

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 Very Weak solutions	pH5 to pH9 2 - 3%	Stainless Steel ¹	45	1200
	Weak Solutions	5 - 6%	INCOLOY®	45	1600
	Demineralized, De-ionized or pure water	—	INCOLOY® w/ Stainless Flange	45	1600
Corrosive & High Viscous Solutions	Mild Corrosive Solution	5 - 15%	Stainless Steel ¹	23	1200
	More Severe Corrosive Solution	10 - 25%	INCOLOY®	23	1200
	Severe Corrosive Solution	30 - 60%	INCOLOY® w/ Stainless Flange	15	1600
Specialty Water	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.

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Application	Flange Size (In.)	Sheath Material	Flange Material	Heater Type	Page
Clean Water	3	Copper	Steel	TM	B-92
	5	Copper	Steel	TM	B-92
	6	Copper	Steel	TM	B-93
	8	Copper	Steel	TM	B-93
	10	Copper	Steel	TM	B-93
	12	Copper	Steel	TM	B-93
	14	Copper	Steel	TM	B-93
Process Water	3	SS	Steel	TMS	B-94
	5	SS	Steel	TMS	B-95
	6	SS	Steel	TMS	B-95
	8	SS	Steel	TMS	B-95
Solution Water	3	INCOLOY®	Steel	TMI	B-96
	5	INCOLOY®	Steel	TMI	B-97
	6	INCOLOY®	Steel	TMI	B-97
	8	INCOLOY®	Steel	TMI	B-97
Mildly Corrosive Solution	3	SS	Steel	TMS	B-98
	5	SS	Steel	TMS	B-99
	6	SS	Steel	TMS	B-99
	8	SS	Steel	TMS	B-99
Corrosive Solution & Gas	3	INCOLOY®	Steel	TMI	B-100
	5	INCOLOY®	Steel	TMI	B-101
	6	INCOLOY®	Steel	TMI	B-101
	8	INCOLOY®	Steel	TMI	B-101
	10	INCOLOY®	Steel	TMI	B-101
	12	INCOLOY®	Steel	TMI	B-101
Severely Corrosive Solution	3	INCOLOY®	SS	TMIS	B-102
	5	INCOLOY®	SS	TMIS	B-102
	6	INCOLOY®	SS	TMIS	B-102
	6	INCOLOY®	SS	TMIS	B-102
Demineralized or De-ionized Water	3	INCOLOY®	SS	TMIS	B-103
	5	INCOLOY®	SS	TMIS	B-103
Boiler & Water	2-1/2 Sq.	Copper	Brass	TTSF	B-109
	2-1/2 Sq.	INCOLOY®	Steel	TTSF	B-109
	4-1/2 Sq.	Copper	Steel	WCFS	B-109
Light Weight Oil	3	Steel	Steel	TMO	B-104
	5	Steel	Steel	TMO	B-104
	6	Steel	Steel	TMO	B-105
	8	Steel	Steel	TMO	B-105
	10	Steel	Steel	TMO	B-105
	12	Steel	Steel	TMO	B-105
	14	Steel	Steel	TMO	B-105
Medium Weight Oil	3	Steel	Steel	TMO	B-106
	5	Steel	Steel	TMO	B-106
	6	Steel	Steel	TMO	B-106
Heavy Weight Oil	3	Steel	Steel	TMO	B-108
	5	Steel	Steel	TMO	B-108
Food Equipment	3-1/4 Dia.	Copper	Brass	TTUH	B-110
		Copper	Brass	TTUH-CO	B-111

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, 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

Type E3 Explosion Resistant

Type E4 Moisture Resistant

Type E2 and E3 Explosion Resistant enclosures involve the use of a wiring enclosures for use in hazardous location conditions:

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

Safe operation of heaters equipped with these enclosures depends on employment of electrical wiring meeting the National Electrical Code 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

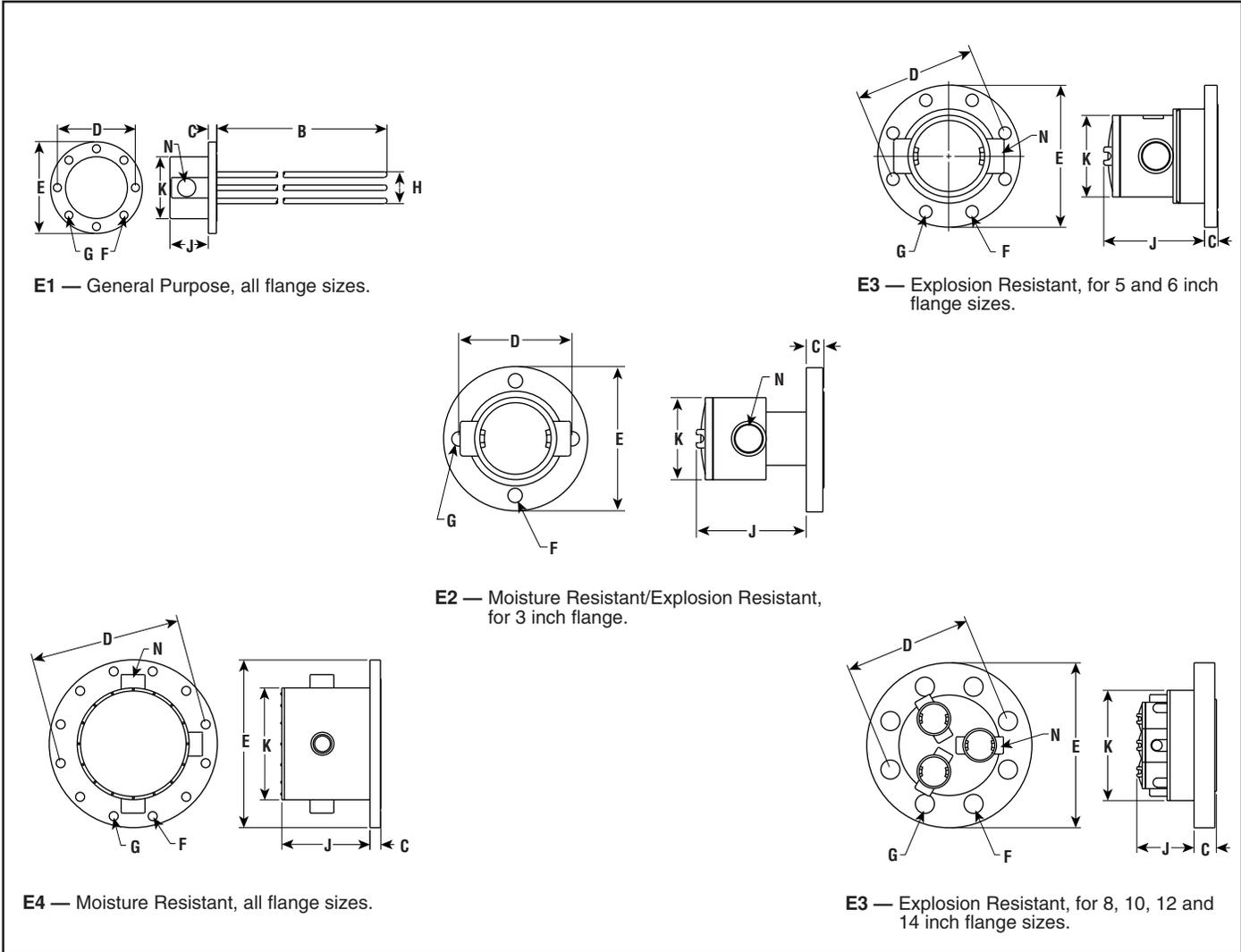
- A thermostat protective well is standard on most models. This well is installed through the flange, parallel with the heating elements. An AR type on-off mechanical control can be externally mounted to the heater with the capillary bulb installed in this well (order separately — see Controls section 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 Terminal Enclosures

Dimensions (Inches)



Specifications

Nom. Pipe Size	No. Elem.	150 Lb. Rated Flange Dimensions (In.)						Terminal Enclosure ²					
		C	D	E	Dia. F	G No. Holes	H Min. Hole Dia. Reqd. ¹	General Purpose E1		Explosion Resistant E3		Moisture Resistant E4	
								J	K	J	K	J	K
3	3	15/16	6	7-1/2	3/4	4	2-3/4	3-1/2	4-9/16	5-3/8	4-1/4	5-3/8	4-1/4
5	6	15/16	8-1/2	10	7/8	8	5	3-1/2	6-11/16	6-15/16	5-3/4	3-7/16	7-1/4
6	12	1	9-1/2	11	7/8	8	6	5-3/8	7-11/16	8-5/8	8	5-11/32	8
8	18	1-1/8	11-3/4	13-1/2	7/8	8	7-15/16	5-3/8	9-13/16	7-9/16	10	5-11/16	10
10	27	1-3/16	14-1/4	16	1	12	9-3/4	6-9/16	11-3/16	9-1/8	10-1/2	5-11/16	12
12	36	1-1/4	17	19	1	12	11-3/4	6-9/16	13-3/16	7-15/16	12-3/4	6-1/4	12-3/4
14	45	1-3/8	18-3/4	21	1-1/8	12	12-3/4	6-9/16	15-3/16	9-1/8	14	6-5/16	14

1. Bundle diameters are suitable for insertion into standard schedule 40 pipe. If higher schedule pipe is used, please specify.
2. The "N dimension" (referred to as the conduit opening on E1 enclosures, and the NPT opening for E2/E3/E4 enclosures) varies with heater size, kilowatt rating and voltage. The number of conduit openings corresponds with the number of circuits supplied. Refer to product offering page for specific "N" dimension.

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.

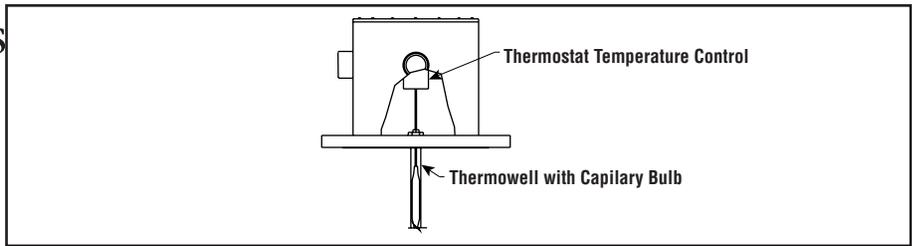
Temperature Control — Electronic Devices

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.

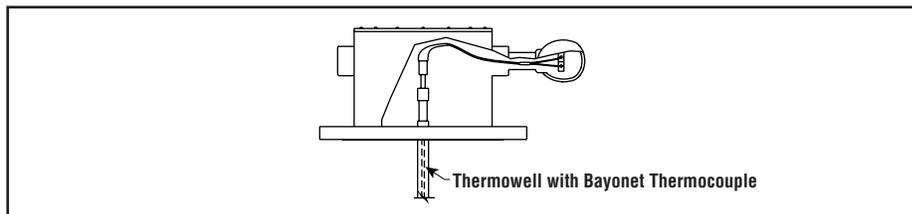
Overtemperature Protection — Electronic Devices

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.

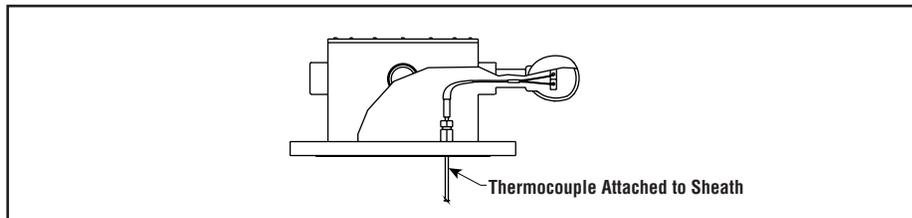
Mechanical Device Temperature Control (T1, T2 or T3)



Process Control Thermocouple (C46 or C47)



Overheat Protection Thermocouple (C36 or C37)



Electronic Devices

Option Number	Thermocouple	Enclosure Type	Description
Temperature Control			
C40	J	E1	Process thermocouple in thermowell. Connect to remote mounted control (not included). ¹
C41	K	E1	Process thermocouple in thermowell. Connect to remote mounted control (not included). ¹
C42	J	E2/E3	Process thermocouple in thermowell without separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C43	K	E2/E3	Process thermocouple in thermowell without separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C44	J	E2/E3	Process thermocouple in thermowell with separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C45	K	E2/E3	Process thermocouple in thermowell with separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C46	J	E4	Process thermocouple in thermowell with separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C47	K	E4	Process thermocouple in thermowell with separate thermocouple termination box. Connect to remote mounted control (not included). ¹
Overtemperature Protection			
C30	J	E1	Overheat protection thermocouple welded onto heater sheath. Connect to remote mounted control (not included). ¹
C31	K	E1	Overheat protection thermocouple welded onto heater sheath. Connect to remote mounted control (not included). ¹
C32	J	E2/E3	Overheat protection thermocouple welded onto heater sheath without separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C33	K	E2/E3	Overheat protection thermocouple welded onto heater sheath without separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C34	J	E2/E3	Overheat protection thermocouple welded onto heater sheath with separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C35	K	E2/E3	Overheat protection thermocouple welded onto heater sheath with separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C36	J	E4	Overheat protection thermocouple welded onto heater sheath with separate thermocouple termination box. Connect to remote mounted control (not included). ¹
C37	K	E4	Overheat protection thermocouple welded onto heater sheath with separate thermocouple termination box. Connect to remote mounted control (not included). ¹

1. See the Controls section for information on electronic or remote mounted controls.

Other Note — To order, add the option number to the end of the heater model number.

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