

# INTERNATIONAL STANDARD

**IEC**  
**60384-4-1**

QC 300301

Second edition  
2000-05

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## Fixed capacitors for use in electronic equipment –

### Part 4: Blank detail specification – Aluminium electrolytic capacitors with non-solid electrolyte – Assessment level E

*Condensateurs fixes utilisés dans les équipements  
électroniques –*

*Partie 4:  
Spécification particulière-cadre –  
Condensateurs électrolytiques à l'aluminium  
à électrolyte non solide –  
Niveau d'assurance E*



Reference number  
IEC 60384-4-1:2000(E)

## Numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series.

## Consolidated publications

Consolidated versions of some IEC publications including amendments are available. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

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Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is to be found at the following IEC sources:

- **IEC web site\***
- **Catalogue of IEC publications**  
Published yearly with regular updates  
(On-line catalogue)\*
- **IEC Bulletin**  
Available both at the IEC web site\* and as a printed periodical

## Terminology, graphical and letter symbols

For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary (IEV)*.

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

\* See web site address on title page.

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE

P

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –**

**Part 4: Blank detail specification –  
Aluminium electrolytic capacitors with non-solid electrolyte –  
Assessment level E**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
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International Standard IEC 60384-4-1 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 1985, amendment 1 (1992) and amendment 2 (1996). This second edition constitutes a technical revision.

The text of this standard is based on the first edition, amendment 1, amendment 2 and the following documents:

FDIS	Report on voting
40/1123/FDIS	40/1169/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 3.

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

The committee has decided that the contents of this publication will remain unchanged until 2003. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition; or
- amended.

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

IECNORM.COM: Click to view the full PDF of IEC 60384-4-1:2000  
**Withdrawn**

## FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

### Part 4: Blank detail specification – Aluminium electrolytic capacitors with non-solid electrolyte – Assessment level E

#### 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, 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 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 60384-4-1-XXX QC 300301-XXX	[2]
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH:	IEC 60384-4-1 QC 300301	[4]
[3]	ALUMINIUM ELECTROLYTIC CAPACITORS WITH NON-SOLID ELECTROLYTE	[5]
Outline drawing: (see table 1) (..... angle projection)	[7]	[6]
(Other shapes are permitted within the dimensions given.)	Assessment level(s): E Performance grade:	[8]

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 1.4.2 of IEC 60384-4.)

### 1.2 Dimensions

Table 1

Case size reference	Dimensions mm or in and mm				
	Ø	L	H	d	.....

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

NOTE 2 The dimensions are given as maximum dimensions or as nominal dimensions with a tolerance.

### 1.3 Ratings and characteristics

Capacitance range (see table 2a)

Tolerance on rated capacitance

Rated voltage (see table 2a)

Category voltage (if applicable) (see table 2a)

Climatic category

Rated temperature

Rated ripple current (see table 2b)

Tangent of loss angle (see table 2b)

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

Leakage current

Impedance (if applicable) (see table 2b)

Reverse voltage (if required)

Insulation resistance (if applicable)

Table 2a – 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 2b – Tangent of loss angle, impedance and rated ripple current**

$U_R$ V	$C_R$ $\mu\text{F}$	Tangent of loss angle at ..... °C, ..... Hz	Impedance at ..... °C, ..... Hz (if applicable) $\Omega$	Rated ripple current at ..... °C, ..... Hz A

**1.4 Rated documents**

Generic specification: IEC 60384-1

Sectional specification: IEC 60384-4

**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.

NOTE 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:

- Rated capacitance.
- Tolerance on rated capacitance.
- Rated d.c. voltage.
- 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.
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## 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 60384-4.

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 the sectional specification.

**Table 4 – Test schedule**

Subclause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	IL (see Note 2)	AQL	Performance requirements (see Note 1)
<b>Group A inspection</b> (lot-by-lot)					
<i>Subgroup A1</i>	ND		S-4	2,5 %	
4.2 Visual examination					As in 4.2
4.2 Dimensions (gauging)					Legible marking and as specified in 1.5 of this specification As specified in table 1 of this specification
<i>Subgroup A2</i>	ND		II	1,0 %	
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

Subclause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	IL (see Note 2)	AQL	Performance requirements (see Notes 1 and 5)										
<b>Group B inspection</b> (lot-by-lot) <i>Subgroup B1</i> 4.6 Solderability*  4.17.1 Initial measurement 4.17 Storage at high temperature (if required)  4.17.3 Final measurements	ND	Method: .....  Capacitance Temperature: Upper category temperature Duration: 96 h ± 4 h Recovery: 16 h min. Visual examination  Leakage current Capacitance Tangent of loss angle	S-3	2,5 %	Good tinning as evidenced by free flowing of the solder with wetting of the terminations or solder shall flow within ..... s, as applicable  No visible damage and no leakage of electrolyte ≤2 times the limits in 4.3.1 $\Delta C/C \leq 10$ % of value measured in 4.17.1 ≤1,2 times the limit in 4.3.3										
<i>Subgroup B2</i> 4.19 Characteristics at high and low temperature	ND	The capacitors shall be measured at each temperature step <i>Step 1:</i> 20 °C Impedance (at same frequency as Step 2) <i>Step 2:</i> Lower category temperature Impedance	S-3	2,5 %	Ratio with respect to value in Step 1: <table border="1"> <thead> <tr> <th>Rated voltage V</th> <th>Ratio of impedance</th> </tr> </thead> <tbody> <tr> <td><math>U_R \leq 6,3</math></td> <td>≤7</td> </tr> <tr> <td><math>6,3 &lt; U_R \leq 16</math></td> <td>≤5</td> </tr> <tr> <td><math>16 &lt; U_R \leq 160</math></td> <td>≤4</td> </tr> <tr> <td><math>160 &lt; U_R</math></td> <td>≤7</td> </tr> </tbody> </table>	Rated voltage V	Ratio of impedance	$U_R \leq 6,3$	≤7	$6,3 < U_R \leq 16$	≤5	$16 < U_R \leq 160$	≤4	$160 < U_R$	≤7
Rated voltage V	Ratio of impedance														
$U_R \leq 6,3$	≤7														
$6,3 < U_R \leq 16$	≤5														
$16 < U_R \leq 160$	≤4														
$160 < U_R$	≤7														
* Not applicable to capacitors with screw terminations or other terminations not designed to be soldered, as stated in the detail specification.															

Subclause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
<b>Group C inspection</b> (periodic)						
<i>Subgroup C1A</i>						
Part of sample of subgroup C1	D		6	9	1	
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  Capacitance				No visible damage Legible marking  $\Delta C/C \leq 5\%$ of value measured in 4.4.1
<i>Subgroup C1B</i>						
Other part of sample of group C1	D		6	18	1	
4.7.1 Initial measurement		Capacitance				
4.7 Rapid change of temperature		$\theta_A$ = lower category temperature $\theta_B$ = Upper category temperature  Five cycles Duration $t_r$ = 30 min or 3 h Recovery: 16 h				
4.7.3 Final measurements		Visual examination				No visible damage and no leakage of electrolyte
4.8 Vibration		Method of mounting: see 1.1 of this specification Procedure B4 Frequency range: ..... Hz to ..... Hz Amplitude: ..... mm or acceleration: ..... m/s <sup>2</sup> (whichever is the less severe) Total duration: ..... h				
4.8.2 Final measurements		Visual examination  Capacitance				No visible damage and no leakage of electrolyte  Legible marking $\Delta C/C \leq 5\%$ 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.						

Subclause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
<i>Subgroup C1B (concluded)</i>						
4.9 Bump (or shock, see 4.10)		Method of mounting: see 1.1 of this specification  Number of bumps: ..... Acceleration: 390 m/s <sup>2</sup> Duration of pulse: 6 ms				
4.10 Shock (or bump, see 4.9)		Method of mounting: see 1.1 of this specification  Acceleration: ..... m/s <sup>2</sup> Duration of pulse: ..... ms				
4.9.2 or 4.10.2 Final measurements		Visual examination  Capacitance				No visible damage and no leakage of electrolyte  $\Delta C/C \leq 5\%$ of value measured in 4.7.1, unless otherwise specified in the detail specification
<i>Subgroup C1</i>						
Combined sample of specimens of subgroups C1A and C1B	D		6	27	1	
4.11 Climatic sequence						
4.11.1 Dry heat		Temperature: upper category temperature Duration: 16 h				
4.11.2 Damp heat, cyclic test Db, first cycle						
4.11.3 Cold		Temperature: lower category temperature Duration: 2 h				
4.11.4 Low air pressure (if required by the detail specification)		Air pressure: 8,5 kPa (85 mbar)				
4.11.4.3 Intermediate measurement		Visual examination				No breakdown, flashover or harmful deformation of the case
4.11.5 Damp heat, cyclic, Test Db, remaining cycles						
4.11.6 Sealing (if required by the detail specification)		Method: .....				
4.11.7 Final measurements		Visual examination  Leakage current Capacitance  Tangent of loss angle				No visible damage and no leakage of electrolyte Legible marking  As in 4.3.1  $\Delta C/C \leq 10\%$ of value measured in 4.5.2, 4.9.2 or 4.10.2 as applicable  $\leq 1,2$ times limit in 4.3.3

Subclause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)																
			p	n	c																	
<p><i>Subgroup C2</i></p> <p>4.12 Damp heat, steady state</p> <p>4.12.1 Initial measurement</p> <p>4.12.2 Final measurements</p>	D	<p>Capacitance</p> <p>Visual examination</p> <p>Leakage current</p> <p>Capacitance</p> <p>Tangent of loss angle</p> <p>Impedance</p> <p>Insulation resistance of the external insulation (if applicable)</p> <p>Voltage proof of the external insulation (if applicable)</p>	6	9	1	<p>No visible damage and no leakage of electrolyte</p> <p>Legible marking</p> <p>As in 4.3.1</p> <p><math>\Delta C/C</math> for:</p> <p><i>Long-life grade:</i>  <math>\leq 10\%</math></p> <p><i>General-purpose grade:</i>  <math>\leq 20\%</math> of value measured in 4.12.1</p> <p><math>\leq 1,2</math> times limit in 4.3.3</p> <p><math>\leq 1,2</math> times limit in the detail specification</p> <p><math>\geq 100\text{ M}\Omega</math></p> <p>No breakdown or flashover</p>																
<p><i>Subgroup C3</i></p> <p>4.13 Endurance</p> <p>4.13.1 Initial measurement</p> <p>4.13.3 Final measurements</p>	D	<p>Duration:</p> <p><i>Long-life grade:</i> 2 000 h</p> <p><i>General-purpose grade:</i> 1 000 h</p> <p>Temperature: upper category temperature</p> <p>Applied voltage: ..... V</p> <p>Recovery: 16 h min.</p> <p>Capacitance</p> <p>Visual examination</p> <p>Leakage current</p> <p>Capacitance</p>	3	21	1	<p>No visible damage and no leakage of electrolyte (see Note 4)</p> <p>As in 4.3.1</p> <p><math>\Delta C/C</math> compared to values measured in 4.13.1</p> <p><i>Long-life grade:</i></p> <table border="1"> <thead> <tr> <th>Rated voltage V</th> <th><math>\Delta C/C</math> %</th> </tr> </thead> <tbody> <tr> <td><math>U_R \leq 6,3</math></td> <td>+15 to -30</td> </tr> <tr> <td><math>6,3 &lt; U_R \leq 160</math></td> <td><math>\pm 15</math></td> </tr> <tr> <td><math>160 &lt; U_R</math></td> <td><math>\pm 10</math></td> </tr> </tbody> </table> <p><i>General-purpose grade:</i></p> <table border="1"> <thead> <tr> <th>Rated voltage V</th> <th><math>\Delta C/C</math> %</th> </tr> </thead> <tbody> <tr> <td><math>U_R \leq 6,3</math></td> <td>+25 to -40</td> </tr> <tr> <td><math>6,3 &lt; U_R \leq 160</math></td> <td><math>\pm 30</math></td> </tr> <tr> <td><math>160 &lt; U_R</math></td> <td><math>\pm 15</math></td> </tr> </tbody> </table>	Rated voltage V	$\Delta C/C$ %	$U_R \leq 6,3$	+15 to -30	$6,3 < U_R \leq 160$	$\pm 15$	$160 < U_R$	$\pm 10$	Rated voltage V	$\Delta C/C$ %	$U_R \leq 6,3$	+25 to -40	$6,3 < U_R \leq 160$	$\pm 30$	$160 < U_R$	$\pm 15$
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Subclause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)	
			p	n	c		
Subgroup C3 (concluded)		Tangent of loss angle  Impedance  Insulation resistance of the external insulation (if applicable)  Voltage proof of the external insulation (if applicable)				<p><i>Long-life grade:</i> ≤1,3 times the limit in 4.3.3</p> <p><i>General-purpose grade:</i> ≤1,5 times the limit in 4.3.3 or ≤0,4 whichever is the greater</p> <p><i>Long-life grade:</i> ≤2 times limit in detail specification</p> <p><i>General purpose grade:</i> ≤3 times the limit in detail specification</p> <p>≥100 MΩ</p> <p>No breakdown or flashover</p>	
Subgroup C4A 4.14 Surge	D	<p>Number of cycles: 1 000</p> <p>Temperature: ..... °C</p> <p>Charge voltage: 1,15 <math>U_R</math> or 1,15 <math>U_C</math> for <math>U_R \leq 315</math> V or 1,10 <math>U_R</math> or 1,10 <math>U_C</math> for <math>U_R &gt; 315</math> V</p> <p>Duration of charge: 30 s</p> <p>Duration of non-load: 5 min 30 s</p> <p>4.14.1 Initial measurement Capacitance</p> <p>4.14.3 Final measurements Visual examination</p> <p>Leakage current Capacitance</p> <p>Tangent of loss angle</p>	12	6	1	<p>No visible damage and no leakage of electrolyte (see Note 4)</p> <p>As in 4.3.1</p> <p><math>\Delta C/C \leq 15</math> % of value measured in 4.14.1</p> <p>As in 4.3.3</p>	
Subgroup C4B 4.15 Reverse voltage (if required)	D	<p>Duration: 125 h, at upper category temperature with a direct voltage of 1 V d.c. in reverse polarity direction, unless otherwise specified in the detail specification, followed by 125 h at upper category temperature with category voltage in forward polarity direction</p> <p>4.15.1 Initial measurement Capacitance</p> <p>4.15.3 Final measurements Leakage current Capacitance</p> <p>Tangent of loss angle</p>	12	6	1	1	<p>As in 4.3.1</p> <p><math>\Delta C/C \leq \dots</math> % of value measured in 4.15.1</p> <p>As in 4.3.3</p>
4.16 Pressure relief (if required)		Test method: .....				Device shall open without danger of explosion or fire	

Subclause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)										
			p	n	c											
<p><i>Subgroup C5A</i></p> <p>4.17 Storage at high temperature*</p> <p>4.17.1 Initial measurement</p> <p>4.17.3 Final measurements</p>	ND	<p>Temperature: upper category temperature Duration: 96 h ± 4 h Recovery: 16 h min.</p> <p>Capacitance</p> <p>Visual examination</p> <p>Leakage current</p> <p>Capacitance</p> <p>Tangent of loss angle</p>	6	12	1	<p>No visible damage and no leakage of electrolyte (see Note 4)</p> <p>≤2 times the limit in 4.3.1</p> <p>ΔC/C ≤ 10 % of value measured in 4.17.1</p> <p>≤1,2 times the limit in 4.3.3</p>										
<p><i>Subgroup C5B**</i></p> <p>4.18 Storage at low temperature</p> <p>4.18.1 Initial measurement</p> <p>4.18.2 Final measurements</p>	ND	<p>Duration: 16 h, or 4 h after thermal stability has been reached (whichever is the shorter) Temperature: -40 °C Recovery: 16 h min.</p> <p>Capacitance</p> <p>Visual examination</p> <p>Leakage current</p> <p>Capacitance</p> <p>Tangent of loss angle</p>	12	6	1	<p>No visible damage and no leakage of electrolyte Legible marking</p> <p>As in 4.3.1</p> <p>ΔC/C ≤ 10 % of value measured in 4.18.1</p> <p>As in 4.3.3</p>										
<p><i>Subgroup C6</i></p> <p>4.19 Characteristics at high and low temperature</p>	D	<p>The capacitors shall be measured at each temperature step</p> <p><i>Step 1:</i> 20 °C Capacitance***</p> <p>Tangent of loss angle***</p> <p>Impedance (at same frequency as Step 2)</p> <p><i>Step 2:</i> Lower category temperature Impedance</p>	6	15	1	<p>For use as reference value</p> <p>For use as reference value</p> <p>Ratio with respect to values in Step 1:</p> <table border="1"> <thead> <tr> <th>Rated voltage V</th> <th>Ratio of impedance</th> </tr> </thead> <tbody> <tr> <td><math>U_R \leq 6,3</math></td> <td>≤7</td> </tr> <tr> <td><math>6,3 &lt; U_R \leq 16</math></td> <td>≤5</td> </tr> <tr> <td><math>16 &lt; U_R \leq 160</math></td> <td>≤4</td> </tr> <tr> <td><math>160 &lt; U_R</math></td> <td>≤7</td> </tr> </tbody> </table>	Rated voltage V	Ratio of impedance	$U_R \leq 6,3$	≤7	$6,3 < U_R \leq 16$	≤5	$16 < U_R \leq 160$	≤4	$160 < U_R$	≤7
Rated voltage V	Ratio of impedance															
$U_R \leq 6,3$	≤7															
$6,3 < U_R \leq 16$	≤5															
$16 < U_R \leq 160$	≤4															
$160 < U_R$	≤7															
<p>* Not applicable if test is made in subgroup B1.</p> <p>** This subgroup only applies to capacitors with a lower category temperature of -25 °C and -10 °C.</p> <p>*** If applicable.</p>																

Subclause number and test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			<i>p</i>	<i>n</i>	<i>c</i>	
<i>Subgroup C6</i> (continued)		<i>Step 3:</i> Upper category temperature Leakage current				At 125 °C: ≤10 times the limit of 4.3.1 At 105 °C: ≤8 times the limit of 4.3.1 At 100 °C: ≤8 times the limit of 4.3.1 At 85 °C: ≤5 times the limit of 4.3.1
4.20 Charge and discharge (if required)		Capacitance* Tangent of loss angle* Temperature: 20 °C Number of cycles: $U_R \leq 160 \text{ V}$ : 10 <sup>6</sup> $U_R > 160 \text{ V}$ : under consideration Duration of charge: 0,5 s Duration of discharge: 0,5 s				See detail specification See detail specification
4.20.1 Initial measurement		Capacitance				
4.20.3 Final measurements		Visual examination Capacitance				No visible damage and no leakage of electrolyte $\Delta C/C \leq 10 \%$ of value measured in 4.20.1
* If applicable						
NOTE 1 Subclause numbers of tests and performance requirements refer to the sectional specification, IEC 60384-4 and clause 1 of this specification.						
NOTE 2 Inspection Levels and AQLs are selected from IEC 60410.						
NOTE 3 In this table:						
<i>p</i> is the periodicity (in months);						
<i>n</i> is the sample size;						
<i>c</i> is the acceptance criterion (permitted number of defectives);						
D is destructive						
ND is non destructive;						
IL is inspection level (IEC 60410);						
AQL is the acceptable quality level (IEC 60410).						
NOTE 4 When the detail specification indicates that a repetitive pressure-relief device is applied at the capacitor, the effects of the intended operation of the pressure-relief device (for example, slight colouring or discolouring, slight wetting, etc.) is not considered as leakage and/or visible damage. Seepage, however, is not permitted.						
NOTE 5 The tests in subgroup B1 are considered non-destructive provided that the (optional) high-temperature storage test is not applied. If the storage at high-temperature test is carried out, the capacitors are re-aged and submitted for inspection as part of a subsequent lot.						