

## Inert to Most Aqueous Acids. Alkalines, Anodizing and Pickling Solutions Up to 100°C

Fluoropolymer (PTFE) heater, or more commonly known as Teflon heater, are compatible with virtually every chemistry and are available in sizes up to 27kW. PTFE heaters are manufactured to heat corrosive liquid solutions, which normally used in metal finishing tanks. They are specifically designed for these process technology and only heating the part that is to be continually immersed. This plastic sheath enables the heaters to resist flow of heat and the aggressive chemical attack of the bath.

### Applications

PTFE heaters are one of the most widely used methods for most plating tank solutions. Designed for use in the most critical environment, the vapour tight polypropylene terminal enclosure and PTFE sheath will protect the heater from any known chemical attack. The direct immersion method is energy efficient and easily monitored and controlled.

Check compatibility guide on page 2 and with chemical supplier for proper sheath material selection.

### Advantages

- Superior Chemical Resistance  
Inert to most aqueous acid, alkaline, anodizing and pickling solutions up to 100°C.
- Rugged Construction  
Heavy wall fluoropolymer (PTFE) covered stainless steel element reduces permeation and eliminates the needs for gas purge system. Guaranteed 100% pin hole free.
- Outstanding Performance  
Low watt density design (10W/inch<sup>2</sup> ; 1.5W/cm<sup>2</sup>) for long service life.



Fig 1. Wide Selection of PTFE Heater Design

### Thermal Protectors

Auto Resettable Type Thermal Fuses

- TF-1 : For solutions up to 90°C
- TF-2 : For solutions up to 100°C
- TF-3: For solutions up to 120°C

Thermocouple

- Type K - Bi-Metal Sheath
- Type J - Bi-Metal Sheath

### Technical Capabilities

- Power  
500 watts to 6000 watts (Higher watts available upon request)
- Voltages  
120V - 600V, Single Phase and 3 Phase Available .

## Compatibility Guide

### SOLUTION

### TYPE OF HEATER

Acetic	PTFE or Quartz
Acid Sulfate	PTFE or Quartz
Actane 70, 80	PTFE
Actane Salt	PTFE
Alcorite	PTFE or Quartz
Alkaline Cleaners (Electrified)	304 Stainless Steel
Alkaline Soaking Cleaners	304 Stainless Steel
Alodine (most formulas)	316 Stainless Steel
Alstan	304 Stainless Steel
Aluminum Anodizing	PTFE or Quartz
Aluminum Bright Dip	PTFE or Quartz
Aluminum Chloride	PTFE or Quartz
<b>Aluminum Cleaners</b>	<b>304 Stainless Steel</b>
Aluminum Sulfate	304 Stainless Steel
Ammonia	304 Stainless Steel
Ammonia Persulfate	PTFE or Quartz
Ammonium Bi Fluoride	PTFE
Ammonium Chloride	Titanium
Ammonium Nitrate	316 Stainless Steel
Anodizing	PTFE or Quartz
ARP 28, 80 Blackening Salts	PTFE or Quartz
Arsenic	304 Stainless Steel
Barium Chloride	Titanium
Benzoic Acid	Titanium
Black Nickel	PTFE or Quartz
<b>Black Oxide (High-Temp)</b>	<b>304 Stainless Steel</b>
Black Oxide (Low-Temp)	Titanium
<b>Bonderizing</b>	<b>316 Stainless Steel</b>
Boric Acid	Titanium
Brass Cyanide	304 Stainless Steel
Bright Copper-Cyanide	304 Stainless Steel
Bright Nickel	PTFE, Quartz or Titanium
Bronze	304 Stainless Steel
Brown Oxide	Titanium
Burnite	PTFE or Quartz
Butyric Acid	Titanium
Cadmium (Alkaline)	304 Stainless Steel
Cadmium Black	PTFE or Quartz
Cadmium Fluoborate	PTFE
Calcium Chloride	Titanium
Calcium Hypochlorite	Titanium
Carbonic Acid	Titanium
<b>Caustic Etch</b>	<b>Steel</b>
Caustics	Steel
<b>Caustics (highly concentrated 20% &amp; over)</b>	<b>Steel</b>
Chloride	PTFE, Quartz or Titanium
Chlorine/Wet	PTFE or Quartz
Chlorosulfuric Acid	Titanium
Chromic Acetate	PTFE or Quartz
Chromic Anodizing	PTFE or Quartz
Chromic Nickel	PTFE or Quartz
Chromium (Fluoride)	PTFE

### SOLUTION

### TYPE OF HEATER

Chromium (No Fluorides)	PTFE, Quartz or Titanium
Citric Acid	Titanium
Clear Chromate	PTFE or Quartz
Cobalt Nickel	PTFE, Quartz or Titanium
Cobalt Plating	304 Stainless Steel
Cobra Etch	PTFE
Copper Acid	PTFE or Quartz
Copper Bright Acid	PTFE or Quartz
Copper Cyanide	304 Stainless Steel
Copper Fluoborate	PTFE
Copper Pyrophosphate	304 Stainless Steel
Copper Strike	304 Stainless Steel
Copper Sulfate	PTFE or Quartz
Cyanide	304 Stainless Steel
Deionized Water	316 Stainless Steel
Deoxidizer (Etching)	PTFE or Quartz
Deoxidizer Non-Chromated	316 Stainless Steel
Dichromic Seal	Steel
Diethylene Glycol	304 Stainless Steel
Diversey, 511, 514	PTFE
<b>Dow Therm</b>	<b>316 Stainless Steel</b>
Dye Solutions	304 Stainless Steel
Ebonal C	Titanium
Electro Cleaner	304 Stainless Steel
Electro Polishing	PTFE or Quartz
Electroless Copper	PTFE
<b>Electroless Nickel</b>	<b>PTFE or Titanium</b>
Electroless Tin (Acid)	PTFE or Quartz
Electroless Tin (Alkaline)	316 Stainless Steel
Enthone 80 Acid	PTFE
<b>Ethylene Glycol</b>	<b>Steel</b>
Ferric Ammonium Oxide	316 Stainless Steel
Ferric Chloride	PTFE, Quartz or Titanium
Ferric Nitrate	304 Stainless Steel
Ferric Sulfate	304 Stainless Steel
Fluoborate	PTFE
Formic Acid	316 Stainless Steel
<b>Glycerol</b>	<b>304 Stainless Steel</b>
Gold-Acid	PTFE, Quartz or Titanium
Gold Cyanide	304 Stainless Steel
Gold-Immersion	304 Stainless Steel
Grey Nickel	PTFE, Quartz or Titanium
Hot Seal Dichromate	316 Stainless Steel
Hydrochloric Acid	PTFE or Quartz
Hydrofluoric Acid	PTFE
<b>Hydrogen Peroxide</b>	<b>PTFE or Quartz</b>
Indium	PTFE or Quartz
Iridite (1, 2, 3, 4-C, 7, 8, 15)	PTFE or Quartz
Iridite (4-75, 4-73, 14, 14-2, 14-9)	316 Stainless Steel
Iron Fluoborate	PTFE
<b>Iron Phosphate</b>	<b>316 Stainless Steel</b>
Isoprep (186, 187, 188)	316 Stainless Steel



## Compatibility Guide (cont.)

SOLUTION	TYPE OF HEATER	SOLUTION	TYPE OF HEATER
Isoprep Acid Salts .....	PTFE	Silver Lume .....	304 Stainless Steel
Jetal .....	304 Stainless Steel	Silver Nitrate .....	316 Stainless Steel
Lead Acetate .....	304 Stainless Steel	Sodium Bisulfate .....	PTFE or Quartz
<b>Lime Saturated Water (Alkaline) .....</b>	<b>316 Stainless Steel</b>	Sodium Carbonate .....	Titanium
Linseed Oil .....	304 Stainless Steel	Sodium Chlorate .....	Titanium
<b>Magnesium Hydroxide .....</b>	<b>304 Stainless Steel</b>	Sodium Chloride .....	Titanium
Magnesium Nitrate .....	PTFE or Quartz	Sodium Cyanide .....	304 Stainless Steel
<b>Manganese Phosphate .....</b>	<b>316 Stainless Steel</b>	Sodium Dichromate (Hot Seal) .....	316 Stainless Steel
McDermid 629 .....	PTFE	Sodium Hydroxide .....	Steel
Mercuric Chloride .....	Titanium	Sodium Hypochlorite .....	PTFE
Muriatic Acid .....	PTFE or Quartz	Sodium Persulfate .....	PTFE or Quartz
Nickel (Plating Solution) (Watts) .....	PTFE, Quartz or Titanium	Stannate .....	Steel
Nickel Acetate Seal .....	316 Stainless Steel	Stanostar .....	PTFE or Quartz
Nickel Chloride .....	Titanium	Stearic Acid .....	Quartz
Nitric Acid .....	PTFE or Quartz	Sulfamate Nickel .....	PTFE, Quartz or Titanium
Nitric Hydrochloric Acids .....	PTFE or Quartz	Sulfur .....	PTFE or Quartz
<b>Nitric Phosphoric .....</b>	<b>Quartz</b>	Sulfur Peroxide .....	PTFE or Quartz
<b>Oil .....</b>	<b>Steel</b>	Sulfuric Acid .....	PTFE or Quartz
Oleic Acid .....	PTFE or Quartz	Sulphamic Acid .....	PTFE or Quartz
Oxalic Acid .....	PTFE or Quartz	Tannic Acid .....	Titanium
<b>Paint Stripper (Alkaline) .....</b>	<b>304 Stainless Steel</b>	Tin Nickel .....	PTFE
<b>Perchlorethylene .....</b>	<b>316 Stainless Steel</b>	Tin Plating (Acid) (Fluoborate) .....	PTFE
<b>Phosphate .....</b>	<b>316 Stainless Steel</b>	Tin Plating (Acid) (Stanus/Sulphate) .....	PTFE or Quartz
<b>Phosphate Cleaner .....</b>	<b>304 Stainless Steel</b>	Tin Plating (Alkaline) .....	304 Stainless Steel
<b>Phosphoric Acid (No Fluoride) .....</b>	<b>PTFE or Quartz</b>	<b>Trichlorethylene .....</b>	<b>316 Stainless Steel</b>
Potassium Acid Sulfate .....	PTFE or Quartz	Trioxide (Pickle) .....	PTFE or Quartz
Potassium Cyanide .....	304 Stainless Steel	<b>Turco (4181, 4338) .....</b>	<b>316 Stainless Steel</b>
Potassium Hydrochloric .....	PTFE or Quartz	Unichrome .....	PTFE or Quartz
Potassium Hydroxide .....	304 Stainless Steel	Water .....	316 Stainless Steel or Quartz
<b>Potassium Permanganate .....</b>	<b>PTFE or Titanium</b>	Wood's Nickel Strike .....	PTFE, Quartz or Titanium
Rhodium .....	PTFE or Quartz	Yellow Dichromate .....	PTFE or Quartz
Rochelle Salt Cyanide .....	304 Stainless Steel	Zinc Acid .....	PTFE or Titanium
Ruthenium .....	PTFE or Quartz	Zinc Ammonium Chloride .....	Quartz or Titanium
Salt (Actine) .....	PTFE	Zinc Cyanide .....	304 Stainless Steel
Sea Water .....	Titanium	<b>Zinc Phosphate .....</b>	<b>316 Stainless Steel</b>
Silver Bromide .....	316 Stainless Steel	Zinc Phosphate (Fluoride) .....	PTFE
Silver Cyanide .....	304 Stainless Steel	Zincate .....	304 Stainless Steel

**Solutions requiring derated heaters are indicated in RED type.**

NOTE: The data listed is provided as a reference and is offered as a guide only. It is not intended to be used as the sole basis of design or to establish specification limits. PMJ HEATERS assumes no obligation or liability for any advise furnished by it or for results obtained from its use. Due to the complexities of solutions and applications, it is the customer's responsibility to contact their chemical supplier for heater material compatibility and recommendations. Ultimate responsibility lies with the user.

**DO NOT USE ELECTRIC IMMERSION HEATER TO HEAT FLAMMABLE SOLUTIONS!**

Please insure applicability of heater before installation since we cannot guarantee heaters against premature failure due to corrosion or chemical destruction caused by unusual conditions over which we have no control such as:

- Excessive high solution temperatures
- The concentration of the solution
- The presence of other acids causing a secondary reaction
- Flux floating on the surface
- The presence of dissolved gas
- Stray electrical currents
- Excessive sludge buildup
- Aeration