

# Chromalox®

## Installation Instructions

### SERVICE REFERENCE

DIVISION 4	SECTION GS, GT
SALES REFERENCE (Supersedes PD442-1)	PD442-2
161-562650-001	
DATE	DECEMBER, 2004

## Chromalox Type GS and GT Series Over-The-Side Immersion Heaters



GS or GT



GSL3 or GTL3

### GENERAL

#### ⚠ WARNING

**FIRE/EXPLOSION HAZARD: This heater is 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 explosion or fire.**

Chromalox type GS and GT over-the-side immersion heaters are designed primarily for corrosive baths and available in a variety of sheath materials. 316 stainless steel and titanium sheets are standard.

#### ⚠ 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. Chromalox cannot warrant any electric immersion heater against failure by sheath corrosion if such failure is the result of operating conditions beyond our control.**

1. Heater Construction Characteristics
  - A. High quality resistance wire held in place by ceramic core and magnesium oxide in various sheath materials.
  - B. Medium and low watt densities.
  - C. Epoxy filled cavity to prevent entry of contaminants.
  - D. Over-temperature protection.
  - E. Flexible conduit 3' long with 6" leadwire extension.

#### ⚠ 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 the type GS or GT heater, inspect it for possible damage which may have occurred during shipment. Also, check to insure that the line voltage is the same as that stamped on the nameplate.
2. **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

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

3. Where work will pass over or near equipment, additional protection, such as a guard, may be needed.
4. In an electroplating operation the heaters are not, under any circumstance, to be placed between the electrodes and the work.
5. When melting solids by direct immersion, a surface vent should be provided to allow gases to escape. Operate the heater on half voltage until melted material completely covers the heater area.
6. A drip loop is recommended to minimize passage of moisture along wiring into terminal box and connections.

### ⚠ WARNING

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

- A. Avoid contact between heater and combustible material.
- B. Keep combustible materials far enough away to be free of the effects of high temperatures.

## 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.**

1. Electrical wiring to heater must be installed in accordance with the National Electrical Code and local electrical codes by a qualified person.
2. When element wattages are not equal, heaters must not be connected in series.

**Representative wiring diagrams for heaters with Single use fuse (F) or Resettable fuse (RF) —**

Single phase heater circuit using a SPST thermostat. Line Voltage and/or current do not exceed thermostat or thermal fuse rating (Figure 3).

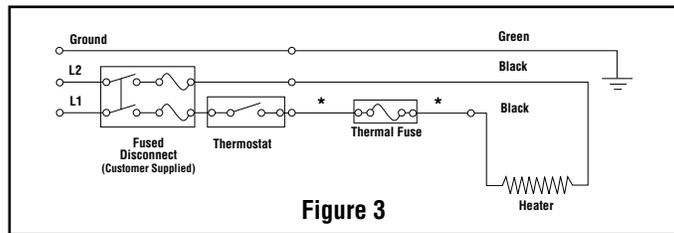


Figure 3

One Single phase heater or (3) single phase heaters equal in size and each having a thermal fuse wired as a 3 phase heater circuit using a DPST thermostat. Line voltage and current do not exceed thermostat or thermal fuse(s) rating (Figure 4). Dotted line and L3 indicate 3 phase connections.

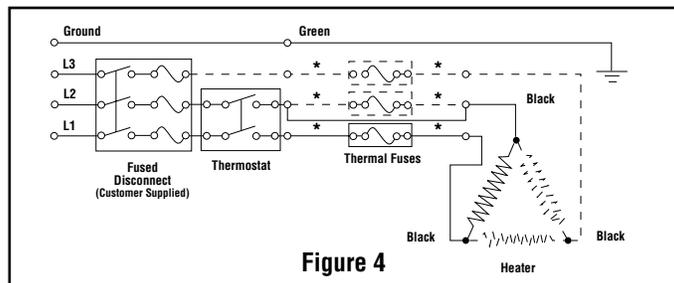


Figure 4

Single phase or 3 phase heater circuit. Line voltage and/or current exceeds thermostat or thermal fuses ratings (Figure 5). Dotted line and L3 indicate 3 phase connections.

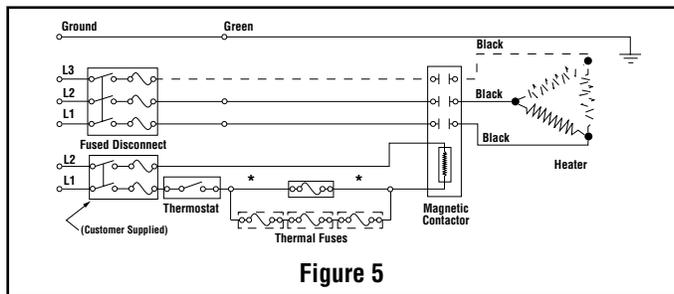
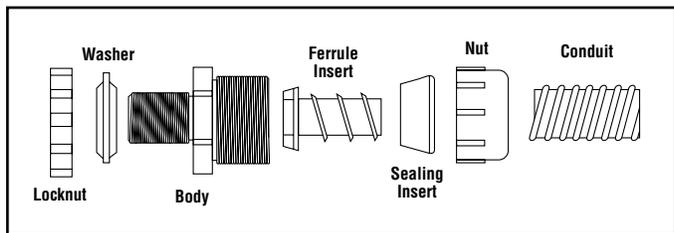


Figure 5

### Flexible Conduit Fittings —



1. Cut conduit. Slide nut and sealing insert onto the conduit.
2. Screw the ferrule insert into one end of the flexible conduit.
3. Seat the ferrule insert inside of the body, seat the sealing insert and hand tighten the cap onto the body.
4. Repeat steps 1 thru 3 above for the other end of the conduit, after pulling the wires.
5. If the fitting is used in a threaded hole, first thread the body into the hole then follow steps 1 thru 3.
6. If the fitting is used thru an opening\* use the locknut and plastic washer to fasten it.

\* Opening for 1/2" NPT thread is 7/8".

## OPERATION

1. Do not operate heater at voltages in excess of that stamped on the heater since excess voltage will shorten heater life.
2. Always maintain a minimum of 2" of solution 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, create a hazard of fire and shorten heater life. *Do not operate heater if dry.*
3. Sludge should not be allowed to build-up to the point where it contacts heater, as this can lead to premature heater failure. Sludge legs are standard on L-shaped heaters. *Heater must not be operated in sludge.*

## MAINTENANCE

### **⚠ 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. Heaters should be checked periodically for coating and corrosion buildup and cleaned if necessary.
2. Tank should be checked regularly for sediment around the elements, as sediment can act as an insulator and shorten heater life.
3. Check for loose terminal connections.
4. If corrosion or moisture is indicated in the terminal housing, check the conduit layout to correct the conditions that allow corrosion or moisture to enter the terminal housing.

## THERMAL FUSE INSTALLATION/REPLACEMENT

### **⚠ 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.**

The Thermal fuse device must be properly installed and these procedures followed or heater failure or fire may result.

A liquid level control is a must as an additional safety feature to help minimize the possibility of fire.

1. Make sure all electrical power to the heater is shut-off.
2. Unscrew the head cover. Remove the wire nuts from the fuse leads and save for re-use.
3. Remove the "Sealing Putty" and pull the Thermal fuse out of its well. Clean the "putty" out of the well and save for re-use.
4. Check the Thermal fuse and the inside of the well to see if it is wet. If wet inside, dry out well. Immerse the tube into the solution. If moisture appears again inside the well **DO NOT** use the heater! Call the factory for further advice.
5. If the removed Thermal fuse is dry, proceed by using it as a guide to cut and strip the wires of the new Thermal fuse.
6. Re-connect the Thermal fuse leads to the extension leads using the original wire nuts.
7. Re-insert the Thermal fuse into the well making sure it is "fully seated" to the bottom of the well.
8. Re-seal using the original "sealing putty" or an RTV type sealant.
9. Replace the head cover, return the heater to the tank.
10. Turn the power back on.

### **Thermal Fuse Temperature System —**

Be sure and satisfied that your process bath tanks are as well protected as possible from tank leaks, excessive evaporation, tank refill failures, and worker error.

Grounded Electric Immersion Heaters are practical, efficient and safe when used properly and installed in tanks that have proper solution levels, good ventilation, trained operators and safeguards such as liquid level controls and Thermal fuse over-temperature sensors.

Thermal fuse systems help reduce the hazards created by low liquid levels and when properly seated and wired, they will cut off the power to the heaters, thus avoiding the extreme temperatures resulting if solution levels are low enough to expose heater hot zones.

### **Single Use Fuse (F) —**

Sensor consists of a one-time thermal fuse which is standard on all GS and GT over-the-side heaters.

The F thermal fuse is wired in series with the controller. To operate properly the fuse must be fully seated to the bottom of the thermowell tube. When the fuse "blows", shut off the main power to the heater, remove the spent fuse and install the new fuse. Refill the tank to proper level prior to turning power back on. Replacement thermal devices must be purchased from Chromalox.

### **Resettable Fuse (RF) —**

Sensor consists of a Bi-metallic thermostatic sensor, an audible alarm, alarm relay, and reset button.

The RF System operates on the same principle as the F except that the sensor does not "blow". It operates as a Bi-metallic thermostat which "opens" and sounds the alarm. The reset button must be pushed to re-activate the heater and control, after the solution level in the tank has been raised to the proper level.

### **⚠ WARNING**

**FIRE/SHOCK HAZARD: Before replacing fuse, make sure the cause of the "failure" has been detected and corrected.**

## THERMAL FUSE INSTALLATION/REPLACEMENT (con't.)

### Thermal Fuse Replacement Protection Devices

Model Number	Used On
F, FM, FH RF, RFM, RFH	Standard OTS Heater
FL, FLM, FLH RFL, RFLM, RFLH	L-Shaped OTS Heater

F Amp Capacity - 25 Amps; RF Amp Capacity - 5 Amps;  
Blank (low) Temp = 180°F; M (Medium) Temp - 230°F; H (High) Temp = 300°F.  
(Max Process Temperature)

Medium temp. most common for this style heater.

RF sensors require additional control components which include a Relay, Audible Alarm, and Manual Reset Pushbutton.

Specify 120 or 240 V when ordering.

### WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

Chromalox warrants only that the Products and parts manufactured by Chromalox, when shipped, and the work performed by Chromalox when performed, will meet all applicable specification and other specific product and work requirements (including those of performance), if any, and will be free from defects in material and workmanship under normal conditions of use. All claims for defective or nonconforming (both hereinafter called defective) Products, parts or work under this warranty must be made in writing immediately upon discovery, and in any event, within one (1) year from delivery, provided, however all claims for defective Products and parts must be made in writing no later than eighteen (18) months after shipment by Chromalox. Defective and nonconforming items must be held for Chromalox's inspections and returned to the original f.o.b. point upon request. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Notwithstanding the provisions of this WARRANTY AND LIMITATION Clause, it is specifically understood that Products and parts not manufactured and work not performed by Chromalox are warranted only to the extent and in the manner that the same are warranted to Chromalox by Chromalox's vendors, and then only to the extent that Chromalox is reasonably able to enforce such warranty, it being understood Chromalox shall have no obligation to initiate litigation unless Buyer undertakes to pay all cost and expenses

thereof, including but not limited to attorney's fees, and indemnifies Chromalox against any liability to Chromalox's vendors arising out of such litigation.

Upon Buyer's submission of a claim as provided above and its substantiation, Chromalox shall at its option either (i) repair or replace its Products, parts or work at the original f.o.b. point of delivery or (ii) refund an equitable portion of the purchase price.

THE FOREGOING IS CHROMALOX'S ONLY OBLIGATION AND BUYER'S EXCLUSIVE REMEDY FOR BREACH OF WARRANTY, AND IS BUYER'S EXCLUSIVE REMEDY AGAINST CHROMALOX FOR ALL CLAIMS ARISING HEREUNDER OR RELATING HERETO WHETHER SUCH CLAIMS ARE BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, BUYER'S FAILURE TO SUBMIT A CLAIM AS PROVIDED ABOVE SHALL SPECIFICALLY WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF, INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. IN NO EVENT SHALL BUYER BE ENTITLED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES AND BUYER SHALL HOLD CHROMALOX HARMLESS THEREFROM. ANY ACTION BY BUYER ARISING HEREUNDER OR RELATING HERETO, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, MUST BE COMMENCED WITHIN ONE (1) YEAR AFTER THE DATE OF SHIPMENT OR IT SHALL BE BARRED.

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**Chromalox**<sup>®</sup>  
**PRECISION HEAT AND CONTROL**

2150 N. RULON WHITE BLVD., OGDEN, UT 84404  
Phone: 1-800-368-2493      www.chromalox.com