IEC 60384-26

Edition 1.0 2010-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fixed capacitors for use in electronic equipment –
Part 26: Sectional specification – Fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte

Condensateurs fixes utilisés dans les équipements électroniques –
Partie 26: Spécification intermédiaire – Condensateurs fixes électrolytiques en aluminium à électrolyte solide en polymère conducteur

IEC 60384-26:2010

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 26: Sectional specification – Fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte

FOREWORD

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International Standard IEC 60384-26 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

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

FDIS	Report on voting
40/2052/FDIS	40/2062/RVD

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

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

A list of all parts of the IEC 60384 series can be found, under the general title *Fixed capacitors for use in the electronic equipment*, 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 26: Sectional specification – Fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte

1 General

1.1 Scope

This part of IEC 60384 is applicable to aluminium electrolytic capacitors with conductive polymer solid electrolyte primarily intended for d.c. applications for use in electronic equipment.

NOTE Aluminium electrolytic capacitors with solid (MnO_2) are covered by IEC 60384-4 and IEC 60384-4-2. Surface mount aluminium electrolytic capacitors with conductive polymer solid electrolyte are covered by IEC 60384-25 and IEC 60384-25-1.

1.2 Object

The object of this standard is to prescribe preferred ratings and characteristics and to select from IEC 60384-1, the appropriate quality assessment procedures, tests and measuring methods and to give general performance requirements for this type of capacitor. Test severities and requirements prescribed in detail specifications referring to this sectional specification shall be of equal or higher performance level, lower performance levels are not permitted.

1.3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60063:1963, *Preferred number series for resistors and capacitors*
Amendment 1 (1967)
Amendment 2 (1977)

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*[1]

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

IEC 60068-2-20:2008, *Environmental testing – Part 2-20: Tests – Test T – Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60384-1:2008, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

[1] For the tests in the IEC 60068 series of publication, the editions referenced in the applicable test clauses of the generic specification shall be used.

1.4 Information to be given in a detail specification

Detail specifications shall be derived from the relevant blank detail specification.

Detail specifications shall not specify requirements inferior to those of the generic, sectional or blank detail specification. When more severe requirements are included, they shall be listed in 1.9 of the detail specification and indicated in the test schedules, for example by an asterisk.

NOTE The information given in 1.4.1 may for convenience, be presented in tabular form.

The following information shall be given in each detail specification and the values quoted shall preferably be selected from those given in the appropriate clause of this sectional specification.

1.4.1 Outline drawings and dimensions

There shall be an illustration of the capacitor as an aid to easy recognition and for comparison of the capacitor with others. Dimensions and their associated tolerances, which affect interchangeability and mounting, shall be given in the detail specification. All dimensions shall preferably be stated in millimeters.

Normally the numerical values shall be given for cylindrical types, the body diameter, and the length and diameter, and the spacing of the terminations. When necessary, for example when a number of items (capacitance values/voltage ranges) are covered by a detail specification, the dimensions and their associated tolerances shall be placed in a table below the drawing.

When the configuration is other than described above, the detail specification shall state such dimensional information as will adequately describe the capacitor. When the capacitor is not designed for use on printed boards, this shall be clearly stated in the detail specification.

1.4.2 Mounting

The detail specification shall specify the method of mounting to be applied for normal use and for the application of the vibration and the bump or shock tests. The capacitors shall be mounted by their normal means. The design of the capacitor may be such that special mounting fixtures are required in its use. In this case, the detail specification shall describe the mounting fixtures and they shall be used in the application of the vibration and bump or shock tests.

1.4.3 Rating and characteristics

The ratings and characteristics shall be in accordance with the relevant clauses of this specification, together with the following:

1.4.3.1 Nominal capacitance range

See 2.2.1.

NOTE When products approved to the detail specification have different ranges, the following statement should be added:

"The range of values available in each voltage range is given in QPL (qualified products list)."

1.4.3.2 Particular characteristics

Additional characteristics may be listed, when they are considered necessary to specify adequately the component for design and application purposes.

1.4.3.3 Soldering

The detail specification shall prescribe the test methods, severities and requirement applicable for the solderability and the resistance to soldering heat tests.

1.4.4 Marking

The detail specification shall specify the content of the marking on the capacitor and on the package. Deviations from 1.6 of this sectional specification shall be specifically stated.

1.5 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60384-1, as well as the following apply.

1.5.1
capacitance of an electrolytic capacitor
capacitance of an equivalent circuit having capacitance and resistance in series measured with alternating current approximately sinusoidal waveform at a specified frequency

1.6 Marking

IEC 60384-1, 2.4 with the following details:

1.6.1 General

The information given in the marking is normally selected from the following list; the relative importance of each item is indicated by its position in the list:

a) nominal capacitance;
b) rated voltage (d.c. voltage may be indicated by the symbol (⎓ or ⎓));
c) polarity of the terminations;
d) tolerance on nominal capacitance;
e) year and month (or week) of manufacture;
f) manufacturer's name or trade mark;
g) climatic category;
h) manufacturer's type designation;
i) reference to the detail specification.

Any marking shall be legible and not easily smeared or removed by rubbing with the finger.

1.6.2 Marking on capacitor

The capacitor shall be clearly marked with a), b), c), d), e) and f) above with as many as possible of the remaining items as is considered necessary. Any duplication of information in the marking on the capacitor shall be avoided.

1.6.3 Marking on package

The package containing the capacitor(s) shall be clearly marked with all the information listed in 1.6.1

1.6.4 Additional markings

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

2 Preferred rating and characteristics

2.1 Preferred characteristics

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

2.1.1 Preferred climatic categories

The capacitors covered by this specification are classified into climatic categories according to the general rules given in IEC 60068-1, Clause 8.

The lower and upper category temperatures and the duration of the damp heat, steady state test shall be chosen from the following:

Lower category temperature: –55 °C

Upper category temperature: +105 °C and +125 °C

Duration of the damp heat, steady state test: 21 days

The severities for the cold and dry heat tests are the lower and upper category temperatures respectively.

2.2 Preferred values of ratings

2.2.1 Nominal capacitance (C_N)

The nominal capacitance shall be expressed in micro Farad (µF).

Preferred values of nominal capacitance are the values from the E6 and E12 series of IEC 60063 and their decimal multiples ($\times 10^n$, n: integer).

2.2.2 Tolerance on nominal capacitance

Preferred values of tolerance on nominal capacitance are: ± 10 % and ± 20 %.

2.2.3 Rated voltage (U_R)

Preferred values of rated direct voltages taken from R10 and R20 series of ISO 3 are:

From R10: 1,0 - 1,25 - 1,6 - 2,0 - 2,5 - 4,0 - 5,0 - 6,3 - 8,0

From R20: 3,5

and their decimal multiples ($\times 10^n$, n: integer).

2.2.4 Surge voltage

The surge voltage shall be 1,15 times the rated voltage rounded off (significant digit of 2) to the nearest volt. See Table 1.

Table 1 – Surge voltage

Rated voltage V	2,0	2,5	4,0	5,0	6,3	8,0	10	12,5	16	20	25	35
Surge voltage V	2,3	2,9	4,6	5,8	7,2	9,2	12	14	18	23	29	40

2.2.5 Rated temperature

The value of the rated temperature shall be upper category temperature.

3 Quality assessment procedures

3.1 Primary stage of manufacture

The primary stage of manufacture is the capacitor manufacturer's evaluation of the formed anode foil.

3.2 Structurally similar components

Capacitors considered as being structurally similar are capacitors produced with similar processes and materials, though they may be of different case sizes and values.

3.3 Declaration of conformity (basic requirements)

3.4 Test schedule and requirement for initial assessment (mandatory and optional tests)

The procedures for qualification approval testing are given in IEC 60384-1.

The schedule to be used for Qualification Approval testing on the basis of lot-by-lot and periodic tests is given in 3.5 of this specification. The procedure using a fixed sample size schedule is given in 3.4.1 and 3.4.2 below.

3.4.1 Qualification approval on the basis of the fixed sample size procedures sampling

The fixed sample size procedure is described in Q.5.3, b) of IEC 60384-1. 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 of capacitors of maximum and minimum size and for each of these sizes the maximum capacitance value for the highest rated voltage and minimum rated voltage of the voltage ranges for which approval is sought. When there are more than four rated voltages, an intermediate voltage shall also be tested. Thus for the approval of a range, testing is required of either four or six values (capacitance/voltage combinations) for each temperature characteristic. Where the total range consists of less than four values, the number of specimens to be tested shall be that required for four values.

In case assessment level EZ is used, spare specimens are permitted as follows:

Two (for 6 values) or three (for 4 values) per value which may be used as replacements for specimens, which are non-conforming because of incidents not attributable to the manufacturer. The numbers given in Group 0 assume that all groups are applicable. If this is not so the numbers may be reduced accordingly.

When additional groups are introduced into the qualification approval test schedule, the number of specimens required for Group 0 shall be increased by the same number as that required for the additional groups.

Table 2 gives the number of samples to be tested in each group or subgroup together with the number of permissible non-conformances for qualification approval test.

3.4.2 Tests

The complete series of tests specified in Table 2 and Table 3 are required for the approval of capacitors covered by one detail specification. The tests of each group shall be carried out in the order given.

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

Non-conforming (Table 2) specimens found during the tests of Group 0 shall not be used for the other groups.

"One non-conforming item" is counted when a capacitor has not satisfied the whole or a part of the tests of a group.

The approval is granted when the number or non-conforming items do not exceed the specified number of permissible non-conforming items for each group or subgroup and the total number of permissible non-conformances.

NOTE Table 2 and Table 3 together form the fixed sample size test schedule. Table 2 includes the details for the sampling and permissible non-conforming items for the different tests or groups of tests. Table 3 together with the details of the test contained in Clause 4 gives a complete summary of test conditions and performance requirements and indicates where, for example for the test method or conditions of test, a choice has to be made in detail specification.

The conditions of test and performance requirements for the fixed sample size test schedule shall be identical to those prescribed in the detail specification for quality conformance inspection.

Table 2 – Fixed sample size test plan for qualification approval, assessment level EZ

Group No.	Test	Subclause of this publication	Number of specimens n [b]	Permissible number of non-conforming items c [c]
0	High surge current [a]	4.22	120	0
	Visual examination	4.3		
	Dimensions	4.3		
	Leakage current	4.4.1		
	Capacitance	4.4.2		
	Tangent of loss angle (tan δ)	4.4.3		
	Equivalent series resistance (ESR)	4.4.4		
	Spare specimens		12	
1A	Robustness of terminations	4.5	12	0
	Resistance to soldering heat	4.6		
	Component solvent resistance [a]	4.17		
1B	Solderability	4.7	24	0
	Solvent resistance of the marking [a]	4.18		
	Rapid change of temperature	4.8		
	Vibration	4.9		
	Shock or bump (Specify in the detail specification)	4.10 or 4.11		
1	Climatic sequence	4.12	36	0
2	Damp heat, steady state	4.13	24	0
3	Endurance	4.14	36	0
4	Storage at high temperature	4.19	12	0
	Surge	4.15		
	Reverse voltage [a]	4.16		
5	Characteristics at high and low temperature	4.20	12	0
	Charge and discharge [a]	4.21		

a if required in the detail specification.

b For case size/voltage combinations, see 3.4.1.

c The permissible number of non-conforming items indicates acceptance criteria. In case non-conforming item(s) is equal or less than the number, this lot shall be accepted.