INTERNATIONAL STANDARD

IEC 60384-19-1

QC 302201

Second edition
2006-01

Fixed capacitors for use in electronic equipment –

Part 19-1:
Blank detail specification –
Fixed metallized polyethylene-terephthalate film dielectric surface mount d.c. capacitors –
Assessment level EZ

Reference number
IEC 60384-19-1:2006(E)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 19-1: Blank detail specification – Fixed metallized polyethylene-terephthalate film dielectric surface mount d.c. capacitors – Assessment level EZ

FOREWORD

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International Standard IEC 60384-19-1 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 1993 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
40/1623/FDIS	40/1646/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 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]

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.

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[1] To be published.

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 edition of this blank detail specification may be issued at a later date.

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 19-1: Blank detail specification – Fixed metallized polyethylene-terephthalate film dielectric surface mount d.c. capacitors – Assessment level EZ

Blank detail specification

A blank detail specification is a supplementary document to the sectional specification and contains requirements for style and layout and minimum content of detail specifications. Detail specifications not complying with these requirements may not be considered as being in accordance with IEC specifications nor shall they so be described.

In the preparation of detail specifications, the content of 1.4 of the sectional specification shall be taken into account.

The numbers between brackets on the first page correspond to the following information which shall be inserted in the position indicated.

Identification of the detail specification

[1] The "International Electrotechnical Commission" or the National Standards Organization under whose authority the detail specification is drafted.

[2] The IEC or National Standards number of the detail specification, date of issue and any further information required by the national system.

[3] The number and issue number of the IEC or national generic specification.

[4] The IEC number of the blank detail specification.

Identification of the capacitor

[5] A short description of the type of capacitor.

[6] Information on typical construction (when applicable).

When the capacitor is not designed for use in printed-board applications, this shall be clearly stated in the detail specification in this position.

[7] Outline drawing with main dimensions which are of importance for interchangeability and/or reference to the national or international documents for outlines. Alternatively, this drawing may be given in an annex to the detail specification.

[8] Application or group of applications covered and/or assessment level.

NOTE The assessment level(s) to be used in a detail specification are selected from 3.5.4 of the sectional specification. This implies that one blank detail specification may be used in combination with several assessment levels, provided the grouping of the tests does not change.

[9] Reference data on the most important properties, to allow comparison between the various capacitor types.

[1]	IEC 60384-19-1-XXX [2] QC 302201-XXX
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]	IEC 60384-19-1 [4] QC 302201
	FIXED METALLIZED POLYETHYLENE-TEREPHTHALATE FILM DIELECTRIC DC SURFACE MOUNT CAPACITORS [5]
Outline drawing: (see Table 1) [...angle projection] [7]	[6]
[Other shapes are permitted within the dimensions given.]	Assessment level(s): EZ [8]

Information on the availability of components qualified to this detail specification is given in IEC QC 001005

(9)

1 General data

1.1 Recommended method(s) of mounting (to be inserted)

See IEC 60384-19, 1.4.2

1.2 Dimensions

Table 1 – Case size reference and dimensions

Case size reference	**Dimensions** mm						
	L_1 **max**	W_1 **max**	H_1 **max**	L_2	L_3	L_4 **min**	....

When there is no case size reference, Table 1 may be omitted and the dimensions shall be given in Table 2, which then becomes Table 1.

The dimensions shall be given as maximum dimensions or as nominal dimensions with a tolerance.

1.3 Ratings and characteristics

Capacitance range	(see Table 2)
Tolerance on rated capacitance	
Rated voltage	(see Table 2)
Category voltage (if applicable)	(see Table 2)
Climatic category	
Rated temperature	
Max. a.c. voltage (if applicable)	
Max. pulse load (if applicable)	
Tangent of loss angle	
Insulation resistance	

Table 2 – Values of capacitance and of voltage related to case sizes

Rated voltage				
Category voltage[a]				
Rated capacitance (in nF and/or µF)	**Case size**	**Case size**	**Case size**	**Case size**

[a] If different from the rated voltage.

1.4 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 60384-1, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

IEC 60384-19, *Fixed capacitors for use in electronic equipment – Part 19: Sectional specification Fixed metallized polyethylene-terephthalate film dielectric surface mount d.c. capacitors*

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

1.5 Marking

The marking of the capacitor and the package shall be in accordance with the requirements of IEC 60384-19, 1.6.

The details of the marking of the component and package shall be given in full in the detail specification.

1.6 Ordering information

Orders for capacitors covered by this specification shall contain, in clear or in coded form, the following minimum information:

a) rated capacitance;

b) tolerance on rated capacitance;

c) rated d.c. voltage;

d) number and issue reference of the detail specification and style reference;

e) packaging instructions.

1.7 Certified records of released lots

Required/not required.

1.8 **Additional information** (not for inspection purposes)

1.9 Additional or increased severities or requirements to those specified in the generic and/or sectional specification

NOTE Additions or increased requirements should be specified only when essential.

Table 3 – Other characteristics

This table is to be used for defining characteristics which are additional to, or more severe than, those given in the sectional specification.

2 Inspection requirements

2.1 Procedures

2.1.1 For qualification approval, the procedures shall be in accordance with the sectional specification, IEC 60384-19, 3.4.

2.1.2 For quality conformance Inspection, the test schedule (Table 4) includes sampling, periodicity, severities and requirements. The formation of inspection lots is covered by IEC 60384-19, 3.5.1.

Table 4 – Test schedule for quality conformance Inspection

Subclause number and test[a]	D or ND	Conditions of test[a]	*IL*	*n* [c]	*c*	Performance requirements[a]
GROUP A INSPECTION (Lot-by-lot)						
Subgroup A0	ND		100 % [d]			
4.3.2 Capacitance		Frequency : 1kHz for all capacitance values				Within specified tolerance
4.3.3 Tangent of loss angle		Method : …				As in 4.3.3.2
4.3.1 Voltage proof (Test A)		Measuring point 1a				No breakdown or flashover. Self-healing breakdown allowed.
4.3.4 Insulation resistance (Test A)		Measuring point 1a				As in 4.3.4.3
Subgroup A1	ND		S-3	[b]	0	
4.2 Visual examination						As in 4.2.2 Legible marking (if applicable) and as specified in 1.5 of this specification
Subgroup A2	ND		S-3	[b]	0	
4.2 Dimensions						As specified in Table 1 of this specification
GROUP B INSPECTION (Lot-by-lot)						
Subgroup B1	D		S-3	[b]	0	
4.7 Solderability		No ageing Method: …				
4.7.2 Final measurements		Visual examination				As in 4.7.2
Subgroup B2	D		S-3	[b]	0	
4.14 Solvent resistance of the marking (if applicable)[f]		Solvent: … Solvent temperature: … Method 1 Rubbing material: cotton wool Recovery: …				Legible marking

Table 4 *(continued)*

Subclause number and test[a]	D or ND	Conditions of test[a]	Sample size and acceptance criterion[c]			Performance requirements[a]
			p	*n*	*c*	
GROUP C INSPECTION (Periodic)						
Subgroup C1	D		3	12	0[g)]	
4.6 Resistance to soldering heat		Method: …				
4.6.1 Initial measurements		Capacitance				
4.6.2 Test conditions		Duration: …				
		If method 1 is applied, immersion and withdrawal speed shall be 25 mm/s ± 2,5 mm/s				
		Recovery: 24 h ± 2 h				
4.6.3 Final measurements		Visual examination				As in 4.6.3
		Capacitance				$\Delta C/C \leq$ 3% of value measured in 4.6.1
4.13 Components solvent resistance (if applicable)		Solvent: …				See detail specification
		Solvent temperature				
		Method 2				
		Recovery: …				
Subgroup C2	D		3	12	0[g)]	
4.5 Substrate bending test						
Subgroup C3	D					
4.1 Mounting[h]		Substrate material: …[i]				
4.2.1 Visual examination						As in detail specification
4.3.2 Capacitance						$\Delta C/C \leq$ 2% of value measured before mounting
4.3.3 Tangent of loss angle		Frequency: 1 kHz (for all capacitance values) 10 kHz for capacitors with $C_R \leq 1$ µF (in addition, see 4.3.3.3)				As in 4.3.3 (Reference values for final measurements in subgroups C3.1, C3.3 and C3.4)
4.3.4 Insulation resistance						As in 4.3.4.3

Table 4 *(continued)*

Subclause number and test[a]	D or ND	Conditions of test[a]	Sample size and acceptance criterion[c]			Performance requirements[a]
			p	*n*	*c*	
Subgroup C3.1	D		6	27	0[g)]	
4.4 Shear						
4.8 Rapid change of temperature						
4.8.1 Initial measurements		Not required, see Subgroup C3				
4.8.2 Test conditions		T_A = Lower category temperature T_B = Upper category temperature Five cycles Duration t_1 = 30 min				
4.8.3 Intermediate inspection		Visual examination				
4.9 Climatic sequence						
4.9.1 Initial measurements		Not required, see Subgroup C3				
4.9.2 Dry heat		Temperature: upper category temperature Duration: 16 h				
4.9.3 Damp heat, cycle, test Db, first cycle						
4.9.4 Cold		Temperature: lower category temperature Duration: 2 h				
4.9.5 Damp heat, cycle, test Db, remaining cycles		Within 15 min after removal from test chamber U_R to be applied for 1 min				
4.9.6 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C \leq 5$ % of the value measured in Subgroup C3
		Tangent of loss angle: at 10 kHz for $C_R \leq 1$ µF				Increase of tan δ: ≤ 0,005 for Grade 1 ≤ 0,008 for Grade 2
		at 1 kHz for $C_R > 1$ µF				≤ 0,003 for Grade 1 ≤ 0,005 for Grade 2 compared to values measured in Subgroup C3
		Insulation resistance				≥ 50 % of values in 4.3.4.3
Subgroup C3.2	D		6	15	0[g)]	
4.10 Damp heat, steady state						
4.10.1 Initial measurements		Not required, see Subgroup C3				

Table 4 *(continued)*

Subclause number and test[a]	D or ND	Conditions of test[a]	Sample size and acceptance criterion[c]			Performance requirements[a]
			p	*n*	*c*	
4.10.2 Final measurements		Visual examination				No visible damage
		Capacitance				$\Delta C/C$ ≤ 5 % of the value measured in Subgroup C3
		Tangent of loss angle at 1 kHz				Increase of tan δ: ≤ 0,005 compared to values measured in Subgroup C3
		Insulation resistance				≥ 50 % of values in 4.3.4.3
Subgroup C3.3	D		3	15	0[g)]	
4.11 Endurance						
4.11.1 Initial measurements		Not required, see Subgroup C3				
4.11.2 Test conditions		See 4.11.2, 4.11.3 and 4.11.4				
4.11.5 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ ≤ 5 % for Grade 1 $\Delta C/C$ ≤ 8 % for Grade 2 compared to values measured in Subgroup C3
		Tangent of loss angle: at 10 kHz for C_R ≤ 1 µF				Increase of tan δ: ≤ 0,003 for Grade 1 ≤ 0,005 for Grade 2
		at 1 kHz for C_R > 1 µF				≤ 0,002 for Grade 1 ≤ 0,003 for Grade 2 compared to values measured in Subgroup C3
		Insulation resistance				≥ 50 % of values in 4.3.4.3
Subgroup C3.4	D		6	9	0[g)]	
4.12 Charge and discharge						
4.12.1 Initial measurement		Not required, see Subgroup C3				
4.12.2 Test conditions		10 000 cycles				
4.12.3 Final measurements		Capacitance				$\Delta C/C$ ≤ 3 % for Grade 1 $\Delta C/C$ ≤ 5 % for Grade 2 compared to value measured in Subgroup C3
		Tangent of loss angle: at 10 kHz for C_R ≤ 1 µF				Increase of tan δ: ≤ 0,003 for Grade 1 ≤ 0,005 for Grade 2
		at 1 kHz for C_R > 1 µF				≤ 0,002 for Grade 1 ≤ 0,003 for Grade 2 compared to values measured in Subgroup C3
		Insulation resistance				≥ 50 % of values in 4.3.4.3

Table 4 *(continued)*

[a] Subclause numbers of tests and performance requirements refer to the sectional specification, IEC 60384-19 and Clause 1 of this specification.

[b] Number to be tested: sample size as directly allotted to the code letter for *IL* in Table 2a of IEC 60410 (single sampling plan for normal inspection).

[c] In this table:

p = periodicity (in months)

n = sample size

c = acceptance criterion (permitted number of defectives)

D = destructive

ND = non-destructive

IL = inspection level

[d] 100% testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million (ppm). The sampling level shall be established by the manufacturer. For the calculation of ppm values any parametric failure shall be counted as a nonconforming item. If one or more nonconforming items occur in a sample, this lot shall be rejected.

[e] This test may be replaced by in-production testing if the manufacturer installs statistical process control (SPC) on dimensional measurements or other mechanisms to avoid parts exceeding the limits.

[f] This may be carried out on surface mount capacitors mounted on a substrate.

[g] If one nonconforming item is obtained, all the tests of the subgroup shall be repeated on a new sample and then no further nonconforming items are permitted. Release of the product may continue during repeat testing.

[h] Any specimen found defective after mounting shall not be taken into account when calculating the permissible non-conforming items for the following tests. They shall be replaced by spare parts.

[i] When different substrate materials are used for the individual subgroups, the detail specification shall indicate which substrate material is used in each subgroup.

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