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INTERNATIONAL STANDARD

QC 302001

Fixed capacitors for use in electronic equipment – Part 20-1: Blank detail specification – Fixed metallized polyphenylene sulfide film dielectric surface mount d.c. capacitors – Assessment level EZ

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

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Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

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FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

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FOREWORD

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International Standard IEC 60384-20-1 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 1996 and constitutes a minor revision related to tables and references.

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

FDIS	Report on voting
40/1872/FDIS	40/1889/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.

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 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- withdrawn,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.

The contents of the corrigendum of February 2008 have been included in this copy.

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 20-1: Blank detail specification – Fixed metallized polyphenylene sulfide film dielectric surface mount d.c. capacitors – 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 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).

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 60384-20-1XX [2] QC 302001XXXXXX
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]	IEC 60384-20-1 [4] QC 302001
	FIXED METALLIZED POLYETHYLENE SULFIDE FILM DIELECTRIC SURFACE MOUNT 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]

Information on the availability of components qualified to this detail specification is given in the Register of Approvals

(9)

1 General data

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

See 1.4.2 of IEC 60384-20.

1.2 Dimensions

Table 1 – Dimensions

Case size reference	Dimensions mm						
	L_1	W_1	H_1	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 becomes Table 1.

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	
Maximum a.c. voltage (if applicable)	
Maximum pulse load (if applicable)	
Tangent of loss angle	
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 60384-1, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

IEC 60384-20, *Fixed capacitors for use in electronic equipment – Part 20: Sectional specification – Fixed metallized polyphenylene sulfide film dielectric surface mount 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 60384-20.

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 60384-20.

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 60384-20.

Table 4 – Test schedule for quality conformance inspection

Subclause number and test [a]	D or ND [c]	Conditions of test [a]	*IL*	*n* [c]	*c*	Performance requirements [a]
Group A inspection (lot-by-lot)						
Sub-group A0	ND		100 % [d]			
4.3.2 Capacitance						Within specified tolerance
4.3.3 Tangent of loss angle		Frequency: 1 kHz for all capacitance values				As in 4.3.3.2
4.3.1 Voltage proof (Test A)		Method:... Measuring point 1a				No breakdown or flashover. Self-healing breakdowns allowed
4.3.4 Insulation resistance (Test A)		Measuring point 1a				As in 4.3.4.3
Sub-group A1	ND		S-4	[b]	0	
4.2.1 Visual examination						As in 4.2.2 Legible marking (if applicable) and as specified in 1.5 of this specification
Sub-group A2	ND		S-3	[b]	0	
4.2 Dimensions [e]						As specified in Table 1 of this specification
Group B inspection (lot-by-lot)						
Sub-group B1	D		S-3	[b]	0	
4.7 Solderability		No ageing method:... Visual examination				As in 4.7.2
4.7.2 Final measurements						
Sub-group B2	D		S-3	[b]	0	
4.14 Solvent resistance of the marking (if applicable) [f]		Solvent:... Solvent temperature:... Method 1 Rubbing material: cotton wool Recovery: ...				Legible marking

Table 4 *(continued)*

Subclause number and test [a]	D or ND [c]	Conditions of test [a]	Sample size and acceptance criterion [c]			Performance requirements [a]
			p	*n*	*c*	
Group C inspection (periodic)						
Sub-group C1	D		3	12	0 [g]	
4.6 Resistance to soldering heat		Method:...				
		Capacitance				
4.6.1 Initial measurements		Duration:...				
4.6.2 Test conditions		If Method 1 is applied immersion and withdrawal speed shall be 25 mm/s ± 2,5 mm/s				
		Recovery: 24 h ± 2 h				
		Visual examination				As in 4.6.3
4.6.3 Final measurements		Capacitance				$\Delta C/C$ for Grade 1 and Grade 2: ≤ 2 %, Grade 3: ≤ 3 % of value measured in 4.6.1
		Solvent:...				See detail specification
4.13 Component solvent resistance (if applicable)		Solvent temperature:...				
		Method 2				
		Recovery:...				
Sub-group C2	D		3	12	0 [g]	
4.5 Bond strength of the end face plating						
4.5.1 Initial measurements		Capacitance				
4.5.2 Final inspection		Capacitance (with board in bent position)				$\Delta C/C$ for Grade 1 and Grade 2: ≤ 2 %, Grade 3: ≤ 5 % of value measured in 4.5.1
		Visual examination				No visible damage
Sub-group C3	D					
4.1 Mounting		Substrate material: ... *				
4.2.1 Visual examination						As in detail specification
4.3.2 Capacitance						$\Delta C/C$ ≤ 2% of value measured in Sub-group A0
4.3.3 Tangent of loss angle		Frequency: 1 kHz (for all capacitance values) 10 kHz for capacitors with C_R ≤ 1 µF (in addition, see 4.3.3.3)				As in 4.3.3.2 (Reference values for final measurements in sub-groups C3.1, C3.3 and C3.4)
4.3.4 Insulation resistance						As in 4.3.4.3

* When different substrate materials are used for the individual sub-groups, the detail specification shall indicate which substrate material is used in each sub-group.

Table 4 *(continued)*

Subclause number and test [a]		D or ND [c]	Conditions of test [a]	Sample size and acceptance criterion [c]			Performance requirements [a]
				p	*n*	*c*	
Sub-group C3.1		D		6	27	0 [g]	
4.4	Adhesion						
4.4.1	Intermediate inspection		Visual examination				No visible damage
4.8	Rapid change of temperature						
4.8.1	Initial measurements		Not required, see Sub-group C3				
4.8.2	Test conditions		T_A = Lower category temperature T_B = Upper category temperature Five cycles Duration t_1 = 30 min				
4.8.3	Intermediate inspection		Visual examination				No visible damage
4.9	Climatic sequence						
4.9.1	Initial measurements		Not required, see Sub-group 3				
4.9.2	Dry heat		Temperature: upper category temperature Duration: 16 h				
4.9.3	Damp heat, cyclic, test Db, first cycle						
4.9.4	Cold		Temperature: lower category temperature Duration: 2 h				
4.9.5	Damp heat, cyclic, test Db, remaining cycles		Within 15 min after removal from test chamber U_R to be applied for 1 min				
4.9.6	Final measurements		Visual examination				No visible damage Legible marking
			Capacitance				$\Delta C/C$ for Grade 1 and Grade 2: ≤ 3 %, Grade 3: ≤ 5 % of value measured in Sub-group C3.
			Tangent of loss angle: at 10 kHz for $C_R \leq 1$ µF				Increase of tan δ: ≤ 0,0025 for Grade 1 ≤ 0,004 for Grade 2 ≤ 0,005 for Grade 3
			at 1 kHz for $C_R > 1$ µF				≤ 0,0015 for Grade 1 ≤ 0,0025 for Grade 2 ≤ 0,003 for Grade 3 compared to values measured in Sub-group C3
			Insulation resistance				≥ 50 % of values in 4.3.4.3 however, ≥ 25 % for Grade 3

Table 4 *(continued)*

Subclause number and test [a]	D or ND [c]	Conditions of test [a]	Sample size and acceptance criterion [c]			Performance requirements [a]
			p	*n*	*c*	
Sub-group C3.2	D		6	15	0 [g]	
4.10 Damp heat, steady state						
4.10.1 Initial measurements		Not required, see Group 3 Recovery:...				
4.10.2 Final measurements		Visual examination				No visible damage
		Capacitance				$\Delta C/C$ for Grade 1 and Grade 2: ≤ 3 %, Grade 3: ≤ 5 % of value measured in Sub-group C3
		Tangent of loss angle at 1 kHz				Increase of tan δ: ≤ 0,0025 compared to values measured in Sub-group 3
		Insulation resistance				≥ 50 % of values in 4.3.4.3, however, ≥ 25 % for Grade 3
Sub-group C3.3	D		3	15	0 [g]	
4.11 Endurance						
4.11.1 Initial measurements		Not required, see Sub-group C3				
4.11.2 Test conditions		See 4.11.2, 4.11.3 and 4.11.4				
4.11.5 Final measurements		Visual examination				No visible damage Legible marking
		Capacitance				$\Delta C/C$ ≤ 5 % for Grade 1 $\Delta C/C$ ≤ 8 % for Grade 2 and Grade 3 compared to measurements in Sub-group 3
		Tangent of loss angle: at 10 kHz for $C_R \leq 1$ µF				Increase of tan δ: ≤ 0,003 for Grade 1 ≤ 0,005 for Grade 2 and Grade 3
		at 1 kHz for $C_R > 1$ µF				≤ 0,002 for Grade 1 ≤ 0,003 for Grade 2 and Grade 3 compared to values measured in Sub-group C3
		Insulation resistance				≥ 50 % of values in 4.3.4.3 however, ≥ 30 % for Grade 3
Sub-group C3.4	D		6	9	0 [g]	
4.12 Charge and discharge						
4.12.1 Initial measurement		Not required, see Sub-group 3				
4.12.2 Test conditions		10 000 cycles				

Table 4 *(continued)*

Subclause number and test [a]	D or ND [c]	Conditions of test [a]	Sample size and acceptance criterion [c]			Performance requirements [a]
			p	*n*	*c*	
4.12.3 Final measurements		Capacitance				$\Delta C/C \leq 3$ % for Grade 1 $\Delta C/C \leq 5$ % for Grade 2 however, ≤ 8 % for Grade 3 compared to values measured in Sub-group C3
		Tangent of loss angle: at 10 kHz for $C_R \leq 1$ µF				Increase of tan δ: ≤ 0,003 for Grade 1 ≤ 0,005 for Grade 2 and Grade 3
		at 1 kHz for $C_R > 1$ µF				≤ 0,002 for Grade 1 ≤ 0,003 for Grade 2 and Grade 3 compared to values measured in Sub-group C3
		Insulation resistance				≥ 50 % of values in 4.3.4.3, however, ≥ 30 % for Grade 3

[a] Subclause numbers of tests and performance requirements refer to the sectional specification IEC 60384-20 and clause 1 of this specification.

[b] Inspection levels are selected from IEC 60410 (Sampling plans and procedures for inspection by attributes).

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

[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] This may be carried out on surface mount capacitors mounted on a substrate.

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

NOTE Any specimen found defective after mounting shall not be taken into account when calculating the permissible non-conforming items for the following tests. They shall be replaced by spare parts.

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

3, rue de Varembé
P.O. Box 131
CH-1211 Geneva 20
Switzerland

Tel: + 41 22 919 02 11
Fax: + 41 22 919 03 00
info@iec.ch
www.iec.ch