

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fixed capacitors for use in electronic equipment –
Part 2: Sectional specification – Fixed metallized polyethylene-terephthalate film
dielectric DC capacitors ([standards.iec.ch](https://standards.iec.ch/catalog/standards/580/adv/cdd-1503-4e4b-0004/))

Condensateurs fixes utilisés dans les équipements électroniques –
Partie 2: Spécification intermédiaire – Condensateurs fixes pour courant continu
à diélectrique en film de téraphthalate de polyéthylène métallisé





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 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 l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables 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 It also gives information on projects, replaced and withdrawn publications.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 online and once a month by email. <https://standards.iteh.ai/catalog/standards?start=1&size=100&sort=IEV-003-400-008a>

IEC 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: sales@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) 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 IEC

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

Recherche de publications IEC - webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC 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.

IEC Just Published - webstore.iec.ch/justpublished

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

Service Clients - webstore.iec.ch/csc

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

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

www.electropedia.org

IEC online collection - oc.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.



IEC 60384-2

Edition 5.0 2021-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fixed capacitors for use in electronic equipment –
Part 2: Sectional specification – Fixed metallized polyethylene-terephthalate film
dielectric DC capacitors

Condensateurs fixes utilisés dans les équipements électroniques –
Partie 2: Spécification intermédiaire – Condensateurs fixes pour courant continu
à diélectrique en film de téraphthalate de polyéthylène métallisé

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.060.30

ISBN 978-2-8322-1030-2

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	5
1 Scope	7
2 Normative references	7
3 Terms and definitions	7
4 Preferred ratings and characteristics	8
4.1 Preferred characteristics	8
4.2 Preferred values of ratings	8
4.2.1 Nominal capacitance (C_N)	8
4.2.2 Tolerance on nominal capacitance	8
4.2.3 Rated voltage (U_R)	9
4.2.4 Category voltage (U_C)	9
4.2.5 Rated temperature	9
5 Test and measurement procedures, and performance requirements	9
5.1 Visual examination and check of dimensions	9
5.2 Electrical tests	9
5.2.1 Voltage proof	9
5.2.2 Capacitance	10
5.2.3 Tangent of loss angle ($\tan \delta$)	10
5.2.4 Insulation resistance	11
5.3 Robustness of terminations	12
5.3.1 General	12
https://standards.iteh.ai/catalog/standards/sist/fad71cd6-1563-4e4b-b68a-978e4b30afcc/iec-60384-2-2021	12
5.3.2 Initial inspections	12
5.3.3 Test method	13
5.3.4 Final inspections and requirements	13
5.4 Resistance to soldering heat	13
5.4.1 General	13
5.4.2 Test conditions	13
5.4.3 Final inspections and requirements	13
5.5 Solderability	13
5.5.1 General	13
5.5.2 Test conditions	13
5.5.3 Final requirements	14
5.6 Rapid change of the temperature	14
5.6.1 General	14
5.6.2 Initial inspections	14
5.6.3 Test conditions	14
5.6.4 Final inspections	14
5.7 Vibration	14
5.7.1 General	14
5.7.2 Test conditions	14
5.7.3 Final inspections and requirements	14
5.8 Bump (repetitive shock)	14
5.8.1 General	14
5.8.2 Initial inspections	14
5.8.3 Test conditions	15

5.8.4	Final inspections and requirements.....	15
5.9	Shock	15
5.9.1	General	15
5.9.2	Initial inspections.....	15
5.9.3	Test conditions	15
5.9.4	Final inspections and requirements.....	15
5.10	Climatic sequence.....	16
5.10.1	General	16
5.10.2	Initial inspections.....	16
5.10.3	Dry heat	16
5.10.4	Damp heat, cyclic, Test Db, first cycle	16
5.10.5	Cold.....	16
5.10.6	Low air pressure	16
5.10.7	Damp heat, cyclic, Test Db, remaining cycles	16
5.11	Damp heat, steady state	17
5.11.1	General	17
5.11.2	Initial inspections	17
5.11.3	Test conditions	17
5.11.4	Final inspections and requirements.....	17
5.12	Endurance	17
5.12.1	General	17
5.12.2	Initial inspections	17
5.12.3	Test conditions	17
5.12.4	Final inspections and requirements.....	17
5.13	Charge and discharge	18
5.13.1	General	18
5.13.2	Initial inspections	18
5.13.3	Test conditions	18
5.13.4	Final inspections and requirements.....	19
5.14	Component solvent resistance	19
5.15	Solvent resistance of the marking	19
6	Marking	19
6.1	General.....	19
6.2	Information for marking	19
6.3	Marking of capacitors.....	19
6.4	Marking of packaging	19
6.5	Additional marking	19
7	Information to be given in a detail specification.....	20
7.1	General.....	20
7.2	Outline drawing and dimensions	20
7.3	Mounting.....	20
7.4	Rating and characteristics.....	20
7.4.1	General	20
7.4.2	Particular characteristics	20
7.4.3	Soldering	20
7.5	Marking.....	21
8	Quality assessment procedures	21
8.1	Primary stage of manufacture	21
8.2	Structurally similar components	21

8.3 Certified records of released lots	21
8.4 Qualification approval procedures	21
8.4.1 General	21
8.4.2 Qualification approval on the basis of the fixed sample size procedures	21
8.5 Quality conformance inspection	28
8.5.1 Formation of inspection lots	28
8.5.2 Test schedule	29
8.5.3 Delayed delivery	29
8.5.4 Assessment levels	29
Annex X (informative) Cross-references to the previous edition of this document	31
Bibliography	32
 Table 1 – Test points and voltages	10
Table 2 – Tangent of loss angle requirements	11
Table 3 – Insulation resistance requirements	12
Table 4 – Correction factors	12
Table 5 – Preferred severities	15
Table 6 – Test conditions	17
Table 7 – Lead spacing and dU/dt	18
Table 8 – Sampling plan together with numbers of permissible non-conformance for qualification approval test	23
Table 9 – Test schedule for qualification approval	24
Table 10 – Lot-by-lot inspection	IEC 60384-2:2021 29
Table 11 – Periodic inspection	https://standards.iteh.ai/catalog/standards/sist/fad71cd6-1563-4e4b-b68a-978e4b30afcc/iec-60384-2-2021 30
Table X.1 – Cross-references	31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –**Part 2: Sectional specification – Fixed metallized
polyethylene-terephthalate film dielectric DC 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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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 60384-2 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This fifth edition cancels and replaces the fourth edition published in 2011. This edition constitutes a technical revision.

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

- a) revision of all parts of the document based on the ISO/IEC Directives, Part 2:2018 and harmonization with other similar kinds of documents;
- b) the document structure has been organized to follow the new sectional specification structure decided by TC 40;
- c) revision of tables and Clause 5 so as to prevent duplications and contradictions.

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

FDIS	Report on voting
40/2821/FDIS	40/2830/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

A list of all parts in the IEC 60384 series, published 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 document will remain unchanged until the stability date indicated on the IEC website under "http://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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 60384-2:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/fad71cd6-1563-4e4b-b68a-978e4b30afcc/iec-60384-2-2021>

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 2: Sectional specification – Fixed metallized polyethylene-terephthalate film dielectric DC capacitors

1 Scope

This part of IEC 60384 applies to fixed capacitors for direct current, with metallized electrodes and polyethylene-terephthalate dielectric for use in electronic equipment.

These capacitors have a possibility of "self-healing properties" depending on conditions of use. They are primarily intended for applications where the AC component is small with respect to the rated voltage. Two performance grades of capacitors are covered: grade 1 for long-life application and grade 2 for general application.

Capacitors for electromagnetic interference suppression and surface mount fixed metallized polyethylene-terephthalate film dielectric DC capacitors are not included, but are covered by IEC 60384-14 and IEC 60384-19, respectively.

The object of this document 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 are of equal or higher performance level, because lower performance levels are not permitted.

[IEC 60384-2:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/fad71cd6-1563-4e4b-b68a-978e4b30afcc/iec-60384-2-2021>

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 60063:2015, *Preferred number series for resistors and capacitors*

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

IEC 60384-1:2016, *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 3:1973, *Preferred numbers – Series of preferred numbers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60384-1:2016 and the following apply.

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

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

3.1

grade 1 capacitors

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

3.2

grade 2 capacitors

<general purpose> capacitors for general application where the stringent requirements for grade 1 are not necessary

3.3

rated voltage

U_R

maximum DC voltage that can be continuously applied to a capacitor at the rated temperature

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 specification are classified into climatic categories in accordance with the general rules given in IEC 60068-1:2013, Annex A.

[\[978e4b30afcc/iec-60384-2-2021\]\(https://standards.iec.ch/online Standards/500.html?cd6-1563-4e4b-b68a-978e4b30afcc/iec-60384-2-2021\)](https://standards.iec.ch/online Standards/500.html?cd6-1563-4e4b-b68a-</p></div><div data-bbox=)

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 and –25 °C |
| – upper category temperature: | +85 °C, +100 °C, +105 °C and +125 °C |
| – duration of the damp heat, steady-state test: | 21 days and 56 days |

NOTE With continuous operation at 125 °C in excess of the endurance test time, accelerated ageing is considered (see detail specification).

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 values chosen from the E series of IEC 60063, which are given in Table 1, and their decimal multiples ($\times 10^n$, where n is an integer).

4.2.2 Tolerance on nominal capacitance

The preferred tolerances on the nominal capacitance are ±5 %, ±10 % and ±20 %.

4.2.3 Rated voltage (U_R)

The preferred values of rated voltages are: 40 V – 50 V – 63 V – 100 V – 160 V – 200 V – 250 V – 400 V – 630 V – 1 000 V – 1 600 V. These values conform to the basic series of preferred values R5 and R 10 given in ISO 3.

The sum of the DC voltage and the peak AC voltage applied to the capacitor shall not exceed the rated voltage. The value of the peak AC voltage shall not exceed the following percentages of the rated voltage at the frequencies stated and shall be not greater than 280 V:

- 50 Hz: 20 %
- 100 Hz: 15 %
- 1 000 Hz: 3 %
- 10 000 Hz: 1 %

unless otherwise specified in the detail specification.

4.2.4 Category voltage (U_C)

The category voltage is equal to the rated voltage for upper category temperatures up to 85 °C.

For the upper category temperature of 100 °C, the voltage is 0,8 U_R .

iTeh STANDARD PREVIEW
For the upper category temperature of 105 °C, the voltage is 0,75 U_R .
(standards.iteh.ai)

For the upper category temperature of 125 °C, the voltage is 0,5 U_R .

[IEC 60384-2:2021](#)

4.2.5 Rated temperature <https://standards.iteh.ai/catalog/standards/sist/fad71cd6-1563-4e4b-b68a-978e4b30afcc/iec-60384-2-2021>

The standard value of rated temperature is 85 °C.

5 Test and measurement procedures, and performance requirements

5.1 Visual examination and check of dimensions

See IEC 60384-1:2016, 4.4.

5.2 Electrical tests

5.2.1 Voltage proof

5.2.1.1 General

See IEC 60384-1:2016, 4.6, with the details of 5.2.1.2 to 5.2.1.4.

5.2.1.2 Test circuit

Delete the capacitor C_1 .

The product of R_1 and the nominal capacitance (C_N) of the capacitor under test (C_X) shall be smaller than or equal to 1 s and greater than 0,01 s.

R_1 includes the internal resistance of the power supply.

R_2 shall limit the discharge current to a value equal to or less than 1 A.

5.2.1.3 Test conditions

The voltages in Table 1 shall be applied between the measuring points of IEC 60384-1:2016, Table 3, for a period of 1 min for qualification approval testing and for a period of 1 s for the lot-by-lot quality conformance testing.

Table 1 – Test points and voltages

Test point	Test voltage
1 a)	Grade 1: 1,6 U_R Grade 2: 1,4 U_R
1 b), 1 c)	2 U_R with a minimum of 200 V

5.2.1.4 Requirements

See Table 9.

The occurrence of self-healing breakdowns during the application of the test voltages is allowed.

5.2.2 Capacitance

5.2.2.1 General **iTeh STANDARD PREVIEW** (standards.iteh.ai)

See IEC 60384-1:2016, 4.7, with the details of 5.2.2.2 and 5.2.2.3.

5.2.2.2 Measuring conditions [IEC 60384-2:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/fad71cd6-1563-4e4b-b68a-978e4890aace4ecf60384-2:2021>
The capacitance shall be measured at or corrected to a frequency of 1 kHz.

For nominal capacitance values > 10 μF , 50 Hz to 120 Hz may be used, but 1 kHz shall be the reference frequency.

The applied peak voltage at 1 kHz shall not exceed 3 % of the rated voltage, and the applied peak voltage at 50 Hz to 120 Hz shall not exceed 20 % of the rated voltage, with a maximum of 100 V (70 V RMS).

5.2.2.3 Requirements

The capacitance shall be within the specified tolerance. See Table 9.

5.2.3 Tangent of loss angle ($\tan \delta$)

5.2.3.1 General

See IEC 60384-1:2016, 4.8, with the details of 5.2.3.2 to 5.2.3.5.

5.2.3.2 Measuring conditions for measurements at 1 kHz

Tangent of loss angle shall be measured as follows:

- frequency: 1 kHz;
- peak voltage: $\leq 3\%$ of the rated voltage;
- inaccuracy: $\leq 10 \times 10^{-4}$ (absolute value).

5.2.3.3 Requirement for measurements at 1 kHz

Tangent of loss angle shall not exceed the applicable values shown in Table 2.

Table 2 – Tangent of loss angle requirements

Nominal capacitance	$\tan \delta$ (absolute value)	
	Grade 1 capacitors	Grade 2 capacitors
$\leq 1 \mu\text{F}$	0,008	0,01
$> 1 \mu\text{F}$	0,01	0,01

5.2.3.4 Measuring conditions for measurements at 10 kHz

For capacitors with $C_N \leq 1 \mu\text{F}$, $\tan \delta$ shall be measured as follows:

- frequency: 10 kHz;
- voltage: $\leq 1 \text{ V RMS}$;
- inaccuracy: $\leq 10 \times 10^{-4}$ (absolute value).

5.2.3.5 Requirement for measurements at 10 kHz

Tangent of loss angle shall be prescribed in the detail specification.

iTeh STANDARD PREVIEW

5.2.4 Insulation resistance (standards.iteh.ai)

5.2.4.1 General

See IEC 60384-1:2016, 4.5, with the details of 5.2.4.2 to 5.2.4.5.
<https://standards.iteh.ai/catalog/standards/sist/fad/1cd6-1563-4e4b-b68a-978e4b30afcc/iec-60384-2-2021>

5.2.4.2 Preconditioning

Before measurement, the capacitor shall be fully discharged. The product of the resistance of the discharge circuit and the nominal capacitance of the capacitor under test shall be $\geq 0,01 \text{ s}$ or any other value prescribed in the detail specification.

5.2.4.3 Measuring conditions

The measuring voltage shall be in accordance with IEC 60384-1:2016, 4.5.2.

The voltage shall be applied immediately at the correct value through the internal resistance of the voltage source.

The product of the internal resistance and the nominal capacitance of the capacitor under test shall be smaller than 1 s or any other value prescribed in the detail specification.

5.2.4.4 Requirements

The insulation resistance shall meet the requirements given in Table 3. However, in lot-by-lot quality conformance testing, the measuring may be interrupted when the limits stated in Table 3 are reached, which can happen in under 60 s.

Table 3 – Insulation resistance requirements

Measuring points ^a	Nominal capacitance	Rated voltage	Minimum RC product ^b		Minimum insulation resistance between terminations		Minimum insulation resistance between terminations and case MΩ	
			S		MΩ			
			Grade 1	Grade 2	Grade 1	Grade 2		
1a)	> 0,33 µF	> 100 V	10 000	2 500	—	—	—	
		≤ 100 V	5 000	1 250	—	—	—	
	≤ 0,33 µF	> 100 V	—	—	30 000	7 500	—	
		≤ 100 V	—	—	15 000	3 750	—	
1b), 1c)	—	—	—	—	—	—	30 000	

^a Measuring points in accordance with Table 3 of IEC 60384-1:2016.

^b R = insulation resistance between the terminations
C = nominal capacitance

5.2.4.5 Correction factors

When the test is carried out at a temperature other than 20 °C, the result shall, when necessary, be corrected to 20 °C by multiplying the result of the measurement by the appropriate correction factor. In case of doubt, measurement at 20 °C is decisive. The following correction factors (see Table 4) can be considered as an average for metallized polyethylene-terephthalate film capacitors:

ITECH STANDARD PREVIEW
(standards.iteh.ai)

Table 4 – Correction factors

IEC 60384-2:2021

Temperature °C	Correction factor	Temperature °C	Correction factor
15	0,79	26	1,32
16	0,83	27	1,38
17	0,87	28	1,45
18	0,91	29	1,52
19	0,95	30	1,59
20	1,00	31	1,66
21	1,05	32	1,74
22	1,10	33	1,82
23	1,15	34	1,91
24	1,20	35	2,00
25	1,26		

5.3 Robustness of terminations

5.3.1 General

See IEC 60384-1:2016, 4.13, with the details of 5.3.2 to 5.3.4.

5.3.2 Initial inspections

The capacitance shall be measured in accordance with 5.2.2.2.

The tangent of loss angle shall be measured in accordance with 5.2.3.2 or 5.2.3.4, as appropriate.

5.3.3 Test method

See IEC 60384-1:2016, 4.13.

5.3.4 Final inspections and requirements

See Table 9.

5.4 Resistance to soldering heat

5.4.1 General

See IEC 60384-1:2016, 4.14, with the details of 5.4.2 and 5.4.3.

5.4.2 Test conditions

No pre-drying.

Method 1 (solder bath) or Method 2 (soldering iron) of IEC 60384-1:2016, 4.14, unless otherwise specified in the detail specification.

If method 1 is applied, **iTeh STANDARD PREVIEW**

- temperature of the solder bath: $(260 \pm 5)^\circ\text{C}$
- immersion time: $(5 \pm 0,5)$ s or (10 ± 1) s, as specified in the detail specification.

If method 2 is applied,

<https://standards.iteh.ai/catalog/standards/sist/fad71cd6-1563-4e4b-b68a-978e4b30afcc/iec-60384-2-2021>

- temperature of the soldering iron: $(350 \pm 10)^\circ\text{C}$;
- soldering iron size A;
- soldering duration time: (10 ± 1) s.

5.4.3 Final inspections and requirements

After recovery, the capacitors shall be visually examined and measured and shall meet the requirements given in Table 9.

5.5 Solderability

5.5.1 General

See IEC 60384-1:2016, 4.15, with the details of 5.5.2 and 5.5.3.

5.5.2 Test conditions

No aging.

Temperature of the solder bath and process time for preferred solders:

- SnPb solder: $(235 \pm 3)^\circ\text{C}$ for $(2 \pm 0,2)$ s;
- Sn96,5Ag3Cu,5 solder: $(245 \pm 3)^\circ\text{C}$ for $(3 \pm 0,3)$ s;
- Sn99,3Cu,7 solder: $(250 \pm 3)^\circ\text{C}$ for $(3 \pm 0,3)$ s.

The requirements for the globule test method shall be prescribed in the detail specification.