

# 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 = pressure sensitive adhesive) 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

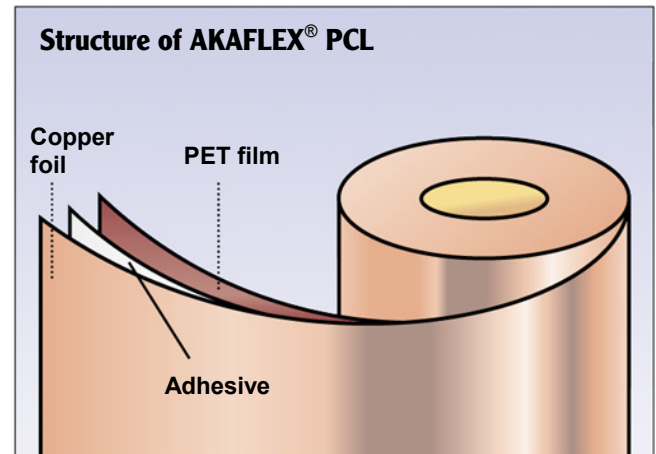
**AKAFLEX® PCL 3-00/00**

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
<b>Two-layer laminates</b>		
PCL 2-35/75	35 µm	75 µm
PCL 2-35/100	35 µm	100 µm
PCL 2-35/125	35 µm	125 µm
<b>... with self-adhesive coating</b>		
PCL 2-17/75 psa	17 µm	75 µm
<b>Three-layer laminates</b>		
PCL 3-35/75	35 µm	75 µm

Other types on request

## Processing AKAFLEX® PCL

AKAFLEX® PCL can be processed »reel to reel« by screen-printing or photolithography 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 Krempele GmbH. This quality assurance system is certified as meeting the requirements of ISO 9001 and QS 9000. 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.



### 1.1.2

All values stated are to be seen as typical values. We reserve the right to introduce changes within the framework of further technical development. We do not accept any obligations or liabilities in respect of this information. Status: 09/2006  
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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
<b>Peel strength</b>					
- 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
<b>Tensile strength</b>	N/mm <sup>2</sup>	2.4.19	> 138	> 140	> 140
<b>Failure strain</b>	%	2.4.19	> 70	> 90	> 90
<b>Initial tear strength</b>	N	2.4.16	> 8	> 8	> 8
<b>Flexural strength</b>	cycles	2.4.3 Equipment per 2.4.3.1 Test mandrel: 2 mm	N/A	> 150	> 150
<b>Dimensional stability (after etching and 30 min. at 150 °C)</b>	%	2.2.4 Method C	<b>class 2:</b> ≤ 0.7* <b>class 1:</b> ≤ 1.2*	0.4 -	- 0.9
<b>Solder-bath stability</b>	sec	2.4.13	N/A	N/A	N/A
<b>Dissipation factor (at 1 MHz)</b>	--	ASTM D-150	< 0.02	0.02	0.02

N/A = Not Applicable

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

## 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
<b>Peel strength</b>						
- 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
<b>Tensile strength</b>	N/mm <sup>2</sup>	2.4.19	> 138	> 140	> 140	> 140
<b>Failure strain</b>	%	2.4.19	> 70	> 90	> 90	> 90
<b>Initial tear strength</b>	N	2.4.16	> 8	> 8	> 8	> 8
<b>Flexural strength</b>	cycles	2.4.3 Equipment per 2.4.3.1 Test mandrel: 2 mm	N/A	> 150	> 150	> 150
<b>Dimensional stability (after etching and 30 min. at 150 °C)</b>	%	2.2.4 Method C	<b>class 3:</b> ≤ 0.4* <b>class 2:</b> ≤ 0.7* <b>class 1:</b> ≤ 1.2*	0.37 - -	- 0.6 -	- - 0.9
<b>Solder-bath stability</b>	sec	2.4.13	N/A	N/A	N/A	N/A
<b>Dissipation factor (at 1 MHz)</b>	--	ASTM D-150	< 0.02	0.02	0.02	0.02

N/A = Not Applicable

\* = classification class 1 to 3 acc. to Krempe specification

## 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
<b>Peel strength</b>					
- 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
<b>Tensile strength</b>	N/mm <sup>2</sup>	2.4.19	> 138	> 140	> 140
<b>Failure strain</b>	%	2.4.19	> 70	> 90	> 90
<b>Initial tear strength</b>	N	2.4.16	> 8	> 8	> 8
<b>Flexural strength</b>	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
<b>Dimensional stability (after etching and 30 min. at 150 °C)</b>	%	2.2.4 Method C	<b>class 2:</b> ≤ 0.7* <b>class 1:</b> ≤ 1.2*	0.4 -	- 0.9
<b>Solder-bath stability</b>	sec	2.4.13	N/A	N/A	N/A
<b>Dissipation factor (at 1 MHz)</b>	--	ASTM D-150	< 0.02	0.02	0.02

N/A = Not Applicable

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#### 1.1.5

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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
<b>Peel strength</b>					
- 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
<b>Tensile strength</b>	N/mm <sup>2</sup>	2.4.19	> 138	> 140	> 140
<b>Failure strain</b>	%	2.4.19	> 70	> 90	> 90
<b>Initial tear strength</b>	N	2.4.16	> 8	> 8	> 8
<b>Flexural strength</b>	cycles	2.4.3 Equipment per 2.4.3.1  Test mandrel: 2 mm  Test mandrel: 6.34 mm	N/A  N/A	5  > 50	5  > 50
<b>Dimensional stability (after etching and 30 min. at 150 °C)</b>	%	2.2.4 Method C	<b>class 2:</b> ≤ 0.7* <b>class 1:</b> ≤ 1.2*	0.4 -	- 0.9
<b>Solder-bath stability</b>	sec	2.4.13	N/A	N/A	N/A
<b>Dissipation factor (at 1 MHz)</b>	--	ASTM D-150	< 0.02	0.02	0.02

N/A = Not Applicable

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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	Dimension	Test method IPC-TM 650	IPC-4204/5 May 2002	Typical values
<b>Resin coating:</b> One side, self-adhesive, Tack A, on the polyester-film side	g/m <sup>2</sup>	In-house method	-	According to customer standard
<b>Peel strength</b>				
- 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
<b>Tensile strength</b>	N/mm <sup>2</sup>	2.4.19	> 138	> 140
<b>Failure strain</b>	%	2.4.19	> 70	> 90
<b>Initial tear strength</b>	N	2.4.16	> 8	> 8
<b>Flexural strength</b>	cycles	2.4.3 Equipment per 2.4.3.1 Test mandrel 2 mm	N/A	> 150
<b>Dimensional stability</b> (after etching and 30 min. at 150 °C)	%	2.2.4 Method C	<b>class 1: &lt; 1.2*</b>	< 1.2
<b>Solder-bath stability</b>	sec	2.4.13	N/A	N/A

N/A = Not Applicable

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