
Materiali za plošče tiskanih vezij in druge povezovalne strukture - 3-6. del: Nabor področnih specifikacij za ojačane podložne materiale, pokovinjene in nepokovinjene - laminatne plošče z določeno vnetljivostjo, polnjene s politetrafluoretilenom (navpični preskus gorljivosti), z bakreno oblogo

Materials for printed boards and other interconnecting structures - Part 3-6: Sectional specification set for unreinforced base materials, clad and unclad - PTFE filled laminate sheets of defined flammability (vertical burning test), copper-clad

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Matériaux pour circuits imprimés et autres structures d'interconnexion - Partie 3-6: Collection de spécifications intermédiaires pour matériaux de base non renforcés, métallisés et non métallisés - Feuilles stratifiées en PTFE avec charges d'inflammabilité définie (essai de combustion verticale), plaquées cuivre

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TITLE:

Materials for printed boards and other interconnecting structures - Part 3-6: Sectional specification set for unreinforced base materials, clad and unclad - PTFE filled laminate sheets of defined flammability (vertical burning test), copper-clad

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NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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**Part 3-6: Unreinforced base materials clad and unclad - PTFE filled
laminates sheets of defined flammability (vertical burning test), copper-
clad**

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FOREWORD

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134 International Standard IEC 61249-X-X has been prepared by IEC technical committee 91,
135 Electronics assembly technology.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

137

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

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

141 The committee has decided that the contents of this document will remain unchanged until the
142 stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to
143 the specific document. At this date, the document will be

- 144 • reconfirmed,
- 145 • withdrawn,
- 146 • replaced by a revised edition, or
- 147 • amended.

148

149 The National Committees are requested to note that for this document the stability date
150 is 20XX.

151 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED
152 AT THE PUBLICATION STAGE.

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MATERIALS FOR CIRCUIT BOARDS AND OTHER INTERCONNECTING STRUCTURES –

Part 3-6: Unreinforced base materials clad and unclad - PTFE filled laminate sheets of defined flammability (vertical burning test), copper-clad

1 Scope

This part of IEC 61249 specifies requirements for properties of PTFE filled unreinforced laminated sheet of a thickness 0,02 mm up to 3,2 mm, of defined flammability (vertical burning test), copper-clad.

This part of IEC 61249 is applicable to the design, manufacture, use of PTFE filled unreinforced laminated sheet of defined flammability (vertical burning test), copper-clad.

Its flame resistance is defined in terms of the flammability requirements of 8.2.

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 61189-2-721:2015, *Test methods for electrical materials, printed board and other interconnection structures and assemblies - Part 2-721: Test methods for materials for interconnection structures – Measurement of relative permittivity and loss tangent for copper clad laminate at microwave frequency using split post dielectric resonator*

IEC 61189-2-803:2023, *Test methods for electrical materials, printed board and other interconnection structures and assemblies - Part 2-803: Test methods for materials for interconnection structures - Test methods for Z-axis expansion of base materials and printed boards*

IEC 61189-2-805:20XX, *Test methods for electrical materials, printed board and other interconnection structures and assemblies – Part 2-805: Test methods for materials for interconnection structures - X/Y CTE Test for Thin Base Materials by TMA*

IEC 61189-2-807:2021, *Test methods for electrical materials, printed board and other interconnection structures and assemblies - Part 2-807: Test methods for materials for interconnection structures – Decomposition temperature (Td) using TGA*

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)*

ISO 11014:2009, *Safety data sheet for chemical products – Content and order of sections*

IPC TM-650 TM 2.5.5.5, *Stripline Test for Permittivity and Loss Tangent (Dielectric Constant and Dissipation Factor) at X-Band*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

201 ISO and IEC maintain terminology databases for use in standardization at the following
202 addresses:

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

205 3.1

206 PTFE

207 polytetrafluoroethylene

208 4 Construction and Materials

209 4.1 Construction

210 The sheet consists of an insulating base made of PTFE or modified PTFE as the primary resin,
211 with metal-foil bonded to one side or both.

212 4.2 Resin system

213 PTFE resin or modified PTFE as the primary resin, and have filler addition.

214 4.3 Filler

215 Typical filling (filler) materials can be silicon dioxide, titanium dioxide, aluminium oxide, boron
216 nitride, chopped fiber, hollow sphere. It is possible to use other or additional filling material to
217 achieve specific characteristic.

218 4.4 Metal foil

219 Copper, as specified in IEC 61249-5-1, copper foil (for the manufacture of copper-clad
220 materials). The preferred foils are electrodeposited of defined ductility.

221 4.5 Reinforcement

222 None Reinforcement.

223 5 Internal marking

224 Shall be as agreed upon between user and supplier.

225 6 Electrical properties

226 The electrical properties requirements are shown in Table 1.

227

Table 1 – Electrical properties

Property	Test method	Units	Requirement
Surface resistivity after damp heat while in the humidity chamber	IEC 61189-2 2E04	MΩ	≥10000
Volume resistivity after damp heat while in the humidity chamber	IEC 61189-2 2E04	MΩ · m	≥5000
Surface resistivity after E-24/125 while in the chamber	IEC 61189-2 2E04	MΩ	≥1000
Volume resistivity after E-24/125 while in the chamber	IEC 61189-2 2E04	MΩ · m	≥1000
Relative permittivity as received (10 GHz) ^a	IPC TM-650 TM 2.5.5.5	-	Type A: ≤2,75 Type B: >2,75 ≤6,00 Type C: >6,00 Nominal value shall be as agreed upon between user and supplier

Relative permittivity as received (10 GHz)	IEC 61189-2-721	-	As agreed upon between user and supplier
Dissipation factor as received (10 GHz)	IEC 61189-2-721	-	≤0,003
Thermal coefficient of relative permittivity (10 GHz, -55 °C~ +85 °C)	IEC 61189-2-721	10 ⁻⁶ /°C	As agreed upon between user and supplier
Electric strength (only for material thickness <0,5 mm)	IEC 61189-2 2E02	kV/mm	≥20
Arc resistance	IEC 61189-2 2E14	s	≥60
Dielectric breakdown (only for material thicknesses ≥0,5 mm)	IEC 61189-2 2E15	kV	≥35
^a The tolerance of relative permittivity around that nominal can be chosen as follows, 1: ± 0,02 2: ± 0,04 3: ± 0,05 4: ± 0,25 5: ± 0,50 6: As agreed upon between user and supplier.			

228 7 Non-electrical properties of the base material

229 7.1 Appearance of the copper-clad sheet

230 7.1.1 General

231 Appearance of the copper-clad sheet shall be inspected in accordance with Visual Test methods
232 of IEC 61189-2.

233 The copper-clad face shall be substantially free from pinhole and resin spots, and free from
234 defects that may have an impact on the material's use for the intended purpose.

235 For the following specific defects the requirements given shall apply.

236 7.1.2 Indentations (pits and dents)

237 The size of an indentation, usually the length, shall be determined and given a point value to
238 be used as measure of the quality, see Table 2.

239 **Table 2 – Indentations**

Size mm	Point value for each indentation
≥0,13 ≤0,25	1
>0,25 ≤0,50	2
>0,50 ≤0,75	4
>0,75 ≤1,00	7
>1,00	30

240 The total point count for any 300 mm × 300 mm area shall be calculated to determine the class
241 of the material.

242 Class A 29 maximum

243 Class B 17 maximum Longest Dimensions ≤500 μm

244 Class C 5 maximum Longest Dimensions ≤380 μm

245 Class D 0

246 Class X To be agreed upon by user and supplier