INTERNATIONAL STANDARD

IEC 60384-8-1

QC 300601

Second edition
2005-05

Fixed capacitors for use in electronic equipment –

Part 8-1:
Blank detail specification:
Fixed capacitors of ceramic dielectric, Class 1 – Assessment level EZ

Reference number
IEC 60384-8-1:2005(E)

Publication numbering

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 8-1: Blank detail specification: Fixed capacitors of ceramic dielectric, Class 1 – Assessment level EZ

FOREWORD

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International Standard IEC 60384-8-1 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 1988, amendment 1 (1993) and amendment 2 (2000). This second edition is a result of maintenance activities related to the previous edition. All changes that have been agreed upon can be categorized as minor revisions.

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

FDIS	Report on voting
40/1529/FDIS	40/1549/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 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[1]

Part 24: Sectional specification – Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte①

Part 25: Sectional specification – Surface mount fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte①

[1] To be published.

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.

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

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT

Part 8-1: Blank detail specification: Fixed capacitors of ceramic dielectric, Class 1 – 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 be so 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).

NOTE When the capacitor is not designed for use in printed board applications, this should 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 is/are selected from the sectional specification, 3.5.4. 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 60384-8-1-XXX QC 300601-XXX [2]
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]	IEC 60384-8-1 QC 300601 [4]
	FIXED CAPACITORS OF CERAMIC DIELECTRIC, CLASS 1 [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 60384-8, 1.4.2).

1.2 Dimensions

Table 1 – Case size reference and dimensions

Case size reference	Dimensions (in mm)						
	∅	*L*	*H*	*d*	.....		

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

Rated capacitance range (see Table 2)
Tolerance on rated capacitance
Rated voltage
Category voltage (see Table 2)
Climatic category
Rated temperature
Tangent of loss angle
Insulation resistance
Temperature coefficient α: … 10^{-6}/K

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

Rated voltage					
Temperature coefficient α					
Rated capacitance (in pF and/or nF)	Tolerance %	Case size	Case size	Case size	Case size

Table 3 – Temperature coefficient, permissible capacitance variation and cyclic drift

Temperature coefficient (nominal value) and tolerance(s)		Change of capacitance at:			Cyclic drift
		Lower category temperature	85 °C	Upper category temperature	
T.C. nearest to zero	minimum tolerance				
	maximum tolerance				
	minimum tolerance				
	maximum tolerance				
T.C. further from zero	minimum tolerance				
	maximum tolerance				

The figures of this table shall be extracted without any deviation from IEC 60384-8, Table 3.

Table 4 – Multiplying factor of temperature coefficient tolerance for low capacitance values (if applicable)

Capacitance			
Multiplying factor			

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 60384-8:200X, *Fixed capacitors for use in electronic equipment – Part 8: Sectional specification: Fixed capacitors of ceramic dielectric, Class 1*

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

1.5 Marking

The marking of the capacitor and the packing shall be in accordance with the requirements of IEC 60384-8, 1.6.

The details of the marking of the component and packing 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) temperature coefficient and tolerance;

e) number and issue reference of the detail specification and style reference.

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 5 – 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 60384-8, 3.4.

2.1.2 For quality conformance inspection the test schedule (Table 6) includes sampling, periodicity, severities and requirements. The formation of inspection lots is covered by 3.5.1 of the sectional specification, IEC 60384-8.

Table 6 – Test schedule for qualification conformance inspection

Subclause number and test [a]	D or ND	Conditions of test [a]	Number of specimens and number of non-conforming items [b]			Performance requirements [a]
			IL	*n*	*c*	
Group A inspection (lot-by-lot)						
Subgroup A0	ND		100% [c]			
4.2.1 Capacitance		Frequency: ... Hz				Within the specified tolerance
4.2.2 Tangent of loss angle		Frequency: ... Hz				As in 4.2.2
4.2.3 Insulation resistance (Test A)		Method: ...				As in 4.2.3
4.2.4 Voltage proof (Test A)		Method: ...				No breakdown or flashover
Subgroup A1	ND		S-4	[d]	0	
4.1 Visual examination						As in 4.1 Legible marking and as specified in 1.5 of this specification
Subgroup A2	ND		S-3	[d]	0	
4.1 Dimensions (gauging) [e]						As specified in Table 1 of this specification
Group B inspection (lot-by-lot)						
Subgroup B1	D		S-3	[d]	0	
4.6 Solderability		No pre-drying Method: ...				Good tinning as evidenced by free flowing of the solder with wetting of the terminations or solder shall flow within ... s, as applicable
4.15 Solvent resistance of the marking (if applicable)		Solvent: ... Solvent temperature: ... Method 1 Rubbing material: cotton wool Recovery: ...				Legible marking
Subgroup B2 [g]	ND		S-2	[d]	0	
4.3 Temperature-coefficient and cyclic drift of capacitance		Pre-drying for 16 h to 24 h				As in 4.3

Table 6 *(continued)*

Subclause number and test [a]	D or ND	Conditions of test [a]	Number of specimens and number of non-conforming items [b]			Performance requirements [a]
			p	*n*	*c*	
Group C inspection (periodic)						
Subgroup C1A	D		6	9	0 [f]	
Part of sample of Subgroup C1						
4.1 Dimensions (detail)						See detail specification
4.4 Robustness of terminations		Visual examination				No visible damage
4.5.1 Initial measurement		Capacitance				
4.5 Resistance to soldering heat		No pre-drying Method: ...				
4.5.3 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ as in 4.5.3
4.14 Component solvent resistance (if applicable)		Solvent: ... Solvent temperature: ... Method 2 Recovery: ...				See detail specification
Subgroup C1B	D		6	18	0 [f]	
Other part of sample of Subgroup C1						
4.7.1 Initial measurement		Capacitance				
4.7 Rapid change of temperature		T_A = Lower category temperature T_B = Upper category temperature Five cycles Duration t_1 = 30 min Recovery: 24 h ± 2 h				
		Visual examination				No visible damage
4.8 Vibration		Method of mounting: see 1.1 of this specification Frequency range: ... Hz to ... Hz Amplitude 0,75 mm or acceleration 100 m/s^2 (whichever is the less severe) Total duration: 6 h				
4.8.2 Intermediate inspection		Visual examination				No visible damage
4.9 Bump (or shock, see 4.10)		Method of mounting: see 1.1 of this specification Acceleration: ... m/s^2 Duration of pulse: ... ms				
4.10 Shock (or bump, see 4.9)		Method of mounting: see 1.1 of this specification Acceleration: ... m/s^2 Duration of pulse: ... ms				
4.9.3 Final measurements or 4.10.3		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ as in 4.10.3

Table 6 *(continued)*

Subclause number and test [a]	D or ND	Conditions of test [a]	Number of specimens and number of non-conforming items [b]			Performance requirements [a]
			p	*n*	*c*	
Subgroup C1	D		6	27	0 [f]	
Combined sample of specimens of Subgroups C1A and C1B						
4.11 Climatic sequence						
4.11.2 Dry heat		Temperature: upper category temperature Duration: 16 h				
4.11.3 Damp heat, cyclic, Test Db, first cycle						
4.11.4 Cold		Temperature: lower category temperature Duration: 2 h				
		Visual examination				No visible damage
4.11.5 Low air pressure (if required by the detail specification)		Air pressure: 8 kPa				
4.11.5.3 Intermediate inspection		Visual examination				No breakdown or flashover
4.11.6 Damp heat, cyclic, Test Db, remaining cycles		Recovery: 6 h to 24 h				
4.11.6.3 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ as in 4.11.6.3
		Tangent of loss angle				As in 4.11.6.3
		Insulation resistance				As in 4.11.6.3
Subgroup C2	D		6	15	0 [f)]	
4.12 Damp heat, steady state						
4.12.1 Initial measurements		Capacitance				
		Recovery: 6 h to 24 h				
4.12.5 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ as in 4.12.5
		Tangent of loss angle				As in 4.12.5
		Insulation resistance				As in 4.12.5

Table 6 *(continued)*

Subclause number and test [a]	D or ND	Conditions of test [a]	Number of specimens and number of non-conforming items [b]			Performance requirements [a]
			p	*n*	*c*	
Subgroup C3	D		3	15	0 [f]	
4.13 Endurance		Voltage: V				
		Duration: h				
4.13.1 Initial measurement		Capacitance				
		Recovery: 6 h to 24 h				
4.13.4 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ as in 4.13.4
		Tangent of loss angle				As in 4.13.4
		Insulation resistance				As in 4.13.4
Subgroup C4	ND		12	9	0 [f]	
4.3 Temperature coefficient and cyclic drift		Conditioning: pre-drying for 16 h to 24 h				$\Delta C/C$ as in 4.3.3

[a] Subclause numbers of tests and performance requirements refer to the sectional specification, IEC 60384-8 and Clause 1 of this specification.

[b] In this table: p = periodicity (in months), n = sample size, c = acceptance criterion (permitted number of non-conforming items), D = destructive, ND = non-destructive, IL = inspection level.

[c] 100 % testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million (10^{-6}). The sampling level shall be established by the manufacturer. For the calculation of 10^{-6} values, any parametric failure shall be counted as a non-conforming item. In case one or more non-conforming items occur in a sample, this lot shall be rejected.

[d] Inspection levels are selected from IEC 60410: Sampling plans and procedures for inspection by attributes.

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

[g] This subgroup may be omitted if a corresponding test is carried out on each manufacturing batch of dielectric material.

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ISBN 2-8318-7959-0

ICS 31.060.20

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND