

INTERNATIONAL STANDARD



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

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CONTENTS

FOREWORD	6
1 General	8
1.1 Scope	8
1.2 Object	8
1.3 Normative references	8
1.4 Information to be given in a detail specification	9
1.4.1 General	9
1.4.2 Outline drawings and dimensions	9
1.4.3 Mounting	9
1.4.4 Rating and characteristics	10
1.4.5 Marking	10
1.5 Terms and definitions	10
1.6 Marking	10
1.6.1 General	10
1.6.2 Information for marking	11
1.6.3 Marking on capacitors	11
Additional markings	11
1.6.4 Marking on package packaging	11
2 Preferred ratings and characteristics	11
2.1 Preferred characteristics	11
Preferred climatic categories	11
2.2 Preferred values of ratings	12
2.2.1 Nominal capacitance (C_N)	12
2.2.2 Tolerance on nominal capacitance	12
2.2.3 Rated voltage (U_R)	12
2.2.4 Category voltage (U_C)	12
2.2.5 Surge voltage	12
2.2.6 Rated temperature	12
3 Quality assessment procedures	13
3.1 Primary stage of manufacture	13
3.2 Structurally similar components	13
Declaration of conformity (basic requirements)	13
Test schedule and requirement for initial assessment (mandatory and optional tests)	13
3.3 Certified test records of released lots	13
3.4 Qualification approval (QA) procedures	13
3.4.1 General	13
3.4.2 Qualification approval on the basis of the fixed sample size procedure s sampling	13
3.4.3 Tests	14
3.5 Quality conformance inspection	28
3.5.1 Formation of inspection lots	28
3.5.2 The schedule	29
3.5.3 Delayed delivery	29
3.5.4 Assessment levels	29
4 Test and measurement procedures	32

4.1	Pre-conditioning (if required).....	32
4.2	Measuring conditions	32
4.3	Visual examination and check of dimensions	32
4.3.1	General	32
4.3.2	Visual examination and check of dimensions	32
4.3.3	Requirements	32
4.4	Electrical tests	32
4.4.1	Leakage current.....	32
4.4.2	Capacitance	33
4.4.3	Tangent of loss angle ($\tan \delta$)	33
4.4.4	Equivalent series resistance (ESR).....	34
4.5	Robustness of terminations.....	34
4.5.1	General	34
4.5.2	Initial measurement inspection.....	34
4.5.3	Final inspections and requirements.....	34
4.6	Resistance to soldering heat.....	34
4.6.1	General	34
4.6.2	Initial measurement inspection.....	34
4.6.3	Test conditions	34
4.6.4	Final inspections, measurements and requirements.....	35
4.7	Solderability.....	35
4.7.1	General	35
4.7.2	Test conditions	35
4.7.3	Final inspections, measurements and requirements.....	35
4.8	Rapid change of temperature	35
4.8.1	General	35
4.8.2	Initial measurement inspection.....	35
4.8.3	Test conditions	35
4.8.4	Recovery	36
4.8.5	Final inspections, measurements and requirements.....	36
4.9	Vibration	36
4.9.1	General	36
4.9.2	Test conditions	36
4.9.3	Final inspections, measurements and requirements.....	36
4.10	Shock	36
4.10.1	General	36
4.10.2	Test conditions	36
4.10.3	Final inspections, measurements and requirements.....	37
4.11	Bump.....	37
4.11.1	General	37
4.11.2	Test conditions	37
4.11.3	Final examination, measurements inspections and requirements.....	37
4.12	Climatic sequence.....	37
4.12.1	General	37
4.12.2	Initial measurement inspection.....	37
4.12.3	Dry heat	37
4.12.4	Damp heat, cyclic, Test Db, first cycle	38
4.12.5	Cold.....	38
4.12.6	Damp heat, cyclic, Test Db, remaining cycles	38

4.12.7	Recovery	38
4.12.8	Final inspections, measurements and requirements	38
4.13	Damp heat, steady state	38
4.13.1	General	38
4.13.2	Initial measurement inspection	38
4.13.3	Test conditions	38
4.13.4	Recovery	38
4.13.5	Final inspections, measurements and requirements	38
4.14	Endurance	39
4.14.1	General	39
4.14.2	Initial measurement inspection	39
4.14.3	Test conditions	39
4.14.4	Recovery	39
4.14.5	Final inspections, measurements and requirements	39
4.15	Surge	39
4.15.1	General	39
4.15.2	Initial measurement inspection	39
4.15.3	Test procedure conditions	39
4.15.4	Recovery	39
4.15.5	Final inspections, measurements and requirements	40
4.16	Reverse voltage (if required by the detail specification)	40
4.16.1	Initial measurement inspection	40
4.16.2	Test procedure conditions	40
4.16.3	Recovery	40
4.16.4	Final inspections, measurements and requirements	40
4.17	Component solvent resistance (if required by the detail specification)	40
	Test conditions	
4.18	Solvent resistance of the marking (if required by the detail specification)	41
	Test conditions	
4.19	Storage at high temperature	41
4.19.1	General	41
4.19.2	Initial measurement inspection	41
4.19.3	Test conditions	41
4.19.4	Recovery	41
4.19.5	Final inspections, measurements and requirements	41
4.20	Characteristics at high and low temperature	41
4.20.1	General	41
4.20.2	Measurements Inspections and requirements	41
4.21	Charge and discharge (if required by the detail specification)	41
4.21.1	General	41
4.21.2	Initial measurement inspection	42
4.21.3	Test procedure conditions	42
4.21.4	Final inspections, measurements and requirements	42
4.22	High surge current (if required by the detail specification)	42
4.22.1	General	42
4.22.2	Initial measurement inspection	42
4.22.3	Final measurements inspections and requirements	42
	Bibliography	43

Table 1 – Surge voltages 12

Table 2 – ~~Fixed sample size test~~ Sampling plan for qualification approval, assessment level EZ 15

Table 3 – Test schedule for qualification approval (1 of 6) 16

Table 4 – ~~Test plan for~~ Lot-by-lot inspection ~~(Assessment level EZ)~~ 30

Table 5 – ~~Test plan for~~ Periodic inspection ~~(Assessment level EZ)~~ 31

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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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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) revision of the structure in accordance with ISO/IEC Directives, Part 2:2016 to the extent practicable, and harmonization between other similar kinds of documents;
- b) in addition, Clause 4 and all the tables have been reviewed in order to prevent duplications and contradictions.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
40/2599/FDIS	40/2605/RVD

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

This document 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 electronic equipment*, on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

The contents of the corrigendum of April 2020 have been included in this copy.

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~~ applies to fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte primarily intended for d.c. applications for use in electronic equipment.

NOTE Fixed aluminium electrolytic capacitors with solid (MnO₂) electrolyte are covered by IEC 60384-4 ~~and IEC 60384-4-2~~. Surface mount Fixed aluminium electrolytic surface mount capacitors with conductive polymer solid electrolyte are covered by IEC 60384-25 ~~and IEC 60384-25-1~~.

1.2 Object

The object of this document 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, because lower performance levels are not permitted.

1.3 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2013, *Environmental testing – Part 1: General and guidance*⁴

~~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 2016, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

~~IEC 60410:1973, sampling plans and procedures for inspection by attributes~~

⁴ ~~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.~~

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 61193-2:2007, *Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and packages*

ISO 3, *Preferred numbers – Series of preferred numbers*

1.4 Information to be given in a detail specification

1.4.1 General

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 1.4.2 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.

1.4.2 Outline drawings and dimensions

There shall be an illustration of the capacitors as an aid to easy recognition and for comparison of the capacitors 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 millimetres; ~~however, when the original dimensions are given in inches, the converted metric dimensions in millimetres shall be added.~~

~~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.~~

The numerical values of the body shall be given as follows:

- general case: width, length and height;
- for cylindrical body: diameter and length.

The numerical values of the terminals shall be given as follows:

- for leaded terminals: diameter, length and spacing.

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.~~

1.4.3 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.

1.4.4 Rating and characteristics

1.4.4.1 General

The ratings and characteristics shall be given in accordance with the relevant subclauses of this sectional specification, including the items specified in 1.4.4.2 to 1.4.4.4.

1.4.4.2 Nominal capacitance range

See 2.2.1.

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

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

"The nominal capacitance range available in each voltage range is given in the register of approvals, available for example on the website www.iecq.org".

1.4.4.3 Particular characteristics

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

1.4.4.4 Soldering

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

1.4.5 Marking

The detail specification shall specify the content of the marking on the capacitor and on the ~~package~~ packaging. Any deviations from 1.6 ~~of this sectional specification~~ shall be ~~specifically~~ stated in the detail specification.

1.5 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60384-1:2016 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

1.5.1

capacitance

<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

1.6.1 General

See IEC 60384-1:2016, 2.4, with 1.6.2, 1.6.3 and 1.6.4 of this document.

1.6.2 Information for marking

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) polarity of the terminations;
- b) nominal capacitance;
- c) rated voltage (d.c. voltage may be indicated by the symbol: $\overline{\text{---}}$ (IEC 60417-5031-2002-10) or ---);
- d) year and month (or, year and week) of manufacture;
- d) manufacturer's name and/or trade mark;
- e) tolerance on nominal capacitance;
- f) climatic category temperature;
- g) manufacturer's type designation;
- h) reference to the detail specification.

1.6.3 Marking on capacitors

~~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.~~

Polarity of the terminations shall be marked. The other information listed in 1.6.2 is marked as necessary.

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

1.6.4 Marking on package packaging

The package packaging containing the capacitors shall should be clearly marked with all the information listed in 1.6.2 as necessary.

~~1.6.4 Additional markings~~

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

2 Preferred ratings 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~~

Preferred climatic categories only shall be given in the preferred characteristics.

The capacitors covered by this sectional specification are classified into climatic categories in accordance with the general rules given in IEC 60068-1:2013, Annex A.

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

- lower category temperature: -55 °C ;
- upper category temperature: $+105\text{ °C}$ and $+125\text{ °C}$.

~~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)

Preferred values of nominal capacitance ~~shall be expressed~~ are indicated in microfarad (μF).

Preferred values of nominal capacitance ~~are the values~~ shall be taken from the ~~E6 and~~ E12 series of IEC 60063 as follows:

1,0 – 1,2 – 1,5 – 1,8 – 2,2 – 2,7 – 3,3 – 3,9 – 4,7 – 5,6 – 6,8 – 8,2;

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

2.2.2 Tolerance on nominal capacitance

Preferred values of tolerance on nominal capacitance are:

$\pm 10\%$ and $\pm 20\%$.

2.2.3 Rated voltage (U_R)

Preferred values of rated ~~direct~~ d.c. voltages taken from the R10 and R20 series of ISO 3 are:

- from R10: 1,0 – 1,25 – 1,6 – 2,0 – 2,5 – 3,15 – 4,0 – 5,0 – 6,3 – 8,0;
- from R20: 3,5¹ – 4,5;
- and their decimal multiples ($\times 10^n$, n : integer).

2.2.4 Category voltage (U_C)

The category voltage is equal to the rated voltage.

2.2.5 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 voltages

Values in volts

Rated voltage	2,0	2,5	4,0	5,0	6,3	8,0	10	12,5	16	20	25	35	50
Surge voltage	2,3	2,9	4,6	5,8	7,2	9,2	12	14	18	23	29	40	58

2.2.6 Rated temperature

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

¹ ISO 3 indicates the value 3,55 for R20.