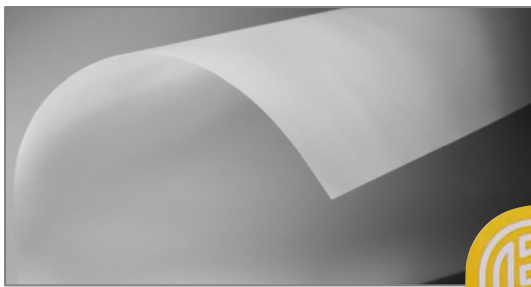
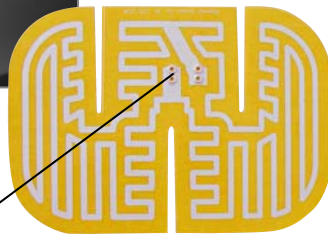


Since its inception in 1978, in Ingolstadt, Germany, Thermo Heating Elements has been recognized in the industry as a world leader in heating innovation and technology. Along with the facility in Piedmont, South Carolina, Thermo has been on the forefront of polymer thick film research and product development. Through the many years of research, Thermo has received and holds many patents in heating technology and has leveraged that technology to serve numerous industries with their heating needs.

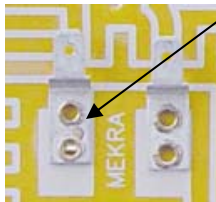


## Polymer Thick Film (PTF) Heating Elements Construction

A PTF heater starts with a high grade, low shrinkage polyester substrate in sheet or roll form.



A polymeric, silver-based paste is screen printed onto the polyester in the desired circuit pattern. This sheet or roll is then oven dried to cure or “set” the element. The circuits are then die cut apart.

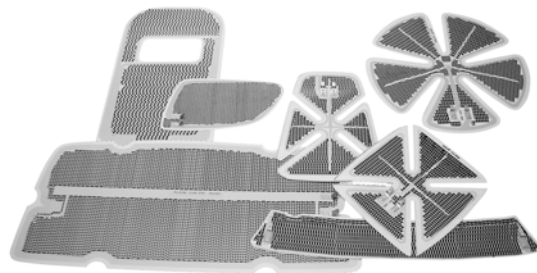


The next step is to add the terminals for lead attachment. The open face circuit is then covered with a double-sided pressure sensitive adhesive (PSA) tape on a polyester substrate. One side of the PSA joins the top and bottom layers of the heater. The other side of the PSA is used to apply the heater to the desired part to be heated.

## Advantages

By using printed thick film technology, heat is spread evenly and efficiently across the surface. This leads to very cost effective heating systems.

- Optimal energy efficiency
- Thin, flexible construction
- Superior heat transfer
- Uniform heat distribution
- Unlimited heater configurations and connections



## UL Recognition

Thermo has the capability to produce UL/CUL recognized components to meet application requirements. Our heating elements have passed the extensive and thorough UL testing process enabling us to apply the UL/CUL mark to our heaters. Thermo’s heating elements can be designed for either AC or DC variable input voltages.

# Technical Specifications - POLYMER THICK FILM HEATERS on POLYESTER



	FIXED RESISTANCE ON POLYESTER	POSITIVE TEMPERATURE COEFFICIENT (PTC) ON POLYESTER
<b>Minimum Size</b>	1.57" x 0.79"	1.10" X 1.75"
<b>Maximum Size</b>	39.37" x 39.37" Larger if Connected	18.25" x 18.25" Larger if Connected
<b>Standard Thickness</b>	0.01"	0.01"
<b>Min Operating Temp</b>	-120° F (-84°C)	-120° F (-84°C)
<b>Max Exposure Temp</b>	240°F (115°C)	190°F (88°C)
<b>Max Continuous Use Temp</b>	212°F (100°C)	176°F (80°C)
<b>Maximum Watt Density</b>	1.25 watts/sq.in., regulated	1.25 watts/sq.in., regulated
<b>Maximum Voltage</b>	1000V Single Phase Only	48V Single Phase Only
<b>Standard Voltages</b>	12V, 24V, 48V, 120V & 240V	12V, 24V, 48V
<b>Wattage Tolerances</b>	+/- 10% UL +5% / -10%	+/- 20% at Given Ambient
<b>Dielectric Strength</b>		
<ul style="list-style-type: none"> <li>• <b>Single Layer PSA</b></li> <li>• <b>Double Layer PSA</b></li> <li>• <b>Triple Layer PSA</b></li> </ul>	1500V 2200V 2500V-2700 V	1500V 2200V 2500V-2700 V
<b>Standard Length and Width Dimensional Tolerances</b>		
<ul style="list-style-type: none"> <li>• <b>0" – 7.87"</b></li> <li>• <b>7.87" – 19.69"</b></li> <li>• <b>19.69" – 39.37"</b></li> </ul>	+/- .02" +/- .04" +/- .12"	+/- .02" +/- .04" +/- .12"
<b>Possible Connections</b>	Eyelets, Lead Tabs (90°, 45° z-shaped tabs) Lead wires Insulated terminals Thermostats Thermal fuses, sensors	Eyelets, Lead Tabs (90°, 45° z-shaped tabs) Lead wires Insulated terminals Thermostats Thermal fuses, sensors

## Positive Temperature Coefficient (PTC) Capability

Thermo Heating Elements have produced PTC heaters for over 15 years. This patented technology is used to produce heating elements that have self-regulating properties. This means that the elements serve as their own sensor - they increase the wattage used in colder temperatures and decrease the wattage used as the temperature increases. This occurs due to the construction. First, silver is printed on the polyester film then a carbon layer is printed on top of that. As the temperature of the heater increases, the carbon layer causes the silver layer's resistance to increase. This increase in resistance corresponds to the decrease in wattage. This results in a more efficient heating system.

