



# Properties of Bal Seal® Polymer Materials

Technical Report  
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## 1.0 Definitions

### Elongation at Break

The maximum percent of elongation that a material can sustain under load just before it ruptures during a tensile test. Results shown are typical and at room temperature (70 °F, 23 °C) unless indicated otherwise.

### FDA Approved

Compositions that, as a whole entity, have been approved by the FDA and are listed as approved compositions on [www.fda.gov](http://www.fda.gov).

### FDA Compliant

Compositions in which all ingredients are designated by the FDA to be “safe for use in food contact.” In addition, none of the ingredients are listed on the California Code of Regulations Hazardous Substance list (<https://www.dir.ca.gov/title8/339.html>). Note that everything that is FDA approved is automatically FDA compliant.

### FDA Compatible

Compositions in which the majority (67%) of ingredients are designated by the FDA to be “safe for use in food contact.” In addition, none of the ingredients are listed on the California Code of Regulations Hazardous Substance list (<https://www.dir.ca.gov/title8/339.html>). Note that everything that is FDA approved is automatically FDA compatible.

### Operating Temperature Range

The suggested minimum and maximum limits at which the materials operate effectively. It is important to note that operating temperature range is significantly affected by the operation speed and pressure. As the operating speed and pressure increase, so does the temperature at the contact point, thus reducing the overall operating temperature range.

### Tensile Strength at Break

The maximum stress level that the material can withstand without tearing. Typical results are shown at room temperature (70 °F, 23 °C) unless indicated otherwise.

## 2.0 Properties of Bal Seal® Polymer Materials

Bal Seal Material	Operating Temperature Range °F (°C)	Tensile Strength At Break psi (kg/cm <sup>2</sup> )	Elongation At Break (molded direction) %	Color
<p><b>ER55 Polyester Elastomer</b> Used with poor mating surface finish where flexibility for excellent sealing ability is needed. For use at low speeds and moist or wet food contact. FDA compliant and compatible.</p>	-70 to 280 (-57 to 138)	2,370 (167)	520	Black
<p><b>FEP Fluorocarbon Resin Thermoplastic</b> Fluorinated Ethylene Propylene (FEP), compression-molded thermoplastic. Melt Processable. Excellent chemical compatibility. FDA Compliant.</p>	-320 to 400 (-196 to 204)	3,400 (239)	325	White
<p><b>FP Fluoropolymer</b> Fluoropolymer in rod/tube/plate form, compression molded. Not FDA compliant or compatible.</p>	-70 to 390 (-57 to 199)	6,250 (439)	225	White
<p><b>G Graphite PTFE</b> General-purpose application where more extrusion/creep-resistance and less wear than virgin PTFE are desired. G material is compatible with most fluids and gases except strong oxidizers and certain concentrated acids. Not for general use in vacuum or dry gases. Not FDA compliant or compatible.</p>	-450 to 475 (-268 to 246)	3,800 (267)	325	Gray/Black
<p><b>GC Graphite Carbon PTFE</b> General-purpose application where extrusion/creep resistance is important. Resists deformation at high temperatures. Not for general use in vacuum or inert gases. Not FDA compliant or compatible.</p>	-450 to 500 (-268 to 260)	4,100 (288)	325	Gray/Black
<p><b>GF Graphite Fiber-Reinforced PTFE</b> Fiber-reinforced PTFE provides improved wear and extrusion resistance over other general-purpose compounds. Not FDA compliant or compatible.</p>	-450 to 500 (-268 to 260)	3,200 (225)	300	Gray/Black
<p><b>GFP Graphite Fiber-Reinforced PTFE</b> Moderate to extreme service, excellent wear resistance at moderate speeds, high pressure and high temperatures. Excellent for use in water and other liquid solutions, and on dynamic surfaces. Dynamic surface hardness should be Rc 40 or higher. Limited use in vacuum and inert gases. Not FDA compliant or compatible.</p>	-450 to 500 (-268 to 260)	2,000 (141)	175	Black
<p><b>GFPM Moly Disulfide-Reinforced PTFE</b> Excellent wear resistance in vacuum and inert gas applications, can be used both in liquid services or severely dry applications. High extrusion resistance, suitable for high-pressure and low-speed rotary applications. Not FDA compliant or compatible.</p>	-328 to 500 (-196 to 260)	2,386 (168)	201	Black
<p><b>P170 High-Performance Polymer Blend</b> Higher-temperature PEEK blend. Designed for glue dispensers. Not recommended for low to moderate temperature applications. Not FDA compliant or compatible.</p>	200 to 600 (93 to 315)	17,000 (1195)	6	Dark Brown

Bal Seal Material	Operating Temperature Range °F (°C)	Tensile Strength At Break psi (kg/cm <sup>2</sup> )	Elongation At Break (molded direction) %	Color
<p><b>P181 High-Performance Polymer</b>                      Polyimide material with good toughness, low water absorption, good wear and chemical resistance, and excellent stability against oxidation. Useful in scraping, low speed, high temperature applications.</p>	-450 to 570 (-268 to 299)	18,900 (1329)	4	Yellow
<p><b>P240 High-Performance Polymer with Lubricant</b>                      Lubricated high-performance polymer blend, injection molded or extruded. Not FDA compliant or compatible.</p>	to 570 (to 299)	8,700 (612)	>1	Black
<p><b>P40 Compression-Molded High-Performance Polymer</b>                      High-performance polymer with superior tensile strength and chemical compatibility. Suitable for sealing viscous and abrasive material in scraping-action applications at high temperatures. FDA compliant and compatible.</p>	-70 to 600 (-57 to 316)	14,500 (1019)	>2	Beige
<p><b>P41 Extruded High-Performance Polymer</b>                      Superior tensile strength and chemical compatibility. Suitable for sealing viscous and abrasive material in scraping-action applications at high temperatures. FDA compliant and compatible.</p>	70 to 600 (-57 to 316)	14,500 (1019)	>2	Beige
<p><b>P60 Mineral-Filled PTFE</b>                      Mineral-filled PTFE compound, exhibiting superior dimensional stability and creep resistance as compared with virgin PTFE and graphite-filled compounds. Designed for service in FDA regulated applications, and non-permeable in steam (good for autoclave applications). Exhibits low friction, minimal wear, and non-particulate/low shedding. Suitable for use in rotary and reciprocating equipment applications.</p>	-320 to 500 (-196 to 260)	1,300 (91)	14	White/Off White
<p><b>P64 PCTFE Fluoropolymer</b>                      PCTFE fluoropolymer useful for cryogenic valve seat applications. Good retention of properties at cryogenic temperatures.</p>	-400 to 250 (-240 to 121)	4,000 (281)	140	White
<p><b>P66 High-Performance Carbon Fiber-Reinforced Polymer</b>                      Designed for applications that require tolerance for high temperature, high pressure, and chemical compatibility. Ability to flex at low and high pressures, and elevated temperatures. Not FDA compliant or compatible.</p>	-70 to 600 (-57 to 316)	15,000 (1054)	>1	Black
<p><b>P69D High-Performance Polymer with Carbon Fiber and PTFE</b>                      Used for bearing seals and backup ring applications. Tolerance for high temperatures and pressure. Excellent chemical compatibility. Not FDA compliant or compatible.</p>	-70 to 600 (-57 to 316)	13,300 (935)	2	Black
<p><b>P69N High-Performance Polymer</b>                      Extruded filled PEEK-based material with very high elongation. Not FDA compliant or compatible.</p>	70 to 500 (21 to 260)	13,900 (977)	10	Black
<p><b>SP191 Polymer-Filled PTFE</b>                      High-performance PTFE composition. Ideal for oxygen intensifier/compressor applications. FDA compliant and compatible. Implantable per USP Class VI and ISO 10993-5.</p>	-450 to 500 (-267 to 260)	3,000 (211)	315	Yellow/Tan

Bal Seal Material	Operating Temperature Range °F (°C)	Tensile Strength At Break psi (kg/cm <sup>2</sup> )	Elongation At Break (molded direction) %	Color
<p><b>SP36 Polymer-Filled PTFE</b> Superior heat and wear resistance. Well suited for rotary service. Recommended for low to high-speed applications when running against soft metals. Not FDA compliant or compatible.</p>	-450 to 500 (-268 to 260)	3,000 (211)	350	Tan
<p><b>SP45 Polymer-Filled PTFE</b> Low abrasion to mating parts. General-purpose material for use in contact with shaft/housing made from 300 series stainless steel, aluminum and other soft metallic or plastic materials. Suitable for sealing most liquid media including moisture and air at high speeds and low pressures with very high PV values. FDA compliant and compatible.</p>	-450 to 500 (-268 to 260)	3,000 (211)	315	Green
<p><b>T Virgin PTFE</b> General-purpose material for use in applications where low friction and chemical compatibility are important. Usually limited to light-duty service, and can be used in vacuum and inert gases. Subject to cold flow and exhibits high wear in water/aqueous media. Compatible with most fluids and gases except molten sodium, some others. Excellent performance at low temperatures. FDA compliant, compatible, and approved.</p>	-450 to 450 (-268 to 232)	4,800 (337)	400	White
<p><b>TA Low Permeability PTFE</b> Superior mechanical properties with good surface finishes, good sealing ability in gases and vacuum. Suitable for semiconductor applications. FDA compliant and compatible.</p>	-450 to 450 (-268 to 232)	5,250 (369)	570	White
<p><b>TFM PTFE</b> Modified PTFE-TFM fluoropolymer. Not FDA compliant but is FDA compatible.</p>	-320 to 500 (-200 to 260)	4,800 (337)	N/A	White
<p><b>UP30 Filled UHMWPE Composition</b> Filled UHMW polyethylene composition polymer in rod/tube/plate form. Not FDA compliant but is FDA compatible.</p>	-450 to 180 (-268 to 82)	5,500 (387)	N/A	Yellow/Gold
<p><b>UPC UHMWPE Composition</b> Suitable for aqueous service. Commercial grade for general-purpose applications. Good wear resistance in water and aqueous solutions. High extrusion resistance, but high friction. Limited to temperatures to 180 °F (82 °C). Suitable for low-speed rotary service. FDA compliant and compatible.</p>	-450 to 180 (-268 to 82)	7,600 (534)	500	Translucent White
<p><b>UPC15 Virgin UHMWPE</b> Implantable-grade UHMWPE, ideal for use in applications requiring seal materials that are compliant with the ISO 10993-5 standard for cytotoxicity (safe for direct or indirect contact with the human body). Offers excellent wear resistance in water and other aqueous media. Suitable for low speed, low pressure service. FDA compliant and compatible.</p>	-450 to 180 (-268 to 82)	9,400 (661)	420	Translucent White
<p><b>UPC25 High-Temperature UHMWPE</b> UHMW-polyethylene with additives to improve performance over standard UHMWPE in higher temperatures. FDA compliant and compatible.</p>	-450 to 212 (-268 to 100)	5,800 (408)	300	White