



Heating Elements

Features	Diffusion Cassette	Helix	Helix II	Aztec Helix	Black Max
Shell	Stainless steel shell strengthened with 1/4" bends throughout and welded end rings	Stainless steel shell strengthened with 1/4" bends throughout and welded end rings	Stainless steel shell strengthened with 1/4" bends throughout and welded end rings	Stainless steel shell strengthened with 1/4" bends throughout and welded end rings	Stainless steel shell strengthened with 1/4" bends throughout and welded end rings
Insulation	Vacuum Formed 50% Alumina/50% Silica Ceramic Fiber	Vacuum Formed 50% Alumina/50% Silica Ceramic Fiber	Vacuum Formed Hot Internal Surfaces 97% Alumina	Vacuum Formed Hot Internal Surfaces 97% Alumina	Vacuum Molded 50% Alumina/50% Silica Ceramic Fiber
Wire	Cr-Al-Fe Wire	Cr-Al-Fe-Y Wire	Cr-Al-Fe-Y Wire	Cr-Al-Fe Wire (Powdered Metallurgy)	Cr-Al-Fe-Y Wire
Spacers	Standard	Standard	Patented Interlocking	Patented Interlocking	Not Applicable
Inner Coating			Zirconia Oxide	Zirconia Oxide	Zirconia Oxide & Black Coating
Bore Size	up to 10"	up to 10"	Large Bore	Large Bore	Unlimited
Operating Temperature	400° - 1300°C	400° - 1300°C	400° - 1300°C	400° - 1300°C	200° - 1200°C
Application	Low Cost Normal Life OEM Equivalent	MRL OEM Longer Life High Quality	Large Bore Design with Extended Life and High Efficiency for Production Equipment	Large Bore Design for High Temperature Applications with Extended Life for a Production Environment	Fast Response for Low Temperature (LPCVD) and Diffusion up to 1100°C
Low Particulate Generation			Zirconia coated for cleaner operation	Zirconia coated for cleaner operation	Zirconia coated for cleaner operation

Capabilities

All MRL heating elements are designed for specific applications, and to match the existing electric's of the furnace assembly in which they will be installed. In many cases our retrofit elements can increase load size capabilities, and improve throughput.

Diffusion Cassette

When price consideration is the primary determining factor, the Diffusion Cassette provides a standard OEM replacement element for many existing semiconductor furnaces. It's construction is superior to other elements in its class featuring a stainless steel canister, welded end rings, and high purity insulation.

Helix

MRL offers Helix elements for all purpose applications in retrofit, direct replacement, and maxi-bore configurations. The standard Helix design has been improved over the years to include a stainless steel canister with welded end rings, Cr-Al-Fe wire, and zirconia oxide coated internal insulation.

Helix II

✓ This patented element addresses the industry's needs for longer lasting high temperature production heating elements. Features include patented interlocking spacers to prevent coil sag and reduced insulation shrinkage/"powdering" with vacuum molded ceramic fiber layers that are zircon coated and compressed between coil windings in the manufacturing process. The long life of the Helix II elements has improved production by reducing down time for element maintenance. It's especially useful for systems using silicon carbide tubes with operating temperatures exceeding 1100°C. Helix II technology is best applied in large bore processes operating up to 1150°C.

Aztec

The patented Aztec element was developed in conjunction with the Helix II specifically to address the larger wafer, high temperature process applications. The Aztec is constructed with all the features of the Helix II technology, with the addition of Cr-Al-Fe heavy gauge wire that is manufactured with **powdered metallurgical techniques** which produces a wire with form stability at high temperature that has twice the hot strength of conventional heavy gauge wire. Aztec wire also lacks the "continuous growth" characteristics associated with conventional wire during high temperature cycles operating over 1150°C. The extended lifetime feature of the Aztec element is a direct result of the combination of the wire, premium insulation, and the interlocking spacers and is frequently requested by customers world-wide.

Black Max

Patented in 1985, this low mass element is vacuum molded with light gauge (12 - 20 GA) high temperature resistance wire. The interior zirconia and black coatings direct the heat away from the wire towards the load. The Black Max is known for its rapid heat-up and cool-down capabilities due to its low mass construction and is especially useful for LPCVD applications and low temperature diffusion processes. Recently introduced is a "Fast Cool" Black Max element which significantly reduces cool down time at the end of a process cycle.

Black Max II

Another version of Black Max Technology with individual sinuated wire strips with leads internally welded providing **greater design flexibility in zoning for custom elements**. Also features high purity (97% Alumina) vacuum molded insulation.

Aztec Black Max

Utilizes the same construction features of the Black Max II and includes powdered metallurgical wire for higher temperature operation (1200°C range) and longer life expectancy. The Aztec wire also lacks the "continuous growth" characteristics associated with conventional wire during high temperature cycles operating over 1100°C.

