



## WR<sup>®</sup> 650

### Superior Dry Run Capability with Excellent Thermal and Chemical Resistance

WR<sup>®</sup> 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 500°F (260°C).

The advanced mechanical, thermal, and tribological properties of WR<sup>®</sup> 650 provide increased operating efficiency and improved MTBR (mean time between repair).

WR<sup>®</sup> 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 counterparts 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<sup>®</sup> 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<sup>®</sup> 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.).

#### Contact Us

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09/18-GT DS-US-EN-004



Description	Stress Direction	Typical
<b>Physical and Mechanical Properties (ASTM Standard)</b>		
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]
<b>Thermal Properties</b>		
Coefficient of Thermal Expansion, 75 – 200°F [24 – 93°C], 10 <sup>-6</sup> in/in/°F [10 <sup>-6</sup> m/m/°C]	Radial	4.8 [8.6]
Coefficient of Thermal Expansion, 75 – 300°F [24 – 149°C], 10 <sup>-6</sup> in/in/°F [10 <sup>-6</sup> m/m/°C]	Radial	6.1 [11.0]
Coefficient of Thermal Expansion, 75 – 400°F [24 – 204°C], 10 <sup>-6</sup> in/in/°F [10 <sup>-6</sup> m/m/°C]	Radial	7.3 [13.1]
Coefficient of Thermal Expansion, 75 – 500°F [24 – 260°C], 10 <sup>-6</sup> in/in/°F [10 <sup>-6</sup> m/m/°C]	Radial	9.2 [16.6]
Coefficient of Thermal Expansion, 75 – 200°F [24 – 93°C], 10 <sup>-6</sup> in/in/°F [10 <sup>-6</sup> m/m/°C]	Axial	46.3 [83.3]
Coefficient of Thermal Expansion, 75 – 300°F [24 – 149°C], 10 <sup>-6</sup> in/in/°F [10 <sup>-6</sup> m/m/°C]	Axial	58.1 [104.6]
Coefficient of Thermal Expansion, 75 – 400°F [24 – 204°C], 10 <sup>-6</sup> in/in/°F [10 <sup>-6</sup> m/m/°C]	Axial	70.9 [127.6]
Coefficient of Thermal Expansion, 75 – 500°F [24 – 260°C], 10 <sup>-6</sup> in/in/°F [10 <sup>-6</sup> m/m/°C]	Axial	95.1 [171.2]
<b>Wear Property</b>		
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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