Darcoid works with Parker EPS which has over 300 PTFE compounds and polymeric materials for the manufacture of FlexiSeal®, FlexiLip™ and FlexiCase™ seals. Our material offering includes non-filled PTFE, standard and specialty filled PTFE compounds, TFM blends, UHMW polyethylene and thermoplastic elastomers. Parker can meet your seal material requirements for PTFE sealing in most all environmental and operating conditions.

Advantages of PTFE as a Jacket Material Low Friction

The low coefficient of friction (.06) of PTFE material results from low interfacial forces between its surface and other materials that it may come in contact with. This behavior of PTFE material reduces any possibility of stick-slip effects in dynamic sealing applications.

Wide Temperature Range (-450 to 600 °F)

PTFE's high melting point and morphological characteristics allow components made from the resin to be used continuously at service temperatures to 600 °F. Above this temperature the components' physical properties tend to decrease, causing heat-aging and material degradation. The polymer itself might remain unaffected, if the temperature is insufficient for thermal degradation. For sealing cryogenic fluids down to -450 °F, special designs using PTFE and other fluoropolymers are available.

Chemical Compatibility

The intra polymer chain bond strengths of PTFE compounds preclude reaction with most chemicals, thereby making them chemically inert at elevated temperatures and pressures with virtually all industrial chemicals and solvents. For a comparison of compatibility ratings for PTFE compound with other plastics and elastomers.

Dry Running Capability

Due to the strength of the carbon-fluorine and carbon-carbon single bonds, PTFE compounds have high thermal stability and self-lubricating capabilities, offering continuous dry running ability in dynamic sealing applications.

Temperature Cycling

Unlike most elastomers, PTFE compounds have the unique ability to resist material degradation, heat-aging and alteration in physical properties during temperature cycling.

High Surface Speeds

The low friction characteristics and resistance to heat of PTFE makes it the ideal candidate for high surface speed applications. PTFE compounds perform exceptionally well in high surface speed sealing applications where O-rings or U-cups made of elastomers fail due to heat generation.

Enhancing Performance of PTFE with Fillers

An important requirement for any potential PTFE filler is that it must be able to withstand the sintering temperatures of PTFE. Sintering involves exposure to temperatures close to 700 °F for several hours.
In fluid power applications, it can be beneficial to add fillers to PTFE compounds in order to enhance its physical characteristics. Specific fillers can be incorporated to provide improved compression strength, wear, and creep and extrusion resistance.

0102 — Modified Virgin PTFE

Same basic properties as virgin, but with increased wear and creep resistance and lower gas permeability.

0307 — Carbon-Graphite Filled
Carbon reduces creep, increases hardness and elevates thermal conductivity of PTFE. Carbon graphite compounds have good wear resistance and perform well in non-lubricated applications.

0502 — Carbon Fiber Filled
Carbon fiber lowers creep, increases flex and compressive modulus and raises hardness. Coefficient of thermal expansion is lowered and thermal conductivity is higher for compounds of carbon fiber filled PTFE. Ideal for automotive applications in shock absorbers and water pumps.

0601 — Aromatic Polyester Filled
Aromatic polyester is excellent for high temperatures and has excellent wear resistance against soft, dynamic surfaces. Not recommended for sealing applications involving steam.

0204 — Molybdenum Disulfide and Fiberglass Filled
Molybdenum disulfide increases the hardness of the seal surface while decreasing friction. It is normally used in small proportions combined with other fillers such as glass. MoS_2 is also inert towards most chemicals.

0203 — Fiberglass Filled
Glass fiber has a positive impact on creep performance of PTFE. It also adds wear resistance and offers good compression strength.

0301 — Graphite Filled
Since graphite is often used as a lubricant, it does not significantly increase the coefficient of friction of PTFE when used as a filler. The low friction allows the compound to be used when both shaft speed and pressure are high. Graphite also is chemically inert which enables its use in corrosive medias.

0120 — Mineral Filled
Mineral is ideal for improved upper temperatures and offers low abrasion to soft surfaces. PTFE with this filler can easily be qualified to FDA and other food-grade specifications like 0127 and 0128.

0405 — Stainless Steel Filled
Although stainless steel filler is very abrasive, this compound has excellent extrusion and high temperature resistance in static and slow dynamic applications.

0615 — Proprietary Low Wear PTFE
This proprietary filled PTFE offers low wear and friction properties, used in general applications where long life is required. Not recommended for applications with abrasive media.

Features of Other Machinable Plastics

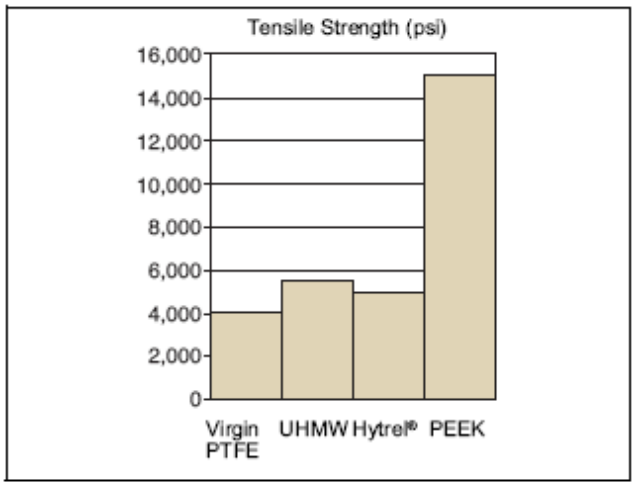

Figure 1. Ultimate Tensile Strength (psi)

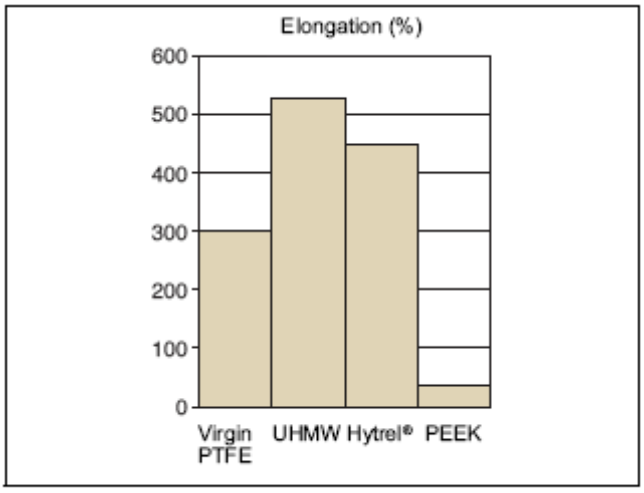

Figure 2. Ultimate Elongation (%)

UHMW Polyethylene
• Temperature Range -360 to 180 °F
• Excellent wear and abrasive resistance
• Good lubricity in water
• Excellent sealing of light gases at low pressures
• Excellent high pressure extrusion resistance
• Moderate abrasion to soft hardware
• Excellent wear resistance in reciprocating applications

Hytrel®* Thermoplastic (TPE) Elastomer
• Temperature Range -80 to 275 °F
• Excellent wear and extrusion resistance
• Excellent sealing of light gases at low pressures
• Excellent high pressure extrusion resistance
• Low abrasion to soft dynamic hardware material
• Minimum dynamic surface hardness 25 Rc
• Excellent wear resistance in reciprocating applications
• Good wear resistance in rotary applications

Polychlorotriflouroethylene (PCTFE)
• Excellent electrical properties
• Stable for continuous usage until 400 °F
• Low creep at room temperature

Polyetheretherketone (PEEK)
• Chemically inert
• Very strong and rigid
• Temperature range -80 to 500 °F
• Excellent abrasion resistance

*Hytrel® is a registered trademark of DuPont.

Table 1. FlexiSeal Materials — Typical Physical Properties

Parker Material Code	Material	Color	Typical Applications & Description	Service Temperature Range (°F)	Tensile Strength in psi at Break	Elongation in %	Hardness-Shore D
0100	Virgin PTFE	White	Excellent for cryogenic applications. Good for gases.	-425 to +450	4575	400	60
0102	Modified PTFE	Turquoise	Lower creep, reduced permeability and good wear resistance.	-320 to +450	4600	390	60
0203	Fiberglass Filled PTFE	Gold	Excellent compressive strength and good wear resistance.	-200 to +575	3480	190	67
0204	Fiberglass & Moly Filled PTFE	Gray	Excellent for extreme conditions such as high pressure & temperature and for longer wear life on hardened dynamic surfaces.	-200 to +575	3100	245	62
0307	Carbon-Graphite Filled PTFE	Black	Excellent wear resistance and reduced creep.	-360 to +575	2250	100	64
0301	Graphite Filled PTFE	Black	Excellent for corrosive service. Low abrasion to soft shafts. Good in unlubricated service.	-250 to +550	3200	260	60
0502	Carbon Fiber Filled PTFE	Brown	Good for strong alkali and hydrofluoric acid. Good in water service.	-200 to +550	3200	312	60
0120	Mineral Filled PTFE	White	Excellent low abrasion to soft surfaces & improved upper temperature performance.	-360 to +550	4070	270	65
0601	Aromatic Polyester Filled PTFE	Tan	Excellent high temperature capabilities & excellent wear resistance.	-360 to +550	2500	200	61
0405	Stainless Steel Filled PTFE	Gray	Excellent extrusion resistance at high temperatures and pressures.	-300 to +600	2200	190	72
0913	Hytrel®* Unlubricated Thermoplastic Elastomer	Black	Excellent in gases and most hydraulic fluids. Good abrasion resistance with high wear properties.	-80 to +275	5800	500	55
0901	UHMW Polyethylene	Translucent	High wearing plastic for use in abrasive medias. Excellent in water-based medias, but restricted chemical and heat resistance.	-320 to +200	6000	325	67
0615	Proprietary Low Wear PTFE	Purple	Excellent low wearing material. Kind to soft mating surfaces in the Rb range.	-360 to +550	3470	200	63
0127	Mineral Filled PTFE — FDA compliant for rotary appl.	White	FDA compliant materials for sanitary food and pharmaceutical processing.	-360 to +550	2800	250	66
0128	Mineral Filled PTFE — Antimicrobial	White	FDA material with an antimicrobial agent added to prevent bacterial growth.	-360 to +550	2800	250	66

Parker Material Code	Coefficient of Friction	Thermal Conductivity in W/mK	Coefficient of Thermal Expansion in/in/°F x 10^{-5} at 203 °F	Permanent Deformation Under Load 70 °F 2000 psi in %	Chemical Compatibility Rating	Wear Resistance Rating	High Pressure/ Extrusion Resistance Rating	FDA/NSF Compliant
					5 = Excellent 1 = Fair			
0100	0.05 – 0.10	0.30	11.0	7.0	5	1	1	Yes
0102	0.05 – 0.10	0.29	11.0	6.9	5	2	2	Yes
0203	0.08 – 0.12	0.27	10.0	6.0	5	5	5	No
0204	0.08 – 0.12	0.28	11.0	6.0	5	4	4	No
0307	0.08 – 0.11	0.35	8.0	2.5	5	4	4	No
0301	0.07 – 0.09	0.39	11.0	3.5	5	4	3	No
0502	0.09 – 0.12	0.31	13.0	1.8	4	5	5	No
0120	0.08 – 0.12	0.23	11.0	4.2	5	3	4	Yes
0601	0.09 – 0.13	0.32	9.0	5.5	4	4	4	No
0405	0.30 – 0.34	0.40	8.0	3.6	5	4	5	No
0913	0.18 – 0.30	0.16	7.2	—	2	4	5	No
0901	0.17 – 0.22	—	11.0	7.1	3	5	5	Yes
0615	0.09 – 0.12	0.30	9.0	3.2	5	5	3	No
0127	0.07 – 0.10	0.30	11.0	5.5	5	3	4	Yes
0128	0.07 – 0.10	0.30	11.0	5.3	5	3	4	Yes

Note: We emphasize that this tabulation should be used as a guide only.

It is based primarily on laboratory and service tests, but does not take into account all variables that can be encountered in actual use. Therefore, it is always advisable to test the material under actual service conditions before specification. If this is not practical, tests should be devised that simulate service conditions as closely as possible.

Materials

Spring Materials

Table 2. Spring Materials

Spring Material	Application
300 Series Stainless Steel (Cantilever — 301 SS) (Canted Coil — 302 SS)	General purpose spring material for most fluids up to 600 °F. It is recommended to 400 °F in corrosive media.
17-7PH Stainless Steel (Helical)	17-7PH exhibits better retention of mechanical properties at temperatures over 400 °F than 300 series stainless steel.
Elgiloy® (Cantilever and Helical)	NACE approved. Recommended for applications above 500 °F and is corrosion resistant in salt water or severe media.
Hastelloy® C276 (Canted Coil and Helical)	Resistant in severely corrosive or milder fluids when temperatures exceed 400 °F.

Table 3. Spring Loads Available by Cross-Section

Seal	Spring Cross-Section	Spring Load	Spring Material Available	Cross-Section Available				
				062	093	125	187	250
FlexiSeal V Series		L M	S = 301 Stainless E = Elgiloy®	4 4	4 4	4 4	4 4	4 4
FlexiSeal C Series		L M H	S = 302 Stainless H = Hastelloy®	4 4	4 4	4 4	4 4	4 4
FlexiSeal H Series		H	S = 17-7PH Stainless E = Elgiloy®	4 4	4 4	4 4	4 4	4 4

L = Light
M = Medium
H = Heavy