



INDUSTRIAL ELECTRIC HEATERS



Circulation Heaters
Flanged Immersion Heaters
Screw Plug Immersion Heaters
Casings • Assemblies • Accessories



**ELECTRIC
PROCESS HEATER
SOLUTIONS
BEGIN HERE...**



*Electric heaters are our only business.
We are specialists in designing, engineering, and manufacturing
both standard and custom Electric Process Heaters.*

WARREN ELECTRIC CORPORATION

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ASME ACCREDITED

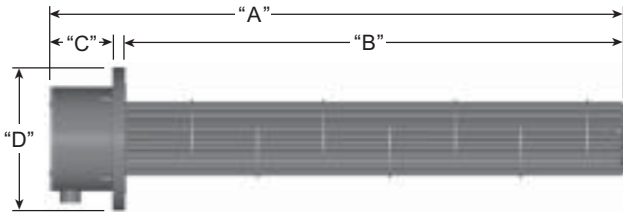




Flanged Immersion Heaters

SPECIFICATIONS:

- Watts:** to 800 Kilowatts
- Volts/Phase:** to 600 Volts, Single or 3 Phase
- Flange Size:** to 24" ANSI, Custom Sizes
- Flange Material:** Carbon Steel, Stainless Steel, Incoloy
- Pressure Rating:** ANSI to 1500 PSIG, Custom to 300 PSIG
- Immersion Length:** to 144"

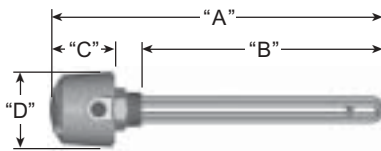


Flanged Immersion Heaters to suit your application requirements.

Screw Plug Immersion Heaters

SPECIFICATIONS:

- Watts:** to 100 Kilowatts
- Volts/Phase:** to 600 Volts, Single or 3 Phase
- Screw Plug Size:** 1" to 4" NPT
- Screw Plug Material:** Steel, Stainless Steel, or Brass/Bronze
- Pressure Rating:** 300 PSIG
- Immersion Length:** to 144"



Screw Plug Immersion Heaters designed in a wide range of models, ratings, materials, and capacities for mounting into standard threaded openings.

Flanged, Screw Plug, & Circulation Heater Options:

- A wide selection of **Watt Densities**, **Power Ratings**, and **Voltages**.
- **Element Sheath Materials** including Steel, Copper, Stainless Steel(s), Incoloy(s), and Inconel.
- Refer to page 9 for an abbreviated recommended **Watt Density Chart**.
- **Brazed**, **Welded**, or **Removable** elements.
- **Thermostats** available in a variety of ranges, multiple types of Thermocouples, RTDs, and hi-limit switches available in a thermowell or strapped to the element sheath.
- **Terminal Enclosure** choices include General Purpose (std.), Weather-Resistant, Explosion-Resistant, Rotating, Economy, Helmet Head, and Extended Head for High-Temperature Applications. NEMA equivalent enclosures available.
- Standard and custom **Gaskets** in a variety of materials, types, and sizes.
- May be supplied with **Power Distribution Blocks** for Multiple Circuits.
- **Copper** ("wet" side) **Face Plates** on flanged water heater designs available to reduce corrosion.
- **Certifications** on many models including UL listings, ASME Certification, CE Conformance.
- **Passivation** or **Electropolishing** available on Stainless Steel and Incoloy sheathed elements.
- Center core **Baffles** for increased velocity and staggered baffle plates available to increase turbulence for better heat transfer.
- **ASME Code Certification** and National Board of Boiler and Pressure Vessels Registration available.

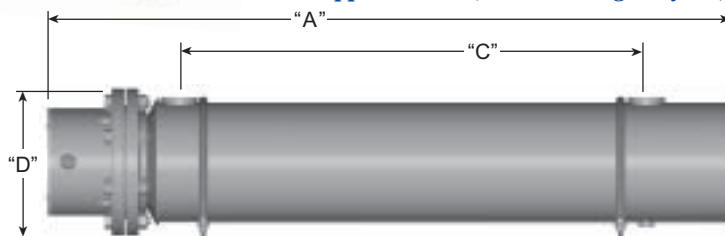
Circulation Heaters

SPECIFICATIONS:

- Available in Flanged & Screw Plug Designs*
- Inlet/Outlet:** FNPT coupling (std.), MNPT thd. pipe, beveled pipe, or flanged
- Insulation:** 1" Calcium Silicate (std.) with steel jacket, to 2", available without insulation
- Mounting U-bolts (std.) on insulated heaters, support legs, & custom mounting blocks available on insulated or uninsulated designs.



Circulation Heaters with high temperature insulation and steel jackets. Also available without insulation and jackets for lower temperature applications. (A cost savings to you.)



For more information or a quick quotation, please use our "Quick Quote" on the back of this brochure, or CALL, FAX, WRITE, or EMAIL us!



Casings & Assemblies



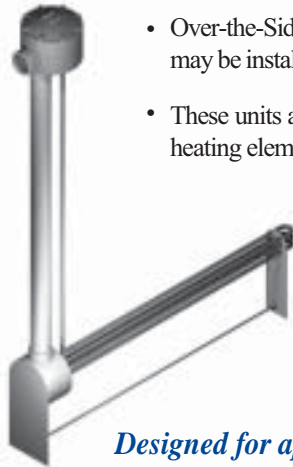
Casings assembled with your electric immersion heaters with options of your choice.

- Flanged or screw plug designs. Overall, immersed lengths, and inlet and outlet dimensions varied to suit your application.
- Casings can be assembled and constructed in assemblies. Design variations are virtually limitless with your choice of configurations. (See circulation heater section on page 1 for additional specifications)
- **ASME Code Certification** and National Board of Boiler and Pressure Vessels Registration available.

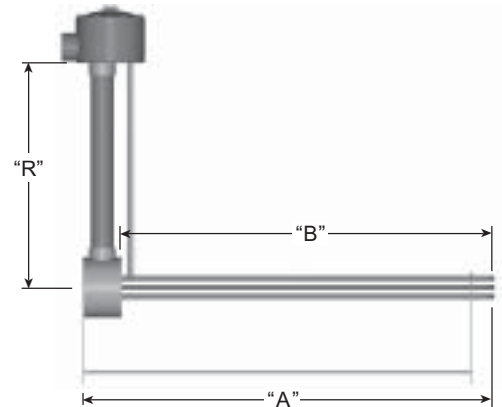


ELECTRIC PROCESS HEATER SOLUTIONS BEGIN HERE.

Over-the-Side Heaters



- Over-the-Side Immersion Heaters permit portability and may be installed and removed with ease.
- These units are inserted through the top of the tank with the heating elements along the bottom of the reservoir.
- Legs increase the space between heater and tank bottom to keep the heater out of any sludge.
- Rugged construction to resist damage during installation and removal.



Designed for applications where through-the-side immersion heaters cannot be conveniently installed.

Please contact our Applications Engineers who will gladly assist you in determining your heating application solution.

Heating up the web...

**ISO 9001
REGISTERED**



warrenonline



Toll Free: 1-877-399-HEAT (4328)

Since 1962, Warren Electric Corporation has been industry's source for high quality standard and custom electric immersion heaters, casings, assemblies, and accessories. We offer solutions for nearly any process heater application, from the simple to the most demanding. Warren Electric means quality products and total quality service defined by application expertise, quick turnaround, competitive prices, and rapid response to customer needs. Turn to the HEAT SOURCE, Warren Electric Corporation, for your next requirement.



Standard & Custom Heaters Manufactured to Heat...

Acid Solutions ...

Air ...

Caustic Solutions ...

Chemicals ...

Degreasing Solutions ...

Deionized Water ...

Ethylene Glycol ...

Fuel Oils ...

Heat Transfer Fluids ...

Hydraulic Oils ...

Liquid Mixtures ...

Oils ...

Parts Cleaning Solutions ...

Petroleum Products ...

Process Water ...

Saline Solutions ...

Salt Baths ...

Steam ...

Steam Generation ...

Vapors ...

Water Purification ...

Water ...

And more!

Water Heaters

- Deionized, Demineralized, Clean, Potable, Process
- WEC aqueous based heaters may be UL Listed.
- WEC manufactures **Water Heaters** in either a Flanged or Screw Plug design.
- Heaters may have brazed, welded, or removable elements. We suggest that elements be welded to the Flange or Screw Plug if the aqueous solution is corrosive to silver alloy.
- **Process Water Heaters** have the capability of heating aqueous solutions to be used in parts cleaning and other chemical industrial applications.
- **Deionized Water Heaters** are generally used in medical and pharmaceutical industries where sterilized environments are critical.
- The chemical make up of deionized water is corrosive, therefore requiring passivation of both the Flange/Screw Plug and elements. Passivation is a chemical bath that removes free iron from the surface of Stainless Steel and Incoloy. If further protection is needed, electropolishing is recommended.

Chemical Heaters

- WEC manufactures **Chemical Heaters** to heat a wide range of chemicals or solutions.
- Specific application information is needed to determine watt density, whether the heater should be directly or indirectly immersed, Flange/Screw Plug material, and element sheath material.
- Examples of **Chemical Heater** applications:

- | | |
|-----------------------|--------------------|
| Acetone | Formaldehyde |
| Alcohol | Hydrogen Sulfide |
| Ammonia (Gas) | Magnesium Sulfate |
| Ammonium Acetate | Methylchloride |
| Amyl Alcohol | Potassium Chlorate |
| Barium Hydroxide | Potassium Chloride |
| Butyl Acetate | Sodium Hydroxide |
| Calcium Bisulfate | Sodium Phosphate |
| Calcium Chloride | Sulfur (Molten) |
| Carbon Tetra Chloride | and more... |
| Ethylene Glycol | |



Circulation Heater, shown with cut away section to show insulation and metal jacket.



Hydraulic & Lube Oil Heaters

- WEC manufactures a complete line of heaters designed specifically for hydraulic or lube oil with low watt densities to allow direct immersion into storage vessels.
- These heaters are used to maintain a desired temperature within hydraulic or lube oil reservoirs.

*WEC offers a catalog with standard listings of hydraulic and lube oil heaters. Many custom designs are also available. Ask for the **HL-100 Catalog**.*



- Typical applications include fluid power, compressors, hydraulics, turbines, and bearings.

ELEMENT SHEATH MATERIALS ...FLANGE TYPES ...SCREW PLUGS ...TERMINAL ENCLOSURES ...THERMOSTATS, THERMOWELLS, AND/OR THERMOCOUPLES ...PRESSURE VESSELSTO MEET YOUR REQUIREMENTS.

Please give us your specifications and allow us to recommend a solution to your electric heater needs..



Parts Cleaning Heaters

- Warren Electric Corporation manufactures a complete line of **Parts Cleaning Heaters** used in the parts cleaning industry. They are used to heat water or an aqueous based chemical solution.
- The most common heaters used are the **Process Water Heater, Solution Water Heater, and Chemical Heater.**
- Warren Electric Corporation offers **UL Listed heaters for Aqueous Based Solutions!**
- As an alternative to your screw plug design, consider the WEC "AB" Flanged Immersion Heater described below.

Fuel Oil Heaters

- Warren Electric Corporation provides the largest selection of **Fuel Oil** heaters.
- Our **Electric Oil Preheaters** can be provided in a Flanged or Screw Plug design.
- Custom fuel oil heater designs - no matter what the size - are also our specialty.

WEC'S OH-2 Fuel Oil Heater Catalog, with over 400 UL Listed standard models to choose from, is the industry's most comprehensive catalog for Fuel Oil heating.



"AB" Flanged Heaters

- Includes all the options available with NPT Screw Plug heaters but flanged design makes replacement easier. "AB" Flanged Heaters can be easily removed and installed using a 7/16" ratchet.
- Designed to fit in 2", 2-1/2", and 3" pipe.
- Tank adaptors for mounting these heaters are available.



*Consider as an alternative to your Screw Plug design!
Contact us for a brochure on the "AB" series.*

High-Temperature Heaters

- "Extended Head" Heaters are designed and recommended for high-temperature applications where the fluid temperature exceeds 450° F.
- The terminal enclosure is separated from the flange by an air gap to lower the ambient temperature of the electrical wiring in the terminal enclosure.
- Standard design includes welded elements.
- Operating and/or high limit temperature thermocouples and pressure vessel assemblies are available. (ASME certification also available)



Circulation Heater with ASME certified casing and "Extended Head" terminal enclosure.

Heat Transfer Fluid Heaters

- Heaters designed specifically for heat transfer fluids. Typical applications include gases, water, and steam.
- Heat Transfer Fluids allow for heating another medium without direct contact between the electric immersion heater and the heated medium.

Thermostats and Accessories

- Thermostats, thermowells, thermocouples, RTD's, and a variety of temperature sensors.
- Gaskets come in a large variety of materials and types.
- Custom made casings and assemblies.



Screw Plug Heater with Explosion-Resistant Terminal Enclosure.

Standard & Custom Heaters for Industries Including:

- Chemical ...**
- Cryogenics ...**
- Custom Machinery ...**
- Degreasing ...**
- Distillation ...**
- Fluid Power ...**
- Freeze Protection ...**
- Hydraulics ...**
- Medical ...**
- Oils ...**
- Paper ...**
- Parts Cleaning ...**
- Petroleum ...**
- Pharmaceutical ...**
- Plastic ...**
- Plating...**
- Reclaiming Fluids ...**
- Recycling ...**
- Rubber ...**
- Steam Generation ...**
- Water Purification ...**
- And more!**

WARREN ELECTRIC CORPORATION, AN ISO 9001 REGISTERED COMPANY, ALSO IS CAPABLE AND ACCREDITED TO MANUFACTURE AND CERTIFY HEATERS AND CASINGS WITH THE ASME "U" OR "UM" STAMP.

...and/or please complete the WEC "Quick Quote" form on the back of this brochure for assistance and Call or FAX!



Reference Data

OHM'S Law

Watts = W = Power

$$\text{Watts} = \frac{\text{Volts}^2}{\text{Ohms}}$$

$$\text{Watts} = \text{Volts} \times \text{Amps}$$

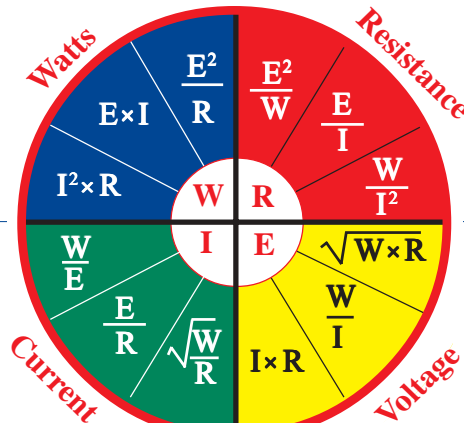
$$\text{Watts} = \text{Amps}^2 \times \text{Ohms}$$

Amps = I = Current

$$\text{Amps} = \frac{\text{Watts}}{\text{Volts}}$$

$$\text{Amps} = \frac{\text{Volts}}{\text{Ohms}}$$

$$\text{Amps} = \sqrt{\frac{\text{Watts}}{\text{Ohms}}}$$



Ohms = R = Resistance

$$\text{Ohms} = \frac{\text{Volts}^2}{\text{Watts}}$$

$$\text{Ohms} = \frac{\text{Volts}}{\text{Amps}}$$

$$\text{Ohms} = \frac{\text{Watts}}{\text{Amps}^2}$$

Volts = E = Voltage

$$\text{Volts} = \sqrt{\text{Watts} \times \text{Ohms}}$$

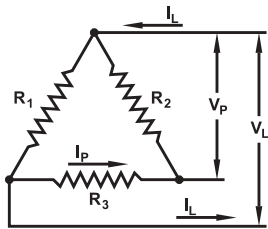
$$\text{Volts} = \frac{\text{Watts}}{\text{Amps}}$$

$$\text{Volts} = \text{Amps} \times \text{Ohms}$$

FIG. 5.1

Delta & Wye Circuit Equations

Delta (Balanced Load)



$$I_P = \frac{I_L}{1.73}$$

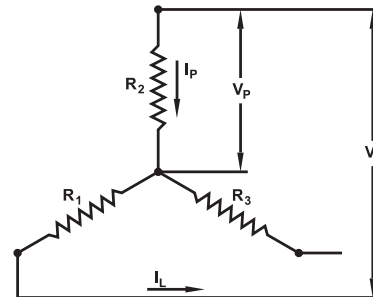
$$W_{\text{DELTA}} = \frac{3 \times V_L^2}{R}$$

$$V_P = V_L$$

$$W_{\text{DELTA}} = 1.73 \times V_L \times I_L$$

V_P = Phase Voltage
 V_L = Line Voltage
 I_P = Phase Current
 I_L = Line Current
 $R = R_1 = R_2 = R_3$ = Resistance of each branch
 W = Wattage

Wye (Balanced Load)



$$I_P = I_L$$

$$W_{\text{WYE}} = \frac{V_L^2}{R} = \frac{3 \times V_P^2}{R}$$

$$V_P = \frac{V_L}{1.73}$$

$$W_{\text{WYE}} = 1.73 \times V_L \times I_L$$

FIG. 5.2

Important Formulas

Determining Required Power:

$$P = \frac{\text{FR} \times g_c \times C_p \times \Delta T}{3412} \times \text{SF}$$

P = Power [KW]
 FR = Flow Rate [gal/hr]
 g_c = Density of Fluid [lb/gal]
 C_p = Specific heat of Fluid [BTU/(lb·°F)]
 ΔT = Temperature Differential [°F]
 SF = Safety Factor of 1.2 (typ. 20%)
 3412 = Conversion Factor [BTU/(KW·hr)]

Determining Actual Power Output:

$$P_{\text{ACT}} = P_{\text{DES}} \times \left(\frac{V_{\text{ACT}}}{V_{\text{DES}}} \right)^2$$

P_{ACT} = Actual Power [Watts]
 P_{DES} = Designed Power [Watts]
 V_{ACT} = Actual Voltage [V]
 V_{DES} = Designed Voltage [V]

Amperage:

$$I_{1\text{PH}} = \frac{P_{\text{ACT}}}{V_{\text{ACT}}}$$

$$I_{3\text{PH}} = \frac{P_{\text{ACT}}}{V_{\text{ACT}} \times 1.73}$$

$I_{1\text{PH}}$ = Single Phase Current [A]
 P_{ACT} = Actual Power [Watts]
 V_{ACT} = Actual Voltage [V]
 $I_{3\text{PH}}$ = Three Phase Current [A]

FIG. 5.3

Fraction Equivalents

Fraction	Dec.	mm	Fraction	Dec.	mm
1/32	.03125	0.794	17/32	.53125	13.494
1/16	.0625	1.588	9/16	.5625	14.288
3/32	.09375	2.381	19/32	.59375	15.081
1/8	.1250	3.175	5/8	.6250	15.875
5/32	.15625	3.969	21/32	.65625	16.669
3/16	.1875	4.763	11/16	.6875	17.463
7/32	.21875	5.556	23/32	.71875	18.256
1/4	.2500	6.350	3/4	.7500	19.050
9/32	.28125	7.144	25/32	.78125	19.844
5/16	.3125	7.938	13/16	.8125	20.638
11/32	.34375	8.731	27/32	.84375	21.431
3/8	.3750	9.525	7/8	.8750	22.225
13/32	.40625	10.319	29/32	.90625	23.019
7/16	.4375	11.113	15/16	.9375	23.813
15/32	.46875	11.906	31/32	.96875	24.606
1/2	.5000	12.700	1	1.000	25.400

FIG. 5.4



Reference Data

Suggested Heater Wirings

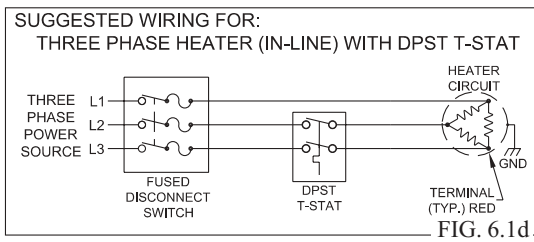
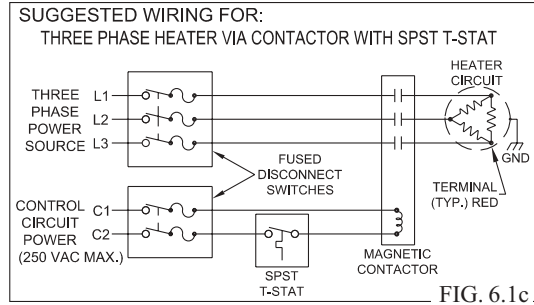
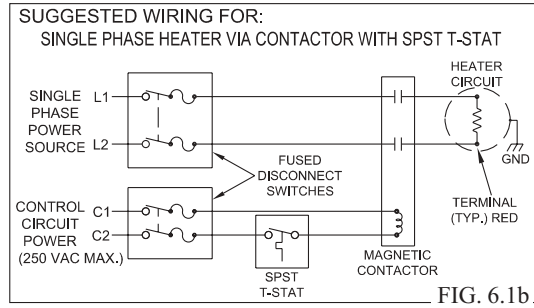
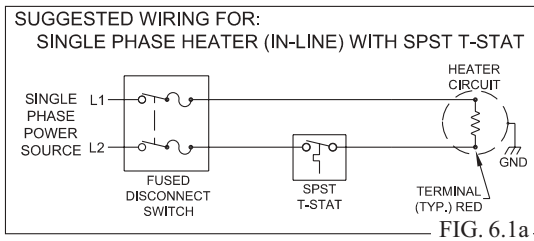


FIG. 6.1

Kilowatt Hours (KWH) To Heat Water

AMOUNT OF FLUID ft ³	GAL.	TEMPERATURE RISE (°F)						
		20°	40°	60°	80°	100°	120°	140°
1.3	10	0.6	1.2	1.8	2.3	2.9	3.5	4.1
6.7	50	2.9	5.9	8.8	11.7	14.6	17.6	20.5
13.3	100	5.9	11.7	17.6	23.4	29.3	35.1	41.0
26.7	200	11.7	23.4	35.1	46.8	58.6	70.3	82.0
66.7	500	29.3	58.6	87.8	117.1	146.4	175.7	204.9

Based on a specific heat of 1.0 and implied 20% safety factor.

$$KWH = \frac{\text{Gallons} \times \text{Temperature Rise} (°F)}{340}$$

Kilowatt Hours (KWH) To Heat Oil

AMOUNT OF FLUID ft ³	GAL.	TEMPERATURE RISE (°F)						
		50°	100°	150°	200°	300°	400°	500°
1.3	10	0.6	1.1	1.7	2.2	3.4	4.5	5.6
6.7	50	2.8	5.6	8.4	11.2	16.8	22.4	28.0
13.3	100	5.6	11.2	16.8	22.4	33.6	44.8	56.0
26.7	200	11.2	22.4	33.6	44.8	67.2	89.6	112.1
66.7	500	28.0	56.0	84.1	112.1	168.1	224.1	280.2

Based on an average specific heat of 0.43, average fluid density of 55.6 lb/ft³ and implied 20% safety factor.

$$KWH = \frac{\text{Gallons} \times \text{Temperature Rise} (°F)}{893}$$

Kilowatt Hours (KWH) To Heat Air

AMOUNT OF AIR SCFM	TEMPERATURE RISE (°F)								
	50°	100°	150°	200°	300°	400°	500°	600°	800°
100	2	4	6	8	12	16	20	24	32
250	5	10	15	20	30	40	50	60	80
500	10	20	30	40	60	80	100	120	160
1,000	20	40	60	80	120	160	200	240	320
1,250	25	50	75	100	150	200	250	300	400

Assumed insulated duct and inlet air at 70°F and 14.7psia and implied 20% safety factor.

$$KWH = \frac{\text{SCFM} \times \text{Temperature Rise} (°F)}{2500}$$

FIG. 6.2

Percent of Rated Wattage for Various Applied Voltages

APPLIED VOLTAGE	RATED VOLTAGE													
	550	480	460	440	415	380	277	240	230	220	208	120	115	110
110	4%	5.2%	5.7%	6.2%	7%	8.4%	16%	21%	23%	25%	28%	84%	91%	100%
115	4.3%	5.7%	6.2%	6.7%	7.6%	9.0%	17%	23%	25%	27%	31%	92%	100%	109%
120	4.8%	6.3%	6.8%	7.4%	8.4%	10%	19%	25%	27%	30%	33%	100%	109%	119%
208	14%	19%	20%	22%	25%	30%	56%	75%	82%	89%	100%			
220	16%	21%	23%	25%	28%	34%	63%	84%	91%	100%	112%			
230	17%	23%	25%	27%	31%	37%	69%	92%	100%	109%				
240	19%	25%	27%	30%	33%	40%	75%	100%	109%	119%				
277	25%	33%	36%	40%	45%	53%	100%							
380	47%	63%	68%	74%	84%	100%								
415	57%	75%	81%	89%	100%	119%								
440	64%	84%	91%	100%	112%									
460	70%	92%	100%	109%										
480	76%	100%	109%	119%										
550	100%													

This table shows the effect on wattage output when heaters are used at voltages other than the design voltage. To use this table find the Rated and Applied Voltages and the resulting value is the percentage of the Rated Wattage of the heater.

$$\text{Actual Wattage} = \frac{\text{Rated Wattage} \times (\text{Applied Voltage})^2}{(\text{Rated Voltage})^2}$$

CAUTION: Applying higher than the actual rated voltage to heating elements will increase the watt density (watts/in²), which can lead to premature heater failure and/or damage the material being heated.

FIG. 6.3



Reference Data

Conversions

Table with 3 columns: Physical Quantity (Units)..., Mult. By..., To Convert To (Units)...

FIG. 7.1

Temperature Equivalents

Table with 9 columns: °C Temp, °F, °C Temp, °F, °C Temp, °F, °C Temp, °F

How to use this table: Find the temperature you are converting from in the "Temp" column. Look in the column to the right to convert to Fahrenheit or to the left for the conversion to Celsius.

(°F) = 9/5 x °C + 32 (°C) = 5/9 x (°F - 32)

FIG. 7.2

Watt Density (W/in²)

Watt density (WSD) is the amount of watts per square inch of the element sheath heated surface area. It is critical to determine the correct WSD. If the watt density is too high, it may result in premature heater failure, damage to the substance being heated, and/or unsafe conditions.

Watt density = Watts / (E_A x #_ELE x H_L)

E_A = Element Area Per Inch = 3.1416 x Ele. Dia. x 2 #_ELE = Number of Elements H_L = Heated Length = (Imm_L - Cold)

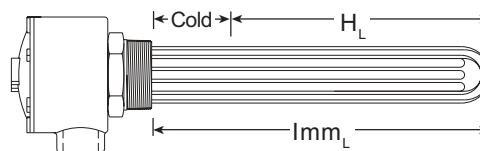


FIG. 7.3



Reference Data

ANSI Flange Specifications

150 LB. ANSI BLIND & SLIP ON Flange Specifications

WEC MODEL DESIGNATION	SIZE	O.D.	THK.	DIA. OF RAISED FACE	# BOLT HOLES	DIA. OF BOLT HOLES	DIA. OF BOLTS	BOLT CIRCLE DIA.	APPROX. WEIGHT (LBS.)	
									BLIND	SLIP ON
	1/2"	3 1/2"	7/16"	1 3/8"	4	5/8"	1/2"	2 3/8"	2	1
	3/4"	3 7/8"	1/2"	1 11/16"	4	5/8"	1/2"	2 3/4"	2	1 1/2
F	1"	4 1/4"	9/16"	2"	4	5/8"	1/2"	3 1/8"	2	2
G	1 1/4"	4 5/8"	5/8"	2 1/2"	4	5/8"	1/2"	3 1/2"	3	2 1/2
Q	1 1/2"	5"	11/16"	2 7/8"	4	5/8"	1/2"	3 7/8"	3	3
P	2"	6"	3/4"	3 5/8"	4	3/4"	5/8"	4 3/4"	4	5
R	2 1/2"	7"	7/8"	4 1/8"	4	3/4"	5/8"	5 1/2"	7	8
C	3"	7 1/2"	15/16"	5"	4	3/4"	5/8"	6"	9	9
U	4"	9"	15/16"	6 3/16"	8	3/4"	5/8"	7 1/2"	17	13
W	5"	10"	15/16"	7 5/16"	8	7/8"	3/4"	8 1/2"	20	15
H	6"	11"	1"	8 1/2"	8	7/8"	3/4"	9 1/2"	27	17
K	8"	13 1/2"	1 1/8"	10 5/8"	8	7/8"	3/4"	11 3/4"	47	28
L	10"	16"	1 3/16"	12 3/4"	12	1"	7/8"	14 1/4"	67	40
M	12"	19"	1 1/4"	15"	12	1"	7/8"	17"	123	61
N	14"	21"	1 3/8"	16 1/4"	12	1 1/8"	1"	18 3/4"	139	83
T	16"	23 1/2"	1 7/16"	18 1/2"	16	1 1/8"	1"	21 1/4"	187	106
V	18"	25"	1 9/16"	21"	16	1 1/4"	1 1/8"	22 3/4"	217	109
E	20"	27 1/2"	1 11/16"	23"	20	1 1/4"	1 1/8"	25"	283	148
Z	24"	32"	1 7/8"	27 1/4"	20	1 3/8"	1 1/4"	29 1/2"	415	204

300 LB. ANSI BLIND & SLIP ON Flange Specifications

WEC MODEL DESIGNATION	SIZE	O.D.	THK.	DIA. OF RAISED FACE	# BOLT HOLES	DIA. OF BOLT HOLES	DIA. OF BOLTS	BOLT CIRCLE DIA.	APPROX. WEIGHT (LBS.)	
									BLIND	SLIP ON
	1/2"	3 3/4"	9/16"	1 3/8"	4	5/8"	1/2"	2 5/8"	2	1 1/2
	3/4"	4 5/8"	5/8"	1 11/16"	4	3/4"	5/8"	3 1/4"	3	2 1/2
F	1"	4 7/8"	11/16"	2"	4	3/4"	5/8"	3 1/2"	4	3
G	1 1/4"	5 1/4"	3/4"	2 1/2"	4	3/4"	5/8"	3 7/8"	6	4 1/2
Q	1 1/2"	6 1/8"	13/16"	2 7/8"	4	7/8"	3/4"	4 1/2"	7	6 1/2
P	2"	6 1/2"	7/8"	3 5/8"	8	3/4"	5/8"	5"	8	7
R	2 1/2"	7 1/2"	1"	4 1/8"	8	7/8"	3/4"	5 7/8"	12	10
C	3"	8 1/4"	1 1/8"	5"	8	7/8"	3/4"	6 5/8"	16	13
U	4"	10"	1 1/4"	6 3/16"	8	7/8"	3/4"	7 7/8"	28	23 1/2
W	5"	11"	1 3/8"	7 5/16"	8	7/8"	3/4"	9 1/4"	37	29
H	6"	12 1/2"	1 7/16"	8 1/2"	12	7/8"	3/4"	10 5/8"	48	36
K	8"	15"	1 5/8"	10 5/8"	12	1"	7/8"	13"	79	56
L	10"	17 1/2"	1 7/8"	12 3/4"	16	1 1/8"	1"	15 1/4"	122	77
M	12"	20 1/2"	2"	15"	16	1 1/4"	1 1/8"	17 3/4"	183	113
N	14"	23"	2 1/8"	16 1/4"	20	1 1/4"	1 1/8"	20 1/4"	241	159
T	16"	25 1/2"	2 1/4"	18 1/2"	20	1 3/8"	1 1/4"	22 1/2"	315	210
V	18"	28"	2 3/8"	21"	24	1 3/8"	1 1/4"	24 3/4"	414	253
E	20"	30 1/2"	2 1/2"	23"	24	1 3/8"	1 1/4"	27"	515	307
Z	24"	36"	2 3/4"	27 1/4"	24	1 5/8"	1 1/2"	32"	800	490

1/16" raised face included in flange thickness. The above ANSI flange information is just for reference and is based on steel ANSI flanges. The actual weights vary based on manufacturer and material type. Dimensions are in inches and weights are in pounds.

FIG. 8.1

Std. Pipe Specifications

SIZE	SCH.	O.D.	WALL THK.
1/2"	40	0.840	0.109
	80		0.147
	10		0.830
3/4"	40	1.050	0.113
	80		0.154
	10		0.109
1"	40	1.315	0.133
	80		0.179
	10		0.109
1 1/4"	40	1.660	0.140
	80		0.191
	10		0.109
1 1/2"	40	1.900	0.145
	80		0.200
	10		0.109
2"	40	2.375	0.154
	80		0.218
	10		0.109
2 1/2"	40	2.875	0.203
	80		0.276
	10		0.120
3"	40	3.500	0.216
	80		0.300
	10		0.120
4"	40	4.500	0.237
	80		0.337
	10		0.134
5"	40	5.563	0.258
	80		0.375
	10		0.134
6"	40	6.625	0.280
	80		0.432
	10		0.148
8"	40	8.825	0.322
	80		0.500
	10		0.165
10"	40	10.75	0.365
	80		0.594
	10		0.180
12"	STD	12.75	0.375
	40		0.406
	10		0.250
14"	STD	14.0	0.375
	40		0.438
	10		0.250
16"	STD	16.0	0.375
	10		0.250
	10		0.250
18"	STD	18.0	0.250
	10		0.250
	10		0.250
20"	STD	20.0	0.250
	10		0.250
	10		0.250
24"	STD	24.0	0.250
	10		0.250
	10		0.250

FIG. 8.2



Reference Data

Watt Density Guidelines

MATERIAL TO BE HEATED	MAX. OPERATING TEMP.	MAX. WATT DENSITY	RECOMMENDED SHEATH MATERIAL
Acid Solutions (Mild) or Electroplating Baths	180	40	316SS
Air	C.F.	C.F.	IC
Alkaline Solutions (Mild)	212	40	321SS
Asphalt, Tar	200-500	4-10	S
Caustic Soda			
2%	210	45	IC
10%	210	25	IC
75%	180	25	IC
Degreasing Solution	275	23	S
Dyes & Pigments	212	23	321SS
Ethylene Glycol (100% Solution)	300	30	S
Freon Gas	300	2-5	S
Fuel Oils			
Grade 1 & 2 (Distillate)	200	23	S
Grade 4 & 5 (Residual)	200	16	S
Grade 6 & Bunker C (Residual)	160	12	S
Gasoline, Kerosene	300	20	S
Glycerine	50	40	IC
Glycerol	212	23	IC
Heat Transfer Oils (Static)			
Low Temp	500	16	S
High Temp	600	10	S
Heat Transfer Oils (Circulating)			
Low Temp	500	20	S
High Temp	600	15	S
Linseed Oil	150	50	S
Lubrication Oils			
SAE 10-30	250	23	S
SAE 40-50	250	13	S
Magnesium Sulfate	212	40	304SS
Manganese Sulfate	212	40	316SS
Mineral Oil			
Low Temp	200	23	S
High Temp	400	16	S
Molasses	100	4-5	321SS
Paraffin or Wax (Liquid State)	150	16	S
Perchloroethylene	200	23	S
Potassium Chloride	212	40	316SS
Sodium Cyanide	140	40	IC
Sodium Hydroxide	C.F.	C.F.	C.F.
Trichlorethylene	150	20	S
Vegetable Oil & Shortening	400	30	321SS
Water			
Process	212	60	IC
Deionized	212	60	321SS
Potable	212	60	C

C.F. = Consult factory, C = Copper, IC = Incoloy, S = Steel, SS = Stainless Steel
 The "Max. Operating Temperatures", "Max. Watt Densities", & "Recommended Sheath Materials" listed above should only be used as a guide. Warren Electric Corporation cannot warrant any immersion heater against failure by sheath corrosion and it is the responsibility of the purchaser to make the final choice of both sheath material and watt density. For a more complete list of materials visit our website.

FIG. 9.1

Terminal Enclosures

Without Thermostat	With Thermostat	Description
		General Purpose NEMA 1 enclosure intended for use indoors, primarily to prevent accidental contact of personnel with the enclosed equipment. Used in areas where unusual service conditions do not exist.
		Explosion-Resistant NEMA 7 enclosure intended for use indoors, where resistance to explosion is required.
		Weather-Resistant NEMA 4 enclosure intended for indoor or outdoor use. Used primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water, and external ice formation.
		"Helmet Head" Rugged compact screw plug heater enclosure for indoor use to provide optimal protection from physical damage.
		General Purpose Economy NEMA 1 enclosure intended for use indoors, primarily to prevent accidental contact of personnel with the enclosed equipment. Used where economy is a factor and in areas where unusual service conditions do not exist.

FIG. 9.2

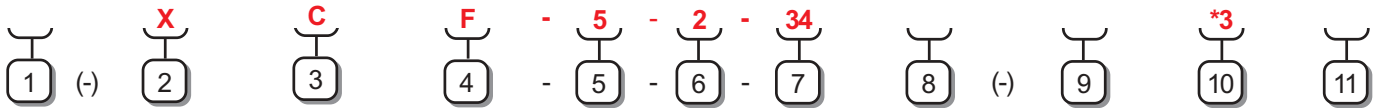


MODEL NUMBER DESCRIPTION

Warren Electric has established a model numbering system that is unique in that it allows you to identify most specifications, such as wattage, voltage, flange or screw plug size, immersed length, element sheath material, etc., just by looking at the model number.

- 1 **PRESSURE RATING:** The maximum pressure rating is included in the model number. If no pressure rating is indicated, the pressure rating is 150 PSI.
- 2 **TEMPERATURE CONTROL:** Temperature control designations are indicated by either an "X" which signifies no control or a number "1" through "8" designating a thermostat, thermostat temperature range, thermocouple, or RTD. Note: The model number does not indicate the type of thermostat, thermocouple, or RTD.
- 3 **FLANGE OR SCREW PLUG SIZE:** Flange or Screw Plug sizes are designated with a letter.
- 4 **FLANGE OR SCREW PLUG CONSTRUCTION:** Each standard heater type has its own letter designation.
- 5 **WATTAGE:** Indicates Kilowatt rating.
- 6 **VOLTAGE:** Indicates nominal operating voltage. "1" through "6" indicate standard voltages, all other voltages are designated by the 3-digit voltage number.
- 7 **IMMERSED LENGTH:** Measured from the "wet-side" face of the flange or screw plug to the end of the hair pin end of the element(s). Indicated in inches.
- 8 **ELEMENT SHEATH MATERIAL:** Indicates the element sheath material. If no letter is indicated, the sheath material is steel.
- 9 **OPTIONAL MODIFICATIONS:** Non-standard options such as weather-resistant terminal enclosure, etc. are indicated in this section.
- 10 **PHASE:** Indicates Single or Three phase. If there is no designation then the unit is single phase.
- 11 **CIRCUITS:** Indicates the quantity of circuits. If there is no designation then the unit is wired as a single circuit.

XCF-5-2-34*3: The model number featured below has a maximum pressure rating of 150 PSI with no temperature control. It has a 3" x 150# ANSI steel flange, with an output of 5KW (at 240 V, 3 phase, one circuit). The immersed length is 34 inches with steel elements and a general purpose terminal enclosure.



PRESSURE RATING (PSI)	TEMPERATURE CONTROL	FLANGE OR SCREW PLUG SIZE	CONSTRUCTION TYPE	WATTAGE (KW)	VOLTAGE (VOLTS)	IMMERSED LENGTH (INCHES)	ELEMENT SHEATH	OPTIONAL MODIFICATIONS	PHASE	CIRCUITS
Blank = 150 PSI 300 = 300 PSI 600 = 600 PSI 900 = 900 PSI	X=No Thermostat, No Thermocouple, and No RTD 1=0-100°F 2=60-250°F 3=175-550°F 4=Other Ranges 5=Thermocouple 7=RTD 8=Non-Standard Ranges - Not to exceed 250°F Max. Setting A = WE Fuel Oil B = Preheater D = **	A = A* B = B* F = 1" G = 1-1/4" Q = 1-1/2" P = 2" R = 2-1/2" C = 3" U = 4" W = 5" H = 6" K = 8" L = 10" M = 12" N = 14" T = 16" V = 18" E = 20" Z = 24"	F = Flange S = NPT Plug J = Jacketed Flanged Circulation Heater JS = Jacketed Screw plug Circulation Heater T = Over-the-side	Values Shown In KW	1 = 120V 2 = 240V 3 = 380V 4 = 480V 5 = 550V 6 = 600V Others - Use Full Numbers	Values Shown In Inches	Blank = Steel C = Copper IC = Incoloy IL = Inconel SS = Stainless Steel R after above letter indicates Removable Elements	Blank = General Purpose Enclosure LT = Weather-Resistant Enclosure EP = Explosion-Resistant Enclosure EP/LT = Explosion/Weather-Resistant Enclosure HH = Helmet Head Enclosure Y = Any other Specification	Blank = Single Phase *3 = Three Phase	Blank = 1 Circuit +2 = 2 Circuits +3 = 3 Circuits etc...

* WEC Fuel Oil Models - Special Industrial Flange and Thermostat for Residual Fuel Oils. Request WEC Oil Heater Catalog
** Used with A or B Types such as AD or BD and indicates WEC Fuel Oil Heater Thermostat with additional Interlock Control.



**QUICK
QUOTE**

Warren Electric Corporation

36 Franklin Street, P.O. Box 86,
Warren, Rhode Island 02885 USA

**QUICK
QUOTE**



TOLL FREE: 877 399-4328 TEL: 401 245-3700 FAX: 401 245-9331

For help with your electric heater application, please complete as much information as possible.

An applications engineer or technical salesperson will respond to help you with your specific needs.

Name _____ Title _____
 Company _____
 Address _____
 City _____ State _____ Zip _____ Country _____
 Tel: (____) ____-____ Ext _____ Fax: (____) ____-____
 EMAIL ADDRESS: _____ WEB SITE: _____

REQUEST FOR QUOTATION

Please (____) MAIL, (____) FAX, or (____) EMAIL a quotation for the following.
Delivery required (____) ASAP or _____

Yes, there are a lot of details to an Electric Heater! Please let us know about your application!

(____) **REPLACEMENT HEATER** Model # _____ Quantity _____
 Manufacturer _____ KW _____ VOLTS _____ PHASE _____
 The heater failed due to: (____) Old Age (____) Operator Error (____) Misapplication (____) Don't Know
 (____) Other

... OR ...

Please complete as much information as possible or applicable:

(____) **NEW APPLICATION** (____) Just Quote or (____) If further recommendation(s) can be made, CONTACT
 (____) **I Need Technical Assistance** _____ TEL(____) ____-____ EXT _____
 (if other than above)
 QUANTITY REQUIRED _____
My Application Requires:
 A. (____) Flanged Immersion Heater(s)
 B. (____) Screw Plug Immersion Heater(s)
 C. (____) Fuel Oil Heater(s)
 D. (____) Hydraulic/Lube Oil Heater(s)
 E. (____) Circulation Heater(s)
 F. (____) Other _____
 E. Circulation Heater(s) Details... Insulation & Jacket: (____) No (____) Yes
 Insulation: Type _____ Thickness _____
 ASME Certification Required: (____) No, (____) Yes, (____) Maybe
 Inlet & Outlet: Size _____ Location _____
 (____) Flanged (____) FNPT (____) MNPT (Sketch or indicate)
 (____) Drain (____) Vent (____) OTHER _____
 POWER - Required Wattage _____ KW or _____ Watts (if unknown - refer to POWER REQUIREMENT below-A & B)
 Volts _____ Phase _____ Watt Density _____ WSI (watts per square inch - specify if known)
 Fluid/Gas to be heated _____ Cold Lead Wet Side _____" (indicate desired minimum if applicable)
 Element Sheath Material _____ Flange/Plug Material _____ (if specific materials are required)
 Maximum Immersion Length _____" Preferred Flange/Plug Size _____ Operating Pressure _____ PSIG
 Operating Temperature _____ (°F or °C) Maximum Bundle Diameter _____
 Mounting Installation (____) Horizontal (____) Vertical If Vertical, Terminal Enclosure (____) Up (____) Down
 Terminal Enclosure (____) Standard (____) Weather-Resistant (____) Explosion-Resistant (____) Other _____
 Thermostat (____) No (____) Yes Temperature Range (____) 0°-100°F (____) 60°-250°F (____) 175°-550°F (____) Other _____
 Thermocouple (____) No (____) Yes If Yes, Type "____" RTD (____) No (____) Yes Other comments _____

POWER REQUIREMENT

Please complete the following if power is unknown. Should your application require both temperature elevation and temperature maintenance, complete both items A & B below.

(____) **A. I Need to Maintain Tank Temperature**
 Tank Dimensions _____ Dia. x _____ L or _____ L x _____ W x _____ H Closed Top (____) No (____) Yes
 Tank Insulation (____) No (____) Yes Type/Thickness _____ Tank (____) Vertical (____) Horizontal
 Desired Temperature _____ (°F or °C) Ambient Temperature (worst case) _____ (°F or °C)
 (____) **B. I Need to Increase the Temperature**
 Beginning Temp _____ (°F or °C) Desired Temp _____ (°F or °C) Allowable Heat-up Time _____ HRS/MIN
 Flow rate _____ (____) gallons or (____) pounds per _____ hour, _____ minute, or _____ second

Please do not hesitate to call, write, or FAX for more assistance in sizing, calculating, or any other guidance you require to determine your electric heater needs...

PHOTOCOPY AND FAX OR MAIL FOR QUOTE.

CALL, WRITE OR FAX FOR ADDITIONAL "QUICK QUOTE" FORMS - "QQ-100"