PIP Ring and Type B PolyPak™ save space and provide efficient bi-directional sealing solution

Parker’s patented PIP Ring (Pressure Inverting Pedestal) converts the time-tested and performance proven PolyPak™ into a bi-directional seal for critical high-pressure applications.

**Features**
- Single groove design
- Can be installed on a one-piece piston in most instances
- Eliminates possible pressure trap associated with two “squeeze type” seals
- Available in Molythane™, PolyMyte™, UltraCOMP™, Nitrile, HSN, TPR, Fluorocarbon

**Benefits**
- => Saves space and machining
- => Increases available bearing length of piston and reduces the number of components required
- => Extends seal life and efficiency
- => Wide range of pressures, temperatures and fluid compatibility

**Pressure Trapping**
A pressure trap may occur in a bi-directional pressure application, when two squeeze seals are installed on a piston -- as they maintain sealability in both directions. Such a design creates “trapped” pressurized fluid between the two seals. This confined pressure can increase exponentially and reach pressures exceeding 10,000 psi. Such extreme pressures cause:
- severe seal extrusion
- excessive friction
- heat build-up
- metal damage

**Typical Applications**
Parker’s PIP seal assembly is designed for high pressures and rigorous duty requirements associated with bi-directional applications, such as:
- Energy, oil & gas blow-out preventer seals
- Energy, oil & gas risers, connectors
- Industrial hydraulic cylinders

**Design Assistance**
For details on installation, dimensions, sizes and gland cross sections, consult Parker’s PolyPak Seal Design Handbook, Catalog EPS3800, or call the factory and speak with our application engineers.

The solution is a bi-directional seal such as Parker’s PIP seal assembly which requires only one seal groove. See reverse side of this bulletin for details on how the PIP seal assembly works.
How the PIP seal works

The PolyPak, at low pressure “P”, relies on the compression of the O-spring “A” for its principle sealing force, “S.” As the pressure “P” increases, as shown in Fig. 1, it is transmitted to the sealing lips by the O-spring “A”, increasing the sealing force “S” proportionately to the pressure “P”, providing sealability at all pressures.

If the pressure “P” is applied from the reverse side, as shown in Fig. 2, low pressure sealability is maintained by the force of the O-spring “A.”

However, as the reverse pressure “P” increases, the pressure does not actuate the O-spring “A,” and the sealing force “S” does not increase proportional to “P.” As a result, seal extrusion and leakage may occur.

With the addition of the PIP ring, low pressure sealability in the conventional direction, is maintained. Higher pressure from the normal direction bypasses the PIP ring, as shown in Fig. 3, actuating on the O-spring “A”, providing proportional sealing forces “S.” Low pressure sealing in reverse occurs exactly as in Fig. 2.

However, as pressure “P” rises in the opposite direction, the body of the PolyPak is forced downstream by the pressure “P” into the PIP ring. The PIP ring actuates the O-spring, which in turn transmits this force to the sealing lips, providing the proportional sealing force “S” necessary to maintain sealability over a full range of pressures, as shown in Fig. 4.

**PIP Seal Materials**

<table>
<thead>
<tr>
<th>Compound Number</th>
<th>Material</th>
<th>Color</th>
<th>Hardness</th>
<th>Temp Range F</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4617</td>
<td>Molythane™</td>
<td>gray</td>
<td>A90</td>
<td>-65 to +200</td>
<td>Polyurethane compounded for long service. High extrusion resistance, excellent wear and abrasion resistance. Excellent resistance to petroleum fluids, salts, weak acids and alkaline solutions &lt;10% conc., up to 140° in water.</td>
</tr>
<tr>
<td>4652</td>
<td>PolyMyte™</td>
<td>orange</td>
<td>D65</td>
<td>-65 to +275</td>
<td>High tear strength, abrasion and extrusion resistance. Excellent resistance to petroleum fluids, many phosphate esters, some chlorinated hydraulic fluids, up to 180° in water.</td>
</tr>
<tr>
<td>4684</td>
<td>PolyMyte™</td>
<td>black</td>
<td>D65</td>
<td>-65 to +275</td>
<td>Polyester alloy. High tear strength, abrasion and extrusion resistant. Excellent resistance to petroleum fluids, many phosphate ester fluids, some chlorinated hydraulic fluids, up to 180°F in water.</td>
</tr>
<tr>
<td>4732</td>
<td>Gen. purpose TPR</td>
<td>black</td>
<td>D57</td>
<td>-40 to +250</td>
<td>Excellent general purpose thermoplastic elastomer blend of Nitrile and Polypropylene. Good with water, oils, mild acids and abrasives.</td>
</tr>
<tr>
<td>4007</td>
<td>Highly Saturated Nitrile (HSN, HNBR)</td>
<td>black</td>
<td>A95</td>
<td>-30 to +120</td>
<td>High tensile strength (4600 psi) coupled with abrasion resistance and high heat resistance. Compatible with hydrogen sulfide, corrosion inhibitors, steam and oil. Performs well in flex fuels, silicon greases and oils, ethylene glycol based fluids, petroleum oils and fluids.</td>
</tr>
<tr>
<td>4266</td>
<td>Fluorocarbon</td>
<td>black</td>
<td>A95</td>
<td>-10 to +450</td>
<td>General purpose fluorocarbon. Excellent compression set resistance, high temperature, high pressure material. Excellent resistance to petroleum oils and fluids.</td>
</tr>
<tr>
<td>4685</td>
<td>UltraCOMP™ HTP</td>
<td>tan</td>
<td>126 Rockwell R</td>
<td>-65 to +500</td>
<td>Outstanding performance and retention of mechanical properties at high temperatures and pressures. Excellent extrusion resistance. UltraCOMP™ maintains its properties and performs in very harsh chemical environments, at very high temperatures and at pressures where most other compounds would extrude, making it the material of choice for back-up devices and special sealing devices (PIP rings). It has superior chemical resistance to a wide range of fluids. Four UltraCOMP™ formulations available. (See Technical Bulletin EPS 5264.)</td>
</tr>
</tbody>
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