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Basic materials for printed circuits - Part 2: Specifications - Specification No.  
2: Phenolic cellulose paper copper-clad laminated sheet, economic quality

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English version

**Base materials for printed circuits**  
**Part 2: Specifications**  
**Specification No. 2: Phenolic cellulose paper copper-clad laminated sheet,**  
**economic quality**  
**(IEC 60249-2-2:1985/A5:2000)**

Matériaux de base pour circuits  
imprimés

Partie 2: Spécifications

Spécification n° 2: Feuille de papier  
cellulose phénolique recouverte de  
cuivre de qualité économique  
(CEI 60249-2-2:1985/A5:2000)

Basismaterialien für gedruckte  
Schaltungen

Teil 2: Einzelbestimmungen

Einzelbestimmung Nr. 2:

Kupferkaschierte

Phenolharz-Hartpapiertafeln,  
wirtschaftliche Qualität

(IEC 60249-2-2:1985/A5:2000)

<https://standards.iteh.ai/catalog/standards/sist/6483b51b-db67-4d14-9b6a-27975769d627/sist-en-60249-2-2-1997-a5-2002>

This amendment A5 modifies the European Standard EN 60249-2-2:1994; it was approved by CENELEC on 2000-04-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 Central Secretariat or to any CENELEC member.

This amendment 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 Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**CENELEC**

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

### Foreword

The text of document 52/836/FDIS, future amendment 5 to IEC 60249-2-2:1985, prepared by IEC TC 52, Printed circuits, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A5 to EN 60249-2-2:1994 on 2000-04-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2001-01-01
- latest date by which the national standards conflicting  
with the amendment have to be withdrawn (dow) 2003-04-01

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### Endorsement notice

The text of amendment 5:2000 to the International Standard IEC 60249-2-2:1985 was approved by CENELEC as an amendment to the European Standard without any modification.

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**NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD**

**CEI  
IEC**

**60249-2-2**

1985

AMENDEMENT 5  
AMENDMENT 5  
2000-03

Amendement 5

**Matériaux de base pour circuits imprimés –**

**Partie 2:**

**Spécifications –  
Spécification n° 2: Feuille de papier cellulose  
phénolique recouverte de cuivre,  
de qualité économique**

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Amendment 5

**Base materials for printed circuits –**

**Part 2:**

**Specifications –  
Specification No. 2: Phenolic cellulose paper  
copper-clad laminated sheet, economic quality**

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

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## FOREWORD

This amendment has been prepared by IEC technical committee 52: Printed circuits.

This amendment incorporates amendment 3 (1993) and amendment 4 (1994).

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

FDIS	Report on voting
52/836/FDIS	52/847/RVD

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

A vertical line in the margin indicates the text of amendment 5.

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#### 4 Electrical properties

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Amend table 1 as follows:

SIST EN 60249-2-2:1997/A5:2002

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Property	Test method (subclause of IEC 60249-1)	Requirements
Surface corrosion	2.4	Under consideration
Corrosion at the edge	2.5	Under consideration
Relative permittivity after damp heat and recovery	2.7	The average value shall not exceed 5,5
Dielectric dissipation factor after damp heat and recovery	2.7	The average value shall not exceed 0,1
Surface resistance after damp heat and recovery	2.2	10 MΩ min.
Volume resistivity after damp heat and recovery	2.3	10 MΩm min.

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#### 5.3 Maximum bow and twist

Replace the title by the following title:

#### 5.3 Bow and twist

Replace table IV by the following new table:

**Table IV – Maximum bow and twist**

Property	Test method (IEC 61189-2)	Nominal thickness  mm	Panel dimension Maximum length  mm	Requirement(s) % maximum	
				Copper foil on one side	Copper foil on both sides
Bow and twist	2M01	$\geq 0,8 \leq 1,2$	$\leq 350$	3,0	2,5
			$> 350 \leq 500$	2,8	2,3
			$> 500$	2,5	2,0
		$> 1,2 \leq 1,6$	$\leq 350$	2,5	2,0
			$> 350 \leq 500$	2,3	1,8
			$> 500$	2,0	1,5
		$> 1,6$	$\leq 350$	2,0	1,5
			$> 350 \leq 500$	1,8	1,4
			$> 500$	1,5	1,3
Bow and twist after etching and heating	2M02	Under consideration			

NOTE The requirements for bow and twist apply only to one sided copper-clad laminates with maximum foil thickness of 105  $\mu\text{m}$  (915  $\text{g/m}^2$ ) and double sided copper-clad laminates with maximum foil thickness difference of 70  $\mu\text{m}$  (610  $\text{g/m}^2$ ).

Requirements for laminates beyond these limits shall be subject to agreement between purchaser and supplier.

[SIST EN 60249-2-2:1997/A5:2002](https://standards.iteh.ai/catalog/standards/sist/6483b51b-db67-4d14-9b6a-27975769d627/sist-en-60249-2-2-1997-a5-2002)

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Delete table V.

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## 5.4 Properties related to the copper foil bond

Replace the first row of table VI as follows:

Property	Test method (IEC 61189-2)	Requirement
Pull-off strength	2M05	Not less than 25 N

Table VI, column 1

Delete "1,1,1-trichloroethane" and replace "Solvents other than trichloroethane" by "Solvents as agreed upon between purchaser and supplier".

Column 3:

Delete the sentence "As agreed upon between purchaser and supplier".

Add the following table VI:

Table VI

Property	Test method (subclause of IEC 60249-1)	Requirement
Peel strength after simulated plating (optional)	3.6.5	Not less than 0,5 N/mm (3,4 lbf/in)

## 5.5 Punching and machining

Replace the text of this subclause by the following new text:

Requirements for punching and machining properties of laminates are matters for agreement between purchaser and supplier as evaluated using test method 2M19 of IEC 61189-2.

## 5.7 Dimensional stability

Replace "Not specified" by the following table.

**Table XII**

Property	Test method (subclause of IEC 60249-1)	Requirement
Dimensional stability	EN 60249-3.11997/A5.2002 $T = (150 \pm 2) ^\circ\text{C}$	2,0 mm/m max.

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Add the following subclauses:

## 5.8 Sheet sizes

### 5.8.1 Typical sheet sizes

Typical sheet sizes are:

1 060 mm × 1 150 mm  
 915 mm × 1 220 mm  
 1 000 mm × 1 000 mm  
 1 000 mm × 1 200 mm

Apart from these typical sheet sizes, fractions of the sizes and other sizes, for example larger, are available on the market.

### 5.8.2 Tolerances for sheet sizes

The size of the sheets delivered by the supplier shall not deviate more than  $^{+20}_0$  mm from the ordered size.



5.9 Cut panels

5.9.1 Cut panel sizes

Cut panel sizes shall be, when delivered, in accordance with the purchaser's specification.

5.9.2 Size tolerances for cut panels

For panels cut to size according to the purchaser's specification; the following tolerances for length and width shall apply:

Panel size mm	Tolerance ± mm	
	Normal	Close
Up to 300	2	0,5
Over 300 to 600		0,8
Over 600		1,6
NOTE The specified tolerances include all deviations caused by cutting the panels.		

5.9.3 Rectangularity of cut panels

Property	Test method (subclause of IEC 60249-1)	Requirements	
		Coarse mm/m	Normal mm/m
Rectangularity of cut panels	3.15	3	2

6.2 Flexural strength

Replace "Table VII" by "Table IX".

Replace, in table IX, third column, the value in "N/cm<sup>2</sup>" by the value in "N/mm<sup>2</sup>".