AKAFLEX® PCL:
Copper laminates on a polyester-film backing for flexible printed circuits

The AKAFLEX® PCL programme

AKAFLEX® PCL is available from KREMPEL as

✓ **two-layer laminates** and
✓ **three-layer laminates**.

A low-shrinkage polyester film (PET) is used as the backing material for the copper. This is laminated on one or both sides with electrolytic (ED) copper foil. AKAFLEX® PCL is available in various degrees of dimensional stability according to class 1,2 and 3 of IPC specifications. Special types, e.g. laminates with self-adhesive coating (psa types = **p**ressure **s**ensitive **a**dhesive) or laminates with special types of copper foil, are available on request. Only modified **epoxyresin adhesives** are used in the production of these laminates.

AKAFLEX® PCL is manufactured from polyester film and copper foil of differing thickness grades. The various types are identified in the product designation by letters and combinations of numbers.

Designation for a two-layer laminate

AKAFLEX PCL 2-00/00

- Two-layer laminate with PET film
- Thickness of copper foil, in µm
- Thickness of the polyester film, in µm

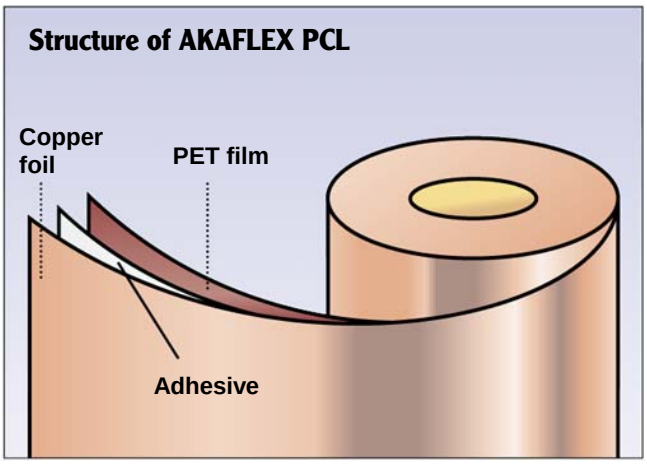
e.g.: AKAFLEX PCL 2-35/75

Designation for a three-layer laminate

AKAFLEX PCL 3-00/00

- Three-layer laminate with PET film
- Thickness of copper foil, in µm
- Thickness of the polyester film, in µm

e.g.: AKAFLEX PCL 3-35/75



Standard types of AKAFLEX® PCL

Standard-type designation	Thickness of copper foil	Thickness of polyester film
Two-layer laminates		
PCL 2-35/75	35 µm	75 µm
PCL 2-35/100	35 µm	100 µm
PCL 2-35/125	35 µm	125 µm
... with self-adhesive coating		
PCL 2-17/75 psa	17 µm	75 µm
Three-layer laminates		
PCL 3-35/75	35 µm	75 µm

Other types on request

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Processing AKAFLEX® PCL

AKAFLEX PCL can be processed **»reel to reel«** by screen-printing or photo-lithography and the standard etching and cleaning techniques. The technical advantages in manufacturing are assured in this way.

A comprehensive range of **coverlays** for mechanical protection of the etched circuits is available from KREMPEL.

The special type, **AKAFLEX PCL psa**, has a self-adhesive coating on the polyester-film side for permanent fixation of the formats on suitable surfaces.

Quality assurance

All AKAFLEX products are subject to the procedures of on-going quality control as defined in the Quality Assurance Handbook of August Krempel Soehne. This quality assurance system is certified as meeting the requirements of ISO 9001 and ISO/TS 16949. For AKAFLEX PCL, testing is performed on the master reels according to the methods given in IPC-TM 650. The test results are evaluated in accordance with IPC-4204/5.

Availability of AKAFLEX® PCL

- ✓ **Standard reel width:**
  1350 mm, 1100 mm or 1000 mm;
  Special type AKAFLEX PCL psa:
  610 mm;
  other widths on request
- ✓ **Standard reel length:**
  100 m;
  other lengths on request
- ✓ **Format:**
  As requested by the customer
- ✓ **Packaging:**
  Reels packed suspended in robust corrugated-cardboard cartons
- ✓ **Standard cores:**
  Inside diameter 76 mm
- ✓ **Certificate:**
  Test certificate according to EN 10 204 - 2.2.


Test report - EN 10 204 - 2.2

KREMPEL

Purchaser
Specification
Terms of delivery
Commercial product name
Name and address of manufacturer
Order No.
Quantity supplied
Roll No.
Remarks
Remarks

August Krempel Soehne, D-76456 Kuppenheim
Krempel order No.
Date supplied
Batch No.

Property	Unit	Test procedure	Required value	Test result*

* test results from current factory run

We certify hereby, that the material complies with the terms of the order contract.

Date

Qualitätssicherungsabteilung
AUGUST KREMPEL SOEHNE

Signature

elektroisolierstoffe · verbundwerkstoffe · basislaminate · electrical insulations · composites · base laminates

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Technical data for AKAFLEX® PCL 2-35/75

35 µm copper foil / 75 µm polyester film

Laminate properties	Dimension	Test method IPC-TM 650	IPC-4204/5 May 2002	Typical values	
				Class 2	Class 1
Peel strength					
- as delivered	N/mm	2.4.9 B	> 0.88	> 0.88	> 0.88
- after solder dip	N/mm	2.4.9 D	N/A	N/A	N/A
- after temperature cycling	N/mm	2.4.9 F	> 0.7	> 0.7	> 0.89
Tensile strength	N/mm²	2.4.19	> 138	> 140	> 140
Failure strain	%	2.4.19	> 70	> 90	> 90
Initial tear strength	N	2.4.16	> 8	> 8	> 8
Flexural strength	cycles	2.4.3 Equipment per 2.4.3.1 Test mandrel: 2 mm	N/A	> 150	> 150
Dimensional stability (after etching and 30 min. at 150 °C)	%	2.2.4 Method C	**class 2:** ≤ 0.7* **class 1:** ≤ 1.2*	0.4 -	- 0.9
Solder-bath stability	sec	2.4.13	N/A	N/A	N/A
Dissipation factor (at 1 MHz)	--	ASTM D-150	< 0.02	0.02	0.02

N/A = Not Applicable

*** = classification class 1 to 3 acc. to Krempel specification**

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Technical data for AKAFLEX® PCL 2-35/100

35 µm copper foil / 100 µm polyester film

Laminate properties	Dimension	Test method IPC-TM 650	IPC-4204/5 May 2002	Typical values		
				Class 3	Class 2	Class 1
Peel strength						
- as delivered	N/mm	2.4.9 B	> 0.88	> 1.0	> 1.0	> 1.0
- after solder dip	N/mm	2.4.9 D	N/A	N/A	N/A	N/A
- after temperature cycling	N/mm	2.4.9 F	> 0.7	> 0.7	> 0.7	> 0.7
Tensile strength	N/mm²	2.4.19	> 138	> 140	> 140	> 140
Failure strain	%	2.4.19	> 70	> 90	> 90	> 90
Initial tear strength	N	2.4.16	> 8	> 8	> 8	> 8
Flexural strength	cycles	2.4.3 Equipment per 2.4.3.1 Test mandrel: 2 mm	N/A	> 150	> 150	> 150
Dimensional stability (after etching and 30 min. at 150 °C)	%	2.2.4 Method C	**class 3:** ≤ 0.4* **class 2:** ≤ 0.7* **class 1:** ≤ 1.2*	0.37 - -	- 0.6 -	- - 0.9
Solder-bath stability	sec	2.4.13	N/A	N/A	N/A	N/A
Dissipation factor (at 1 MHz)	--	ASTM D-150	< 0.02	0.02	0.02	0.02

N/A = Not Applicable
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Technical data for AKAFLEX® PCL 2-35/125

35 µm copper foil / 125 µm polyester film

Laminate properties	Dimension	Test method IPC-TM 650	IPC-4204/5 May 2002	Typical values	
				Class 2	Class 1
Peel strength					
- as delivered	N/mm	2.4.9 B	> 0.88	> 1.3	> 1.3
- after solder dip	N/mm	2.4.9 D	N/A	N/A	N/A
- after temperature cycling	N/mm	2.4.9 F	> 0.7	> 0.7	> 0.89
Tensile strength	N/mm²	2.4.19	> 138	> 140	> 140
Failure strain	%	2.4.19	> 70	> 90	> 90
Initial tear strength	N	2.4.16	> 8	> 8	> 8
Flexural strength	cycles	2.4.3 Equipment per 2.4.3.1			
			Test mandrel: 2 mm	N/A	> 30	> 30
			Test mandrel: 6,34 mm	N/A	> 500	> 500
Dimensional stability (after etching and 30 min. at 150 °C)	%	2.2.4 Method C	**class 2:** ≤ 0.7*	0.4	-
			class 1: ≤ 1.2*	-	0.9
Solder-bath stability	sec	2.4.13	N/A	N/A	N/A
Dissipation factor (at 1 MHz)	--	ASTM D-150	< 0.02	0.02	0.02

N/A = Not Applicable

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Technical data for AKAFLEX® PCL 3-35/75

35 µm copper foil / 75 µm polyester film / 35 µm copper foil

Laminate properties	Dimension	Test method IPC-TM 650	IPC-4204/5 May 2002	Typical values	
				Class 2	Class 1
Peel strength					
- as delivered	N/mm	2.4.9 B	> 0.88	> 0.88	> 0.88
- after solder dip	N/mm	2.4.9 D	N/A	N/A	N/A
- after temperature cycling	N/mm	2.4.9 F	> 0.7	> 0.7	> 0.89
Tensile strength	N/mm²	2.4.19	> 138	> 140	> 140
Failure strain	%	2.4.19	> 70	> 90	> 90
Initial tear strength	N	2.4.16	> 8	> 8	> 8
Flexural strength	cycles	2.4.3 Equipment per 2.4.3.1			
			Test mandrel: 2 mm: N/A	5	5
			Test mandrel: 6.34 mm: N/A	> 50	> 50
Dimensional stability (after etching and 30 min. at 150 °C)	%	2.2.4 Method C	**class 2:** ≤ 0.7*	0.4	-
			class 1: ≤ 1.2*	-	0.9
Solder-bath stability	sec	2.4.13	N/A	N/A	N/A
Dissipation factor (at 1 MHz)	--	ASTM D-150	< 0.02	0.02	0.02

N/A = Not Applicable

*** = classification class 1 to 3 acc. to Krempel specification**

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Technical data for AKAFLEX® PCL 2-17/75 psa

17 µm copper foil / 75 µm polyester film
with pressure sensitive adhesive coating on one side

Laminate properties	Dimen-sion	Test method IPC-TM 650	IPC-4204/5 May 2002	Typical values
Resin coating: One side, self-adhesive, Tack A, on the polyester-film side	g/m²	In-house method	-	According to cus-tomer standard
Peel strength				
- as delivered	N/mm	2.4.9	> 0.88	> 0.88
- after solder dip	N/mm	2.4.9	N/A	N/A
- after temperature cycling	N/mm	2.4.9	> 0.7	> 0.7
Tensile strength	N/mm²	2.4.19	> 138	> 140
Failure strain	%	2.4.19	> 70	> 90
Initial tear strength	N	2.4.16	> 8	> 8
Flexural strength	cycles	2.4.3 Equipment per 2.4.3.1 Test mandrel 2 mm	N/A	> 150
Dimensional stability (after etching and 30 min. at 150 °C)	%	2.2.4 Method C	**class 1:** < 1.2*	< 1.2
Solder-bath stability	sec	2.4.13	N/A	N/A

N/A = Not Applicable

*** = classification class 1 to 3 acc. to Krempel specification**

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