

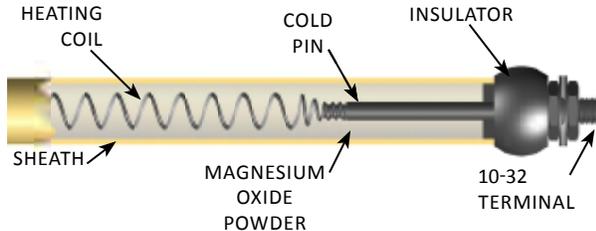
## Introduction

Heatrex designs and manufactures commercial and industrial electric heating and control systems that set the industry standard for excellence. The company's heating solutions reflect more than 55 years of innovation, product quality and efficient service.

Our product offering ranges from the tubular heating elements described in this catalog to the most sophisticated, custom designed systems. Heatrex's attention to detail and rigorous testing give worldwide customers premium products that they receive quickly and at a fair market price.

## Construction

### One-Pass Construction

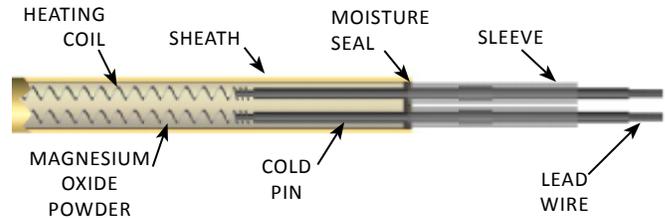


The cutaway view of a typical Heatrex tubular element shows its basic construction. A coil of high grade-resistance wire (nickel, chromium) is precisely centered in a heavy gauge metal tube while the tube is filled with granular magnesium oxide powder. Cold pins are welded to the resistance coil at each end to provide an unheated length near the terminals and to secure the coil in the magnesium oxide. Through rolling, the diameter of this assembly is reduced and the magnesium oxide compacted, insuring rapid heat transfer from the coil to the sheath, as well as high dielectric strength.

After compaction, the element is processed in one of three ways:

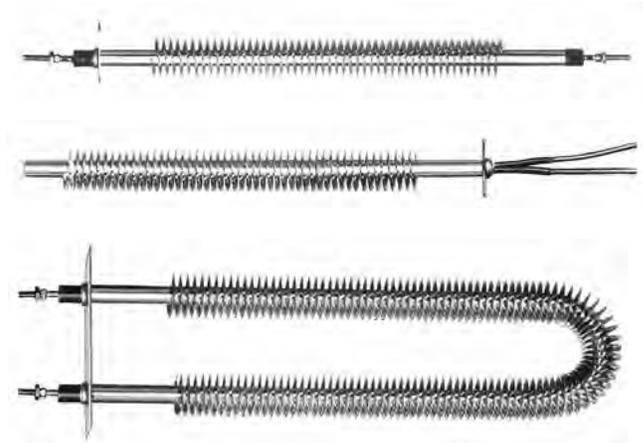
1. **Straight length elements** are sealed and appropriate terminals applied.
2. **Formed elements are annealed** and bent before they are sealed and terminated.
3. **Finned elements** are wound with a helical fin before processing as described in #1 and #2 above.

### Two-Pass Construction



For applications requiring both terminations at the same end, two-pass construction may be used. Two-pass elements, as shown in the cutaway view, have a U-bent coil inside the sheath and two leads or terminals at one end. The opposite end is sealed by welding or silver soldering. These elements are available in straight lengths, either finned or unfinned. They can be permanently mounted with a variety of factory-furnished mounting methods see page 31 and 32. By contrast, one-pass elements in straight lengths must have a flexible electrical connection at one end to allow for thermal expansion.

### Finned Construction



A corrugated metal fin is helically wound on a tubular element to improve heat transfer in air applications. Depending on the sheath and fin material selected, the fins are either permanently attached, mechanically or via furnace brazing. The entire assembly then goes through a computer controlled atmosphere furnace. This process prepares the element to be bent into a variety of configurations. Standard fin density is five fins per inch, while eight fins per inch can be furnished when specified for lower sheath temperatures.

# Construction/Quality Control

## Construction Techniques

Heatrex construction techniques are designed to insure high quality and long life.

- **Rolling** – All standard diameter elements listed in this catalog are compacted through multi-stage rolls. This process insures uniform compaction of the magnesium oxide, a truly round cross section and a consistent diameter. This is critical if the element is being inserted into a machined hole.
- **Terminal Construction** – A threaded stainless steel terminal is welded onto the cold pin for the standard construction. Stainless steel nuts and washers are furnished for field wiring. The terminal must be prevented from rotating when connecting field wiring.
- **Terminal insulator and seals** — Element ends are normally sealed against moisture, which can rapidly deteriorate the insulating properties of magnesium oxide. The terminal

insulator and seal must be suitable for the temperature, voltage and atmospheric conditions of the application. Heatrex offers a wide variety of terminals, insulators and seals to meet virtually any combination of field conditions (see pages 19 thru 23).

- **Recompaction** – In the process of bending, density is reduced in the compacted magnesium oxide. These reductions, in turn, can lead to overheating and coil failure, especially at high temperatures or high watt densities. To prevent such failures, we recompress bends to improve density in the magnesium oxide when necessary.

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## Quality Control

From raw materials through the finished product, Heatrex maintains the highest standards in the industry through a series of Quality Control/Assurance checks.

- **Magnesium Oxide** – Heatrex uses the highest grade MgO available for electric heating elements under various applications. Each batch is checked against two ASTM Standards: ASTM D3347 determines tap density to assure a high insulation density. ASTM D2755 is used for sieve analysis. Samples are sifted through ten progressively finer sieves to assure a normal distribution and controlled concentration of grains. As a result, Heatrex elements have extremely high MgO density.
- **Certification to Special Standards** – Elements can be certified to Military Standards such as MIL-H-22577 Rev C and MIL-PRF-22594 Rev C, and special customer specifications regarding tolerances, hydrostatic testing, etc. Please consult the factory for details.

## UL and CSA Recognition

Most of the elements described in this catalog are Recognized by the Underwriters Laboratories under UL Standard 1030. Our File No. is E78533. In addition, elements for refrigeration defrost are Recognized under File No. SA3254. Such recognition makes it simpler for manufacturers to incorporate Heatrex elements into equipment that is UL or Third Party Listed. Tubular and finned tubular elements are also CSA approved under contract No. 151727, Class 2871-02, 2871-82. Elements may also be supplied with CE markings required for the European Communities upon request. Please consult the factory for details.