



**BS CECC 30000: 1984**

*(Incorporating (CECC) Amendments 1 and 2)*

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British Standard

# Harmonized system of quality assessment for electronic components: Generic specification: Fixed capacitors

Système harmonisé d'assurance de la qualité des composants électroniques  
Spécification générique: condensateurs fixes

Harmonisiertes Gütebestätigungssystem für Bauelemente der Elektronik  
Fachgrundspezifikation: Festkondensatoren

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## BS CECC 30000 : 1984

**National foreword**

This British Standard has been prepared under the direction of the Electronic Components Standards Committee. It is identical with CENELEC Electronic Components Committee (CECC) 30000 : 1983 'Harmonized system of quality assessment for electronic components : Generic specification : Fixed capacitors (Issue 3) including Amendments 1 and 2 (1984).

This standard is a harmonized specification within the CECC system.

This standard supersedes BS E9070 which is withdrawn.

**Terminology and conventions.** The text of the CECC specification has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

**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 : 1983 'Specification for national implementation of CECC basic rules and rules of procedure'.

| International standard | Corresponding British Standard                                                                                                                                             |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ISO 3-1973             | BS 2045 : 1965 Preferred numbers                                                                                                                                           |
| ISO 497-1973           | (Technically equivalent)                                                                                                                                                   |
| ISO 1000-1973*         | BS 5555 : 1976* SI units and recommendations for the use of their multiples and of certain other units<br>(Identical)                                                      |
| IEC 62 : 1974          | BS 1852 : 1975 Marking codes for resistors and capacitors<br>(Identical)                                                                                                   |
| IEC 63 : 1963          | BS 2488 : 1966 Schedule of preferred numbers for the resistance of resistors and the capacitance of capacitors for telecommunication equipment<br>(Technically equivalent) |
|                        | BS 2011 Basic environmental testing procedures                                                                                                                             |
| IEC 68-1 : 1978†       | BS 2011 : Part 1.1 : 1980† General<br>(Identical)                                                                                                                          |
| IEC 68-2-1 : 1974      | BS 2011 : Part 2.1A : 1977 Tests A. Cold                                                                                                                                   |
| 68-2-1A : 1976         | (Identical)                                                                                                                                                                |
| IEC 68-2-2 : 1974      | BS 2011 : Part 2.1B : 1977 Tests B. Dry heat                                                                                                                               |
| 68-2-2A : 1976         | (Identical)                                                                                                                                                                |
| IEC 68-2-3 : 1969      | BS 2011 : Part 2.1Ca : 1977 Test Ca. Damp heat, steady state<br>(Identical)                                                                                                |
| IEC 68-2-6 : 1970‡     | BS 2011 : Part 2.1Fc : 1977‡ Test Fc. Vibration (sinusoidal)<br>(Identical)                                                                                                |
| IEC 68-2-13 : 1966     | BS 2011 : Part 2.1M : 1977 Test M. Low air pressure<br>(Identical)                                                                                                         |
| IEC 68-2-14 : 1974     | BS 2011 : Part 2.1N : 1977 Test N. Change of temperature<br>(Identical)                                                                                                    |
| IEC 68-2-17 : 1978     | BS 2011 : Part 2.1Q : 1981 Test Q. Sealing<br>(Identical)                                                                                                                  |
| IEC 68-2-20 : 1979     | BS 2011 : Part 2.1T : 1981 Test T. Soldering<br>(Identical)                                                                                                                |

European Committee for Electrotechnical Standardization (CENELEC)  
Cenelec Electronic Components Committee

# CECC

English version

Harmonized System of Quality Assessment for  
Electronic Components

## GENERIC SPECIFICATION: FIXED CAPACITORS

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Système Harmonisé d'Assurance de la Qualité  
des Composants Electroniques

## SPECIFICATION GÉNERIQUE: CONDENSATEURS FIXES

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Harmonisiertes Gütebestätigungssystem für  
Bauelemente der Elektronik

## FACHGRUNDSPEZIFIKATION: FESTKONDENSATOREN



# 3

Issue  
Edition  
Ausgabe

## CECC 30000

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## 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 accepted by 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 FIXED CAPACITORS. It should be read in conjunction with document CECC 00 100: Basic Rules (1974).

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, Sweden, Switzerland and the United Kingdom, and copies of it can be obtained from the addresses shown on the inside cover.

## PREFACE

This generic specification was prepared by CECC Working Group 3: "Capacitors", and it is an editorially revised version of CECC 30 000 Issue 2.

In accordance with the requirements of document CECC 00 100 it is based, wherever possible, on the requirements of the Publications of the International Electrotechnical Commission and in particular on IEC Publication 384-1: Fixed capacitors for use in electronic equipment: Part 1: Terminology and methods of test.

Sectional specifications shall refer to the equivalent IEC Publications and shall select from the relevant documents the terms and methods of test and specify test conditions and the possible requirements applicable to a particular sub-family.

The text of this generic specification was circulated to the CECC for voting in the documents listed below and was ratified by the President of the CECC for publication as a CECC Specification.

| <u>Document</u>       | <u>Voting date</u> | <u>Report on the voting</u> |
|-----------------------|--------------------|-----------------------------|
| CECC(Secretariat)1218 | July 1982          | CECC(Secretariat)1281       |
| CECC(Secretariat)1175 | April 1982         | CECC(Secretariat)1283       |
| CECC(Secretariat)1286 | January 1983       | CECC(Secretariat)1374       |

This third issue of CECC 30 000 shall become effective for all new qualification approvals on 1 January 1984. Issue 2 will continue to remain effective to cover all past approvals.

SECTION 1 - SCOPE1. Scope

This specification is applicable to fixed capacitors for use in electronic equipment.

It establishes standard terms, inspection procedures and methods of test for use in sectional and detail specifications within the CECC System for electronic components.

SECTION 2 - GENERAL2.1 Related documents

|                                                                 |                                                                                                                      |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| CECC 00100 (1974)                                               | Basic Rules                                                                                                          |
| ISO 3 (1973)                                                    | Preferred numbers - Series of preferred numbers                                                                      |
| ISO 497 (1973)                                                  | Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers |
| ISO 1000 (1973)                                                 | SI units and recommendations for the use of their multiples and of certain other units                               |
| IEC 27-1 (1971)                                                 | Letter symbols to be used in electrical technology: Part 1: General                                                  |
| IEC 50                                                          | International Electrotechnical Vocabulary                                                                            |
| IEC 62 (1974)                                                   | Marking codes for resistors and capacitors                                                                           |
| IEC 63 (1963)<br>Amendment No.1 (1967)<br>Amendment No.2 (1977) | Preferred number series for resistors and capacitors                                                                 |
| IEC 68                                                          | Basic environmental testing procedures                                                                               |
| IEC 68-1 (1978)                                                 | General                                                                                                              |
| IEC 68-2-1 (1974)<br>68-2-1A (1976)                             | Test A: Cold<br>First supplement                                                                                     |

|                                                                      |                                                                                              |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| IEC 68-2-2(1974)<br>68-2-2A (1976)                                   | Test B: Dry heat<br>First supplement                                                         |
| IEC 68-2-3 (1969)                                                    | Test Ca: Damp heat, steady<br>state                                                          |
| IEC 68-2-6 (1970)<br>Amendment No.1 (1972)                           | Test Fc: Vibration (sinusoidal)                                                              |
| IEC 68-2-13 (1966)                                                   | Test M: Low air pressure                                                                     |
| IEC 68-2-14 (1974)<br>Amendment No.1 (1978)                          | Test N: change of temperature                                                                |
| IEC 68-2-17 (1978)                                                   | Test Q: Sealing                                                                              |
| IEC 68-2-20 (1979)                                                   | Test T: Soldering                                                                            |
| IEC 68-2-21 (1975)<br>Amendment No.1 (1979)<br>Amendment No.2 (1980) | Test U: Robustness of terminations<br>and integral mounting devices                          |
| IEC 68-2-27 (1972)                                                   | Test Ea: Shock                                                                               |
| IEC 68-2-29 (1968)                                                   | Test Eb: Bump                                                                                |
| IEC 68-2-30 (1980)                                                   | Test Db: Damp heat, cyclic<br>(12 + 12 hour cycle)                                           |
| IEC 117                                                              | Recommended graphical symbols                                                                |
| IEC 294                                                              | Measurement of the dimensions<br>of a cylindrical component<br>having two axial terminations |
| IEC 410                                                              | Sampling plans and procedures<br>for inspection by attributes                                |

Note : The above references apply to the current editions, except for IEC 68 for which the referenced edition shall be used.

## 2.2 Units, symbols and terminology

### 2.2.1 General

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

ISO 1000  
IEC 27  
IEC 50  
IEC 117

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

### 2.2.2 Type

A group of components having similar design features and the similarity of whose manufacturing techniques enables them to be grouped together either for qualification approval or for quality conformance inspection.

They are generally covered by a single detail specification.

Note: Components described in several detail specifications, may, in some cases, be considered as belonging to the same type and may therefore be grouped together for qualification approval and quality conformance inspection.

### 2.2.3 Style

A sub-division of a type, generally based on dimensional factors.

A style may include several variants, generally of a mechanical order.

### 2.2.4 Grade

A term to indicate additional general characteristics concerning the intended application, for example long life application.

The term "Grade" may only be used in combination with one or more words (for example long life grade) and not by a single letter or number.

Figures to be added after the term "Grade" should be arabic numerals.

### 2.2.5 Family (of electronic components)

A group of electronic components which predominantly displays a particular physical attribute and/or fulfils a defined function.

### 2.2.6 Sub-family (of electronic components)

A group of components within a family manufactured by similar technological methods.

### 2.2.7 D.C. capacitor

A capacitor designed essentially for application with direct voltage.

Note: A d.c. capacitor may not be suitable for use on a.c. supplies. For other applications, e.g. pulse or a.c., the operating voltage shall be prescribed in the relevant specification.

2.2.8 Polar capacitor (for electrolytic capacitors)

A capacitor intended for use with a unidirectional voltage connected according to the polarity indication.

2.2.9 Bipolar capacitor (for electrolytic capacitors)

An electrolytic capacitor designed to withstand an alternating voltage and/or reversal of the applied direct voltage.

2.2.10 A.C. capacitor

A capacitor designed essentially for application with alternating voltages.

2.2.11 Pulse capacitor

A capacitor for use with pulses of current or voltage.

2.2.12 Rated capacitance ( $C_R$ )

The capacitance value for which the capacitor has been designed and which is usually indicated upon it.

2.2.13 Category temperature range

The range of ambient temperatures for which the capacitor has been designed to operate continuously; this is defined by the temperature limits of the appropriate category.

2.2.14 Upper category temperature

The maximum ambient temperature for which a capacitor has been designed to operate continuously.

2.2.15 Lower category temperature

The minimum ambient temperature for which a capacitor has been designed to operate continuously.

2.2.16 Rated temperature

The maximum ambient temperature at which the rated voltage may be continuously applied.

2.2.17 Rated voltage ( $U_R$ )

The maximum direct voltage or the maximum r.m.s. alternating voltage or peak value of pulse voltage which may be applied continuously to a capacitor at any temperature between the lower category temperature and the rated temperature (see 2.2.13).

#### 2.2.18 Category voltage ( $U_C$ )

The maximum voltage which may be applied continuously to a capacitor at its upper category temperature (see 2.2.14).

#### 2.2.19 Temperature derated voltage

For any temperature between the rated temperature and the upper category temperature, the temperature derated voltage is the maximum voltage that may be applied continuously to a capacitor.

Note: Information on the voltage/temperature dependence at temperatures between the rated temperature and the upper category temperature should, if applicable, be given in the sectional or the detail specification.

#### 2.2.20 Surge voltage ratio

The quotient of the maximum instantaneous voltage which may be applied to the terminations of the capacitor for a specified time at any temperature within the category temperature range and the rated voltage or the temperature derated voltage as appropriate. The number of times per hour that this voltage may be applied shall be specified.

#### 2.2.21 Rated ripple voltage

The r.m.s. value of the maximum allowable alternating voltage of a specified frequency superimposed on the d.c. voltage at which the capacitor may be operated continuously at a specified temperature. The sum of the direct voltage and the peak value of the alternating voltage applied to the capacitor shall not exceed the rated voltage or temperature derated voltage as applicable.

#### 2.2.22 Reverse voltage (for polar capacitors only)

A voltage applied to the capacitor terminations in the reverse polarity direction.

#### 2.2.23 Rated ripple current

The r.m.s. value of the maximum allowable alternating current of a specified frequency, at which the capacitor may be operated continuously at a specified temperature.

#### 2.2.24 Time constant

The product of the insulation resistance and the capacitance. It is normally expressed in seconds.

2.2.25 Tangent of loss angle ( $\tan \delta$ )

The power loss of the capacitor divided by the reactive power of the capacitor at a sinusoidal voltage of specified frequency.

2.2.26 Self-healing

The process by which the electrical properties of the capacitor, after a local breakdown of the dielectric, are rapidly and essentially restored to the values before the breakdown.

2.2.27 Maximum temperature of a capacitor

The temperature at the hottest point of its external surface.

Note: The terminations are considered to be part of the external surface.

2.2.28 Minimum temperature of a capacitor

The temperature at the coldest point of its external surface.

Note: The terminations are considered to be part of the external surface.

2.2.29 Minimum storage temperature

The minimum permissible ambient temperature which the capacitor shall withstand in the non-operating condition without damage.

Note: The maximum permissible storage temperature is equal to the upper category temperature.

2.2.30 Variation of capacitance with temperature

The variation of capacitance with temperature can be expressed in two ways:

- temperature characteristic of capacitance;
- temperature coefficient of capacitance.

(1) Temperature characteristic of capacitance

The term characterizing this property applies mainly to capacitors of which the variations of capacitance as a function of temperature, linear or non-linear, cannot be expressed with precision and certainty.

The temperature characteristic of capacitance is the maximum reversible variation of capacitance produced over a given temperature range within the category temperature range. It is expressed normally as a percentage of the capacitance related to a reference temperature of 20°C.

(2) Temperature coefficient of capacitance and temperature cyclic drift of capacitance

The terms characterizing these two properties apply to capacitors of which the variations of capacitance as a function of temperature are linear or approximately linear and can be expressed with a certain precision.

For these capacitors, the variation of capacitance for any temperature, within the category temperature range, can be analysed into two components:

- Temperature coefficient of capacitance ( $\alpha$ )

The rate of change of capacitance with temperature measured over a specified range of temperature. It is normally expressed in parts per million per degree Celsius ( $10^{-6}/^{\circ}\text{C}$ ).

- Temperature cyclic drift of capacitance

The maximum irreversible variation of capacitance observed at room temperature during or after the completion of a number of specified temperature cycles. It is expressed normally as percentage of the capacitance related to a reference temperature. This is normally  $20^{\circ}\text{C}$ .

The conditions of measurement, during or after temperature cycling, a description of the temperature cycle and the number of cycles, shall be stated.

2.2.31 Visible damage

Visible damage which reduces the usability of the capacitor for its intended purpose.

2.3 Preferred values

2.3.1 General

Each sectional specification shall prescribe the preferred values appropriate to the sub-family; for rated capacitance see 2.3.2.

2.3.2 Preferred values of rated capacitance

The preferred values of rated capacitance shall be taken from the series specified in IEC Publication 63.

2.4 Marking

2.4.1 General

The sectional specification shall indicate the identification criteria and other information to be shown on the capacitor and/or packing.

The order of priority for marking small capacitors shall be specified.

#### 2.4.2 Coding

When coding is used for capacitance value, tolerance or date of manufacture, the method shall be selected from those given in IEC Publication 62.

### SECTION 3 - QUALITY ASSESSMENT PROCEDURES

#### 3.1 Qualification approval/Quality assessment systems

For a Quality Assessment System the procedures of 3.4 and 3.5 shall be followed.

#### 3.2 Primary stage of manufacture

For fixed capacitor specifications, the primary stage shall be defined in the sectional specification.

#### 3.3 Structurally similar components

The grouping of structurally similar components for the purpose of qualification approval and quality conformance inspection shall be prescribed in the sectional specification.

#### 3.4 Qualification approval procedures

3.4.1 The manufacturer shall comply with:

- the general requirements of the Rule of Procedure 7 governing qualification approval
- the requirements for the primary stage of manufacture (see 3.2).

3.4.2 In addition to the requirements of 3.4.1 procedures (1) or (2) below shall apply:

- (1) The manufacturer shall produce test evidence of conformance to the specification requirements on three inspection lots for lot-by-lot inspection taken in as short as time as possible and one lot for periodic inspection. No major changes in the manufacturing process shall be made in the period during which the inspection lots are taken.

Samples shall be taken from the lots in accordance with IEC Publication 410 (see Appendix A). The capacitance and voltage ranges for which qualification approval is granted, are defined by the sample taken in accordance with the sampling procedures prescribed by the sectional specification.