

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Fixed capacitors for use in electronic equipment –
Part 17: Sectional specification: Fixed metallized polypropylene film dielectric
a.c. and pulse capacitors**

**Condensateurs fixes utilisés dans les équipements électroniques –
Partie 17: Spécification intermédiaire – Condensateurs fixes pour tension
alternative et pour impulsions à diélectrique en film de polypropylène métallisé**

<https://standards.iteh.ai/standards/iec/7355a26e-046d-48fd-8894-f119c4d4b457/iec-60384-17-2005>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2005 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, 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 either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

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

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente. un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Fixed capacitors for use in electronic equipment –
Part 17: Sectional specification: Fixed metallized polypropylene film dielectric
a.c. and pulse capacitors**

**Condensateurs fixes utilisés dans les équipements électroniques –
Partie 17: Spécification intermédiaire – Condensateurs fixes pour tension
alternative et pour impulsions à diélectrique en film de polypropylène métallisé**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 31.060.30

ISBN 978-2-83220-603-4

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

| | |
|--|----|
| FOREWORD..... | 4 |
| 1 General..... | 7 |
| 1.1 Scope..... | 7 |
| 1.2 Object..... | 7 |
| 1.3 Normative references..... | 7 |
| 1.4 Information to be given in a detail specification..... | 8 |
| 1.5 Terms and definitions..... | 9 |
| 1.6 Marking..... | 10 |
| 2 Preferred ratings and characteristics..... | 11 |
| 2.1 Preferred characteristics..... | 11 |
| 2.2 Preferred values of ratings..... | 11 |
| 3 Quality assessment procedures..... | 12 |
| 3.1 Primary stage of manufacture..... | 12 |
| 3.2 Structurally similar components..... | 12 |
| 3.3 Certified records of released lots..... | 13 |
| 3.4 Qualification approval..... | 13 |
| 3.5 Quality conformance inspection..... | 20 |
| 4 Test and measurement procedures..... | 22 |
| 4.1 Visual examination and check of dimensions..... | 22 |
| 4.2 Electrical tests..... | 22 |
| 4.3 Robustness of terminations..... | 25 |
| 4.4 Resistance to soldering heat..... | 25 |
| 4.5 Solderability..... | 25 |
| 4.6 Rapid change of temperature..... | 25 |
| 4.7 Vibration..... | 25 |
| 4.8 Bump..... | 26 |
| 4.9 Shock..... | 26 |
| 4.10 Climatic sequence..... | 27 |
| 4.11 Damp heat, steady state..... | 28 |
| 4.12 Endurance..... | 28 |
| 4.13 Charge and discharge..... | 30 |
| 4.14 Component solvent resistance..... | 30 |
| 4.15 Solvent resistance of the marking..... | 30 |
| Bibliography..... | 31 |
| Table 1 – Preferred values..... | 10 |
| Table 2 – Preferred combinations..... | 12 |
| Table 3 – Sampling plan together with numbers of permissible defectives for qualification approval tests for a.c. and pulse capacitors..... | 14 |
| Table 4 – Test schedule for qualification approval..... | 15 |
| Table 5 – Lot-by-lot inspection..... | 21 |

| | |
|--|----|
| Table 6 – Periodic inspection | 21 |
| Table 7 – Tangent of loss angle | 23 |
| Table 8 – Insulation resistance requirements | 23 |
| Table 9 – Correction factors | 24 |
| Table 10 – Characteristics at lower category temperature | 24 |
| Table 11 – Characteristics at upper category temperature | 24 |
| Table 12 – Preferred severities | 26 |

Withdrawing

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

IEC 60384-17:2005
<https://standards.iteh.ai/document/standards/iec/7355a26e-046d-48fd-8894-f119c4d4b457/iec-60384-17-2005>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 17: Sectional specification: Fixed metallized polypropylene film dielectric a.c. and pulse capacitors

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 60384-17 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 1987 and constitutes minor revisions related to tables, figures and references.

This bilingual version (2013-01) corresponds to the monolingual English version, published in 2005-11.

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

| FDIS | Report on voting |
|--------------|------------------|
| 40/1597/FDIS | 40/1630/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.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 60384 consists of the following parts, under the (new) general title *Fixed capacitors for use in electronic equipment*:

- Part 1: Generic specification
- Part 2: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors
- Part 3: Sectional specification: Fixed tantalum chip capacitors
- Part 4: Sectional specification: Aluminium electrolytic capacitors with solid and non-solid electrolyte
- Part 5: Sectional specification: Fixed mica dielectric d.c. capacitors with a rated voltage not exceeding 3000 V – Selection of methods of test and general requirements
- Part 6: Sectional specification: Fixed metallized polycarbonate film dielectric d.c. capacitors
- Part 7: Sectional specification: Fixed polystyrene film dielectric metal foil d.c. capacitors
- Part 8: Sectional specification: Fixed capacitors of ceramic dielectric, Class 1
- Part 9: Sectional specification: Fixed capacitors of ceramic dielectric, Class 2
- Part 11: Sectional specification: Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors
- Part 12: Sectional specification: Fixed polycarbonate film dielectric metal foil d.c. capacitors
- Part 13: Sectional specification: Fixed polypropylene film dielectric metal foil d.c. capacitors
- Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains
- Part 15: Sectional specification: Fixed tantalum capacitors with non-solid or solid electrolyte
- Part 16: Sectional specification: Fixed metallized polypropylene film dielectric d.c. capacitors
- Part 17: Sectional specification: Fixed metallized polypropylene film dielectric a.c. and pulse capacitors
- Part 18: Sectional specification: Fixed aluminium electrolytic chip capacitors with solid and non-solid electrolyte
- Part 19: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric chip d.c. capacitors
- Part 20: Sectional specification: Fixed metallized polyphenylene sulfide film dielectric chip d.c. capacitors
- Part 21: Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1
- Part 22: Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 2
- Part 23: Sectional specification: Fixed surface mount metallized polyethylene naphthalate film dielectric d.c. capacitors
- Part 24: Sectional specification – Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte (under consideration)
- Part 25: Sectional specification – Surface mount fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte (under consideration)

All sectional specifications mentioned above do have one or more blank detail specifications being a supplementary document, containing requirements for style, layout and minimum content of detail specifications.

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.

Withdrawn

iTech Standards
(<https://standards.itih.ai>)
Document Preview

[IEC 60384-17:2005](https://standards.itih.ai/standards/iec/7355a26e-046d-48fd-8894-f119c4d4b457/iec-60384-17-2005)

<https://standards.itih.ai/standards/iec/7355a26e-046d-48fd-8894-f119c4d4b457/iec-60384-17-2005>

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 17: Sectional specification: Fixed metallized polypropylene film dielectric a.c. and pulse capacitors

1 General

1.1 Scope

This part of IEC 60384 applies to fixed capacitors with metallized electrodes and polypropylene dielectric for use in electronic equipment.

NOTE Capacitors which have mixed foil and metallized electrodes are also within the scope of this standard.

These capacitors may have "self-healing" properties depending on conditions of use.

Capacitors covered by this specification are mainly intended for use with alternating voltage and/or for pulse applications. The maximum reactive power applicable is 10 000 var and the maximum peak voltage is 3 000 V.

Capacitors for reactive power exceeding 500 var and to which a maximum peak voltage of 2 500 V at 50 Hz can be applied are not covered by this standard, except when they are the highest part of a range of reactive power mainly situated below 500 var at 50 Hz.

This standard is not intended to cover capacitance values higher than 20 μ F.

Two performance grades of capacitors are covered, Grade 1 for long-life application and Grade 2 for general application.

Capacitors for electromagnetic interference suppression are not included, but are covered by IEC 60384-14.

Capacitors for electrical shock hazard protection (covered by IEC 60065) and fluorescent lamp and motor capacitors (covered by IEC technical committee 33, and IEC technical committee 34) are also excluded.

1.2 Object

The 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 an 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 60063:1963, *Preferred number series for resistors and capacitors*
Amendment 1 (1967)
Amendment 2 (1977)

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

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

IEC 60384-17-1, *Fixed capacitors for use in electronic equipment – Part 17: Blank detail specification: Fixed metallized polypropylene film dielectric a.c. and pulse capacitors. Assessment level E*

IEC 60410, *Sampling plans and procedures for inspection by attributes*

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

1.4 Information to be given in a detail specification

Detail specifications shall be derived from the relevant blank detail specification.

Detail specifications shall not specify requirements inferior to those of the generic, sectional or blank detail specification. When more severe requirements are included, they shall be listed in 1.9 of the detail specification and indicated in the test schedules, for example by an asterisk.

NOTE The information given in 1.4.1 may for convenience, be presented in tabular form.

The following information shall be given in each detail specification and the values quoted shall preferably be selected from those given in the appropriate clause of this sectional specification.

1.4.1 Outline drawing and dimensions

There shall be an illustration of the capacitor as an aid to easy recognition and for comparison of the capacitor with others. Dimensions and their associated tolerances, which affect interchangeability and mounting, shall be given in the detail specification. All dimensions shall preferably be stated in millimetres.

Normally, the numerical values shall be given for the length of the body, the width and height of the body and the wire spacing, or for cylindrical types, the body diameter, and the length and diameter of the terminations. When necessary, for example when a number of items (capacitance values/voltage ranges) are covered by a detail specification, the dimensions and their associated tolerances shall be placed in a table below the drawing.

When the configuration is other than described above, the detail specification shall state such dimensional information as will adequately describe the capacitor. When the capacitor is not designed for use on printed boards, this shall be clearly stated in the detail specification

1.4.2 Mounting

The detail specification shall specify the method of mounting to be applied for normal use and for the application of the vibration and the bump or shock tests. The capacitors shall be mounted by their normal means. The design of the capacitor may be such that special mounting fixtures are required in its use. In this case, the detail specification shall describe the mounting fixtures and they shall be used in the application of the vibration and bump or shock tests.

1.4.3 Ratings and characteristics

The ratings and characteristics shall be in accordance with the relevant clauses of this specification, together with the following:

1.4.3.1 Rated capacitance range

See 2.2.1.

NOTE When products approved to the detail specification have different ranges, the following statement should be added:

"The range of values available in each voltage range is given in IEC QC 001005."

1.4.3.2 Sinusoidal current (if applicable)

The detail specification shall state the derating curve of the sinusoidal current versus temperature with reference to 70 °C, and the derating curve of the sinusoidal current versus frequency and of the sinusoidal current versus capacitance.

1.4.3.3 Particular characteristics

Additional characteristics may be listed, when they are considered necessary to specify adequately the component for design and application purposes.

1.4.3.4 Soldering

The detail specification shall prescribe the test methods, severities and requirements applicable for the solderability and the resistance to soldering heat test.

1.4.4 Marking

The detail specification shall specify the content of the marking on the capacitor and on the package. Deviations from 1.6 of this sectional specification, shall be specifically stated.

1.5 Terms and definitions

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

1.5.1

Performance grades

1.5.1.1

performance grade 1 capacitors (long-life)

capacitors intended for long-life applications with stringent requirements for the electrical parameters

1.5.1.2

performance grade 2 capacitors (general purpose)

capacitors for general application where the stringent requirements of performance grade 1 are not necessary

1.5.2

stability grade

capacitance drift after climatic and mechanical tests and after endurance tests.

NOTE The performance grade and the stability grade must be noted in the detail specification.

1.5.3

performance grade and stability grade combinations (if stability grade is required for a.c. and pulse capacitors)

see the table below for preferred values:

Table 1 – Preferred values

| Performance grades | Stability grades | Combination designations |
|--------------------|------------------|--------------------------|
| 1 | 1 | 1.1 |
| | 2 | 1.2 |
| 2 | – | 2 |

The three combinations concern capacitance stability and $\tan \delta$ values. Distinction in performance of the three combinations is shown in Table 4.

**1.5.4
rated voltages**

NOTE The sum of the d.c. voltage and the peak a.c. voltage or the peak pulse voltage applied to the capacitor must not exceed the rated voltage. The value of the peak a.c. voltage allowed at different frequencies is under consideration.

**1.5.4.1
rated d.c. voltage**

maximum d.c. voltage which may be applied continuously to a capacitor at the rated temperature

**1.5.4.2
rated a.c. voltage**

maximum r.m.s. alternating voltage which may be applied continuously to a capacitor at the rated temperature and at a given frequency

**1.5.4.3
rated pulse voltage**

peak value of the pulse voltage which may be applied continuously to a capacitor at the rated temperature and at a given frequency

**1.5.5
rated voltage pulse slope $\frac{(dU)}{(dr)_R}$ (if applicable)**

maximum admissible value of the voltage slope $\frac{dU}{dt}$ of a pulse, at the rated temperature at such a repetition frequency that no significant increase of temperature occurs

1.6 Marking

See 2.4 of IEC 60384-1, with the following details:

1.6.1 The information given in the marking is normally selected from the following list; the relative importance of each item is indicated by its position in the list:

- a) rated capacitance;
- b) rated a.c. and/or pulse voltage (a.c. voltage may be indicated by the symbol ~) and the corresponding frequency if different from 50 Hz;
- c) tolerance on rated capacitance;
- d) rated voltage pulse slope (if applicable);
- e) rated current and corresponding frequency (if applicable);
- f) year and month (or week) of manufacture;

- g) manufacturer's name or trade mark;
- h) climatic category;
- i) manufacturer's type designation;
- j) reference to the detail specification.

1.6.2 The capacitor shall be clearly marked with a), b) and c) above and with as many as possible of the remaining items as is considered necessary. Any duplication of information in the marking on the capacitor should be avoided.

1.6.3 The package containing the capacitor(s) shall be clearly marked with all the information listed in 1.6.1.

1.6.4 Any addition marking shall be so applied that no confusion can arise.

2 Preferred ratings and characteristics

2.1 Preferred characteristics

The values given in detail specifications shall preferably be selected from the following:

2.1.1 Preferred climatic categories

The capacitors covered by this specification are classified into climatic categories according to the general rules given in IEC 60068-1.

The lower and upper category temperatures and the duration of the damp heat, steady state test shall be chosen from the following:

Lower category temperature: –55 °C, –40 °C, –25 °C and –10 °C

Upper category temperature: +70 °C, +85 °C; +100 °C and +105 °C

Duration of the damp heat, steady state test: 4, 10, 21 and 56 days

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

2.2 Preferred values of ratings

2.2.1 Rated capacitance (C_R)

Preferred values of rated capacitance are values chosen from the E series of preferred values given in IEC 60063.

2.2.2 Tolerances on rated capacitance

The preferred tolerances on the rated capacitance are $\pm 20\%$; $\pm 10\%$; $\pm 5\%$; $\pm 2\%$; $\pm 1\%$.

2.2.3 Rated capacitance with associated tolerance values

For preferred combinations of capacitance series and tolerances see the table below:

Table 2 – Preferred combinations

| Preferred combinations | |
|------------------------|------------|
| Series | Tolerances |
| E 6 | ±20 % |
| E 12 | ±10 % |
| E 24 | ±5 % |
| E 48 | ±2 % |
| E 96 | ±1 % |

2.2.4 Rated a.c. voltage ($U_{Ra.c.}$ or $U_{R\sim}$)

The frequency for the rated a.c. voltage shall be 50/60 Hz unless the detail specification prescribes a higher frequency.

The preferred values of rated a.c. voltage (r.m.s. value) shall be chosen from the R10 or R20 series given in ISO 3.

The detail specification shall give the derating curve of the admissible r.m.s. voltage versus temperature (higher than rated temperature) and, if applicable, versus frequency.

2.2.5 Category a.c. voltage ($U_{Ca.c.}$ or $U_{C\sim}$)

The category a.c. voltage is equal to the rated a.c. voltage $U_{Ra.c.}$ for upper category temperatures up to 85 °C. For an upper category temperature >85 °C the category a.c. voltage is 0,7 $U_{R\sim}$.

2.2.6 Rated temperature

The standard value for rated temperature is 85 °C. Except for upper category temperature of 70 °C, the rated temperature is 70 °C.

NOTE AC rated temperature is 15 °C less than d.c. rated temperature.

2.2.7 Rated a.c. current (when required in the detail specification)

The detail specification shall state:

- the frequency
- the r.m.s. value of the rated a.c. current applicable at the specified frequency (value chosen from R10 or R20 series)
- the derating curve of the admissible a.c. current versus ambient temperature.

3 Quality assessment procedures

3.1 Primary stage of manufacture

The primary stage of manufacture is the winding of the capacitor element or the equivalent operation.

3.2 Structurally similar components

Capacitors considered as being structurally similar are capacitors produced with similar processes and materials, though they may be of different case sizes and values.