PIP Ring (Pressure Inverting Pedestal)

Technical Bulletin

No. 5218B1-USA

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	Benefits
• Single groove design	=> Saves space and machining
• Can be installed on a one-piece piston in most instances	=> Increases available bearing length of piston and reduces the number of components required
• Eliminates possible pressure trap associated with two "squeeze type" seals	=> Extends seal life and efficiency
• Available in Molythane™, PolyMyte™, UltraCOMP™, Nitrile, HSN, TPR, Fluo-rocarbon	=> Wide range of pressures, temperatures and fluid compatibility

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.

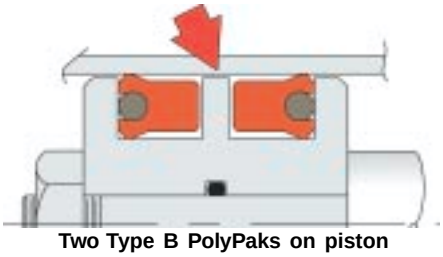
Type B PolyPak™ with UltraCOMP™ PIP Ring

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

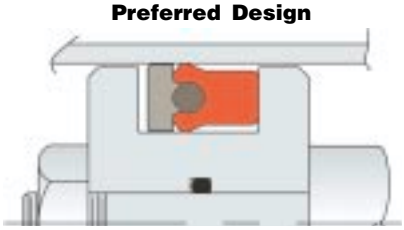
Pressure Trap



Two Type B PolyPaks on piston

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.

Preferred Design



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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.

Fig. 1

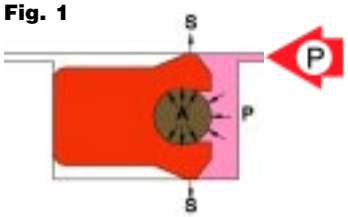
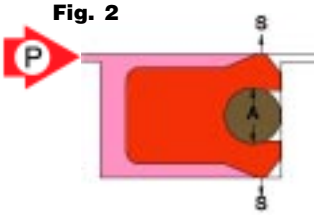


Fig. 2



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.

Fig. 3

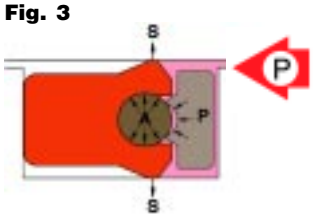
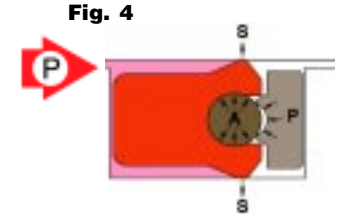


Fig. 4



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

Compound Number	Material	Color	Hardness	Temp Range °F	Description
4617	Molythane™	gray	A90	-65 to +200	Polyurethane compounded for long service. High extrusion resistance, excellent wear and abrasion resistance. Excellent resistance to petroleum fluids, salts, weak acids and alkaline solutions <10% conc., up to 140° in water.
4652	PolyMyte™	orange	D65	-65 to +275	High tear strength, abrasion and extrusion resistance. Excellent resistance to petroleum fluids, many phosphate esters, some chlorinated hydraulic fluids, up to 180° in water.
4684	PolyMyte™	black	D65	-65 to +275	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, oxygen, common solvents, dilute bases and mineral acids. Good resistance to hostile environments.
4732	Gen. purpose TPR	black	D57	-40 to +250	Excellent general purpose thermoplastic elastomer blend of Nitrile and Polypropylene. Good with water, oils, mild acids and abrasives.
4007	Highly Saturated Nitrile (HSN, HNBR)	black	A95	-30 to +320	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.
4266	Fluorocarbon	black	A95	-10 to +450	General purpose fluorocarbon. Excellent compression set resistance, high temperature, high pressure material. Excellent resistance to petroleum oils and fluids.
4685	UltraCOMP™ HTP	tan	126 Rockwell R	-65 to +500	Outstanding performance and retention of mechanical properties at high temperatures and pressures. Excellent extrusion resistance. UltraCOMP™ maintains its properties and performs in very harsh chemicals 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.)

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