
**Harmonized system of quality
assessment for electronic components
Sectional specification: Aluminium
electrolytic capacitors**

Système harmonisé d'assurance de la qualité des composants électroniques
Spécification intermédiaire: Condensateurs électrolytiques à l'aluminium

Harmonisiertes Gütebestätigungssystem für Bauelemente der Elektronik
Rahmenspezifikation: Aluminium-Electrolytkondensatoren

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) 30300 'Harmonized system of quality assessment for electronic components. Sectional specification: Aluminium electrolytic capacitors'.

This standard is a harmonized specification within the CECC system. The existing non-harmonized British Standard BS 9070 : 1971 : Section 8 'Aluminium electrolytic capacitors', will eventually be superseded by this standard, but for a period both standards will remain in force because of current BS 9078 series approvals.

Terminology and conventions. The text of the CECC specification has been approved as suitable for publication, without deviation, as a British Standard. Some terminology and certain conventions are not identical with those used in British Standards; attention is especially drawn to the following. The comma has been used throughout 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 harmonized with CECC 00100 is BS 9000 'General requirements for electronic components of assessed quality'.

For each of the following references to international standards given in the text, there is a corresponding British Standard; these are as listed below:

Reference to international standard	Corresponding British Standard
IEC 62: 1974	BS 1852 : 1975 Marking codes for resistors and capacitors
IEC 63: 1963	BS 2488 : 1966 Schedule for preferred numbers for the resistance of resistors and capacitance of capacitors for telecommunications equipment
IEC 68-1: 1968	BS 2011 Basic environmental testing procedures Part 1.1 : 1977 General
IEC 68-2-1: 1974	BS 2011 Basic environmental testing procedures Part 2.1A : 1977 Tests A: Cold
IEC 68-2-2: 1974	BS 2011 Basic environmental testing procedures Part 2.1B : 1977 Tests B: Dry heat
IEC 68-2-20: 1968	BS 2011 Basic environmental testing procedures Part 2.1T : 1977 Test Ta: Soldering
CECC 00007: 1973	BS E9007 : 1973 Harmonized system of quality assessment for electronic components: Basic specification: Sampling plans and procedures for inspection by attributes
CECC 30000: Edition 2: 1975	BS E9070 : 1975 Harmonized system of quality assessment for electronic components: General specification for fixed capacitors

NOTE. There are no corresponding British Standards for IEC 103 and IEC 384-4. The committees responsible for them having been consulted, their technical requirements are hereby confirmed as being acceptable, and insofar as they are called up in the main body of this standard as requirements to be complied with, they are to be regarded as mandatory for the purposes of this standard.

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

CECC

English Version

Harmonized System of Quality Assessment for
Electronic Components

**SECTIONAL SPECIFICATION:
ALUMINIUM ELECTROLYTIC
CAPACITORS**

Système Harmonisé d'Assurance de la Qualité
des Composants Electroniques

**SPECIFICATION INTERMEDIAIRE:
CONDENSATEURS
ELECTROLYTIQUES
A L'ALUMINIUM**

Harmonisiertes Gütebestätigungssystem für
Bauelemente der Elektronik

**RAHMENSPEZIFIKATION:
ALUMINIUM-ELEKTROLYT-
KONDENSATOREN**



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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 document 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 ALUMINIUM ELECTROLYTIC CAPACITORS. It should be read in conjunction with document CECC 00 100 : Basic Rules (1974).

At the date of printing of this document the member countries of the CECC are Belgium, Denmark, Germany, France, Ireland, Italy, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and copies of it can be obtained from the National Committees of the CENELEC in these countries.

PREFACE

This sectional specification was prepared by CECC Working Group 3 : "Capacitors".

It is one of a series of sectional specifications all relating to the generic specification printed as CECC 30 000.

In accordance with the requirements of document CECC 00 100, it is based, wherever possible, on the Publications of the International Electrotechnical Commission.

The text of this sectional specification was circulated to the CECC for voting in document CECC (Secretariat) 191 in August 1973, and was formally approved by the CECC for printing as a CECC Specification.

SECTION 1 - GENERAL1.1 Scope

This document relates to polar and bi-polar aluminium electrolytic capacitors with solid and non-solid electrolyte.

1.2 Related documents

The following document and any other documents to which it may relate are mandatory unless otherwise stated.

CECC 30 000 (Issue 2) (1975)

Generic Specification :
Fixed Capacitors

For information only :

IEC 384-4 (in publication)

Aluminium electrolytic capacitors for long life (Type 1) and for general purpose application (Type 2)

1.3 Terminology

See 2.2 of CECC 30 000 with the following additional definitions.

1.3.1 Capacitance

The capacitance of an electrolytic capacitor is the capacitance of an equivalent circuit having capacitance and resistance in series measured with alternating current of approximately sinusoidal wave form of the specified frequency.

1.3.2 Long life use capacitors

Long life use capacitors are capacitors intended for applications where a high degree of stability of characteristics over a long life is essential. The material is so chosen and manufacture so carried out that improved performance is obtained with consequent increase in life.

1.3.3 General use capacitors

General use capacitors are capacitors intended for applications where the high performance level of long life use capacitors is not required.

1.3.4 Reverse voltage (for polar capacitors only)

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

1.4 Marking

The following marking information, in the order of importance given below, is required :

- (1) Rated capacitance in microfarads .

Note : When values and tolerances are coded one of the methods specified in IEC 62 should be used.

- (2) Rated voltage, and, if different, the category voltage, and category temperatures (for long life use capacitors only). Direct voltage may be indicated by symbols --- or --- .
- (3) Polarity of the terminations.
For multisection capacitors, the rated capacitance and rated voltage of the sections connected to each termination shall be shown in an unambiguous way. The termination of a section which is intended for direct connection to the rectifier (so-called reservoir section) shall be marked with the number 1 or with the colour red.
- (4) Tolerance on rated capacitance (See also note to item 1).
- (5) Reference to the grade.(Only for long life use capacitors).
- (6) Rated ripple current (This marking may be omitted where dimensions and rated ripple current are established in the detail specification).
- (7) Climatic category.
- (8) Manufacturer's name or trade mark.
- (9) Year and month (or week) of manufacture : (See IEC 62 (1971))
- (10) Manufacturer's type designation.
- (11) Reference to the national and CECC number of the detail specification.

The capacitors shall be clearly marked with items (1) to (5) and with as many of the remaining items as is practical.

The package containing the capacitor(s) shall be clearly marked with all the information listed above as far as applicable.

Any additional marking shall be so applied that no confusion can arise.

SECTION 2 - RATINGS AND CHARACTERISTICS

The values given in detail specifications shall preferably be selected from the following :

2.1 Climatic categories

The aluminium electrolytic capacitors covered by this document are classified into climatic categories according to the general rules given in the Appendix of IEC 68-1.

The standard severities for the cold, dry heat and damp heat, steady state tests are within the following ranges :

Cold (Test Aa)	- 10 to - 55°C
Dry heat (Test Ba).	+ 70 to + 125°C
Damp heat, steady state (Test Ca)	4 to 56 days

Values selected within these ranges shall be chosen from those listed in the relevant tests of IEC 68-2. The severities for the cold and dry heat tests are the lower and upper category temperatures respectively.

2.2 Rated voltage (U_R)

Standard values of rated direct voltages taken from the R5 and R10 series of ISO R3 are :

For values < 250 V : 1 - 1,6 - 2,5 - 4 - 6,3 V and their decimal multiples. (R5 series)

For values ≥ 250 V : 250 - 315 - 350 - 400 - 450 V.
(250 - 315 and 400 V are in accordance with the R10 series, 350 and 450 V are permitted in addition).

2.3 Category voltage (U_C)

The category voltage is equal to the rated voltage, unless otherwise stated in the detail specifications.

2.4 Ripple voltage

An alternating voltage may be applied provided that the peak voltage resulting from the alternating voltage superimposed on the direct voltage does not exceed the value of rated direct voltage and that the rated ripple current (see 2.7) and the permissible reverse voltage (see detail specification) are not exceeded.

2.5 Reverse voltage

The permissible reverse voltage shall be prescribed in the detail specification.

2.6 Surge voltage ratio

The surge voltage shall be $1,15 \times$ the rated or category voltage for rated voltages ≤ 315 V or $1,1 \times$ the rated or category voltage for rated voltages > 315 V.

See also 4.14.

2.7 Rated ripple current

The rated ripple current at 100 or 120 Hz and at upper category temperature shall be prescribed in the detail specification.

Note. - This value is determined by the dimensions of the capacitor and several other factors; e.g. the dissipation factor and the permissible temperature rise.

See also 2.4 : Ripple voltage.

2.8 Rated capacitance

Standard values of rated capacitance in accordance with E6 series of IEC 63 are 1 - 1,5 - 2,2 - 3,3 - 4,7 and 6,8 and their decimal multiples.

The underlined values are preferred.

2.9 Tolerance on rated capacitance

Standard values of tolerances on rated capacitance are :

-10	/	+	10 %
-10	/	+	30 %
-10	/	+	50 %
-10	/	+	100 %
-20	/	+	20 %

SECTION 3 - QUALITY ASSESSMENT PROCEDURE3.1 Primary stage of manufacture

The primary stage of manufacture is the forming of the oxide.

3.2 Certified test records

When certified test records are prescribed in the detail specification the information required in 3.6 of CECC 30 000, Generic specification : Fixed capacitors, shall be made available when requested by a purchaser. After the endurance test the parameters for which variable information is required are the capacitance change, $\tan \delta$ and leakage current.

3.3 Qualification approval

Note : This corresponds to type test in IEC 103 (under revision).

3.3.1 Sampling

The sample shall be representative of the range of capacitors for which approval is sought. This may or may not be the complete range covered by the detail specification.

The sample shall consist of specimens having the lowest and highest voltages, and for these voltages the smallest and largest case size. When there are more than four case sizes an intermediate size shall also be tested. In each of these case size/voltage combinations (values) the highest capacitance shall be chosen. Thus for the approval of a range testing is required of either four or six values. Where the range consists of less than four values, the number of specimens to be tested shall be that required for four values.

The test schedule and samples required for qualification approval are given in Table 1. The headings of columns No. 4 to 10 have the following significance :

- | | |
|---|--|
| 4 | This is the number of specimens to be tested per value for each group or sub-group. |
| 5 | This is the total number of specimens required where four or less values are to be tested. |
| 8 | This is the total number of specimens required where six values are to be tested. |

- 6 and 9 These are the numbers of permissible defectives in any group or sub-group with reference to columns 5 and 8 respectively.
- 7 and 10 These are total numbers of permissible defectives for all groups (other than Group 0) and sub-groups combined with reference to columns 5 and 8 respectively.

Spares are permitted as follows :

- One per value which may be used to replace the permitted defective in Group 0 ;
- One per value which may be used as replacements for specimens lost due to incidents not attributable to the manufacturer.

3.3.2 Tests

The complete series of tests specified in Table 1 are required for the approval of capacitors covered by one detail specification. The tests of each group shall be carried out in the order stated.

The whole sample shall be subjected to the tests of Group 0 and then divided for testing in the other groups.

Specimens found to be defective during the tests of Group 0 shall not be used for the other groups.

When a capacitor has not satisfied the whole or a part of the tests of a group, this capacitor is counted as "one defective".

The approval is granted when the number of defectives does not exceed the number of permissible defectives specified.

3.4 Quality conformance inspection

3.4.1 Groups A and B inspection

These tests shall be carried out on a lot-by-lot basis according to Table 2.

A manufacturer may aggregate his current production into inspection lots subject to the following safeguards :

- (1) The inspection lot shall consist of capacitors produced with similar processes and materials, though they may be of different case sizes and values.
- (2) The sample tested shall contain capacitors of each of the values and dimensions in the inspection lot
 - proportionately to their number
 - with a minimum of five of the same value.

- (3) If the strict application of the sampling plan requires less than five of any one value in the sample, the basis for the drawing of samples shall be agreed between manufacturers and the ONS.

3.4.2 Group C inspection

These tests shall be carried out on a periodic basis according to Table 3.

Samples shall be representative of the current production for the specified periods and shall be divided into high, medium and low voltage ratings or case sizes. In any one period one high, one medium and one low voltage or case size shall be tested. In subsequent periods other voltages or case sizes shall be tested with the aim of covering the whole range of approval.

Table 1

Test schedule for qualification approval

(Other assessment levels will be included later)

1	2	3	4	5	6	7	8	9	10
Group No.	Test	Para-graph	Number of specimens tested per value	When 4 or less values are tested			When 6 values are tested		
				Number of specimens	Permissible defect.	Total permissible defect.	Number of specimens	Permissible defect.	Total permissible defect.
0	Visual examination, marking dimension Leakage current Capacitance Tangent of loss angle Impedance (1) Spares	4.3 4.4 4.5 4.6 4.7	30 2	120 8	1	~~X~~	180 12	2 ⁽²⁾	~~X~~
1a	U : Robustness of terminations Tb : Resistance to soldering heat	4.9.2 4.9.3	3	12	1		18	1	
1b	Ea : Shock 4.10.5.1 and/or Eb : Bump 4.10.5.2	4.10.2 4.10.3 4.10.4 4.10.5	6	24	1		36	2 ⁽²⁾	
1	Climatic sequence, consisting of Tests Ba: Dry heat - D: Damp heat, accel. (1st cycle) Aa : Cold - M: Low air pressure - D: Damp heat, accel., (remaining cycles)	4.11	9	36	2 ⁽²⁾		54	2 ⁽²⁾	
2	Ca: Damp heat steady state	4.12	5	20	1	4	30	2 ⁽²⁾	6
3	Endurance	4.13	5	20	1		30	2 ⁽²⁾	
4a	Surge voltage	4.14	2	8	1		12	1	
4b	Reverse voltage (1) Pressure relief (1)	4.15 4.16	2	8			12	1	
5a	Storage at upper cat. temp.	4.17	2	8	1		12	1	
5b	Storage at low temp. (1)	4.18	2	8			12	1	
6	Characteristics at high and low temperature Charge/discharge (1)	4.19 4.20	3	12	1		18	2 ⁽²⁾	

(1) If prescribed in the detail specification.

(2) Not more than one defective is permitted from any one value.

Documents

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Table 2Lot by lot tests

(Other assessment levels will be included later)

Group	Test	Paragraph No.	Inspection level	AQL %
A.1	Visual examination Marking Dimensions	4.3	S 4	2,5
A 2	Leakage current Capacitance Tangent of loss angle Impedance (1)	4.4 4.5 4.6 4.7	II	1,0
B 1	Solderability Storage at upper category temp. (1)	4.10.2 4.17	S 3	2,5
B 2	Impedance at low temperature (2)	4.19	S 3	2,5

- (1) If prescribed in the detail specification.
- (2) Test B2, impedance at low temperature, may be discontinued if it has given satisfactory results during one year of continuous production. It shall be reintroduced when a defective occurs in the same test of Group C6.

Note: Inspection level and acceptable quality level (AQL) for sample size according to CECC 00 007 (related to IEC 410).