



# Installation, Operation and Maintenance Instructions

## 1. Heater Construction Characteristics:

- 1.1. High quality resistance wire held in place by compacted Magnesium Oxide refractory enclosed in a wide variety of sheath materials.
  - 1.2. Variety of (low to high) watt densities.
  - 1.3. Standard selection of sheath materials include copper, steel, INCOLOY® alloy and stainless steel (AISI304, AISI316L). This broad selection of sheath materials will operate successfully in many corrosive solutions.
  - 1.4. Pipe flange sizes in 3, 5, 6, 8, 10, 12, 14 inches are standard. Other sizes are also available upon request.
3. 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.
  4. 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.

**Important note:** It is the responsibility of the purchaser of the heater to make the choice of sheath material based upon their 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 !

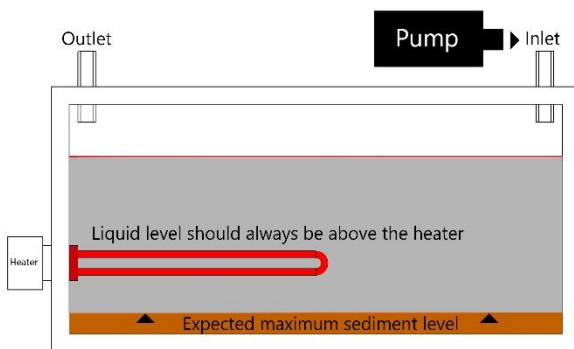
1. Sheath corrosion can result in a ground fault which, depending upon the solution being heated, can cause an explosion or fire.
2. An integral thermostat, if provided, is designed for Temperature control service only. Because the thermostat does not fail safe, it should not be used for temperature limiting duty. Wiring to this device is the responsibility of the user.



## INSTALLATION

### Important notes:

1. Before installing, unpack and check the heater for any damage that may have occurred during shipment. Report any claims to your carrier if damage has occurred in shipment. **Do not operate damaged equipment.** Consult factory for instructions.
2. Check to ensure that the line voltage is the same as that stamped on the nameplate. Verify wattage and capacity versus the requirements at installation site.
3. Do not bend the heating elements. If bending is necessary, consult factory.
4. Mount the heater in the tank so that the liquid level will always be above the effective heated portion of the heater. If the heater is not properly submerged, it will overheat and damage the heating elements.



### WARNING !

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

5. Heater must not be operated in sludge.
6. The gasket surface must be clean and dry before the heater is seated

When heating in closed vessels, controls and back-up controls must be used to prevent buildup of temperature and/or pressure.

1. Place heater at an elevation so that natural circulation can take place.
2. 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 enclosure prior to operation.
3. **Important:** Heater should never be located at the highest point of the water system. Provide expansion tank if necessary.
4. Heaters shall be supported if the immersion length is greater than 36".

### WARNING !

Because of these heaters are capable of developing high temperatures, extreme care should be taken to:

- A. Prefer explosion-resistant terminal enclosures in hazardous locations.
- B. Avoid contact between heater and combustible materials.
- C. Keep combustible materials far enough away to be free of the effects of high temperatures.

**Important:** Do not allow moisture to accumulate in the terminal enclosure. Moisture could lead to electrical shorts! This could result in a fire, damaged equipment or injury.

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

- A. Slope conduit away from enclosure (drip loop).
- B. Seal all conduit openings to moisture/explosion resistant terminal enclosure.
- C. Insulate terminal enclosure.



#### Before energizing:

1. Check that the gasket is in place and the flange is securely bolted to the tank.
2. Check that power supply connections are made according to the wiring diagram. Also check for positive connection of all bus bars and power supply leads.
3. Check all bussing hardware is tightened to 5-10N.m.
4. Check all bussing to element connections are tightened 5-10N.m.
5. Check if the thermocouples are correctly wired and reading the correct temperature values.

#### WARNING

Moisture accumulation in the element refractory material, element over-temperature, or sheath corrosion can cause ground fault to the element sheath, generating arcing and molten metal. Make sure that grounding is properly made.

Install Ground Fault Circuit-Interrupter (GFCI) to prevent personal injury or Equipment Ground Fault Protection to prevent property damage.

## WIRING

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.

1. Electric wiring to heater must be installed in accordance with the National Electrical Code, International Electric code and/or with local codes by a qualified person.
2. When element wattages are not equal, heaters must not be connected in series.
3. Electrical wiring to heater should be contained in rigid conduit or in sealed flexible conduit to keep corrosive vapors and liquids out of the terminal enclosure. If high humidity is encountered, the conduit should slope away from the heater.
4. If flexible cord is employed, a watertight connector should be used for entry of the cord into the terminal enclosure. Outdoor applications require liquid-tight conduit and connectors.
5. Bring the power line wires through the opening in the terminal box.
6. Heating elements are prewired and tagged for easy installation of electrical wiring to the heater.
7. Check the provided wiring diagram.

8. Check for loose terminal connections and tighten if necessary.
9. Check voltage and phase on the heater nameplate.
10. The current carrying capacity of the power supply leads should exceed the heater amperage by at least 25%. Be sure to consider the ambient operating temperature and apply the appropriate correction factor to the ampacity rating of the wire. Heaters with the same voltage and wattage may be connected in series for operation at a higher voltage.

#### Maximum Temperatures

Safe operation in a hazardous location requires the maximum operating temperatures of all exposed surfaces of the heater including temperatures on the outside of the vessel, piping, flanges, screw plugs, enclosures and other heat conducting parts be limited. The flammable liquids, vapors or gases present determine the maximum surface temperature permitted in any hazardous location. The end user or purchaser of the electric heating equipment is responsible for determining the proper classification of an area and for providing ISIN with hazardous area specifications and requirements for proper equipment design.



## OPERATION

1. Do not operate heaters at voltages in excess of that stamped on the heater since excess voltage will shorten heater life.
2. Always maintain a minimum of ~25mm (~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 drastically shorten heater life. **DO NOT OPERATE HEATER IF DRY.**
3. Be sure all trapped air is removed when using a closed tank. Bleed the air out of the liquid piping system and heater enclosure prior to energizing. The tank or heating chamber in closed tank systems must be kept filled with liquid at all times.
4. **Low Megohm Condition** — The refractory material used in electric heaters may absorb moisture during transit, storage or when subject to humid environments that will reduce the cold insulation resistance (low megohm). Low megohm may result in high leakage current to ground and nuisance trips of ground fault protection equipment.

Normally, the megohm value increases after heat-up.

Typical insulation values are 5 megohm or greater on complete assemblies of unsealed elements or 20 megohm on individual unsealed elements. It is recommended that heaters with 1 megohm or less be dried out before applying full power. If dried properly low megohm will not affect heater life or efficiency. To correct a low megohm condition, remove terminal enclosure cover, gaskets, and terminal hardware. Bake heaters in an oven at 175-200°C (350-390°F) for several hours or preferably overnight. If baking is not an option, an alternate procedure is to cycle the heater in 10-to-15-minute periods at low voltage until megohm values are normal. Sheath temperatures should not exceed 175°C (350°F).

**Note:** Low megohm on heating elements with epoxy or hermetic seals cannot be serviced in the field. Typical resistance values when sealed are 200 megohm or greater. Contact manufacturer for service.

## MAINTENANCE

Disconnect all power before installing or servicing heater. Failure to do so could result in personal injury or property damage.

1. Heaters should be checked regularly for coatings and corrosion and cleaned if necessary.
2. The tank should be checked regularly for sediment around the heater as sediment can act as an insulator and shorten heater life.  
**Note:** User is responsible for maintenance schedule based on their knowledge of the heated medium and operating conditions.
3. Remove any accumulated sludge deposits from heater and from tank.

4. Check for loose terminal connections and tighten if necessary.
5. If corrosion is indicated in the terminal enclosure, check terminal enclosure gasket and replace if necessary. Check conduit layout to correct conditions that allow moisture to enter the terminal enclosure.
6. Clean terminal ends of all contamination.
7. Check Thermocouple/thermostat wiring, make sure that they are measuring the right value. If in doubt, replace them with new ones.
8. Do not energize the heater without the use of thermocouple/thermostat. The heater is capable of heating up quickly.



9. Check the temperature controllers, check its wiring and make sure its settings are correct.
10. Check the fuses, contactors, relays for loose wiring, tighten them if needed.
11. Relays & contactor coils may get stuck over long period of usage. Make sure they are functioning as it should. Replace them if it has been used for a long time. Stuck relay switches or contactor coils may cause overheating which may result in damaging the equipment.
12. The heater can be protected from possible mechanical damage by placing a screen or grill around the elements.
13. Protect the terminal end of the heater from spray, condensation, dripping and vapors. A protective terminal enclosure should be used if the heater is to be subjected to these conditions.
14. If the heater is to be operated in the presence of explosive vapors or dust, an explosion resistant terminal enclosure must be provided.
15. Do not set the temperature controllers above the boiling point of the liquid. The boiling liquid could create a steam pocket which could cause the element(s) to overheat and burn out.
16. Periodically, remove the heater from the tank to inspect the elements for signs of corrosion and remove any deposits from the sheath. **BE SURE POWER IS DISCONNECTED BEFORE REMOVING ELEMENTS.**
17. Be sure the sheath material is compatible with the material being heated. Copper sheathed elements are used to heat water. Steel sheath elements are used to heat oil, alkaline, wax and other similar materials. Stainless steel and Incoloy sheathed elements are most often used for heating water and corrosive solutions. If unsure, check with the supplier of the material or factory for a recommendation of a suitable sheath material.
18. Make sure the watt-density of the heater is not higher than suitable for the material being heated.

The velocity, viscosity, thermal conductivity of the material and operating temperature are all factors in determining the allowable watt-density of the element. Consult factory if in doubt about the proper watt-density for the heater in a particular application.

19. When heating liquids in a large tank, the use of several heaters will provide more uniform heat distribution than a single large heater.