

Fixed capacitors for use in electronic equipment -- Part 4: Sectional specification - Aluminium electrolytic capacitors with solid (MnO₂) and non-solid electrolyte

Fixed capacitors for use in electronic equipment --
Part 4: Sectional specification - Aluminium
electrolytic capacitors with solid (MnO₂) and non-
solid electrolyte

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60384-4:2007 sisaldab Euroopa standardi EN 60384-4:2007 ingliskeelset teksti. Käesolev dokument on jõustatud 25.07.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 60384-4:2007 consists of the English text of the European standard EN 60384-4:2007. This document is endorsed on 25.07.2007 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.
--	---

Käsitlusala: This part of IEC 60384 applies to aluminium electrolytic capacitors with solid (MnO₂) and nonsolid electrolyte primarily intended for d.c. applications for use in electronic equipment. It covers capacitors for long-life applications and capacitors for general-purpose applications. Capacitors for special-purpose applications may need additional requirements. Capacitors for fixed surface mount aluminium electrolytic capacitors are not included but they are covered by IEC 60384-18.	Scope: This part of IEC 60384 applies to aluminium electrolytic capacitors with solid (MnO₂) and nonsolid electrolyte primarily intended for d.c. applications for use in electronic equipment. It covers capacitors for long-life applications and capacitors for general-purpose applications. Capacitors for special-purpose applications may need additional requirements. Capacitors for fixed surface mount aluminium electrolytic capacitors are not included but they are covered by IEC 60384-18.
--	--

ICS 31.060.50

Võtmesõnad:

English version

**Fixed capacitors for use in electronic equipment -
Part 4: Sectional specification -
Aluminium electrolytic capacitors
with solid (MnO₂) and non-solid electrolyte
(IEC 60384-4:2007)**

Condensateurs fixes utilisés
dans les équipements électroniques -
Partie 4: Spécification intermédiaire -
Condensateurs électrolytiques
en aluminium à électrolyte solide (MnO₂)
et non solide
(CEI 60384-4:2007)

Festkondensatoren zur Verwendung
in Geräten der Elektronik -
Teil 4: Rahmenspezifikation -
Aluminium-Elektrolyt-Kondensatoren
mit festen (MnO₂) und
flüssigen Elektrolyten
(IEC 60384-4:2007)

This European Standard was approved by CENELEC on 2007-04-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 40/1759/CDV, future edition 4 of IEC 60384-4, prepared by IEC TC 40, Capacitors and resistors for electronic equipment, was submitted to the IEC-CENELEC parallel Unique Acceptance Procedure and was approved by CENELEC as EN 60384-4 on 2007-04-01.

This European Standard supersedes EN 130300:1998.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2008-01-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2010-04-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60384-4:2007 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60063	- ¹⁾	Preferred number series for resistors and capacitors	-	-
IEC 60068-1	- ¹⁾	Environmental testing - Part 1: General and guidance	EN 60068-1	1994 ²⁾
IEC 60068-2-17	- ¹⁾	Environmental testing - Part 2-17: Tests - Test Q: Sealing	EN 60068-2-17	1994 ²⁾
IEC 60068-2-54	- ¹⁾	Environmental testing - Part 2-54: Tests - Test Ta: Solderability testing of electronic components by the wetting balance method	EN 60068-2-54	2006 ²⁾
IEC 60384-1 (mod)	1999	Fixed capacitors for use in electronic equipment - Part 1: Generic specification	EN 60384-1 + corr. October	2001 2001
IEC 60384-4-1	- ¹⁾	Fixed capacitors for use in electronic equipment - Part 4-1: Blank detail specification - Fixed aluminium electrolytic capacitors with non-solid electrolyte - Assessment level EZ	EN 60384-4-1	2007 ²⁾
IEC 60384-4-2	- ¹⁾	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	EN 60384-4-2	2007 ²⁾
ISO 3	- ¹⁾	Preferred numbers - Series of preferred numbers	-	-

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

INTERNATIONAL STANDARD

IEC
60384-4

QC 300300

Fourth edition
2007-03

Fixed capacitors for use in electronic equipment –

Part 4:
Sectional specification –
Aluminium electrolytic capacitors with
solid (MnO₂) and non-solid electrolyte



Reference number
IEC 60384-4:2007(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. 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.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. 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 also available from the following:

- **IEC Web Site** (www.iec.ch)
- **Catalogue of IEC publications**
The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.
- **IEC Just Published**
This summary of recently issued publications (www.iec.ch/online_news/justpub) is also available by email. Please contact the Customer Service Centre (see below) for further information.
- **Customer Service Centre**
If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

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

INTERNATIONAL STANDARD

IEC
60384-4

QC 300300

Fourth edition
2007-03

Fixed capacitors for use in electronic equipment –

Part 4: Sectional specification – Aluminium electrolytic capacitors with solid (MnO₂) and non-solid electrolyte

© IEC 2007 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

W

For price, see current catalogue

CONTENTS

FOREWORD	4
1 General	6
1.1 Scope	6
1.2 Object	6
1.3 Normative references	6
1.4 Information to be given in a detail specification	7
1.5 Terms and definitions	8
1.6 Marking	8
2 Preferred ratings and characteristics	9
2.1 Preferred characteristics	9
2.2 Preferred values of ratings	9
3 Quality assessment procedures	11
3.1 Primary stage of manufacture	11
3.2 Structurally similar components	11
3.3 Certified records of released lots	11
3.4 Qualification approval procedures	11
3.5 Quality conformance inspection	24
4 Test and measurement procedures	26
4.1 Pre-conditioning (for non-solid electrolyte capacitors only)	26
4.2 Visual examination and check of dimensions	26
4.3 Electrical tests	26
4.4 Robustness of terminations	29
4.5 Resistance to soldering heat	29
4.6 Solderability	29
4.7 Rapid change of temperature	30
4.8 Vibration	30
4.9 Bump	30
4.10 Shock	31
4.11 Climatic sequence	31
4.12 Damp heat, steady state	32
4.13 Endurance	32
4.14 Surge	33
4.15 Reverse voltage (if required by the detail specification)	34
4.16 Pressure relief (if required by the detail specification)	34
4.17 Storage at high temperature	35
4.18 Storage at low temperature (for non-solid electrolyte capacitors only)	35
4.19 Characteristics at high and low temperature	35
4.20 Charge and discharge (if required by the detail specification)	35
4.21 High surge current (for solid electrolyte capacitors only and if required by the detail specification)	36
4.22 Voltage transient overload	36

Table 1 – Fixed sample size test plan for qualification approval, assessment level EZ	13
Table 2 – Test schedule for qualification approval.....	14
Table 3 – Lot-by-lot inspection	25
Table 4 – Periodic inspection	25
Table 5 – Leakage current requirements	26
Table 6 – Amplitude and acceleration options	30
Table 7 – Preferred severities	31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –**Part 4: Sectional specification –
Aluminium electrolytic capacitors with solid (MnO₂)
and non-solid electrolyte**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60384-4 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This fourth edition cancels and replaces the third edition published in 1998 and its amendment 1 (2000). This edition 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
40/1759/CDV	40/1819/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 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.

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

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 4: Sectional specification – Aluminium electrolytic capacitors with solid (MnO₂) and non-solid electrolyte

1 General

1.1 Scope

This part of IEC 60384 applies to aluminium electrolytic capacitors with solid (MnO₂) and non-solid electrolyte primarily intended for d.c. applications for use in electronic equipment. It covers capacitors for long-life applications and capacitors for general-purpose applications.

Capacitors for special-purpose applications may need additional requirements.

Capacitors for fixed surface mount aluminium electrolytic capacitors are not included but they are covered by IEC 60384-18.

1.2 Object

The principal object of this standard is to prescribe preferred ratings and characteristics and to select from IEC 60384-1 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 shall be of equal or higher performance level, because lower performance levels are not permitted.

1.3 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 60063, *Preferred number series for resistors and capacitors*

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

IEC 60068-2-17, *Environmental testing – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-54, *Environmental testing – Part 2-54: Tests – Test Ta: Solderability testing of electronic components by the wetting balance method*

IEC 60384-1:1999, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

IEC 60384-4-1, *Fixed capacitors for use in electronic equipment – Part 4-1: Blank detail specification – Fixed aluminium electrolyte capacitors with non-solid electrolyte – Assessment level EZ*

IEC 60384-4-2, *Fixed capacitors for use in electronic equipment – Part 4-2: Blank detail specification – Fixed aluminium electrolyte capacitors with solid (MnO₂) electrolyte – Assessment level EZ*

ISO 3, *Preferred numbers – Series of preferred numbers*