

IE - Cable Installation

- 1) Cut outer jacket of cable to desired length, taking care not to damage the insulation on the internal power wires (See figure 7.)
- 2) Apply compression nut over end of cable.
- 3) Apply connector ferrule over end of cable.
- 4) Place threaded insert over end of cable.
- 5) Place cable with insert, ferrule and nut into the connector body until the insert sits firmly in the bottom of the connector body interior.
- 6) Slip the connector ferrule along the cable until it is seated against the connector body.
- 7) Hand tighten the compression nut firmly onto the connector body threads.
- 8) Place sealing ring onto the connector body.
- 9) Insert assembly into a 7/8-inch (22mm) diameter hole (or appropriately sized hole) in panel or box opening.
- 10) Secure the assembled connector into the panel or box using the locknut, making sure that the sealing ring is between the connector body and the panel or box.
- 11) Taking care not to damage the insulation on the internal power wires, carefully strip the power wires as required to connect to the appropriate relay or control device.

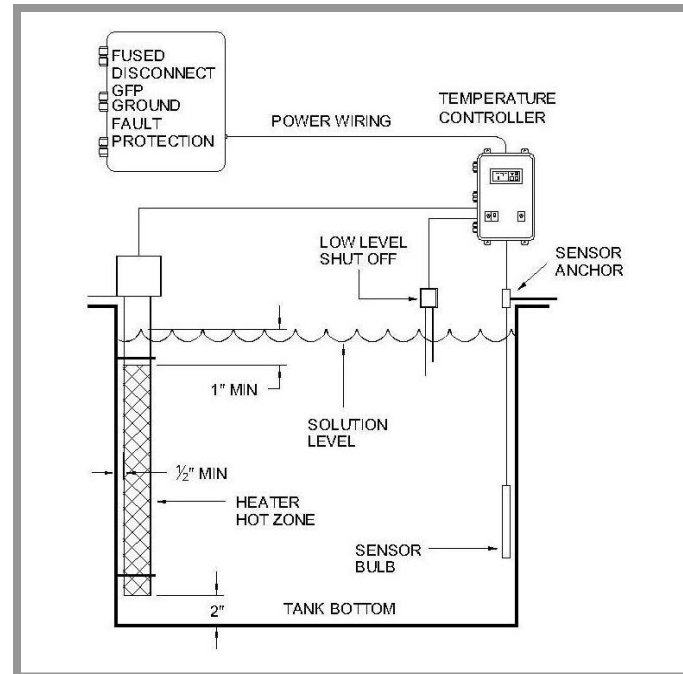


Figure 6: Typical Tank Setup

Important Wiring Notes (Repeated from Section 1C: Wiring Notes)

- All SafeOne heaters will have a *temporary* current surge when energized. This is a normal occurrence. This surge will last around 60 seconds, and should not trip a properly sized time delay fuse. After the first minute of operation, the electrical current will return to its normal value.
- Because the SafeOne heaters have no separate over-temperature protection device, the electrician may need to bypass the wiring terminals for these items in a temperature controller equipped for these devices (See step 9 in Section 1D: Heater Installation).

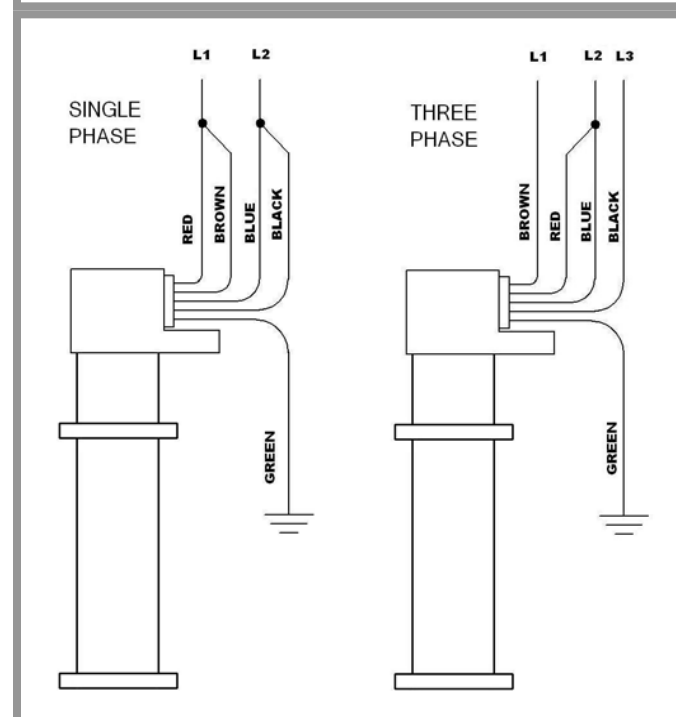


Figure 2 (repeated): Heater Wiring (Single and Three Phase)

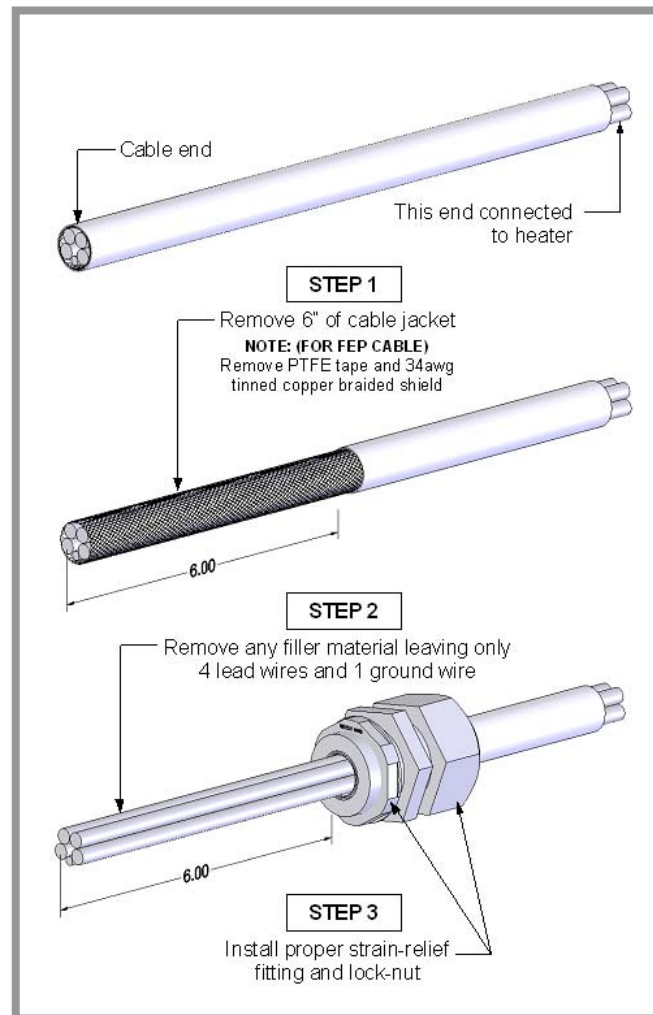


Figure 7: Cable Stripping/Trimming Steps

Getting Started

Quick Reference Guide

Important

Please review this entire document and all information included with this product before beginning installation or setup. Save these instructions as reference material for product installation and maintenance.

This heater is a component part for a heating system typically used to heat open-top process tanks containing aqueous solutions.

IA - Heater System Requirements

Listed below are **minimum** system requirements. "Shut-off" provides the ability to interrupt power if pre-determined values are exceeded.

- **High Solution Temperature Detection** to shut-off if the solution temperature exceeds value.
- **Solution Level Detection** to shut-off if the solution level falls below value, exposing the heater's Hot Zone. This helps prevent an overheat hazard.
- **Temperature Control** with sensor detection for failed (open or shorted) temperature sensors to prevent an overheat hazard, as heating control circuitry permits heater power until the temperature reaches its set value.
- **Ground Fault Detection** to detect ground fault leakage (electrical power conducted through earth ground) and shut off if current exceeds value.
- **Total Earth Ground Resistance** is less than 5 ohms; including resistance from grounding conductors connecting heater to earth ground.



Warning



Ignition Source



Shock Hazard

Electric immersion heaters will damage many plastic tanks such as polypropylene and polyethylene, and can subject personnel to a shock hazard if not properly installed and maintained. All heaters must be equipped with a ground fault detection device and must have liquid level control to reduce the potential of exposed heated surfaces and tank damage. It is the customer's responsibility to purchase, install and maintain ground fault and liquid level protection.

Prior to removing and inspecting heaters, it is strongly recommended that you turn off all power. Although the heater and tank are grounded, the probability of full line voltage resident in the tank is high if heater sheath fails. Adhere to all System Requirements in electric immersion heater applications to help prevent electrical shock. If heater is improperly installed and maintained or installed without a properly engineered control system, a serious fire and personnel hazard is present.

Do not use electric immersion heaters to heat flammable solutions.

IB - General Guidelines

Always follow installation instructions, wiring diagrams and these general guidelines to ensure optimal performance and heater life longevity.

Cooldown Before Removal

Never remove heaters from solution while at operating temperatures as personnel may be exposed to hot surfaces. Power down and allow heater to cool for five to ten (5 to 10) minutes before removal or drainage of the tank.

Heater Cleaning and Maintenance

Sludge and particle buildup on or around heater results in excessive temperatures that reduce the output of a heater and may affect sheath corrosion rates. Ensure installation provides sufficient excess power line for easy cleaning/maintenance. Check heaters frequently for buildup and clean if accumulation is present.

- Turn off power before beginning maintenance. Wear appropriate protective clothing for removal and inspection.
- Use care when maintaining heaters. Scraping the surface can destroy fluoropolymer sheaths and remove passivation surfaces on metal heaters. Never hammer heaters to remove buildup deposits.
- Consult with your process supplier for chemical sludge removal procedures.

IC - Wiring Notes

Important Wiring Notes

- All SafeOne heaters will have a *temporary* current surge when energized. This is a normal occurrence. This surge will last around 60 seconds, and should not trip a properly sized time delay fuse. After the first minute of operation, the electrical current will return to its normal value.
- Because the SafeOne heaters have no separate over-temperature protection device, the electrician may need to bypass the wiring terminals for these items in a temperature controller equipped for these devices (See step 9 in Section 1D: Heater Installation).

Power Wiring

Size/route wires to latest edition NEC (U. S. Customers) ; connect to manufacturer temperature controller.

Three Phase Current Rating

The three phase current on single phase heater nameplates only applies when field installing/assembling three (3) identical single phase heaters in a three phase delta arrangement. Each element to be rated at phase-to-phase voltage. **Do not wire in the three phase WYE (star) connection as irreparable damage to the heater will occur.**

Fusing

Only use time delay fuses suitable for branch circuit protection. Fast acting fuses such as semiconductor type fuses may be tripped by the partial inductive load of this device.

ID - Heater Installation

Unpacking and Inspection

Fluoropolymer heaters are very fragile and require care when handling and assembling.

Use extreme care when handling equipment, as fluoropolymer sheaths can be irreparably damaged by the slightest nick or cut. Never use knives or any other sharp instrument to open heater wrapping.

- 1) Unpack your equipment and thoroughly inspect each product for damage that may have occurred during shipping. Should damage exist, notify the carrier immediately for instructions and filing claims.

Do not operate damaged products.

(Warning: Heater contains aluminum which could react with caustic solutions. Never operate or submerge any damaged or perforated heater in a caustic solution.)

- 2) Locate the heater nameplate tag which provides voltage and amperage information. Identify heater style and refer to the packing list and purchase order to verify you have the correct equipment, see figures for reference.
- 3) If all data on the nameplate matches the information provided on the packing list and purchase order, review the installation location to identify and verify the following:
 - Line voltage is in agreement with nameplate information.
 - The process tank is equipped with a low solution level detection shutoff device.
 - The temperature controller is properly sized for the line voltage and amperage of the heater(s).
 - Heater sheath material is compatible with the solution to be heated. Consult with your chemical supplier and refer to the Process Technology *Immersion Heater Solution Guide* for a list of various solutions and the applicable heater sheath material.
 - If the line voltage or heater sheath material is not correct, do NOT install or operate heater.
- 4) ASSEMBLY: For heaters to be mounted on the sidewall of the tank, the mounting flange must be assembled:
 - Snap the two halves of the mounting flange around the heater head in the desired direction. The flange should fit into the groove on the heater head (see figure 1).
 - Make sure the two pieces of the mounting flange are fastened securely to each other.
 - Recommended: Use CPVC glue to permanently attach the two halves of the flange together.

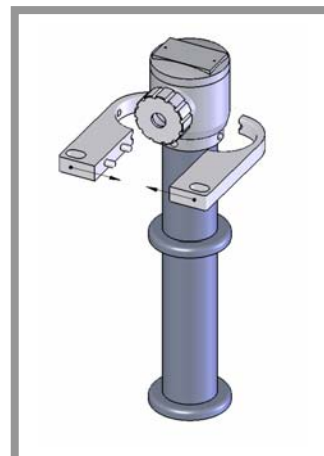


Figure 1: Mounting Flange Assembly (OTS Heaters)

ID - Heater Installation (Continued)

- 5) Review installation location to identify and verify the following items (see figure 6):
 - Hot zone must be totally immersed at all times – the cold length of the heater must be long enough to prevent exposing the top of the heater hot zone.
 - Low solution level detection with heater power shutoff provides the ability to interrupt heater power if the solution level falls, exposing the hot zone of the heater. Level controls must be used, set at least 1-inch (25mm) above the hot zone.
 - Minimum ½-inch (13mm) clearance between heater sheath and tank at all points.
 - Minimum 1-inch (25mm) tank freeboard above the heater hot zone is required to prolong heater life. If solution level drops below the hot zone, it may shorten the life of the heater and may damage plastic lined tanks.
 - Heaters need to be mounted in locations away from contact with work. Minimum 2-inch (50mm) clearance above any parts/sludge accumulation on bottom of tank.
 - Heater heads should be protected from splashing, dripping or excessive moisture. Do not operate electric heaters under tank covers and always provide adequate ventilation.
 - Isolate heaters from any electrified source. Heaters should not contact anodes, cathodes, any electrified portions of the tank, racks or parts at any time.
 - Connect the heater ground leads to the building ground (or rectifier ground) to prevent voltage potential difference.
 - Heaters need to be inspected periodically and cleaned when any buildup appears on the surface. This buildup restricts heat transfer resulting in decreased heat output, higher internal temperatures, increased corrosion and reduced service life.
 - Heater junction box is sealed. Do not attempt to open.
- 6) Carefully mount heater (and guard if applicable) securely to tank.
- 7) WIRING: Route heater cable in protected area to control. Size and route wiring to NEC latest edition. Standard heater wiring consists of the following colors:
 - Red – power lead
 - Blue – power lead
 - Brown – power lead
 - Black – power lead
 - Green/Yellow – ground leadPlease refer to figure 2 to illustrate single and three phase wiring for a single heater.
- 8) Install the control. Secure the sensor or place in a suitable thermowell to prevent movement that could lead to erroneous readings and a dangerous overheat condition. Install the top of the sensor bulb below the minimum liquid level and always above the bottom of the heater. A mislocated or floating sensor can result in an overheat condition which could result in a significant fire hazard in plastic tanks.
- 9) If the control includes wiring terminals for a high temperature cutoff device (i.e. PI, PII, PIII), then install a jumper wire across these terminals. **CAUTION: Never operate any standard resistance wire heater without some means of thermal protection.**

ID - Heater Installation (Continued)

- 10) Set low level shut-off at least 1-inch (25mm) above the top of the heater hot zone.
- 11) Install the junction box per NEC latest edition (U. S. customers). Mount on an ambient surface. Using approved splice connectors, install a 60°C wire (minimum – based upon nameplate amperage).

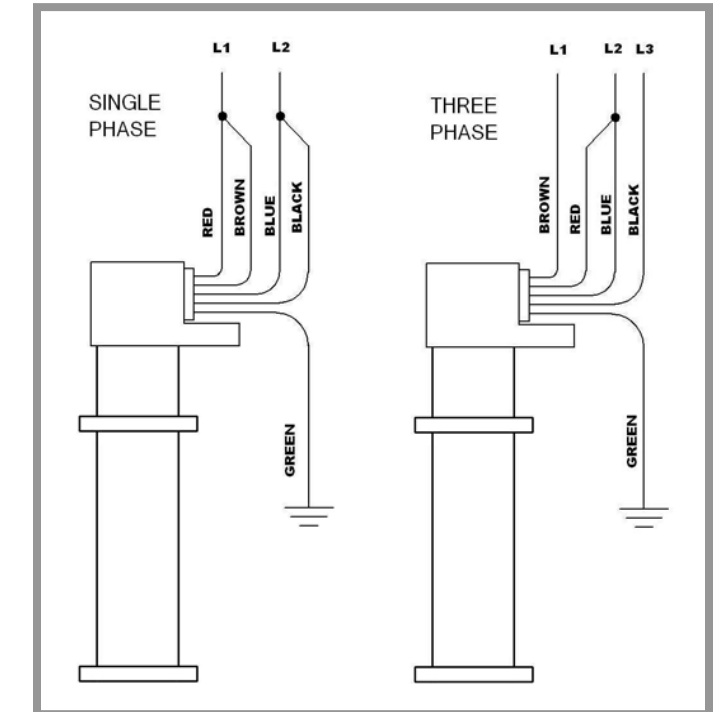


Figure 2: Single Heater Wiring (Single and Three Phase)

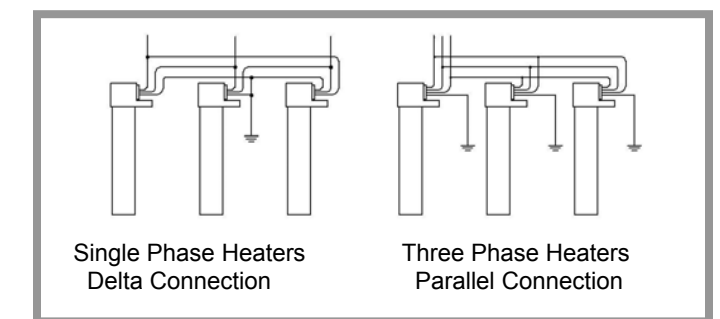


Figure 3: Multiple Heater Wiring: Three Phase (Branch fusing and control circuitry not shown)

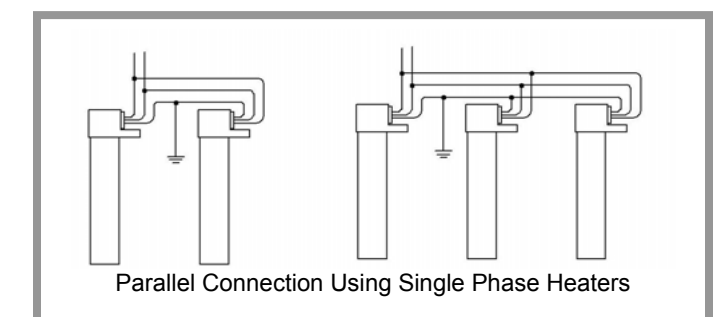


Figure 4: Multiple Heater Wiring: Single Phase (Branch fusing and control circuitry not shown)