

Pyro-Bloc® EES System

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Product Description

The Pyro-Bloc Electric Element Support (EES) System is a complete engineered package which includes Pyro Bloc Y modules, heating elements, hanging systems, and detailed drawings, that are a cost-effective method of hanging electric heating elements from Pyro-Bloc modules. EES system was patented over 20 years ago on the pre-embedded tubes, located within a ceramic fiber module, and the supporting hooks and washers.

EES systems have been provided for:

- Melting, holding, and annealing furnaces for non-ferrous metals
- Continuous strip and coil annealing furnaces for the steel industry
- A wide variety of heat treating furnaces

Design and Installation

There are a number of factors which must be considered when designing a Morgan Thermal Ceramics Pyro-Bloc EES System, including temperature, atmosphere, contaminants and type of furnace. Contact your nearest Thermal Ceramics representative for further information.

Applications

The type of furnace plays an important role in element orientation and manner of installation. For example, a bell furnace that is constantly moved would be designed much differently than a stationary pit furnace. Other furnaces requiring special consideration include car bottoms, tip-ups, and furnaces that see vibration, such as from roller rails.

Design

Each system is designed to the requirements of the customer's specific application. Designs include:

- Determining alloy - the alloy selection is determined by the atmosphere and temperature of the furnace.
- Wall loading - depending on the wattage requirements, elements are designed in a rod overbend, ribbon, or coil configuration. Rod overbend is by far the preferred configuration due to long life and excellent heat radiation.
- Wiring design - in a 3-phase circuit, which is standard for industrial furnaces, the amperage determines whether the elements should be wired in a "wye" or "delta" connection.
- Watt density - watt density is the power loading in watts per square inch of surface area of the heating element and indicates the potential for the surface to transmit heat energy. This is a basic factor of element operating temperature and overall element life. Thermal Ceramics' watt density designs have historically provided a more robust system than industry standards.

Pyro-Bloc® EES System

Properties	R Grade	ZR Grade
Color	White	White
Density, pcf (kg/m ³)	10, 12, 15 (160, 192, 240)	10, 12, 15 (160, 192, 240)
Thickness, in. (mm)	6 - 12 (152 - 305)	6 - 12 (152 - 305)
Maximum Temperature Rating, °F (°C)	2400 (1316)	2600 (1427)
Melting point, °F (°C)	3200 (1760)	3200 (1760)
Continuous Use Limit, °F (°C)	2200 (1204)	2450 (1343)

Chemical Analysis, % weight basis after firing		
Alumina, Al ₂ O ₃	47	37.5
Silica, SiO ₂	53	47
Zirconia, ZrO ₂	–	15.5
Loss on ignition, L.O.I.	trace	trace
Other	trace	trace

Thermal Conductivity, Btu·in./hr·ft ² ·°F (W/m·K), ASTM C 201			
Measured Density, pcf (kg/m ³)	<u>10</u>	<u>12</u>	<u>15</u>
Mean temperature			
@ 500°F (260°C)	0.52 (0.07)	0.50 (0.07)	0.49 (0.07)
@ 1000°F (538°C)	1.04 (0.15)	0.96 (0.14)	0.84 (0.12)
@ 1500°F (816°C)	1.81 (0.26)	1.66 (0.24)	1.43 (0.21)
@ 2000°F (1093°C)	2.68 (0.39)	2.45 (0.35)	2.19 (0.31)

Installation

The foundation of the Electric Element Support System is the one-step welded Pyro-Bloc Y module. Attachment hardware is contained within the module itself, effecting a fast, easy installation. The edge-grain monolithic construction minimizes heat loss and heat storage, and permits rapid furnace cycles. Elements are suspended with ceramic hangers from pre-embedded tubes located within the module. There are no conductors to the shell; therefore the system is thermally and electrically isolated within the furnace. Each system includes a detailed instruction manual and engineered installation drawings.

The values given herein are typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Therefore, the data contained herein should not be used for specification purposes. Check with your Morgan Thermal Ceramics office to obtain current information.