IEC 60384-19

Edition 2.0 2006-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fixed capacitors for use in electronic equipment –
Part 19: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric surface mount d.c. capacitors

Condensateurs fixes utilisés dans les équipements électroniques –
Partie 19: Spécification intermédiaire: Condensateurs fixes pour montage en surface pour courant continu à diélectrique en film de polyéthylène téréphtalate métallisé

IEC 60384-19:2006

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 19: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric surface mount d.c. capacitors

FOREWORD

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International Standard IEC 60384-19 has been prepared by technical committee 40: Capacitors and resistors for electronic equipment.

This second edition cancels and replaces the first edition published in 1993 and constitutes minor revisions related to tables, figures and references.

This bilingual version (2012-03) corresponds to the monolingual English version, published in 2006-01.

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

FDIS	Report on voting
40/1622/FDIS	40/1645/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.

The French version of this standard has not been voted upon.

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

IEC 60384 consists of the following parts, under the 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 surface mount 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 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 surface mount capacitors with solid and non-solid electrolyte

Part 19: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric surface mount d.c. capacitors

Part 20: Sectional specification: Fixed metallized polyphenylene sulfide film dielectric surface mount 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 DC capacitors

Part 24: Sectional specification - Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte [1]

Part 25: Sectional specification - Surface mount fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte[1]

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 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.

1 To be published.

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 19: Sectional specification – Fixed metallized polyethylene-terephthalate film dielectric surface mount d.c. capacitors

1 General

1.1 Scope

This part of IEC 60384 is applicable to fixed surface mount capacitors for direct current, with metallized electrodes and polyethylene-terephthalate dielectric for use in electronic equipment. These capacitors have metallized connecting pads or soldering strips and are intended to be mounted direct onto substrates for hybrid circuits or onto printed boards. 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.

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

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 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

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 inter-changeability and mounting, shall be given in the detail specification. All dimensions are preferably to be stated in millimetres.

Normally, the numerical values shall be given for the length, width and height of the body. When necessary, for example when a number of items (sizes and capacitance/voltage ranges) is 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.

1.4.2 Mounting

The detail specification shall give guidance on methods of mounting for normal use. Mounting for test and measurement purposes (when required) shall be in accordance with 4.1 of this sectional specification.

1.4.3 Ratings 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 have different ranges, the following statement should be added: "The range of capacitance values available in each voltage range is given in IEC QC 001005.".

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 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 sectional specification, the terms and definitions given in IEC 60384-1, as well as the following, apply.

1.5.1
surface mount capacitor
capacitor whose small dimensions and nature or shape of terminations make it suitable for surface mounting in hybrid circuits and on printed boards

1.5.2
performance grade 1 capacitors (long-life)
capacitors for long-life applications with stringent requirements for the electrical parameters

1.5.3
performance grade 2 capacitors (general-purpose)
capacitors for general applications where the stringent requirements for grade 1 capacitors are not necessary

1.5.4
rated voltage (U_R)
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 should not exceed the rated voltage. The value of the peak a.c. voltage should not exceed the following percentages of the rated voltage at the frequencies stated and should 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 IEC 60384-1, 2.4, 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 ⎓ or ⎓);
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 Surface mount capacitors are generally not marked on the body. If some marking can be applied, they shall be clearly marked with as many as possible of the above items as is considered useful. Any duplication of information in the marking on the capacitor should be avoided.

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

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

1.6.5 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 surface mount 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 temperature 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)

The 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 ±5 %, ±10 % and ±20 %.

2.2.3 Rated voltage (U_R)

The preferred values of rated voltage are:

25 V - 40 V - 63 V - 100 V - 160 V - 250 V - 400 V - 630 V.

These values conform to the basic series of preferred values R5 given in ISO 3.

2.2.4 Category voltage (U_C)

The category voltage is:

0,8 U_R for upper category temperature 100 °C and 0,5 U_R for upper category temperature 125 °C.

2.2.5 Rated temperature

The standard value of rated temperature is 85 °C.

3 Quality assessment procedures

3.1 Primary stage of manufacture

The primary stage of manufacture is the winding of the capacitor element or the equivalent operation.

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 capacitance and voltage values.

3.3 Certified records of released lots

The information required in IEC 60384-1, 3.9, shall be made available when prescribed in the detail specification and when requested by a purchaser. After the endurance test the parameters for which variables information is required are the capacitance change, tan δ and the insulation resistance.

3.4 Qualification approval

The procedures for qualification approval testing are given in IEC 60384-1, 3.5.

The schedule to be used for qualification approval testing on the basis of lot-by-lot and periodic tests is given in 3.5. The procedure using a fixed sample size schedule is given in 3.4.1.

3.4.1 Qualification approval on the basis of the fixed sample size procedure

3.4.1.1 Sampling

The fixed sample size procedure is described in IEC 60384-1, 3.5.3b). 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 lowest and highest capacitances. 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). When the range consists of less than four values, the number of specimens to be tested shall be that required for four values.

Spare specimens are permitted as follows:

- two (for six values) or three (for four 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 1 gives the number of samples to be tested in each group or subgroup together with the permissible number of nonconformances for qualification approval tests.

3.4.1.2 Tests

The complete series of tests specified in Tables 1 and 2 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.

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

"One nonconforming 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 of nonconforming items does not exceed the specified number of permissible nonconformances for each group or subgroup and the total number of permissible nonconformances.

NOTE Tables 1 and 2 together form the fixed sample size test schedule. Table 1 includes the details for the sampling and permissible nonconformances for the different tests or groups of tests. Table 2, together with the details of tests 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 should be made in the 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 1 – Fixed sample size test plan for qualification approval
Assessment level EZ

Group No.	Test	Subclause of this publication	Number of specimens *n*[a]	Permissible number of non-conforming items *c*
0	Visual examination	4.2		
	Dimensions	4.2		
	Capacitance	4.3.2	144	0
	Tangent of loss angle	4.3.3		
	Voltage proof	4.3.1		
	Insulation resistance	4.3.4		
	Spare specimens		12	
1A	Resistance to soldering heat	4.6	12	0
	Component solvent resistance[b]	4.13		
1B	Solderability	4.7	12	0
	Solvent resistance of the marking[b]	4.14		
2	Substrate bending test (formerly bond strength of the end face plating)	4.5	12	0
3	Mounting	4.1		
	Visual examination	4.2		
	Capacitance	4.3.2	108	0[c)]
	Tangent of loss angle	4.3.3		
	Voltage proof	4.3.1		
	Insulation resistance	4.3.4		
3.1	Shear (formerly adhesion) test	4.4		
	Rapid change of temperature	4.8	24	0
	Climatic sequence	4.9		
3.2	Damp heat, steady state	4.10	24	0
3.3	Endurance	4.11	36	0
3.4	Charge and discharge	4.12	24	0

[a] Capacitance/voltage combinations, see 3.4.1.

[b] If required by the detail specification.

[c] Specimens found defective after mounting shall not be taken into account when calculating the permissible nonconforming items for the following tests. They shall be replaced by spare parts.