

Section 1D – Heater Installation (continued)

Mounting and Wiring

- 1.) Carefully mount heater (and guard if applicable) securely to tank.
 - 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 shut-off provides the ability to interrupt heater power if the solution level falls, exposing the heater Hot Zone. Therefore, liquid level controls must be used.
 - Heater Hot Zone must be kept at minimum ½ -inch (13mm) clearance between heater sheath and tank at all points.
 - A 1-inch (25mm) minimum 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 or plastic-lined tanks.
 - Minimum 2-inch (50mm) clearance above any parts accumulation /sludge on bottom of tank.
 - Isolate heaters from any electrified source. Heaters should not contact anodes, cathodes, any electrified portions of tank, racks or parts at any time.
 - Heater heads should be protected from splashing, dripping and excessive moisture. **Do not operate heaters under covers and always provide adequate ventilation.**
- 2.) Route heater power lead wires along with ground lead through conduit. Size and route power wiring to NEC latest edition. Standard wiring consists of the following colored wire:
 - black—power leads
 - green—ground leadConnect the heater ground leads to the building ground (or rectifier ground) to prevent voltage potential difference.
If installing flexible nonmetallic conduit, properly install connector ferrule to ensure liquid-tight operation. See section 1E.
- 3.) Install the control. Secure the sensor or insert 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 but above the bottom of the heater. An incorrectly located or floating sensor can result in an overheat condition.

- 4.) If the control includes wiring terminals for a high temperature cutoff device (i.e. P1, P2, P3), then install a jumper wire across these terminals as SmartOne PTC heaters do not utilize external thermal protectors. If you utilize resistance heaters, observe the following caution:

CAUTION: *Never operate any standard resistance wire heater without some means of thermal protection.*



- 5.) Set low level shut-off at least 1-inch (25mm) above the top of heater Hot Zone.
- 6.) Install the junction box per NEC latest edition. Mount on an ambient surface. Using approved splice connectors, install a 60° Celsius wire (minimum—based on nameplate amperage).

Section 1E – Conduit Installation

See Figure 3 for illustration of Conduit.

- 1.) Cut conduit end square.
- 2.) Apply compression nut over end of conduit.
- 3.) Apply connector ferrule over end of conduit.
- 4.) Place threaded insert into end of conduit.
- 5.) Place conduit 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 conduit 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 (or appropriately sized) hole in panel or box opening.
- 10.) Secure the assembled connector into the panel or box using the locknut, ensuring that the sealing ring is between the connector body and the panel or box.

Getting Started

Quick Reference Guide

For SmartOne® Industrial Series Heaters

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.

Introduction

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

Section 1A – Heater System Requirements

Listed below are **minimum** system requirements. Shutoff provides the ability to interrupt power if predetermined values are exceeded.

- **Ground Fault Detection** to detect ground fault leakage (heater power conducted through earth ground) and shut-off if current exceeds value.
- **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 Hot Zone of the heater. 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.
- **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 short circuit protection fuse or circuit breaker, a ground fault detection device, and must have a 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 short circuit, 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.***

Section 1B – General Guidelines

Always follow installation instructions, wiring diagrams and these general guidelines to ensure safe, optimal performance and heater longevity. Consult the Authority Having Jurisdiction (AHJ) for adherence to local National Electric Code (NEC) requirements.

Cooldown Before Removal

Never remove heaters from solution while at operating temperature as personnel may be exposed to hot surfaces. Power down and allow heater to cool for ten to fifteen (10–15) minutes before removal or drainage. Verify heater is at ambient temperature before handling.

Heater Cleaning and Maintenance

Sludge and particle buildup on or around heater results in excessive temperatures that reduce the output of the heater and may affect sheath corrosion rates. Ensure installation provides sufficient slack in conduit (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 personal protective equipment (PPE) for removal and inspection.
- Use care when maintaining heaters. Scraping the surface can remove passivated surfaces on metal heaters. Never hammer heaters to remove built-up deposits.
- Consult with your process supplier for chemical sludge removal procedures.

Section 1C – General Wiring Notes

Important Wiring Notes

- SmartOne® heaters will have a *temporary* current surge when energized. This is a normal occurrence for Positive Temperature Coefficient (PTC) heaters. This surge will dissipate and should not trip a properly sized time delay fuse. Within the first minute of operation, the electrical current will return to its normal value.
- Because the SmartOne® heaters require no separate external overtemperature protection device, an electrician may need to bypass the wiring terminals for these items in a temperature controller equipped for these devices (see step 4 in Section 1D: Heater Installation – Mounting and Wiring).

Power Wiring

Size/route power wires to latest edition NEC; connect to an appropriate 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 is rated at a phase-to-phase voltage. **Do not wire in the three phase WYE (star) connection as irreparable damage to the heater can occur.**

Fusing

Only use time delay fuses suitable for branch circuit protection. Fast acting fuses such as semiconductor-type fuses may be opened by the initial inrush of this device.

Section 1D – Heater Installation

Unpacking and Inspection

- 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 instruction on filing claims.
Do not operate damaged products.
- 2.) Locate the heater nameplate tag, which provides wattage and voltage information. Identify heater style and refer to the packing list and purchase order to verify you have received the correct equipment.
- 3.) If all data matches, review installation location to identify and verify the following items:

- Line and heater voltages are in agreement.
- Fused disconnect or circuit breaker is correct, of sufficient capacity, and sized per NEC, latest edition.
- Process tank is equipped with a Low Solution Level Detection shut-off device.
- The correct size and type of temperature controller (thermostat) for heater voltage and amperage requirements. Confirm the controller also has circuitry provisions for the Low Solution Level Detector.
- Confirm that the heater sheath material and the heated solution are chemically compatible.

If any of this is incorrect, do **NOT** install or operate the heater.

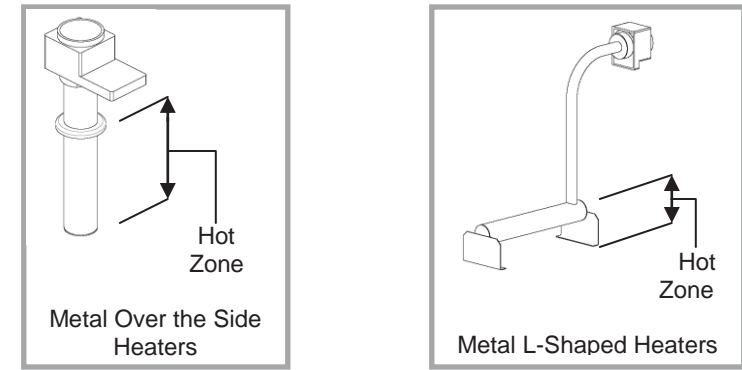


Figure 1: Typical Heater Types

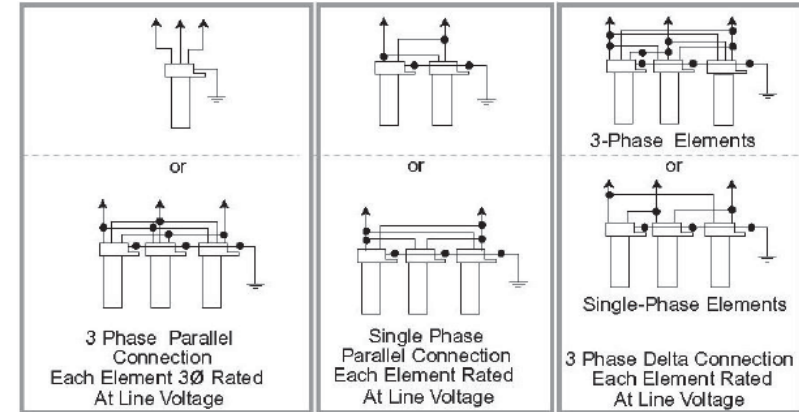


Figure 2: Single and Three Phase Connection Wiring Diagrams

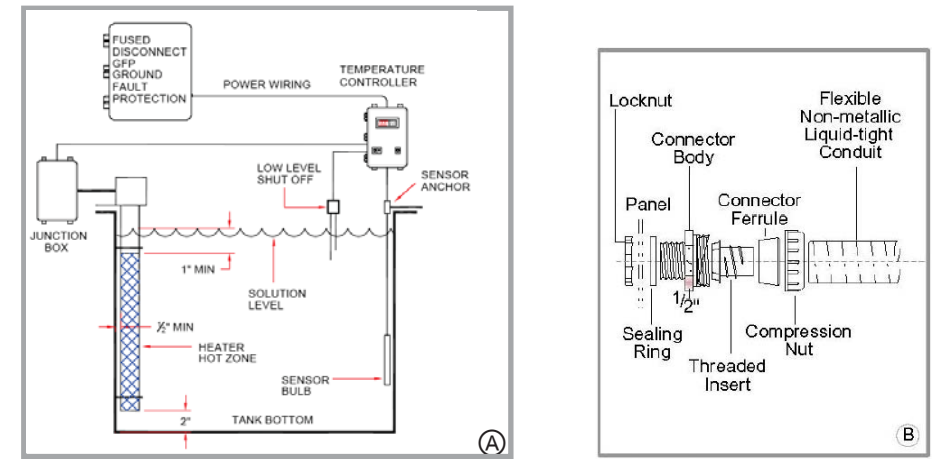


Figure 3: Typical Installation in a Process Tank (A), Flexible Non-Metallic Conduit Connection Installation (B)