

INTERNATIONAL STANDARD

IEC
61249-3-4

First edition
1999-02

**Materials for printed boards and
other interconnecting structures –**

Part 3-4:

**Sectional specification set for unreinforced
base materials, clad and unclad
(intended for flexible printed boards) –
Adhesive coated flexible polyimide film**

Document Preview

*Matériaux pour circuits imprimés et autres structures
d'interconnexion –*

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Partie 3-4:

*Collection de spécifications intermédiaires pour les matériaux
de base non renforcés, recouverts ou non
(prévus pour les circuits imprimés flexibles) –
Film flexible de polyimide recouvert de colle*



Reference number
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Numbering

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- **IEC web site***
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For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary (IEV)*.

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

* See web site address on title page.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MATERIALS FOR PRINTED BOARDS AND OTHER INTERCONNECTING STRUCTURES –

Part 3-4: Sectional specification set for unreinforced base materials, clad and unclad (intended for flexible printed boards) – Adhesive coated flexible polyimide film

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
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- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61249-3-4 has been prepared by IEC technical committee 52: Printed circuits.

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

FDIS	Report on voting
52/773/FDIS	52/798/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.

Annex A is for information only.

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

MATERIALS FOR PRINTED BOARDS AND OTHER INTERCONNECTING STRUCTURES –

Part 3-4: Sectional specification set for unreinforced base materials, clad and unclad (intended for flexible printed boards) – Adhesive coated flexible polyimide film

1 Scope

This part of IEC 61249 gives requirements for flexible polyimide films coated on one side or both sides with acrylic or epoxide type adhesive for use in the fabrication of flexible printed wiring.

Films coated on only one side are used as a coverlay or covercoat in the fabrication of flexible printed wiring. This coverlay or covercoat is also used to provide local support to areas subjected to mechanical or environmental stress.

Films coated on both sides are used as bonding films in the fabrication of printed boards.

2 Normative reference

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61249. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61249 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 61189-2:1997, *Test methods for electrical materials, interconnection structures and assemblies – Part 2: Test methods for materials for interconnection structures*

3 Materials and construction

The material consists of an insulating flexible film base of polyimide coated with an adhesive on one side or both sides.

3.1 Insulating film

Polyimide films of preferred thicknesses and permitted tolerances are given in table 1 when measured by the method 2D01 of IEC 61189-2, provided that the micrometer used is capable of resolving 0,002 mm or better.

Other thicknesses may be used by agreement between purchaser and supplier. The maximum permitted tolerances of such thicknesses shall be those of the nearest greater thickness stated in table 1.

Table 1 – Preferred thicknesses and maximum permitted tolerances

Nominal thickness (without adhesive) μm	Maximum tolerance at any measured point %
12,5	± 30
25	± 20
50	± 15
75	± 10
125	± 10

3.2 Adhesive

The adhesive shall be compatible with the copper-clad polyimide film. Relevant adhesives are B-staged adhesives based on acrylic or epoxy resin.

The thickness of the adhesive is defined as follows:

$$T_a = T_c - T_f$$

where

T_a is the thickness of the adhesive;

T_c is the average value of the total thickness of the adhesive coated film under test;

T_f is the average value of the thicknesses of the insulation film under test without adhesive.

Thickness values T_c and T_f shall be measured as described in 3.1.

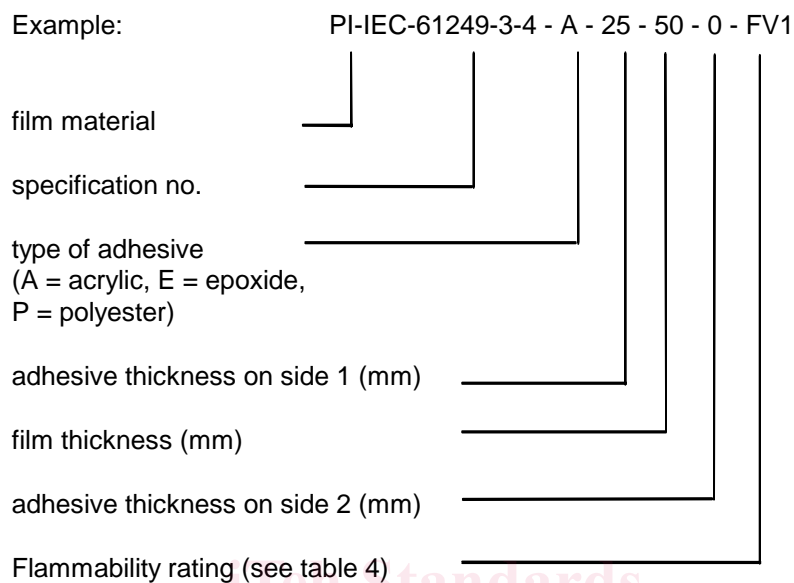
The thickness of the adhesive shall be between 12,5 μm and 75 μm with a permissible tolerance of ±20 %. Preferred thicknesses are 20 μm, 25 μm, 38 μm, 50 μm, and 75 μm.

4 Internal marking

Not applicable.

5 Designation

The following code shall be used to designate adhesive coated polyimide films according to this specification:



If there is no risk of confusion, the designation may be abbreviated to read (the same example as above): PI-IEC-A-25-50-0-FV1.

6 Properties of adhesive coated polyimide films

6.1 Appearance

[IEC 61249-3-4:1999](https://standards.iteh.ai/catalog/standards/iec/1e582a9e-bb2d-4136-9116-d084690a0f89/iec-61249-3-4-1999)

<https://standards.iteh.ai/catalog/standards/iec/1e582a9e-bb2d-4136-9116-d084690a0f89/iec-61249-3-4-1999>

The adhesive coated film shall be free from blisters and wrinkles. There shall be no imperfections which will be detrimental to the material properties or to their intended use. The film shall be uniform in colour and free from foreign inclusions. Colour degradation shall not occur when the film is processed in accordance with the manufacturer's instructions.

The adhesive shall be protected by a polymeric release film or release paper which shall adhere until lamination. For polyimide films with adhesive on both sides, one adhesive layer or both shall be protected with such release materials.

The appearance of the adhesive coated film shall only be inspected with the release material present in cases where the release material is transparent. Where foreign inclusions appear to be imbedded in the adhesive and/or between the adhesive and the polyester film, the release material shall be removed and the coated film shall be re-inspected.

6.2 Properties of adhesive coated polyimide films after curing

6.2.1 Preparation of laminated specimens

In order to determine the properties listed in 6.2.2 and 6.2.3, laminated specimens shall be prepared as follows.

6.2.1.1 Specimens from cover sheets

Test specimens shall comply with the requirements of IEC 61189-2 (see annex A). They shall be cut from a set of samples prepared by laminating copper foil to the film material under test. Laminating conditions should be agreed upon between purchaser and supplier, and should comply with the material manufacturer's recommendations regarding pressure, temperature and pressing duration. The copper foil, as used in the fabrication of copper-clad laminates, shall have a thickness of 35 μm (305 g/m^2) and shall be applied with the untreated (shiny) side to the adhesive layer.

If any argument arises in relation to the laminating conditions, it is desirable to apply the standard procedures and conditions in the relevant test method specification (see IEC 61189-2) by agreement between purchaser and supplier.

NOTE – When the release or protective materials are peeled off from coverlay films with punched holes and/or slits for further fabrication processes, careful attention should be paid in order to avoid deformation of the film due to any excessive peeling force.

6.2.1.2 Specimens from bonding films

The required test specimens according to the relevant clauses of IEC 61189-2 shall be cut from a set of samples prepared by laminating copper foils to both sides of the film material under test as described in 6.2.1.1, except for peel strength and heat shock testing.

For peel strength and heat shock testing the samples shall be prepared by laminating a single-sided copper-clad epoxide/glass laminate on one side of the adhesive coated bonding film, and an unclad epoxide/glass laminate with a thickness not less than 0,5 mm on the other side, as described in 6.2.1.1. Two sets of samples shall be prepared: one with the copper foil facing side 1 of the bonding film, one with the copper foil facing side 2 of the bonding film.

6.2.2 Electrical properties

Table 2 – Electrical properties

Property	Test method (IEC 61189-2)	Requirement
Surface resistance after damp heat while in the humidity chamber (optional)	2E12	$10^3 \text{ M}\Omega \text{ min.}$
Surface resistance after damp heat and recovery	2E03	$10^4 \text{ M}\Omega \text{ min.}$
Volume resistivity after damp heat while in the humidity chamber (optional)	2E04	$10^3 \text{ M}\Omega\text{m min.}$
Volume resistivity after damp heat and recovery	2E04	$10^4 \text{ M}\Omega\text{m min.}$
Surface corrosion	2E08	No visible corrosion products in the gap
Relative permittivity after damp heat and recovery (optional)	2E10	4,5 max.
Dielectric dissipation factor after damp heat and recovery (optional)	2E10	0,05 max.
Electrical strength	2E11	60 kV/mm min.

6.2.3 Non-electrical properties

6.2.3.1 Properties related to the copper foil bond

Table 3 – Properties related to the copper foil bond

Property	Test method (IEC 61189-2)	Requirement
Peel strength as received	2M13	Not less than 0,7 N/mm
Peel strength after thermal shock of 10 s	2M14	Not less than 0,6 N/mm
Peel strength after dry heat at 125 °C (optional)	2M15	Not less than 0,35 N/mm
Blistering after 10 s thermal shock	2C05	No blistering or delamination

6.2.3.2 Flammability

Table 4 – Flammability

Property	Test method (IEC 61189-2)	Requirement
Flammability of films 50 µm thick or greater when used in combination with material specified in IEC 61249-3-2 ¹⁾	2C08	As agreed upon between supplier and purchaser or that the flammability rating of the base material (61249-3-2) is not increased

6.2.3.3 Water absorption

Not specified.

6.3 Other properties before curing

6.3.1 Dimensional stability (coverlays only)

Table 5 – Dimensional stability of coverlays

Property	Test method (IEC 61189-2)	Requirement
Dimensional change due to careful peeling off of release/protective materials	2X02	1,5 µm/mm max. in either direction
Dimensional change due to heating at (150 ± 2) °C	2X02 (process step 2 only)	3,0 µm/mm max. in either direction

6.3.2 Adhesive flow during lamination

Table 6 – Adhesive flow

Property	Test method (IEC 61189-2)	Adhesive thickness µm	Requirement mm
Adhesive flow	(Under consideration)	20	0,20
		25	0,20
		38	0,25
		50	0,30
		75	0,35
Clearance filling with adhesive	(Under consideration)	Any	No void shall remain in the testing areas of test specimens

¹⁾ Under consideration.