Flanged Immersion Heaters

Flanged Immersion Heaters are designed for use in tanks and pressurized vessels to heat both liquids and gases. They mate to a companion flange that is either welded to a tank wall or, for circulating type heaters, to a pipe. See pages 11-46 through 11-69 for TEMPCO circulation heaters, which consist of a flange heater and a pipebody pressure vessel assembly.

Design Features

The catalog items listed on pages 11-32 through 11-44 have the following features, making them suitable for many applications:

- ✳ *150-lb forged steel or 316 stainless steel flanges*
- ✳ *Gasket Supplied*
- ✳ *Incoloy® 800, 316 stainless steel, steel or copper tubular elements*
- ✳ *Element hairpin bends are spanked in specially designed dies to re-compact the MgO insulating powder*
- ✳ *Silicone resin seal of elements standard*
- ✳ *1/2" OD thermowell for a 3/8" diameter sensing bulb*
- ✳ *NEMA 1 electrical enclosure*
- ✳ *Standard heaters have elements wired into branch circuits having a maximum current of 48 Amps*

The items listed in this catalog are only a small sample of the heaters that can be supplied by THERMAL DEVICES. The next few pages will describe both standard and optional materials and features available to meet the requirements of your application.

Checklist — Selecting the Proper Flanged Heater

☑ Determine a Safe and Efficient Element Watt Density

Element Watt Density is the wattage dissipated per square inch of the element sheath surface and is calculated with the following formula:

$$\text{Watt Density} = \frac{\text{element wattage}}{\pi \times \text{element dia.} \times \text{element heated length}}$$

For a particular application, element watt density will govern element sheath temperature. Factors to consider when choosing a suitable watt density are:

1. Many materials are heat sensitive and can decompose or be damaged if the element is running too hot.
2. Air and other gases that are poor conductors of heat require watt densities matched to the velocity of the gas flow to prevent element overheating.
3. When heating hard water and cleaning solutions mineral deposits can build up on the element sheath, acting as a heat insulator and raising the internal element temperature. If these deposits cannot be periodically removed, use a lower watt density element to increase heater life expectancy.

☑ Determine Pressure-Temperature Rating of Flange Required

NOTE: Catalog heaters listed on pages 11-32 through 11-44 have Class 150-lb flanges. For heaters with a higher Pressure-Temperature Rating consult Tempco.

Pressure-Temperature Ratings Class 150-LB *(Pressure in PSIG)*

Flange Material	Temperature °F (°C)													
	-20 to 100 (-28.9 to 37.8)	200 (93.3)	300 (148.9)	400 (204.4)	500 (260.0)	600 (315.6)	650 (343.3)	700 (371.1)	750 (398.9)	800 (426.7)	850 (454.4)	900 (482.2)	950 (510.0)	1000 (537.8)
A105 Steel	285	260	230	200	170	140	125	110	95	80	—	—	—	—
316 Stainless	275	240	215	195	170	140	125	110	95	80	65	50	35	20
304 Stainless	275	235	205	180	170	140	125	110	95	80	65	50	35	20

Over-the-Side Immersion Heaters

Application

Tempco Over-the-Side Immersion Heaters are specifically designed for heating fluids in tanks. Depending on the tank shape, size, accessibility and working area inside the tank, choose a round or L shaped heater.

Standard sheath materials are Incoloy® 800 and steel with all wetted parts made with compatible alloys.

Construction

Tubular heating elements are welded into a liquid-tight junction box. Power leads for the elements travel up through the riser pipe and are connected to a terminal block in a NEMA 4 Housing. Unless otherwise specified, heaters are wired for three-phase from the factory but can easily be converted to single-phase.

A thermowell for a 3/8" diameter bulb is standard to accommodate an optional thermostat. A thermostat can be field installed to mounting lugs located in the electrical enclosure.

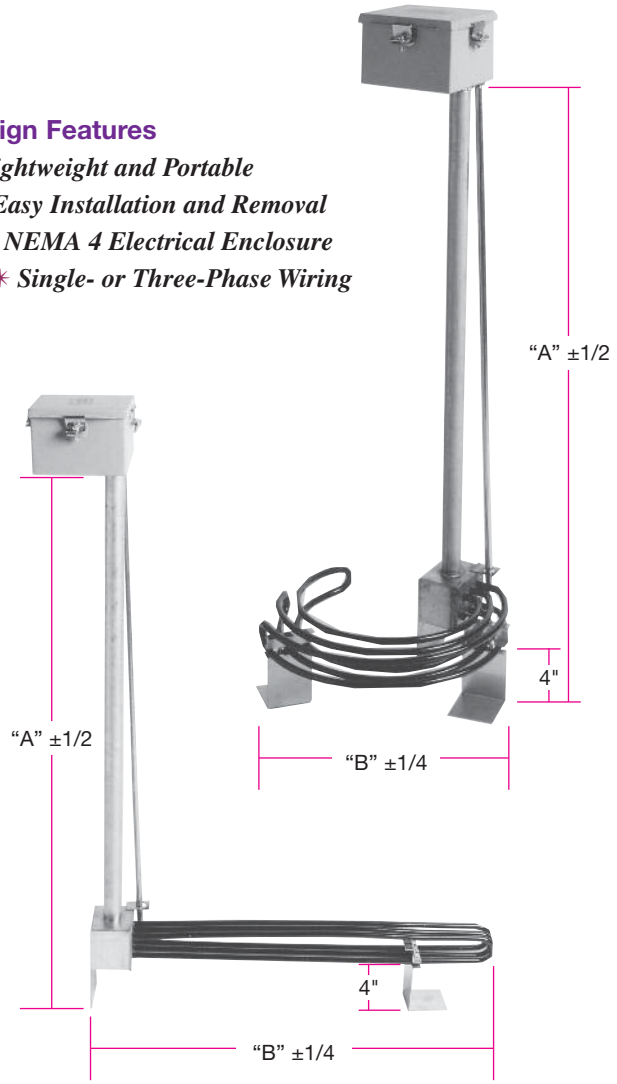
4" (102 mm) sludge legs keep the elements off the bottom of the tank and above any deposits that may accumulate there.

Optional Features

- ***304 or 316 Stainless Steel construction for all wetted parts***
- ***Passivation of all wetted parts. Electropolished or bright annealed surface treatments for Stainless Steel or Incoloy designs (heating elements only)***
- ***NEMA 1 or NEMA 4/7 (explosion resistant) terminal housings***
- ***Flange, fixed or adjustable bracket on riser for mounting***
- ***Mounting flange for terminal housing***
- ***External power wiring options include flexible cord/plug, armored cable, wire braided or plain lead wire***
- ***Double- or Single- pole thermostat (see page 11-6 for available ranges)***
- ***Process or Hi-limit thermocouple in thermowell in place of the thermostat***
- ***Hi-limit MI thermocouple on sheath***
- ***Special riser and/or sludge leg heights***
- ***Up to 12 elements per heater assembly***
- ***Right-angle riser design***

Design Features

- ***Lightweight and Portable***
- ***Easy Installation and Removal***
- ***NEMA 4 Electrical Enclosure***
- ***Single- or Three-Phase Wiring***



Typical Heating Applications: Lightweight Oils • Degreasing Solutions • Mineral Oil

Design Features

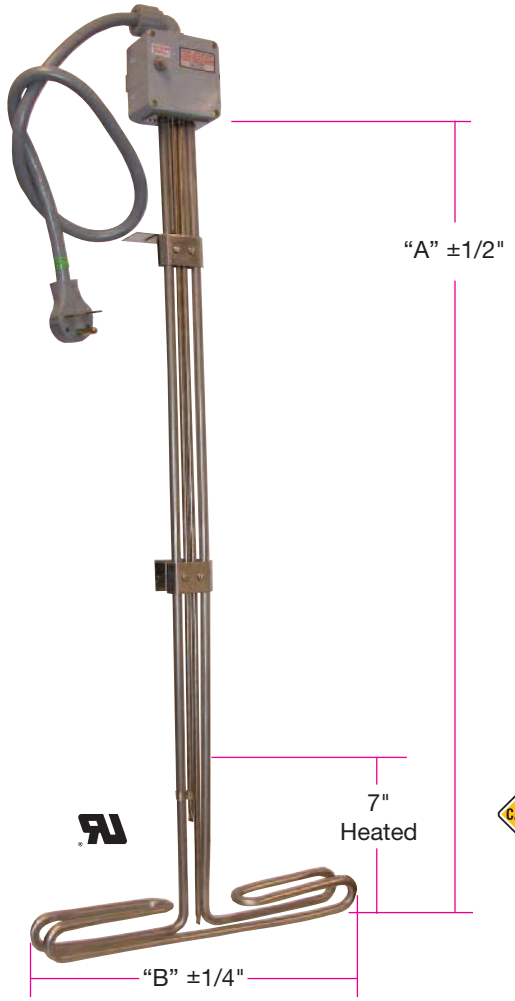
- ***Steel Sheath Heating Elements***
- ***NEMA 4 Terminal Housing***
- ***Watt Density of 23 watts/in² (3.6 watts/cm²)***

Standard (Non-Stock) and Stock Sizes and Electrical Ratings

Stock Items Are Shown In RED

Element Shape	"A" in	"A" mm	"B" in	"B" mm	KW	Part Number 240V-3Ph	Part Number 480V-3Ph	Approximate Net Weight lbs	Approximate Net Weight kg
Round	39 5/16	999	13 1/2	343	3	TAT20001	TAT20002	17	8
	51 5/16	1303	18 1/2	470	6	TAT20003	TAT20004	20	9
	51 5/16	1303	23 1/2	597	9	TAT20005	TAT20006	22	10
Straight	39 5/16	999	22 5/8	575	3	**TAT10001**	TAT10002	15	7
	51 5/16	1303	37 5/8	956	6	**TAT10003**	**TAT10004**	18	8
	51 5/16	1303	52 5/8	1337	9	**TAT10005**	**TAT10006**	20	9

General Purpose Tank or Reservoir Water Immersion Heater



Design Features

- *Immersion section of heater made of 316 Stainless Steel*
- *Cold riser extends to the top of container where control housing is located*
- *Cord set with 3-wire grounding plug is included for easy installation and wiring.*
- *Adjustable vapor-proof thermostat control with temperature range of 55°F to 115°F (±3°)*
- *Hi-limit cut switch set to 125°F (±4°)*
- *Stainless Steel mounting bracket also supplied for easy mounting*
- *Pilot light and on-off switch provided*

Hi-Limit:

If the thermostat should fail and its contacts stick in a closed position, the heating element will continue to heat to about 125°F. At this temperature the Hi-Limit will open and turn the heating element off. After repairing or replacing the thermostat the Hi-Limit can be manually reset.

CAUTION

Hazard of electric shock. Installation must be grounded to earth and heater connected to line input through properly sized GFCI circuit breaker.

Disconnect power to heater before servicing. There should be no body contact with the water while the heater is in the water.

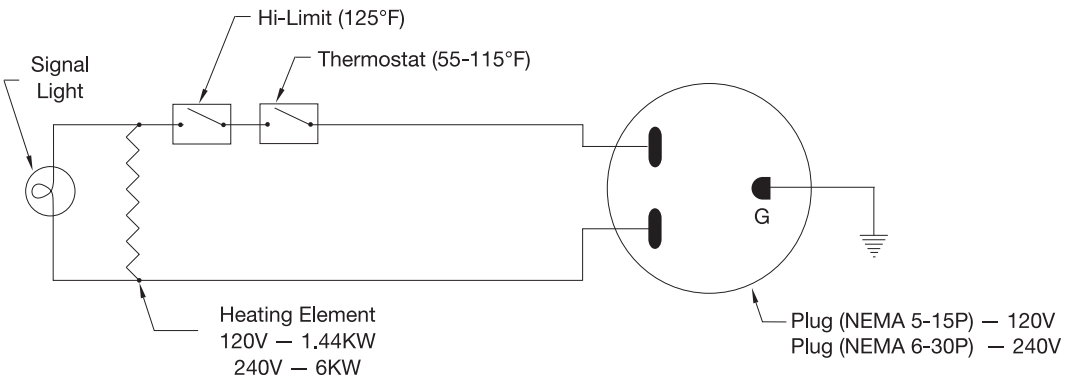
Under NO circumstances should this heater be turned on unless the system is full of water.

Standard (Non-Stock) and Stock Sizes and Electrical Ratings

Stock Items Are Shown In RED

Sheath	Watt Density w/in²	Watts	Volts	"A" Dim. in	"B" Dim. in	Part Number 4 ft. cord	Part Number 6 ft. cord
316 Stainless Steel	51	6000	240	39-3/4	17-1/2	TAT40012	**TAT40017**
(Bright Annealed)	13	1440	120	39-3/4	17-1/2	TAT40016	**TAT40013**

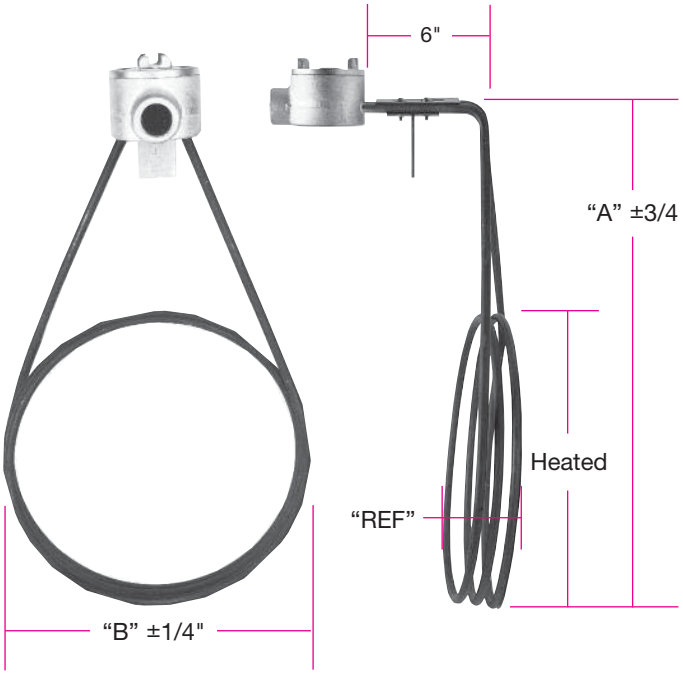
Wiring Diagram — Internal Electrical Connections



Tubular Industrial Process

Tank Immersion Heaters

Vertical Loop – Low Profile Immersion Heaters



Design Features

- *Used on open-top tanks for heating water, water-based solutions, citrus juices, plating tanks, oil tempering, salt baths and other mild corrosive solutions.*
- *NEMA 4 (moisture resistant) housing with integral grounding terminal is standard. Other NEMA ratings available.*
- *Low-profile design with adjustable SS mounting bracket.*
- *Optional Passivated, Electropolished, or Bright Annealed surface treatments available for Stainless Steel or Incoloy sheath designs.*
- *External power wiring options including flexible cord/plug, armor cable, braided or plain lead wire.*
- *Optional Hi-limit MI thermocouple on heater sheath.*

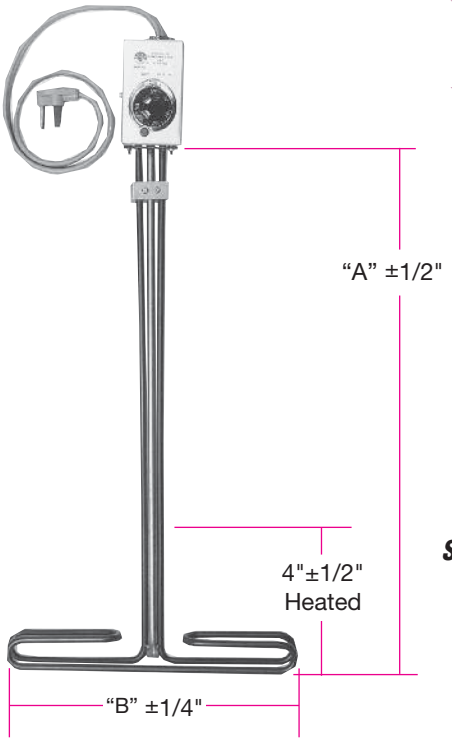
Standard (Non-Stock) and Stock Sizes

Stock Items Are Shown In RED

Sheath	Watt Density w/in²	Watts	Volts	Dimensions (in) "A"	"B"	"REF"	Part Number
Copper	25	5000	240	26	15	2	TAT50011
	40	7500	240	26	15	2	TAT50012
Stainless Steel	25	5000	240	26	15	2¾	**TAT50013**
	40	7500	240	26	15	2¾	TAT50014
Steel	25	5000	240	26	15	2	TAT50015
	40	7500	240	26	15	2	TAT50016

Standard lead time is Stock to 3 weeks.

Sanitizing Sink Immersion Heaters



Design Features

- *Used for sterilization of water tanks in restaurants, taverns and laboratories*
- *Double Pole 60-250°F thermostat with over-temperature cutout. Optional pilot lamp to indicate heater on/off status available.*
- *Standard 6 ft. (optional 4 ft.) cord set with grounding plug (NEMA 5-15P for 120V and 6-30P for 240V)*
- *Adjustable Stainless Steel mounting bracket*
- *Consult Tempco for custom designs*

Standard (Non-Stock) and Stock Sizes

Stock Items Are Shown In RED

Sheath	Watt Density w/in²	Watts	Volts	"A" Dim. in	"B" Dim. in	Part Number
316 Stainless Steel (Electropolished)	65	6000	240	26	17	TAT40001
	56	4000	240	26	13	TAT40002
	16	1500	120	26	17	TAT40003
	14	1000	120	26	13	TAT40004
316 Stainless Steel (Bright Annealed)	65	6000	240	26	17	**TAT40005**
	56	4000	240	26	13	**TAT40006**
	16	1500	120	26	17	**TAT40007**
	14	1000	120	26	13	**TAT40008**

Standard lead time is Stock to 3 weeks.

Tubular Industrial Process

Tank Immersion Heaters

Deep Tank/Sump Immersion Heater

Application

These fluid immersion heaters are designed for top mounting in large or deep enclosed tanks having a manhole access or opening suitable to insert & attach the heater. They are usable for either outdoor or indoor applications, within exposed or in-ground tanks and sewerage sumps. They are designed for permanent mounting and can be sealed weathertight with supplied gaskets and adjustable riser fittings.

NEMA 4 terminal housing is easily removable & resealed to facilitate installation. Units are available with element watt densities from 6 wsi for heavy oils, to 60 wsi for clean water immersion applications. Element bundle diameters ranging from minimum of 10" OD to a maximum of 30" OD are available.

Construction

The tubular elements are welded into a submersible liquid-tight stainless steel junction box. Element power leads are routed up through adjustable riser pipe and connected to a terminal block inside the upper NEMA 4 terminal housing. Unless specified otherwise, heaters are factory wired for three phase and are easily converted to single phase.

All wetted parts are 300 series stainless steel. Standard unit includes 60-250°F double-pole thermostat mounted in upper housing that has a 3/8" dia. bulb & capillary installed in watertight thermowell with adjustable compression fitting.

Design Features

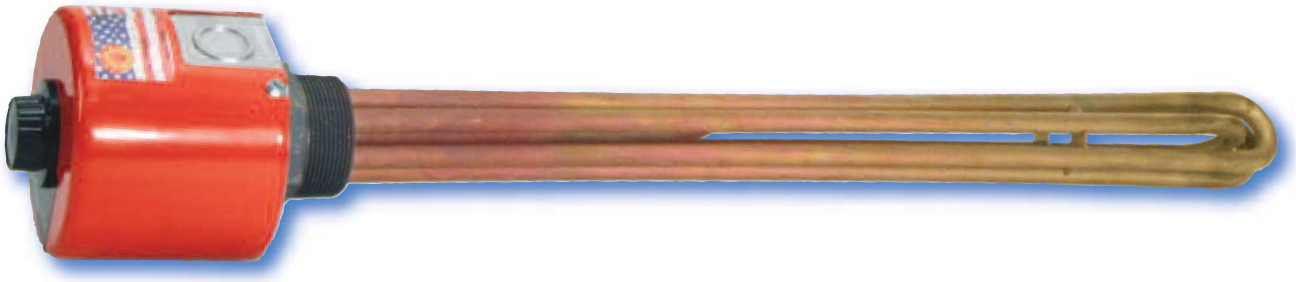
- *.475 diameter Incoloy elements and stainless steel wetted parts standard*
- *Designed for permanent installation in outdoor/indoor applications*
- *2 ft to 12 ft vertical riser height (for thermostat designs)*
- *Weathertight mounting hardware supplied*
- *Riser adjustable to facilitate mounting variations*
- *NEMA 4 Electrical Enclosure with 3/4 conduit fitting*
- *1-1/2" Sludge legs*
- *Double-pole 60-250°F pilot duty thermostat*
- *Watertight thermowell sized for 3/8" max. dia. sensing bulb*
- *120V, 208V, 277V, & 575V versions available (consult Tempco)*

Optional Features

- *316 SS, Steel, or Copper element designs*
- *Passivation, electropolished, or bright annealed surface treatments for stainless steel or Incoloy designs (elements only)*
- *Custom or ASI pressure rated flange on riser for mounting*
- *NEMA 1 or NEMA 4/7 (explosion resistant) terminal housings*
- *Alternate single- or double-pole thermostat (see page 11-6 through 11-9 for ranges)*
- *Internally mounted definite purpose Magnetic Contactor, single circuit units only (see page 13-96 for volt/amp ratings and coil voltages available)*
- *RTD or Process MI thermocouple in thermowell in place of thermostat*
- *Hi-limit thermocouple on element sheath*
- *Special riser or sludge leg heights*
- *Right-angle riser design for offset terminal housing*
- *Up to 24 elements per heater assembly*
- *1/32 DIN temperature controller, internal or panel mounted on terminal housing and used with T/C or RTD probe & contactor for heater control*
- *Integrated float switch for liquid level control*

Screw Plug Immersion Heaters

Screw Plug Immersion Heaters **consist of tubular elements welded or brazed into a threaded screw plug which can then be inserted into a threaded opening in a tank wall or through a mating full or half coupling.**

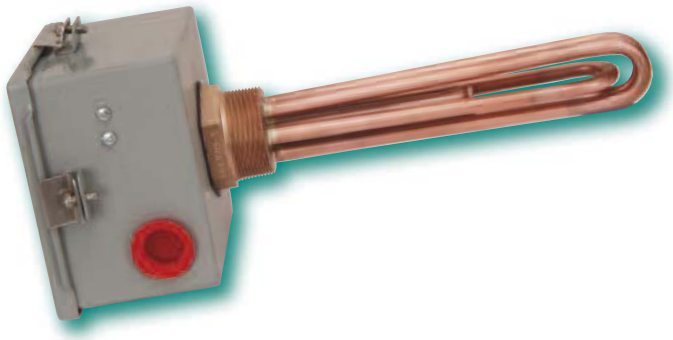


Design Features

- *Stainless Steel, Brass or Steel Screw Plugs*
- *Four Standard Screw Plug Sizes—1", 1-1/4", 2", 2-1/2"*
- *Recompacted element bends restore insulation resistance after forming*
- *Thermowell for optional bulb & capillary thermostat, RTD or T/C probe*
- *Corrosion-Resistant electrical wiring hardware*
- *Four standard sheath materials — Copper, Steel, 316 Stainless Steel and Incoloy®800*
- *NEMA 1 round terminal housing*
- *Silicone resin element seal standard*

Optional Features

- *NEMA 4 Moisture-Proof and/or NEMA 7 Explosion-Resistant terminal housings*
- *Integral Single or Double Pole Thermostats in various temperature ranges to suit the application*
- *Passivation, Electropolishing or Bright Annealing surface treatments available for Stainless Steel & Incoloy® elements*
- *Type J & K Thermocouples or RTD probes for sensing process temperatures, or over-temperature protection when attached to the sheath*
- *Special sheath materials*
- *Special straight bulkhead or European thread fittings*



Need Customer Assistance?

We take pride in our record of working with our customers to develop the right heater for the job.

Call Thermal Devices with your requirements.

Agency Approvals

Tempco Screw Plug Immersion Heaters are UL recognized and CSA certified in many design variations. The UL File Numbers are E90771 (CCN UBJY2/8) for heaters not containing a thermostat and E234452 (CNN KSXF2) for heaters used in water based solutions that include a thermostat. Tempco's equivalent CSA file number is 043099.

If you require UL, CSA, or other NRTL agency approvals, please specify when ordering.

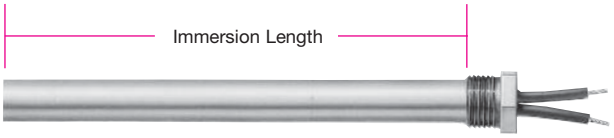
Cartridge Heaters

Hi-Density Immersion Heaters

Standard Size Stock Type CM 1/2" & 3/4 NPT Screw Plug Hi-Density Cartridge Immersion Heaters

Hi-Density Cartridge Immersion Heaters are designed for heating water and other liquids. The high watt density capability of this heater permits greater heat dissipation in a given area than would a tubular immersion heater.

However, it is important to note that allowable watt density depends on the material being heated. For water heating, watt densities of several hundred watts per square inch are possible; oil heating may be limited to 5 to 20 watts per square inch.



Design Features

- *Passivated Incoloy® Sheath*
- *10" long Teflon® Insulated Lead Wires*
- *Brass Fitting*
- *Epoxy Seal at Lead End 266°F (130°C) Standard UL Rating 194°F (90°C)*

Note: See pages 2-50 & 2-51 for other fitting options

Diameter	Heater Immersion Length in	mm	Watts	Watt Density W/in²	W/cm²	Part Number 120V	240V	480V
5/8" Incoloy® Sheath 1/2 NPT Fitting	1½	38.1	100	41	6	HDL00001	—	—
	1½	38.1	400	163	25	—	HDL00002	—
	3½	88.9	250	39	6	HDL00003	HDL00004	—
	3½	88.9	1000	157	24	—	HDL00005	HDL00006
	7⅞	200.0	500	33	5	HDL00007	HDL00008	—
	7⅞	200.0	2000	134	21	—	HDL00009	HDL00010
	12	304.8	750	33	5	HDL00011	HDL00012	—
	12	304.8	3000	130	20	—	HDL00013	HDL00014
3/4" Incoloy® Sheath 3/4 NPT Fitting	4¼	108.0	500	53	8	HDL00015	HDL00016	—
	4¼	108.0	750	80	12	HDL00017	HDL00018	—
	4¼	108.0	1000	106	16	HDL00019	HDL00020	—
	4⅝	117.5	300	29	5	HDL00021	HDL00022	—
	4⅝	117.5	1200	116	18	—	HDL00023	HDL00024
	4¾	120.7	375	35	5	HDL00025	HDL00026	—
	4¾	120.7	1500	141	22	—	HDL00027	HDL00028
	5¾	146.1	500	39	6	HDL00029	HDL00030	—
	5¾	146.1	2000	154	24	—	HDL00031	HDL00032
	6¼	158.8	500	35	5	HDL00033	HDL00034	—
	6¼	158.8	2000	141	22	—	HDL00035	HDL00036
	6½	165.1	625	42	7	HDL00037	HDL00038	—
	6½	165.1	2500	170	26	—	HDL00039	HDL00040
	7¼	184.2	750	45	7	HDL00041	HDL00042	—
	7¼	184.2	3000	182	28	—	HDL00043	HDL00044
	9	228.6	1000	49	8	HDL00045	HDL00046	—
	9	228.6	4000	194	30	—	HDL00047	HDL00048
	10½	266.7	750	31	5	HDL00049	HDL00050	—
	10½	266.7	3000	124	19	—	HDL00051	HDL00052
	10¾	273.1	1250	51	8	HDL00053	HDL00054	—
	10¾	273.1	5000	202	31	—	HDL00055	HDL00056
	12½	317.5	1500	52	8	—	HDL00057	—
	12½	317.5	6000	208	32	—	—	HDL00058
	13⅝	346.1	1000	32	5	HDL00059	HDL00060	—
	13⅝	346.1	4000	127	20	—	HDL00061	HDL00062
	16	406.4	2000	54	8	—	HDL00063	—
	16	406.4	8000	216	33	—	—	HDL00064
	19¼	489.0	2500	56	9	—	HDL00065	—
	19¼	489.0	10000	223	35	—	—	HDL00066

Ordering Information

Stock Heaters

Part Numbers listed above are for 1/2" and 3/4" NPT Brass Screw Plug Cartridge Immersion Heaters with Type CM termination and 10" long leads. ***Standard lead time is 72 hours.***

Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Cartridge Immersion Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Screw Plug NPT Size
- ❑ Screw Plug material (Brass or SS)
- ❑ Sheath material (Incoloy®, 321 SS)
- ❑ Element Watt Density
- ❑ Immersion Length
- ❑ Heated Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination types
- ❑ Lead Length