

INTERNATIONAL STANDARD

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**Radio frequency connectors –
Part 1: Generic specification – General requirements and measuring methods**

**Connecteurs pour fréquences radioélectriques –
Partie 1: Spécification générique – Exigences générales et méthodes de mesure**

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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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**Radio frequency connectors –
Part 1: Generic specification – General requirements and measuring methods**

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RADIO FREQUENCY CONNECTORS –**Part 1: Generic specification –
General requirements and measuring methods**

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International Standard IEC 61169-1 has been prepared by subcommittee 46F: R.F. and microwave passive components, of IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories.

This second edition cancels and replaces the first edition, published in 1992, its Amendments 1 (1996) and 2 (1997). This edition constitutes a technical revision.

With respect to the previous edition, tests methods have been updated as well as terminology.

This bilingual version (2016-03) corresponds to the monolingual English version, published in 2013-07.

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

CDV	Report on voting
46F/216/CDV	46F/226/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.

The French version of this standard has not been voted upon.

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

A list of all the parts in the IEC 61169 series, published 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

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RADIO FREQUENCY CONNECTORS –

Part 1: Generic specification – General requirements and measuring methods

1 Scope

This part of IEC 61169, which is a generic specification, relates to radio frequency connectors for r.f. transmission lines for use in telecommunications, electronics and similar equipment.

It provides the basis for the sectional standards, which apply to individual connector types. It is intended to establish uniform concepts and procedures concerning:

- terminology;
- standard ratings and characteristics;
- testing and measuring procedures concerning electrical, mechanical and climatic properties;
- classification of connectors with regard to climatic testing procedures involving temperature and humidity.

The test methods and procedures of this standard are intended for acceptance and type approval testing.

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 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available from: <http://www.electropedia.org>)

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1:1990, *Environmental testing – Part 2-1: Tests – Test A: Cold*¹

IEC 60068-2-2:1974, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*²

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-11, *Environmental testing – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-13, *Environmental testing – Part 2-13: Tests – Test M: Low air pressure*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-17, *Environmental testing – Part 2-17: Tests – Test Q: Sealing*

¹ This publication has been withdrawn.

² This publication has been withdrawn.

IEC 60068-2-20, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-29, *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-42, *Environmental testing – Part 2-42: Tests – Test Kc: Sulphur dioxide test for contacts and connections*

IEC 60068-2-52:1996, *Environmental testing – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

IEC 60068-2-54, *Environmental testing – Part 2-54: Tests – Test Ta: Solderability testing of electronic components by the wetting balance method*

IEC 60068-2-61:1991, *Environmental testing – Part 2-61: Test methods – Test Z/ABDM: Climatic sequence*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60457-1, *Rigid precision coaxial lines and their associated precision connectors – Part 1: General requirements and measuring methods*

IEC 60617, *Graphical symbols for diagrams* (available from: <http://std.iec.ch/iec60617>)

IEC 62153 (all parts), *Metallic communication cables test methods*

IEC 61726, *Cable assemblies, cables, connectors and passive microwave components – Screening attenuation measurement by the reverberation chamber method*

IEC 62037 (all parts), *Passive RF and microwave devices, intermodulation level measurement*

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*³

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE Some of the terms defined are not used in the present document, but may be used in the different sectional specifications.

3.1 General, parts of connectors

3.1.1

contact (electrical)

state in which individual electrically conductive parts are in such close mechanical touch as to provide a low resistance path to electrical current in either direction

3.1.2

contact

conductive element in a component which mates with a corresponding element to provide an electrical path (to provide electrical contact)

³ This publication has been withdrawn.

3.1.3**male (pin) contact**

contact intended to make electrical engagement on its outer surface and which will enter a female (socket) contact

3.1.4**female (socket) contact**

contact intended to make electrical engagement on its inner surface and which will accept entry of a male (pin) contact

3.1.5**hermaphroditic contact**

contact which is intended to mate with an identical contact

3.1.6**resilient contact**

contact having elastic properties to provide a force to its mating part

3.2 Basic connector terms**3.2.1****connector**

component normally attached to a cable or mounted on a piece of apparatus (excluding an adaptor) for electrically joining separable parts of a transmission line system

3.2.2**connector pair**

two connectors having complementary mating faces and locking means, so as to be mateable and interlockable

3.2.3**series type**

terms characterizing the particular mating faces and locking means of a connector pair with regard to construction and dimension

Note 1 to entry: The term "series" is sometimes used as an approximate synonym of 'type' for designating the entirety of connector styles with identical mating face and locking means.

3.2.4**style**

particular form or shape of connector, as well as a combination of connectors of the same type

Note 1 to entry: For "adaptor", see 3.5.1 to 3.5.5: a 'within-type adaptor' may also be considered as a particular style of a given type.

Note 2 to entry: Examples are: free and fixed connectors, both straight and right angle, within-type adaptors straight and right angle.

3.2.5**variant**

variation of a style, in particular details, such as cable-entry dimensions

3.2.6**grade**

qualification of a connector with regard to mechanical and electrical precision in particular with respect to a defined return loss

3.2.7**general purpose connector: Grade 2**

connector making use of the widest permitted dimensional deviations (tolerances) so as still to guarantee minimum stated performance and intermateability

Note 1 to entry: A requirement for the return loss may or may not be specified.

3.2.8

high performance connector: Grade 1

connector for which limits of return loss are specified as a function of frequency.

Note 1 to entry: No tighter dimensional tolerances than those applicable to Grade 2 are normally specified. The manufacturer is responsible, however, for choosing tighter tolerances where necessary to ensure that the return loss requirements are met.

3.2.9

standard test connector: Grade 0

precisely made connector of a particular type used to carry out return loss measurements on Grade 1 and Grade 2 connectors, contributing only negligible errors to the measuring result

Note 1 to entry: The standard test connector is often part of an inner-type adaptor which allows connection with a precision connector forming part of the measuring equipment.

3.2.10

precision connector

connector that has coincident mechanical and electrical reference planes, air dielectric, and has the property of making connections with a high degree of repeatability without introducing significant reflections, loss or leakage

Note 1 to entry: It is intended for mounting on air-lines and instruments. Precision connectors can be of the hermaphroditic type, flange type or of the pin and socket type as stated in IEC 60457-1.

3.2.11

laboratory precision connector

LPC

precision connector without dielectric support for the centre conductor

3.2.12

general precision connector (standards.iteh.ai)

GPC

precision connector with self-contained dielectric support capable of supporting the unsupported centre conductor of an LPC and standard air-line which it is mated

3.3 Constructional terms

3.3.1

male connector/pin connector

connector containing a male (pin) centre contact

3.3.2

female connector/socket connector

connector containing a female (socket) centre contact

3.3.3

plug connector

connector featuring the active part of the coupling mechanism, i.e. the nut or bayonet ring, and which normally is a free contact

Note 1 to entry: Depending on the particular type, a plug may be a male or female connector.

3.3.4

socket

connector complimentary to the plug

3.3.5

hermaphroditic connector

connector which mates with an identical connector

3.3.6

free connector

connector for attachment to a free end of a cable

Note 1 to entry: If not specified as fixed, a connector is assumed to be free.

3.3.7**fixed connector**

connector with provision for attachment to a mounting surface

3.3.8**triaxial**

transmission line comprising three concentric conductors having a common axis and with each conductor insulated from the other two

3.4 Sealing**3.4.1****sealed connector**

connector employing a seal capable of fulfilling specified gas-, moisture- or liquid tightness requirements

3.4.2**barrier seal**

seal preventing the passage of gases, moisture or liquids in an axial direction within the body shell of a connector

3.4.3**panel seal**

seal preventing the passage of gases, moisture or liquids between the fixed connector or adaptor body shell and the panel via the mounting hole(s)

Note 1 to entry: The sealing member is often provided as a discrete item.

3.4.4**mating face seal**

seal preventing the passage of gases, moisture or liquids into the interface space of a pair of mated connectors

3.4.5**hermetic seal**

seal meeting the requirements specified on application of Test Qk of IEC 60068-2-17

3.5 Miscellaneous terms**3.5.1****adaptor**

two-port device for joining two transmission lines having non-mating connectors

3.5.2**fixed adaptor**

adaptor with provision for attachment to a mounting surface

Note 1 to entry: If not specified as fixed, an adaptor is assumed to be free.

3.5.3**within-type adaptor**

adaptor for use between two or more connectors all of the same type

3.5.4**inter-type adaptor**

adaptor for use between two or more connectors of different types

3.5.5**standard test adaptor**

inter-type adaptor for test purposes, having a standard test connector at one end and a precision connector at the other end

3.5.6**standard air line**

homogenous air dielectric transmission line having the smallest possible irregularities in diameter and straightness of conductors, no self-contained supports for the inner conductor and using non-magnetic material with good conductivity

3.5.7**reference line**

air-line similar to the standard air-line but with dielectric support of the inner conductor, and with a design such that the internal return loss is kept at a minimum within the frequency range made use of for measurements

3.5.8**proof coupling torque**

maximum torque to be applied to the screw-coupling mechanism of a specific connector series for testing the mechanical strength of the coupling mechanism

3.5.9**normal coupling torque**

maximum/minimum values of torque to be applied in normal use to the coupling of screw type connectors

3.5.10**engagement and separation torque**

torque required to overcome friction, compression of springs, etc. during the engagement and separation of connectors with rotary type coupling mechanisms before or after complete engagement

Note 1 to entry: This is intended to check for undue tightness of threads, burrs on bayonet-cams, freedom of rotation of coupling rings, etc.

3.5.11**push-on**

connectors with interfaces that engage/disengage in an axial direction

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3.6 General electrotechnical terms**3.6.1****nominal value**

typical value used to designate or identify a component, device or equipment

Note 1 to entry: It follows from the definition that a nominal value is not subject to tolerances.

Note 2 to entry: Typical and nominal are interchangeable.

3.6.2**limiting value**

in a specification, the greatest and/or smallest admissible value of one of the quantities

3.6.3**rated value**

operational values that are provided in the detailed specification

4 Units, symbols and dimensions**4.1 Units and symbols**

Units, graphical symbols, letter symbols and terminology shall whenever possible, be taken from the following IEC publications:

60027: Letter symbols to be used in electrical technology.

60050: International Electrotechnical Vocabulary (IEV).

60617: Graphical symbols for diagrams.

Other publication:

ISO 1000: SI units and recommendations for the use of their multiples and of certain other units.

4.2 Dimensions

4.2.1 Details to be provided in relevant specifications

Each relevant specification shall provide the following.

- Sufficient dimensional information on the mating faces of connectors should be provided to ensure intermateability and compliance with performance requirements.
- Information on the connector envelope maximum dimensions shall be provided to enable the user to accommodate the connectors in their equipment.
- The relevant specification is not intended to restrict details of construction which do not affect interchangeability or performance, nor are they to be used as manufacturing drawings.

4.2.2 Dimensional units to be used in specifications

The dimensions and tolerances shall be given in metric units.

During conversion of dimensions given in inches into millimetres, they shall, in principle, be rounded to the nearest 0,001 mm or 0,000 05 in. Where, however, mechanical and electrical considerations permit, the rounding shall usually be to the nearest 0,01 mm or 0,000 5 in.

5 Standards ratings and characteristics

The ratings and characteristics applicable to each connector type and style shall be stated in the relevant specification. They should normally cover:

- a short description of the connector construction stating in particular the inner diameter of the outer conductor and, if applicable, the preferable cable types to be used with the connector;
- the return loss as a function of frequency for the different grades (if applicable) together with the conditions for which it is valid;
- the working voltage at different altitudes (pressures);
- the climatic categories;
- any other rating or characteristic applicable.

6 Classifications into climatic categories

The classification of connectors with regard to climatic conditions is based on IEC 60068-1 and indicated by a series of three sets of digits separated by oblique strokes corresponding respectively to tests at low temperature (minus sign not shown), high temperature and the number of days of exposure to damp heat, steady state.

The climatic severities are referenced by a cold temperature, high temperature and damp heat steady state duration. Examples of climatic category of this are shown in Table 1:

Table 1 – Preferred climatic categories (see IEC 60068-1)

Category designation	Letter	Temperature range	Damp heat steady state
40/85/21	A	–40 °C to +85 °C	21 days
55/125/21	B	–55 °C to +125 °C	21 days
55/155/56	C	–55 °C to +155 °C	56 days