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QC 300101

Fixed capacitors for use in electronic equipment – Part 11-1: Blank detail specification – Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors – Assessment level EZ

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FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 11-1: Blank detail specification – Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors – Assessment level EZ

FOREWORD

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International Standard IEC 60384-11-1 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 and constitutes a minor revision related to tables, figures and references.

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

CDV	Report on voting
40/1840/CDV	40/1865/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 QC number that appears on the front cover of this publication is the specification number in the IECQ Quality Assessment System for Electronic Components (IECQ).

The list of all parts of the IEC 60384 series, under the (new) 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- withdrawn,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.

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

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 11-1: Blank detail specification – Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors – Assessment level EZ

INTRODUCTION

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).

NOTE 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 60384-11-1-XXX [2] QC 300101-XXX
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]	IEC 60384-11-1 [4] QC 300101
	FIXED POLYETHYLENE-TEREPHTHALATE FILM DIELECTRIC METAL FOIL D.C. CAPACITORS [5]
Outline drawing: (see Table 1) [...angle projection] [7]	[6]
[Other shapes are permitted within the dimensions given.]	Assessment level(s): EZ [8]
For Notes [1] to [9] see preceding page.	

Information on the availability of components qualified to this detail specification is given in the Qualified Products List.

(9)

1 General data

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

See IEC 60384-11, 1.4.2.

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 shall be given in Table 2, which then becomes Table 1.

NOTE 2 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)

Tangent of loss angle (tan δ)

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 60384-11, *Fixed capacitors for use in electronic equipment – Part 11: Sectional specification – Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors*

1.5 Marking

The marking of the capacitor and the package shall be in accordance with the requirements of 1.6 of IEC 60384-11.

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 3.4 of the sectional specification, IEC 60384-11.

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 60384-11.

Table 4 – Test schedule for quality conformance inspection

Subclause number and test [a]	D or ND[c]	Conditions of test [a]	Number of specimens and number of non-conforming items [c]			Performance requirements [a]
			IL	*n*	*c*	
Group A inspection (lot-by-lot) **Sub-group A0**	ND		100% [d]			
4.2.2 Capacitance						Within specified tolerance
4.2.3 Tangent of loss angle (tan δ)		Frequency : 1 kHz for all capacitance values				As in 4.2.3.2
4.2.1 Voltage proof (Test A)		Method: … Measuring point 1a				No breakdown or flashover
4.2.4 Insulation resistance (Test A)		Measuring point 1a				As in 4.2.4.2
Group A inspection (lot-by-lot) **Sub-group A1**	ND		S-3	[b]	0	
4.1 Visual examination						As in 4.1 Legible marking and as specified in 1.5 of this specification
Sub-group A2	ND		S-3	[b]	0	
4.1 Dimensions (gauging) [e]						As specified in Table 1 of this specification

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

Subclause number and test [a]	D or ND[c]	Conditions of test [a]	Number of specimens and number of non-conforming items [c]			Performance requirements [a]
			IL	*n*	*c*	
Group B inspection (lot-by-lot)						
Sub-group B1	ND		S-3	[b]	0	
4.5 Solderability (if applicable)		Without ageing Method: …				Good tinning as evidenced by free flowing of the solder with wetting of the termina-tions or solder shall flow within … s, as applicable
4.14 Solvent resistance of the marking (if applicable		Solvent: … Solvent temperature: … Method 1 Rubbing material: cotton wool Recovery: …				Legible marking

[a] Subclause numbers of tests and performance requirements refer to the sectional specification, IEC 60384-11, 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.

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

[d] 100 % testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million ($\times 10^{-6}$). The sampling level shall be established by the manufacturer. For the calculation of $\times 10^{-6}$ 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.

[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 components exceeding the limits.

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

Subclause number and test [a]	D or ND[c]	Conditions of test [a]	Number of specimens and number of non-conforming items [c]			Performance requirements [a]
			p	*n*	*c*	
Group C inspection (periodic)						
Sub-group C1A	D		6	5	0[f]	
Part of sample of Sub-group C-1						
4.1 Dimensions (detail)						See detail specification
4.4.1 Initial measure-ments		Capacitance Tangent of loss angle (tan δ): For $C_R \leq$ 10 µF: at 1 kHz $C_R >$ 10 µF: at 50 Hz to 120 Hz				
4.3 Robustness of terminations		Visual examination				No visible damage
4.4. Resistance to soldering heat		Method: ...				
4.4.2 Final measure-ments		Visual examination				No visible damage $\Delta C/C \leq$ 2 % of the value measured initially
4.13 Component solvent resistance (if applicable)		Solvent: ... Solvent temperature: ... Method 2 Recovery: ...				See detail specification
Sub-group C1B	D		6	5	0[f]	
Other part of sample of Subgroup C1						
4.6.1 Initial measurements		Capacitance Tangent of loss angle (tan δ): For $C_R \leq$ 10 µF: at 1 kHz $C_R >$ 10 µF: at 50 Hz to 120 Hz				
4.6 Rapid change of temperature		T_A = Lower category temperature T_B = Upper category temperature Five cycles Duration t_1 = 30 min Visual examination				No visible damage
4.7 Vibration		Method of mounting , see 1.1 of this specification Procedure B4 Frequency range: . . . Hz to . . . Hz Amplitude: 0,75 mm or acceleration 98 m/s^2 (whichever is the less severe) Total duration: 6 h				

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

Subclause number and test [a]	D or ND[c]	Conditions of test [a]	Number of specimens and number of non-conforming items [c]			Performance requirements [a]
			p	*n*	*c*	
4.7.2 Final inspection		Visual examination				No visible damage
4.8 Bump (or shock, see 4.9)		Method of mounting, see 1.1 of this specification Number of bumps: ... Acceleration: ... m/s^2 Duration of pulse: ... ms				
4.9 Shock (or bump, see 4.8)		Method of mounting: see 1.1 of this specification Acceleration: ... m/s^2 Duration of pulse: ... ms				
4.8.3 or 4.9.3 Final measurements		Visual examination				No visible damage
		Capacitance				$\Delta C/C \leq 5$ % of value measured in 4.6.1
		Tangent of loss angle (tan δ)				See detail specification
Sub-group C1 Combined sample of specimens of Subgroups C1A and C1B	D		6	10	0[f]	
4.10 Climatic sequence						
4.10.2 Dry heat		Temperature: upper category temperature Duration: 16 h				
4.10.3 Damp heat, cyclic, Test Db, first cycle						
4.10.4 Cold		Temperature: lower category temperature Duration: 2 h				
4.10.5 Low air pressure (if required by the detail specification)		Air pressure: 8,5 kPa (85 mbar)				
4.10.5.3 Intermediate inspection		Visual examination				No permanent breakdown, flashover or harmful deformation of the case
4.10.6 Damp heat, cyclic, Test Db, remaining cycles		Recovery: 1 h to 2 h				
4.10.6.2 Final measure-ments		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$: ≤ 5 % of value measured in 4.4.2, 4.8.3 or 4.9.3 as applicable
		Tangent of loss angle (tan δ)				Tan $\delta \leq 0{,}01$ or 1,2 times values measured in 4.3.1 or 4.6.1, as applicable, whichever is the greater
		Insulation resistance				≥50 % of values in 4.2.4.2

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

Subclause number and test [a]	D or ND[c]	Conditions of test [a]	Number of specimens and number of non-conforming items [c]			Performance requirements [a]
			p	*n*	*c*	
Sub-group C2			6	10	0[f]	
4.11 Damp heat, steady state						
4.11.1 Initial measurements		Capacitance Tangent of loss angle (tan δ) For $C_R \leq$ 10 µF: at 1 kHz $C_R >$ 10 µF: at 50 Hz to 120 Hz Recovery: 1 to 2 h				
4.11.3 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C \leq$ 5 % of value measured in 4.11.1
		Tangent of loss angle (tan δ)				Tan $\delta \leq$ 0,01 or 1,2 times values measured in 4.11.1, whichever is the greater
		Insulation resistance				≥50 % of values in 4.2.4.2
Sub-group C3	D		6	10	0[f]	
4.12 Endurance		Duration: 1 000 h				
4.12.1 Initial measurements		Capacitance Tangent of loss angle (tan δ) For $C_R \leq$ 10 µF: at 1 kHz $C_R >$ 10 µF: at 50 Hz to 120 Hz Recovery: 1 h to 2 h				
4.12.5 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C \leq$ 5 % of value measured in 4.12.1
		Tangent of loss angle (tan δ)				Tan $\delta \leq$ 0,01 or 1,2 times values measured in 4.12.1, whichever is the greater
		Insulation resistance				≥50 % of values in 4.2.4.2
Sub-group C4	ND		6	10	0[f]	
4.2.5 Characteristics depending on temperature		Capacitance				As in 4.2.5

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

[a] Subclause numbers of tests and performance requirements refer to the sectional specification, IEC 60384-11, 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.

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

[d] 100 % testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million ($\times 10^{-6}$). The sampling level shall be established by the manufacturer. For the calculation of $\times 10^{-6}$ 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.

[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 components 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.

Bibliography

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

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