On first impression, various manufacturers of screw plug immersion heaters appear to be all alike; but when you take a closer look at screw plug immersion heaters, it becomes evident that considerable differences exist. The following information will help to explain the differences in construction of Chromalox screw plug immersion heaters compared to other manufacturers. It will also describe Chromalox’s third party listing program, quality testing, and delivery capabilities.

Before buying a screw plug heater, you should ask the manufacturer questions to insure you are getting a quality heater that will last in your application. Below, you will find a list of some of these important questions.

1. How is your resistance wire sized?
2. What grade of magnesium oxide is being used?
3. How is your cold pin attached to your resistance wire?
4. What is your standard element diameter?
5. Do you passivate stainless steel heaters?
6. Do you repress U-bends when required?
7. Do you use terminal sealant as a standard?
8. How are your elements fixed to the screw plug?
9. Are screw plug hex and threads to industry standards?
10. Do you provide a standard thermowell?
11. Is the terminal housing rotatable?
12. Do you have a standard grounding lug?
13. Are your heaters UL listed and CSA certified?
14. What quality assurance testing is done on your finished products?
15. Can you ship out of stock in 24 hours and provide assembly stock products in 5 days?
16. Can you provide me expert technical assistance when needed?
The basic construction of an immersion heater includes the terminal housing, standard NPT screw plug, thermowell and heating elements. If you take a closer look at the construction of a heating element, you will find the heart of the heater is the resistance wire. Chromalox’s resistance wire is computer designed in order to select the correct gauge wire for the required heating element wattage and voltage. Many manufacturers use limited sizes of wire, and may not choose the optimal wire for the application. Ask the heater manufacturer how they determine resistance wire dimensions.

Chromalox connects the resistance wire to the cold pin with a weld. This provides a solid electrical connection that better withstands thermal cycling. Some manufacturers press or braze the cold pin onto the resistance wire, making failure due to thermal cycling more common. Ask the heater manufacturer how they make their cold pin connections. Chromalox uses only high purity magnesium oxide insulation to insure good dielectric resistance between the resistance wire and the metal sheath. In addition, Chromalox uses a rolling method to reduce the diameter and compact the MgO refractory. Other manufacturers often use lower grades of MgO, and swage versus rolling down the element diameters, causing inferior dielectric properties which can lead to a less reliable heater. By utilizing high grade materials and having controlled manufacturing processes, good thermal conductivity is achieved and a longer life heating element is produced. Ask the heater manufacturer how they compact element refractory.

Although Chromalox makes elements that range from 0.315” to 0.475” in diameter, our standard 2” and 2-1/2” NPT screw plug immersion heater elements are 0.475” in diameter. Other manufacturers have standardized on 0.430” diameter elements to reduce costs. For an equivalent immersion length, the 0.475” diameter heating element provides 10% more surface area versus a 0.430” diameter element. The greater the surface area, the lower the heater watt density and lower its operating temperature. Lower operating temperatures result in longer heater life. Ask the heater manufacturer what diameter elements they supply as standard.

Corrosion is often accelerated by a poor surface finish. Proper surface finish of stainless steel heating elements is very important to prevent corrosion. During typical heater manufacturing processes, steel dies and rollers come into contact with the element sheath, and as a result, carbon steel particles are embedded into the surface of the element. If not removed, pitting and corrosion will occur, eventually leading to premature heater failure. As standard practice, Chromalox pickles and passivates stainless steel heaters by soaking the elements in an acid bath. This process removes the carbon steel particles from the surface of the heating element and prolongs heater life. Other manufacturers will only passivate for an extra charge. Ask the heater manufacturer if passivation is a standard practice.
Most screw plug immersion heater elements are bent in a U-bend configuration. When bending a heating element on a tight radius, air gaps can occur in the magnesium oxide insulation within the element bend. Air gaps can permit a dielectric (insulation) breakdown to occur, and cause an electrical short to the metal sheath of the heater.

Chromalox represses U-bends to recompact the MgO and remove any air gaps, which ensures dielectric integrity. Many manufacturers do not repress bends to save time and money. **Ask the heater manufacturer if they repress U-bends when necessary.**

Heating element refractory can absorb moisture from the air, and if enough moisture is absorbed, high leakage current could occur during start-up. Chromalox screw plug immersion heaters contain heating element terminal sealant as a standard feature. A terminal sealant inhibits moisture from being absorbed by the heating element refractory. There are several optional types of terminal sealants to suit the particular application. **Ask the heater manufacturer about terminal sealants before making a purchase decision.**

Chromalox stainless steel, INCOLOY® and carbon steel elements are welded to stainless and carbon steel screw plugs. A welded element provides superior corrosion protection and element attachment. Some manufacturers braze elements to the screw plug without concern for the heaters intended application. In heating a corrosive fluid, braze material is susceptible to being chemically attacked by the fluid. A welded-in element prevents corrosive fluid leakage into the terminal housing which can lead to heater failure. **Ask the heater manufacturer how they secure their elements to the screw plug.**
Chromalox heater design provides a screw plug hex and threads that are user friendly. Wide hex and generous threaded lengths allow standard tools to be used and allows a secure fit. Other manufacturers often provide a narrow hex, making the hex difficult to grip, potentially damaging the screw plug threads, or short thread lengths that may not provide a tight seal. Chromalox screw plug immersion heaters are easy to install — no special tools are required. **Ask the heater manufacturer if their Hex and Threads meet industry standards.** Chromalox stainless steel and steel screw plugs come with a standard solid hex and threads. Others use stamped, cast or hollow plugs and threads that can fail under higher pressures.

**Chromalox**

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**Thermowells**

Chromalox screw plug immersion heaters can be provided with or without an integral thermostat. Regardless, a thermowell is standard on most heaters to accept the sensing bulb of a thermostat. This allows an easy retrofit if later you learn that a thermostat is necessary. Most manufacturers charge extra for thermowells. **Ask the heater manufacturer if a thermowell is standard.**

**Rotatable Terminal Housing**

The NEMA 1 terminal enclosure of the Chromalox screw plug heater is fully rotatable. This patented feature allows 360° rotation of the terminal enclosure (270° rotation for heaters with thermostat). Thus, you are able to rotate the enclosure (housing) to face the electrical conduit connection after the heater has been properly installed. During installation, it is preferred that the conduit for the wiring be in a down position. This prevents any moisture that may accumulate on the conduit from running down into the terminal enclosure of the heater and cause potential heater failure. **No other heater manufacturer offers this feature.**
Proper electrical grounding is extremely important and is required by the National Electrical Code. Some manufacturers do not provide a standard grounding lug with their heaters. Grounding lugs are a standard feature with Chromalox heaters. Ask the heater manufacturer if a grounding lug is standard.

Chromalox has the most extensive third party listing in the industry. We provide more heaters with Underwriters Laboratory listing and/or Canadian Standards Association Certification than all other heater manufacturers combined. This assures the heater is built to stringent standards and allows you to receive quick electrical inspector approval. Ask the heater manufacturer about UL Listing and CSA Certification.

Chromalox heaters undergo extensive quality inspection prior to shipment. All screw plug heaters are 100 percent hydrostatically pressure tested to insure a tight leak-proof fit of the elements to the screw plug. We also perform a 100 percent resistance check on all our heater elements to ensure proper heating element wattage. A two-step insulation resistance check is also performed. First, elements must have a test measurement of insulation resistance to insure minimal moisture content of the element refractory. Then, a dielectric high potential check insures that no electrical short exists from the resistance wire to the metal sheath. Many manufacturers do not perform all of this quality assurance testing. Ask the heater manufacturer about their testing program.

Chromalox's stocking program is unequaled in the industry. Our distribution warehouse can ship stock heaters within 24 hours of receipt of an order. Chromalox has over 1,000 different screw plug heaters in stock. In addition, most of our assembly stock products can ship within 5 days. And, we offer 10 day shipment for many of our other thousands of pre-engineered designs. We also provide a toll free service number for replacement part orders and installation assistance. 1-800-368-2493. Ask the heater manufacturer about their delivery times and stock offering.
Chromalox has over 80 years of experience, the highest quality construction, extensive UL Listings and CSA Certifications, a comprehensive quality program and the largest stock and pre-engineered designs of any manufacturer. Chromalox also has the largest and most technically competent field sales force in the industry. This means you get the best products and application support when you need it!

To Chromalox, an educated customer is our best customer. We are proud to build the world’s highest quality and longest lasting screw plug heaters. We ask you to ask these questions to whomever you buy your screw plug heaters from. Remember, not all screw plug heaters are created equal.

**Feature / Benefit Analysis**

**Feature**
- High Quality Components
- Strict Manufacturing Processes
- Element Diameter as required
- Repressed Bends where necessary
- Standard Terminal Sealant
- Welded Elements
- Standard Hex Width and Thread Length
- Standard Grounding Lug
- Rotatable Enclosure
- Third Party Listing (for a list, ask your Representative for bulletin PD314)
- Comprehensive Quality Assurance Testing
- Product Availability
- Responsive Production Facilitye
- Highly Technical and Experienced Sales Force

**Benefit**
- Longer Lasting, More Reliable Heater
- Higher Consistency and Quality
- Longer Lasting Heaters
- Higher Dielectric Integrity
- Insulation Moisture Inhibitor
- Resists Chemical Attack
- Easier Installation, Better Fit
- Insures NEC Compliance for Ground
- Proper Enclosure Orientation Makes for Easy Installation
- Insures Highest Quality and Strict Manufacturing Procedures
- Greater Reliability
- Large Stock & Assembly Stock Offering
- Lower Lead Times for Assembly Stock and Special Order Products
- Support and Assistance When You Need It Most