



QUANTUM® PTFE SEALING PRODUCTS

PTFE (polytetrafluoroethylene) boasts a unique combination

of outstanding material properties that makes it one of the best-performing materials in the field of sealing technology. Significant characteristics of PTFE include:

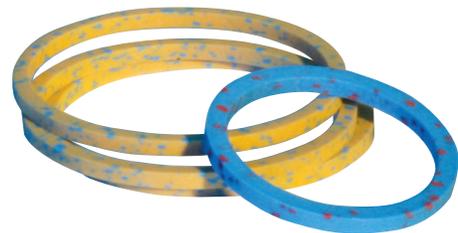
- Broad operating temperature range -200°C to 260°C (-328°F to $+500^{\circ}\text{F}$)
- Optimum electrical insulating properties and great dielectric properties
- Superior longevity, weather-resistant
- Excellent frictional characteristics; no "stick-slip" effect
- PTFE is self-lubricating, which means that bearings and dynamic seals can run dry under certain conditions
- Anti-adhesive behavior
- Non-flammable
- Extremely low water absorption

APPLICATIONS

- Compressor pistons
- Gas direct injection
- Engine cams
- Engine crankshafts
- Pneumatic and hydraulic cylinders and actuators
- Shock and strut-banded pistons
- Spring-energized seals
- Transmission Seal
- Power Steering Seals

VALUES TO THE CUSTOMER

- **PTFE is a partially crystalline polymer** with an extremely high melting viscosity
- **Filled PTFE compounds extend the range** of low-friction applications in which pure PTFE provides high temperature resistance, low deformation under load, and enhanced wear characteristics
- **The use of standard fillers** (like carbon, glass, and bronze) or special fillers allow scientists to make specific changes to PTFE's material properties
- **Unfilled PTFE's universal chemical resistance** means that the PTFE is not affected by aggressive acids, alkali, nitrides, highly polarized and halogenated organic solvents, ketones, esters, and ethers
- **PTFE has one of the lowest coefficients of friction** of all solid materials, giving PTFE outstanding non-stick properties (no "stick-slip" effect)

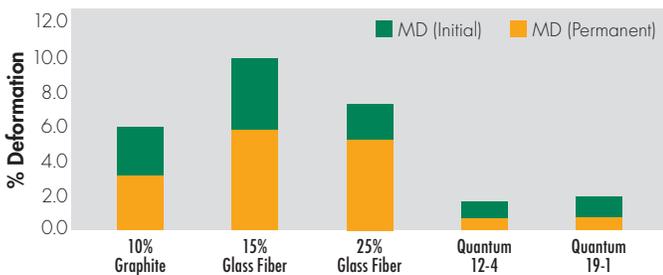


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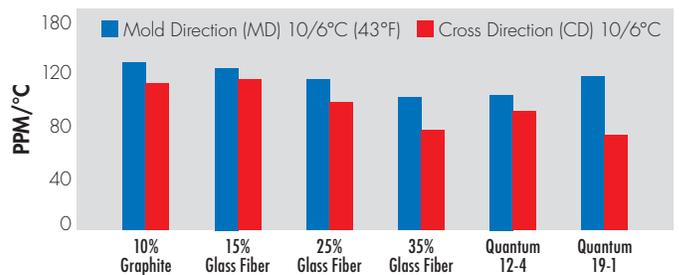
FEATURES AND BENEFITS

Measured Property	Unit	Test Method	Test Data Values					
			10% Graphite	15% Glass Fiber	25% Glass Fiber	35% Glass Fiber	Quantum PTFE 12-4	Quantum PTFE 19-1
Fundamental Properties :								
Density	g/cc	ASTM D-4745	2.118	2.191	2.211	2.169	2.518	2.566
Tensile Strength	psi	ASTM D-4745	2925	3231	2578	1796	2410	1940
Elongation	%	ASTM D-4745	226	243	220	175	170	227
Hardness, Initial	Shore D	ASTM D-2240	64	63	64	65	69	65
Compressive Strength								
0.2% Offset, Compressive Strength	psi	ASTM D-695	5370	4980	5050		6940	5000
0.2% Offset, Compressive Modulus	psi	ASTM D-695	49500	47500	57300		74100	64800
10% Deformation, Compressive Strength	psi	ASTM D-695	2260	2030	2200		3450	2900
10% Deformation, Compressive Modulus	psi	ASTM D-695	2300	2070	2250		3470	2940
Compressive Creep (Deformation Under Load), 13.7 MPa, 25°C, 24 Hours (1987 psi, 73°F, 24 Hours)								
Total Deformation (MD)	%	Based on ASTM D-621	5.9	9.9	7.2	7	1.6	2
MD (Permanent)	%	Based on ASTM D-621	3.2	5.9	5.3	3	0.7	0.7
Tribological, .92 MPa, .76 m/s, 5 days (150 f/m , 133 psi , 5 days)								
Friction Coefficient	~	ASTM D-3702	0.213	0.303	0.29		0.381	0.264
Wear Coefficient	K Factor	ASTM D-3702	31.3	7.6	16		14.6	6.7
Running Temperature	°C (°F)	ASTM D-3702	163 (235)	135 (274.8)	142.2 (286.3)		184.4 (364)	115.5 (240)
Coefficient of Thermal Expansion 25°C to 155°C (77°F to 311°F)								
Mold Direction (MD) 10/6°C (43°F)	ppm/°C	ASTM E-831	127.65	122.73	113.87	99.23	102.22	116.74
Cross Direction (CD) 10/6°C (43°F)	ppm/°C	ASTM E-831	110.88	115.14	95.75	75.79	90.14	72.5

Percent Deformation Under Load 13.7 MPa, 25°C (1987psi, 73°F) 24hrs.



Thermal Expansion 25°C to 155°C (77°F to 311°F)



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