BRITISH STANDARD

BS EN
60384-24-1:
2006

Fixed capacitors for use in electronic equipment —

Part 24-1: Blank detail specification — Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte — Assessment level EZ

The European Standard EN 60384-24-1:2006 has the status of a British Standard

ICS 31.060.40; 31.060.50

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 60384-24-1:2006. It is identical with IEC 60384-24-1:2006.

The UK participation in its preparation was entrusted to Technical Committee EPL/40X, Capacitors and resistors for electronic equipment.

A list of organizations represented on EPL/40X can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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EN 60384-24-1

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English version

Fixed capacitors for use in electronic equipment Part 24-1: Blank detail specification – Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte – Assessment level EZ

(IEC 60384-24-1:2006)

Condensateurs fixes utilisés dans les équipements électroniques
Partie 24-1: Spécification particulière cadre –
Condensateurs fixes électrolytiques au tantale pour montage en surface à électrolyte solide en polymère conducteur –
Niveau d'assurance de la qualité EZ
(CEI 60384-24-1:2006)

Festkondensatoren zur Verwendung in Geräten der Elektronik
Teil 24-1: Vordruck für Bauartspezifikation –
Oberflächenmontierbare Tantal-Elektrolyt-Kondensatoren mit leitfähigem Polymerfestkörper-Elektrolyten –
Bewertungsstufe EZ
(IEC 60384-24-1:2006)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 60384-24-1:2006 E

Foreword

The text of document 40/1732/FDIS, future edition 1 of IEC 60384-24-1, prepared by IEC TC 40, Capacitors and resistors for electronic equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60384-24-1 on 2006-07-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2007-04-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2009-07-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60384-24-1:2006 was approved by CENELEC as a European Standard without any modification.

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT

Part 24-1: Blank detail specification – Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte – 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 square brackets on the first page of the detail specification 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).

[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.

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

	[1]		[2]
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH :	[3]	IEC 60384-24-1	[4]
		Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte	[5]
Outline drawing : (see Table 1) (…angle projection)	[7]		[6]
		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 1.4.2 of IEC 60384-24).

1.2 Dimensions

Table 1 – Case size reference and dimensions

Case size reference	Dimension mm						
	L	*W*	*H*				

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

NOTE 2 The dimensions should 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 (see Table 2)

Category voltage (see Table 2)

Climatic category

Rated temperature

Variation of capacitance with temperature (see Table 3)

Tangent of loss angle (see Table 3)

Leakage current (see Table 3)

Equivalent series resistance (see Table 3)

Surge voltage (see Table 2)

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

Rated voltage V					
Category voltage V					
Surge voltage V	**Rated temperature**				
	Upper category temperature				
		Case sizes	**Case sizes**	**Case sizes**	**Case sizes**
Rated capacitance µF					

Table 3 – Characteristics

Case size	U_R V	C_R µF	**Capacitance change %**			**Maximum values**							
						Tangent of loss angle tan δ at 120 Hz				**Leakage current** µA			**Equivalent series resistance at 100 kHz** mΩ
			-55 °C	**Rated temperature**	**Upper category temperature**	**-55 °C**	**20 °C**	**Rated temperature**	**Upper category temperature**	**20 °C**	**Rated temperature**	**Upper category temperature**	**20 °C**

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 60384-1:1999, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

IEC 60384-24:2006, *Fixed capacitors for use in electronic equipment – Part 24: Sectional specification – Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte*

1.5 Marking

The marking of the capacitor and the package shall be in accordance with the requirements of 1.6 of IEC 60384-24.

NOTE The details of the marking of the component and package should 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 4 – 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 3.4 of IEC 60384-24.

2.1.2 For quality conformance inspection, the test schedule (Table 5) includes sampling, periodicity, severities and requirements. The formation of inspection lots is covered by 3.5.1 of IEC 60384-24.

Table 5 – Test schedule for quality conformance inspection

Subclause number and test[a]	D or ND[b]	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]			
4.18 High surge current (if applicable)						
4.5.1 Leakage current		Protective resistor: 1 000 Ω				As in Table 3
4.5.2 Capacitance		Frequency: 120 Hz				Within specified tolerance
4.5.3 Tangent of loss angle (tan δ)		Frequency: 120 Hz				As in Table 3
4.5.4 Equivalent series resistance (ESR) (if applicable)		Frequency: 100 kHz				As in Table 3
Subgroup A1	ND		S-3	[d]	0	
4.4 Visual examination						As in 4.4.2 Legible marking (if required) and as specified in the detail specification
Subgroup A2	ND		S-3	[d]	0	
4.4 Dimension (detail)[e]						As specified in Table 1 of this specification
Group B inspection (lot-by-lot)			S-3	[d]	0	
4.7 Solderability	D					
4.7.1 Test		See detail specification for the method				
4.7.2 Final measurement		Visual examination				As in 4.7.2

Table 5 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test[a]	D or ND[b]	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 C1	D		3	12	0 [f]	
4.6 Resistance to soldering heat						
4.6.1 Initial measurement		Capacitance				For use as reference value
4.6.2 Test		Method: ...				
		Deflection: ...s				
		Reflow profile: ...				
		Recovery: 24 h ± 2 h				
4.6.3 Final measurement		Visual examination				As in 4.6.3
		Leakage current				As in Table 3
		Capacitance				See detail specification
		Tangent of loss angle (tan δ)				As in Table 3
		Equivalent series resistance (ESR)				See detail specification
Sub group C2	D		3	12	0 [f]	
4.9 Substrate bending test						
4.9.1 Initial measurement		Capacitance				For use as reference value
4.9.3 Final inspection		Capacitance (with printed board in bent position)				See detail specification
Sub group C3						
4.3 Mounting	D	Substrate material: ...	[g]			
4.3.1 Initial measurement		Capacitance (the value obtained in 4.5.2 may be used)				
4.3.3 Final inspection		Visual examination				No visible damage
		Leakage current				As in Table 3
		Capacitance				$\Delta C/C \leq 8$ %
		Tangent of loss angle (tan δ)				As in Table 3
		Equivalent series resistance (ESR)				See detail specification

Table 5 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test[a]	D or ND[b]	Conditions of test[a]	Number of specimens and number of non-conforming items[b]			Performance requirements[a]
			p	*n*	*c*	
Sub group C3.1			6	18	0	
4.8 Shear test		Visual examination			[f]	No visible damage
4.10 Rapid change of temperature						
4.10.1 Initial measurement		Capacitance (the value obtained in Group 3 may be used)				
4.10.2 Test		T_A = Lower category temperature				
		T_B = Upper category temperature				
		Five cycles				
		Duration t_1 = 30 min				
		Recovery: 1 h to 2 h				
4.10.3 Final measurements		Leakage current				As in Table 3
		Capacitance				$\Delta C/C \leq$ 10 % of value measured in 4.10.1
		Tangent of loss angle (tan δ)				As in Table 3
4.11 Climatic sequence						
4.11.1 Initial measurement		Capacitance (the value obtained in 4.10.3 may be used)				
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: 2h				
4.11.5 Damp heat, cyclic, test Db, remaining cycles						
4.11.6 Final measurements		Visual examination				No visible damage
						Legible marking
		Leakage current				As in Table 3
		Capacitance				$\Delta C/C <$ ± 20 % of the value measured in 4.11.1
		Tangent of loss angle				≤ 1,2 times the limit of Table 3

Table 5 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test[a]	D or ND[b]	Conditions of test[a]	Number of specimens and number of non-conforming items[b]			Performance requirements[a]
			p	*n*	*c*	
Subgroup C3.2	D		6	12	0 [f]	
4.12 Damp heat, steady state		Recovery: 1 h to 2 h				
4.12.1 Initial measurement		Capacitance (the value obtained in Group 3 may be used)				
4.12.3 Final measurements		Visual examination				No visible damage
						Legible marking
		Leakage current				≤5 x initial limit
		Capacitance				-20 % $\leq \Delta C/C \leq$ 40 % of the value measured in 4.12.1
		Tangent of loss angle				≤ 1,2 times the limit of Table 3
Sub group C3.3	D		6	15	0 [f]	
4.13 Characteristics at high and low temperature		The capacitors shall be measured at each temperature step				
		Step 1:20 °C				
		Leakage current				As in Table 3
		Capacitance				For use as reference value
		Tangent of loss angle				As in Table 3
		Step 2: lower category temperature				
		Capacitance (if applicable)				As in Table 3
		Tangent of loss angle (if applicable)				As in Table 3
		Step 3 :20 °C				
		Leakage current				As in Table 3
		Capacitance				$\Delta C/C \leq$ 5 % of value measured in Step 1
		Tangent of loss angle				As in Table 3
		Step 4 : rated temperature				
		Leakage current				As in Table 3
		Capacitance				As in Table 3
		Tangent of loss angle				As in Table 3
		Step 5 : upper category temperature				
		Leakage current				As in Table 3
		Capacitance				As in Table 3
		Tangent of loss angle				As in Table 3

Table 5 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test[a]	D or ND[b]	Conditions of test[a]	Number of specimens and number of non-conforming items[b]			Performance requirements[a]
			p	*n*	*c*	
		Step 6 :20 °C	6	15	0	
		Leakage current				As in Step 3
		Capacitance				As in Step 3
		Tangent of loss angle				As in Step 3
4.14 Surge		Number of cycles: 1 000				
		Test temperature: ...°C				
		Voltage: 1,15 U_R				
		Protective resistor: 1 000 Ω				
		Duration of charge: 30 s				
		Duration of no load: 5 min 30 s				
4.14.3 Final measurements		Visual examination				No visible damage
		Leakage current				As in Table 3
		Capacitance				$\Delta C/C$ < ± 20 % of the value measured in 4.13 Step 6
		Tangent of loss angle				≤ 1,5 times the limit of Table 3
Subgroup C3.4	D		3	24	0	
4.15 Endurance		Duration: 1 000 h			[f]	
		Test temperature: ... °C				
		Voltage: ... V				
		Recovery: 1 h to 2 h				
4.15.1 Initial measurement		Capacitance				
4.15.3 Final measurements		Visual examination				No visible damage
						Legible marking
		Leakage current				≤ 2 times the limit of Table 3
		Capacitance				$\Delta C/C$ ≤ 20 % of value measured in 4.15.1
		Tangent of loss angle				≤ 1,5 times the limit of Table 3
		Equivalent series resistance (if required by the detail specification)				≤ 2 times the limit of Table 3

Table 5 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test[a]	D or ND[b]	Conditions of test[a]	Number of specimens and number of non-conforming items[b]			Performance requirements[a]
			p	*n*	*c*	
Sub group C3.5	D		6	12	0	
4.19 Storage at high temperature		Test temperature: upper category temperature			[f]	
		Duration: 96 h ± 4 h				
		Recovery: 16 h min				
4.19.1 Initial measurement		Capacitance (the value obtained in Group 3 may be used)				
4.19.3 Final measurements		Visual examination				No visible damage
		Leakage current				≤ 5 times the limit of Table 3
		Capacitance				$\Delta C/C \leq \pm$ 10 % of the value measured in 4.19.1
		Tangent of loss angle				As in Table 3

[a] Subclause numbers of tests and performance requirements refer to IEC 60384-24 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 reinspection 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 non-conforming item. If one or more non-conforming items occur in a sample, this lot shall be rejected.

[d] Inspection Levels are selected from IEC 60410.

[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. The release of the product may continue during repeat testing.

[g] The capacitors which found non-conformances after mounting shall not be taken into account when calculating the non-conformances for the following tests. They shall be replaced by spare capacitors.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60384-1 (mod)	1999	Fixed capacitors for use in electronic equipment Part 1: Generic specification	EN 60384-1 + corr. October	2001 2001
IEC 60384-24	2006	Fixed capacitors for use in electronic equipment Part 24: Sectional specification: Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte	EN 60384-24	2006

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