

The Glo-Stix™ range of igniters are manufactured using a patented silicon nitride material and have been developed for lasting durability and service. The advanced ceramic technology used in these Infrared Gas Igniters (IGI's) ensures a very stable product with electrical properties unmatched in other igniters and possess intrinsic physical and thermal strength.

Glo-Stix™ have been created and patented for use in all appliance products. They reach ignition temperature very quickly (some models within 2 seconds) and are designed to replace all silicon carbide or mini hot surface igniter products. The use of advanced ceramic technology ensures that these igniters overcome the inherent problem characteristics of a silicon carbide product.

figure 1

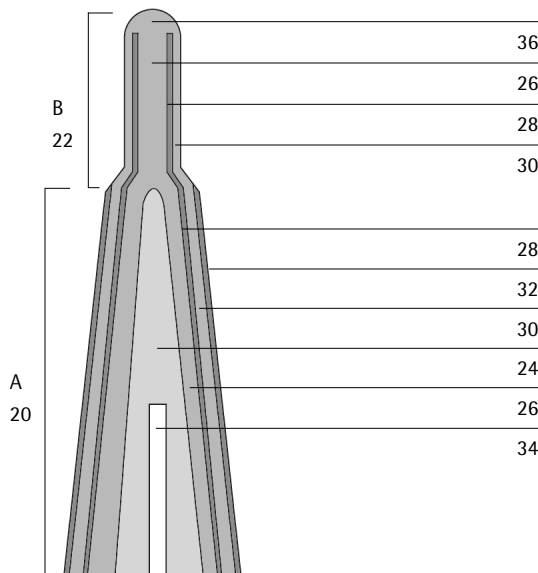


figure 2

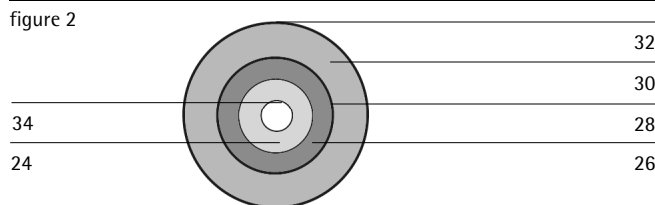
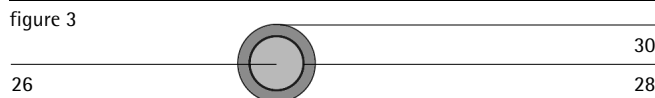


figure 3



The igniter consists of two portions:

- the base (20)
- and the heater (22).

These two portions form a cylindrical igniter heating element that is very distinctive in the low voltage variants, being thicker in diameter at the base tapering to a thinner diameter heater portion at the tip. Because the heater portion has a lesser diameter than the base portion there is a higher resistance in the heater portion, and, consequently, a higher heat output. Thus, heating of the igniter is concentrated in the heater portion.

The base is formed of five layers of ceramic and conductive material and the composition of the layers differs, particularly in the amount of conductive material (MoSi_2). In this way the electrical conductivity of the different layers can be controlled.

Starting at the center, the base portion consists of an inner electrically conductive core (24), an electrically conductive layer (26), an electrically insulative layer (28), an electrically resistive layer (30) and an outer electrically conductive layer (32).

The base portion also includes a hole (34) that permits connection to an electrical lead (not shown) when the igniter is assembled. For the purposes of description, the conductive layer and resistive layer are differentiated. However, these two layers have similar characteristics, and any heating ascribed to the resistive layer can be equally well accomplished in the conductive layer.

The heater portion is formed of three layers of ceramic material. Beginning again at the innermost layer, the heater portion consists of a conductive layer (26), insulative layer (28) and resistive layer (30). The distal end of the heater portion is formed into a tip (36) that forms an electrical connection between the conductive layer (26) and resistive layer (30).

Si_3N_4 is the ceramic material that forms the various layers. This non-conductive ceramic material is doped with MoSi_2 . The percentage concentration of the conductive component, in conjunction with the layer thickness, determines

the resulting conductivity of the ceramic material. A sintering additive up to 10 percent by volume can also be included. The sintering additive includes yttrium, magnesia, calcium and others of the Lanthanide group of elements. Both conductive and non-conductive components are supplied as finely ground particles. The particles can range in size from about 0.2 to about 0.8 microns. These components are mixed and suspended in a solvent, such as water, to form slurry. A suitable deflocculant, such as ammonium polyacrylate, is also added.

The igniter is manufactured by slip casting. This process uses an absorbent, tubular mold, open at both ends. The mold can is fabricated from plaster of paris or any other suitable absorbent material.

Generally, successive layers of the igniter are added to the mold from the tip end. The method commences by laying down the outer layer, and then forming the resistive layer. Next, the insulative layer (28) is formed in the mold. Finally, the conductive layer (26) is formed. The inner core (24) is then injected into the mold from the opposite end so that it extends substantially the length of the base portion. The connecting hole (34) is formed in the inner core (24) at this time. To form an integral electrical connection between the conductive layer (26) and the resistive layer (30), the tip of the green body is reformed by applying low intensity vibrations from an ultrasonic wand to the tip before the green body is removed from the mold. These vibrations cause the particles at the apex to be blended into an electrically conductive tip. Once the liquid phase has been substantially absorbed through the walls of the mold, the green body is removed from the mold and allowed to air dry. Sintering of the green ceramic body takes place in vacuum furnaces (pictured opposite, right) using graphite heaters for 24 hours. The igniters are cleaned and polished and all sprues are removed using diamond cutters.

In operation, an electrical potential when applied causes a current to flow through the conductive inner core to conductive layer. The current then flows through resistive layer at the exterior of heater portion, and returns along outer layer. As the current flows through the resistive layer in the region of the heater portion, it heats to a temperature sufficient to ignite many different fuels both gaseous and liquid. The igniter elements are capable of repeated cycling to temperatures in the range of 1500°C without failure. The high conductivity of outer layer results in little current flow through the resistive layer in the base portion, and therefore concentrates the heat in the resistive layer of the heater portion.



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