PRECISION GRAPHITE COMPONENTS

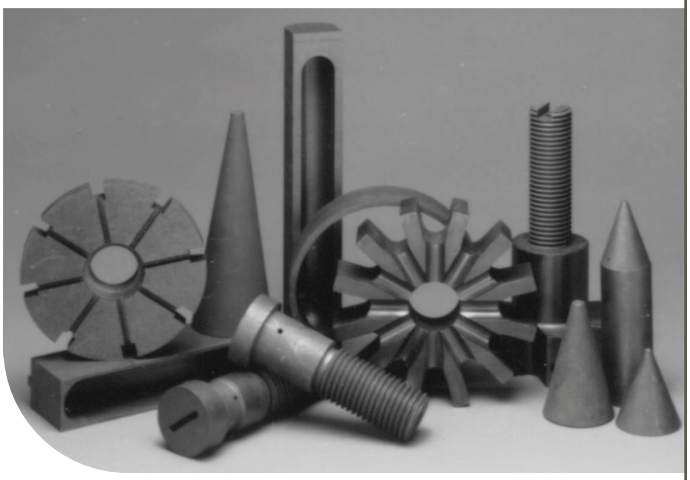
MACHINED GRAPHITE PARTS INCLUDING SPECIALTY GRAPHITE SHAPES, TUBES, AND RODS

Pyrotek offers multiple grades of graphite with unique operating characteristics. The strength of graphite increases as temperatures rise. It has exceptional corrosion resistance and is virtually immune to thermal-shock damage. Dimensional and thermal stability remain constant at temperatures up to 4712°F (2600°C). Due to its erosion resistance, this product is non-fatiguing. There are no changes in properties with age or cyclical operation.

Multiple proprietary oxidation treatment options are available. Pyrotek can supply most standard high-temperature graphite parts for the aluminium industry, as well as custom components.

Engineering and CNC machining capability allows Pyrotek to assist customers in product design and cost reduction programs. High quality machined graphite parts for crucibles, molds, heater components, electrodes, dies, and many other applicationscan be provided. Graphite shapes up to 54 inches (1375 millimeter) in diameter and 120 inches (3050 mm) in length can be machined.

Specialty graphite high quality products include rods, tubes, flux tubes, rocket nozzles, custom purification services and other specialty products. Pyrotek can purify any of its standard size tubes and rods. Ash content can be reduced to 0.002% (20 parts per million). Additionally, outsourced materials up to 12 inches (305 mm) in diameter and 144 inches (3650 mm) in length can be graphitized, purified or heat treated. Specialty graphite rods and tubes are available in a wide variety of grades and sizes.



MACHINED COMPONENTS

- Custom parts available
- AutoCAD & Solidworks drawing compatibility
- Extensive CNC machining capability
- Graphite protection for specific applications
- Oxidation resistant and low permeability
- Over 60 years of graphite manufacturing
- ISO 9001:2015 certified

FLUXING TUBES

- Treated to retard oxidation, maximize life
- Any length, threading or special fittings are available
- Standard stock items are available at global locations for convenient delivery

APPLICATIONS

FLOW CONTROL SYSTEMS

- Furnace plugs
- Metering rod tips
- Casting molds
- Lubrication rings

FLUXING TUBES

- Transfer ladles
- Melting and holding furnaces

DEGASSING COMPONENTS

- Diffuser tubes, shafts and rotors
- Specialized degassing heads

CONVEYING SYSTEMS

- Extrusion table run-out slabs

SPECIALIZED APPLICATIONS

- Custom machined parts
- Aerospace products
- Chemical
- Electronics
- Nuclear
- Quartz
- Vacuum furnace

Pyrotek

PRECISION GRAPHITE PRODUCTS

Typical Physical Properties of Specialty Graphite								
Grade	Product	Diameter, inch (cm)	Max Grain Size, in. (mm)	Apparent Density, g/cm^3 (oz/in^3)	Specific Electrical Resistivity, ohm-in x 10^{-5} (ohm-cm x 10^{-5})	Compressive Strength, psi (MPa)	Flexural Strength, psi (MPa)	Coefficient of Thermal Expansion in./in./°F x 10^{-7} (in./in. /°C x10^{-7})
GSXP	Tubes Rods Rods	0.75–5.25 (1.9–13.3) 3/4–4.25 (1.9–10.8) 5–12 (12.7–30.5)	0.008 (0.20) 0.008 (0.20) 0.033 (0.84)	1.65 (0.9) 1.65 (0.9) 1.72 (1.0)	36 (91.43) 36 (91.43) 36 (91.43)	6000 (41.37) 6000 (41.37) 6500 (44.82)	3700 (25.51) 3700 (25.51) 2700 (18.62)	6.0 (10.8) 6.0 (10.8) 15.0 (27)
G-83	Rods Rods	3/4–4.25 (1.9–10.8) 5–12 (12.7–30.5)	0.008 (0.20) 0.033 (0.84)	1.83 (1.06) 1.83 (1.06)	31 (78.74) 30 (76.20)	8000 (55.16) 7800 (53.78)	4000 (27.58) 2900 (19.99)	6.0 (10.8) 15.0 (27)
G-Grade	Rods Rods	3/4–4.25 (1.9–10.8) 5–12 (12.7–30.5)	0.008 (0.20) 0.033 (0.84)	1.87 (1.08) 1.87 (1.08)	29 (73.66) 27 (68.58)	10300 (71.02) 9000 (62.05)	5000 (34.47) 3000 (20.68)	6.0 (10.8) 15.0 (27)
G-90	Rods Rods	3/4–4.25 (1.9–10.8) 5–12 (12.7–30.5)	0.008 (0.20) 0.033 (0.84)	1.90 (1.1) 1.90 (1.1)	29 (73.66) 27 (68.58)	10500 (72.39) 9200 (63.43)	5200 (35.85) 3100 (21.37)	6.0 (10.8) 15.0 (27)

*For information on sizes not listed, contact us.

1) Values shown in this table are typical. Within each grade, values will vary as the product diameter varies. The coefficient of variation of the values shown in this table may be as high as 10%. 2) Where appropriate, all properties shown in this table have been measured with grain. 3) The typical ash level will be less than 0.005% for all products shown in this table. 4) The typical wall clearance of GSXP tube products will be ±0.030 in (0.076 cm). 5) The typical curvature of small-diameter stock will be ±0.5% arc – cord or 0.5 inch (1.27 cm) over 100 inches (254 cm).

GRAPHITE USED IN MOLTEN METAL

In use at the elevated temperatures of a molten metal bath, and if not in an inert atmosphere, graphite tends to oxidize and deteriorate in the presence of oxygen. This erosion is most severe at the molten metal line where the heated graphite material reacts from oxygen in the air. Deterioration from oxidation can be reduced by an SST or ZX material, and/or by protecting the graphite with various coatings or a ceramic sleeve.

GRAPHITE USED IN SPECIALTY MARKETS

G-series grades of graphite are specialty materials, purified, and enhanced to reduce permeability / increase density. They are non-treated, fine-grain materials with ash levels below 50 ppm. The G-series materials also have a uniform structure, and are free of flaws and laminations. The denser G-series materials were developed for aerospace and other selected applications.

STANDARD AND PREMIUM MATERIAL GRADES

- SST—oxide resistant graphite protected with Pyrotek's proprietary oxidation-resistant treatment process. The best standard oxidation-resistant graphite in the industry by our tests.
- ZX—premium oxide-resistant graphite protected with Pyrotek's proprietary oxidation-resistant treatment process. ZX graphite has nearly twice the oxidation resistance of SST.

G-SERIES GRADES SPECIALTY MATERIALS

- GSXP—a basic purified graphite having densities, strengths and resistivities typical of single-step impregnated graphite.
- G-grade—a fine-grain structure, high-strength, high-density, purified graphite with excellent resistance to erosion.
- G-83 & G-90—a high-performance, reduced-permeability purified graphite with uniform structure developed for aerospace and other selected applications.

Pyrotek®

PRECISION GRAPHITE PRODUCTS

Specifications of Various Graphite Grades							
Feature	SST Oxide Treated	ZX Oxide Treated	GSXP Purified	G-83 Purified, Density Enhanced	G-grade Purified, Density Enhanced *		G-90 Purified, Density Enhanced
					at room temp	at 4199°F (2315°C)	
Typical Density—g/cm³ (oz/in³)	1.75 (1.01)	1.79 (1.03)	1.65–1.72 (0.95–0.99)	1.83 (1.06)	1.87 (1.08)	1.86 (1.07)	1.90 (1.10)
Oxidative Weight Loss—24 hrs @ 1400°F in 3000 cm³ / min air flow	7%	3%	70%				
Flexural Strength—psi (MPa)	3700 (25.51)	3700 (25.51)	3500 (24.13)		5000 (34.47)	9000 (62.05)	
Compressive Strength—psi (MPa)					10300 (71.02)	18600 (128.24)	
Modulus of Elasticity—K10^{-5} psi (MPa)					14 (0.10)	27 (0.19)	
Thermal Expansion—in./in./°F x 10^{-7} (in./in./°C x 10^{-7})					6 (10.80)	18 (32.4)	
Electrical Resistivity—ohm-in. x 10^{-5} (ohm-cm x 10^{-5})			36 (91.43)	31 (78.74)	29 (73.66)	33 (82.82)	29 (73.66)
Thermal Conductivity—BTU-ft/ft²/hr°F [W/(m·K)]					101 (175)	89 (154)	
Ash Content—(%)					0.005	0.005	

** Unlike metals, graphite increases in strength with rising temperatures. Therefore, as a guide to high-temperature strength, the data for G-grade graphite is compared at room temperature and 4199°F (2315°C).*

Note: The physical and chemical properties listed represent 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.

FEB-20-EN-1808

Product Type: 140, 155, 161, 164, 550
Commodity Code: 14002, 14003, 14004, 14008, 14011, 14013, 16023, 16026, 26115, 26116, 26801, 27409