Cirlex® Technical Information

Cirlex® has been proven to successfully perform in the most demanding physical environments. If your application requires a material with the best possible performance – you can count on Cirlex®.

Downloads

Get Acrobat Reader

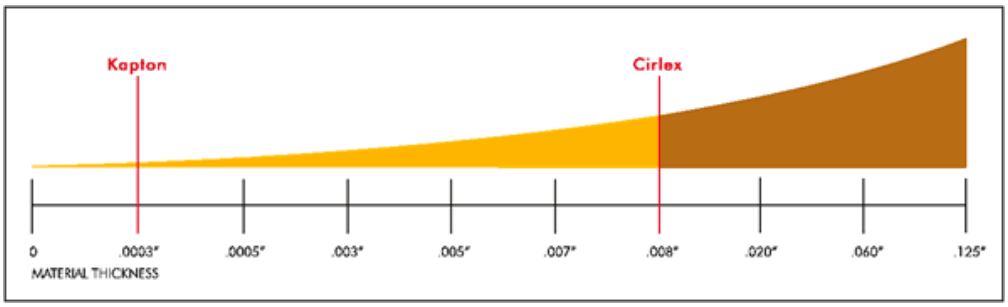
- General Cirlex® Processing Procedures
- Cirlex® Data Sheet
- Cirlex® MSDS Sheet
- Kapton® General Properties Data
- ISO 9001:2000 Certification

Size: 13.5" x 23.5" (343mm x 596mm) or 23.5" x 23.5" (596mm x 596mm) Custom sizes available upon request.

Thermal: Temperature range from -452°F to 664°F (269°C to 351°C) Flammability Rating, UL® 94VO

Electrical: 2790 volts/mil @ .009" (.23mm)

Chemical: Impervious to most organic chemicals, solvents, fuels and lubricants.



Make your design a reality. Contact a Fralock design engineer for detailed information and for help in obtaining materials for test and prototype.

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F R A L O C K ®

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CIRLEX® Technical Data Sheet

Product Description

CIRLEX® has been developed to provide industry with a wider variety of thick polyimides, with pricing reflective of market needs.

CIRLEX® has the same excellent balance of physical, chemical, and electrical properties over a wide temperature range as offered by all Kapton® films. Overall operating temperature range is -269°C to +351°C.

CIRLEX® is offered in thicknesses from 0.006" (0.15mm) to 0.125" (3.175mm). Thicker constructions are available.

CIRLEX® can be modified by laser cutting, drilling, machining, stamping, shearing and chemical etching to very exact tolerances. A brief processing guide is available upon request

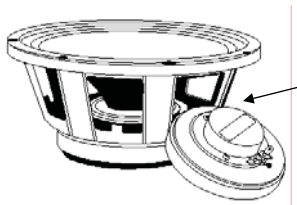
CIRLEX® is offered with a wide variety of laminated foils, either on the surface or imbedded, utilizing all-polyimide adhesiveless technology. Special applications are always welcome.

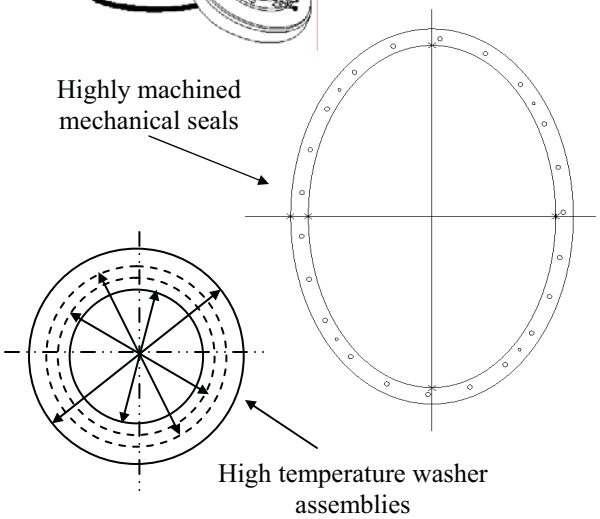
Applications

- PCB stencils
- Loudspeaker components
- Metal clad, thick polyimide materials (>0.008" thick)
- High-density electronic interconnects
- High-temperature mechanical seals

Packaging

CIRLEX® is packaged in "lay-flat" containers with protective interleaving. Several thicknesses may be shipped in each box to best utilize space or shipped as required by the customer. Customers are responsible for shipping cost unless other arrangements are made.





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San Carlos, CA 94070
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Ordering Information:

Call Fralock at 1.800.372.5625
or contact Fralock on the web:
http://www.fralock.com
http://www.cirlex.com
MSDS available upon request

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CIRLEX® Technical Data Sheet

Typical Properties of CIRLEX® at 23 ^{0}C (73 ^{0}F) and at 200 ^{0}C (392 ^{0}F)

Gauge	Cirlex® 900 CL	Cirlex® 1200 CL	Cirlex® 1500 CL	Cirlex® 3000 CL	Cirlex® 5000 CL
Thickness	**0.009" (0.23mm)**	**0.012" (0.31mm)**	**0.015" (0.38mm)**	**0.030" (0.76mm)**	**0.050" (1.27mm)**
Yield Point @ 3% Elong. (PSI)					
23 ^{0}C	6112	6500	7836	7097	6113
200 ^{0}C	5490	EL	EL	EL	EL
Stress @ 5% Elong. (PSI)					
23 ^{0}C	10360	10800	11230	10370	9413
200 ^{0}C	8339	EL	EL	EL	EL
Tensile (PSI)					
23 ^{0}C	32490	34000	35000	33300	31800
200 ^{0}C	32490	EL	EL	EL	EL
Elongation (%)					
23 ^{0}C	65	64	63	57	56
200 ^{0}C	85	EL	EL	EL	EL
Modulus (KPSI)					
23 ^{0}C	330	332	334	274	264
200 ^{0}C	239	EL	EL	EL	EL
Density (G/cc or G/ml)	1.42	1.42	1.42	1.42	1.42
Specific Heat (J/g K)	1.09	1.09	1.09	1.09	1.09
CTE (ppm/^{0}C)	20 ppm	20 ppm	20 ppm	20 ppm	20 ppm
Tg (^{0}C)	~351^{0}C	~351^{0}C	~351^{0}C	~351^{0}C	~351^{0}C
Dimensional Stability 250 ^{0}C					
Machine Direction	0.13	0.09	0.07	0.27	0.20
Transverse Direction	0.07	0.07	0.07	0.27	0.40
Dimensional Stability 400 ^{0}C					
Machine Direction %	0.33	0.33	0.33	0.13	0.00
Transverse Direction %	0.40	0.40	0.40	0.40	0.20
Dielectric Strength					
V/mil	2790	2000	1940	1270	Arc Over
Dielectric Constant KHz					
25 ^{0}C	3.45	3.55	3.58	3.74	3.72
Dissipation Factor	0.0021	0.002	0.0018	0.0023	0.0026
Moisture Absorption					
% Max.	4.0	4.0	4.0	4.0	4.0
Thermal Conductivity					
W/m K	0.17	0.17	0.17	0.17	0.17
UL Rating					
UL File # - E39505	UL 94V0	UL 94V0	UL 94V0	UL 94V0	UL 94V0

* **EL** *(Material exceeded test limits of test equipment)*

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General Cirlex® Processing Procedures

Drilling/ Machining

Drilling and machining of Cirlex® follows certain technical guidelines that can be used over all thicknesses. In general, Cirlex® can be machined similar to soft Aluminum materials. With the proper entry and back-up materials, hole drilling can be done so the holes are clean and linear top-to-bottom. Thicker materials may require either peck drilling or 2-sided drilling to get good top to bottom location.

Recommended drilling materials:

- Entry foil = L.C.O.A. type SEO+ (0.009")
- Backer foil = L.C.O.A. type EO+ (0.014")
- Backer board = phenolic

Use a phenolic backer board followed by the EO+, Cirlex®, and the SEO+ entry foil. Small holes (0.002" – 0.025") should not penetrate the EO+ backer foil. Larger drill sizes may go through slightly and still leave a clean hole. Keep a close watch on drill depth to assure good hole quality.

Drill recommendations:

- Carbide drills
- Thick web
- High relief flutes

Drilling parameters

- The best way/source for drilling information can be found at the below link. Just click/select **The Drilling Process** for an Excel file that shows many ways of processing/calculating drilling parameters. Cirlex® is considered an "Abrasive Material". The "F&S Tables" tab has listings for several material types. Use the "Abrasives" column to use as a reference for setting feeds and speeds.
- Optimum hole quality may require some adjustment in feed of speed. General drilling knowledge of materials is a key to making any required adjustments. Plasma etching can be used to clean holes for best results.

http://www.excellon.com/ApplicationEngineering/diam.htm

Mechanical Machining / Routing

- Machining and/or routing is most commonly done with multi-facet or 2-flute carbide routing bits. Generally feed rates from 10 to 30 IPM (inches per minute) are used, depending on the bit size.

Laser Machining

- Lasers are commonly used to machine Cirlex® materials. Most commonly laser machining is done be professional laser companies with several types of lasers. Laser drilling and laser routing are commonly used to produce intricate deigns.
- Lasers can also be used to remove polyimide to expose underlying pads and/or metal details. If electrical contact is required in these areas after polyimide removal, using plasma etching works the best to completely clean the area.

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Etching

Chemical Etching

- Process :

- 2N Aqueous alcoholic KOH @ 60 C or 12N Aqueous KOH @ 80 C

Chemical etching with generally leave a conical or trapezoidal hole where the top of the hole will be larger than the bottom. The sidewall will normally be ~ 45^0. Chemical will be the faster of the 2 common etching processes.

Other process options are possible depending upon desired results. Please contact us for more information.

Plasma Etching

- Cirlex® can be etched using 2 primary gas compositions.

1. Pure Oxygen – normally 5 to 10 minutes
2. Oxygen + Freon – normally 5 to 10 minutes

The above conditions are for surface preparation and hole cleaning only. Longer times will be required to remove substantial amounts of polyimide. Either process works well, although the pure Oxygen tends to be more aggressive and etch vertical walls more uniformly. Both processes are widely used in the industry. Etch rates may vary with application.