BRITISH STANDARD

BS EN 60384-21-1: 2004
Incorporating corrigenda September 2004 and March 2010

Fixed capacitors for use in electronic equipment —

Part 21-1: Blank detail specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1 — Assessment level EZ

ICS 31.060.10

BSI British Standards

National foreword

This British Standard is the UK implementation of EN 60384-21-1:2004. It is identical to IEC 60384-21-1:2004 incorporating corrigendum September 2004. Together with BS EN 60384-22-1:2004, it supersedes BS EN 132101:1997 which is withdrawn. Together with BS EN 60384-21:2004, BS EN 60384-22:2004 and BS EN 60384-22-1:2004 it supersedes BS QC 301900:1992 and BS QC 301901:1992 which are withdrawn.

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 this committee 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.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 19 January 2005

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Amendments/corrigenda issued since publication

Date	Comments
31 March 2010	Supersession text amended

EUROPEAN STANDARD **EN 60384-21-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM November 2004

ICS 31.060.10 Partially supersedes EN 132101:1996

English version

Fixed capacitors for use in electronic equipment Part 21-1: Blank detail specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1 – Assessment level EZ

(IEC 60384-21-1:2004 + corrigendum 2004)

Condensateurs fixes utilisés dans les équipements électroniques
Partie 21-1: Spécification particulière cadre: Condensateurs multicouches fixes pour montage en surface pour diélectriques en céramique, classe 1 – Niveau d'évaluation EZ
(CEI 60384-21-1:2004 + corrigendum 2004)

Festkondensatoren zur Verwendung in Geräten der Elektronik
Teil 21-1: Vordruck für Bauartspezifikation: Oberflächenmontierbare Vielschichtkeramik-Festkondensatoren, Klasse 1 – Bewertungsstufe EZ
(IEC 60384-21-1:2004 + corrigendum 2004)

This European Standard was approved by CENELEC on 2004-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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 60384-21-1:2004 E

Foreword

The text of document 40/1421/FDIS, future edition 1 of IEC 60384-21-1, 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 60384-21-1 on 2004-09-01.

This European Standard, together with EN 60384-22-1:2004, supersedes EN 132101:1996.

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)	2005-06-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2007-09-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 60384-21-1:2004 + corrigendum September 2004 was approved by CENELEC as a European Standard without any modification.

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CONTENTS

INTRODUCTION

Blank detail specification

A blank detail specification is a supplementary document to the sectional specification and contains requirements for style, 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)	IEC 60384-21-1-ZZZ QC 30XXXX-ZZZ	(2)
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH :	(3)	IEC 60384-21-1 QC30 XXXX	(4)
Outline drawing : (see Table 1) (…angle projection)	(7)	FIXED SURFACE MOUNT MULTILAYER CAPACITORS OF CERAMIC DIELECTRIC, CLASS 1	(5)
			(6)
(Other shapes are permitted within the dimensions given)		Assessment level: EZ	(8)

Information on the availability of components qualified to this detail specification is given in the IECQ 001005.

(9)

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 21-1: Blank detail specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1 – Assessment level EZ

1 General data

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

(See 1.4.2 of IEC 60384-21).

1.2 Dimensions

Table 1 – Case size reference and dimensions

Case size reference	Dimension (mm)						
	L_1	W	H	L_2	L_3	L_4	---

When there is no case size reference, Table 1 may be omitted and the dimensions shall be given in Table 2, which then become 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	(see Table 2)
Category voltage (if applicable)	(see Table 2)
Climatic category	
Rated temperature	
Category temperature (if applicable)	
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				
Category voltage [1)]				
Rated capacitance	Case size	Case size	Case size	Case size
(in pF, nF)				

[1)] If different from the rated voltage.

1.4 Normative references

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

IEC 60384-21:2004, *Fixed capacitors for use in electronic equipment – Part 21: Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1*

1.5 Marking

The marking of the capacitor, if applied, and the package shall be in accordance with the requirements of 1.6 of IEC 60384-21.

NOTE 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 DC voltage.

d) Temperature coefficient.

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 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 3.4 of IEC 60384-21.

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 3.5.1 of IEC 60384-21.

Table 4 – Test schedule for quality conformance inspection

Subclause number and test [1]	**D or ND**	**Conditions of test** [1]	**Number of specimens and number of non-conformances** [2]			**Performance requirements** [1]
			IL	***n***	***c***	
Group A inspection (lot-by-lot)						
Subgroup A0	ND		100% [3]			
4.5.1 Capacitance		Frequency: ... Hz Measuring voltage: ... V r.m.s				Within specified tolerance
4.5.2 Tangent of loss angle (tanδ)		Frequency and measuring voltage same as in 4.5.1				As in 4.5.2
4.5.3 Insulation resistance		See detail specification for the method				As in 4.5.3.3
4.5.4 Voltage proof		See detail specification for the method				No breakdown or flashover

Table 4 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test [1]	D or ND	Conditions of test [1]	Number of specimens and number of non-conformances [2]			Performance requirements [1]
			IL	*n*	*c*	
Subgroup A1 4.4 Visual inspection	ND		S-4	[4]	0	As in 4.4.2 Legible marking and as specified in 1.5 of this specification
Subgroup A2 4.4 Dimensions [5]	ND		S-3	[4]	0	As specified in Table 1 of this specification
Group B inspection (lot-by-lot)						
Subgroup B1	D		S-3	[4]	0	
4.10 Solderability		See detail specification for the method				
4.10.3 Final measurements		Visual examination				As in 4.10.3
4.17 Solvent resistance of the marking (if required) [6]		Solvent: ... Solvent temperature: ... Method 1 Rubbing material: cotton wool Recovery: ...				Legible marking
Subgroup B2 4.6 Temperature coefficient and cyclic drift [7]	ND	Preliminary drying: 16 h to 24 h	S-2	[4]	0	$\Delta C/C$: As in 4.6.3

Table 4 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test [1]	D or ND	Conditions of test [1]	Number of specimens and number of non-conformances [2]			Performance requirements [1]
			p	*n*	*c*	
Group C inspection (periodic)						
Subgroup C1	D	Test Ua, Force: 2,5 N	3	12	0 [8]	
		Test Ub, Method 1, Force: 2,5 N				
		Number of bends:1				
		Visual examination				No visible damage
4.15 Robustness of termination (if required)						
4.9.1 Initial measurement		Capacitance				
4.9 Resistance to soldering heat		See detail specification for the method				
4.9.4 Final measurements		Visual examination				As in 4.9.4
		Capacitance				As in 4.9.4
4.16 Component solvent resistance (if required)		Solvent: ...				See detail specification
		Solvent temperature: ...				
		Method 2				
		Recovery: ...				
Subgroup C2	D		3	12	0 [8]	
4.8 Substrate bending test [9]		Deflection: ...				See detail specification
		Number of bends: ...				
4.8.1 Initial measurement		Capacitance				
4.8.2 Final inspection		Capacitance (with printed board in bent position)				$\Delta C/C \leq 5\%$
		Visual examination				No visible damage

Table 4 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test [1]	D or ND	Conditions of test [1]	Number of specimens and number of non-conformances [2]			Performance requirements [1]
			p	*n*	*c*	
Subgroup C3	D					
4.3 Mounting [10]		Substrate material: …				
		Visual examination				As in 4.4.2
		Capacitance				Within specified tolerance
		Tangent of loss angle				As in 4.5.2
		Insulation resistance				As in 4.5.3.3
		Voltage proof				No breakdown or flashover

Table 4 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test [1]	D or ND	Conditions of test [1]	Number of specimens and number of non-conformances [2]			Performance requirements [1]
			p	*n*	*c*	
Subgroup C3.1	D		6	27	0	
4.7 Shear test [11]		Visual inspection			[8]	No visible damage
4.11.1 Initial measurement		Capacitance				
4.11 Rapid change of temperature		T_A = Lower category temperature				
		T_B = Upper category temperature				
		Five cycles				
		Duration t_1 = 30 min				
		Recovery: 6 h to 24 h				
4.11.4 Final measurements		Visual examination				No visible damage
		Capacitance				$\Delta C/C$: As in 4.11.4
4.12 Climatic sequence						
4.12.1 Initial measurement		Capacitance				
4.12.2 Dry heat		Temperature: upper category temperature				
		Duration: 16 h				
4.12.3 Damp heat, cyclic, test Db, first cycle						
4.12.4 Cold		Temperature: lower category temperature				
		Duration: 2 h				
		Visual inspection				No visible damage
4.12.5 Damp heat, cyclic, test Db, remaining cycles		Recovery: 6 h to 24 h				
4.12.6 Final measurements		Visual examination				No visible damage, Legible marking
		Capacitance				$\Delta C/C$: As in 4.12.6
		Tangent of loss angle				As in 4.12.6
		Insulation resistance				As in 4.12.6

Table 4 – Test schedule for quality conformance inspection *(continued)*

Subclause number and test [1]	D or ND	Conditions of test [1]	Number of specimens and number of non-conformances [2]			Performance requirements [1]
			p	*n*	*c*	
Subgroup C3.2	D		6	15	0 [8]	
4.13 Damp heat, steady state		Capacitance Recovery: 6 h to 24 h				
4.13.1 Initial measurement		Visual examination				No visible damage, Legible marking
4.13.4 Final measurements		Capacitance Tangent of loss angle Insulation resistance				$\Delta C/C$: As in 4.13.4 As in 4.13.4 As in 4.13.4
Subgroup C3.3	D		3	15	0 [8]	
4.14 Endurance		Duration: ... h Temperature: ... °C Voltage: ... V				
4.14.1 Initial measurement		Capacitance Recovery: 6 h to 24 h				
4.14.4 Final measurements		Visual examination				No visible damage, Legible marking
		Capacitance Tangent of loss angle Insulation resistance				$\Delta C/C$: As in 4.14.4 As in 4.14.4 As in 4.14.4
Subgroup C3.4	D		6	15	0 [8]	
4.18 Accelerated damp heat, steady state (if required)		Duration: ... h Temperature: (85 ± 2) °C Humidity: (85 ± 3) %				
4.18.1 Initial measurement		Insulation resistance Recovery: 6 h to 24 h				As in 4.18.1
4.18.4 Final measurements		Insulation resistance				As in 4.18.4
Subgroup C4	ND		6	9	0 [8]	
4.6 Temperature coefficient and cyclic drift		Preliminary drying: 16 h to 24 h				$\Delta C/C$: As in 4.6.3

1) Subclause numbers of tests and performance requirements refer to the sectional specification, IEC 60384-21 and to Clause 1 of this specification.

2) 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

3) 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 non-conforming item. In case one or more non-conforming items occur in a sample, this lot shall be rejected.

4) Inspection Levels are selected from IEC 60410.

5) 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.

6) This test may be carried out on capacitors mounted on a substrate.

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

8) 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.

9) Not applicable to capacitors, which according to their detail specification shall only be mounted on alumina substrates.

10) The capacitors 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.

11) Not applicable to capacitors with strip terminations.

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 Where 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	2001
IEC 60384-21 + corr. September	2004 2004	Part 21: Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1	EN 60384-21	2004
IEC 60410	1973	Sampling plans and procedures for inspection by attributes	-	-

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