

# INTERNATIONAL STANDARD

# IEC 60384-2

QC 300400

Third edition  
2005-11

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## Fixed capacitors for use in electronic equipment –

### Part 2:

### Sectional specification:

### Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –****Part 2: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors**

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International Standard IEC 60384-2 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 1982, amendment 1 (1987) and amendment 2 (1992) and constitutes minor revisions related to tables, figures and references.

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

FDIS	Report on voting
40/1593/FDIS	40/1626/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.

IEC 60384 consists of the following parts, under the (new) general title *Fixed capacitors for use in electronic equipment*:

- Part 1: Generic specification
- Part 2: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors
- Part 3: Sectional specification: Fixed tantalum chip capacitors
- Part 4: Sectional specification: Aluminium electrolytic capacitors with solid and non-solid electrolyte
- Part 5: Sectional specification: Fixed mica dielectric d.c. capacitors with a rated voltage not exceeding 3000 V – Selection of methods of test and general requirements
- Part 6: Sectional specification: Fixed metallized polycarbonate film dielectric d.c. capacitors
- Part 7: Sectional specification: Fixed polystyrene film dielectric metal foil d.c. capacitors
- Part 8: Sectional specification: Fixed capacitors of ceramic dielectric, Class 1
- Part 9: Sectional specification: Fixed capacitors of ceramic dielectric, Class 2
- Part 11: Sectional specification: Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors
- Part 12: Sectional specification: Fixed polycarbonate film dielectric metal foil d.c. capacitors
- Part 13: Sectional specification: Fixed polypropylene film dielectric metal foil d.c. capacitors
- Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains
- Part 15: Sectional specification: Fixed tantalum capacitors with non-solid or solid electrolyte
- Part 16: Sectional specification: Fixed metallized polypropylene film dielectric d.c. capacitors
- Part 17: Sectional specification: Fixed metallized polypropylene film dielectric a.c. and pulse capacitors
- Part 18: Sectional specification: Fixed aluminium electrolytic chip capacitors with solid and non-solid electrolyte
- Part 19: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric chip d.c. capacitors
- Part 20: Sectional specification: Fixed metallized polyphenylene sulfide film dielectric chip d.c. capacitors
- Part 21: Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1
- Part 22: Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 2
- Part 23: Sectional specification: Fixed surface mount metallized polyethylene naphthalate film dielectric d.c. capacitors
- Part 24: Sectional specification – Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte (under consideration)
- Part 25: Sectional specification – Surface mount fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte (under consideration)

All sectional specifications mentioned above do have one or more blank detail specifications being a supplementary document, containing requirements for style, layout and minimum content of detail specifications.

The QC 300400 number that appears on the front cover of this publication is the specification number in the IECQ Quality Assessment System for Electronic Components.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

A bilingual version of this publication may be issued at a later date.

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## FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

### Part 2: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors

#### 1 General

##### 1.1 Scope

This part of IEC 60384 applies to fixed capacitors for direct current, with metallized electrodes and polyethylene-terephthalate dielectric for use in electronic equipment.

These capacitors may have "self-healing properties" depending on conditions of use. They are primarily intended for applications where the a.c. component is small with respect to the rated voltage. Two performance grades of capacitors are covered, Grade 1 for long-life application and Grade 2 for general application.

Capacitors for electromagnetic interference suppression and surface mount fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors are not included, but are covered by IEC 60384-14 and IEC 60384-19 respectively.

##### 1.2 Object

The object of this standard is to prescribe preferred ratings and characteristics and to select from IEC 60384-1 (1999) 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 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, *Environmental testing – Part 1: General and guidance*

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

IEC 60384-2-1, *Fixed capacitors for use in electronic equipment – Part 2: Blank detail specification: Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors. Assessment level E*

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

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



## 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 drawing and dimensions

These 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 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 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 Rated capacitance range

See 2.2.1.

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

"The range of values available in each voltage range is given in IEC QC001005."

#### 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 requirements applicable for the solderability and the resistance to soldering heat test.

### 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 purpose of this document, the terms and definitions given in IEC 60384-1 and the following apply.

### 1.5.1

#### performance grade 1 capacitors (long-life)

capacitors 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 capacitors are not necessary

### 1.5.3

#### rated voltage

maximum d.c. voltage which may be applied continuously to a capacitor at the rated temperature

NOTE The sum of the d.c. voltage and the peak a.c. voltage applied to the capacitor must not exceed the rated voltage. The value of the peak a.c. voltage must not exceed the following percentages of the rated voltage at the frequencies stated and must be not greater than 280 V:

50 Hz:	20 %
100 Hz:	15 %
1 000 Hz:	3 %
10 000 Hz:	1 %

unless otherwise specified in the detail specification.

## 1.6 Marking

See 2.4 of IEC 60384.1, with the following details:

**1.6.1** 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) rated capacitance;
- b) rated voltage (d.c. voltage may be indicated by the symbol  $\text{---}$  or  $\text{—}$ );
- c) tolerance on rated capacitance;
- d) category voltage;
- 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.

**1.6.2** 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.

**1.6.3** The package containing the capacitors shall be clearly marked with all the information listed in 1.6.1.

**1.6.4** 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 detail specifications 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.

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 and –25 °C

Upper category temperature: +85 °C, +100 °C and +125 °C

Duration of the damp heat, steady-state test: 4, 10, 21 and 56 days

NOTE With continuous operation at 125 °C in excess of the endurance test time, accelerated ageing has to be considered (see detail specification).

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 Rated capacitance ( $C_R$ )**

Preferred values of rated capacitance are: 1, 1,5, 2,2, 3,3, 4,7 and 6,8 and their decimal multiples.

These values conform to the E6 series of preferred values given in IEC 60063.

If other values are required, they shall preferably be chosen from the E12 series.

#### **2.2.2 Tolerance on rated capacitance**

The preferred tolerances on the rated capacitance are  $\pm 5\%$ ,  $\pm 10\%$  and  $\pm 20\%$ .

#### **2.2.3 Rated voltage ( $U_R$ )**

The preferred values of rated voltage are: 40 V – 63 V – 100 V – 160 V – 250 V – 400 V – 630 V – 1 000 V – 1 600 V. These values conform to the basic series of preferred values R5 given in ISO 3.