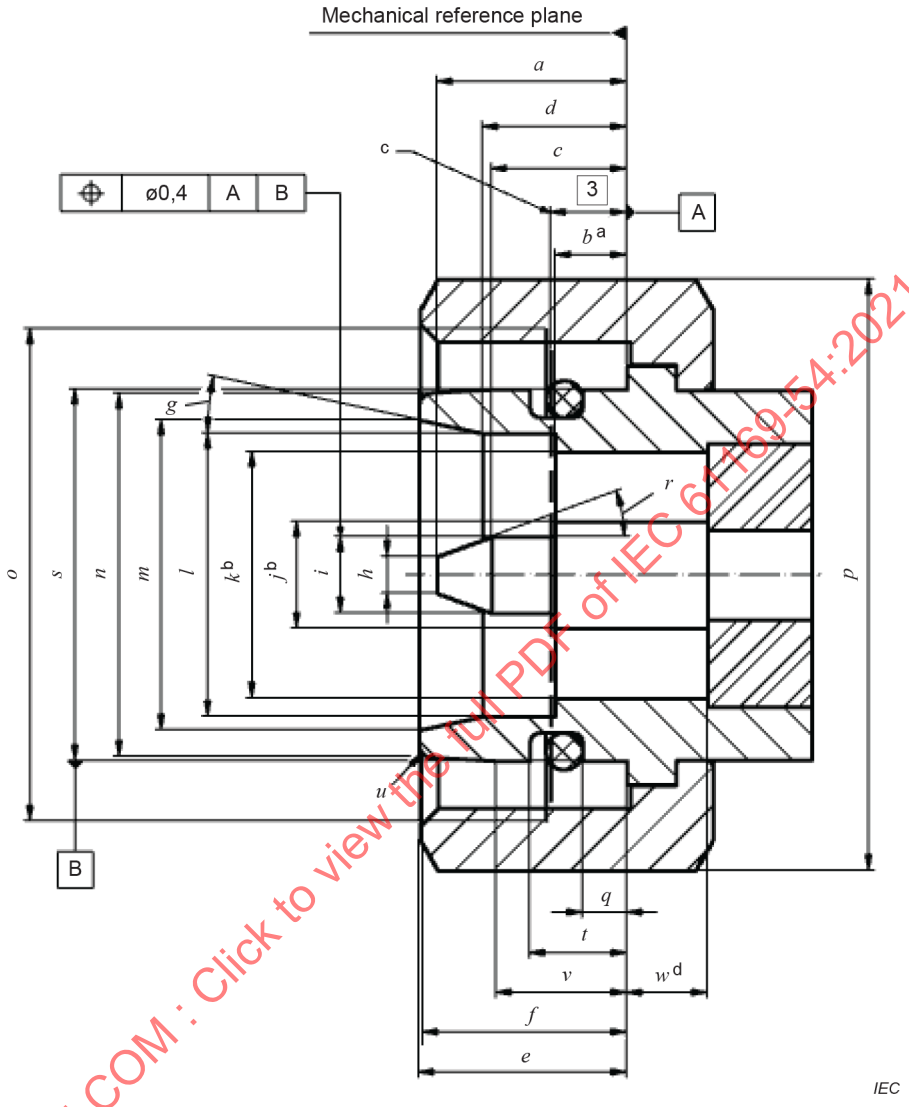


Figure 8 – Connector with pin-centre contact (for dimensions and key, see Table 5)

Table 5 – Dimensions of connector with pin-centre contact

Ref.	mm		Additional notes
	Min.	Max.	
a	–	8,0	
b	2,8	2,9	[a]
c	5,0	–	
d	4,4	–	
e	8,3	8,5	
f	8,0	8,5	
g	10°	14°	
h	–	2,3	diameter
i	3,085	3,115	diameter
j	4,35 nom.		diameter [b]
k	9,98	10,02	diameter [b]
l	11,485	11,515	diameter
m	12,5	–	diameter
n	14,7	14,8	diameter
o	M20 × 1	tolerance 6H	thread
p	22 nom.		wrench size
q	1,8	–	
r	20° nom.		
s	15,07	15,11	diameter
t	–	4,1	
u	0,5 nom.		radius
v	5,1	5,5	
w	15	–	[d]

[a] Applicable for inner and outer contact.

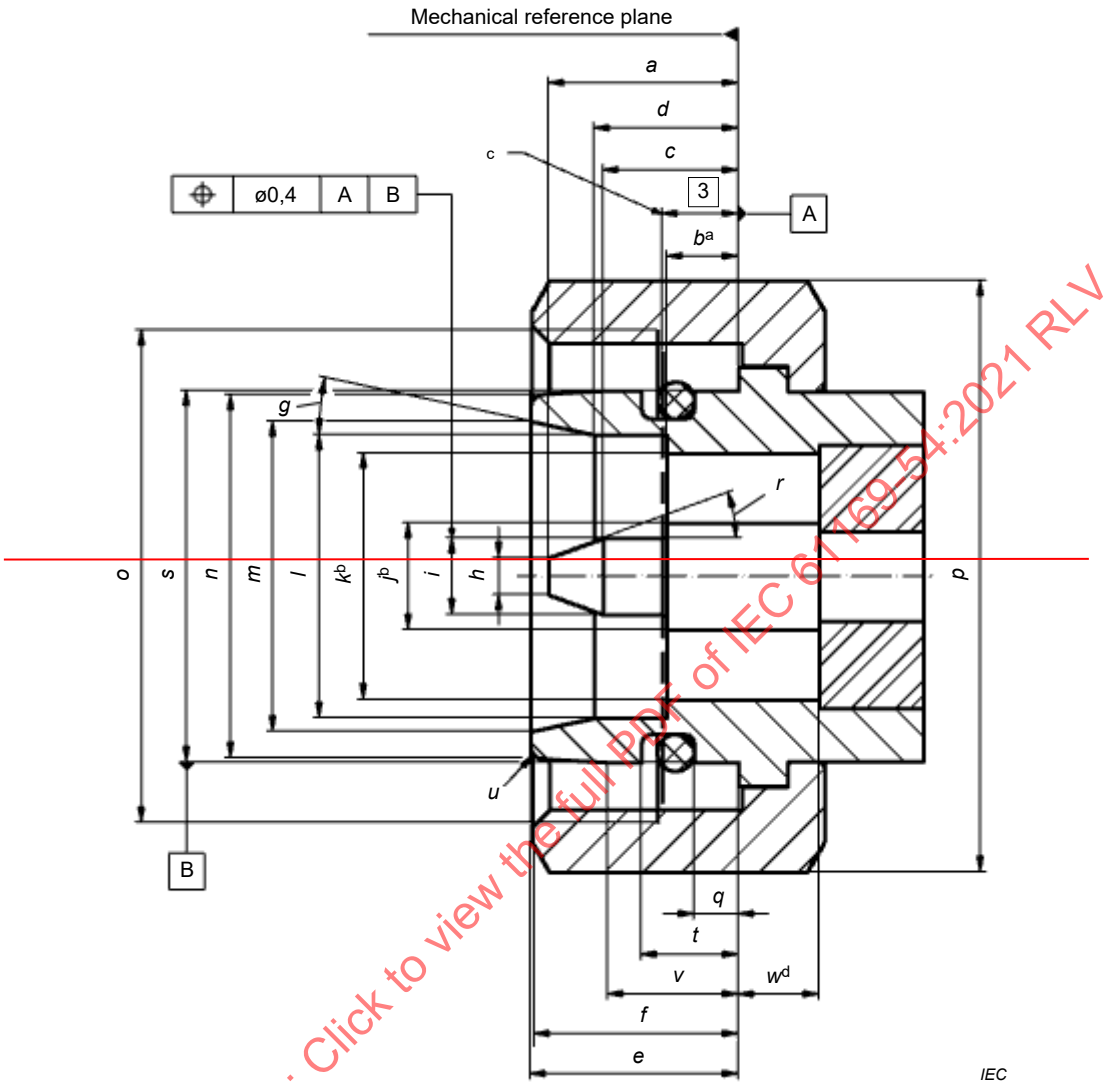
[b] For 50 Ω ± 0,3 Ω impedance.

[c] Electrical reference plane.

[d] Minimum distance to insulating bead.

4.3.2 Connector with socket-centre contact (see Figure 9)

Dimensions in millimetres



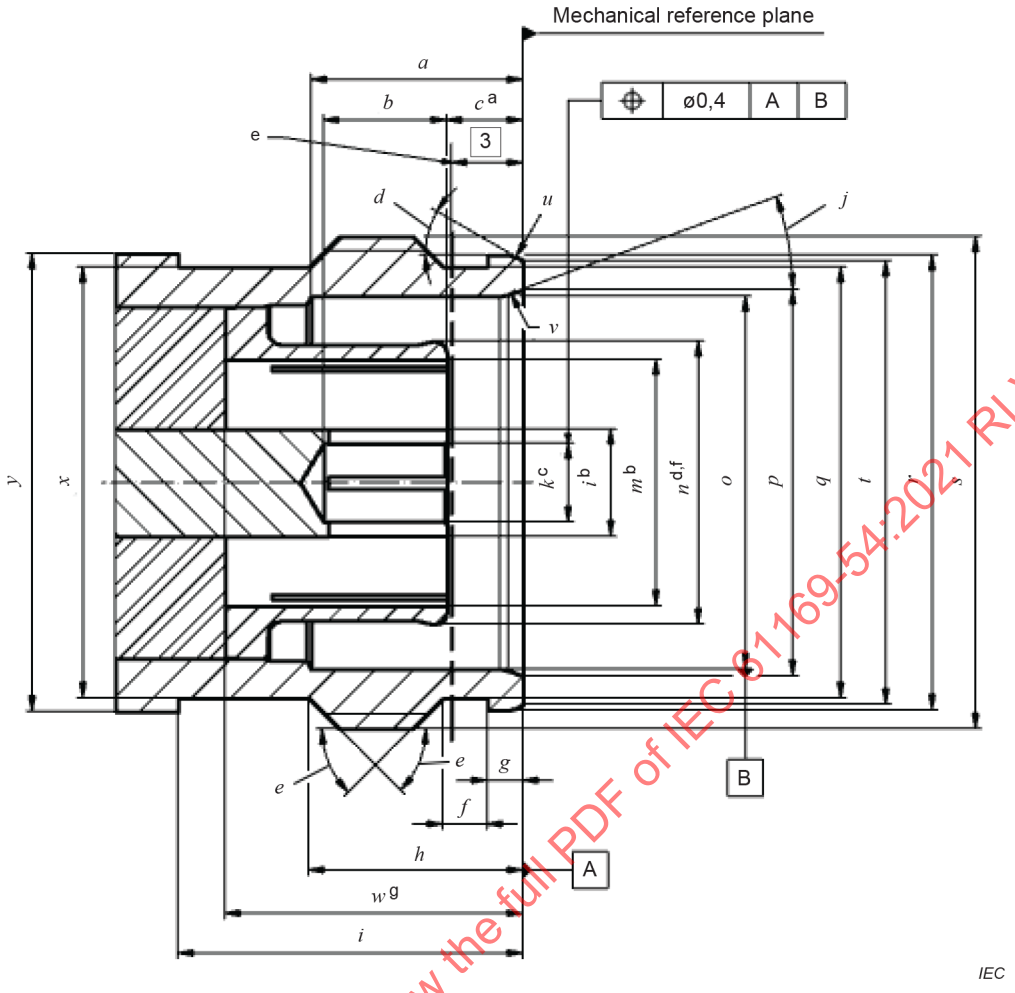


Figure 9 – Connector with socket-centre contact (for dimensions and key, see Table 6)

Table 6 – Dimensions of connector with socket-centre contact

Ref.	mm		Additional notes
	Min.	Max.	
a	8,5	–	
b	5,0	–	
c	3,1	3,2	[a]
d	30° nom.		
e	45° nom.		
f	1,7	1,9	
g	1,44	1,50	
h	8,7	9,0	
i	13,9	14,1	
j	20° nom.		
k			[c]
l	4,35 nom.		diameter [b]
m	9,98	10,02	diameter [b]
n	–	12,3	[d, f]
o	15,13	15,17	diameter
p	15,7	15,9	diameter
q	17,4	17,5	diameter
r	18,44	18,5	diameter
s	M20 × 1	tolerance 6g	thread
t	17,9	18,1	diameter
u	0,6 nom.		radius
v	1,0 nom.		radius
w	15	–	[g]
x	17,45	17,55	diameter
y	18,6	–	diameter

[a] Applicable for inner and outer contact.

[b] For 50 Ω ± 0,3 Ω impedance.

[c] Resilient to meet the requirements with gauge pins for socket centre contact.

[d] Expand to meet the requirements with gauge rings for socket outer contact.

[e] Electrical reference plane.

[f] In unmated condition.

[g] Minimum distance to insulating bead.

5 Quality assessment procedure

5.1 General

Subclauses 5.2 to 5.4 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.

5.2 Ratings and characteristics

The values indicated below in Table 7 and Table 8 are recommended for type 4,3-10 connectors and are given for the writer of the detail specification. They are applicable for the condition when the connectors are fully mated.

Certain tests will usually not be required. When these tests are required, appropriate values shall be entered in the detail specification at the discretion of the specification writer.

Table 7 – Climatic categories

Category designation	Letter	Temperature range	Damp heat steady state
40/85/21		−40 °C to +85 °C	

Table 8 – Ratings and characteristics

Ratings and characteristics	Test method IEC 61169-1:2013 Subclause	Value	Remarks, deviation from standard test method
Electrical			
Nominal impedance		50 Ω	
Frequency range		DC to 6 GHz	Or upper frequency limit of cable
~~Reflection factor~~ Return loss[a]	9.2.1		
Straight styles			
– Interface only		~~≤0,015~~ ≥ 36 dB	Up to 4 GHz
		~~≤0,025~~ ≥ 32 dB	4 GHz to 6 GHz
Flexible cables		See DS	
– Right angle styles		See DS	
Semi rigid/semi flexible cables		See DS	
Solder bucket and PCB mounting style		See DS	
– Component mounting styles		See DS	
Insertion loss		<0,05 × $\sqrt{f}$ (GHz) in dB	The test method is under consideration
Centre contact resistance[b]	9.2.3		
– initial		≤ 1,0 mΩ	
– after tests		≤ 1,5 mΩ	
Outer contact continuity[b]	9.2.3		
– initial		1,0 mΩ	
– after tests		1,5 mΩ	
Insulation resistance	9.2.5		
– initial		5 000 MΩ	
– after tests		200 MΩ	

Ratings and characteristics	Test method IEC 61169-1:2013 Subclause	Value	Remarks, deviation from standard test method
Proof voltage [c, d]			
– at sea level	9.2.6	2 500 V RMS	
– at 4,4 kPa	9.2.6	450 V RMS	
Screening effectiveness[e]	9.2.7	≥ 90 dB, up to 3 GHz	
Handscrew & quick-lock interfaces		≥ 70 dB, 3 GHz to 6 GHz	
Screw type interfaces		≥ 110 dB, up to 6 GHz	
Intermodulation level[f]	9.2.9	−160 dB	0,4 GHz to 4 GHz 2 carriers +46 dBm
RF-power handling	9.2.2	500 W at 2 GHz (3 000 m altitude, 90 °C ambient, 155 °C inner contact temperature)	Peak power: 15 kW (ambient temperature 90 °C max.)
Mechanical			
Centre contact captivation – axial force	9.3.5	30 N	Maximum displacement of 0,25 mm in axial direction
Engagement and separation force	9.3.6		
– axial force (engagement)		Typically 100 N	Push pull
– axial force (separation)		Typically 80 N	Push pull
– torque		≥ 5 Nm	Screw type (coupling torque)
~~Gauge retention~~ Insertion force	9.3.4		
– centre contact		≥ 1,5 N	
– outer contact		≥ 4 N	
– torque		na	
Mechanical tests on cable fixing			
– cable rotation (nutation)	9.3.7	See DS	
– cable pulling	9.3.8	See DS	
– cable bending	9.3.9	See DS	
– cable torsion	9.3.10	See DS	
Tensile strength of coupling mechanism	9.3.11	≥ 450 N	
Bending moment of coupling mechanism	9.3.12	na	
Vibration	9.3.3	100 m/s^2 2 Hz to 200 Hz	10 *gn*
Shock	9.3.14	981 m/s^2 half-sine wave 6 ms	100 *gn*
Endurance			
Mechanical endurance	9.3.15	100 operations	
High temperature endurance	9.4.5	250 h at 85 °C	

Ratings and characteristics	Test method IEC 61169-1:2013 Subclause	Value	Remarks, deviation from standard test method
Environmental			
Climatic sequence			
– storage	9.4.2	40/85/21	
Sealing	9.4.7	IP X8 2,5 bar, 1 h	
Salt mist	9.4.10	48 h spray	
Sulphur dioxide test	9.4.12		
Change of temperature	9.4.4		
– dry heat		+85 °C	
– cold		−40 °C	
– damp heat	9.4.3		
Upper temperature limit can be restricted by the cable characteristics. Reference should be applied according the relevant cable specification.			

[a] Characteristics indicated are those that can be applied to basic connector. Intrinsic limitations of the cable can diminish the performance of the assembly and reference should always be made to the actual values given in the detail specification.

[b] Values for a single pair of connectors.

[c] Voltage are RMS values of AC from 40 Hz to 65 Hz, unless otherwise specified.

[d] Values are depending also of the cable type.

[e] Applicable in fully mated position. Depending on cable type values for a single pair of connectors.

[f] To obtain an accurate intermodulation measurement, the PIM floor should be 10 dB lower than the connector PIM requirement (see IEC 62037-1:2012, Clause 5). This maintains an accuracy of 3 dB. The accuracy will worsen as the connector PIM requirement gets closer to instrument setup PIM floor (see IEC 62037-1:2012, Figure 3).

5.3 Test schedule and inspection requirements

5.3.1 Acceptance tests

Table 9 describes the acceptance tests to be performed.

Table 9 – 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					Lot-by-lot				Lot-by-lot
Visual examination	9.1.1	a	II	1		a	S3	1,5	
Group B1									
Outline dimension	9.1.2	a	S4	0,4		a	S3	4	
Mechanical compatibility	9.1.2.2	a	II	1		a	S3	1,5	
Engagement and separation	9.3.6	a	S4	0,4		a	S3	1,5	
Insertion retention force (resilient contacts)	9.3.4	ia	II	1		ia	S3	1,5	
Sealing									
non hermetic	9.4.7	ia	II	0,65		ia	S3	1	
hermetic	9.4.8	ia	II	0,015		ia	S3	0,025	
Water immersion	9.4.9	ia	II	0,015		ia	S3	0,025	
Voltage proof	9.2.6	a	II	0,4		a	II	4	
Solderability *(d)*	9.3.2.2	ia	S4	0,4		ia	S3	4	
Insulation resistance	9.2.5	a	S4	0,4		a	S3	4	
For the symbols, abbreviations and procedures, see the end of Table 10.									

5.3.2 Periodic tests

There are no group C tests for levels H and M. Table 10 lists the periodic tests to be performed.

Table 10 – Periodic tests

	IEC 61169-1:2013 Subclause	Assessment level M (higher)				Assessment level H (lower)			
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	na				na			
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 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			
Discharge test	9.2.8								
Climatic conditioning	9.4	na				na			
Group D5 (d)			**6**	**1**	**3 years**		**3**	**1**	**3 years**
Return loss	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			
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**
Salt mist	9.4.10	a							

a = suggested as applicable
ia = test suggested (if technically applicable)
na = not applicable
IL = inspection level
AQL = acceptable quality level
* = one set of piece-parts of each style and variant, unless using common piece parts
\# = for Qualification Approval (QA), a total of two failures only permitted for level H and one 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

5.4 Procedures for quality conformance

5.4.1 Quality conformance inspection

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

5.4.2 Quality conformance and its maintenance

5.4.2.1 General procedure

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 group D tests.

5.4.2.2 Procedure for quality conformance involving structural similarity

During the initial procedure, the declared structurally similar styles and variants may be included by merely subjecting the distinguishing piece-part(s) to subgroup D3 testing.

When structurally similar styles or variants are to be added to an existing conformance document, they shall be assembled and subject to group A1 and group B1 testing and any appropriate group D tests. The distinguishing piece-parts shall be subjected to subgroup D3 testing before inclusion of the additional style or variant on the conformance document.

It should be noted that:

a) connector styles and variants of styles may be qualified by invoking structural similarity when applicable;

b) it ~~may~~ is not ~~always be considered~~ necessary to assemble and test all structurally similar styles and variants as complete connectors.

5.5 Test and measurement procedures

5.5.1 General

The related clauses cover the majority of tests and measuring procedures required for the qualification approval and conformance inspection of RF connectors. However,

- not all the tests are applicable to all sectional and detail specifications;
- the sectional specification shall ~~prescribe~~ indicate the tests (and any additional tests) applicable to a particular connector type;
- detail specifications shall identify which of the non-mandatory tests ~~prescribed~~ indicated in the relevant sectional specification are applicable to a particular style/variant of connector;
- any additional test methods shall be clearly identified as such.

5.5.2 Schedule of basic test groupings for acceptance and periodic tests

5.5.2.1 General

Unless otherwise ~~prescribed~~ indicated in the sectional specification (SS), the schedule below shall provide the basis for qualification approval and quality conformance inspection tests to be included in each SS.

Details of any deviations necessary from the standard test method and/or conditions are to be indicated. Tests are to be carried out in the order shown unless otherwise ~~prescribed~~ indicated.

5.5.2.2 Sampling and lot-by-lot system

One of the following procedures is to be used.

a) Fixed quantity sample procedure

This shall consist of the appropriate fixed quantity sample 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.

b) Lot-by-lot

This shall consist of three consecutive lots passing test groups A1 and B1 followed by the selection of specimens from the lots as appropriate. These specimens shall successfully pass the specified periodic group D tests.

5.6 Specifications

5.6.1 Specification structures

The relationship between the generic, general blank detail, sectional and detail specifications is detailed hereafter.

5.6.2 Sectional specification (SS)

Each sectional specification relates only to a particular series or type of RF connector, e.g. type SMA, type N, type BNC, etc.

It ~~prescribes~~ specifies:

- mating face dimensions for general purpose and for test connectors;
- gauging information – particularly that applicable to resilient contacts;
- performance parameters common to all connector styles within the series;
- mandatory tests, indicated by "a" for applicable in the test schedule, and levels of conformance inspection for two levels of quality assessment to be observed when writing an associated detail specification.

The SS also provides recommended ratings, performance characteristics and test conditions to be considered when writing a DS together with any general deviations from the test conditions.

5.6.3 Detail specification (DS)

Detail specifications for levels M and H shall normally be prepared using the blank detail specification provided in 5.6.5 and periodicity of certain specialized tests is dependent upon the physical and electrical characteristics of the individual connector style/variant(s) covered by the DS.

The detail specification, when completed, shall provide the user, manufacturer, test house and certification body with all the necessary information for the approval testing and quality conformance inspection relating to a connector style and any variants within a specific series of RF connectors.

5.6.4 Blank detail specification

5.6.4.1 General

Detail specifications (DS) writers shall use the appropriate blank detail specification (BDS). The following pages comprise the BDS dedicated for use with 50 Ω type 4,3-10 connectors. As such, it will have already entered on it information in relation to:

a) the basic specification number applicable to all the detail specifications covering connector styles of the series covered by the sectional specification;

b) the connector series designation.

The specification writer should enter the details relating to the connector style to be covered as indicated. The numbers in brackets in the BDS correspond to the following indications, which shall be given.

5.6.4.2 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 feathers and marking: as applicable.
   - Series designation: in bold characters/digits approximately 15 mm high.
2) Enter detail 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 limitation for fixed connectors shall be stated.
5) Particulars of all variants covered by the DS. As appropriate, the information shall include:
   - cable type (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.

5.6.4.3 Performance

6) Performance data listing the most important characteristics of the connector in accordance with the requirements of the relevant sectional specification. Deviations from the minimum requirements shall be clearly indicated. Non applicable shall be marked "na".

5.6.4.4 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.

5.6.4.5 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 of the relevant sectional specification. Any additional test 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 conditions, including any relevant deviations given in the test schedule of the sectional specification.

5.6.5 Blank detail specification pro-forma for 50 Ω type 4,3-10 connectors

The following pages contain the complete BDS pro-forma.

<table>
<tr><td colspan="3">(1)</td><td colspan="3">Page 1 of
(2)</td></tr>
<tr><td colspan="3">ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH GENERIC SPECIFICATION IEC 61169-1:2013
NATIONAL REFERENCE</td><td colspan="3">ISSUE
(3) .
(4) .</td></tr>
<tr><td colspan="4">(5) Detail specification for radio frequency coaxial connector of assessed quality</td><td colspan="2">Type 4,3-10</td></tr>
<tr><td colspan="3">Style</td><td colspan="3">Special features and markings</td></tr>
<tr><td colspan="2">Method of cable/wire+ attachment</td><td colspan="4">centre conductor – solder/crimp+
outer conductor – solder/clamp/crimp +
+ delete as appropriate</td></tr>
<tr><td colspan="2">(6) Assessment level</td><td colspan="2">Characteristic impedance
... Ω</td><td colspan="2">Climatic category .../.../.../</td></tr>
<tr><td colspan="3">(7) Outline and maximum dimensions</td><td colspan="3">Panel piercing and mounting details</td></tr>
<tr><td colspan="6">(8) Variants</td></tr>
<tr><td>Variant No.</td><td>Description of variant</td><td>IEC 61196</td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Information about manufacturers who have components qualified under the IECQ conformity assessment system is available through the IECQ on-line certificate system.</td></tr>
</table>

(9) Performance (including limiting conditions of use)

Ratings and characteristics	Variant No. Designation	IEC 61169-1:2013 Subclause	Value	Remarks including any deviations from standard test methods
Electrical				
Nominal impedance			Ω	
Frequency range Return loss		9.2.1	GHz GHz GHz GHz	Measurement frequency range
Centre contact resistance		9.2.3	≤ mΩ ≤ mΩ	Initial After conditioning
Centre conductor continuity		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		9.2.6	kV kV kV kV	86 kPa to 106 kPa
+ Proof voltage at 4,4 kPa		9.2.6	kV kV kV kV	kPa (if not 4,4 kPa)
Screening effectiveness		9.2.7	dB at GHz	Z_t ≤ mΩ
Discharge test (corona) at sea level		9.2.8	≥ V ≥ V ≥ V ≥ V	Extinction voltage
ADDITIONAL ELECTRICAL CHARACTERISTICS				
+ Voltage values are RMS values at 50 Hz to 60 Hz, unless otherwise specified.				

Ratings and characteristics	Variant No. Designation	IEC 61169-1:2013 Subclause	Value	Remarks including any deviations from standard test methods
Mechanical				
Soldering – bit size		9.3.2		
Gauge retention resilient contacts – inner contact – outer contact		9.3.4	 N N	
Centre contact captivation – axial force – permitted displacement in each direction – torque		9.3.5	 N mm Nm	
Engagement and separation – axial force		9.3.6		
Strength of coupling mechanism		9.3.11	N	
Effectiveness of cable fixing against – cable rotation		9.3.7	 Rotations	
– cable pulling		9.3.8	N N N N	
– cable bending		9.3.9	cycles	Length of cable and mass
– cable torsion		9.3.10	Nm	
Bending moment		9.3.12	Nm	Relative to reference plane
Bumps total		9.3.13	m/s^2 to Hz	(*g*n acceleration)
Vibration		9.3.3	m/s^2 to Hz	(*g*n acceleration)
Shock		9.3.14	m/s^2 Shape ms	(*g*n acceleration)
ADDITIONAL MECHANICAL CHARACTERISTICS				

Ratings and characteristics	Variant No. Designation	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		
Salt mist		9.4.10	h	Duration of spraying
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 Applicable fluids		9.4.11		
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 procedure** 1) Identity of manufacture 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~~ specified in 11.1 of IEC 61169-1:2013 detailed above 2) Nominal characteristic impedance Ω 3) Assessment level code letter 4) Any additional marking required
– **Ordering information:** 1) Number of the detail specification /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.

6 Marking

6.1 Marking of component

Each component shall be legibly and durably marked, where space permits and in the following order of precedence, with:

a) identity code of the manufacturer;

b) manufacturer's connector identification code or IEC connector designation.

If the nominal impedance of a connector is to be indicated by colour coding, the following convention shall be used:

50 Ω: no additional colouring 75 Ω: yellow or black band.

6.2 Marking and contents of package

The package shall be marked with the information prescribed in 6.1 and, in addition, the following information shall be given:

a) nominal characteristic impedance;

b) manufacturing date code;

c) any additional marking required by the relevant specification.

When required by the relevant specification, the package shall also include instructions for assembling the connector(s) and instructions for the use of any special tools or materials, as necessary.

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IEC 61169-54

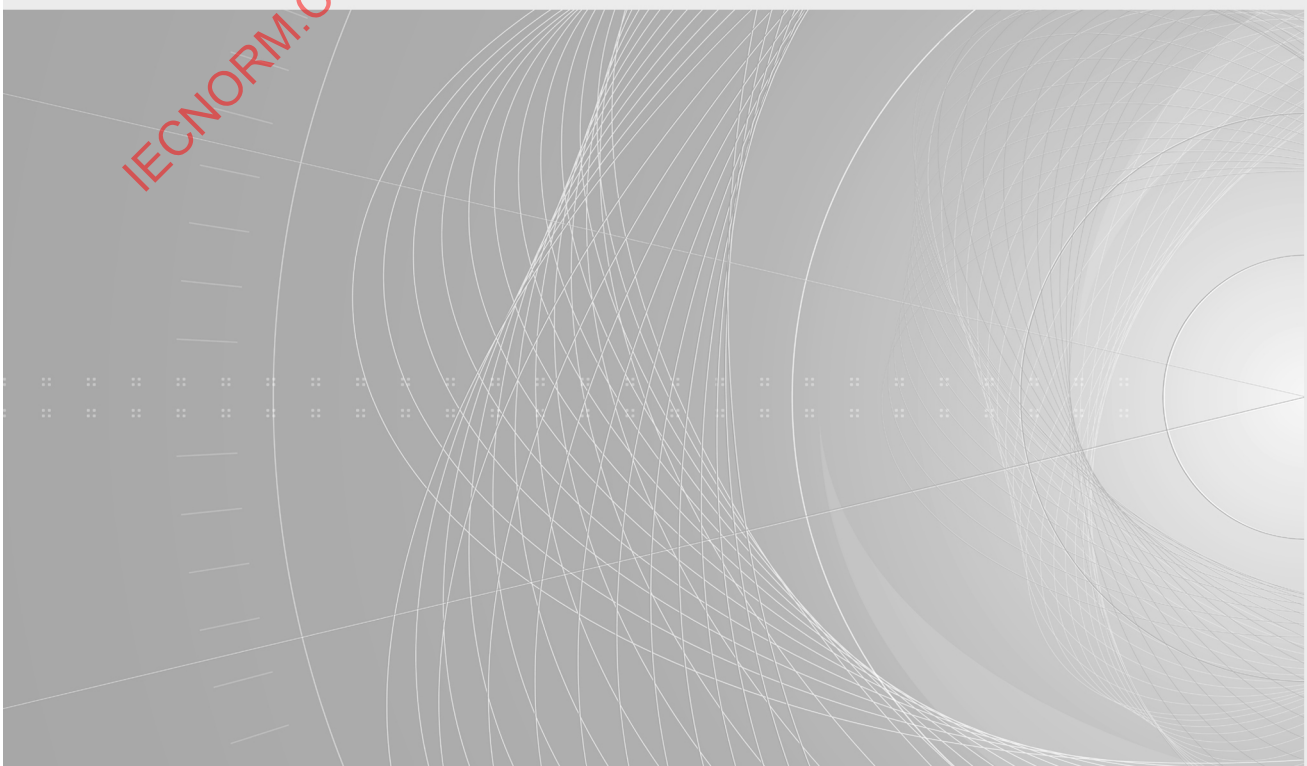
Edition 2.0 2021-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Radio-frequency connectors – Part 54: Sectional specification for coaxial connectors with 10 mm inner diameter of outer conductor, nominal characteristic impedance 50 Ω, series 4,3-10

Connecteurs pour fréquences radioélectriques – Partie 54: Spécification intermédiaire relative aux connecteurs coaxiaux avec diamètre intérieur du conducteur extérieur de 10 mm, impédance caractéristique nominale 50 Ω, série 4,3-10



IEC 61169-54:2021-08(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RADIO-FREQUENCY CONNECTORS –

Part 54: Sectional specification for coaxial connectors with 10 mm inner diameter of outer conductor, nominal characteristic impedance 50 Ω, series 4,3-10

FOREWORD

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8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61169-54 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. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) updated patent statement,
b) Table 8: some values changed.

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

FDIS	Report on voting
46F/574/FDIS	46F/577/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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.

INTRODUCTION

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent. IEC takes no position concerning the evidence, validity, and scope of this patent right.

The holder of this patent right has assured IEC that s/he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from the patent database available at http://patents.iec.ch.

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RADIO-FREQUENCY CONNECTORS –

Part 54: Sectional specification for coaxial connectors with 10 mm inner diameter of outer conductor, nominal characteristic impedance 50 Ω, series 4,3-10

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 coaxial connectors with 10 mm inner diameter of outer conductor, characteristic impedance 50 Ω, series 4,3-10 with screw type, hand screw type or quick-lock type coupling, for an upper operating frequency limit of 6 GHz, for use in wireless telecommunication and wireless network applications in conjunction with appropriate transmission line types for these applications.

It also describes mating face dimensions for general purpose connectors, gauging information and tests selected from IEC 61169-1, applicable to all detail specifications relating to 4,3-10 series connectors.

This specification indicates the recommended performance characteristics to be considered when writing a detail specification and it covers test schedules and inspection requirements for assessment levels M and H.

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*

IEC 62037-1:2012, *Passive RF and microwave devices, intermodulation level measurement – Part 1: General requirements and measuring methods*

3 Terms and definitions

No terms and definitions are listed in this document.

4 Mating face and gauge information

4.1 Dimensions – General connectors – Grade 2

4.1.1 Connector with pin-centre contact (see Figure 1)

Metric dimensions are original dimensions. All un-dimensioned pictorial configurations are for reference purpose only.

Dimensions in millimetres

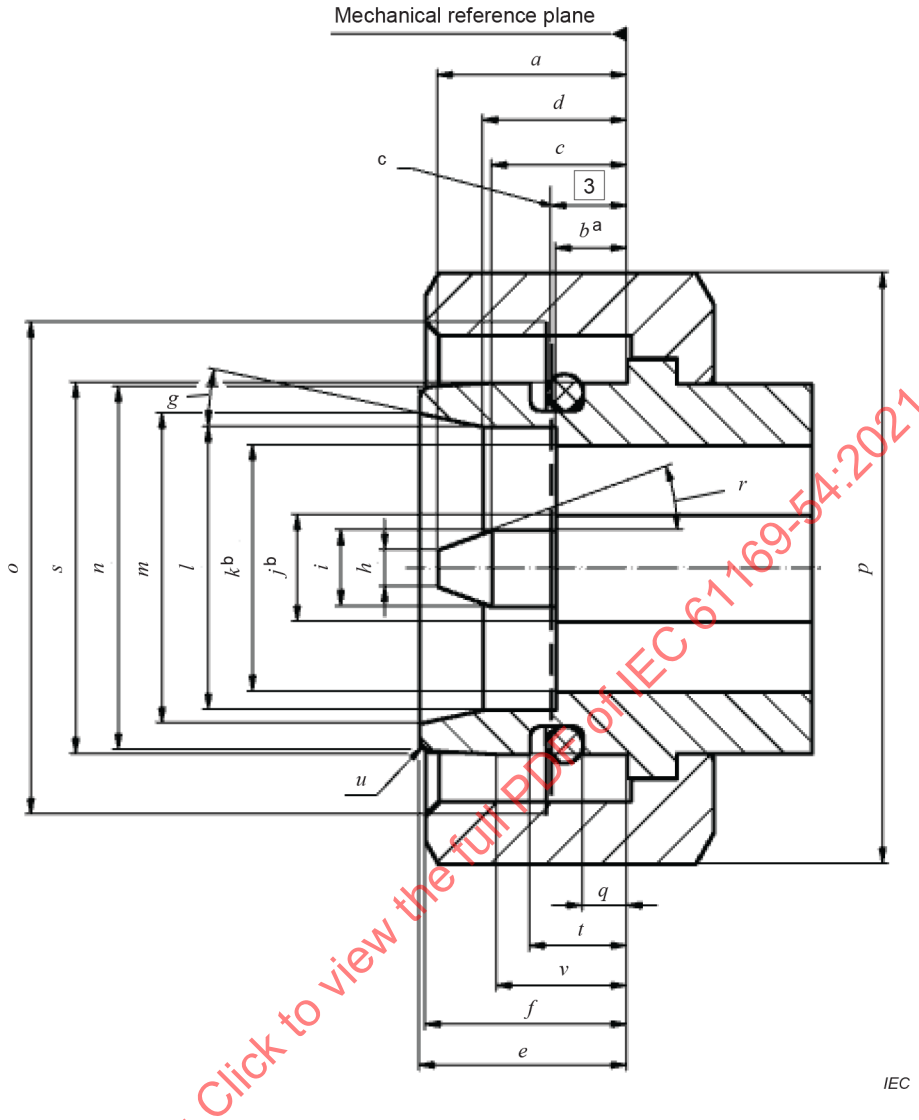


Figure 1 – Connector with pin-centre contact (for dimensions and key, see Table 1)

Table 1 – Dimensions of connector with pin-centre contact

Ref.	mm		Additional notes
	Min.	Max.	
a	–	8,0	
b	–	2,9	[a]
c	5,0	–	
d	4,4	–	
e	8,3	8,5	
f	8,0	8,5	
g	10°	14°	
h	–	2,3	diameter
i	3,07	3,13	diameter
j	4,35 nom.		diameter [b]
k	10,0 nom.		diameter [b]
l	11,47	11,53	diameter
m	12,5	–	diameter
n	14,7	14,8	diameter
o	M20 × 1	tolerance 6H	thread
p	22 nom.		wrench size
q	1,8	–	
r	20° nom.		
s	15,07	15,11	diameter
t	–	4,1	
u	0,5 nom.		radius
v	5,1	5,5	

[a] Applicable for inner and outer contact.

[b] For 50 Ω nominal impedance.

[c] Electrical reference plane.

4.1.2 Connector with socket-centre contact (see Figure 2)

Dimensions in millimetres

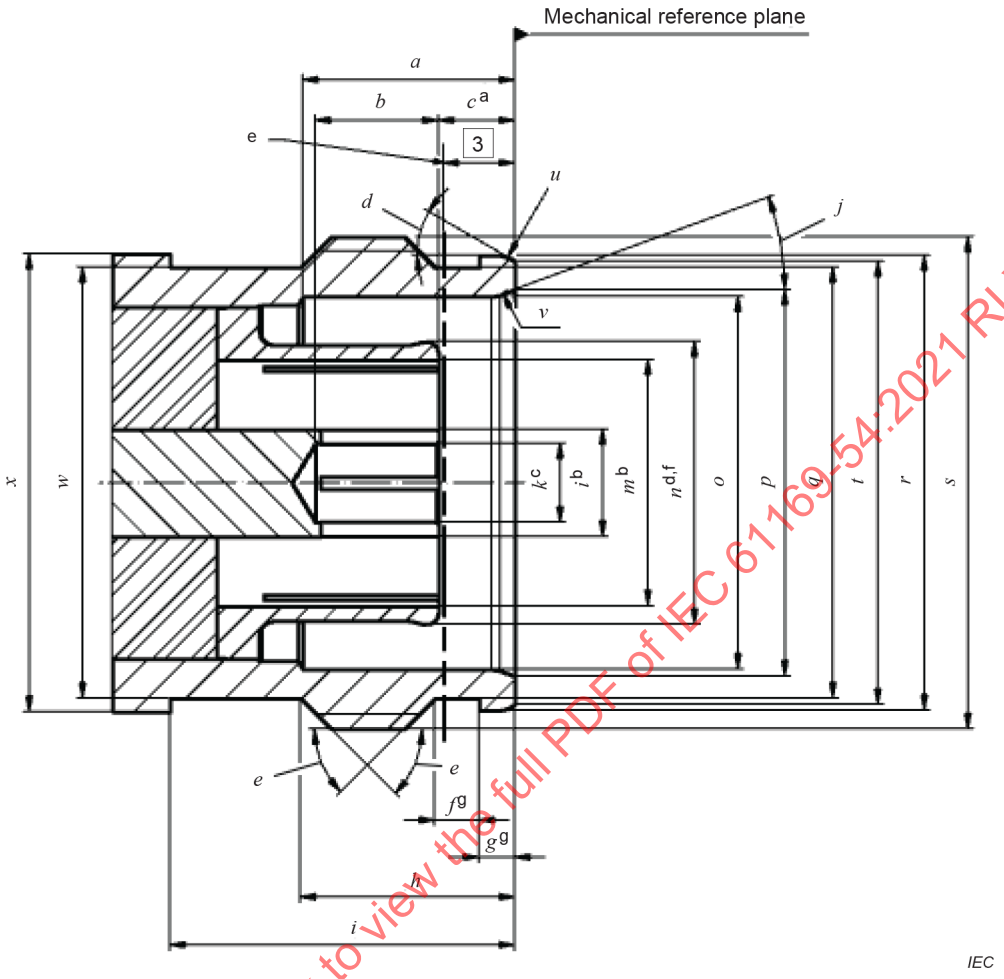


Figure 2 – Connector with socket-centre contact (for dimensions and key, see Table 2)

Table 2 – Dimensions of connector with socket-centre contact

Ref.	mm		Additional notes
	Min.	Max.	
a	8,5	–	
b	5,0	–	
c	3,1	3,5	[a]
d	30° nom.		
e	45° nom.		[g]
f	1,7	1,9	[g]
g	1,44	1,50	[g]
h	8,7	9,0	
i	13,9	14,1	
j	20° nom.		
k			[c]
l	4,35 nom.		diameter [b]
m	9,8	10,2	diameter [b]
n	–	12,3	[d, f]
o	15,13	15,19	diameter
p	15,7	15,9	diameter
q	17,4	17,5	diameter [g]
r	18,44	18,5	diameter [g]
s	M20 × 1	tolerance 6g	thread
t	17,9	18,1	diameter
u	0,6 nom.		radius
v	1,0 nom.		radius
w	17,45	17,55	diameter
x	18,6	–	diameter

[a] Applicable for inner and outer contact.

[b] For 50 Ω nominal impedance.

[c] Resilient to meet the requirements with gauge pins for socket centre contact.

[d] Expand to meet the requirements with gauge rings for socket outer contact.

[e] Electrical reference plane.

[f] In unmated condition.

[g] Rim and groove on socket front provided for quick lock attachment.

4.1.3 Presentation of possible coupling mechanisms

4.1.3.1 Screw type (see Figure 3)

Dimensions in millimetres

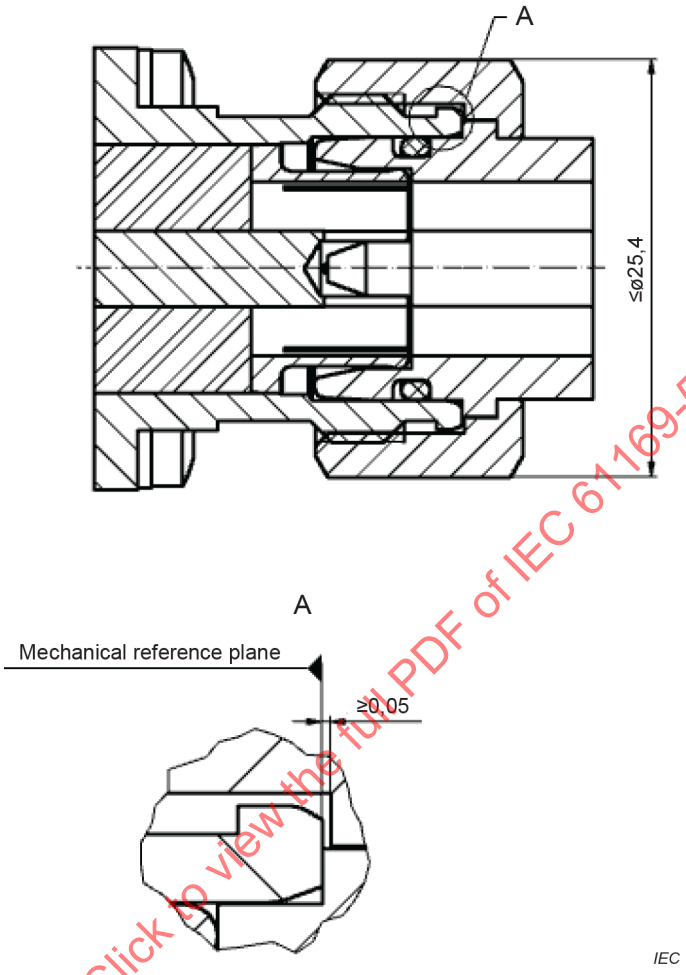


Figure 3 – Screw type

4.1.3.2 Hand screw type (see Figure 4)

Dimensions in millimetres

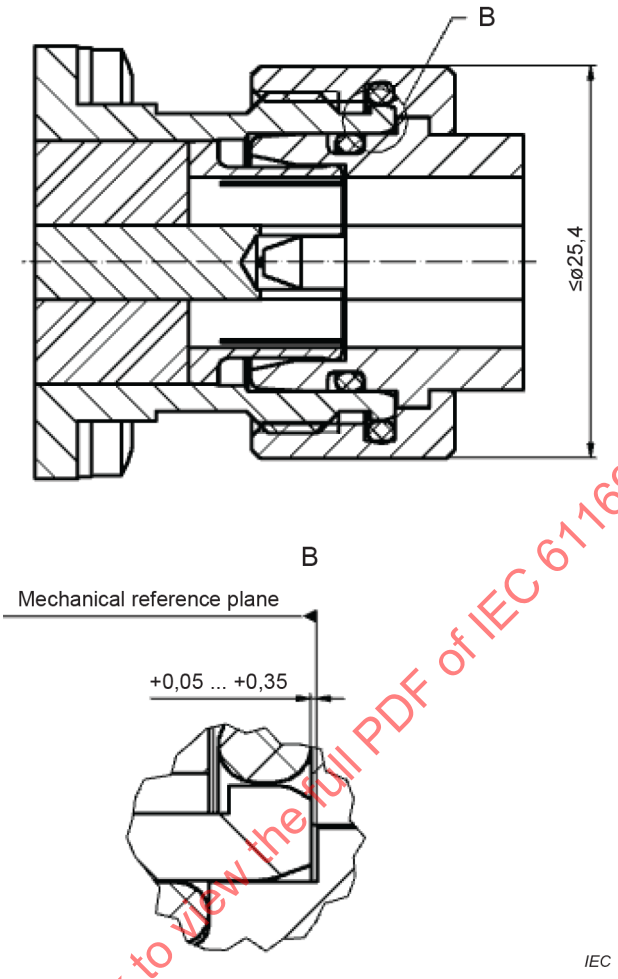
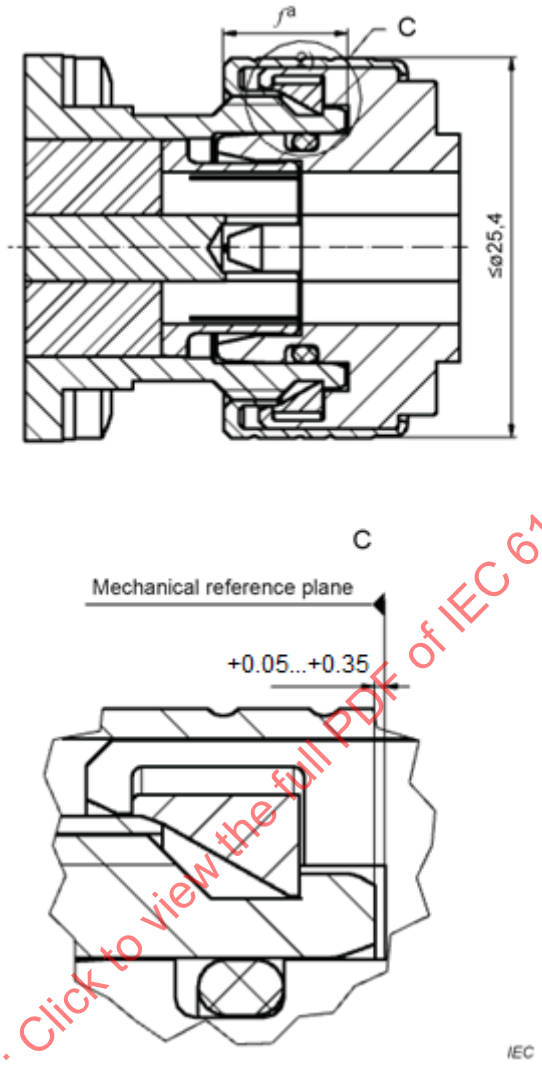


Figure 4 – Hand screw type

4.1.3.3 Quick lock type (see Figure 5)

Dimensions in millimetres



[a] Max 13,5 mm for this variant.

Figure 5 – Quick lock type

4.2 Gauges

4.2.1 Gauge pins for socket-centre contact (see Figure 6)

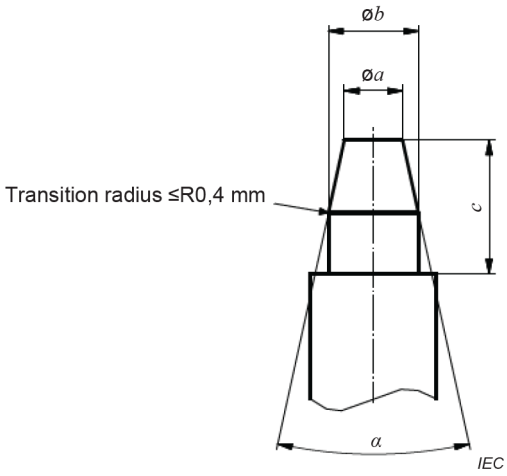


Figure 6 – Gauge pins for socket-centre contact (for dimensions, see Table 3)

Table 3 – Dimensions of gauge pins for socket-centre contact

Ref.	Gauge A		Gauge B	
	mm		mm	
	Min.	Max.	Min.	Max.
a	2,27	2,33	2,27	2,33
b	3,13	3,137	3,063	3,07
c	4,8	5	4,8	5,0
α	44°	46°	36°	44°
Material: steel, polished, surface roughness: Ra = 0,4 µm maximum.				

4.2.2 Test procedure

The gauge A shall be completely inserted three times into the socket centre contact. This is a sizing operation.

After sizing, gauge A shall be inserted into socket centre contact. The insertion force shall not exceed 20 N.

Separation force is measured with gauge B and shall require a minimum force of 1,5 N.

4.2.3 Gauge rings for plug outer contact (see Figure 7)

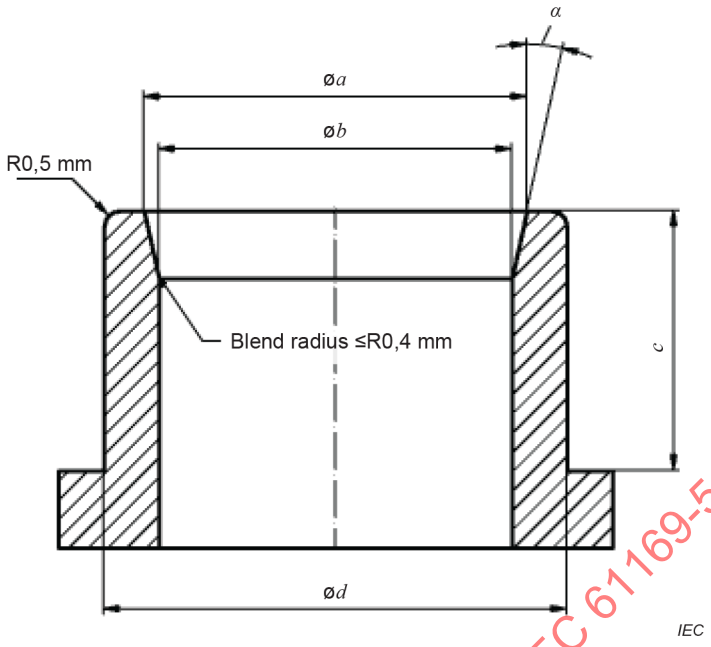


Figure 7 – Gauge rings for socket outer contact (for dimensions see Table 4)

Table 4 – Dimensions of gauge rings for socket outer contact

Gauge A			Gauge B	
Ref.	mm		mm	
	Min.	Max.	Min.	Max.
a	12,45	12,65	12,45	12,65
b	11,46	11,48	11,53	11,537
c	8,3	8,5	8,3	8,5
d	15,04	15,08	–	14,8
α	14°	15°	10°	14°
Material: steel, polished, surface roughness: Ra = 0,4 µm maximum.				

4.2.4 Test procedure

The gauge A shall be completely inserted three times into the resilient outer contact. This is a sizing operation.

After sizing, gauge A shall be inserted into the resilient contact. The insertion force shall not exceed 35 N.

Separation force is measured with gauge B and shall require a minimum force of 4 N. All contact segments shall touch the diameter *b* in the region of the tips.

4.3 Dimensions – Standard test connectors – Grade 0

4.3.1 Connector with pin-centre contact (see Figure 8)

Dimensions in millimetres

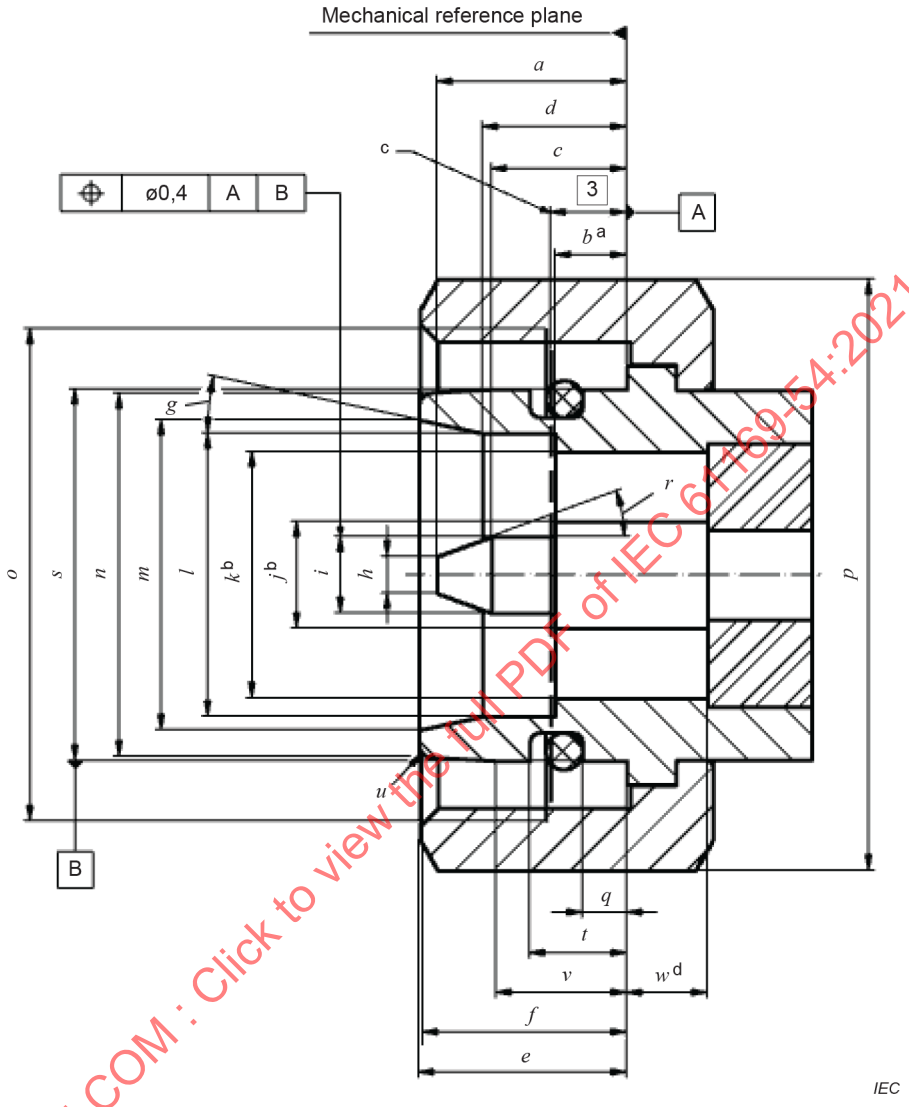


Figure 8 – Connector with pin-centre contact (for dimensions and key, see Table 5)

Table 5 – Dimensions of connector with pin-centre contact

Ref.	mm		Additional notes
	Min.	Max.	
a	–	8,0	
b	2,8	2,9	[a]
c	5,0	–	
d	4,4	–	
e	8,3	8,5	
f	8,0	8,5	
g	10°	14°	
h	–	2,3	diameter
i	3,085	3,115	diameter
j	4,35 nom.		diameter [b]
k	9,98	10,02	diameter [b]
l	11,485	11,515	diameter
m	12,5	–	diameter
n	14,7	14,8	diameter
o	M20 × 1	tolerance 6H	thread
p	22 nom.		wrench size
q	1,8	–	
r	20° nom.		
s	15,07	15,11	diameter
t	–	4,1	
u	0,5 nom.		radius
v	5,1	5,5	
w	15	–	[d]

[a] Applicable for inner and outer contact.

[b] For 50 Ω ± 0,3 Ω impedance.

[c] Electrical reference plane.

[d] Minimum distance to insulating bead.

4.3.2 Connector with socket-centre contact (see Figure 9)

Dimensions in millimetres

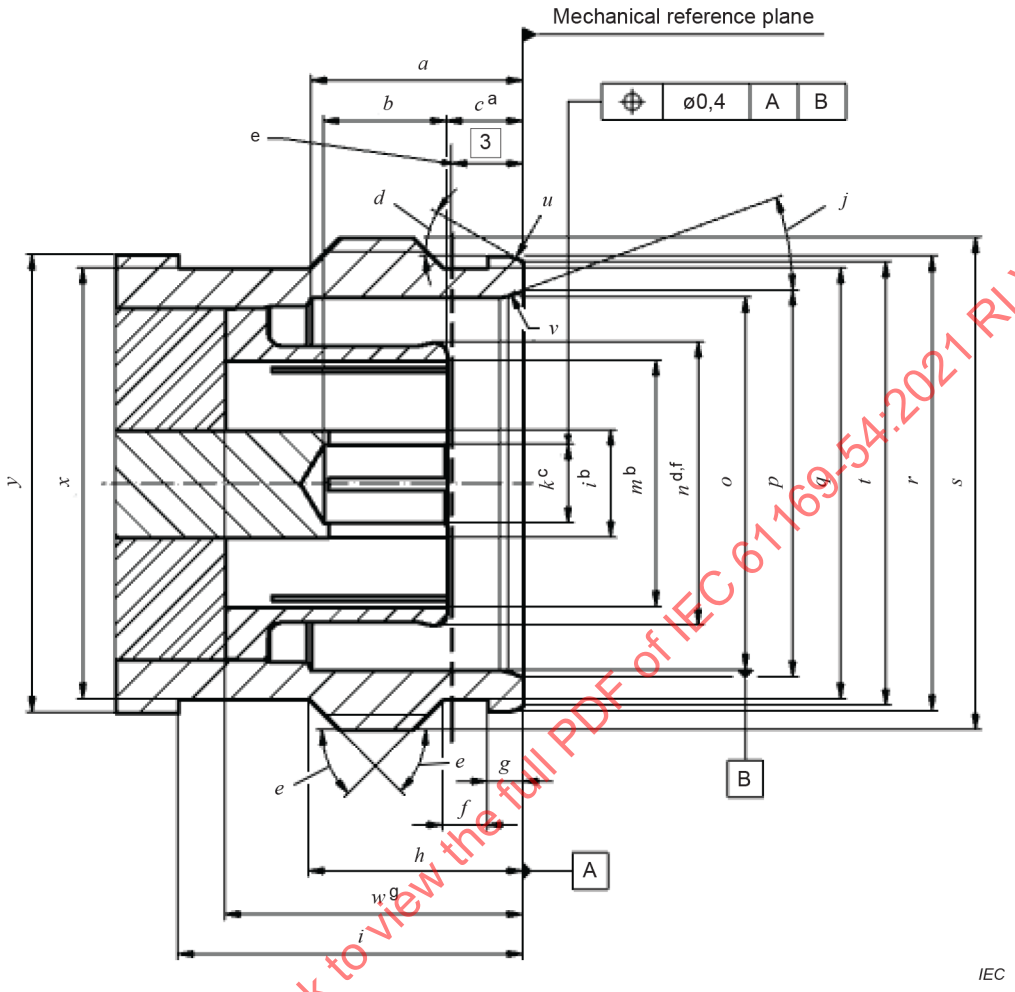


Figure 9 – Connector with socket-centre contact (for dimensions and key, see Table 6)

Table 6 – Dimensions of connector with socket-centre contact

Ref.	mm		Additional notes
	Min.	Max.	
a	8,5	–	
b	5,0	–	
c	3,1	3,2	[a]
d	30° nom.		
e	45° nom.		
f	1,7	1,9	
g	1,44	1,50	
h	8,7	9,0	
i	13,9	14,1	
j	20° nom.		
k			[c]
l	4,35 nom.		diameter [b]
m	9,98	10,02	diameter [b]
n	–	12,3	[d, f]
o	15,13	15,17	diameter
p	15,7	15,9	diameter
q	17,4	17,5	diameter
r	18,44	18,5	diameter
s	M20 × 1	tolerance 6g	thread
t	17,9	18,1	diameter
u	0,6 nom.		radius
v	1,0 nom.		radius
w	15	–	[g]
x	17,45	17,55	diameter
y	18,6	–	diameter

[a] Applicable for inner and outer contact.

[b] For 50 Ω ± 0,3 Ω impedance.

[c] Resilient to meet the requirements with gauge pins for socket centre contact.

[d] Expand to meet the requirements with gauge rings for socket outer contact.

[e] Electrical reference plane.

[f] In unmated condition.

[g] Minimum distance to insulating bead.

5 Quality assessment procedure

5.1 General

Subclauses 5.2 to 5.4 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.

5.2 Ratings and characteristics

The values indicated below in Table 7 and Table 8 are recommended for type 4,3-10 connectors and are given for the writer of the detail specification. They are applicable for the condition when the connectors are fully mated.

Certain tests will usually not be required. When these tests are required, appropriate values shall be entered in the detail specification at the discretion of the specification writer.

Table 7 – Climatic categories

Category designation	Letter	Temperature range	Damp heat steady state
40/85/21		−40 °C to +85 °C	

Table 8 – Ratings and characteristics

Ratings and characteristics	Test method IEC 61169-1:2013 Subclause	Value	Remarks, deviation from standard test method
Electrical			
Nominal impedance		50 Ω	
Frequency range		DC to 6 GHz	Or upper frequency limit of cable
Return loss[a]	9.2.1		
Straight styles			
– Interface only		≥ 36 dB	Up to 4 GHz
		≥ 32 dB	4 GHz to 6 GHz
Flexible cables		See DS	
– Right angle styles		See DS	
Semi rigid/semi flexible cables		See DS	
Solder bucket and PCB mounting style		See DS	
– Component mounting styles		See DS	
Insertion loss		<0,05 × $\sqrt{f}$ (GHz) in dB	The test method is under consideration
Centre contact resistance[b]	9.2.3		
– initial		≤ 1,0 mΩ	
– after tests		≤ 1,5 mΩ	
Outer contact continuity[b]	9.2.3		
– initial		1,0 mΩ	
– after tests		1,5 mΩ	
Insulation resistance	9.2.5		
– initial		5 000 MΩ	
– after tests		200 MΩ	

Ratings and characteristics	Test method IEC 61169-1:2013 Subclause	Value	Remarks, deviation from standard test method
Proof voltage [c, d]			
– at sea level	9.2.6	2 500 V RMS	
– at 4,4 kPa	9.2.6	450 V RMS	
Screening effectiveness[e]	9.2.7	≥ 90 dB, up to 3 GHz	
Handscrew & quick-lock interfaces		≥ 70 dB, 3 GHz to 6 GHz	
Screw type interfaces		≥ 110 dB, up to 6 GHz	
Intermodulation level[f]	9.2.9	−160 dB	0,4 GHz to 4 GHz 2 carriers +46 dBm
RF-power handling	9.2.2	500 W at 2 GHz (3 000 m altitude, 90 °C ambient, 155 °C inner contact temperature)	Peak power: 15 kW (ambient temperature 90 °C max.)
Mechanical			
Centre contact captivation	9.3.5		Maximum displacement of 0,25 mm in axial direction
– axial force		30 N	
Engagement and separation force	9.3.6		
– axial force (engagement)		Typically 100 N	Push pull
– axial force (separation)		Typically 80 N	Push pull
– torque		≥ 5 Nm	Screw type (coupling torque)
Insertion force	9.3.4		
– centre contact		≥ 1,5 N	
– outer contact		≥ 4 N	
– torque		na	
Mechanical tests on cable fixing			
– cable rotation (nutation)	9.3.7	See DS	
– cable pulling	9.3.8	See DS	
– cable bending	9.3.9	See DS	
– cable torsion	9.3.10	See DS	
Tensile strength of coupling mechanism	9.3.11	≥ 450 N	
Bending moment of coupling mechanism	9.3.12	na	
Vibration	9.3.3	100 m/s^2 2 Hz to 200 Hz	10 *gn*
Shock	9.3.14	981 m/s^2 half-sine wave 6 ms	100 *gn*
Endurance			
Mechanical endurance	9.3.15	100 operations	
High temperature endurance	9.4.5	250 h at 85 °C	

Ratings and characteristics	Test method IEC 61169-1:2013 Subclause	Value	Remarks, deviation from standard test method
Environmental			
Climatic sequence			
– storage	9.4.2	40/85/21	
Sealing	9.4.7	IP X8 2,5 bar, 1 h	
Salt mist	9.4.10	48 h spray	
Sulphur dioxide test	9.4.12		
Change of temperature	9.4.4		
– dry heat		+85 °C	
– cold		−40 °C	
– damp heat	9.4.3		
Upper temperature limit can be restricted by the cable characteristics. Reference should be applied according the relevant cable specification.			

[a] Characteristics indicated are those that can be applied to basic connector. Intrinsic limitations of the cable can diminish the performance of the assembly and reference should always be made to the actual values given in the detail specification.

[b] Values for a single pair of connectors.

[c] Voltage are RMS values of AC from 40 Hz to 65 Hz, unless otherwise specified.

[d] Values are depending also of the cable type.

[e] Applicable in fully mated position. Depending on cable type values for a single pair of connectors.

[f] To obtain an accurate intermodulation measurement, the PIM floor should be 10 dB lower than the connector PIM requirement (see IEC 62037-1:2012, Clause 5). This maintains an accuracy of 3 dB. The accuracy will worsen as the connector PIM requirement gets closer to instrument setup PIM floor (see IEC 62037-1:2012, Figure 3).

5.3 Test schedule and inspection requirements

5.3.1 Acceptance tests

Table 9 describes the acceptance tests to be performed.

Table 9 – 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					Lot-by-lot				Lot-by-lot
Visual examination	9.1.1	a	II	1		a	S3	1,5	
Group B1									
Outline dimension	9.1.2	a	S4	0,4		a	S3	4	
Mechanical compatibility	9.1.2.2	a	II	1		a	S3	1,5	
Engagement and separation	9.3.6	a	S4	0,4		a	S3	1,5	
Insertion retention force (resilient contacts)	9.3.4	ia	II	1		ia	S3	1,5	
Sealing									
non hermetic	9.4.7	ia	II	0,65		ia	S3	1	
hermetic	9.4.8	ia	II	0,015		ia	S3	0,025	
Water immersion	9.4.9	ia	II	0,015		ia	S3	0,025	
Voltage proof	9.2.6	a	II	0,4		a	II	4	
Solderability *(d)*	9.3.2.2	ia	S4	0,4		ia	S3	4	
Insulation resistance	9.2.5	a	S4	0,4		a	S3	4	
For the symbols, abbreviations and procedures, see the end of Table 10.									

5.3.2 Periodic tests

There are no group C tests for levels H and M. Table 10 lists the periodic tests to be performed.

Table 10 – Periodic tests

	IEC 61169-1:2013 Subclause	Assessment level M (higher)				Assessment level H (lower)			
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	na				na			
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 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			
Discharge test	9.2.8								
Climatic conditioning	9.4	na				na			
Group D5 (d)			**6**	**1**	**3 years**		**3**	**1**	**3 years**
Return loss	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			
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**
Salt mist	9.4.10	a							

a = suggested as applicable
ia = test suggested (if technically applicable)
na = not applicable
IL = inspection level
AQL = acceptable quality level
* = one set of piece-parts of each style and variant, unless using common piece parts
\# = for Qualification Approval (QA), a total of two failures only permitted for level H and one 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

5.4 Procedures for quality conformance

5.4.1 Quality conformance inspection

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

5.4.2 Quality conformance and its maintenance

5.4.2.1 General procedure

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 group D tests.

5.4.2.2 Procedure for quality conformance involving structural similarity

During the initial procedure, the declared structurally similar styles and variants may be included by merely subjecting the distinguishing piece-part(s) to subgroup D3 testing.

When structurally similar styles or variants are to be added to an existing conformance document, they shall be assembled and subject to group A1 and group B1 testing and any appropriate group D tests. The distinguishing piece-parts shall be subjected to subgroup D3 testing before inclusion of the additional style or variant on the conformance document.

It should be noted that:

a) connector styles and variants of styles may be qualified by invoking structural similarity when applicable;

b) it is not necessary to assemble and test all structurally similar styles and variants as complete connectors.

5.5 Test and measurement procedures

5.5.1 General

The related clauses cover the majority of tests and measuring procedures required for the qualification approval and conformance inspection of RF connectors. However,

- not all the tests are applicable to all sectional and detail specifications;
- the sectional specification shall indicate the tests (and any additional tests) applicable to a particular connector type;
- detail specifications shall identify which of the non-mandatory tests indicated in the relevant sectional specification are applicable to a particular style/variant of connector;
- any additional test methods shall be clearly identified as such.

5.5.2 Schedule of basic test groupings for acceptance and periodic tests

5.5.2.1 General

Unless otherwise indicated in the sectional specification (SS), the schedule below shall provide the basis for qualification approval and quality conformance inspection tests to be included in each SS.

Details of any deviations necessary from the standard test method and/or conditions are to be indicated. Tests are to be carried out in the order shown unless otherwise indicated.

5.5.2.2 Sampling and lot-by-lot system

One of the following procedures is to be used.

a) Fixed quantity sample procedure

This shall consist of the appropriate fixed quantity sample 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.

b) Lot-by-lot

This shall consist of three consecutive lots passing test groups A1 and B1 followed by the selection of specimens from the lots as appropriate. These specimens shall successfully pass the specified periodic group D tests.

5.6 Specifications

5.6.1 Specification structures

The relationship between the generic, general blank detail, sectional and detail specifications is detailed hereafter.

5.6.2 Sectional specification (SS)

Each sectional specification relates only to a particular series or type of RF connector, e.g. type SMA, type N, type BNC, etc.

It specifies:

- mating face dimensions for general purpose and for test connectors;
- gauging information – particularly that applicable to resilient contacts;
- performance parameters common to all connector styles within the series;
- mandatory tests, indicated by "a" for applicable in the test schedule, and levels of conformance inspection for two levels of quality assessment to be observed when writing an associated detail specification.

The SS also provides recommended ratings, performance characteristics and test conditions to be considered when writing a DS together with any general deviations from the test conditions.

5.6.3 Detail specification (DS)

Detail specifications for levels M and H shall normally be prepared using the blank detail specification provided in 5.6.5 and periodicity of certain specialized tests is dependent upon the physical and electrical characteristics of the individual connector style/variant(s) covered by the DS.

The detail specification, when completed, shall provide the user, manufacturer, test house and certification body with all the necessary information for the approval testing and quality conformance inspection relating to a connector style and any variants within a specific series of RF connectors.

5.6.4 Blank detail specification

5.6.4.1 General

Detail specifications (DS) writers shall use the appropriate blank detail specification (BDS). The following pages comprise the BDS dedicated for use with 50 Ω type 4,3-10 connectors. As such, it will have already entered on it information in relation to:

a) the basic specification number applicable to all the detail specifications covering connector styles of the series covered by the sectional specification;

b) the connector series designation.

The specification writer should enter the details relating to the connector style to be covered as indicated. The numbers in brackets in the BDS correspond to the following indications, which shall be given.

5.6.4.2 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 feathers and marking: as applicable.
   - Series designation: in bold characters/digits approximately 15 mm high.
2) Enter detail 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 limitation for fixed connectors shall be stated.
5) Particulars of all variants covered by the DS. As appropriate, the information shall include:
   - cable type (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.

5.6.4.3 Performance

6) Performance data listing the most important characteristics of the connector in accordance with the requirements of the relevant sectional specification. Deviations from the minimum requirements shall be clearly indicated. Non applicable shall be marked "na".

5.6.4.4 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.

5.6.4.5 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 of the relevant sectional specification. Any additional test 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 conditions, including any relevant deviations given in the test schedule of the sectional specification.

5.6.5 Blank detail specification pro-forma for 50 Ω type 4,3-10 connectors

The following pages contain the complete BDS pro-forma.

<table>
<tr><td colspan="3">(1)</td><td colspan="3">Page 1 of
(2)</td></tr>
<tr><td colspan="3">ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH GENERIC SPECIFICATION IEC 61169-1:2013
NATIONAL REFERENCE</td><td colspan="3">ISSUE
(3) .
(4) .</td></tr>
<tr><td colspan="4">(5) Detail specification for radio frequency coaxial connector of assessed quality</td><td colspan="2">Type 4,3-10</td></tr>
<tr><td colspan="3">Style</td><td colspan="3">Special features and markings</td></tr>
<tr><td colspan="2">Method of cable/wire+ attachment</td><td colspan="4">centre conductor – solder/crimp+
outer conductor – solder/clamp/crimp +
+ delete as appropriate</td></tr>
<tr><td colspan="2">(6) Assessment level</td><td colspan="2">Characteristic impedance
... Ω</td><td colspan="2">Climatic category .../.../.../</td></tr>
<tr><td colspan="3">(7) Outline and maximum dimensions</td><td colspan="3">Panel piercing and mounting details</td></tr>
<tr><td colspan="6">(8) Variants</td></tr>
<tr><td>Variant No.</td><td>Description of variant</td><td>IEC 61196</td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Information about manufacturers who have components qualified under the IECQ conformity assessment system is available through the IECQ on-line certificate system.</td></tr>
</table>

(9) Performance (including limiting conditions of use)

Ratings and characteristics	Variant No. Designation	IEC 61169-1:2013 Subclause	Value	Remarks including any deviations from standard test methods
Electrical				
Nominal impedance			Ω	
Frequency range Return loss		9.2.1	GHz GHz GHz GHz	Measurement frequency range
Centre contact resistance		9.2.3	≤ mΩ ≤ mΩ	Initial After conditioning
Centre conductor continuity		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		9.2.6	kV kV kV kV	86 kPa to 106 kPa
+ Proof voltage at 4,4 kPa		9.2.6	kV kV kV kV	kPa (if not 4,4 kPa)
Screening effectiveness		9.2.7	dB at GHz	Z_t ≤ mΩ
Discharge test (corona) at sea level		9.2.8	≥ V ≥ V ≥ V ≥ V	Extinction voltage
ADDITIONAL ELECTRICAL CHARACTERISTICS				
+ Voltage values are RMS values at 50 Hz to 60 Hz, unless otherwise specified.				

Ratings and characteristics	Variant No. Designation	IEC 61169-1:2013 Subclause	Value	Remarks including any deviations from standard test methods
Mechanical				
Soldering – bit size		9.3.2		
Gauge retention resilient contacts – inner contact – outer contact		9.3.4	 N N	
Centre contact captivation – axial force – permitted displacement in each direction – torque		9.3.5	 N mm Nm	
Engagement and separation – axial force		9.3.6		
Strength of coupling mechanism		9.3.11	N	
Effectiveness of cable fixing against – cable rotation		9.3.7	Rotations	
– cable pulling		9.3.8	N N N N	
– cable bending		9.3.9	cycles	Length of cable and mass
– cable torsion		9.3.10	Nm	
Bending moment		9.3.12	Nm	Relative to reference plane
Bumps total		9.3.13	m/s^2 to Hz	(*g*n acceleration)
Vibration		9.3.3	m/s^2 to Hz	(*g*n acceleration)
Shock		9.3.14	m/s^2 Shape ms	(*g*n acceleration)
ADDITIONAL MECHANICAL CHARACTERISTICS				

Ratings and characteristics	Variant No. Designation	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		
Salt mist		9.4.10	h	Duration of spraying
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 Applicable fluids		9.4.11		
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 procedure** 1) Identity of manufacture 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 specified in 11.1 of IEC 61169-1:2013 detailed above 2) Nominal characteristic impedance Ω 3) Assessment level code letter 4) Any additional marking required
– **Ordering information:** 1) Number of the detail specification /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.

6 Marking

6.1 Marking of component

Each component shall be legibly and durably marked, where space permits and in the following order of precedence, with:

a) identity code of the manufacturer;

b) manufacturer's connector identification code or IEC connector designation.

If the nominal impedance of a connector is to be indicated by colour coding, the following convention shall be used:

50 Ω: no additional colouring 75 Ω: yellow or black band.

6.2 Marking and contents of package

The package shall be marked with the information prescribed in 6.1 and, in addition, the following information shall be given:

a) nominal characteristic impedance;

b) manufacturing date code;

c) any additional marking required by the relevant specification.

When required by the relevant specification, the package shall also include instructions for assembling the connector(s) and instructions for the use of any special tools or materials, as necessary.

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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CONNECTEURS POUR FRÉQUENCES RADIOÉLECTRIQUES –

Partie 54: Spécification intermédiaire relative aux connecteurs coaxiaux avec diamètre intérieur du conducteur extérieur de 10 mm, impédance caractéristique nominale 50 Ω, série 4,3-10

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L'IEC 61169-54 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. Il s'agit d'une Norme internationale.

Cette seconde édition annule et remplace la première édition, publiée en 2016. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) mise à jour de la déclaration relative aux brevets,
b) Tableau 8: modification de certaines valeurs.

Le texte de la présente Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
46F/574/FDIS	46F/577/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

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 "webstore.iec.ch" dans les données relatives au document recherché. À cette date, le document sera

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

INTRODUCTION

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CONNECTEURS POUR FRÉQUENCES RADIOÉLECTRIQUES –

Partie 54: Spécification intermédiaire relative aux connecteurs coaxiaux avec diamètre intérieur du conducteur extérieur de 10 mm, impédance caractéristique nominale 50 Ω, série 4,3-10

1 Domaine d'application

La présente partie de l'IEC 61169, qui est une spécification intermédiaire (SI), fournit des informations et des règles en vue de l'établissement de spécifications particulières (SP) pour des connecteurs coaxiaux avec un diamètre intérieur du conducteur extérieur de 10 mm, une impédance caractéristique nominale de 50 Ω, série 4,3-10, à couplage de type à vis, manuel à vis ou à verrouillage rapide, de fréquence de fonctionnement inférieure ou égale à 6 GHz, utilisés dans des applications de télécommunication sans fil et de réseau sans fil conjointement avec des lignes de transmission appropriées destinées à ces applications.

Elle décrit également les dimensions des faces d'accouplement pour des connecteurs d'usage général, ainsi que des informations concernant les calibres et les essais choisis dans l'IEC 61169-1, applicables à toutes les spécifications particulières ayant trait aux connecteurs de la série 4,3-10.

La présente spécification indique les caractéristiques de performance recommandées à prendre en considération pour rédiger une spécification particulière, et elle couvre les programmes d'essais et les exigences de contrôle pour les niveaux d'assurance qualité M et H.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils 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*

IEC 62037-1:2012, *Dispositifs RF et à micro-ondes passifs, mesure du niveau d'intermodulation – Partie 1: Exigences générales et méthodes de mesure*

3 Termes et définitions

Aucun terme n'est défini dans le présent document.

4 Informations relatives aux éléments d'accouplement et aux calibres

4.1 Dimensions – Connecteurs généraux – Classe 2

4.1.1 Connecteur avec contact central mâle (voir Figure 1)

Les dimensions métriques sont les dimensions originales. Toutes les représentations non cotées sont fournies à titre de référence uniquement.

Dimensions en millimètres

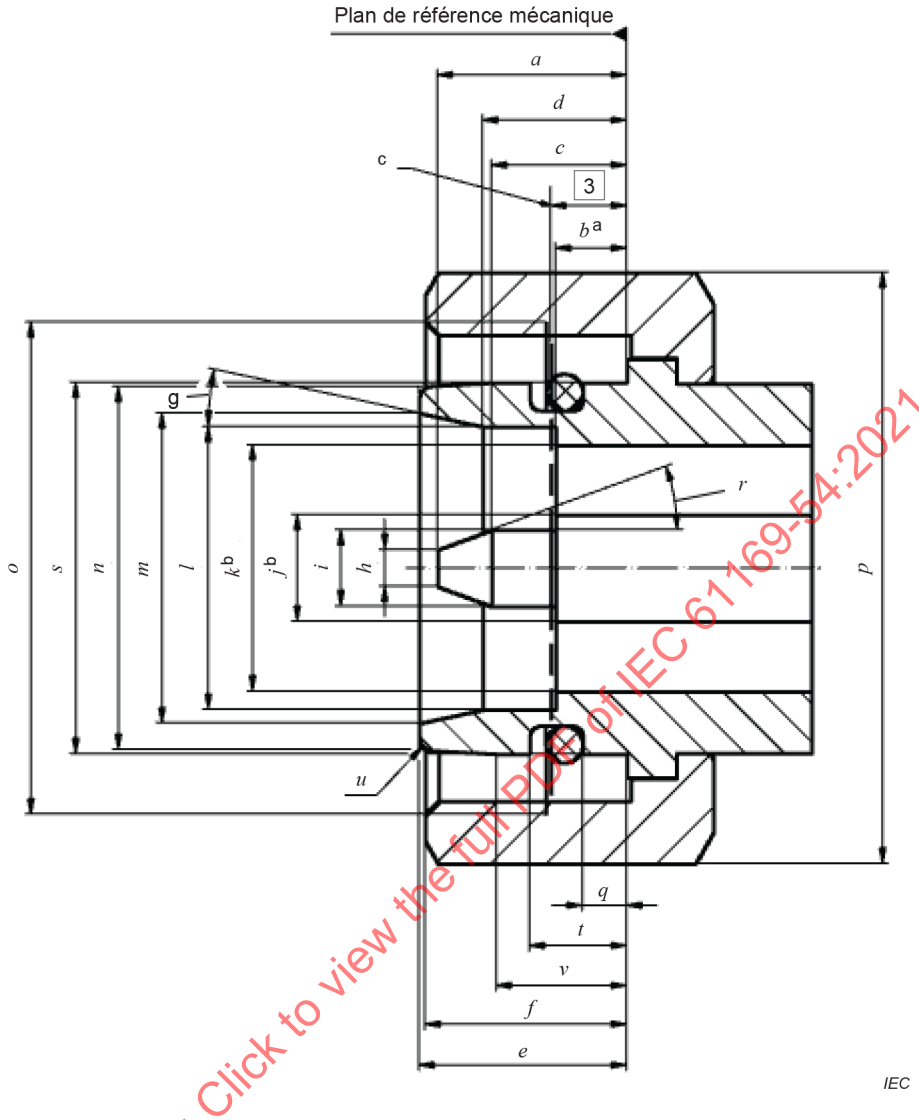


Figure 1 – Connecteur avec contact central mâle (pour les dimensions et la légende, voir Tableau 1)

Tableau 1 – Dimensions du connecteur avec contact central mâle

Réf.	mm		Notes supplémentaires
	Min.	Max.	
a	–	8,0	
b	–	2,9	[a]
c	5,0	–	
d	4,4	–	
e	8,3	8,5	
f	8,0	8,5	
g	10°	14°	
h	–	2,3	diamètre
i	3,07	3,13	diamètre
j	4,35 nom.		diamètre [b]
k	10,0 nom.		diamètre [b]
l	11,47	11,53	diamètre
m	12,5	–	diamètre
n	14,7	14,8	diamètre
o	M20 × 1	tolérance 6H	filetage
p	22 nom.		taille de la clé
q	1,8	–	
r	20° nom.		
s	15,07	15,11	diamètre
t	–	4,1	
u	0,5 nom.		rayon
v	5,1	5,5	

[a] Applicable aux contacts intérieur et extérieur.

[b] Pour une impédance nominale de 50 Ω.

[c] Plan de référence électrique.

4.1.2 Connecteur avec contact central femelle (voir Figure 2)

Dimensions en millimètres

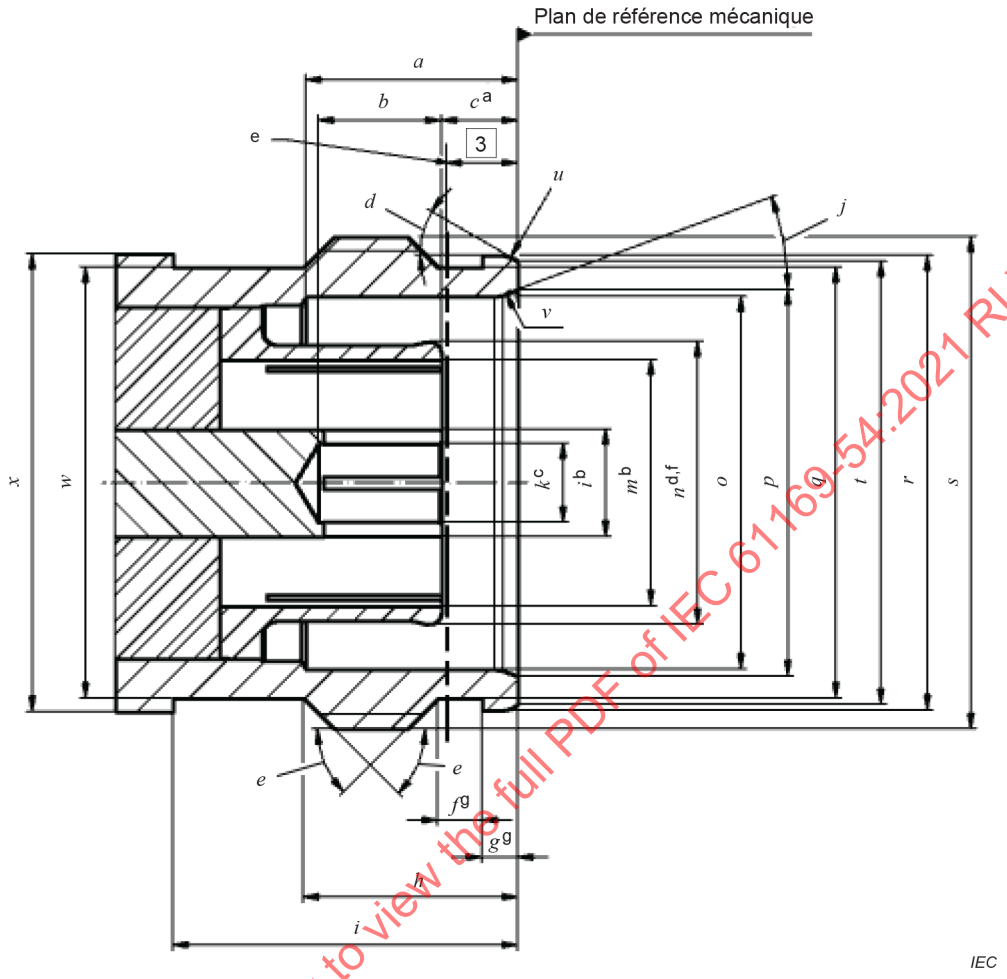


Figure 2 – Connecteur avec contact central femelle (pour les dimensions et la légende, voir Tableau 2)

Tableau 2 – Dimensions du connecteur avec contact central femelle

Réf.	mm		Notes supplémentaires
	Min.	Max.	
a	8,5	–	
b	5,0	–	
c	3,1	3,5	[a]
d	30° nom.		
e	45° nom.		[g]
f	1,7	1,9	[g]
g	1,44	1,50	[g]
h	8,7	9,0	
i	13,9	14,1	
j	20° nom.		
k			[c]
l	4,35 nom.		diamètre [b]
m	9,8	10,2	diamètre [b]
n	–	12,3	[d, f]
o	15,13	15,19	diamètre
p	15,7	15,9	diamètre
q	17,4	17,5	diamètre [g]
r	18,44	18,5	diamètre [g]
s	M20 × 1	tolérance 6g	filetage
t	17,9	18,1	diamètre
u	0,6 nom.		rayon
v	1,0 nom.		rayon
w	17,45	17,55	diamètre
x	18,6	–	diamètre

[a] Applicable aux contacts intérieur et extérieur.

[b] Pour une impédance nominale de 50 Ω.

[c] Elastique pour satisfaire aux exigences avec des broches calibrées pour contact central femelle.

[d] Extensible pour satisfaire aux exigences avec des bagues calibrées pour contact extérieur femelle.

[e] Plan de référence électrique.

[f] Etat non accouplé.

[g] Bourrelet et gorge sur l'avant de l'embase prévus pour le verrouillage rapide.

4.1.3 Présentation des mécanismes de couplage possibles

4.1.3.1 Type d'attribut (voir Figure 3)

Dimensions en millimètres

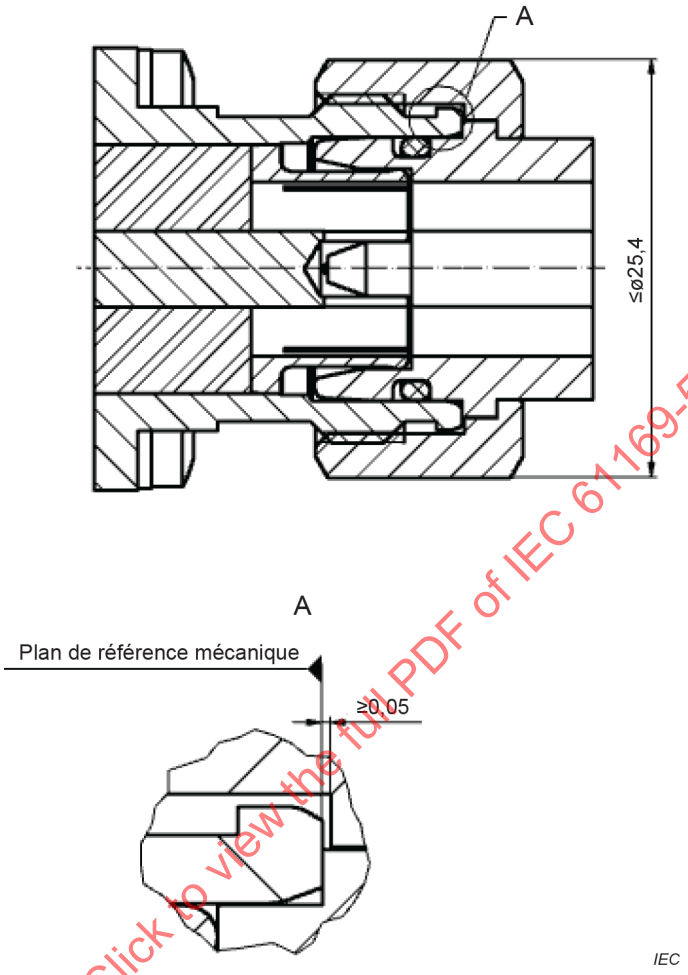


Figure 3 – Couplage de type à vis

4.1.3.2 Couplage de type manuel à vis (voir Figure 4)

Dimensions en millimètres

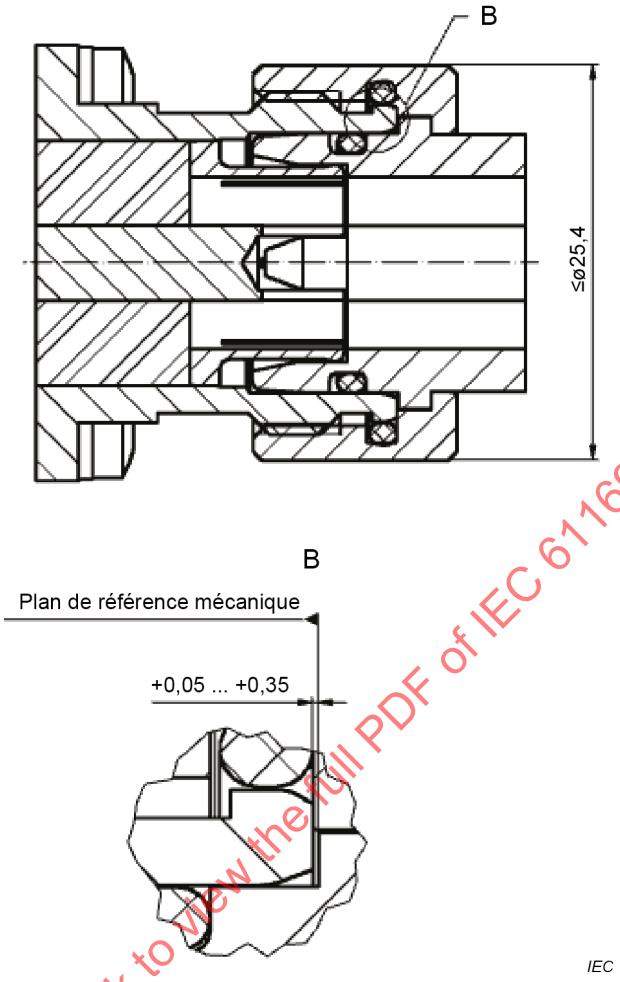
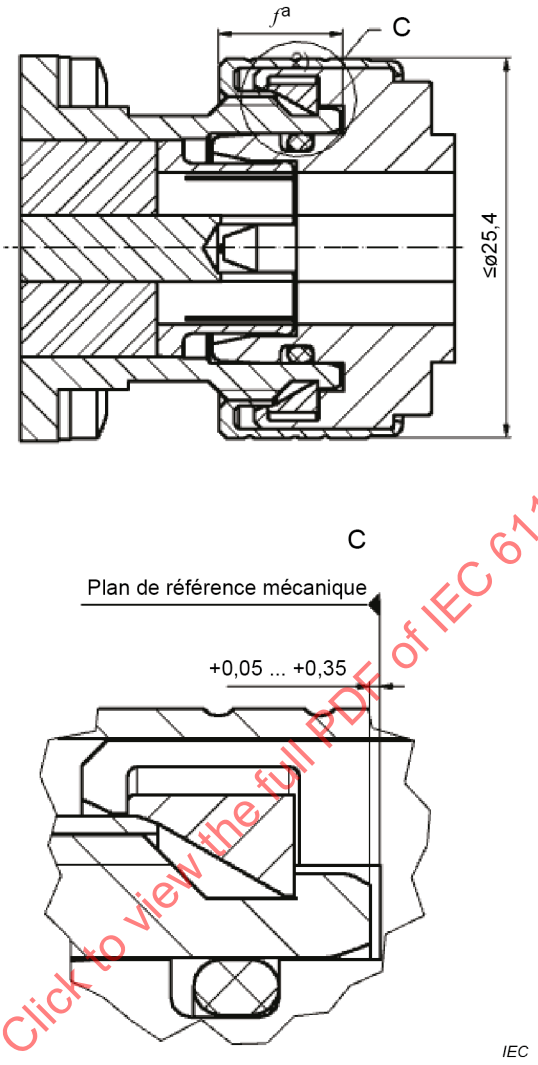


Figure 4 – Couplage de type manuel à vis

4.1.3.3 Couplage de type à verrouillage rapide (voir Figure 5)

Dimensions en millimètres



[a] Max. 13,5 mm pour cette variante.

Figure 5 – Couplage de type à verrouillage rapide