



# CHROMATOGRAPHIC SPECIALTIES INC.

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## Maintaining Your HPLC Pump

## Technical Note CS05

Chromatographic Specialties offers quality replacement parts for most models of HPLC pumps, including Agilent, Waters, Shimadzu, Varian, Beckman, Dionex and Perkin Elmer. Now you can do your own preventive maintenance on check valves and piston seals, cost effectively. Please refer to your instrument manual for the correct procedure.

### Check Valves

The purpose of a check valve is to control flow into and out of the pump head. Check valves consist of either a ceramic ball and seat or ruby ball and sapphire seat with a tension spring. When the piston is drawing solvent from the solvent reservoir, the ball in the inlet valve is pulled upward, allowing solvent to fill the chamber while the ball in the outlet check valve is 'seated' or closed. To pump solvent out of the chamber to the rest of the HPLC system, the piston moves forward, closing the inlet valve and opening the outlet valve by forcing the ball upwards. The lifetime of a check valve depends on usage, contaminants and the build up of buffer salts present in mobile phases. Pre-filtering the mobile phase and/or the installation of a 10  $\mu$ m solvent reservoir filter, removes particulate that can damage the check valves. Proper rinsing of the HPLC system after the use of buffered mobile phases will decrease salt build up. Note: Please make sure you install the check valve correctly, the arrow indicates the direction of the housing.

**Tech Tip:** Check valves with ceramic balls and seats are less likely to stick when using acetonitrile based mobile phases than check valves with ruby balls and sapphire seats. For more information on this phenomenon, see John Dolan's "Check Valves and Acetonitrile"<sup>1</sup>.

### Pistons

Pistons are prone to scratches from buffer salts, seal fragments and other contaminants over time so it is important to inspect the piston anytime you replace the piston seals.

**Tech Tip:** Instrument downtime can be much more expensive than replacing pistons. Many busy labs always replace the piston and seal at the same time because a damaged piston can shorten the lifetime of a piston seal.

### Piston Seals

Two types of piston seals are available, PTFE and ultra high molecular weight polyethylene (UHMW-PE). PTFE is the softer of the two and will compress to the shape of the piston more readily, but it's also more prone to shedding particles during use. UHMW-PE is more resistant to wear but it doesn't conform to the shape of the piston as it wears, increasing leaks.

### Recommended Maintenance Schedule

Timing	Part	Action
Every 3-6 months	Piston Seals	Depending on HPLC use, replace every 3-6 months to minimize pump downtime. For best performance, always presoak piston seals in methanol or isopropanol prior to installation
	Sapphire Pistons	Replace or inspect according to your preference
Every 6 months	Solvent Inlet Filter	Clean or replace if necessary
Every year	Check Valves	Change when required or at least once a year to prevent unscheduled downtime. <i>Replace more frequently if required.</i>

<sup>1</sup> Dolan, John W. "Check Valves and Acetonitrile", *LC\*GC Magazine*, 26 (2008) p 532.

## Trouble Shooting

The table below illustrates the most common pump problems encountered; however, these could also be symptoms of problems with other HPLC components. Always consult your HPLC Operating Manual when problems arise.

Symptom	Probable Cause	Solution
Erratic flow rates or pressure readings	Check valves Gas bubble in pump head Blocked solvent inlet filter	Replace check valve Purge pump head and degas mobile solvents prior to use Clean or replace solvent filter
No solvent flow out of the pump	Check Valve/Solvent draw-off valve	If pump motor is running, could be either check valve or solvent draw off valve, clean or replace
	Clogged inlet filter/Clogged lines	Clean or replace
Solvent is leaking from under pump head	Damaged plunger or seal	If either appears worn, replace
Pump is making a squeaking sound during operation	Worn plunger seal	Replace
Pump will not operate	Blown fuse, damaged plunger, etc.	Consult manufacturer's operating manual
Solvent is leaking from under the solvent draw-off valve	Defective solvent draw-off valve	Some systems require replacing just a seal while others require replacing the entire part

## Available Pump Replacement Parts from Chromatographic Specialties:

### OPTI-MAX® Cartridge Check Valve System

The easy to install OPTI-MAX® cartridge check valve system consists of a free turn OPTI-MAX housing and a replacement cartridge. No more hassle with all the individual components in an OEM check valve assembly. For more information, request literature code **O09**.



### OPTI-SEAL® and ITB™ Piston Seals

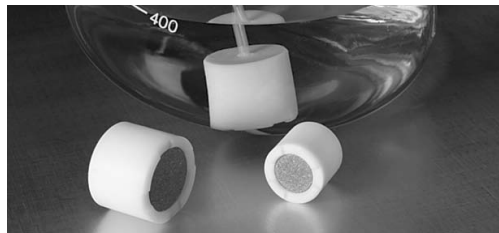
OPTI-Seal piston seals are manufactured from UHMW-PE and are more resistant to abrasion and wear than traditional PTFE based piston seals. Use OPTI-Seals for aqueous or aqueous buffered mobile phases.

Improved PTFE Blend or ITB Seals are designed to shed particles large enough to be trapped at the surface of 2µm frits, not embedded in them. ITB seals are best suited for applications using organic based mobile phases. For more information, request literature Code **O011**.



### OPTI-SOLV™ Solvent Reservoir Filters

OPTI-SOLV reservoir filters feature a unique bubble purging design and a Titanium frit that allows unrestricted solvent access. Literature Code **O04**.



**If you have any questions on repairing your own HPLC pump, please contact our knowledgeable Technical Support Team at 1-800-267-8103 or [tech@chromspec.com](mailto:tech@chromspec.com)**

**Other HPLC Technical Tips are available on our website, [www.chromspec.com](http://www.chromspec.com)**