

## Thick Film

### Printed Thick Film Heating Elements

Tempco's flexible Thick Film Heating Elements offer a wide range of design options for OEM applications. By utilizing printed thick film technology, the heaters can more efficiently spread the heat across the surface, and are more cost effective systems when compared to etched foil or wire elements.

The ink can be designed in various patterns and densities, concentrating power exactly where it is needed. The element traces can be widened or narrowed to allow for cutouts and holes.

#### Construction

Conductive and resistive inks are printed on a film substrate layer, and then covered with another film layer laminated together with pressure sensitive adhesive (PSA). Typically, the film layers are .005" thick thermoplastic or thermoset polymers, like polyester (up to 105°C) or polyimide (up to 180°C), that exhibit good thermal conductivity while serving as electrical insulators.

An additional layer of PSA can be added to the bottom of the assembly so the element can be bonded directly to the surface to be heated, ensuring excellent thermal transfer.

#### Cooler Operating Temperature

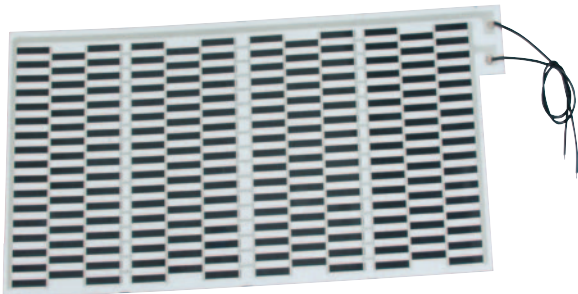
By spreading the heat trace over a larger percentage of the surface of the element, as compared to wire wound elements, a Tempco thick film element will operate at a cooler operating temperature due to the lower watt density in a given area. The low thermal mass of the heater allows the heat to be transferred more quickly to the surface to be heated.

#### Controls and Sensors

More exacting control is available for the heaters as well. Thermostats and temperature sensors can be mounted directly on the heaters for direct temperature control. Thermal fuses/TCOs are available for overtemperature/runaway condition protection.

#### Typical Applications

- ↔ *Blanket Heaters for Battery Back up Systems*
- ↔ *Video Camera Lens Defoggers*
- ↔ *Outdoor Enclosure Warmers*
- ↔ *Fluorescent Bulb Starters*
- ↔ *Clear LCD Heaters*
- ↔ *Packaging/Sealing Bar Element*
- ↔ *Medical Equipment*
- ↔ *Food Service Equipment*
- ↔ *Mirror Heater/Defoggers*



#### Specifications

**Overall Maximum Temperature:** 900°F (482°C)

#### Substrate Materials – Maximum Ratings

**Polyester:** 221°F / 105°C

**Polyethylene:** 221°F / 105°C

**Polyvinyl Chloride (PVC):** 221°F / 105°C

**Thermoset Laminate:** 284°F / 140°C

**Polyethylene Naphthalate (PEN):** 320°F / 160°C

**Polyimide (Kapton®):** 392°F / 200°C

**Silicone Rubber:** 392°F / 200°C

#### Pressure Sensitive Adhesive

**Acrylic:** 221°F / 105°C

**High Temperature Acrylic:** 300°F / 149°C

**Silicone:** 392°F / 200°C

#### Dimensional Limits

**Minimum Width:** 0.25" (6mm)

**Maximum Length:** 30" (508mm)

Heaters can be manufactured that have a length much greater than the width. Up to 24" x 98" have been made.

#### Electrical

**Voltage:** Up to 277 VAC or VDC

**Watt Density:** Standard, up to 25 w/in<sup>2</sup>.

Can go higher under certain conditions.  
Consult Tempco with your requirements.

**Dielectric Strength:** 1500 VAC

#### Ordering Information

##### Custom Engineered / Manufactured Heaters

Understanding that an electric heater can be application specific, Tempco will design and manufacture a Thick Film Heater to meet your requirements. Copy the form on page 9-22, fill it out, and fax it to Tempco to receive a quote.

**⚠ WARNING:** Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).