



# Keratherm FTC F.A.Q.

(Frequently Asked Questions)

# What kind of etching methods can be used?

All conventional kinds of etching methods can be used: spraying, immersion and foam etching. The preferred method is spray etching in a continuous processing machine. Roll-to-roll production is also possible.

#### What sorts of etchants can be used?

At present, wet-chemical etching using sodium persulfate, ammonium persulfate or ferric (III) chloride has been tested.

#### What resolutions are possible / viable when etching?

On standard film Keratherm 86/77, minimum circuit path widths and distances of  $300 - 350 \mu m$  can be reliably reproduced. Circuit path distances down to 125  $\mu m$  are possible. Narrower circuit paths are possible but will probably show a lower adhesive strength.

#### Any Problems regarding chemical resistance?

The films are chemically resistant against all chemicals used in circuit board technology, for example, sulfuric acid, hydrochloric acid, acetone, ethanol, sodium hydroxide, sodium carbonate, sodium persulfate, etc.

#### Can the film cause damage to chemical baths as a result of silicone monometers leaching out?

No, the films can be used without problems concerning other circuit board basis materials being processed in the same chemical baths and equipment.

#### Which film type should be used for flexible printed circuit boards?

The standard material is the film KERATHERM 86/77. For special applications, the highly thermoconductive films KERATHERM 86/30, 86/50, 86/82 can also be used, however, significantly lower adhesive strengths regarding the copper lamination and significantly lower mechanical stability of the films are to be expected. In this case, circuit paths are only possible at circuit path widths of 700-1000 µm and show inferior adhesive strength.

#### Is laser processing possible?

Yes. The polysiloxane films (with or without copper lamination) are very suitable for laser processing. The laser can be used for structuring and separating the films. Holes, blind holes and ultrafine copper structures (30 µm in width) can be produced.

## Is the film suitable for use as a high-frequency circuit board material?

No, because the dielectric constant and loss factor are strongly frequency-dependent and the loss factor is approx. 10 to 20 times higher than for conventional high-frequency circuit board materials.

#### In what widths can the films be manufactured and processed?

The films are currently manufactured and processed in the following standard widths: 100, 200, 300 and 400 mm. They can currently be etched in widths up to 300 mm in a roll-to-roll process. Large-batch assembly and soldering is currently possible at a width of 70 mm.

#### Moisture absorption compared to Kapton

The Moisture absorption for polysiloxane is 0.3 to 1.0 % compared to 2-4 % for Kapton: polysiloxane therefore causes less problems during soldering the moisture (predominantly from the wet-chemical processing step) is released again. Kapton must be dried in a complex process and will absorb humidity from the surrounding air within 24 hours.

#### What design principle is used for electronic assemblies?

The recommended design principles are EPAC or sandwich construction, similar to samples available. To ensure optimal heat dissipation and mechanical stability, the back of the polysiloxane film should be pressed directly onto an aluminium plate. Gluing is possible but decreases the heat dissipation.



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# Keratherm FTC F.A.Q.(cont'd)

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# Can the film be glued on?

The films can be glued onto aluminium plates with the aid of a suitable adhesive. The adhesive however decreases the heat dissipation. We are currently working on improving the adhesive properties with respect to adhesive strength, thermal resistance and thermal conductivity.

#### How should the film be processed mechanically?

The films can be processed by using mechanical tools such as scissors, knives, drills. They can also be processed by means of a laser.

## For what applications are the films particularly well suited?

The films are particularly well suited for boards in the field of power electronics (engine control, IGBT control, etc.) and high-performance LED arrays. The film also offers further application possibilities in the area of rigidflexible sub-assemblies.

#### What soldering methods can be used?

Because of the mechanical properties (flexibility) of the film, only the reflow method is suitable for serial production. The solder joints are heated by conduction would be suitable. For samples or very small-batch production, soldering can also be performed by soldering iron or soldering robots.

#### Are the films suitable for lead-free solders?

Thanks to their high temperature stability, the films are optimally suited for lead-free solders.

#### Which assembly methods can be used?

For series production, only SMD assembly is worth considering. Conventional wired components need to be placed and soldered manually.

#### Is it possible to use COB (Chip On Board) / bonding technologies?

Only the flip-chip process is possible, using either soldering techniques or polymer flip-chip techniques. Conventional wire bonding processes (thermal compression and ultrasonic) are not possible due to the low hardness of the film material.

#### How can multilayer technology be realized?

One way is by combining circuit board and polymer thick film technology (copper coating with printing of polymer paste). The copper coating can be structured by means of etching technology and/or laser processing. Further layers are applied by means of screen printing of polymer pastes (insulation, trace, resistor). Another possible way is the lamination or continuous bonding of multiple polysiloxane films. This variation, however, is currently only in the developmental stage.

#### What is the costs for polysiloxane circuit boards?

The costs for the KERATHERM 86/77 polysiloxane film is comparable to those of standard epoxy resin based materials (FR4). The cost of processing these films is identical to that of standard materials (FR4) both at a laboratory and large-batch production scale and can even be lower because cost-effective roll-to-roll processing is both feasible and preferred.

#### What particular regulations need to be considered when designing the electronic boards?

Yes. We can supply the user with the exact requirements and layout recommendations.



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