



IEC 61249-2-46

Edition 1.0 2018-01

INTERNATIONAL STANDARD

**Materials for printed boards and other interconnecting structures –
Part 2-46: Reinforced base materials clad and unclad – Non-halogenated
epoxide non-woven/woven E-glass reinforced laminate sheets of thermal
conductivity 1,5 W/(m•K) and defined flammability (vertical burning test),
copper-clad for lead-free assembly**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.180

ISBN 978-2-8322-5196-6

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	19
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 2-46: Reinforced base materials clad and unclad – Non-halogenated
epoxide non-woven/woven E-glass reinforced laminate sheets of
thermal conductivity 1,5 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 61249-2-46 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
91/1448/CDV	91/1484/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.

MATERIALS FOR PRINTED BOARDS AND OTHER INTERCONNECTING STRUCTURES –

Part 2-46: Reinforced base materials clad and unclad – Non-halogenated epoxide non-woven/woven E-glass reinforced laminate sheets of thermal conductivity 1,5 W/(m•K) and defined flammability (vertical burning test), copper-clad for lead-free assembly

1 Scope

This part of IEC 61249 gives requirements for properties of non-halogenated epoxide non-woven reinforced core/woven E-glass reinforced surface laminate sheets of thermal conductivity and defined flammability (vertical burning test), copper-clad for lead-free assembly in thicknesses of 0,60 mm up to 1,70 mm. The flammability rating is achieved through the use of non-halogenated fire retardants reacted as part of the epoxide polymeric structure. The glass transition temperature is defined to be 105 °C minimum. Thermal Conductivity is defined to be $(1,5 \pm 0,2)$ W/(m•K).

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 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*

IEC 61249-5-1, *Materials for interconnection structures – Part 5: Sectional specification set for conductive foils and films with and without coatings – Section 1: Copper foils (for the manufacture of copper-clad base materials)*

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*