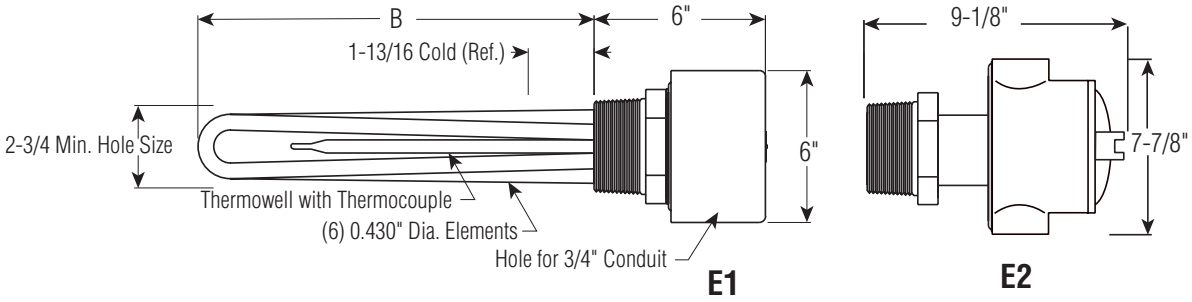
Installation and Operation Instructions

VersaTherm™

Screw Plug Oil & Water Immersion Heater

CHROMALOX
Advanced Thermal Technologies

PD449-2
161-306451-003
January 2018



E1 Specifications and ordering information

Dimension B (In.)	Model	PCN
20-13/16	VTS-3180	181075
20-13/16	VTS-3180	181083
30-3/8	VTS-3200	181913
20-13/16	VTS-3240	181921
20-13/16	VTS-3240	181930
30-3/8	VTS-3400	181948

E2 Specifications and ordering information

Dimension B (In.)	Model	PCN
20-13/16	VTS-3180E2	100167
20-13/16	VTS-3180E2	100175
30-3/8	VTS-3200E2	100204
20-13/16	VTS-3240E2	100220
20-13/16	VTS-3240E2	100239
30-3/8	VTS-3400E2	100247

General

READ ALL INSTRUCTIONS BEFORE USE.

⚠WARNING

FIRE/EXPLOSION HAZARD. Ordinary location heaters are not intended for use in hazardous atmospheres where flammable vapors, gases, liquids or other combustible atmospheres are present as defined in the National Electrical Code. Failure to comply can result in personal injury or property damage.

This design has the versatility of field adjustments of voltage and kW through various wiring combinations.

The versaTHERM™ screw plug heater is a general purpose screw plug immersion heater intended for indoor use. The versaTHERM™ screw plug heater with E2 is designed with a Moisture Resistant/Explosion Resistant enclosure. Clean water designs are available up to 40kW - **DO NOT USE THE WATER WIRING TABLE FOR OIL**. Oil designs are up to 10kW.

Heater Construction Characteristics:
The versaTHERM™ screw plug heater uses six INCOLOY® sheath elements welded to a steel 2.5" screw plug. A J-type thermocouple in a thermowell is standard. VersaTHERM™ screw plug heaters are designed for application temperatures up to 300°F.

A. High quality resistance wire held in place by compacted Magnesium Oxide Refractory enclosed in an INCOLOY® sheath.

B. High to low watt densities.

C. E1 (General Purpose), E2 (Moisture Resistant/Explosion Resistant) enclosures are standard.

Ensure the temperature/pressure is controlled below the vapor point of the liquid at all times and is within the temperature/pressure ratings for this heater.

Heating elements must be completely immersed in liquid when energized.

⚠WARNING

Sheath corrosion can result in a ground fault which, depending upon the solution being heated, can cause an explosion or fire.

IMPORTANT: It is the responsibility of the purchaser of the heater to make the ultimate choice of sheath material based upon his knowledge of the chemical composition of the corrosive solution, character of the materials entering the solution, and controls which he maintains on the process.

⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before installing or servicing heater. Failure to do so could result in personal injury or property damage. Heater must be installed or serviced by a qualified person in accordance with the National Electrical Code, NFPA 70.

⚠WARNING

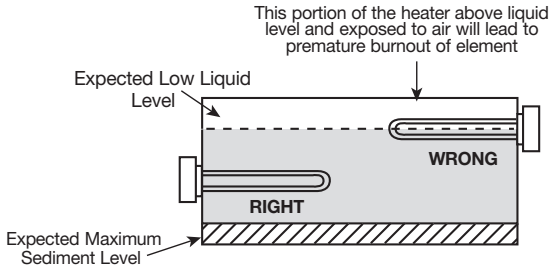
The system designer is responsible for the safety of this equipment and should install adequate back-up controls and safety devices with their electric heating equipment. Where the consequences of failure could result in personal injury or property damage, back-up controls are essential.

Installation

⚠WARNING

ELECTRIC SHOCK HAZARD. DISCONNECT ALL POWER BEFORE INSTALLING OR SERVICING HEATER. FAILURE TO DO SO COULD RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE. HEATER MUST BE INSTALLED BY A QUALIFIED PERSON IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, NFPA 70.

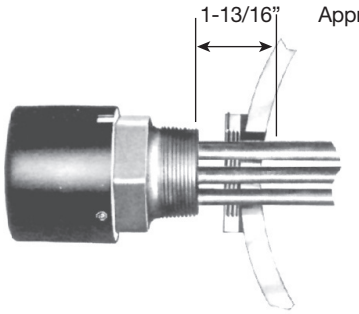
1. Before installing, check your versaTHERM™ screw plug immersion heater for any damage that may have occurred during shipment.
2. Do not bend the heating elements. If bending is necessary, consult factory.



Note: Locate Heater as low as possible for maximum heated liquid storage capacity. Heat does not move downward.

Figure 1 - Open Tank Installation

3. **IMPORTANT:** Mount heater in the tank so the liquid level will always be above the effective heated portion of the heater (see Figure 1). If the heater is not properly submerged, it may overheat and damage the heating elements and create a possible fire hazard due to excessive sheath temperatures.
4. Where work will pass over or near equipment, additional protection such as a metal guard may be needed.
5. Heater must not be operated in sludge.
6. Install the heater using a high quality pipe sealing compound on the threads. Screw the heater into the opening (Figure 2). Tighten sufficiently with wrench applied on the hex portion of the screw plug.



Heavy Tank Walls may be drilled and tapped - if thickness is sufficient to engage 3/4 of threads.

Lighter Tank Walls must be equipped with suitable pipe coupling attached with proper solder or weld material.

WARNING: Care must be taken to insure the heated portion does not extend into the coupling area (see Dimensions).

7. Closed Tank Installation

⚠WARNING

EXPLOSION HAZARD. When heating in closed vessels, controls and back-up controls must be used to regulate build-up of temperature and/or pressure.

A. Horizontal Position (Figure 3)

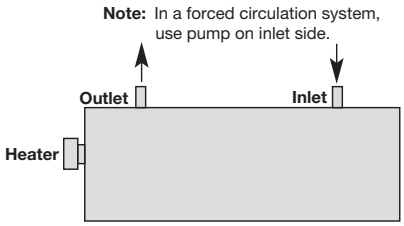


Figure 3 - Closed Tank in Horizontal Position

A1. Place heater at an elevation so that natural circulation can take place.

A2. Position outlet and inlet in a vertical plane, facing upward to prevent air pockets. Be sure all trapped air is removed from the closed tank. Bleed the air out of the liquid piping system and heater housing prior to operation.

A3. IMPORTANT: Heater should never be located at the highest point of the liquid system. Provide expansion tank, if necessary.

⚠WARNING

FREEZE HAZARD. This unit is equipped with a thermowell for process control or over-temperature control. Do not allow moisture to accumulate in thermowell. Freezing temperatures can cause damage that my result in the heated medium leaking into terminal closure.

To prevent moisture accumulation in cryogenic applications or when heater is exposed to freezing temperatures:

A. Slope conduit away from housing (drip loop).

B. Seal all conduit openings to moisture/explosion resistant terminal enclosure.

C. Insulate terminal enclosure.

D. Fill thermowell(s) with silicone fluid when heater is mounted with terminal enclosure up.

B. Vertical Position (Figure 4)

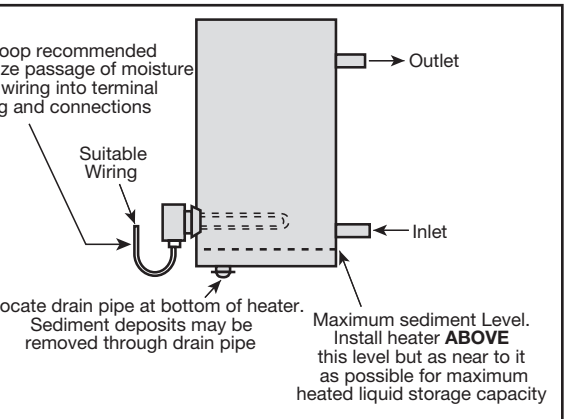


Figure 4 - Closed Tank in Vertical Position

⚠WARNING

8. ***FIRE HAZARD. Since heaters are capable of developing high temperatures, extreme care should be taken to:***

A. Use explosion-resistant electrical enclosure in hazardous locations. See Chromalox catalog for selection of explosion resistant electrical enclosure for hazardous locations.

B. Avoid contact between heaters and combustible material.

C. Keep combustible materials far enough away to be free of the effects of high temperatures.

⚠WARNING

Provisions should be made to prevent damage from any eventual leaking of tank or components. Failure to comply could result in personal injury or property damage.

9. Adjustment Instructions for Rotating Enclosure (E1) Only

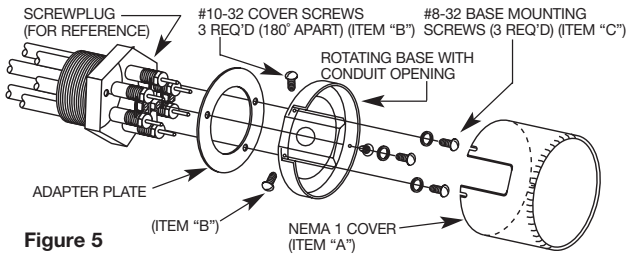


Figure 5

A. After tightening the heater into the tank opening. The electrical enclosure can be rotated to a more convenient position to install the power feed.

B. Remove the cover (Item A) by loosening the three cover screws (Item B) (do not completely remove the screws since the cover holes are open slotted).

C. To rotate the enclosure base, loosen the three mounting screws (Item C) until the base rotates freely (do not completely remove).

D. Turn the base until the conduit opening is on the desired position.

E. Tighten the base mounting screws securely (Item C). ***CAUTION: Do not over tighten.***

F. Follow the rest of the screw plug installation instructions to complete installation.

⚠WARNING

FIRE OR SHOCK HAZARD: Moisture accumulation in the element refractory material, element overtemperature, or sheath corrosion can cause ground fault to the element sheath, generating arcing and molten metal. Install Ground Fault Circuit Interrupter (GFCI) to prevent personal injury or Equipment Ground Fault Protection to prevent property damage.

⚠WARNING

FIRE HAZARD. An integral thermostat, if used, is designed for temperature control service only. Because the thermostat is not fail safe, it should not be used for temperature limiting duty. Wiring to this device is the responsibility of the user.

Wiring

⚠WARNING

ELECTRIC SHOCK HAZARD. Any installation involving electric heaters must be performed by a qualified person and must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

⚠CAUTION

Ensure the correct Wiring Instruction Sheet Table is used for your heated medium and model type, and ensure the correct wiring diagram is used. Miswiring could result in an unsafe wattage.

1. Be sure line voltage matches your intended voltage and does not exceed the max voltage on the nameplate.
2. Electric wiring to heater must be installed in accordance with local and National Electrical Codes by a qualified person as defined in the NEC. ***CAUTION: Use copper conductors only.***
3. Power controllers must be used with this product.
4. Electrical wiring to heater should be contained in rigid conduit or in sealed flexible hose to keep corrosive vapors and liquids out of the electrical enclosure. If high humidity is encountered, the conduit should slope down away from the heater.
5. Refer to appropriate wiring diagram for your model heater from the Wiring Guides (on next two pages). Bring the power line wires through the opening in the electrical enclosure. Connect line wires as shown in the wiring diagrams.

   The specific Wiring Guide provides easy to follow steps to determine the appropriate wiring diagram for your heater installation. Figure 6 may be referenced as a general diagram of how a contactor and temperature control are used in conjunction with the specific wiring diagrams.
6. Use ground fault protection equipment where electrical insulation failure can cause process problems.
7. When element wattages are not equal, heaters must not be connected in series.
8. If flexible cord is employed, a watertight connector should be used for entry of the cord into the electrical enclosure. Outdoor applications require liquid-tight conduit and connectors.
9. If application uses a standard PCN at different voltages and kWs from the Wiring Guides, refer to the Customer Wiring Guide supplement if included with these instructions, or contact Customer Service at (800) 368-2493.

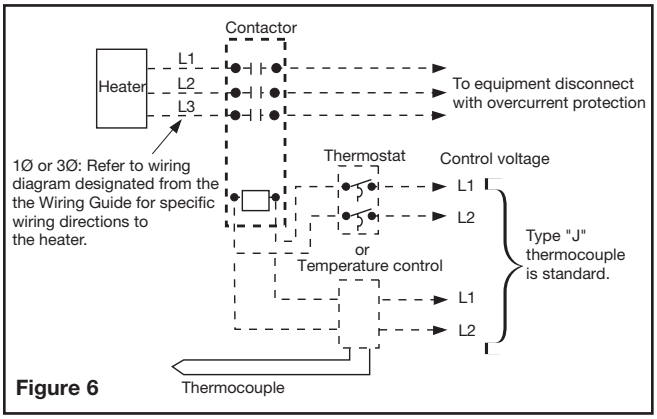


Figure 6

Note: Dotted lines indicate “customer furnished.” Complete power/temperature control panels or components are available. **Contact Chromalox 1-800-443-2640 for more information and assistance.**

Wiring Guide - Oil

Step 1: Select the PCN number below which matches the PCN number on your heater.

Step 2: Choose your kW, Volts, phase, and number of circuits under your PCN number **(you must know the kW and watt density (watts/sq. in.) needs for your application)**.

Step 3: Note the Wiring diagram # for your selection.

Step 4: Go to Wiring Diagram sheet. Peel off the diagram that matches the # in step 3. Stick this to the inside of your electrical enclosure.**

Step 5: Peel off corresponding Volts, circuit-phase, and kW info from the Wiring Diagram sheet and stick to the designated spot on the nameplate. (These labels will cover the maximum rating stamped on the nameplate.)**

Step 6: Wire Heater according to the sticker on the inside of your electrical enclosure (from step 4).

Oil Applications			
Watts - Volts	**Circuit - Phase (Amps)**	**Approx. Watts/Sq. In.**	**Wiring Diag. #**
PCN 181075 (P/N 156-304748-001) PCN 100167 (P/N 156-304748-301)			
4.5kW - 120V	1-1Ph (38 amps)	15	#7
PCN 181083 (P/N 156-304748-002) PCN 100175 (P/N 156-304748-302)			
1.5kW - 480V	1-3Ph (2 amps)	5	#6
2.5kW - 240V	1-1Ph (10 amps)	15	#13*
2.5kW - 240V	1-3Ph (6 amps)	15	#11*
4.5kW - 240V	1-1Ph (19 amps)	15	#7
4.5kW - 240V	2-1Ph (2 x 10 amps)	15	#8
4.5kW - 240V	1-3Ph (11 amps)	15	#1
4.5kW - 240V	2-3Ph (2 x 6 amps)	15	#2
4.5kW - 480V	1-1Ph (10 amps)	15	#10
4.5kW - 480V	1-3Ph (6 amps)	15	#3
PCN 181913 (P/N 156-304748-003) PCN 100201 (P/N 156-304748-303)			
5.0kW - 120V	1-1Ph (42 amps)	11	#7
5.0kW - 208V	1-3Ph (14 amps)	11	#4
5.0kW - 240V	1-1Ph (21 amps)	11	#10
5.0kW - 240V	1-3Ph (13 amps)	11	#3
PCN 181921 (P/N 156-304748-004) PCN 100220 (P/N 156-304748-304)			
3.0kW - 120V	1-1Ph (25 amps)	20	#13*
3.0kW - 208V	1-3Ph (9 amps)	20	#12*
6.0kW - 120V	1-1Ph (2 x 25 amps)	20	#8
6.0kW - 208V	1-3Ph (17 amps)	20	#4
6.0kW - 208V	2-3Ph (2 x 9 amps)	20	#5

Oil Applications			
Watts - Volts	**Circuit - Phase (Amps)**	**Approx. Watts/Sq. In.**	**Wiring Diag. #**
PCN 181930 (P/N 156-304748-005) PCN 100239 (P/N 156-304748-305)			
.5kW - 240V	1-3Ph (1.3 amps)	2	#6
.75kW - 120V	1-1Ph (7 amps)	5	#13*
.75kW - 208V	1-3Ph (2.1 amps)	5	#12*
1.5kW - 120V	1-1Ph (13 amps)	5	#7
1.5kW - 120V	2-1Ph (2 x 7 amps)	5	#8
1.5kW - 208V	1-3Ph (4.2 amps)	5	#4
1.5kW - 240V	1-1Ph (7 amps)	5	#10
1.5kW - 240V	1-3Ph (3.7 amps)	5	#3
2.25kW - 208V	1-1Ph (11 amps)	15	#13*
2.25kW - 208V	1-3Ph (7 amps)	15	#11*
3.0kW - 240V	1-1Ph (13 amps)	20	#13*
3.0kW - 240V	1-3Ph (8 amps)	20	#11*
4.5kW - 208V	1-1Ph (22 amps)	15	#7
4.5kW - 208V	2-1Ph (2 x 11 amps)	15	#8
4.5kW - 208V	1-3Ph (13 amps)	15	#1
4.5kW - 208V	2-3Ph (2 x 7 amps)	15	#2
6.0kW - 240V	1-1Ph (25 amps)	20	#7
6.0kW - 240V	2-1Ph (2 x 13 amps)	20	#8
6.0kW - 240V	1-3Ph (15 amps)	20	#1
6.0kW - 240V	2-3Ph (2 x 8 amps)	20	#2
6.0kW - 480V	1-1Ph (13 amps)	20	#10
6.0kW - 480V	1-3Ph (15 amps)	20	#3
PCN 181948 (P/N 156-304748-006) PCN 100247 (P/N 156-304748-306)			
2.5kW - 120V	1-1Ph (21 amps)	15	#7
2.5kW - 120V	2-1Ph (2 x 11 amps)	15	#8
2.5kW - 208V	1-3Ph (7 amps)	15	#4
2.5kW - 240V	1-1Ph (11 amps)	15	#10
2.5kW - 240V	1-3Ph (7 amps)	15	#3
10kW - 240V	1-1Ph (42 amps)	21	#7
10kW - 240V	2-1Ph (2 x 21 amps)	21	#8
10kW - 240V	1-3Ph (25 amps)	21	#1
10kW - 240V	2-3Ph (2 x 13 amps)	21	#2
10kW - 480V	1-1Ph (21 amps)	21	#10
10kW - 480V	1-3Ph (13 amps)	21	#3
6.0kW - 208V	2-3Ph (2 x 9 amps)	20	#5

* Half of the heating elements are used
** For E2, affix to sheet metal on outside of enclosure

Wiring Guide - Water

Step 1: Select the PCN number below which matches the PCN number on your heater.
Step 2: Choose your kW, Volts, phase, and number of circuits under your PCN number **(you must know the kW and watt density (watts/sq. in.) needs for your application)**.
Step 3: Note the Wiring diagram # for your selection.
Step 4: Go to Wiring Diagram sheet. Peel off the diagram that matches the # in step 3. Stick this to the inside of your electrical enclosure.**
Step 5: Peel off corresponding Volts, circuit-phase, and kW info from the Wiring Diagram sheet and stick to the designated spot on the nameplate. (These labels will cover the maximum rating stamped on the nameplate.)**
Step 6: Wire Heater according to the sticker on the inside of your electrical enclosure (from step 4).

Water Applications			
Watts - Volts	**Circuit - Phase (Amps)**	**Approx. Watts/Sq. In.**	**Wiring Diag. #**
PCN 181075 (P/N 156-304748-001) PCN 100167 (P/N 156-304748-301)			
4.5kW - 120V	1-1Ph (38 amps)	15	#7
9.0kW - 240V	1-1Ph (38 amps)	59	#13*
9.0kW - 240V	1-3Ph (22 amps)	59	#11*
18kW - 240V	2-1Ph (2 x 38 amps)	59	#8
18kW - 240V	1-3Ph (44 amps)	59	#1
18kW - 240V	2-3Ph (2 x 22 amps)	59	#2
PCN 181083 (P/N 156-304748-002) PCN 100175 (P/N 156-304748-302)			
1.5kW - 480V	1-3Ph (42 amps)	5	#6
2.5kW - 240V	1-1Ph (10 amps)	15	#13*
2.5kW - 240V	1-3Ph (6 amps)	15	#11*
4.5kW - 240V	1-1Ph (19 amps)	15	#7
4.5kW - 240V	2-1Ph (2 x 10 amps)	15	#8
4.5kW - 240V	1-3Ph (11 amps)	15	#1
4.5kW - 240V	2-3Ph (2 x 6 amps)	15	#2
4.5kW - 480V	1-1Ph (10 amps)	15	#10
4.5kW - 480V	1-3Ph (6 amps)	15	#3
9.0kW - 480V	1-1Ph (19 amps)	59	#13*
9.0kW - 480V	1-3Ph (11 amps)	59	#11*
18kW - 480V	1-1Ph (38 amps)	59	#7
18kW - 480V	2-1Ph (2 x 19 amps)	59	#8
18kW - 480V	1-3Ph (22 amps)	59	#1
18kW - 480V	2-3Ph (2 x 11 amps)	59	#2
PCN 181913 (P/N 156-304748-003) PCN 1001201 (P/N 156-304748-303)			
5.0kW - 120V	1-1Ph (42 amps)	11	#7
5.0kW - 208V	1-3Ph (14 amps)	11	#4
5.0kW - 240V	1-1Ph (21 amps)	11	#10
5.0kW - 240V	1-3Ph (13 amps)	11	#3
20kW - 240V	2-1Ph (2 x 42 amps)	80	#8
20kW - 240V	2-3 (2 x 25 amps)	80	#2
PCN 181921 (P/N 156-304748-004) PCN 100220 (P/N 156-304748-304)			
3.0kW - 120V	1-1Ph (25 amps)	20	#13*
3.0kW - 208V	1-3Ph (9 amps)	20	#12*
6.0kW - 120V	1-1Ph (2 x 25 amps)	20	#8
6.0kW - 208V	1-3Ph (17 amps)	20	#4
6.0kW - 208V	2-3Ph (2 x 9 amps)	20	#5
12kW - 240V	1-3Ph (29 amps)	78	#11*
24kW - 240V	3-1Ph (3 x 34 amps)	78	#9
24kW - 240V	2-3Ph (2 x 29 amps)	78	#2

* Half of the heating elements are used
** For E2, affix to sheet metal on outside of enclosure

Water Applications			
Watts - Volts	**Circuit - Phase (Amps)**	**Approx. Watts/Sq. In.**	**Wiring Diag. #**
PCN 181930 (P/N 156-304748-005) PCN 100239 (P/N 156-304748-305)			
.5kW - 240V	1-3Ph (1.3 amps)	2	#6
.75kW - 120V	1-1Ph (7 amps)	5	#13*
.75kW - 208V	1-3Ph (2.1 amps)	5	#12*
1.5kW - 120V	1-1Ph (13 amps)	5	#7
1.5kW - 120V	2-1Ph (2 x 7 amps)	5	#8
1.5kW - 208V	1-3Ph (4.2 amps)	5	#4
1.5kW - 240V	1-1Ph (7 amps)	5	#10
1.5kW - 240V	1-3Ph (3.7 amps)	5	#3
2.25kW - 208V	1-1Ph (11 amps)	15	#13*
2.25kW - 208V	1-3Ph (7 amps)	15	#11*
3.0kW - 240V	1-1Ph (13 amps)	20	#13*
3.0kW - 240V	1-3Ph (8 amps)	20	#11*
4.5kW - 208V	1-1Ph (22 amps)	15	#7
4.5kW - 208V	2-1Ph (2 x 11 amps)	15	#8
4.5kW - 208V	1-3Ph (13 amps)	15	#1
4.5kW - 208V	2-3Ph (2 x 7 amps)	15	#2
6.0kW - 240V	1-1Ph (25 amps)	20	#7
6.0kW - 240V	2-1Ph (2 x 13 amps)	20	#8
6.0kW - 240V	1-3Ph (15 amps)	20	#1
6.0kW - 240V	2-3Ph (2 x 8 amps)	20	#2
6.0kW - 480V	1-1Ph (13 amps)	20	#10
6.0kW - 480V	1-3Ph (8 amps)	20	#3
12kW - 480V	1-1Ph (25 amps)	78	#13*
12kW - 480V	1-3Ph (15 amps)	78	#11*
24kW - 480V	2-1Ph (2 x 25 amps)	78	#8
24kW - 480V	1-3Ph (29 amps)	78	#1
24kW - 480V	2-3Ph (2 x 15 amps)	78	#2
PCN 181948 (P/N 156-304748-006) PCN 100247 (P/N 156-304748-306)			
2.5kW - 120V	1-1Ph (21 amps)	15	#7
2.5kW - 120V	2-1Ph (2 x 11 amps)	15	#8
2.5kW - 208V	1-3Ph (7 amps)	15	#4
2.5kW - 240V	1-1Ph (11 amps)	15	#10
2.5kW - 240V	1-3Ph (7 amps)	15	#3
10kW - 240V	1-1Ph (42 amps)	21	#7
10kW - 240V	2-1Ph (2 x 21 amps)	21	#8
10kW - 240V	1-3Ph (25 amps)	21	#1
10kW - 240V	2-3Ph (2 x 13 amps)	21	#2
10kW - 480V	1-1Ph (21 amps)	21	#10
10kW - 480V	1-3Ph (13 amps)	21	#3
20kW - 480V	1-1Ph (42 amps)	80	#13*
20kW - 480V	1-3Ph (25 amps)	80	#11*
40kW - 480V	2-1Ph (2 x 42 amps)	80	#8
40kW - 480V	2-3Ph (2 x 25 amps)	80	#2

Sample page of Wiring Diagram Labels. Please apply actual labels to your product.

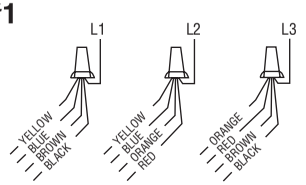
⚠ CAUTION

Before applying rating labels - refer to wiring instructions.
Incorrect wiring could result in an unsafe wattage.

STEP 4: PEEL OFF APPROPRIATE WIRING DIAGRAM AND AFFIX TO INSIDE OF ELECTRICAL ENCLOSURE.

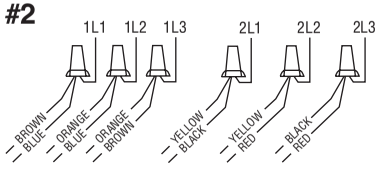
STEP 5: PEEL OFF THE APPROPRIATE VOLTS, CIRCUIT-PHASE, AND kW, AND AFFIX TO NAMEPLATE.

#1



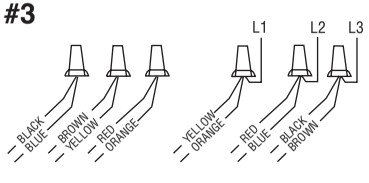
1 CIRCUIT – 3ø (1–3PH)

#2



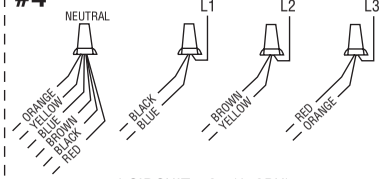
2 CIRCUIT – 3ø (2–3PH)

#3



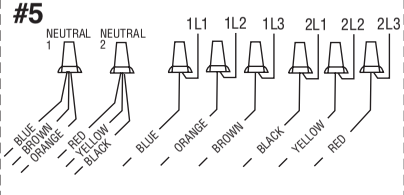
1 CIRCUIT – 3ø (1–3PH)

#4



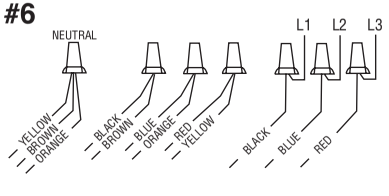
1 CIRCUIT – 3ø (1–3PH)

#5



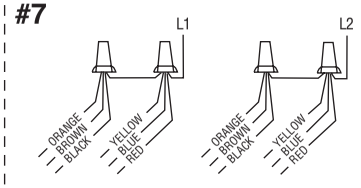
2 CIRCUIT – 3ø (2–3PH)

#6



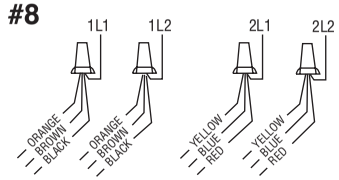
1 CIRCUIT – 3ø (1–3PH)

#7



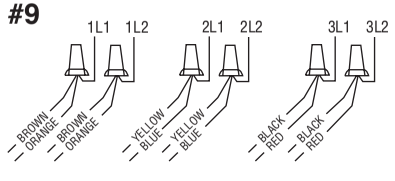
1 CIRCUIT – 1ø (1–1PH)

#8



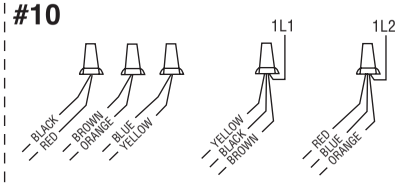
2 CIRCUIT – 1ø (2–1PH)

#9



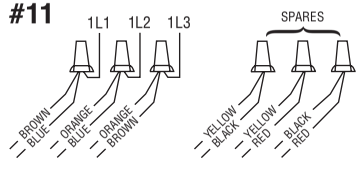
3 CIRCUIT – 1ø (3–1PH)

#10



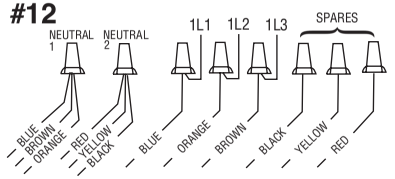
1 CIRCUIT – 1ø (1–1PH)

#11



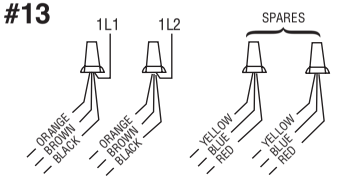
1 CIRCUIT – 3ø (1–3PH)

#12



1 CIRCUIT – 3ø (1–3PH)

#13



1 CIRCUIT – 1ø (1–1PH)

120V	1-1PH	.5kW	.75kW
208V	2-1PH	1.5kW	2.25kW
240V	3-1PH	2.5kW	3.0kW
480V	1-3PH	4.5kW	5.0kW
	2-3PH	6.0kW	9.0kW
		10.0kW	

LIMITED FOR USE ON WATER APPLICATIONS ONLY

- 12kW
- 18kW
- 20kW
- 24kW
- 40kW

NOTES
1. ALL WIRES MARKED 1L1, 2L1, 1L2, ETC. ARE CUSTOMER SUPPLIED CONNECTIONS.
2. ALL WIRES MUST BE CAPPED.

Operation

⚠WARNING

Sheath corrosion can result in a ground fault which depending upon the solution being heated, can cause an explosion or fire.

1. Do not heat solutions that are corrosive to the heating element sheath or the heating chamber.
2. Terminal ends of heater must be protected from drippings, condensation, spray or direct spill-over of material. Their presence at the terminals may damage heater electrical insulation.
3. Liquid flow to the heater should be free of suspended solids.
4. Do not operate heaters at voltages in excess of that stamped on the heater since excess voltage will shorten heater life.
5. Always maintain a minimum of 2" of liquid above the heated portion of the element to prevent exposure of the effective heated length. If the heater is not properly submerged, it may overheat and damage heating elements, tank or contents.

   IMPORTANT: Mount heater in the tank so the liquid level will always be above the effective heated portion of the heater. Provide expansion tank if necessary.

⚠WARNING

If the heater is not properly submerged, the heating elements will overheat and could result in a fire or damaged equipment.

6. Be sure all trapped air is removed from a closed tank. Bleed the air out of the liquid piping system and heater housing prior to energizing.

   N**ote:** The tank or heating chamber in closed tank systems must be kept filled with liquid at all times.
7. Keep heating elements above sediment deposits.

Maintenance

⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before servicing heater. Failure to do so could result in personal injury or property damage. Heater must be serviced by a qualified person in accordance with the National Electrical Code NFPA 70.

1. Heaters should be checked periodically for coatings and corrosion and cleaned if necessary. Correct operating conditions to minimize sheath deterioration. Refer to warnings in operation section.
2. The tank should be checked regularly for sediment around the heater as sediment can act as an insulator and shorten heater life.
3. Remove any accumulated sludge deposits from heater and from tank.
4. Ensure all electrical connections are free of contamination.
5. If corrosion is indicated in the E2 or E4 electrical enclosure, check gasket and replace if necessary. Check screw plug gasket on E4 models and replace if necessary. Check conduit layout to correct conditions that allow moisture to enter the electrical enclosure.
6. Periodically check temperature control operation to insure accurate and safe process operation.
7. Check all electrical connections periodically and retighten connections which may have loosened in service. Replace wire and wire terminals which show signs of oxidation which would interfere with establishment of reliable electrical connections.

   Note: User is responsible for maintenance schedule based on their knowledge of the heated medium and operating conditions.

Renewal Parts Identification

Parts Common to all PCN's	
Thermocouple 12" (Type "J")	309-304460-012
Thermocouple 24" (Type "J")	309-304460-024
Bayonet Fitting	001-027343-007

Limited Warranty:
Please refer to the Chromalox limited warranty applicable to this product at
http://www.chromalox.com/customer-service/policies/termsofsale.aspx.

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