

Harmonized system of quality assessment for electronic components

Generic specification: Radio frequency coaxial connectors

(Parts I, II and III)

Système harmonisé d'assurance de la qualité
des composants électroniques
Specification generique:
Connecteurs coaxiaux pour fréquence
radioélectrique
(Parties I, II et III)

Harmonisiertes Gütebestätigungssystem für
Bauelemente der Elektronik
Fachgrundspezifikation:
Hochfrequenz-Koaxial-Steckverbinder
(Teile I, II und III)

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electronic Components Standards Policy Committee (ECL/-) to Technical Committee ECL/6, upon which the following bodies were represented:

British Cable Makers' Confederation
British Telecommunications plc
EEA (the Association of Electronics, Telecommunications and Business Equipment Industries)
National Supervising Inspectorate
Society of British Aerospace Companies Limited
Telecommunications Cables Group of Bcmc

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

AEA Technology
Beccama (Beama Electrical Cable Connector and Accessories Manufacturer's Association)
Electronic Components Industry Federation
Ministry of Defence
Society of Cable Television Engineers

This British Standard, having been prepared under the direction of the Electronic Components Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on
15 September 1993

© BSI 1993

First published September 1980
Second edition September 1993

The following BSI references relate to the work on this standard:
Committee reference ECL/6
Special announcement in *BSI News* July 1993

ISBN 0 580 22522 4

Amendments issued since publication

Amd. No.	Date	Text affected

National foreword

This British Standard has been prepared under the direction of the Electronic Components Standards Policy Committee and is identical with CECC 22000 : 1992 *Harmonized system of quality assessment for electronic components. Generic specification: Radio frequency coaxial connectors (Parts I, II and III)*, Issue 3, published by the European Committee for Electrotechnical Standardization (CENELEC), Electronic Components Committee (CECC).

This British Standard supersedes BS CECC 22000 : 1980 which is withdrawn. The non-harmonized British Standard BS 9210 : 1984 will be declared obsolescent.

Cross-references

The British Standard which implements CECC 00100 is BS 9000 *General requirements for a system for electronic components of assessed quality Part 2 : 1991 Specification for the national implementation of the CECC system*.

International standard	Corresponding British Standard
IEC 50	BS 4727 <i>Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms</i> (Most Parts Identical)
IEC 68-1 : 1988	BS 2011 <i>Environmental testing</i> Part 1.1 : 1989 <i>General and guidance</i> (Identical)
IEC 68-2-1 : 1990	Part 2.1A : 1990 <i>Tests A. Cold</i> (Identical)
IEC 68-2-6 : 1982	Part 2.1Fc : 1983 <i>Test Fc. Vibration (sinusoidal)</i> (Identical)
IEC 68-2-11 : 1981	Part 2.1Ka : 1982 <i>Test Ka. Salt mist</i> (Identical)
IEC 68-2-13 : 1983	Part 2.1M : 1984 <i>Test M. Low air pressure</i> (Identical)
IEC 68-2-14 : 1984	Part 2.1N : 1985 <i>Test N. Change of temperature</i> (Identical)
IEC 68-2-17 : 1978	Part 2.1Q : 1981 <i>Test Q. Sealing</i> (Identical)
IEC 68-2-20 : 1979	Part 2.1T : 1981 <i>Test T. Soldering</i> (Identical)
IEC 68-2-27 : 1987	Part 2.1Ea : 1988 <i>Test Ea. Shock</i> (Identical)
IEC 68-2-28 : 1990	Part 2.2C & D : 1990 <i>Tests C & D. Guidance for damp heat tests</i> (Identical)
IEC 68-2-29 : 1987	Part 2.1Eb : 1987 <i>Test Eb. Bump</i> (Identical)
IEC 68-2-30 : 1980	Part 2.1Db : 1981 <i>Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)</i> (Identical)
IEC 68-2-33 : 1971	Part 2.2N : 1977 <i>Test N. Guidance on change of temperature tests</i> (Identical)
IEC 68-2-44 : 1979	Part 2.2T : 1981 <i>Test T. Guidance on Test T: soldering</i> (Identical)
IEC 68-2-54 : 1985	Part 2.1 : Ta 1989 <i>Test Ta. Soldering. Solderability testing by the wetting balance method</i> (Identical)

International standard	Corresponding British Standard
IEC 617	BS 3939 <i>Graphical symbols for electrical power, telecommunications and electronics diagrams</i> (Most Parts Identical)
ISO 129 : 1985	BS 308 <i>Engineering drawing practice</i> Part 2 : 1985 <i>Recommendations for dimensioning and tolerancing of size</i> (Technically equivalent)
ISO 286	BS 4500 <i>ISO Limits and fits</i> Part 1 <i>General tolerances and deviations</i> (Identical)
ISO 1302 : 1978	BS 308 <i>Engineering drawing practice</i> Part 2 : 1985 <i>Recommendations for dimensioning and tolerancing of size</i> (Technically equivalent)

The Technical Committee has reviewed the provisions of CECC 22001 : 1992, CECC 22002 : 1991, CECC 22003 : 1991, IEC 27-1 : 1971, IEC 27-2 : 1972, IEC 68-2-2 : 1987, IEC 68-2-3 : 1985, IEC 68-2-42 : 1982, IEC 68-2-49 : 1983, IEC 96-1 : 1986, IEC 96-2 : 1988, IEC 169-1-1 : 1987, IEC 169-1-3 : 1988, IEC 410 : 1973, IEC 457, ISO 370 : 1975, ISO 1101/2 : 1974, ISO 2015 : 1976, to which normative reference is made in the test, and has decided that they are acceptable for use in conjunction with this standard.

NOTE. ISO 1000 : 1981 has been superseded by ISO 1000 : 1992 which is identical with BS 5555 : 1993.

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

Förderverein für Elektrotechnische Normung (FEN) e. V.
Cenelec Electronic Components Committee

CECC

Système Harmonisé d'Assurance de la Qualité
des Composants Electroniques

SPECIFICATION GNERIQUE:

**CONNECTEURS COAXIAUX
POUR FREQUENCE
RADIOELECTRIQUE
(Parties I, II et III)**

Harmonized System of Quality Assessment for
Electronic Components

GENERIC SPECIFICATION:

**RADIO FREQUENCY
COAXIAL CONNECTORS
(Parts I, II and III)**

Harmonisiertes Gütebestätigungssystem für
Bauelemente der Elektronik

FACHGRUNDSPEZIFIKATION:

**HOCHFREQUENZ-KOAXIAL-
STECKVERBINDER
(Teile I, II und III)**



3 Edition
Issue
Ausgabe

CECC 22 000

1992
AVA Documents
Document Sharing Hub

Introduction

CECC 22 000 Issue 3 has been divided into three parts in order to separate the disparate procedural requirements of Capability Approval (Part II) from those of Qualification Approval (Part III). The information common to both procedures, such as terminology and test methods, is contained in Part I.

The following contents list includes all three parts, and it will be noted that sequential page numbering is used from start to finish. The three parts were, however, prepared as separate documents, so the clause numbering and Annexes relate to the individual parts.

CONTENTS

	Page
FOREWORD	7
PREFACE	7
DIAGRAM OF THE CECC RF CONNECTOR SPECIFICATION SYSTEM	8

PART I – GENERIC SPECIFICATION: RADIO FREQUENCY COAXIAL CONNECTORS

SECTION 1 – SCOPE	9
SECTION 2 – GENERAL	9
2.1 Related documents	9
2.2 Units, symbols and terminology	11
2.2.1 Basic terms	11
2.2.2 Connector	11
2.2.3 Types of contact	12
2.2.4 Attachment	13
2.2.5 Connector version	13
2.2.6 Connector styles	13
2.2.7 Mated set	14
2.2.8 Seals	14
2.2.9 Other terminology	15
2.3 Standard ratings and characteristics	16
2.4 Marking of the component	16
2.5 Marking and contents of package	16
2.5.1 Individual unit containers	17
2.6 Ordering information (not for inspection purposes)	17
2.7 Drawings included in the sectional and detail specifications	17
2.8 Order of precedence	17

	Page
SECTION 3 - QUALITY ASSESSMENT PROCEDURE	18
3.1 General	18
3.2 Primary stage of manufacture	18
3.3 Subcontracting	18
3.4 Rework and resubmission of rejected lots	18
3.5 Certified test records (RCE)	18
3.6 Validity of release - delayed delivery	18
SECTION 4 - TEST AND MEASUREMENT PROCEDURES	19
4.1 Measurement and recovery conditions	19
4.1.1 Measurement conditions	19
4.1.2 Recovery conditions	20
4.2 Visual examination	20
4.3 Dimensions	20
4.3.1 Outline dimensions and mass	20
4.3.2 Dimensions and materials (piece-parts)	21
4.3.3 Gauging procedures	21
4.4 Electrical test and measurement procedures	21
4.4.1 Reflection factor $ r $	21
4.4.2 Contact resistance, outer conductor and screen continuity, and centre conductor continuity (mated cabled connectors)	22
4.4.3 Outer conductor/screen continuity	24
4.4.4 Insulation resistance	24
4.4.5 Voltage proof	24
4.4.6 Voltage proof combined with water immersion (water immersion test)	24
4.4.7 RF high potential withstanding voltage	24
4.4.8 Screening effectiveness	24
4.4.9 Discharge test (corona test)	24
4.4.10 Permeability, non-magnetic materials	25
4.4.11 RF insertion loss	25
4.5 Mechanical test and measurement procedures	25
4.5.1 Gauge retention force (resilient contacts male and female)	25
4.5.2 Centre contact captivation	25
4.5.3 Static load (for fixed connectors only)	25
4.5.4 Engagement and separation	25
4.5.5 Mechanical tests on cable fixing	25
4.5.6 Strength of coupling mechanism	26
4.5.7 Compatibility, mechanical	26
4.5.8 Resilient hermaphroditic contacts - centre contact axial force	26
4.5.9 Bending moment	26
4.5.10 Effectiveness of safety wire holes	26

		Page
4.6	Environmental test and measurement procedures	27
4.6.1	Soldering	27
4.6.2	Bump	28
4.6.3	Vibration	28
4.6.4	Shock	28
4.6.5	Climatic tests	29
4.6.6	Damp heat, steady state	30
4.6.7	Rapid change of temperature	30
4.6.8	Sealing - panel and barrier sealed connectors (non-hermetic)	30
4.6.9	Sealing - hermetic	30
4.6.10	Salt mist	30
4.6.11	Dust	31
4.6.12	Corrosive mixed gas test	31
4.6.13	Sulphur dioxide test	32
4.7	Endurance test procedures	32
4.7.1	Mechanical endurance	32
4.7.2	High temperature endurance	32
4.8	Resistance to solvents and contaminating fluids	32
4.9	Crimp resistance test	32

ANNEXES TO PART I

Annex A	Crimp Resistance Test	33
Annex B	Corrosive Mixed Gas Test	36
Annex C	Environmental test voltage and proof voltage derating at low air pressure	45
Annex D	Test Z/ABDM: Climatic Sequence	46
Annex E	Test Apparatus and Composition for Dust Test	52
Annex F	Relationship between Transfer Impedance (Z _t) and Screening Attenuation (dB)	53
Annex G	Listing of Parts of IEC 68 referred to in Issue 2 of this Specification	54
Annex H	Guidelines for the determination of tensile forces and torsional moments to be applied when testing the effectiveness of cable retention with recommended values for some typical cables	55
Annex J	Permeability, Non-magnetic Materials	60
Annex K	RF Insertion Loss	61
Annex L	RF High Potential Withstanding Voltage	63
Annex M	Effectiveness of Safety Wire Holes	64

PART II - CAPABILITY APPROVAL PROCEDURES FOR RF CONNECTORS

SECTION 1 - GENERAL	65
1.1 Scope	65
1.2 Related documents	65
1.3 Units, symbols and terminology	65
1.4 Standard and preferred values	65
1.5 Marking of the connector and package	65
SECTION 2 - QUALITY ASSESSMENT PROCEDURES	66
2.1 General	66
2.1.1 Eligibility for capability approval	66
2.1.2 Primary stage of manufacture	66
2.1.3 Incorporated components	66
2.1.4 Validity of release - delayed delivery	66
2.1.5 Rework	66
2.1.6 Certified test records (RCE)	67
2.2 Procedures for capability approval	67
2.2.1 Application for capability approval	67
2.2.2 Granting of capability approval	67
2.2.3 Description of capability (Capability Manual)	67
2.2.4 Capability qualifying components (CQC)	67
2.2.5 Demonstration and verification of capability	71
2.2.6 Procedures to be followed in the event of a CQC failure	72
2.2.7 Abstract of description of capability	72
2.3 Procedures following the granting of capability approval	73
2.3.1 Maintenance of capability approval	73
2.3.2 Modifications likely to affect the capability approval	73
2.4 Release for delivery	73
2.4.1 Quality conformance inspection requirements	73
2.4.2 Customer detail specifications (CDS)	74
2.4.3 Detail specifications for standard catalogue items to be included in CECC 00 200	74
2.4.4 Structural similarity	74
2.4.5 Register of detail specifications	74
2.5 Withdrawal of capability approval	74

ANNEXES TO PART II

Annex A	Example of manufacturing schematic	75
Annex B	Layout of front page of CQC specifications	76
Annex C	Requirements for capability approval test reports	77
Annex D	Maintenance of capability approval - example table for periodic tests for maintenance of approval	78
Annex E	Example of BDS for customer detail specifications and detail specifications for standard catalogue items together with instructions for preparation of detail specifications	79

PART III – QUALIFICATION APPROVAL PROCEDURES FOR RF CONNECTORS

SECTION 1 – GENERAL	83
1.1 Scope	83
1.2 Related documents	83
1.3 Units, symbols and terminology	83
1.4 Standard and preferred values	83
1.5 Marking of the connector and package	83
1.6 Ordering information	83
SECTION 2 – QUALITY ASSESSMENT PROCEDURES	84
2.1 General	84
2.2 Eligibility for qualification approval	84
2.3 Primary stage of manufacture	84
2.4 Incorporated components	84
2.4.1 Incorporated components covered by a CECC specification	84
2.4.2 The use of unapproved incorporated components	85
2.5 Structurally similar components	85
2.6 Qualification approval procedures	85
2.6.1 Selection of specimens for qualification approval	86
2.7 Quality conformance inspection	86
2.8 Rework and resubmission of rejected lots	86
2.8.1 Rework	86
2.8.2 Repair	87
2.9 Certified test records (RCE)	87

ANNEX TO PART III

Annex A	Example of selection of specimens for qualification approval when structural similarity of components is claimed	88
----------------	---	-----------

FOREWORD

The CENELEC Electronic Components Committee (CECC) is composed of those member countries of the European Committee for Electrotechnical Standardization (CENELEC) who wish to take part in a harmonized System for electronic components of assessed quality.

The object of the System is to facilitate international trade by the harmonization of the specifications and quality assessment procedures for electronic components, and by the grant of an internationally recognized Mark, or Certificate of Conformity. The components produced under the System are thereby acceptable in all member countries without further testing.

This specification has been formally approved by the CECC, and has been prepared for those countries taking part in the System who wish to issue national harmonized specifications for RADIO FREQUENCY CONNECTORS AND ACCESSORIES. It should be read in conjunction with the current regulations for the CECC System.

At the date of printing of this specification, the member countries of the CECC are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom, and copies of it can be obtained from the addresses shown on the blue fly sheet.

PREFACE

This generic specification (GS) was prepared by CECC Working Group 22 "RF Connectors".

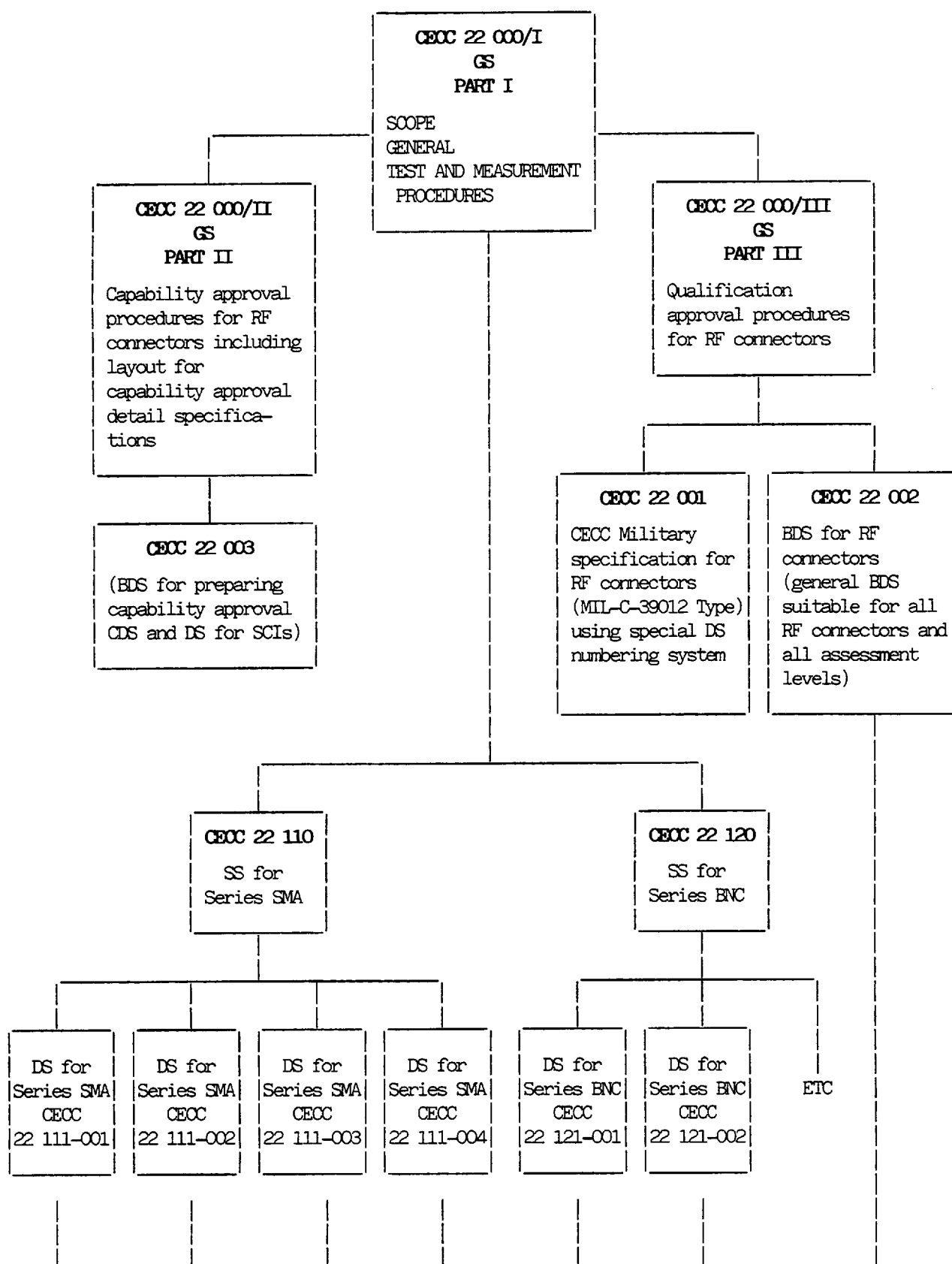
It is based, wherever possible, on the Publications of the International Electrotechnical Commission, and in particular on IEC 169-1 (1987): 'Radio-frequency connectors', Part 1: 'General requirements and measuring methods'.

The text of this specification which supersedes Issue 2 was circulated to the CECC for voting in the documents listed below and was ratified by the President of the CECC for printing as a CECC Specification.

	Document	Date of Voting	Report on the Voting
Part I	CECC(Secretariat)2614	June 1990	CECC(Secretariat)2710
Part II	CECC(Secretariat)2708	December 1990	CECC(Secretariat)2819
Part III	CECC(Secretariat)2614	June 1990	CECC(Secretariat)2710

This specification is supplemented by sectional (SS) and blank detail (BDS) specifications specific to each sub-family (SERIES) of radio-frequency connectors and their associated accessories.

DIAGRAM OF THE CECC SPECIFICATION SYSTEM
FOR RF CONNECTORS



PART I - GENERIC SPECIFICATION: RADIO FREQUENCY COAXIAL CONNECTORS

SECTION 1 - SCOPE

This GS relates to radio-frequency connectors and accessories of assessed quality.

SECTION 2 - GENERAL2.1 Related documents

CECC 00 100	(1974)	Basic Rules
CECC 00 101 to 00 114 (less 00 110)		Rules of Procedure
CECC 22 000/II	(1991)	Capability approval procedures for r.f. connectors
CECC 22 000/III	(1991)	Qualification approval procedures for r.f. connectors
CECC 22 001	(1992)	General BDS - CECC Military specifications for r.f. connectors (Type MIL-C-39012)
CECC 22 002	(1991)	General BDS for r.f. connectors Series
CECC 22 003	(1991)	BDS for preparing capability approval customer detail specifications and detail specifications for standard catalogue items
IEC 27*		Letter symbols to be used in electrical technology
IEC 27-1*	(1971)	General
IEC 27-2*	(1972)	Telecommunications and Electronics
IEC 50*	(1972)	International Electrotechnical Vocabulary
IEC 68+		Basic environmental testing procedures
IEC 96 §		Radio-frequency cables
IEC 96-1 §	(1971)	General requirements and measuring methods
IEC 96-2 §	(1961)	Relevant cable specifications
IEC 169		RF Connectors
IEC 169-1*	(1987)	General requirements and measuring methods
IEC 169-1-1*	(1987)	Electrical Tests and Measuring Procedures: Reflection Factor

IEC 169-1-3*	(1988)	Electrical Tests and Measuring Procedures: Screening Effectiveness
IEC 410	(1973)	Sampling plans and procedures for inspection by attributes
IEC 419	(1973)	Guide to the inclusion of lot-by-lot and periodic inspection procedures to specifications for electronic components (or parts)
IEC 457		Rigid precision coaxial lines and their associated precision connectors
IEC 617*		Graphical symbols for diagrams
ISO/R129	(1959)	Technical drawings - dimensioning
ISO 286	(1962)	ISO system of limits and fits Part 1: General tolerances and deviations
ISO 370 [†]	(1975)	Toleranced Dimensions - conversions from inches to millimetres and vice versa
ISO 1000	(1981)	SI units and recommendations for the use of their multiples and of certain other units
ISO 1101	(1983)	Technical drawings - Geometric Tolerancing - Tolerancing of form, orientation, location and run-out-Generalities, definitions, symbols, indications on drawings
ISO 1101/2	(1974)	Technical drawings - Tolerances of form and of position - Part II: Maximum material principle
ISO 1302	(1978)	Technical drawings - Method of indicating surface texture on drawings
ISO 2015	(1976)	Numbering of weeks
ISO/R 5459	(1981)	Technical drawings - Geometrical tolerancing - Datums and datum-systems for geometric tolerances

Notes:

- * The publications identified with an asterisk are directly related to this generic specification. The remaining publications are related to r.f. connector sectional and detail specifications.
- + See Annex G for listing of IEC 68-2 parts referred to in Issue 2 of this specification.
- [†] When it is clearly required that an original maximum or minimum material condition may not be exceeded, Method B of ISO 370 shall be used in deriving the converted dimension. The numerical basis of the conversion may be as indicated in sub-clause 4.2.3 of IEC 169-1.
- § These specifications are under review.

2.2 Units, symbols and terminology

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

ISO 1000	Rules for the use of units of the international system of units and selection of the decimal multiples and sub-multiples of the SI units.
ISO 2015	Numbering of weeks.
IEC 27-1	Letter symbols to be used in electrical technology-General.
IEC 50	International Electrotechnical Vocabulary.
IEC 617	Recommended graphical symbols; graphical symbols.

The following paragraphs contain additional terminology applicable to coaxial connectors and shall be included in each national harmonized specification system.

Where further items are required they shall be derived in accordance with the principles of the documents listed above.

2.2.1 Basic terms

- series a range of r.f. connectors having a common mating face, as defined in the sectional specification (SS), or a range of r.f. connectors having the same design/constructional philosophy but available in a number of different sizes. Each series shall normally be covered by a single SS. When different size or non-intermateable impedances are involved, the SS may be sub-divided into a number of separate parts, as appropriate.
- style a style is a particular form of component within a series, as defined in a detail specification (DS).
- variant a variant is a variation of a style, as defined in a DS.

2.2.2 Connector

A connector is a component, normally attached to a cable or to a piece of apparatus for the purpose of providing connection(s) between cables and/or pieces of apparatus.

(1) General purpose connector : Grade 2

A general purpose connector Grade 2 is a connector making use of the widest permitted tolerances which will guarantee stated performance and intermateability. The requirement for the worst reflection factor may, or may not, be specified in the SS.

(2) High performance connector : Grade 1

A high performance connector Grade 1 is a connector for which limits for the reflection factor are specified as a function of frequency in the SS and/or DS. No tighter 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 reflection factor requirements are met. These requirements may be agreed between manufacturer and user - especially for microwave applications.

(3) Standard test connector : Grade 0 (also called reference connector)

A standard test connector is a precisely made connector of a particular series, used as a standard connector to carry out reflection factor measurements on Grade 1 and Grade 2 connectors contributing only negligible errors to the measuring result. Often, the standard test connector may be part of an inter-series adaptor which allows connection with a precision (hermaphroditic) connector forming part of the measuring equipment. The dimensions and tolerances are specified in the SS.

(4) Precision connector

A precision connector 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. It is intended for mounting on an air line and is used only for measurement purposes.

There are two types of precision connector :

- Laboratory Precision Connector (LPC)

This does not have a dielectric support for the centre conductor.

- General Precision Connector (GPC)

This has a self-contained dielectric support capable of supporting in a simple manner the unsupported LPC centre conductor and standard air-line with which it is mated.

2.2.3 Types of contact(1) Male contact (pin contact)

A male contact is a contact where electrical engagement is made on the outer surface.

(2) Female contact (socket contact)

A female contact is a contact where electrical engagement is made on the inner surface.

(3) Hermaphroditic contact

A hermaphroditic contact is a contact whose configuration is such that it cannot be classified as male or female, but it will make electrical connection with a contact of identical design.

2.2.4 Attachment(1) Fixed connector

A fixed connector is a connector designed for attachment to a chassis or a piece of apparatus. If not specified as fixed, a connector is assumed to be free.

(2) Free connector, see "Fixed connector."(3) Cable connector

A cable connector is a connector designed for attachment to a coaxial cable.

2.2.5 Connector version(1) Male connector

A male connector is a connector containing a male (pin) centre contact.

(2) Female connector

A female connector is a connector containing a female (socket) centre contact.

(3) Hermaphroditic connector

A hermaphroditic connector is a connector with contacts for inner and outer connection whose configuration is such that it cannot be classified as male or female, but it will make electrical connection with a connector of identical design.

(4) Composite connector

A composite connector is a connector requiring separate parts to effect electrical continuity of inner and/or outer conductors, and mechanical coupling. Detailed terminology for these parts shall be included in the appropriate SS.

2.2.6 Connector styles(1) Plug

A plug is a connector featuring the active part of the coupling mechanism, unless otherwise defined in the relevant SS.

(2) Socket

A socket is a connector featuring the coupling mechanism complementary to the plug.

(3) Adaptors

An adaptor is a component to permit connection(s) between two or more connectors when direct connection is not achievable or suitable. An adaptor shall be described by what it is - not by what it does. Thus an adaptor allowing effective connection of two plugs shall be termed 'adaptor, socket/socket'.

1. Within-series adaptor

A within-series adaptor has mating faces of the same series.

2. Inter-series adaptor

An inter-series adaptor has mating faces of differing series.

3. Standard test adaptor

A standard test adaptor is a particular form of inter-series adaptor used for test purposes. One mating face is that of a standard test connector and the other a precision connector.

4. Fixed adaptor

A fixed adaptor is an adaptor designed for attachment to a chassis or a piece of apparatus. If not specified as fixed, an adaptor is assumed to be free.

5. Free adaptor - see "Fixed adaptor".2.2.7 Mated set

A mated set is a set of two or more connectors designed to be mated with each other, using an adaptor, or separate parts in the case of a composite connector, if necessary.

2.2.8 Seals(1) Barrier seal

A barrier seal is a seal preventing the passage of moisture or gases between the dielectric insert, the contacts, and the body shell of a connector or adaptor.

(2) Panel seal

A panel seal is a seal provided between a fixed connector/adaptor and a panel to prevent the passage of moisture or gases through the gap between the connector/adaptor and the panel mounting hole(s).

(3) Mating face seal

A mating face seal is a seal preventing the passage of moisture or gases into the connecting interface of two connectors when they are in the mated condition.

(4) Hermetic seal

An hermetic seal is a barrier and/or panel seal capable of meeting the requirements of Test Qk of IEC 68-2-17.

2.2.9 Other terminology(1) Normal coupling torque

Normal coupling torque is the torque (expressed as maximum/minimum values) to be applied, in normal use, to the screw-coupling mechanism of a connector.

(2) Proof coupling torque

Proof coupling torque is the 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) Reflection factor $|r|$

The reflection factor is the ratio of the voltage magnitude of the reflected wave to the voltage magnitude of the incident wave.

(4) Voltage standing wave ratio (v.s.w.r.) 's'.

The voltage standing wave ratio is the ratio of the maximum value to the minimum value of the voltages measured on a low-loss homogeneous transmission line.

(5) Standard air-line

A standard air-line comprises a homogeneous air-dielectric transmission line having minimal discontinuities in diameter and straightness of conductors, no self-contained supports for the inner conductor and using non-magnetic material with good conductivity for both inner and outer conductors.

(6) Reference line

The reference line is constructed like the standard air-line but with dielectric support of the inner conductor. The design of the line is such that the internal reflection factor is kept at a minimum within the frequency range made use of for measurements.

(7) Cable simulator

A cable simulator is a section of precise transmission line with accurate characteristic impedance, in general a precision cable, to which the connector under test is attached, in such a way that the transition from line to connector simulates as precisely as possible the normal state of the connector attached to an appropriate cable in particular with regard to reflection factor and reactive disturbances.

2.3 Standard ratings and characteristics

The ratings and characteristics applicable to each connector series shall be specified in the relevant SS.

Similarly, the ratings and characteristics applicable to a particular style and/or variant shall be prescribed in the relevant DS.

2.4 Marking of the component

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

- component identification
- manufacturer's name, logo or identity code
- manufacturing date code (year/week).

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

50 ohms = No additional colouring 75 ohms = Yellow

2.5 Marking and contents of package

Each sealed package containing components from an inspection lot shall include a copy of the Certificate of Conformity in accordance with CECC 00 108. The package shall be marked with the information prescribed in 2.4 and, in addition, the following information shall be given :

- series designation of connector
- nominal characteristic impedance
- number of the DS
- a letter, denoting the assessment level
- any additional special requirement or marking required by the SS or DS.

Example: SMA 50 ohm CECC 22 111-805-03 H

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

2.5.1 Individual unit containers

Where applicable, individual unit packages (within the sealed package) shall be marked with the reference number of the Certificate of Conformity, the manufacturer's factory identity code and the component identification.

2.6 Ordering information (not for inspection purposes)

The following ordering information shall be included in purchasing contracts for items complying with this specification:

- the number of the DS
- assessment level code letter
- body finish - if more than one finish is listed in the DS
- any additional information or special requirements.

2.7 Drawings included in the sectional and detail specifications

The essential purpose of the drawings is to ensure mechanical interchangeability, and they are not intended to restrict details of construction which do not affect interchangeability nor are they to be used as manufacturing drawings.

Equipment designers should work to the limits prescribed and not to dimensions of individual specimens.

2.8 Order of precedence

Where any omissions or ambiguities occur, documents shall rank in the following order of authority:

- the detail specification (DS)
- the sectional specification (SS)
- the generic specification (GS)
- CECC 00 100: Basic Rules (BR)
- any other international documents (for example, of the IEC) to which reference is made.

In the event of discrepancies between CECC documents and national documents purporting to be equivalent, the CECC document shall take precedence.

SECTION 3 - QUALITY ASSESSMENT PROCEDURES

3.1 General

The CECC Rules of Procedure controlling Qualification Approval (QA) and Capability Approval (CA) for all electronic components are given separately in CECC 00 114: RP 14, Part II for QA and Part III for CA.

Detailed information and rules specific to r.f. connectors are given in CECC 22 000: Part II for CA and Part III for QA.

Although CA achieves quality assessment on the basis of process control and proven design concepts, while QA achieves quality assessment by testing representative components after manufacture, a few features are common to both quality assessment systems as briefly explained in the following clauses.

3.2 Primary stage of manufacture

The primary stage of manufacture for r.f. connectors is the first process subsequent to the manufacture of finished piece parts and sub-assemblies.

3.3 Subcontracting

Subcontracting of the primary stage and subsequent stages of manufacture is permitted unless otherwise agreed between the manufacturer and the customer (see § 1.2 and § 1.3 of CECC 00 114/II, RP 14 Part II, or § 2.2 of CECC 00 114/III RP 14 Part III as appropriate)

3.4 Rework and resubmission of rejected lots

Inspection lots rejected during lot-by-lot tests may be reworked, as necessary, and re-submitted for testing, subject to the requirements of CECC 22 000: Parts II or III.

3.5 Certified test records (RCE)

If requested by the customer, Certified Test Records (RCE) may be prepared in accordance with CECC 00 109: RP 9.

3.6 Validity of release - delayed delivery

Connectors held by a manufacturer or distributor for a period exceeding five years following acceptance testing, shall be re-examined to the Group A inspection prescribed in the relevant DS, before being delivered.

SECTION 4 - TEST AND MEASUREMENT PROCEDURES

This section contains the tests which shall be included in each harmonized national specification system,

- not all the tests are applicable to all SS and DS
- the SS shall prescribe the tests (and any additional tests) applicable to a particular connector series
- DS shall identify which of the non-mandatory tests prescribed in the relevant SS are applicable to a particular style/variant of connector
- any additional test methods included shall be clearly indicated as such, any in harmonized national specifications being clearly indicated as non-harmonized.

Where applicable, a reference to the appropriate IEC document is given against each test method.

4.1 Measurement and recovery conditions

4.1.1 Measurement conditions

Tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 68-1. Before measurements are made, the connectors shall be preconditioned under standard atmospheric conditions for testing, for a time sufficient to allow the entire connector to reach thermal stability. The above requirements shall apply unless otherwise prescribed in the SS or DS. When a nominal value only is given for an applied stress and/or duration of application, the specified value shall be taken to indicate the minimum test severity to be applied.

The tests shall be carried out with connectors as received from the supplier. In no case shall the contact parts be cleaned or otherwise prepared prior to tests, unless explicitly prescribed in the SS or DS.

Where it is required that a cable shall be attached to a connector, this shall be done in accordance with the connector manufacturer's instructions (normally supplied with the connector).

Mated sets of connectors shall be fully engaged, and screw-coupled connectors shall be tightened to the normal coupling torque specified in the SS.

When 'mounting' is specified in a test, the connector shall be securely mounted on a rigid plate of suitable material using a clamp for free connectors or the normal fixing for fixed connectors. Mounting and arrangement of cables/wires for dynamic tests - bump, vibration, shock etc. - shall be in accordance with IEC 68-2-47. Unless otherwise indicated in the relevant specification the effects of gravitational force and the direction and level of the prevailing magnetic field may be disregarded when carrying out dynamic tests.

In the case of mounted connectors subjected to environmental conditioning, care shall be taken to ensure that the surface finish of the mounting plate is compatible with that of the connector body so that electrolytic corrosion due to contact of dissimilar metals is avoided. For sealed connectors the mounting shall take the form of a suitable test jig so that without disturbance of the panel seals the leakage rate may be measured at the conclusion of the recovery period after environmental conditioning. The back of the panel portion of such connectors, when appropriate, shall be protected. The free ends of cable shall be protected against ingress of moisture.

For tests involving exposure to high temperature - usually the upper temperature category in the climatic sequence, rapid change of temperature and high temperature endurance - a cable with an appropriate temperature capability should be used. The upper temperature of the cable specified may, however, be less than that of the connector.

The dimensions of the mounting plate shall be such that the contour of the specimen is exceeded.

4.1.2 Recovery conditions

Recovery conditions for the interval after a conditioning and the next measurement of test shall be in accordance with IEC 68-1 unless otherwise prescribed in the SS or DS.

4.2 Visual examination

This shall be carried out in accordance with Clause 12 of IEC 169-1. Marking of the connector and the package shall, however, be in accordance with 2.4 and 2.5 respectively of this specification.

4.3 Dimensions

4.3.1 Outline dimensions and mass

The outline dimensions shall comply with those specified by the relevant detail specification. When specified as a lot-by-lot test, this requirement may be demonstrated prior to final assembly. The mass shall not exceed the maximum specified.

4.3.2 Dimensions and materials (piece-parts)

Set of piece-parts supplied to the requirements of the SS and DS shall be checked for compliance with the drawings quoted on the qualification approval/application certificate.

4.3.3 Gauging procedures

Resilient contacts: see 4.5.1 Gauge retention force

Mating face compatibility: see 4.5.7 Compatibility mechanical

4.4 Electrical test and measurement procedures

4.4.1 Reflection factor $|r|$

The procedure for measurement and the information to be given in the relevant SS or DS shall be in accordance with sub-clause 14.1 of IEC 169-1 and IEC 169-1-1. A different method may be used provided it is acceptable to the ONS.

The SS and DS shall specify the nominal characteristic impedance of the connector. For measurement and test purposes the reference characteristic impedance shall be determined by a reference line or standard air-line whose dimensions shall conform to IEC 457. When appropriate the SS or DS shall specify the connector frequency range, the frequency intervals between measurements and the maximum values of reflection factor and/or VSWR. Additional frequencies or swept frequency bands may also be specified.

The SS shall specify standard test connector (Grade 0) interfaces for measurement and test purposes; mated pairs of standard test connectors shall exhibit uniformity of characteristic impedance throughout the pair and for a sufficient distance into each connector for the verification of nominal characteristic impedance for measurement and test purposes.

A connector shall be accepted if the maximum magnitude of reflection factor and/or v.s.w.r. specified for the range of frequencies is not exceeded.

NOTE: The relationship between reflection factor r and VSWR (s) is given by:

$$s = \frac{1 + |r|}{1 - |r|} \quad \text{and} \quad |r| = \frac{s - 1}{s + 1}$$

Alternative methods of expressing reflection factor and VSWR are:-

$$\begin{aligned} |r| &= x + yf & \text{where } |r| &= \text{reflection factor} \\ s &= x^1 + y^1f & s &= \text{VSWR} \\ & & f &= \text{frequency in GHz} \\ & & x \text{ and } x^1 &= \text{the initial} \\ & & & \text{reflection factor and VSWR} \\ & & & \text{respectively} \\ & & y \text{ and } y^1 &= \text{constants} \end{aligned}$$

4.4.2(1) Contact resistance, outer conductor and screen continuity, and centre conductor continuity (mated cabled connectors)

Measurements will in general be carried out with alternating current (a.c). In case of dispute, however, the measurement with direct current shall govern. The frequency for a.c. measurements shall be $1 \text{ kHz} \pm 200 \text{ Hz}$.

The contact resistance shall normally be calculated from the potential difference measured between the points intended for the connection of the cables and the current. The contact shall be made before the current is switched on.

When direct access to the terminations is impractical as in the case of mated cabled connectors required for environmental conditioning, a measurement of the centre conductor continuity shall be made.

The centre conductor continuity procedure may also be employed, with adaptation, for measuring the outer conductor continuity of triaxial connectors fitted with triaxial cables. Under these circumstances the connectors and the cable outer screens prevent direct access to the connector outer conductor.

In order to prevent the breakdown of possible insulating layers on the contacts, the electromotive force (e.m.f.) of the measuring circuit shall not exceed 20 mV (peak value for a.c.).

In order to prevent undue heating of the contacts, the current shall not exceed 1 A or the value specified by the relevant specification.

In general the resistances of the centre contact, R_c , and the outer contact, R_o , of a pair of connectors shall be measured separately. The relevant specification shall state explicitly if the total resistance, R_{tot} , of the two contacts in series is to be determined by a direct measurement.

Procedure1) Contact resistance and outer conductor continuity

The relevant value of the contact resistance is the mean value calculated from five consecutive measuring cycles. No individual value shall exceed twice the mean value.

One measuring cycle consists of:

when measuring with a.c. :

- a) making the contact (engaging the connectors)
- b) connection of voltage source
- c) measurement
- d) disconnection of voltage source
- e) breaking the contact (disengaging the connectors).

when measuring with d.c. :

- a) making the contact (engaging the connectors)
 - b) connection of voltage source
 - c) measurement
 - d) connection of voltage source in reverse polarity
 - e) measurement
 - f) disconnection of voltage source
 - g) breaking the contact (disengaging the connectors).
- 2) Centre conductor, outer conductor and screen continuity (mated cabled connectors)

The overall resistances of the mated connectors and their attached cables shall be measured between the free ends of the cable conductors. The connectors shall not be disengaged between making the last measurements prior to conditioning and the first measurements after conditioning.

Requirements1) Contact resistance and outer conductor continuity

The values of the contact resistance and outer conductor continuity shall not exceed the values specified by the relevant specification.

2) Centre conductor continuity and outer conductor and screen continuity (mated cabled connectors)

The changes in resistance of the centre conductor, outer conductor and when applicable, the screen of a mated pair of connectors inclusive of cable resistance shall not deviate after conditioning by more than the appropriate maximum permitted values indicated.

Information to be given in the relevant specification

- a) Upper limit of resistance for centre contact and outer contact.
- b) The maximum percentage change of the initial total measured resistances of mated cabled connectors to be permitted after conditioning.
- c) Any deviation from standard procedure.

4.4.2(2) Crimped connectors shall be subjected to the test procedures described in Annex A and shall meet the requirements specified in the relevant DS.

4.4.3 Outer conductor/screen continuity

For details see 4.4.2.

4.4.4 Insulation resistance

The procedure for measurement and the information to be given in the relevant SS or DS shall be as specified in sub-clause 14.5 of IEC 169-1.

4.4.5 Voltage proof

The procedure for testing and the information to be given in the relevant SS or DS shall be as specified in sub-clause 14.6 of IEC 169-1.

4.4.6 Voltage proof combined with water immersion (water immersion test)
(applicable only to connectors fitted with mating-face seals)

The procedure for testing and the information to be given in the relevant SS or DS shall be as specified in sub-clause 14.7 of IEC 169-1.

4.4.7 RF high potential withstanding voltage

The procedure for testing and the information to be given in the relevant DS shall be as specified in Annex L of this specification. The frequency at which the test is carried out is normally 5 MHz to 7,5 MHz.

4.4.8 Screening effectiveness

The procedure for testing and the information to be given in the relevant SS or DS shall be as specified in 14.8 of IEC 169-1 and IEC 169-1-3.

NOTE: Pending availability of the formal details of conversion of the transfer impedance in the time domain to transfer impedance in the frequency domain, it has been proposed that the simple conversion given by the formula

$$t = \frac{1}{\omega} \left[\frac{1}{2\pi f} \right]$$

is adequate for connectors and ideal cables below 100 MHz. It may, therefore, be used to derive specific limits which apply to both time and frequency domains.

4.4.9 Discharge test (corona test)

The procedure for testing and the information to be given in the relevant SS or DS shall be as specified in sub-clause 14.11 of IEC 169-1.