IEC 60384-16

Edition 3.0 2019-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fixed capacitors for use in electronic equipment – Part 16: Sectional specification – Fixed metallized polypropylene film dielectric DC capacitors

Condensateurs fixes utilisés dans les équipements électroniques – Partie 16: Spécification intermédiaire – Condensateurs fixes pour courant continu à diélectrique en film de polypropylène métallisé

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FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

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International Standard IEC 60384-16 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This third edition cancels and replaces the second edition published in 2005. 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
40/2686/FDIS	40/2691/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.

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- withdrawn,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

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 16: Sectional specification – Fixed metallized polypropylene film dielectric DC capacitors

1 General

1.1 Scope

This part of IEC 60384 applies to fixed capacitors with metallized electrodes and poly-propylene dielectric for use in electronic equipment.

These capacitors can have "self-healing properties" depending on conditions of use. They are mainly intended for use with direct voltage.

The maximum power to be applied is 500 var at 50 Hz and the maximum peak voltage is 2 500 V.

The following two grades are covered;

a) Grade 1: for long-life application;

b) Grade 2: for general application.

Capacitors for alternating voltage and pulse applications are not included, but are covered by IEC 60384-17.

Capacitors for electromagnetic interference suppression are not included, but are covered by IEC 60384-14.

Capacitors for electrical shock hazard protection (covered by IEC 60065) and fluorescent lamp and motor capacitors are also excluded.

1.2 Object

The object of this document is to prescribe preferred ratings and characteristics and to select from IEC 60384-1:2016 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 are 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, *Preferred number series for resistors and capacitors*

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60384-1:2016, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

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

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

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 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.

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 drawing and dimensions

There shall be an illustration of the capacitors 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 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 the length of the body, the width and height of the body and the wire spacing, or for cylindrical types, the body diameter, and the length and diameter of the terminals. 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:

– width, length and height, or for cylindrical types, diameter and length.

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

– width or 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.

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 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 Ratings and characteristics

1.4.4.1 General

The ratings and characteristics shall be given in accordance with the relevant clauses of this sectional specification, including the items as specified below.

1.4.4.2 Nominal capacitance range

See 2.2.1.

When products approved in accordance with the detail specification have different ranges, the following statement should be added:

"The nominal capacitance range available in each voltage range is given in the register of approvals, available for example on the IECQ on-line certificate system 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 the test methods, severities and requirements applicable for the solderability and the resistance to the soldering heat test.

1.4.5 Marking

The detail specification shall specify the content of the marking on the capacitor and on the packaging. When there are deviations from 1.6, these shall be stated in the detail specification.

1.5 Terms and definitions

For the purposes of this document, the terms and definitions of 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
performance grade 1 capacitors
<long-life> capacitors intended for long-life applications with stringent requirements for the electrical parameters

1.5.2
performance grade 2 capacitors
<general purpose> capacitors for general application where the stringent requirements for grade 1 are not necessary

1.5.3
stability grade
capacitance drift after climatic and mechanical tests and after endurance tests

Note 1 to entry: The performance grade and the stability grade shall be noted in the detail specification.

1.5.4
performance grade and stability grade combinations
designation for combined performance grade and stability grade

SEE: Table 1

Table 1 – Preferred values

Performance grade	Stability grade	Combination designation
1	1	1.1
	2	1.2
2	–	2

Note 1 to entry: The three combinations of performance grades and stability grades concern capacitance stability and tan δ values. Distinction in performance of the three combinations is shown in Table 4.

1.5.5
rated voltage
maximum DC voltage that can be applied continuously to a capacitor at the rated temperature

Note 1 to entry: The sum of the DC voltage and the peak AC voltage applied to the capacitor shall not exceed the rated voltage. The value of the peak AC voltage allowed at different frequencies is under consideration.

1.6 Marking

1.6.1 General

See IEC 60384-1:2016, 2.4, with the following details.

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) nominal capacitance;
b) rated voltage (DC voltage may be indicated by the symbol ⎓ (IEC 60417-5031-2002-10) or ———);
c) tolerance on rated capacitance;
d) year and month (or, year and week) of manufacture;
e) manufacturer's name and/or trademark;
f) climatic category;
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) and c) above and with as many as possible of the remaining items as is considered necessary. Any duplication of information in the marking on the capacitor should be avoided.

1.6.4 Marking on packaging

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

2 Preferred ratings and characteristics

2.1 Preferred characteristics

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 from the following:

Lower category temperature:	−55 °C, −40 °C, −25 °C and −10 °C;
Upper category temperature:	+70 °C, +85 °C, +100 °C and +105 °C;
Duration of the damp heat, steady-state test:	4, 10, 21 and 56 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 taken from the E series of IEC 60063.

2.2.2 Tolerances on nominal capacitance

Preferred tolerances on the nominal capacitance are;

±20 %, ±10 %, ±5 %, ±2 % and ±1 %.

2.2.3 Nominal capacitance with associated tolerance values

For preferred combinations of capacitance, series and tolerances are shown in Table 2.

Table 2 – Preferred combinations of capacitance value series and tolerances

Preferred combinations	
Series	**Tolerances**
E 6	±20 %
E 12	±10 %
E 24	±5 %
E 48	±2 %
E 96	±1 %

2.2.4 Rated voltage (U_R)

The preferred values of rated voltages taken from the R5 series of ISO 3 are:

40 V – 63 V – 100 V – 160 V – 250 V – 400 V – 630 V – 1 000 V – 1 600 V – 2 500 V.