AKAFLEX® PENDF HT:
Coverlay films on a PEN- film basis for flexible printed circuits

Availability of AKAFLEX® PENDF HT

AKAFLEX PENDF HT is available from KREMPEL as

✓ **Coverlay films coated with adhesive on one side**

for covering etched circuits. The polyethylene-naphthalate film (PEN) is coated with a modified highly flexible epoxy resin and then covered by a protective paper. Because of the high-grade starting materials used, this coverlay film is characterised by **higher fatigue strength at elevated temperatures**. A modified epoxy system characterised by **very good temperature stability** has been developed for the HT product family. In combination with polyimid-film, the bonding system used here reaches a temperature index per UL 796 of 130 °C. PEN-film coverlay films of **higher dimensional stability (HT3)** are also available.

AKAFLEX PENDF HT is available both with different types of **PEN film and thickness grades** as well as with different thickness grades of **adhesive coatings**.

Designation for coverlay films

AKAFLEX PENDF 0 / XX / XX

- PEN coverlay film
- Non-coated top side
- Thickness of PEN-film, in µm
- Thickness of coating on the bottom side, in µm

e.g.: AKAFLEX PENDF 0 / 25 / 25 HT

Standard types of AKAFLEX® PENDF HT

Standard-type designation	Thickness of PEN-film	Thickness of the coating
with PEN standard film		
PENDF 0 / 25 / 25 HT2 Regular dimensional stability (MD/TD ≤ 0.7%)	25 µm	25 µm
with PEN-film for higher dimensional stability		
PENDF 0 / 25 / 25 HT3 High dimensional stability (MD/TD ≤ 0.4%)	25 µm	25 µm

Other types on request

4.3.1

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Processing AKAFLEX® PENDF HT

The following pressing cycle is recommended for processing AKAFLEX PENDF HT in heated-plate presses:

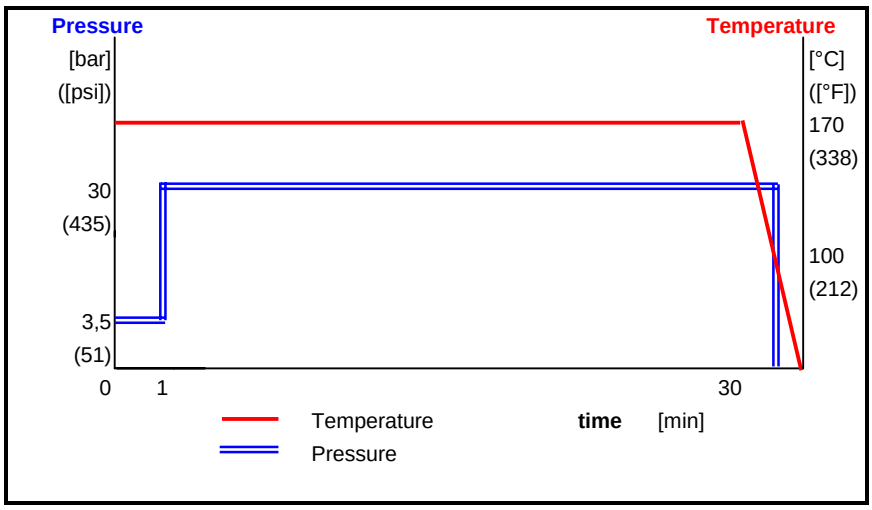

Plate temperature:
170 °C (338°F)

Contact pressure:
3.5 bar (51psi)(1 min)

Pressing pressure:
30 bar (435psi)

Pressing time:
30 minutes

Cooling:
< 100 °C (212°F)
under pressure

Conformal layer:
e.g. silicone rubber

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 PENDF HT, 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 4203/23. AKAFLEX PENDF HT types are approved according to UL 94V-0.

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Availability of AKAFLEX® PENDF HT

- ✓ **Standard reel width:**
  610 mm or 305 mm;
  other widths on request
- ✓ **Standard reel length:**
  100 m; other lengths on request
- ✓ **Format:**
  As requested by the customer
- ✓ **Packaging:**
  Reels suspended in robust corrugated-cardboard cartons
- ✓ **Standard cores:**
  Inside diameter 76 mm
- ✓ **Certificate:**
  Test certificate according to EN 10 204 - 2.2.

Storage

Coverlay and bonding films have a limited shelf life because of their application-specific properties. The adhesive systems used here can be stored for at least 3 months in a dry environment at room temperature (+25 °C/77 °F).

4.3.2

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Technical data for AKAFLEX® PENDF 0/25/25 HT2 and HT3

25 µm PEN film/coated with 25 µm adhesive on one side

Laminate properties	Test method IPC-TM 650	IPC-4203/23 May 2002	Typical values PENDF HT2				Typical values PENDF HT3			
Peel strength to shiny side of copper	2.4.9	≥ 0,61	> 1	N/mm	> 5.7	lb/in	> 1	N/mm	> 5.7	lb/in
Dimensional stability (after removing the release film)	Company-internal test	--	≤ 0.7	%	≤ 0.7	%	≤ 0.4	%	≤ 0.4	%
Dimensional stability (30 min. at 150°C/300°F)	2.2.4 Method A	≤ 1.0	≤ 0.7	%	≤ 0.7	%	≤ 0.4	%	≤ 0.4	%
Solder-bath stability (Reflow)	-	N/A	5 min at 250 °C		5 min at 480 °F		5 min at 250 °C		5 min at 480 °F	

Properties of the PEN film	Test method	Typical values HT2	HT3		Typical values HT2	HT3	
Dimensional stability MD/TD (30 min. at 150°C/300°F)	ASTM D1204	0.5	0.1	%	0.5	0.1	%
Tensile strength MD	ASTM D882	> 140		N/mm²	> 20.3x10³		psi
TD	ASTM D882	> 140		N/mm²	> 20.3x10³		psi
Failure strain MD	ASTM D882	> 50		%	> 50		%
TD	ASTM D882	> 50		%	> 50		%
Volume resistivity	ASTM D257	10^{18}		Ω · cm	10^{18}		Ω · cm
Surface resistivity	ASTM D257	10^{17}		Ω / □	10^{17}		Ω / □
Breakdown voltage	ASTM D149	> 220		kV/mm	> 5600		V/mil
Dielectric constant (ε_r) (23°C/73°F; 1kHz)	ASTM D150	2.9		--	2.9		--
Dielectric loss factor (tan δ) (23°C/73°F; 1kHz)	ASTM D150	0.005		--	0.005		--
Melting point	-	266		°C	510		°F
Glass transition temperature	DSC	120		°C	248		°F
Coefficient of linear thermal expansion (between 30°C/86°F and 50°C/122°F)	ASTM D696	1.3×10^{-5}		1/K	1.3×10^{-5}		1/K
Max. service temperature	UL 746B	160		°C	320		°F
Max. water absorption Immersion, 24 h at 23°C/73°F)	ASTM D570	0.4		%	0.4		%

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