



# ENGINEERING DATA

## Immersion Heater Solution Guide

<u>SOLUTION</u>	<u>TYPE OF HEATER</u>	<u>SOLUTION</u>	<u>TYPE OF HEATER</u>
Acetic Acid.....	PTFE* or Quartz	Cobalt Plating .....	304 Stainless Steel
Actane 70, 80 .....	PTFE*	Cobra Etch .....	PTFE*
Actane Salt .....	PTFE*	Copper Acid .....	PTFE* or Quartz
Acid Sulfate .....	PTFE* or Quartz	Copper Bright Acid .....	PTFE* or Quartz
Alcorite .....	PTFE* or Quartz	Copper Cyanide .....	304 Stainless Steel
Alkaline Cleaners (Electrified).....	304 Stainless Steel	Copper Fluoborate .....	PTFE*
Alkaline Soaking Cleaners .....	304 Stainless Steel	Copper Pyrophosphate .....	304 Stainless Steel
Alodine (most formulas) .....	316 Stainless Steel	Copper Strike .....	304 Stainless Steel
Alstan .....	304 Stainless Steel	Copper Sulfate .....	PTFE* or Quartz
Aluminum Bright Dip .....	PTFE* or Quartz	Cyanide .....	304 Stainless Steel
<b>Aluminum Cleaners .....</b>	<b>304 Stainless Steel</b>	Deionized Water .....	316 Stainless Steel or Titanium
Aluminum Chloride .....	PTFE* or Quartz	Deoxidizer (Etching) .....	PTFE* or Quartz
Aluminum Sulfate .....	304 Stainless Steel	Deoxidizer Non-Chromated .....	316 Stainless Steel
Ammonia .....	304 Stainless Steel	Dichromic Seal .....	Steel
Ammonia Persulfate .....	PTFE* or Quartz	Diethylene Glycol .....	304 Stainless Steel
Ammonium Bi Fluoride.....	PTFE*	Diversey, 511, 514 .....	PTFE*
Ammonium Chloride .....	Titanium	<b>Dow Therm .....</b>	<b>316 Stainless Steel</b>
Ammonium Nitrate .....	316 Stainless Steel	Dye Solutions .....	304 Stainless Steel
Anodizing (Aluminum).....	PTFE* or Quartz	Ebonal C .....	Titanium
ARP 28, 80 Blackening Salts.....	PTFE* or Quartz	Electroless Copper .....	PTFE*
Arsenic .....	304 Stainless Steel	<b>Electroless Nickel .....</b>	<b>PTFE* or Titanium</b>
Barium Chloride .....	Quartz or Titanium	Electroless Tin (Acid) .....	PTFE* or Quartz
Benzoic Acid .....	Titanium	Electroless Tin (Alkaline) .....	316 Stainless Steel
Black Nickel .....	PTFE* or Quartz	Electro Cleaner .....	304 Stainless Steel
<b>Black Oxide (Hi-Temp) .....</b>	<b>304 Stainless Steel</b>	Electro Polishing .....	PTFE* or Quartz
Black Oxide (Low-Temp) .....	Titanium	Ethnone 80 Acid .....	PTFE*
<b>Bonderizing .....</b>	<b>316 Stainless Steel</b>	<b>Ethylene Glycol .....</b>	<b>Steel</b>
Boric Acid .....	Titanium	Ferric Ammonium Oxide .....	316 Stainless Steel
Brass Cyanide .....	304 Stainless Steel	Ferric Chloride .....	PTFE*, Quartz, or Titanium
Bright Nickel .....	PTFE*, Quartz, or Titanium	Ferric Nitrate .....	304 Stainless Steel
Bright Copper Cyanide .....	304 Stainless Steel	Ferric Sulfate .....	304 Stainless Steel
Bronze (Alkaline).....	304 Stainless Steel	Fluoborate .....	PTFE*
Brown Oxide .....	Titanium	Formic Acid .....	316 Stainless Steel
Burnite .....	PTFE* or Quartz	<b>Glycerol .....</b>	<b>304 Stainless Steel</b>
Butyric Acid .....	Titanium	Immersion Gold .....	304 Stainless Steel
Cadmium Black .....	PTFE* or Quartz	Gold-Acid .....	PTFE*, Quartz, or Titanium
Cadmium (Alkaline) .....	304 Stainless Steel	Gold Cyanide .....	304 Stainless Steel
Cadmium Fluoborate .....	PTFE*	Grey Nickel .....	PTFE*, Quartz, or Titanium
Calcium Chloride .....	Titanium	Hot Seal Dichromate .....	316 Stainless Steel
Calcium Hypochlorite .....	Titanium	Hydrochloric Acid .....	PTFE* or Quartz
Carbonic Acid .....	Titanium	Hydrofluoric Acid .....	PTFE*
<b>Caustic Etch .....</b>	<b>Steel</b>	<b>Hydrogen Peroxide .....</b>	<b>PTFE* or Quartz</b>
Caustics .....	Steel	Indium .....	PTFE* or Quartz
<b>Caustics (highly concentrated 20% and over) .....</b>	<b>Steel</b>	Iridite (4-75,4-73,14,14-2,14-9).....	316 Stainless Steel
Chlorine/Wet .....	PTFE* or Quartz	Iridite (1,2,3,4-C,7,8,15) .....	PTFE* or Quartz
Chloride .....	PTFE*, Quartz or Titanium	Iron Fluoborate .....	PTFE*
Chlorosulfuric Acid .....	Titanium	<b>Iron Phosphate .....</b>	<b>316 Stainless Steel</b>
Chromic Anodizing .....	PTFE* or Quartz	Isoprep (186,187,188) .....	316 Stainless Steel
Chromic Acetate .....	PTFE* or Quartz	Isoprep Acid Salts .....	PTFE*
Chromic Nickel .....	PTFE* or Quartz	Jetal .....	304 Stainless Steel
Chromium (No Fluorides) .....	PTFE*, Quartz, or Titanium	Lead Acetate .....	304 Stainless Steel
Chromium (Fluoride) .....	PTFE*	<b>Lime Saturated Water (Alkaline) .....</b>	<b>316 Stainless Steel</b>
Citric Acid .....	Titanium	Linseed Oil .....	304 Stainless Steel
Clear Chromate .....	PTFE* or Quartz	<b>Magnesium Hydroxide .....</b>	<b>304 Stainless Steel</b>
Cobalt Nickel .....	PTFE*, Quartz, or Titanium	Magnesium Nitrate .....	PTFE* or Quartz

Solutions requiring derated heaters are indicated by red, bold, italicized type. \*PTFE is a polytetrafluoroethylene fluoropolymer.

<u>SOLUTION</u>	<u>TYPE OF HEATER</u>
<b>Manganese Phosphate</b> .....	<b>316 Stainless Steel</b>
McDermid 629 .....	PTFE*
Mercuric Chloride .....	Titanium
Muriatic Acid .....	PTFE* or Quartz
Nickel (Plating Solution) (Watts) .....	PTFE*, Quartz, or Titanium
Nickel Acetate Seal .....	316 Stainless Steel
Nickel Chloride .....	Titanium
Nitric Acid .....	PTFE* or Quartz
Nitric Hydrochloric Acids .....	PTFE* or Quartz
<b>Nitric Phosphoric</b> .....	<b>Quartz</b>
<b>Oil</b> .....	<b>Steel</b>
Oleic Acid .....	PTFE* or Quartz
Oxalic Acid .....	PTFE* or Quartz
<b>Paint Stripper (Alkaline)</b> .....	<b>304 Stainless Steel</b>
<b>Perchloroethylene</b> .....	<b>316 Stainless Steel</b>
<b>Phosphoric Acid (No Fluoride)</b> .....	<b>PTFE* or Quartz</b>
<b>Phosphate Cleaner</b> .....	<b>304 Stainless Steel</b>
<b>Phosphate</b> .....	<b>316 Stainless Steel</b>
Potassium Acid Sulfate .....	PTFE* or Quartz
Potassium Cyanide .....	304 Stainless Steel
Potassium Hydroxide .....	304 Stainless Steel
Potassium Hydrochloric .....	PTFE* or Quartz
<b>Potassium Permanganate</b> .....	<b>PTFE* or Titanium</b>
Rhodium .....	PTFE* or Quartz
Rochelle Salt Cyanide .....	304 Stainless Steel
Ruthenium Plating.....	PTFE* or Quartz
Salt (Actine) .....	PTFE*
Sea Water .....	Titanium
Silver Bromide .....	316 Stainless Steel
Silver Cyanide .....	304 Stainless Steel
Silver Lume .....	304 Stainless Steel
Silver Nitrate .....	316 Stainless Steel
Sodium Bisulfate .....	PTFE* or Quartz
Sodium Carbonate .....	Titanium

<u>SOLUTION</u>	<u>TYPE OF HEATER</u>
Sodium Chlorate .....	Titanium
Sodium Chloride .....	Titanium
Sodium Cyanide .....	304 Stainless Steel
Sodium Dichromate (Hot Seal) .....	316 Stainless Steel
Sodium Hydroxide .....	Steel
Sodium Hypochlorite .....	PTFE*
Sodium Persulfate .....	PTFE* or Quartz
Stannate .....	Steel
Stanostar .....	PTFE* or Quartz
Stearic Acid .....	Quartz
Sulfamate Nickel .....	PTFE*, Quartz, or Titanium
Sulfur .....	PTFE* or Quartz
Sulfur Peroxide .....	PTFE* or Quartz
Sulfuric Acid .....	PTFE* or Quartz
Sulphamic Acid .....	PTFE* or Quartz
Tannic Acid .....	Titanium
Tin Nickel .....	PTFE*
Tin Plating (Acid)(Stanus/Sulphate) .....	PTFE* or Quartz
Tin Plating Acid (Fluoborate) .....	PTFE*
Tin Plating (Alkaline) .....	304 Stainless Steel
Trichlorethylene .....	316 Stainless Steel
Trioxide (Pickle) .....	PTFE* or Quartz
Turco (4181, 4338) .....	316 Stainless Steel
Unichrome .....	PTFE* or Quartz
Water .....	316 Stainless Steel or Quartz
Wood's Nickel Strike .....	Titanium, PTFE*, or Quartz
Yellow Dichromate .....	PTFE* or Quartz
Zinc Acid .....	PTFE* or Titanium
Zinc Ammonium Chloride .....	Quartz or Titanium
Zinc Cyanide .....	304 Stainless Steel
<b>Zinc Phosphate</b> .....	<b>316 Stainless Steel</b>
Zinc Phosphate (Fluoride).....	PTFE
Zincate .....	304 Stainless Steel

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**PLEASE ENSURE 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:**

- Excessively high solution temperatures.
- The concentration of the solution.
- The presence of inhibitors.
- The presence of other acids causing a secondary reaction.
- Stray electrical currents.
- Flux floating on the surface.
- The presence of dissolved gases.
- Excessive sludge build-up.
- Stagnant or turbulent flow of the solution.
- Aeration.
- Presence of oxygen or an oxidizing agent in the solution.
- Erosion.
- High pressures.
- Vacuum conditions.

