AKAFLEX® KCL RA HT:
Copper laminates on a polyimide-film backing for flexible printed circuits

The AKAFLEX® KCL RA HT programme

AKAFLEX KCL RA HT is available from KREMPEL as

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

Polyimide film (PI) is used as the backing material for the copper. This is laminated with rolled-annealed (RA) copper foil on one or both sides. A modified epoxy system characterised by very good temperature stability has been developed for the HT product family. In combination with polyimide film, the bonding system used here reaches a temperature index per UL 796 of 150 °C. AKAFLEX KCL HT is **halogen-free** and meets the requirements of **UL 94V-0** for **flame retardance**. The material is compatible with all soldering processes and suitable for surface mounting techniques.

Designation for a two-layer laminate

AKAFLEX KCL 2-XX/XX RA HT

- Two-layer laminate with PI film
- Thickness of copper foil, in µm
- Thickness of the polyimide film, in µm
- Laminate with rolled-annealed copper foil
- High temperature HT adhesive

e.g.: AKAFLEX KCL 2-35/25 RA HT

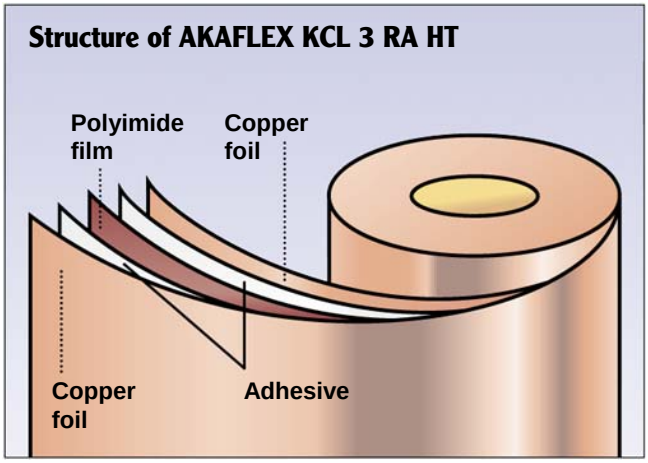
Designation for a three-layer laminate

AKAFLEX KCL 3-XX/XX RA HT

- Two-layer laminate with PI film
- Thickness of copper foil, in µm
- Thickness of the polyimide film, in µm
- Laminate with rolled-annealed copper foil
- High temperature HT adhesive

e.g.: AKAFLEX KCL 3-17/25 RA HT

Structure of AKAFLEX KCL 3 RA HT



Standard types of AKAFLEX® KCL RA HT

Standard type designation	Thickness of copper foil	Thickness of polyimide film
Two-layer laminates		
KCL 2-17/25 RA HT	17 µm	25 µm
KCL 2-35/25 RA HT*	35 µm	25 µm
KCL 2-35/50 RA HT	35 µm	50 µm
Three-layer laminates		
KCL 3-17/12 RA HT*	17 µm	12 µm
KCL 3-17/25 RA HT	17 µm	25 µm
KCL 3-35/25 RA HT	35 µm	25 µm

*Data being developed

Other types on request

6.1.1

August Krempel Soehne GmbH+Co. KG ·P.O.Box 1240 D-71655 Vaihingen ·Tel. (+49) 7042 915-0 · e-mail: info@krempel.com

Processing AKAFLEX® KCL RA HT

AKAFLEX KCL RA HT 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. Diverse **bonding films** are also available for manufacturing **multilayer** circuits.

We use modified **epoxy-resin adhesives** only. This means that no special plasma treatment is necessary in the manufacture of flexible multilayer circuits.

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 KCL RA HT, testing is performed on the master reels according to the methods of IPC-TM 650. The test results are evaluated in accordance with IPC-4204/2. The AKAFLEX KCL HT types also have UL 94V-0 recognition.

Certified according to ISO 9001, ISO/TS 16949 and UL 94V-0

Availability of AKAFLEX® KCL RA HT

- ✓ **Standard reel width:**
  610 mm, 500 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


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

6.1.2

August Krempel Soehne GmbH+Co. KG ·P.O.Box 1240 D-71655 Vaihingen ·Tel. (+49) 7042 915-0 · e-mail: info@krempel.com

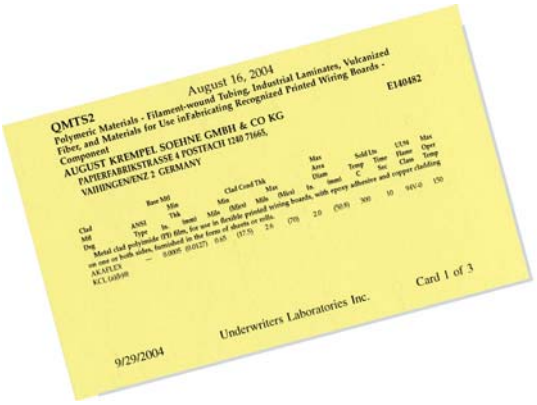
Technical data for AKAFLEX® KCL 2-17/25 RA HT

17 µm rolled annealed copper foil / 25 µm polyimide film

halogenfree

Laminate properties	Test method IPC-TM 650	IPC-4204/2 May 2002	Typical values			
Peel strength						
- as delivered	2.4.9	> 0.7	> 1.5	N/mm	> 8.6	lb/in
- after solder dip	2.4.9	> 0.525	> 1.25	N/mm	> 7.1	lb/in
- after temperature cycling	2.4.9	> 0.7	> 1.3	N/mm	> 7.4	lb/in
Tensile strength	2.4.19	> 165	> 165	N/mm²	>23.9x10³	psi
Failure strain	2.4.19	> 25	> 45	%	> 45	%
Initial tear strength	2.4.16	> 5	> 5	N	> 17.6	oz
Flexural strength	2.4.3 Equipment per 2.4.3.1 Test mandrel d=2 mm	N/A	> 2000	cycles	> 2000	cycles
Dimensional stability (after etching and 30 min. at 150 °C)	2.2.4 Method C	< 0.2	0.08	%	0.08	%
Solder-bath stability at 260 °C	2.4.13 A	N/A	N/A	sec	N/A	sec
at 288 °C	2.4.13 B	> 10	> 180	sec	> 180	sec
at 300 °C	2.4.13 B	--	> 30	sec	> 30	sec
Solder-bath stability at 260 °C without pre-drying	2.4.13 72h at 65%rh	--	> 10	sec	> 10	sec
Temperature index	UL 796	DBD	150	°C	300	°F
CTI (Comparative Tracking Index)	DIN IEC 60112	--	175	--	175	--
Dissipation factor (at 1 MHz)	ASTM D 150	< 0.04	< 0.03	--	< 0.03	--

N/A = Not Applicable
DBD = Data Being Developed


August 16, 2004
QMTS2
E140482
Underwriters Laboratories Inc.
Card 1 of 3
9/29/2004

6.1.3

August Krempel Soehne GmbH+Co. KG ·P.O.Box 1240 D-71655 Vaihingen ·Tel. (+49) 7042 915-0 · e-mail: info@krempel.com

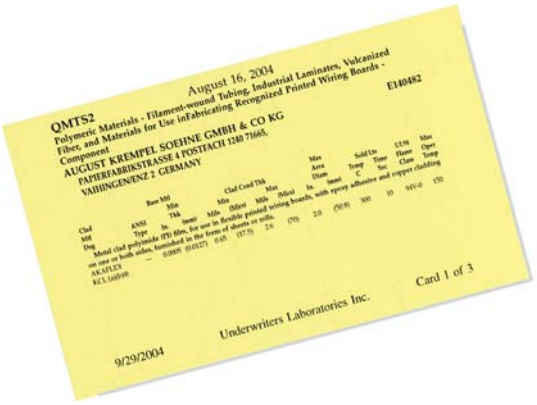
Technical data for AKAFLEX® KCL 2-35/50 RA HT

35 µm rolled annealed copper foil / 50 µm polyimide film

halogenfree

Laminate properties	Test method IPC-TM 650	IPC-4204/2 May 2002	Typical values			
Peel strength						
- as delivered	2.4.9	> 0.7	> 1.5	N/mm	> 8.6	lb/in
- after solder dip	2.4.9	> 0.525	> 1.25	N/mm	> 7.1	lb/in
- after temperature cycling	2.4.9	> 0.7	> 1.3	N/mm	> 7.4	lb/in
Tensile strength	2.4.19	> 165	> 165	N/mm²	>23.9x10³	psi
Failure strain	2.4.19	> 25	> 45	%	> 45	%
Initial tear strength	2.4.16	> 5	> 5	N	> 17.6	oz
Flexural strength	2.4.3 Equipment per 2.4.3.1 Test mandrel d=2 mm	N/A	> 1000	cycles	> 1000	cycles
Dimensional stability (after etching and 30 min. at 150 °C)	2.2.4 Method C	< 0.2	0.1	%	0.1	%
Solder-bath stability at 260 °C	2.4.13 A	N/A	N/A	sec	N/A	sec
at 288 °C	2.4.13 B	> 10	> 180	sec	> 180	sec
at 300 °C	2.4.13 B	--	> 30	sec	> 30	sec
Solder-bath stability at 260 °C without pre-drying	2.4.13 72h at 65%rh	--	> 10	sec	> 10	sec
Temperature index	UL 796	DBD	150	°C	300	°F
CTI (Comparative Tracking Index)	DIN IEC 60112	--	175	--	175	--
Dissipation factor (at 1 MHz)	ASTM D 150	< 0.04	< 0.03	--	< 0.03	--

N/A = Not Applicable
DBD = Data Being Developed


August 16, 2004
QMTS2
E140482
Underwriters Laboratories Inc.
Card 1 of 3
9/29/2004

6.1.4

August Krempel Soehne GmbH+Co. KG ·P.O.Box 1240 D-71655 Vaihingen ·Tel. (+49) 7042 915-0 · e-mail: info@krempel.com

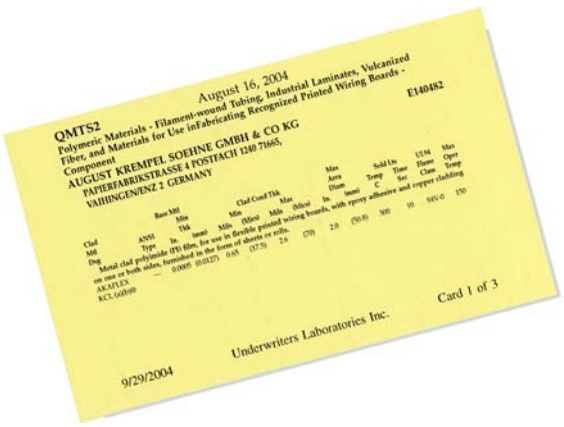
Technical data for AKAFLEX® KCL 3-17/25 RA HT

17 µm rolled annealed copper foil / 25 µm polyimide film / 17 µm rolled annealed copper foil

halogenfree

Laminate properties	Test method IPC-TM 650	IPC-4204/2 May 2002	Typical values			
Peel strength						
- as delivered	2.4.9 B	> 0.7	> 1.3	N/mm	> 7.4	lb/in
- after solder dip	2.4.9 D	> 0.525	> 1.25	N/mm	> 7.1	lb/in
- after temperature cycling	2.4.9 F	> 0.7	> 1.3	N/mm	> 7.4	lb/in
Tensile strength	2.4.19	> 165	> 165	N/mm²	>23.9x10³	psi
Failure strain	2.4.19	> 25	> 45	%	> 45	%
Initial tear strength	2.4.16	> 5	> 5	N	> 17.6	oz
Flexural strength	2.4.3 Equipment per 2.4.3.1 Test mandrel d=2 mm	N/A	> 100	cycles	> 100	cycles
Dimensional stability (after etching and 30 min. at 150 °C/300°F)	2.2.4 Method C	< 0.2	0.08	%	0.08	%
Solder-bath stability at 260 °C	2.4.13 A	N/A	N/A	sec	N/A	sec
at 288 °C	2.4.13 B	> 10	> 180	sec	> 180	sec
at 300 °C	2.4.13 B	--	> 100	sec	> 100	sec
Solder-bath stability at 260 °C without pre-drying	2.4.13 72h at 65%rh	--	> 10	sec	> 10	sec
Temperature index	UL 796	DBD	150	°C	300	°F
CTI (Comparative Tracking Index)	DIN IEC 60112	--	175	--	175	--
Dissipation factor (at 1 MHz)	ASTM D-150	< 0.04	< 0.03	--	< 0.03	--

N/A = Not Applicable
DBD = Data Being Developed



6.1.5

August Krempel Soehne GmbH+Co. KG ·P.O.Box 1240 D-71655 Vaihingen ·Tel. (+49) 7042 915-0 · e-mail: info@krempel.com

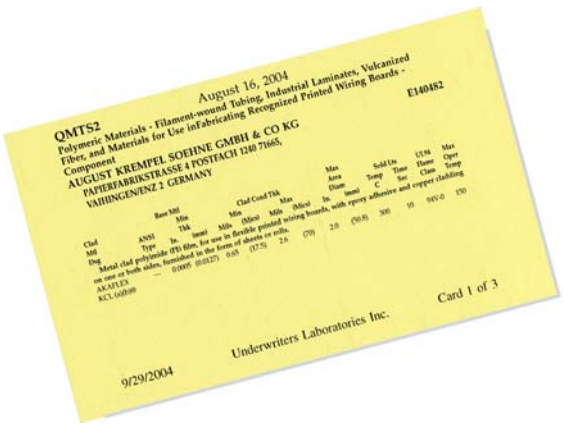
Technical data for AKAFLEX® KCL 3-35/25 RA HT

35 µm rolled annealed copper foil / 25 µm polyimide film / 35 µm rolled annealed copper foil

halogenfree

Laminate properties	Test method IPC-TM 650	IPC-4204/2 May 2002	Typical values			
Peel strength						
- as delivered	2.4.9 B	> 0.7	> 1.5	N/mm	> 8.6	lb/in
- after solder dip	2.4.9 D	> 0.525	> 1.25	N/mm	> 7.1	lb/in
- after temperature cycling	2.4.9 F	> 0.7	> 1.3	N/mm	> 7.4	lb/in
Tensile strength	2.4.19	> 165	> 165	N/mm²	>23.9x10³	psi
Failure strain	2.4.19	> 25	> 45	%	> 45	%
Initial tear strength	2.4.16	> 5	> 5	N	> 17.6	oz
Flexural strength	2.4.3 Equipment per 2.4.3.1 Test mandrel d=2 mm	N/A	> 50	cycles	> 50	cycles
Dimensional stability (after etching and 30 min. at 150 °C/300°F)	2.2.4 Method C	< 0.2	0.06	%	0.06	%
Solder-bath stability at 260 °C	2.4.13 A	N/A	N/A	sec	N/A	sec
at 288 °C	2.4.13 B	> 10	> 180	sec	> 180	sec
at 300 °C	2.4.13 B	--	> 100	sec	> 100	sec
Solder-bath stability at 260 °C without pre-drying	2.4.13 72h at 65%rh	--	> 10	sec	> 10	sec
Temperature index	UL 796	DBD	150	°C	300	°F
CTI (Comparative Tracking Index)	DIN IEC 60112	--	175	--	175	--
Dissipation factor (at 1 MHz)	ASTM D-150	< 0.04	< 0.03	--	< 0.03	--

N/A = Not Applicable
DBD = Data Being Developed


August 16, 2004
QMTS2
Polymeric Materials - Filament-wound Tubing, Industrial Laminates, Vulcanized Fiber, and Materials for Use in Fabricating Recognized Printed Wiring Boards - Component
E140482
AUGUST KREMPEL SOEHNE GMBH & CO KG
PAPIERFABRIKSTRASSE 4 POSTFACH 1240 71665,
VAIHINGEN/ENZ 2 GERMANY
Underwriters Laboratories Inc.
Card 1 of 3
9/29/2004

6.1.6

August Krempel Soehne GmbH+Co. KG ·P.O.Box 1240 D-71655 Vaihingen ·Tel. (+49) 7042 915-0 · e-mail: info@krempel.com