

Screw Plug Immersion Heaters Overview

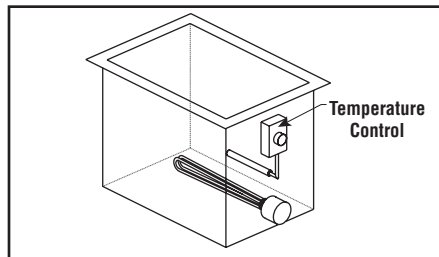
Description

Screw Plug Immersion Heaters consist of hairpin bent tubular elements brazed or welded into a screw plug and provided with terminal enclosures for electrical connections. Screw Plug Immersion Heaters are screwed directly through a threaded opening in a tank wall or through a matching pipe coupling or half coupling. Sizes of screw plug heaters are available with 1/2, 3/4, 1, 1-1/4, 2 and 2-1/2" pipe threads. A wide selection of screwplug sizes, kilowatt ratings, voltages, sheath materials, terminal enclosures and thermostats makes these compact heaters ideal for all types of applications.

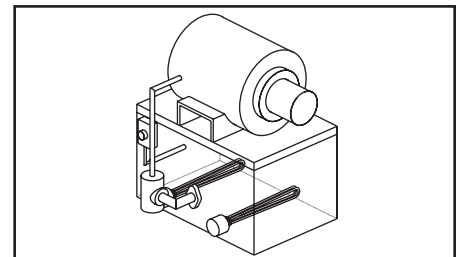
Applications

Screw Plug Immersion Heaters are used for heating liquids and gases in a variety of processes. These heaters are ideal for process water heating and freeze protection. All types of oils and heat transfer solutions can also be heated using these compact, easily controlled units. The direct immersion method is energy efficient and well suited for many applications.

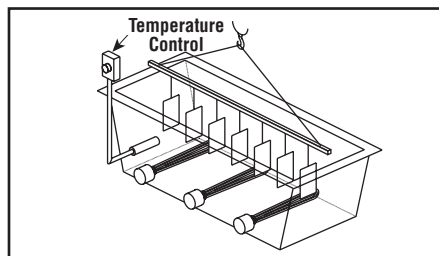
- Hot Water Storage Tanks
- Warming Equipment
- Preheating all Grades of Oil
- Food Processing Equipment
- Cleaning and Rinsing Tanks
- Heat Transfer Systems
- Process Air Equipment
- Boiler Equipment
- Freeze Protection of Any Fluid



MT — screwed into tank wall parallel to bottom for use as a hot water rinse.



MTO — used to preheat oil to ensure efficient lubrication for heavy motor.



MTO — applied to conveyORIZED degreasing operation of many parts at once.



More Information
is Available Online
on Tank Heating. Book-
mark Your Browser to **W-**

www.chromalox.com and Select-
Manuals

Screw Plug Immersion Heaters Selection Guidelines

Selecting a Screw Plug Heater

The selection of the proper screw plug immersion heater requires critical engineering judgement. After determining the heat requirement (see the Technical section of this catalog), the proper selection of the screw plug material, heating element sheath material and correct watt density is critical for long life of the heater. The following table may be used as a guide to this selection, along with the Technical Information at the back of this catalog. Ultimate choice is determined by the knowledge of the process and engineering acumen of the plant engineer.

Caution -- Consideration needs to be given to the length of the cold pin of the elements. In tank heater applications the cold pin should extend into the bulk fluid. When used in pipe or vessel applications, the cold pin should extend into the full flow of fluid.

Application Factors

Heater application is influenced by the following parameters.

- ① The heated media, viscosity, specific heat, density and corrosive properties.
- ② Contaminants or pH present in the media.
- ③ The corrosion resistant properties of heater sheath material.
- ④ Watt density of the heating element—the heat output per square inch.
- ⑤ Screw plug material.

Typical Applications

See screw plug immersion heater selection guide below for your application.

- Hot Water Storage Tanks
- Warming Equipment
- Preheating all Grades of Oil
- Food Processing Equipment
- Cleaning and Rinsing Tanks
- Heat Transfer Systems
- Process Air Equipment
- Boiler Equipment
- Freeze Protection of Any Fluid

Screw Plug Immersion Heaters — Selection Guidelines

	①	②	③	④	⑤
Application	Solution or Heater Type	Alkaline or Acid Content (Est. % by Volume)	Sheath Material	Watt Density (W/In ²)	Screw Plug Material
Water & Very Mild Solutions	Clean Water	pH6 to pH8 Neutral	Copper	45	Brass
	Process Water or Very Weak Solutions	pH5 to pH9 2-3%	Stainless Steel ¹	45	Stainless Steel
	Weak Solutions	5-6%	INCOLOY®	45	Stainless Steel
	Demineralized, Deionized water	—	INCOLOY® Stainless Steel ¹	45	Stainless Steel Stainless Steel
Corrosive & High Viscous Solutions	Mild Corrosive Solution	5-15%	INCOLOY® or Stainless Steel ¹	23	Stainless Steel
	Severe Corrosive Solution	16% or more	INCOLOY®, Stainless Steel or Titanium	15	Stainless Steel
Oil Heating	Low Viscosity Oil	—	Steel	23	Steel
	Medium Viscosity Oil	—	Steel	15	Steel
	High Viscosity Oil	—	Steel	6	Steel
Specialty Heaters	Small Tanks		Stainless Steel ¹		Brass
	Process Water	pH5 to pH9	Stainless Steel ¹	45	Stainless Steel
	Demineralized Water	—	Stainless Steel	23	Steel
	Low Viscosity Oil	—	INCOLOY®	12	Steel
	Pipe Insert Commercial Equipment	Clean Water	Copper	60	Brass

1. Passivated stainless steel recommended for water applications.

Note — Liquid level controls are suggested for all immersion heating applications. See Controls section in this catalog.



More Information is Available Online
on Tank Heating.

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www.chromalox.com and Select Manuals.

Immersion

Screw Plug Immersion Heaters

Application Element Guidelines

Application	Screw Plug Size (In.)	Sheath Material	Screw Plug Material	Heater Model	Integral Thermostat	Page
Clean Water	1	Copper	Brass	ARTM	Yes	B-7
	1	Copper	Brass	MT	No	B-8
	1-1/4	Copper	Brass	ARMT-1	No	B-9
	1-1/4	Copper	Brass	MT-1	No	B-10
	2	Copper	Brass	EMT-3	No	B-15
	2	Copper	Brass	ARMT-2	Yes	B-11
	2	Copper	Brass	MT-2	No	B-13
	2	INCOLOY®	Brass	CH-SD	No	B-16
	2-1/2	Copper	Brass	ARMT-3	Yes	B-17
	2-1/2	Copper	Brass	MT-3	No	B-21
Process Water	1	SS	SS	ARTMS	Yes	B-23
	1	SS	SS	MTS	No	B-24
	1-1/4	SS	SS	ARMTS-1	Yes	B-25
	1-1/4	SS	SS	MTS-1	No	B-26
	2	SS	SS	ARMTS-2	Yes	B-27
	2	SS	SS	MTS-2	No	B-29
	2	SS	SS	AREMTS-3	Yes	B-31
	2	SS	SS	EMTS-3	No	B-32
	2-1/2	SS	SS	ARMTS-3	Yes	B-34
2-1/2	SS	SS	MTS-3	No	B-36	
Solution Water	2	INCOLOY®	SS	ARMTI-2	Yes	B-38
	2	INCOLOY®	SS	MTI-2	No	B-40
	2	INCOLOY®	SS	AREMTI-3	Yes	B-41
	2	INCOLOY®	SS	EMTI-3	No	B-42
	2-1/2	INCOLOY®	SS	ARMTI-3	Yes	B-43
	2-1/2	INCOLOY®	SS	MTI-3	No	B-45
Corrosive Solutions	2	SS	SS	AREMTS-3	Yes	B-46
	2	SS	SS	EMTS-3	No	B-47
	2	INCOLOY®	SS	AREMTI-3	Yes	B-48
	2	INCOLOY®	SS	EMTI-3	No	B-49
Severely Corrosive Solutions	2	SS	SS	AREMTS-3	Yes	B-50
	2	SS	SS	EMTS-3	No	B-51
	2	INCOLOY®	SS	AREMTI-3	Yes	B-52
	2	INCOLOY®	SS	EMTI-3	No	B-53
Light Weight Oil	1	Steel	Steel	ARMTO	Yes	B-54
	1	Steel	Steel	MTO	No	B-55
	1	Steel	Steel	ARTMO-1	Yes	B-56
	1-1/4	Steel	Steel	MTO-1	No	B-57
	2	Steel	Steel	ARMTO-2	Yes	B-58
	2	Steel	Steel	MTO-2	No	B-60
	2	Steel	Steel	AREMTO-3	Yes	B-61
	2	Steel	Steel	EMTO-3	No	B-62
	2-1/2	Steel	Steel	ARMTO-3	Yes	B-63
	2-1/2	Steel	Steel	MTO-3	No	B-65
Medium Weight Oil	2	Steel	Steel	ARMTO-2	Yes	B-67
	2	Steel	Steel	MTO-2	No	B-68
	2	Steel	Steel	AREMTO-3	Yes	B-69
	2	Steel	Steel	EMTO-3	No	B-70
	2-1/2	Steel	Steel	ARMTO-3	Yes	B-71
	2-1/2	Steel	Steel	MTO-3	No	B-72
Heavy Weight Oil	2	Steel	Steel	ARMTO-2	Yes	B-73
	2	Steel	Steel	MTO-2	No	B-74
	2	Steel	Steel	AREMTO-3	Yes	B-73
	2	Steel	Steel	EMTO-3	No	B-74
	2-1/2	Steel	Steel	ARMTO-3	Yes	B-75
	2-1/2	Steel	Steel	MTO-3	No	B-75
Specialty Heaters — Water, Oil & Corrosive Fluids	1/2	INCOLOY®	Steel	RI	No	B-79
	1/2	SS	Steel	RIO	No	B-79
	1/2	INCOLOY®	Brass	RIN	No	B-80
	1/2	SS	Brass	RINO	No	B-80
	1/2	SS	SS	RIS	No	B-79
	3/4	INCOLOY®	Brass	RIN	No	B-80
	3/4	SS	Brass	RINO	No	B-80
	1	Copper	Brass	TMW-1	No	B-76
	1	Copper	Steel	TM-1	No	B-78
	1	SS	SS	TMWS-1	No	B-76
	1	Steel	Steel	TMO-1	No	B-78
	1-1/4	Copper	Brass	TMW-2	No	B-77
	2	INCOLOY®	Brass	DWH-MR	Yes	B-81
	2	INCOLOY®	Steel	MTO-LT	No	B-82
	2-1/2	INCOLOY®	Steel	VTS	Yes	B-83
2-1/2	—	Various	IL-3S	Yes	B-83	

Note — SS denotes 304 Stainless Steel.

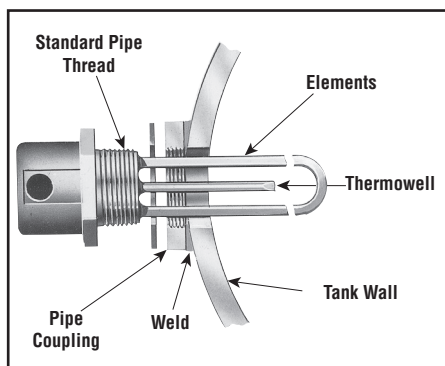
Screw Plug Immersion Heaters Technical & Application Data

Description

Chromalox heavy duty tubular elements are welded or brazed to a screw plug. Uniform heat distribution and repressed element bends, a Chromalox standard feature, lead to long element life. For all heaters, a thermowell (hollow tube sealed at one end) is welded or brazed to the screw plug allowing thermostat sensing element replacement without draining the tank. A variety of methods of terminating power leads is available for special application heaters.

General purpose screw plug heaters are equipped with a steel terminal enclosure painted with red polyester powder coat. These same heaters are also available with a combination moisture tight/explosion resistant terminal enclosure that may be used in applications where either or both conditions exist.

Screw plug type heaters are screwed directly through a threaded opening in the tank wall. Heavy tank walls may be drilled and tapped if thickness is sufficient to engage 3/4 of the threads. Lighter tank walls should be equipped with a suitable pipe half-coupling welded or brazed to the tank wall.



Construction Features — Stock & Assembly Stock Units

Element

- **Materials** — copper, steel, INCOLOY®, 304 stainless steel.
- **Number Elements in Screw Plug** — 1, 2 or 3 depending on screw plug size.
- **Element Diameter** — 0.315, 0.375, 0.430 and 0.475".
- **Watt Density** — 6.5, 15, 23, 45 and 75 W/In².

Screw Plug

- **Materials** — carbon steel, brass, 304 stainless steel.
- **Size** — 1/2, 3/4, 1, 1-1/4, 2, 2-1/2" NPT nominal.
- **Tolerances** — Tolerance on immersion length (B) dimension is $\pm 1\%$ ($\pm 3/8"$ min.).

Terminal Enclosures

Type E1 General purpose, sheet metal, painted with red polyester powder coat. The terminal enclosure rotates 360° to accommodate an electrical conduit run.

Type E4 Moisture resistant housing.

Type E2 Combination moisture resistant/explosion resistant.

Type E2 explosion resistant enclosures are for use in hazardous location conditions:

- Class I Groups B, C & D, Division 1 & 2*
- Class II, Groups E, F & G, Division 1 & 2
- Class III, Division 1 & 2

Safe operation of heaters equipped with explosion resistant enclosures depends on electrical wiring meeting the National Electrical Code for hazardous locations and on limiting the maximum operating temperatures (including temperatures on outside of vessel, piping, flanges, screw plugs, enclosures and other heat conducting parts) as dictated by flammable liquids, vapors or gases present. Approved pressure and/or temperature limiting controls must be used to assure safe operation in the event of a system malfunction.

The 'C' and 'US' indicators adjacent to the CSA mark signify that the product has been evaluated to the applicable CSA and ANSI/UL standards, for use in Canada and the U.S., respectively. This 'US' indicator includes products eligible to bear the 'NRTL' indicator. NRTL, i.e. National Recognized Testing Laboratory, is a designation granted by the U.S. Occupational Safety and Health Administration (OSHA) to laboratories which have been recognized to perform certification to U.S. standards.

Temperature Controls

Many screw plug type heaters are available with built-in thermostatic controls. In some installations where there is more than one heater in a tank, one heater with a built-in control can be used to control the other heaters by wiring the thermostat into the holding coil circuit of a magnetic contactor. If the thermostat is separate from the heater, the thermostat sensing element should be located in the liquid approximately 4 to 6 inches above the heater.

1 and 1-1/4" Screw Plugs — Type ARTM, ARTMO and ARTMS. The ARTM, ARTMO or ARTMS automatic thermostat has a temperature range of 60°F - 187°F (T4). Also available with alternate temperature 60°F - 240°F (T5) or 0°F - 127°F (T8). The tamper resistant temperature adjustment screw and scale are inside requiring the removal of the cover to change temperature setting.

2 and 2-1/2" Screw Plugs — Type ARMT, ARMTI, AREMTI, ARMTS, AREMTS, AREMTO and ARMTO. The integral thermostat is available with temperature ranges at 60°F - 250°F (T2) or 0°F - 100°F (T1) for ARMT, ARMTI, AREMTI, AREMTS and ARMTS heaters. ARMTO and AREMTO heaters are available with three different temperature ranges: 200°F - 550°F (T3), 60°F - 250°F (T2) and 0°F - 100°F (T1). This control is wired in as a line thermostat for loads up to 3 kW on 120 volts and up to 6 kW on 240 volts. For higher wattage ratings, three phase operation and above 240 volts, this control is used for pilot duty only and should be wired to operate the holding coil of a magnetic contactor.

To set the control temperature of heaters equipped with the standard general purpose enclosure (Type E1), adjust the knob on the outside of the terminal enclosure.

For those heaters equipped with a Type E2 and E4 enclosure, remove the terminal enclosure lid to expose the temperature adjusting knob. For safety reasons, power to heater and pilot duty power must be turned off before removing enclosure lid.

Note — The integral thermostat functions as a temperature control only. This is not a fail safe device, so an approved pressure and/or temperature limit control should be used with these heaters to assure safe operation.

CAUTION — Explosion Resistant Type E2 construction refers to heater design features which provide explosion resistant containment of electrical wiring according to National Electrical Code. Application or use of heaters which result in abnormal or excessive temperature can create hazardous conditions which can lead to a fire or explosive condition.

Corrosion Policy

Chromalox cannot warrant any electric immersion heater against failure by sheath corrosion if such failure is the result of operating conditions beyond the control of the heater manufacturer. It is the responsibility of the purchaser to make the ultimate choice of sheath material based on their knowledge of the chemical composition of the corrosive solution, character of materials entering the solution, and controls which he maintains on the process.

* For EMT and MT Class I Group B, Div. 1 & 2, consult factory.

Screw Plug Immersion Heaters

Optional Features

Moisture Resistant Terminal Enclosure Option

- Cast Aluminum Construction
- Red Polyester Powder Coat
- O-Ring Sealed Housing Cover
- Threaded 3/4" NPT Conduit Fitting

Description

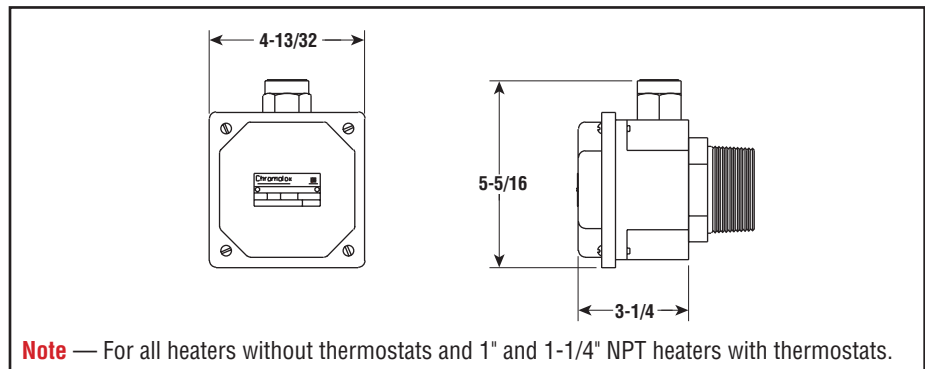
A moisture resistant only (not explosion resistant) terminal enclosure is available on all screw plug immersion heaters.

To Order

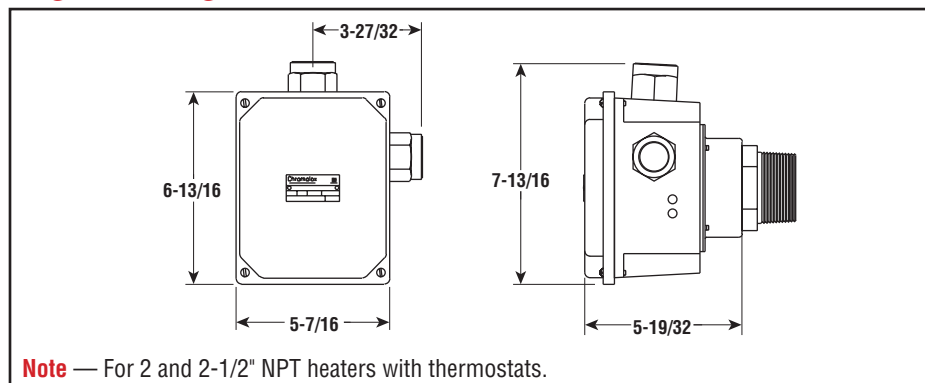
Add E4 to end of model number of the general purpose enclosure heater for moisture resistant construction only. Specify volts, phase and kilowatts. **Do not order by PCN.**



Small Screw Plug Enclosure — Dimensions (Inches)



Large Screw Plug Enclosure — Dimensions (Inches)



Flanged Immersion Heaters

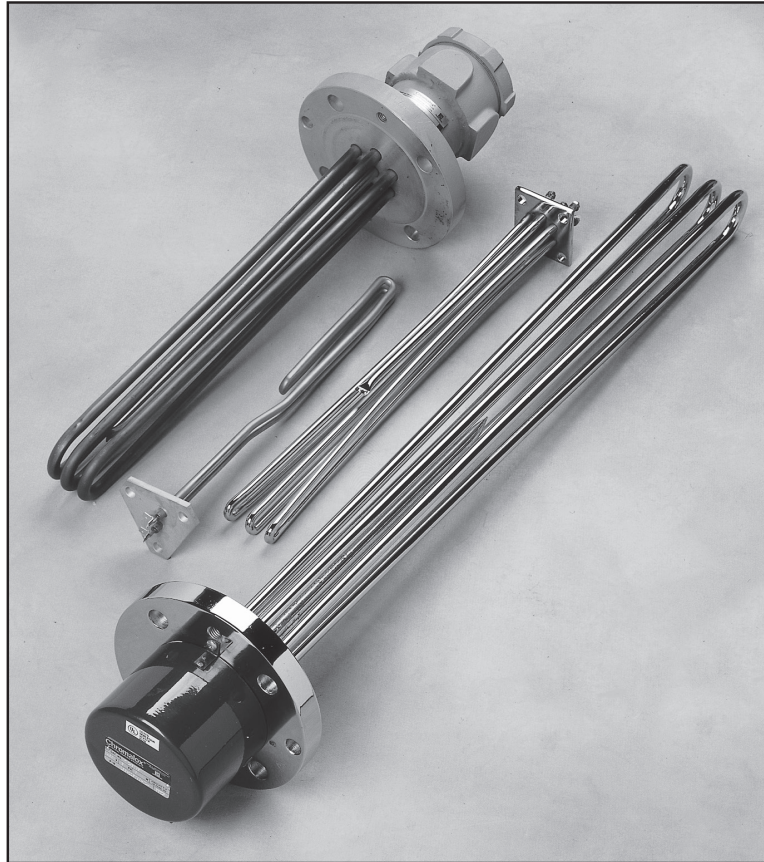
Overview

Flanged Immersion Heaters consist of hairpin bent tubular elements welded or brazed into a flange and provided with wiring boxes for electrical connections. Flange heaters are installed by bolting to a matching flange welded to the tank wall or nozzle. A wide selection of flange sizes, kilowatt ratings, voltages, terminal enclosures and sheath materials make these heaters ideal for all types of heating applications.

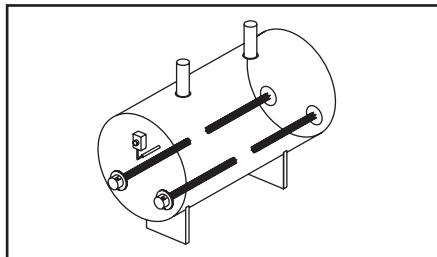
Applications

Flanged immersion heaters are one of the most widely used methods for heating gases and liquids (such as water, oil, heat transfer fluid and corrosive solutions). Designed for use in tanks and pressurized vessels, they are easy to install and maintain to provide heat for many processes. The direct immersion method is energy efficient and easily monitored and controlled.

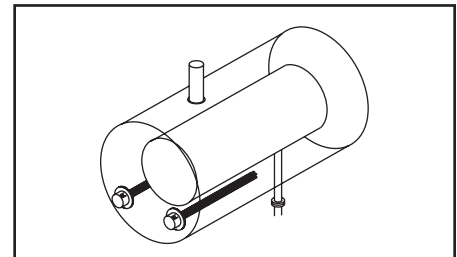
- Hot Water Storage Tanks
- Warming Equipment
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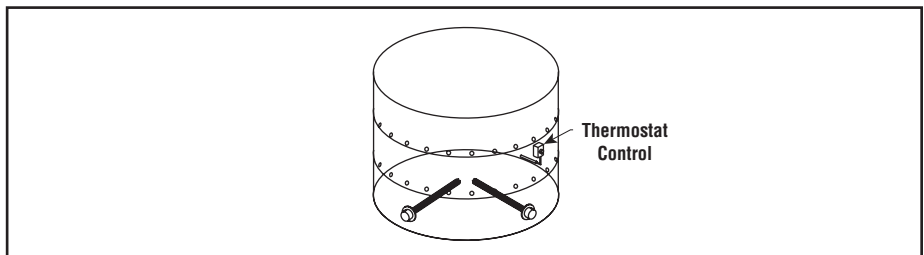
Typical Applications



Flange heaters mounted on each end of hot water storage tank or for an efficient shower system.



Flange heaters in tank of water to heat inner tank of viscous materials.



Flange heaters mounted angularly around tank bottom permitting free vertical work area.

Flanged Immersion Heaters

Application & Selection Guidelines

Selection Guidelines

The selection of the proper Flanged Immersion Heater requires critical engineering judgement. After determining the heat requirement (see the applications section of this catalog), the proper selection of the flange material, heating element sheath material and correct watt density is critical for long life of a heater. The following table may be used as a guide to this selection along with the Technical Information at the back of this catalog. Ultimate choice is determined by the knowledge of the process and engineering acumen of the plant engineer.

Heater application is influenced by the following parameters.

- ① The heated medium viscosity, specific heat density and corrosive properties.
- ② Contaminants present in the medium.
- ③ The heater sheath material corrosion resistant properties.
- ④ Watt density of the heating element — the heat output per square inch.
- ⑤ Maximum sheath temperature — this is the recommended maximum sheath temperature of the element material. It is not the operating temperature of the heated medium (sheath temperature is dependent on items 1 thru 4).

Applications

See Selection Guidelines below for your application.

- Hot Water Storage Tanks
- Warming Equipment
- Preheating All Grades of Oil
- Food Processing Equipment
- Cleaning and Rinsing Tanks
- Heat Transfer Systems
- Process Air Equipment
- Boiler Equipment
- Freeze Protection of Any Fluid

Application Selection — Guidelines

Application	①	②	③	④	⑤
	Solution or Heater Type	Alkaline or Acid Content (Est. % by Volume)	Sheath Material	Watt Density (W/in ²)	Max. Recommended Sheath Temp. (°F)
Water & Very Mild Solutions	Clean Water	pH6 to pH8 Neutral	Copper	45	350
	Process Water	pH5 to pH9	Stainless Steel ¹	45	1200
	Very Weak solutions	2 - 3%	INCOLOY®	45	1600
	Weak Solutions	5 - 6%	INCOLOY®	45	1600
Corrosive & High Viscous Solutions	Demineralized, De-ionized or pure water	—	INCOLOY® w/ Stainless Flange	45	1600
	Mild Corrosive Solution	5 - 15%	Stainless Steel ¹	23	1200
	More Severe Corrosive Solution	10 - 25%	INCOLOY®	23	1200
Specialty Water	Severe Corrosive Solution	30 - 60%	INCOLOY® w/ Stainless Flange	15	1600
	Steam Boilers	Treated	INCOLOY®, Copper	—	1600
Oil	Low Viscosity Oil	—	Steel	23	750
	Medium Viscosity Oil	—	Steel	15	750
	High Viscosity Oil	—	Steel	6.5	750
Oil Reservoir	Lubrication Oil	—	Steel	15	750
Air, Gases & Steam	Low Temperature		Stainless Steel	23	1200
	High Temperature		INCOLOY®	23	1600

1. Passivated stainless steel recommended for water.

Flanged Immersion Heaters Selection Guidelines

Flanged Immersion Heaters — Selection Guidelines

Application	Flange Size (In.)	Sheath Material	Flange Material	Heater Type	Page
Clean Water	3	Copper	Steel	TM	B-95
	5	Copper	Steel	TM	B-95
	6	Copper	Steel	TM	B-96
	8	Copper	Steel	TM	B-96
	10	Copper	Steel	TM	B-96
	12	Copper	Steel	TM	B-96
Process Water	14	Copper	Steel	TM	B-96
	3	SS	Steel	TMS	B-97
	5	SS	Steel	TMS	B-98
	6	SS	Steel	TMS	B-98
Solution Water	8	SS	Steel	TMS	B-98
	3	INCOLOY®	Steel	TMI	B-99
	5	INCOLOY®	Steel	TMI	B-100
	6	INCOLOY®	Steel	TMI	B-100
Mildly Corrosive Solution	8	INCOLOY®	Steel	TMI	B-100
	3	SS	Steel	TMS	B-101
	5	SS	Steel	TMS	B-102
	6	SS	Steel	TMS	B-102
Corrosive Solution & Gas	8	SS	Steel	TMS	B-102
	3	INCOLOY®	Steel	TMI	B-103
	5	INCOLOY®	Steel	TMI	B-104
	6	INCOLOY®	Steel	TMI	B-104
	8	INCOLOY®	Steel	TMI	B-104
	10	INCOLOY®	Steel	TMI	B-104
Severely Corrosive Solution	12	INCOLOY®	Steel	TMI	B-104
	14	INCOLOY®	Steel	TMI	B-104
	3	INCOLOY®	SS	TMIS	B-105
	5	INCOLOY®	SS	TMIS	B-105
Demineralized or De-ionized Water	6	INCOLOY®	SS	TMIS	B-105
	3	INCOLOY®	SS	TMIS	B-106
Light Weight Oil	5	INCOLOY®	SS	TMIS	B-106
	3	Steel	Steel	TMO	B-107
	5	Steel	Steel	TMO	B-107
	6	Steel	Steel	TMO	B-108
	8	Steel	Steel	TMO	B-108
	10	Steel	Steel	TMO	B-108
	12	Steel	Steel	TMO	B-108
14	Steel	Steel	TMO	B-108	
Medium Weight Oil	3	Steel	Steel	TMO	B-109
	5	Steel	Steel	TMO	B-109
	6	Steel	Steel	TMO	B-109
Heavy Weight Oil	3	Steel	Steel	TMO	B-111
	5	Steel	Steel	TMO	B-111
Boiler & Water	2-1/2 Sq.	Copper	Brass	TTSF	B-112
	2-1/2 Sq.	INCOLOY®	Steel	TTSF	B-112
	4-1/2 Sq.	Copper	Steel	WCSF	B-112
Food Equipment	3-1/4 Dia.	Copper	Brass	TTUH	B-113
		Copper	Brass	TTUH-CO	B-114

Flanged Immersion Heaters

Technical & Application Data

Description

These thru-the-side immersion heaters utilize standard pipe flanges ranging from 3 to 14" nominal pipe diameter to support high tank pressures of superheated steam, compressed gases or liquids. They are installed through a matching companion flange (obtainable from local industrial supply houses) to the tank wall. A wide selection of watt densities, heating outputs and flange sizes and ratings make this an excellent heater for all tanks, vats or irregularly shaped vessels.

Features — Stock Units

Element

- **Materials** — Copper, steel, 304 stainless steel, INCOLOY®.
- **Number Elements in Flanges** — 3, 6, 12, 18, 27, 36 and 45.
- **Element Diameter** — 0.475".
- **Watt Density** — 6.5, 15, 23, 45 and 75 W/In².

Flange

- **Material** — Carbon steel, stainless steel.
- **Rating** — 150 lb. pressure class per ANSI B16.5
- **Sizes** — 3, 5, 6, 8, 10, 12 and 14", 150 lb.

Process Control Thermowell

- **Materials** — Copper, carbon steel, stainless steel, INCOLOY®.
- 1/2" diameter.

Special Features

Kilowatt Ratings — 500 kW and above available.

Element

- **Materials** — 316, 321, 347 stainless steel, INCONEL® and more.

Flange

- **Materials** — 316, 321, 347 stainless steel, INCONEL®, INCOLOY® and more.

- **Rating** — 300, 400, 600, 900, 1,500 and 2,500 lb. pressure class.
- **Size** — 16, 18" and larger.

Optional Features

ASME Section I, III, IV and VIII designed and certified

Baffles to distribute flow on elements

Passivation of stainless steel

Immersion Lengths up to 240 inches

Stand-off Terminal Enclosures to isolate terminal housing from flange in high temperature applications

Stock Status & Availability

S — Stocked in finished form

AS — Assembly Stock. Items put together using major stocked subassemblies requiring three day shipping lead time

NS — Non Stock (made to order). Contact your Local Chromalox Sales office for delivery

Terminal Enclosures

Type E1 General Purpose, sheet metal (NEMA 1) painted with red enamel

Type E2 Combination Moisture Resistant, Explosion Resistant enclosures involve the use of wiring enclosures for use in hazardous location conditions.

Type E4 Moisture Resistant

Safe operation of heaters equipped with these enclosures depends on employment of electrical wiring meeting the National Electrical Code and/or IEC for hazardous locations and limiting maximum operating temperatures (including temperatures on outside of vessel, piping, flanges, screw plugs, enclosures and other heat conducting parts) as dictated by flammable liquids, vapors or gases present. Approved pressure and/or temperature limiting controls must be used to assure safe operation in the event of a system malfunction.

Temperature Controls

- A thermostat protective well is standard on most models. This well is installed through the flange, parallel with the heating elements. An AR type on-off mechanical control can be externally mounted to the heater with the capillary bulb installed in this well (order separately — see Controls section for details).
- A contactor is needed when the line voltage and/or current exceeds the thermostat rating.
- Other types of controls and sensors are available where a high degree of accuracy or a more versatile control scheme is required. Electronic controls and complete control panels are easily installed. See the Controls section for details.

Corrosion Policy

Chromalox cannot warrant any electric immersion heater against failure by sheath corrosion if such failure is the result of operating conditions beyond the control of the heater manufacturer. It is the responsibility of the purchaser to make the ultimate choice of sheath material based on their knowledge of the chemical composition of the corrosive solution, character of materials entering the solution, and controls which he maintains on the process.

Flanged Immersion Heaters

Technical & Application Data

*ATEX/IECEX/CSA Zone Classification Selection chart for terminal enclosure
standoff dimension based on 30°C rise over 40°C ambient*

70°C Cable Supply			Vertical Heater Orientation		Horizontal Heater Orientation	
Temperature Code	Wet Face Temperature: °F	Wet Face Temperature: °C	Minimum Standoff Dimension		Minimum Standoff Dimension	
			Inches	mm	Inches	mm
T6	185	85	3	76	1	25
T5	212	100	3	76	2	50
T4A	248	120	5	127	3	76
T4	275	135	6	152	3	76
T3C	320	160	7.5	191	4	102
T3B	329	165	7.5	191	4	102
T3A	356	180	7.5	191	5	127
T3	392	200	9	229	5	127
T2D	419	215	9	229	5	127
T2C	446	230	9	229	6	152
T2B	500	260	10.5	267	6	152
T2A	536	280	10.5	267	6	152
T2	572	300	10.5	267	7.5	191
T1	842	450	13.5	343	9	229

*ATEX/IECEX/CSA Zone Classification Selection chart for terminal enclosure
standoff dimension based on 10°C rise over 60°C ambient*

70°C Cable Supply			Vertical Heater Orientation		Horizontal Heater Orientation	
Temperature Code	Wet Face Temperature: °F	Wet Face Temperature: °C	Minimum Standoff Dimension		Minimum Standoff Dimension	
			Inches	mm	Inches	mm
T6	185	85	9	229	6	152
T5	212	100	10.5	267	7.5	191
T4A	248	120	12	305	7.5	191
T4	275	135	12	305	7.5	191
T3C	320	160	12	305	7.5	191
T3B	329	165	12	305	9	229
T3A	356	180	13.5	343	9	229
T3	392	200	15	381	9	229
T2D	419	215	15	381	10.5	267
T2C	446	230	15	381	10.5	267
T2B	500	260	16.5	419	10.5	267
T2A	536	280	18	457	10.5	267
T2	572	300	18	457	10.5	267
T1	842	450	24	610	12	305

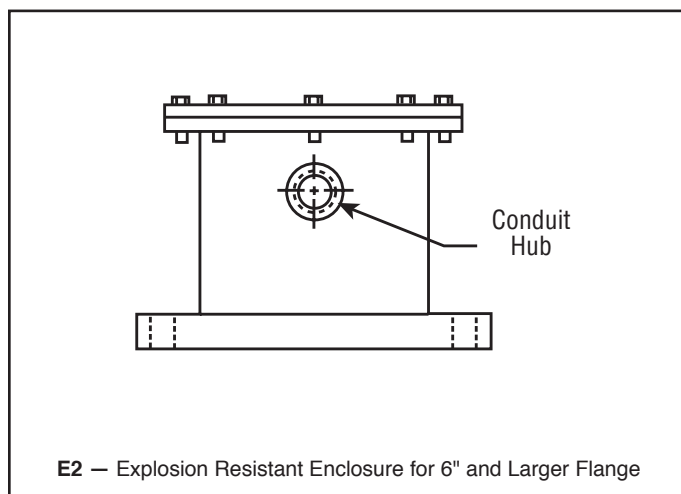
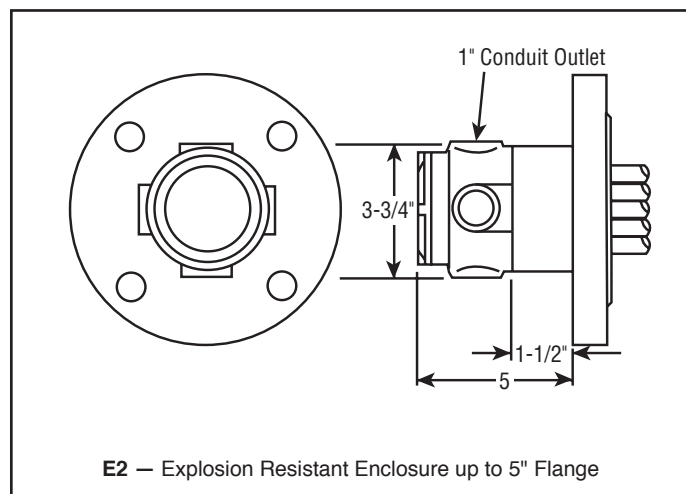
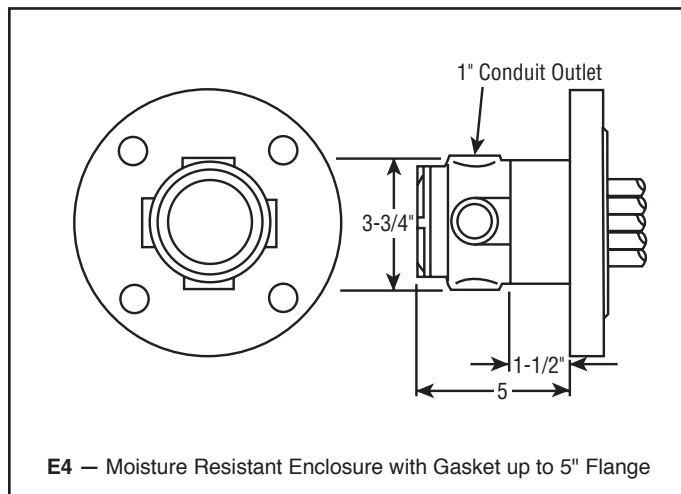
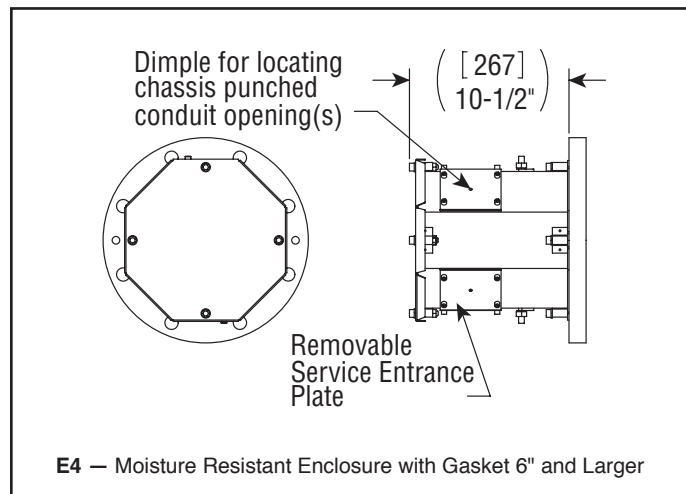
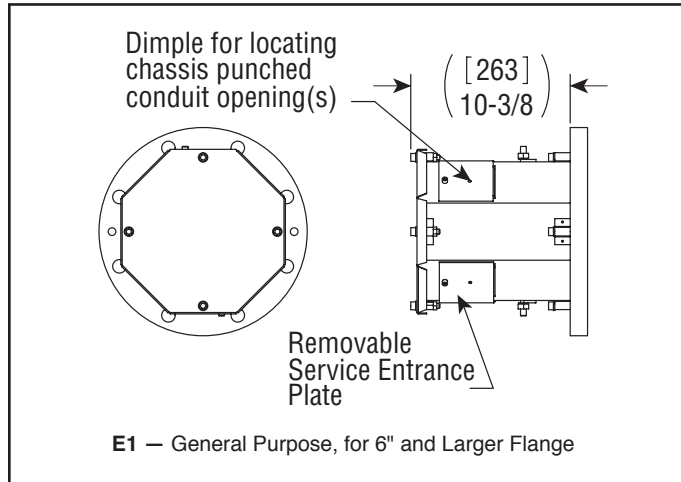
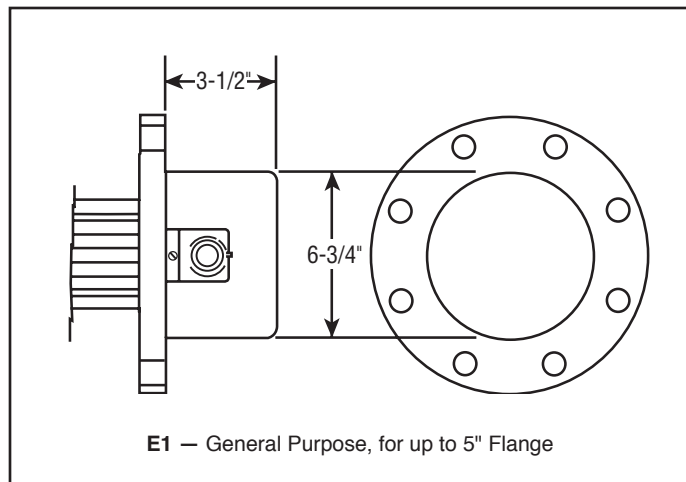
*CSA Class and Division Classification Selection chart for terminal enclosure
standoff dimension based on 85°C rise over 40°C ambient*

125°C Cable Supply			Vertical Heater Orientation		Horizontal Heater Orientation	
Temperature Code	Wet Face Temperature: °F	Wet Face Temperature: °C	Minimum Standoff Dimension		Minimum Standoff Dimension	
			Inches	mm	Inches	mm
T6	185	85	0	0	0	0
T5	212	100	0	0	0	0
T4A	248	120	0	0	0	0
T4	275	135	0	0	0	0
T3C	320	160	2	50	0	0
T3B	329	165	2	50	0	0
T3A	356	180	4	102	2	50
T3	392	200	4	102	2	50
T2D	419	215	4	102	2	50
T2C	446	230	4	102	2	50
T2B	500	260	6	152	4	102
T2A	536	280	6	152	4	102
T2	572	300	6	152	4	102
T1	842	450	7.5	191	6	152

Flanged Immersion Heaters

Terminal Enclosures

Enclosure Styles and Dimensions (Inches)



FLANGED

Flanged Immersion Heaters

Terminal Enclosures

Third Party Specifications by Housing Style

Model	Purpose		North American Designation(s)	Canadian Designation(s)	European Designation(s)	International Designation(s)
E1	General Purpose	Generic Agency (s)	NEMA 1, NEC UL/CSAus	NEMA 1 IP32 CSA	IP32 CE: Manufacturer's Declaration	CE: Manufacturer's Declaration
		Ratings	General Duty Only	General Duty Only	General Duty Only	General Duty Only
E4*	Moisture Resistant Note: Temps over T3 (200°C) require standoffs for third party listing. Refer to IECex & ATEX certifs. for standoff dimensions	Generic Agency (s)	NEMA 4 UL / CSAus	NEMA 4 CSA	IP66 CE: Manufacturer's Declaration	IP66 CE: Manufacturer's Declaration
		Ratings	Class I Div. 2, Groups B, C, D Groups E, F: 200°C (T3) Group G 165°C (T3B) Class I Zone 2 AEx nA II T1 to T6	Class I Div. 2, Groups B, C, D Class II Division 2, Groups E, F: 200°C (T3) Group G 165°C (T3B) Class I Zone 2 Ex nA II T1 to T6	II 3 G Ex nA II T1 to T6	Ex nA II T1 to T6
E2	Moisture Resistant/Explosion Proof Ex de IIB+H2 T1 to T6, 540°C, 600°C Note: Temps over T4 (135°C) require standoffs for third party listing. Refer to IECex & ATEX certifs. for standoff dimensions	Generic Agency (s)	CSAus	CSA	ATEX	IECex
		Ratings	Class I, Div. 1 Groups B, C & D Class II, Div. 1 Groups E, F & G Class I Zone 1 AEx d IIB + H2 T1 to T6	Class I, Div. 1 Groups B, C & D Class II, Div. 1 Groups E, F & G Class I Zone 1 Ex d IIB + H2 T1 to T6	I 2 G EEx d IIB+H2 T1 to T6	Ex d IIB+H2 T1 to T6
E5 Flange Size 3"-8" 8"-12" 12"-18"	Moisture Resistant/Explosion Proof Ex de IIC T1 to T6 540°C, 600°C ATEX IIC Labeling Reference CFP, CFP2, CFP4, CFP8, CFP12, CFP20 Refer to European Catalog.	Generic Agency (s)			ITS ATEX	IECex
		Ratings			II 2 G EEx de IIC T1 to T6, 540°C, 600°C	Ex de IIC T1 to T6 540°C, 600°C

* **WARNING:** Addition of sparking devices such as a Thermostat to an E4 housing will annul hazardous area rating.

Flanged Immersion Heaters

Process Temperature & Overtemperature Controls

Temperature Control — Mechanical Devices

An integral on-off process temperature control thermostat can be factory installed into the housing of the heater. The sensing bulb of the thermostat is inserted into a thermowell in the center of the heating bundle. AR type mechanical controls (see Controls section for details) are utilized.

Mechanical Devices

Option Number	Thermostat Range
T1	0 - 100°F
T2	60 - 250°F
T3	200 - 550°F

Notes —

- A. The controls are for pilot duty only and must be connected to a remote mounted magnetic contactor.
- B. For explosion resistant heaters, an integral thermostat can only be specified on a 3, 5 and 6" flange immersion heater.

Temperature Control — Electronic Devices

A process control thermocouple can be factory installed into a thermowell in the center of the heating bundle for process control. This thermocouple must be connected to a remote mounted electronic temperature controller.

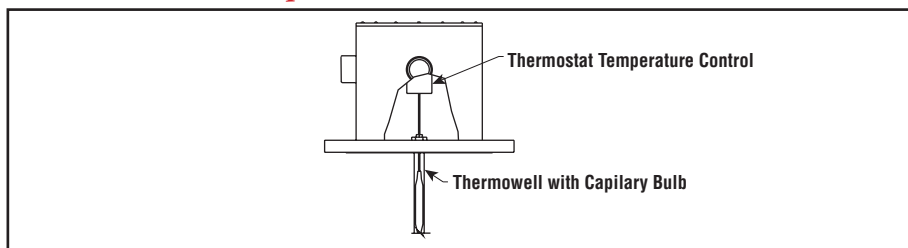
Overtemperature Protection — Electronic Devices

A thermocouple can be attached to the heating element sheath to switch the heater off in the event of a high temperature condition. This thermocouple must be connected to a remote mounted electronic high limit temperature controller.

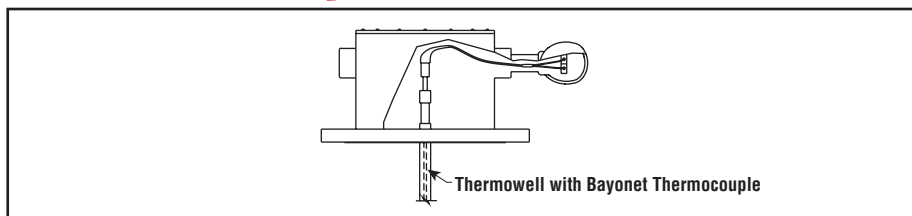
Please refer to the Controls section for an overview of power control panels.

FLANGED

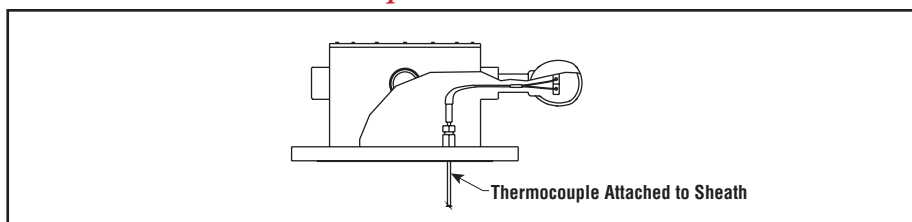
Mechanical Device Temperature Control



Process Control Thermocouple



Overheat Protection Thermocouple



Flanged Immersion Heaters

Process Temperature & Overtemperature Controls

Flanged Immersion Heater Model Descriptions

Model																	
TM	ANSI Flange Immersion Heater																
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TM	I - 03 - 004P5 - E4 480V 1 - 3P 4.5 kW Typical Model Number																

Example of Final Model Description: TMI-03-004P5-E4 480V 1-3P 4.5kW

Note: Shaded sections of the model build table are not a finite list. Items such as Number of Elements, Wattage, Voltage, Circuits, and Phase should be adjusted to match design.