

ASI Replacement Piston Seals

Selecting the Best Material for Your Application

ASI offers both UHMW-PE and Teflon compounds for pump seal jackets. The selection of the best material depends on a number of factors, which are discussed below.

UHMW-PE Compound

This material is based on ultra-high molecular weight polyethylene, and is compounded with other proprietary polymers to provide better lubricity and solvent resistance than pure UHMW-PE. This material is a self-lubricating compound that exhibits excellent wear characteristics, low coefficient of friction, and good resistance to cold-flow (extrusion). It is often used for “dry” bearings and seals, where lubrication by oil or other fluids is not permitted. It is resistant to most HPLC solvents except for methylene chloride and Toluene. UHMW-PE seals should only be used intermittently when using these solvents in 100% concentration. ASI offers two different formulations of this material. One is a gold color and the other is white. The gold material is slightly stiffer than the white material, while the white material exhibits a slightly lower coefficient of friction. The formulation that we feel is most suitable for a specific pump model is the only formulation of UHMW-PE that we offer for that pump model. There are many different UHMW-PE formulations that appear the same color – but they are not all the same. We have subjected our materials to thousands of hours of testing to prove them out, and we are confident of their superior performance.

Teflon® Compound

This material is Teflon (PTFE) with a filler added to it for the purpose of increasing resistance to cold flow and improving wear characteristics. It is absolutely inert to any hplc solvent, but does not have the high resistance to wear and cold-flow that the UHMW-PE compounds have. It is more flexible than UHMW-PE, and therefore will conform better with pistons that are not aligned well, or which are worn flat. The color of our formulation is black. There are dozens of Teflon compounds, many of which are black, but they are not all the same. Some offer an extremely low coefficient of friction but wear rapidly, while others last longer but can rapidly wear the sapphire piston (such as ceramic filled Teflon). The selection of the Teflon compound that we use is based on thousands of hours of testing of compounds from several different suppliers, and we are confident that it offers the best performance.

Conclusion

In general we recommend using our UHMW-PE compound. It generates less wear material than Teflon, tends to act as a better bearing to help align the piston, and has a much longer service life than Teflon. Always inspect the piston for signs of scoring or wear when replacing seals. If your piston is worn or scratched- *replace it*- because nothing will destroy a seal faster than a worn or scratched piston. Refer to the section on pistons for advice on detecting a worn piston.

Piston Seal Installation

It is good practice to clean the pump head when replacing seals. Seal wear material will collect on the wetted surfaces of the head, and these will contaminate check valves and other downstream components. Always wet the seal and inside of the pump head with Isopropanol prior to installing the seal.

Please refer to the “Maintenance and Trouble Shooting Tips” on piston seals for more information (page 103).

ASI Replacement Pistons

It is hard to believe that sapphire, one of the hardest materials known to man, could ever be worn out or scratched by a soft material like Teflon or UHMW-PE. Unfortunately it does wear out. As the seal gets used, small particles of salt crystals, metal fragments, and other contaminants become embedded in the sealing surface of the seal. Over time these contaminants abrade the sapphire or ceramic plunger and form flat spots or longitudinal scratches. These wear spots will destroy any seal in a very short time.

It is extremely important to inspect the sapphire or ceramic plunger whenever you replace a seal. If there are any signs of scratches or glazed spots, replace the piston. Failure to do so will result in a shredded seal and a pump head full of seal wear material.

It is very difficult to see worn spots on a sapphire or ceramic piston. Hold the piston up to a bright light and inspect with a 10x magnifier or microscope. Any spot that appears dull, glazed, or scratched is a sure sign of a worn piston.

About ASI Pistons

Our sapphire and ceramic rods are 100% inspected to ensure that there are no inclusions or other surface defects that may cause premature seal failure. We apply the same rigorous standards for quality control and close manufacturing tolerances that we maintain for our check valves.

Please refer to the “Maintenance and Trouble Shooting Tips” on pistons for more information (page 102).

Piston QC Tests and Instrumentation

Piston diameter	Digital micrometer
Piston length	Caliper
Geometry of ends	Shadowgraph 20X
Roundness	Talysurf
Surface finish	Talysurf
Groove (if any)	Shadowgraph 20X
Visual inspection	Binocular 25X

HIP Increases Density and Toughness

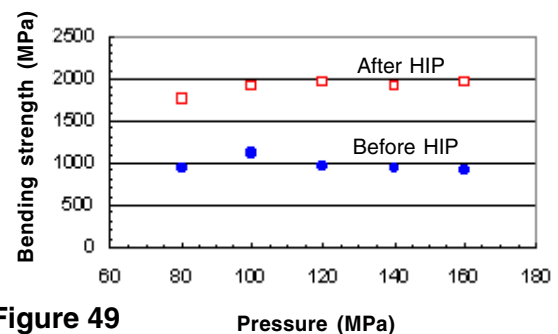


Figure 49

Pressure (MPa)