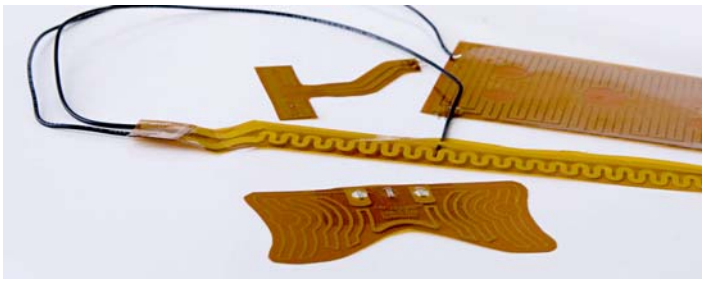
HIGH TEMPERATURE FLEXIBLE HEATING SYSTEMS

Thermo continues to develop and evaluate new technologies and their applications in the heater industry. Many high temperature thick films (conductive inks) are available today, which can be applied to a wide variety of substrates in order to meet high-temperature requirements. Below is a sample list of substrates and their properties, which are available for use in Thermo's flexible heater construction.

			SUBSTRATE				
Properties	**Test Method**	**Unit**	**PET**	**PEN**	**PEI**	**PPS**	**PI**
Ultimate Tensile Strength (MD)	ASTM D882-88	kg/m^2	1,970	2,250	1,060	2,040	2,460
Modulus (MD)	ASTM D882-88	%	150	65	50	50	75
Continuous Use Temp. (Mechanical)	**UL**	**°C**	**105**	**160**	**170**	**180**	**240**
Continuous Use Temp. (Electrical)	**UL**	**°C**	**105**	**180**	**180**	**180**	**240**
Glass Transition Temp.		°C	80	120	212	90	410
Melting Temp.		°C	260	262	365	285	>500
Dielectric Strength	ASTM D150-81	V/25µm	7,000	7,000	3,500	8,000	7,700
Dielectric Constant	ASTM D150-81		3.3	3.16	3.2	3	3.5
Moisture Absorption	IPC-TM-650 No.2.6.2	%	0.6	0.6	0.25	0.01	2.9
Density		g/cm^3	1.4	1.36	1.27	1.35	1.42
Flammability	UL94		VTM-2	VTM-2	V-0	VTM-0	V-0

Kapton® Heaters

Kapton is a clear, amber colored film. The process for making Kapton heaters is similar to that of Etched Foil Silicone heaters. The desired circuit pattern is etched onto the bottom layer of Kapton then another layer of Kapton is added to the top to complete the heater.



Features:

- High tensile strength
- Excellent dimensional stability
- Thin, lightweight profile
- High watt densities
- Applications include: medical diagnostic instruments, LCDs, analytic test equipment heaters

Technical Specifications

Size	Up to 22" x 22"
Standard Thickness	.007"
Maximum Watt Density	50 watts per sq in
Std Maximum Resistance Density	115 ohms per sq in
Maximum Operating Temp	400°F
Minimum Operating Temp	-320°F
Wattage Tolerance	+/-10%
Dielectric Strength	1250 V
Standard Dimensional Tolerances	0-6" +/- .030" 6-12" +/- .060" Over 12" +/- .125"

* Kapton® is a registered trademark of DuPont

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