

---

**Materiali za plošče tiskanih vezij in druge povezovalne strukture - 2-47. del: Pokovinjeni in nepokovinjeni ojačeni osnovni materiali - Z bakrom pokovinjeni laminat s toplotno prevodnostjo (2,0W/m K) in z določeno gorljivostjo (navpični preskus gorljivosti), s površino z netkanim/tkanim E-steklom za sestavljanje brez svinca**

Materials for printed boards and other interconnecting structures - Part 2-47: Reinforced base materials clad and unclad - Non-halogenated epoxide non-woven/woven E-glass reinforced laminate sheets of thermal conductivity  $\leq 2.0\text{W/m K}$  and defined flammability (vertical burning test), copper-clad for lead-free assembly

[SIST EN IEC 61249-2-47:2018](https://standards.iteh.ai/catalog/standards/sist/94be45d3-a7d2-4351-bd7a-1fe5b1a50829/sist-en-iec-61249-2-47-2018)

<https://standards.iteh.ai/catalog/standards/sist/94be45d3-a7d2-4351-bd7a-1fe5b1a50829/sist-en-iec-61249-2-47-2018>

**Ta slovenski standard je istoveten z: EN IEC 61249-2-47:2018**

---

**ICS:**

31.180 Tiskana vezja (TIV) in tiskane Printed circuits and boards  
plošče

**SIST EN IEC 61249-2-47:2018**

**en**

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

SIST EN IEC 61249-2-47:2018

<https://standards.iteh.ai/catalog/standards/sist/94be45d3-a7d2-4351-bd7a-1fe5b1a50829/sist-en-iec-61249-2-47-2018>

EUROPEAN STANDARD

EN IEC 61249-2-47

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2018

ICS 31.180

English Version

Materials for printed boards and other interconnecting structures  
- Part 2-47: Reinforced base materials clad and unclad - Non-  
halogenated epoxide non-woven/woven E-glass reinforced  
laminated sheets of thermal conductivity (2.0W/m K) and defined  
flammability (vertical burning test), copper-clad for lead-free  
assembly  
(IEC 61249-2-47:2018)

Matériaux pour circuits imprimés et autres structures  
d'interconnexion - Partie 2-47 : Matériaux de base  
renforcés, plaqués et non plaqués - Feuilles stratifiées  
renforcées en verre de type E tissé/non tissé époxyde non  
halogéné, plaquées cuivre de conductivité thermique  
(2,0W/m m•K) et d'inflammabilité définie (essai de  
combustion verticale) pour les assemblages sans plomb  
(IEC 61249-2-47:2018)

Materialien für Leiterplatten und andere  
Verbindungsstrukturen - Teil 2-47: Kaschierte und  
unkaschierte verstärkte Basismaterialien -  
Kupferkaschierte, mit E-Glaswirrfaser im Kernbereich und  
E-Glasgewebe in den Außenlagen verstärkte Laminattafeln  
auf der Basis von halogenfreiem Epoxidharz mit  
Wärmeleitfähigkeit (2,0 W/m•K) und definierter Brennbarkeit  
(vertikale Prüflingslage) für bleifreie Bestückungstechnik  
(IEC 61249-2-47:2018)

SIST EN IEC 61249-2-47:2018

This European Standard was approved by CENELEC on 2018-02-14. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

**EN IEC 61249-2-47:2018 (E)****European foreword**

The text of document 91/1449/FDIS, future edition 1 of IEC 61249-2-47, prepared by IEC/TC 91 "Electronics assembly technology" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61249-2-47:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-11-14
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-02-14

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

**Endorsement notice**

The text of the International Standard IEC 61249-2-47:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

ISO 9000	NOTE	Harmonized as EN ISO 9000.
ISO 14001	NOTE	Harmonized as EN ISO 14001.

[SIST EN IEC 61249-2-47:2018](https://standards.iteh.ai/catalog/standards/sist/94be45d3-a7d2-4351-bd7a-1fe5b1a50829/sist-en-iec-61249-2-47-2018)  
<https://standards.iteh.ai/catalog/standards/sist/94be45d3-a7d2-4351-bd7a-1fe5b1a50829/sist-en-iec-61249-2-47-2018>

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

Publication	Year	Title	EN/HD	Year
IEC 61189-2	2006	Test methods for electrical materials, printed boards and other interconnection structures and assemblies -- Part 2: Test methods for materials for interconnection structures	EN 61189-2	2006
IEC 61249-5-1	-	Materials for interconnection structures - Part 5: Sectional specification set for conductive foils and films with or without coatings - Section 1: Copper foils (for the manufacture of copper-clad base materials)	EN 61249-5-1	-
IEC/PAS 61249-6-3	-	Specification for finished fabric woven from "E" glass for printed boards	-	-
ISO 11014	-	Safety data sheet for chemical products - Content and order of sections	-	-

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

SIST EN IEC 61249-2-47:2018

<https://standards.iteh.ai/catalog/standards/sist/94be45d3-a7d2-4351-bd7a-1fe5b1a50829/sist-en-iec-61249-2-47-2018>



# INTERNATIONAL STANDARD

**Materials for printed boards and other interconnecting structures –  
Part 2-47: Reinforced base materials clad and unclad – Non-halogenated  
epoxide non-woven/woven E-glass reinforced laminate sheets of thermal  
conductivity 2,0 W/(m•K) and defined flammability (vertical burning test),  
copper-clad for lead-free assembly**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 31.180

ISBN 978-2-8322-5198-0

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions.....	6
4 Materials and construction.....	7
4.1 General.....	7
4.2 Resin system.....	7
4.3 Metal foil.....	7
4.4 Reinforcement.....	7
5 Electrical properties.....	7
6 Non-electrical properties of the copper-clad laminate.....	8
6.1 Appearance of the copper-clad sheet.....	8
6.1.1 General.....	8
6.1.2 Indentations (pits and dents).....	8
6.1.3 Wrinkles.....	8
6.1.4 Scratches.....	8
6.1.5 Raised areas.....	9
6.2 Appearance of the unclad face.....	9
6.3 Laminate thickness.....	9
6.4 Bow and twist.....	9
6.5 Properties related to the copper foil bond.....	10
6.6 Punching and machining.....	11
6.7 Dimensional stability.....	11
6.8 Sheet sizes.....	11
6.8.1 Typical sheet sizes.....	11
6.8.2 Tolerances for sheet sizes.....	11
6.9 Cut panels.....	12
6.9.1 Cut panel sizes.....	12
6.9.2 Size tolerances for cut panels.....	12
6.9.3 Rectangularity of cut panels.....	12
6.10 Thermal conductivity.....	12
7 Non-electrical properties of the base material after complete removal of the copper foil.....	13
7.1 Appearance of the dielectric base material.....	13
7.2 Flexural strength.....	13
7.3 Flammability.....	13
7.4 Water absorption.....	14
7.5 Measling.....	14
7.6 Glass transition temperature and cure factor.....	14
7.7 Decomposition temperature.....	15
7.8 Time to delamination (TMA).....	15
7.9 Halogen content.....	15
8 Quality assurance.....	15
8.1 Quality system.....	15
8.2 Responsibility for inspection.....	16
8.3 Qualification inspection.....	16
8.4 Quality conformance inspection.....	16



8.5	Certificate of conformance .....	16
8.6	Safety data sheet .....	16
9	Packaging and marking.....	16
10	Ordering information .....	17
Annex A (informative)	Engineering information .....	18
A.1	General.....	18
A.2	Chemical properties .....	18
A.3	Electrical properties .....	18
A.4	Flammability properties .....	18
A.5	Mechanical properties .....	18
A.6	Physical properties.....	18
A.7	Thermal properties .....	18
Annex B (informative)	Common laminate constructions.....	20
Annex C (informative)	Guideline for qualification and conformance inspection.....	21
Bibliography	.....	22
Table 1	– Electrical properties .....	7
Table 2	– Size of indentations .....	8
Table 3	– Nominal thickness and tolerance of metal-clad laminate.....	9
Table 4	– Bow and twist requirements .....	10
Table 5	– Pull-off and peel strength requirements.....	10
Table 6	– Dimensional stability .....	11
Table 7	– Size tolerances for cut panels.....	12
Table 8	– Rectangularity of cut panels .....	12
Table 9	– Thermal conductivity.....	12
Table 10	– Flexural strength requirements .....	13
Table 11	– Flammability requirements .....	14
Table 12	– Water absorption requirements .....	14
Table 13	– Measling requirements .....	14
Table 14	– Glass transition temperature and cure factor requirements .....	15
Table 15	– Decomposition temperature requirements .....	15
Table 16	– Time to delamination requirements.....	15
Table 17	– Halogen content.....	15
Table C.1	– Qualification and conformance inspection .....	21

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

—————

**MATERIALS FOR PRINTED BOARDS AND OTHER  
INTERCONNECTING STRUCTURES –**

**Part 2-47: Reinforced base materials clad and unclad – Non-halogenated  
epoxide non-woven/woven E-glass reinforced laminate sheets of  
thermal conductivity 2,0 W/(m•K) and defined flammability  
(vertical burning test), copper-clad for lead-free assembly**

## 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 61249-2-45 has been prepared by IEC technical committee 91: Electronics assembly technology.

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

CDV	Report on voting
91/1449/FDIS	91/1485/RVC

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 of the IEC 61249 series, under the general title *Materials for printed boards and other interconnecting structures*, 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.

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

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 61249-2-47:2018](https://standards.iteh.ai/catalog/standards/sist/94be45d3-a7d2-4351-bd7a-1fe5b1a50829/sist-en-iec-61249-2-47-2018)

<https://standards.iteh.ai/catalog/standards/sist/94be45d3-a7d2-4351-bd7a-1fe5b1a50829/sist-en-iec-61249-2-47-2018>