IEC 60384-4-2

Edition 2.0 2007-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

QC 300302

Fixed capacitors for use in electronic equipment – Part 4-2: Blank detail specification – Fixed aluminium electrolytic capacitors with solid (MnO_2) electrolyte – Assessment level EZ

Condensateurs fixes utilisés dans les équipements électroniques – Partie 4-2: Spécification particulière cadre – Condensateurs fixes électrolytiques à l'aluminium, à électrolyte solide (MnO_2) – Niveau d'assurance EZ

IEC 60384-4-2:2007

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

N

ICS 31.060.50

ISBN 2-8318-9904-4

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 4-2: Blank detail specification – Fixed aluminium electrolytic capacitors with solid (MnO_2) electrolyte – Assessment level EZ

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International Standard IEC 60384-4-2 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 1985 and its amendment 1 (1992) and amendment 2 (1996). This edition constitutes a minor revision related to tables, figures and references.

This bilingual version, published in 2008, corresponds to the English version.

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

CDV	Report on voting
40/1763/CDV	40/1821/RVC

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.

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

The QC number that appears on the front cover of this publication is the specification number in the IEC Quality Assessment System for Electronic Components (IECQ).

The list of all parts of the IEC 60384 series, under the general title *Fixed capacitors for use in electronic equipment*, can be found on the IEC website.

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- withdrawn,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.

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 4-2: Blank detail specification – Fixed aluminium electrolytic capacitors with solid (MnO_2) 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 be so described.

In the preparation of detail specifications, the contents 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, data 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 is 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 60384-4-2- XXX [2] QC 300302- XXX
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: IEC 60384-1 IEC 60384-4 [3]	IEC 60384-4-2 [4] QC 300302
	FIXED ALUMINIUM ELECTROLYTIC CAPACITORS WITH SOLID (MnO_2) ELECTROLYTE [5]
Outline drawing: (see Table 1) (…angle projection) [7]	[6]
(Other shapes are permitted within the dimensions given.)	Assessment level(s): EZ [8] Performance grade:

Information on the availability of components qualified to this detail specification is given in the IEC QC 001005 [9]

1 General data

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

See 1.4.2 of IEC 60384-4.

1.2 Dimensions

Table 1 – Case size reference and dimensions

Case size reference	Dimensions mm						
	Ø	*L*	*H*	*d*	.....		

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

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

Rated ripple current (see Table 3)

Tangent of loss angle (see Table 3)

NOTE Instead of the tangent of loss angle (tan δ), the equivalent series resistance ESR may be specified in accordance with 4.3.3.2 of IEC 60384-4.

Leakage current

Impedance (if applicable) (see Table 3)

Reverse voltage (if required)

Insulation resistance (if applicable)

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

Rated voltage				
Category voltage*				
	Case size	Case size	Case size	Case size
Rated capacitance µF				

* If different from the rated voltage.

Table 3 – Tangent of loss angle, impedance and rated ripple current

U_R V	C_R µF	Tangent of loss angle at..... °C,..... Hz	Impedance at..... °C, ... Hz (if applicable) Ω	Rated ripple current at..... °C,..... Hz A

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 60384-4:2007, *Fixed capacitors for use in electronic equipment – Part 4: Sectional specification – Aluminium electrolytic capacitors with solid (MnO_2) and non-solid electrolyte*

IEC 60410:1973, *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 1.6 of IEC 60384-4.

The details of the marking of the component and package are 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.

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 60384-4.

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 the sectional specification.

Table 5 – Test schedule for qualification conformance inspection

Subclause number and test [a]	D[c] or ND[c]	Conditions of test [a]	*IL* [c]	*n* [c]	*c* [c]	Performance requirements [a]
Group A inspection (lot-by-lot)						
Subgroup A0	ND			100 %[e]		
4.21 High surge current (if required by the detail specification)						
Subgroup A1	ND		S-3[d]	[d]	0	
4.2 Visual examination						As in 4.2 Legible marking and as specified in 1.5 of this specification
4.2 Dimensions (gauging)						As specified in Table 1 of this specification
Subgroup A2	ND		S-3[d]	[d]	0	
4.3.1 Leakage		Protective resistance:.... Ω				As in 4.3.1.2
4.3.2 Capacitance		Frequency:.... Hz				Within specified tolerance
4.3.3 Tangent of loss angle		Frequency:.... Hz				As in 4.3.3.2
4.3.4 Impedance (if applicable)		Frequency:.... Hz				Within limit specified in the detail specification

[a] Subclause number of tests and performance requirements refer to IEC 60384-4 and Clause 1 of this specification.

[b] Not applicable to capacitors with screw terminations or other terminations not designed to be soldered, as stated in the detail specifications.

[c] In this table,

IL = inspection level (IEC 60410)
n = sample size
c = permissible number of nonconforming items
p = periodicity in months
D = destructive
ND = non-destructive

[d] Number to be tested: sample size as directly allotted to the code letter for IL in Table II A of IEC 60410.

[e] 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.

Table 5 *(continued)*

Subclause number and test [a]	D[c] or ND [c]	Conditions of test [a]	*IL* [c]	*n* [c]	*c* [c]	Performance requirements [a e]
Group B inspection (lot-by-lot)						
Subgroup B1	ND		S-3[d]	[d]	0	
4.6 Solderability[b]		Method:.....				Good tinning as evidenced by free flowing of the solder with wetting of the terminations or meet the required parameter(s) in the detail specification as applicable
Subgroup B2	ND		S-3[d]	[d]	0	
4.19 Characteristics at high and low temperature		The capacitors shall be measured at each temperature step *Step 1:* 20 °C Impedance (at same frequency as Step 2) *Step 2:* Lower category temperature Impedance				Ratio with respect to value in Step 1: ≤2 times

[a] Subclause number of tests and performance requirements refer to IEC 60384-4 and Clause 1 of this specification.

[b] Not applicable to capacitors with screw terminations or other terminations not designed to be soldered, as stated in the detail specifications.

[c] In this table,

IL = inspection level (IEC 60410)
n = sample size
c = permissible number of non-conforming items
p = periodicity in months
D = destructive
ND = non-destructive

[d] Number to be tested: sample size as directly allotted to the code letter for IL in Table II A of IEC 60410.

Table 5 *(continued)*

Subclause number and test [a]	D or ND	Conditions of test [a]	Sample size and criterion of acceptability [c]			Performance requirements [a]
			p	*n*	*c*	
Group C inspection (periodic)						
Subgroup C1A	D		6	9	0	
Part of sample of subgroup C1						
4.2 Dimensions (detail)						See detail specification
4.4.1 Initial measurement		Capacitance				
4.4 Robustness of terminations		Visual examination Method:..... Severity:.....				No visible damage
4.5 Resistance to soldering heat*		No pre-drying Method:.....				
4.5.2 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ ≤5 % of value measured in 4.4.1
Subgroup C1B	D		6	18	0	
Other part of sample of group 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 or 3 h Recovery: 16 h				
4.7.3 Final measurements		Visual examination				No visible damage
		Leakage current				As in 4.3.1
		Tangent of loss angle				As in 4.3.3
		Impedance				Within the limit specified in the detail specification
4.8 Vibration		Method of mounting: see 1.1 of this specification Frequency range: ..... Hz to..... Hz Amplitude:..... mm or acceleration:..... m/s^2 (whichever is the less severe) Total duration:..... h				
4.8.2 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ ≤5 % of value measured in 4.7.1, unless otherwise specified in the detail specification

* Not applicable to capacitors with screw terminations or other terminations not designed to be soldered, as stated in the detail specification.