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- i) has any issues related to 3rd party IPR, patent or copyright
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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



40/3267/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 60384-18 ED4	
DATE OF CIRCULATION: 2025-10-31	CLOSING DATE FOR COMMENTS: 2025-12-26
SUPERSEDES DOCUMENTS: 40/3124A/RR	

IEC TC 40 : CAPACITORS AND RESISTORS FOR ELECTRONIC EQUIPMENT	
SECRETARIAT: Netherlands	SECRETARY: Mr Ronald Drenthen
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED:	

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TITLE:

Fixed capacitors for use in electronic equipment - Part 18: Sectional specification - Fixed aluminium electrolytic surface mount capacitors with solid (MnO₂) and non-solid electrolyte

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 18: Sectional specification –

Fixed aluminium electrolytic surface mount capacitors

with solid (MnO₂) and non-solid electrolyte

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IEC 60384-18 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment. It is an International Standard.

This 4th edition cancels and replaces the 3rd edition published in 2016.

This edition includes the following significant technical changes with respect to the previous edition:

- a) The document structure has been organized to follow new sectional specification structure decided in TC 40 and the contents is harmonized with other similar documents.
- b) In addition, Clause 4 and all the tables have been reviewed in order to prevent duplications and contradictions.
- c) Annex A (Test schedule for quality conformance inspection) has been newly added to withdraw the blank detail specification: IEC 60384-18-1.

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 18: Sectional specification –

Fixed aluminium electrolytic surface mount capacitors with solid (MnO₂) and non-solid electrolyte

1 Scope

This part of IEC 60384 is applicable to fixed aluminium electrolytic surface mount capacitors with solid (MnO₂) and non-solid electrolyte, primarily intended for DC applications for use in electronic equipment.

Fixed aluminium electrolytic surface mount capacitors with conductive polymer solid electrolyte are not included but are covered by IEC 60384-25.

These capacitors are primarily intended for use in electronic equipment to be mounted directly onto substrates for hybrid circuits or on printed boards.

Capacitors for special-purpose applications can need additional requirements.

The object of this standard is to prescribe preferred ratings and characteristics and to select from IEC 60384-1:2021 the appropriate quality assessment procedures, tests and measuring methods and to give general performance requirements for this type of capacitor. Test severities and requirements prescribed in detail specifications referring to this sectional specification are of equal or higher performance level Normative references

This standard contains tests described as if required. For such tests, the relevant detail specification shall specify whether such tests are applicable.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60063, Preferred number series for resistors and capacitors

IEC 60068-1:2013, Environmental testing – Part 1: General and guidance

IEC 60068-2-58:2015, Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)

IEC 60384-1:2021, Fixed capacitors for use in electronic equipment – Part 1: Generic specification

IEC 61193-2:2007, Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and packages

ISO 3, Preferred numbers – Series of preferred numbers

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60384-1:2021 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Capacitance

<electrolytic capacitor> capacitance of an equivalent circuit whose capacitance and resistance in series is measured with an alternating current having an approximately sinusoidal waveform at a specified frequency

4 Preferred ratings and characteristics

4.1 Preferred characteristics

Preferred climatic categories only shall be given in the preferred characteristics.

The capacitors covered by this sectional specification are classified into categories in accordance with the general rules given in IEC 60068-1: 2013, Annex A.

The lower and upper category temperatures shall be taken from the following:

- lower category temperature: –55 °C, –40 °C, –25 °C and –10 °C;
- upper category temperature: +85 °C, +100 °C, +105 °C and +125 °C.

The severities for the cold and dry heat tests are the lower and upper category temperatures respectively.

4.2 Preferred values of ratings

4.2.1 Nominal capacitance (C_N)

Preferred values of nominal capacitance are indicated in microfarad (μF).

Preferred values of nominal capacitance shall be taken from the E12 series of IEC 60063 as follows:

1,0 - 1,2 - 1,5 - 1,8 - 2,2 - 2,7 - 3,3 - 3,9 - 4,7 - 5,6 - 6,8 - 8,2;

and their decimal multiples ($\times 10^n$, n : integer).

4.2.2 Tolerance on nominal capacitance

The preferred values of tolerances on nominal capacitance are: $\pm 10\%$ and $\pm 20\%$.

4.2.3 Rated voltage (U_R)

The preferred values of rated d.c. voltages taken from the R 10 and R 20 series of ISO 3 are:

– from R 10: 1,0 – 1,25 – 1,6 – 2,0 – 2,5 – 3,15 – 4,0 – 5,0 – 6,3 – 8,0;

– from R 20: 3,5¹ – 4,5;

– and their decimal multiples ($\square 10^n$, n : integer).

4.2.4 Category voltage (U_C)

The category voltage is equal to the rated voltage.

4.2.5 Surge voltage (U_{RS})

The surge voltage shall be 1,15 times the rated or category voltage, rounded off to the nearest volt (two significant digits) (Refer to

Table 1).

Rated voltage range	Surge voltage	Remarks
Rated voltage range	Surge voltage	Remarks
$\leq 315V$	$1,15 \times \text{rated voltage}$	
$\geq 315V$	$1,10 \times \text{rated voltage}$	
$\geq 500V$	Rated voltage + 50V	
$\geq 315V$	$1,10 \times \text{rated voltage}$	
$\geq 500V$	Rated voltage + 50V	

Table 1 – Surge voltages

Note 1: This definition may vary depending on the product series and the period of development.

Note 2: Values shall be rounded to two significant figures. When the integer part has three or more digits, rounding shall be applied to the first decimal place.

4.2.6 Rated temperature

The value of the rated temperature is +85 °C, +100 °C, +105 °C or +125 °C.

5 Test and measurement procedures**5.1 General**

This Clause 5 supplements the information given in the relevant clauses of IEC 60384-1:2021.

5.2 Preliminary Drying

The condition is given in IEC 60384-1:2021, 5.3

5.3 Measuring conditions

The measuring condition is as follows:

- Relative humidity: 25 % to 75 %.

5.4 Mounting**5.4.1 General**

Refer to IEC 60384-1:2021, with the details of 5.4.2 to 5.4.4.

5.4.2 Initial inspections

The capacitance shall be measured according to 5.6.2 of this document.

5.4.3 Test conditions

The test method shall be the reflow method and reflow temperature profile specified in the detail specification.

5.4.4 Final inspections

The capacitors shall be visually examined and the electrical characteristics measured as indicated in Table 8.

5.5 Visual examination and check of dimensions**5.5.1 General**

See IEC 60384-1:2021, 7.1, with the details of 5.5.2 and 5.5.3.

5.5.2 Visual examination and check of dimensions

Visual examination shall be carried out with suitable equipment with approximately 10× magnification and lighting appropriate to the specimen under test and quality level required. The operator should have available facilities for incident or transmitted illumination as well as an appropriate measuring facility. The capacitors shall be examined to verify the materials, design, construction, and physical dimensions are appropriate.

5.5.3 Requirements

After recovery, capacitors shall be subjected to a final inspection according to Table 8.

Table 2 Requirements regarding leakage current

Leakage current μA (at $20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$)	
Solid-electrolyte	Non-solid-electrolyte
$\leq 0,15\ C_N U_R$	$\leq 0,025\ C_N U_R$ or $1\mu\text{A}$

There shall be no signs of visible damage. Dissolution of the end face plating (leaching) shall not exceed 25 % of the length of the edge concerned. The requirements will be as follows.

The workmanship shall be in accordance with the applicable requirements given in the detail specification. Electrical tests

5.6 Electrical tests

5.6.1 Leakage current

5.6.1.1 General

Refer to IEC 60384-1:2021, 6.5, with the details of 5.6.1.2 and 5.6.1.3.

5.6.1.2 Measuring conditions

The rated voltage shall be applied across the capacitor and its protective resistor placed in series with the capacitor to limit the charging current. The protective resistor shall have a value of 1 000 Ω .

5.6.1.3 Requirements

After recovery, capacitors shall be subjected to a final inspection according to Table 8. The requirements will be as follows.

Table 3 Requirements regarding leakage current

Leakage current μA (at 20 °C ± 2 °C)	
Solid-electrolyte	Non-solid-electrolyte
$\leq 0,15 C_N U_R$	$\leq 0,025 C_N U_R$ or 1 μA

The capacitance requirements will be as follows. $|\Delta C/C| \leq 5\%$ of value measured in 5.6.2

5.6.2 Capacitance

5.6.2.1 General

Refer to IEC 60384-1:2021, 6.3, with the details of 5.6.2.2 and 5.6.2.3.

5.6.2.2 Measuring conditions

Unless otherwise specified in the detail specifications, the capacitance shall be measured at a frequency of 100 Hz or 120 Hz.

The peak alternating voltage actually applied across the capacitor terminations shall not exceed 0,5 V (RMS).

A DC bias voltage of 0,7 V to 1,0 V may be applied during the measurement to avoid voltage application to the capacitor by applied AC voltage.

The inaccuracy of the measuring instrument shall not exceed $\pm 2\%$ of the limit specified in the detail specification, whether this is given as an absolute value or as a change of capacitance.

5.6.2.3 Requirements

The requirements shall be in accordance with Table 8.

5.6.3 Tangent of loss angle ($\tan \delta$) or equivalent series resistance (ESR)**5.6.3.1 General**

See IEC 60384-1:2021, 6.4, with the details of 5.6.3.2 and 5.6.3.3.

The limits for the tangent of loss angle ($\tan \delta$) or for the equivalent series resistance (ESR) shall be specified in the detail specification.

For capacitors with non-solid electrolyte, instead of the tangent of loss angle ($\tan \delta$), the equivalent series resistance (ESR) may be specified in the detail specification.

5.6.3.2 Measuring conditions

The measurement shall be made under the conditions of 5.6.2.2. The inaccuracy of the measuring equipment shall not exceed 0,01 absolute value.

5.6.3.3 Requirements

The requirements shall be in accordance with Table 8

5.6.4 Impedance (if required)**5.6.4.1 General**

Refer to IEC 60384-1:2021, 6.6, with the details of 5.6.4.2 and 5.6.4.3.

5.6.4.2 Measuring frequency

The measuring frequency shall be chosen from one of the following values: 100 Hz, 120 Hz, 1 kHz, 10 kHz, 100 kHz and 1 MHz and shall be that at which the lowest value of impedance is likely to occur. The tolerance on all frequencies for measuring purposes shall not exceed 20 %. The value of the measuring frequency shall be prescribed by the detail specification.

5.6.4.3 Measuring conditions

The measuring voltage shall be small enough to avoid undue heating of the capacitor.

To demonstrate that the voltage is sufficiently small, it shall be applied to one of the capacitors in each sample for 1 min during which time there shall be no readable change in the impedance of the capacitor.

The error of measurement shall not exceed 5 % of the requirement or 0,02 Ω , whichever is the greater.

5.6.4.4 Measurement at lower category temperature

The measuring frequency at lower category temperature shall be 100 Hz or 120 Hz, unless otherwise specified by the detail specification.

5.6.4.5 Requirements

Refer to Table .

5.7 Resistance to soldering heat**5.7.1 General**

Refer to IEC 60384-1:2021, 5.17, with the details of 5.7.2, 5.7.3 and 5.7.4, unless otherwise specified in the detail specification.

5.7.2 Test conditions

The test method shall be the reflow method and reflow temperature profile specified in the detail specification. The test method shall be the reflow method and reflow temperature profile specified in IEC60068-2-58, 6.6.

5.7.3 Recovery

The recovery period shall be 1 h to 2 h.

5.7.4 Final inspections and requirements

After recovery, the capacitors shall be visually examined under normal lighting and approximately 10× magnification and the electrical characteristics measured as indicated in Table 8.

5.8 Solderability**5.8.1 General**

Refer to IEC 60384-1:2021, 4.17, with the details of 5.8.3.

5.8.2 Test conditions

Refer to IEC 60384-1:2021,4.17

5.8.3 Final inspections and requirements

Refer to Table 8.

5.9 Shear test**5.9.1 General**

Refer to IEC 60384-1:2021, 9.17, with the details of 5.9.2.

5.9.2 Final inspections and requirements

Refer to Table .

5.10 Substrate bending test**5.10.1 General**

Refer to IEC 60384-1: 2021, 9.18, with the details of 5.10.2.