Technical

Suggested Watt Densities

The rates below are recommended watt densities for use with various materials. Safe values vary with operating temperature, flow velocity, and heat transfer rates. In general, the higher the material temperature, the lower the watt density should be, especially those materials which coke or carbonize, such as oils. Watt densities should be low if a material is being heated to a temperature near where the change of state to a vapor occurs (water to steam @212˚F.) since the vapor state has much poorer heat transfer capabilities.

Material being heated	Maximum Operating Temp. ˚F	Maximum Watts Per Sq. In.*
Acid Solutions:		
Acetic	212	40
Chromic (5%)	Boiling	40
Citric	Boiling	40
Ferric	Boiling	40
Chloride (40%)		
Hydrochloric	150	30
Nitric (50%)	Boiling	40
Sulphuric	Boiling	30
Alkai & selected oakite		
cleaning solution	212	40
Asphalt binder, tar, other		
viscous compounds	200	8
	300	7
	400	6
	500	5
Caustic Soda 2%	210	45
10%	210	25
75%	180	25
Coffee (direct immersion)	Boiling	90
Dowtherm A®		
Flowing at 1ft/sec or more	750	22
Non-flowing	750	10
Ethylene Glycol	300	30
± Fuel Oils		
Grades 1 & 2 (Distillate)	200	22
Grades 4 & 5 (Residual)	200	13
Grades 6 & Bunker C (Residual)	160	8
Gasoline, Kerosene	300	20
Glue (heat indirectly using water bath)	100	
Liquid ammonia plating baths	50	25
** Lubrication Oils		
SAE 10, @ 130˚F	250	22
SAE 20, @ 130˚F	250	22
SAE 30, @ 130˚F	250	22
SAE 40, @ 210˚F	250	13
SAE 50, @ 210˚F	250	13

**Some oils contain additives that will boil or carbonize at low watt densities. Where oils of this type are encountered a watt density test should be made to determine a satisfactory watt density.

Material being heated	Maximum Operating Temp. ˚F	Maximum Watts Per Sq. In.*
Metal melting pot	500 to 900	20-27
Mineral oil	200	20
	400	16
Molasses	100	2-3
Molten salt bath	800-950	40
Molten tin	600	20
Oil draw bath	600	20
	400	24
Paraffin or wax	150	16
Photographic solutions	150	70
Plating solutions:		
Cadmium plating		40
Chrome plating		40
Copper plating		40
Nickel plating		40
Tin plating		40
Zinc plating		40
Salt Bath	900	30
Sea Water	Boiling	90
Sodium cyanide	140	40
Steel tubing cast into aluminum	500 to 750	50
Steel tubing cast into iron	750 to 1000	55
Heat transfer oils	500	22
flowing at 1 ft/sec or more	600	22
	650	22
	750	15
Tricholretylene	150	20
Vapor degreasing solutions	275	20
Vegetable oil (fry kettle)	400	30
Water (process)	212	60
Water (washroom)	140	80-90

* Maximum watt densities are based on heated length, and may vary depending upon concentration of some solutions. Watt density should be kept as low as possible in corrosive applications since higher watt densities accelerate corrosive attack on element sheaths. Consult factory for limitations.