

## Bal Seal® spring-energized seals in high-performance liquid chromatography (HPLC) plunger pumps

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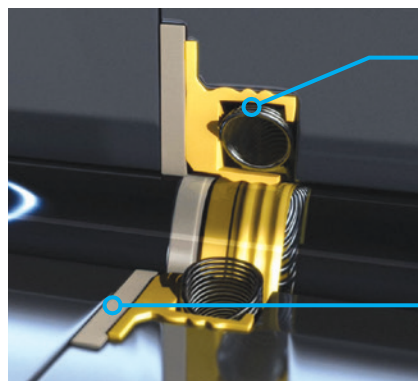


## Overview

High-performance liquid chromatography, or HPLC, is a technique used in analytical chemistry to separate, identify, and quantify each component in a mixture. In HPLC, a pressurized liquid solvent containing the sample mixture is pushed through a column filled with a solid adsorbent material. Each component in the sample interacts with the adsorbent material, separating the components.

HPLC is employed across pharmaceutical, food, environmental, government, research, and medical disciplines. For example, the process facilitates development and manufacture of pharmaceutical and biological products, the detection of performance-enhancing drugs, the separating of components in a complex biological sample, and the evaluation of vitamin levels in blood serum.

Pumps play a central role in HPLC equipment. Most commercial HPLC pumps are based on a reciprocating plunger in which a motor-driven cam, or line drive motor, pulls the plunger back and forth in the pump head. A specialized seal near the front of the plunger prevents the mobile phase from leaking into the back of the pump. Check valves mounted in the head open and close in response to small changes in pressure to maintain a one-way flow of solvent. The seal's ability to wear evenly, resist aggressive solvents, and provide reliable service over millions of cycles can have a significant impact on the precision and consistency of the HPLC equipment, as well as the accuracy of the results it produces.



A Bal Seal® spring-energized seal with a flange design prevents leakage at the pump head, at pressures from aspiration to 20 kpsi over millions of cycles in aggressive HPLC solvents.

A PEEK backup element improves the seal's resistance to extrusion.

## Operating Parameters

Bal Seal® spring-energized seals are custom-engineered for HPLC plunger pumps, providing reliable service at pressures from aspiration to 20,000 psi (1379 bar) at 70 °F (21 °C), in HPLC solvents such as ACN, water, MeOH, etc. Designs can incorporate flanges and lip designs that are precision-engineered to optimize friction and sealing effectiveness, while providing superior protection against contamination. Metallic, ceramic, or PEEK backup elements can be integrated to prevent seal extrusion.

## Advantages

- Seal jackets are available in a variety of materials, including graphite, PTFE, and filled polyethylene, to meet specific chemical compatibility, friction, temperature, and pressure requirements
- Biocompatible seal materials for HPLC systems are also available upon request
- Spring energizer materials are available to meet a broad range of application requirements

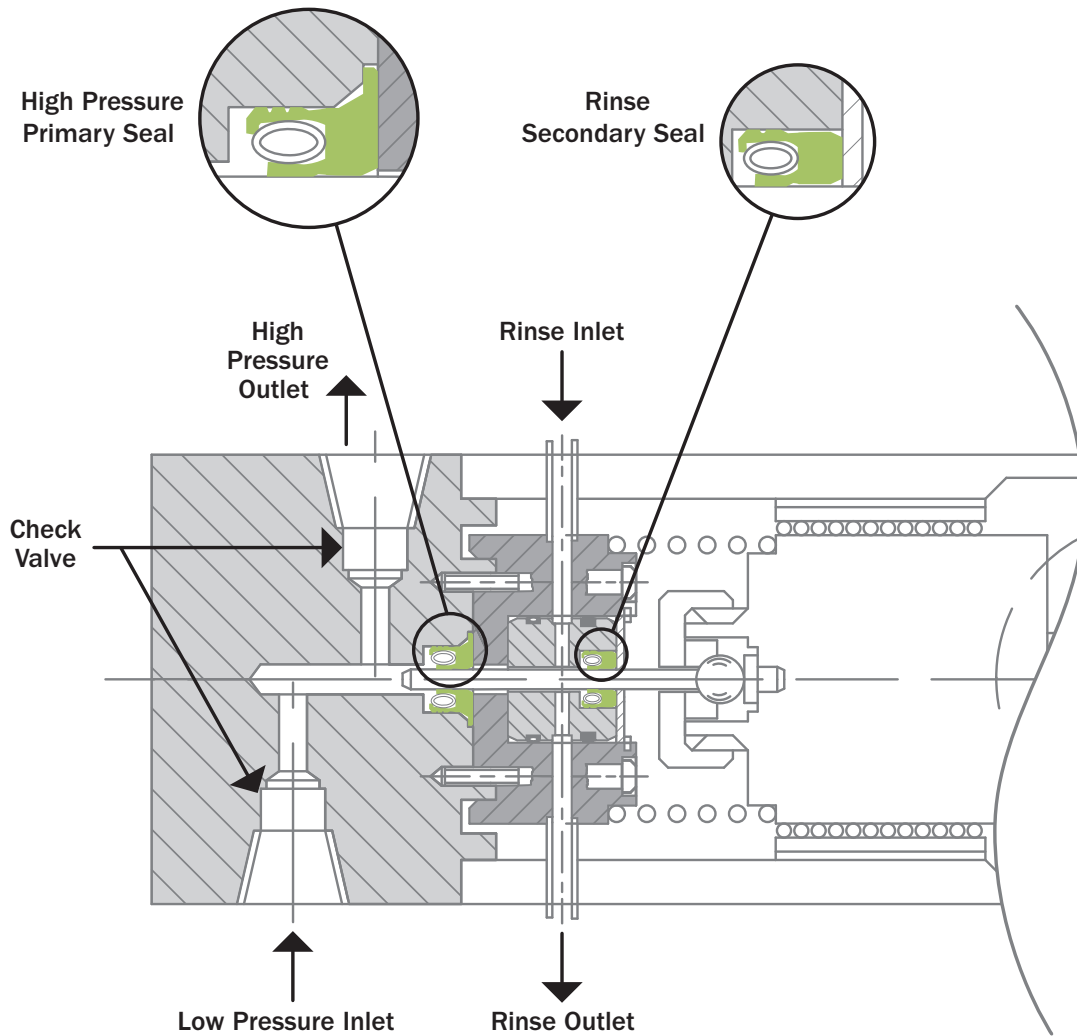
## Design Insight

While use of a rinse seal is not mandatory, incorporating one into a pump design can prolong service life and improve performance by protecting against leakage at lower pressures during the rinse cycle.

## Technical Description

<b>Media</b>	HPLC solvents, buffers	<b>Shaft material</b>	Sapphire or ceramic
<b>Friction</b>	Medium	<b>Housing material</b>	Stainless steel with DLC coating
<b>Cycles</b>	>1 million	<b>Surface finish</b>	2 Ra
<b>Pressure</b>	Aspiration to 20,000 psi (1379 bar)	<b>Hardness</b>	70 Rc
<b>Temperature</b>	70 °F (21 °C)		

For more information and technical assistance, contact your nearest Bal Seal Engineering location, or visit [www.balseal.com](http://www.balseal.com).



Typical HPLC Plunger Pump

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