WR®650

Superior Dry Run Capability with Excellent Thermal and Chemical Resistance

WR®650 is a next-generation PFA composite reinforced with a three-dimensional carbon-fiber architecture. This material offers superior dry run capability, excellent wear and chemical resistance, and an operating temperature range up to 260°C (500°F).

The advanced mechanical, thermal, and tribological properties of WR®650 provide increased operating efficiency and improved MTBR (mean time between repair). WR®650's non-galling/non-seizing characteristics, and its ability to dampen vibrations, allow for tighter clearances compared to traditional metallic components, and increased efficiency. The malleable nature of PFA ensures metallic counter-parts are preserved, even those that are relatively soft (SS 304 or 316). This helps extend the service life of pumps and improves equipment reliability.

WR®650 is available in a broad range of stock shapes, providing customers the ability to machine parts to their exact specifications.

Features and Benefits

- Superior dry run properties to increase MTBR. Due to its three-dimensional carbon fiber reinforcements, WR®650 can handle 2.5x higher dry wear conditions compared to other PFA composites.
- Value engineered to deliver a low total cost of ownership vs. competitive products.
- Enhanced vibration dampening capability extends reliability and the lifetime of the pump.

Applications

- Pump applications in refineries, chemical plants, power plants, and water treatment plants.
- Centrifugal pumps (overhung, vertical in-line, single-stage between bearings, multi-stage horizontal, vertical, etc.).

Description (ASTM Method)	Stress Direction	Typical
Physical and Mechanical Properties		
Color	———	Black
Specific Gravity [D792]	———	1.93
Hardness, Type D [D2240]	Y	80
Tensile Strength @ Break, 75°F [24°C], ksi [MPa] (D638)	X	14.4 [99.3]
Tensile Modulus (0-0.26%), 75°F [24°C], ksi [MPa] (D638)	X	2,500 [17,300]
Tensile Elongation @ Break, 75°F [24°C], % (D638)	X	0.82
Tensile Strength @ Break, 500°F [260°C], ksi [MPa] (D638)	X	3.9 [27.2]
Tensile Modulus (0-0.18%), 500°F [260°C], ksi [MPa] (D638)	X	1,280 [8,800]
Tensile Elongation @ Break, 500°F [260°C], % (D638)	X	0.36
Maximum Flexural Strength, 75°F [24°C], ksi [MPa] (D790)	Z	2.1 [14.5]
Flexural Modulus (0-0.23%), 75°F [24°C], ksi [MPa] (D790)	Z	380 [2,600]
Compressive Strength @ Break, 75°F [24°C], ksi [MPa] (D695)	X	9.5 [65.6]
Compressive Modulus (0.05-0.2%), 75°F [24°C], ksi [MPa] (D695)	X	3,490 [24,040]
Compressive Strength @ Break, 500°F [260°C], ksi [MPa] (D695)	X	2.2 [15.2]
Compressive Modulus (0.03-0.13%), 500°F [260°C], ksi [MPa] (D695)	X	1,420 [9,800]
Thermal Properties		
Coefficient of Thermal Expansion, 75 – 200°F [24 – 93°C], 10^{-6} in/in/°F [10^{-6} m/m/°C]	Radial	4.8 [8.6]
Coefficient of Thermal Expansion, 75 – 300°F [24 – 149°C], 10^{-6} in/in/°F [10^{-6} m/m/°C]	Radial	6.1 [11.0]
Coefficient of Thermal Expansion, 75 – 400°F [24 – 204°C], 10^{-6} in/in/°F [10^{-6} m/m/°C]	Radial	7.3 [13.1]
Coefficient of Thermal Expansion, 75 – 500°F [24 – 260°C], 10^{-6} in/in/°F [10^{-6} m/m/°C]	Radial	9.2 [16.6]

Description (ASTM Method)	Stress Direction	Typical
Thermal Properties (continued)		
Coefficient of Thermal Expansion, 75 – 200°F [24 – 93°C], 10^{-6} in/in/°F [10^{-6} m/m/°C]	Axial	46.3 [83.3]
Coefficient of Thermal Expansion, 75 – 300°F [24 – 149°C], 10^{-6} in/in/°F [10^{-6} m/m/°C]	Axial	58.1 [104.6]
Coefficient of Thermal Expansion, 75 – 400°F [24 – 204°C], 10^{-6} in/in/°F [10^{-6} m/m/°C]	Axial	70.9 [127.6]
Coefficient of Thermal Expansion, 75 – 500°F [24 – 260°C], 10^{-6} in/in/°F [10^{-6} m/m/°C]	Axial	95.1 [171.2]
Wear Property		
PV Limit (Journal Bearing Geometry) 2600 fpm [13.2 m/s], psi * fpm [MPa * m/s], ISO 7148-2	———	42,700 [1.5]

Notes:

1. Reference GT Stock/Solid Code: 8023.
2. Coefficient of Thermal Expansion values are approximated based on internal testing methods. Radial values are the average of ID and OD measurements from D/t= 8, 16, and 32 tubes.

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