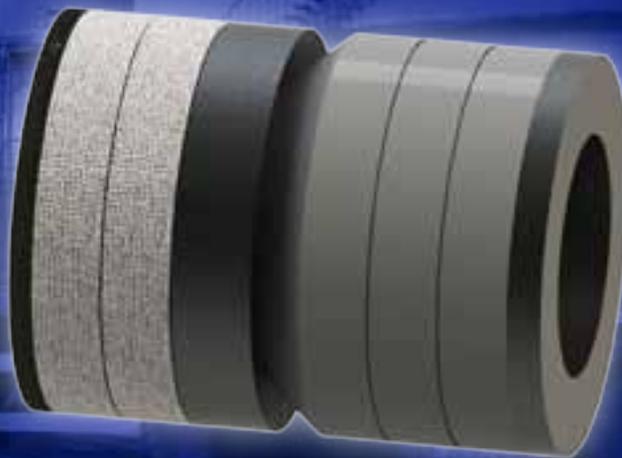
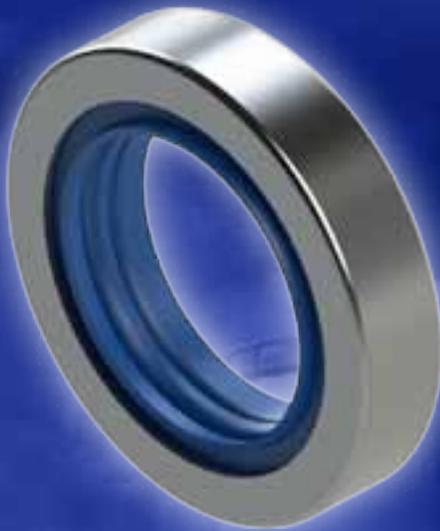




Sealing Options



Introduction

Today's modern industrial environments require a great amount of consideration when choosing the right sealing arrangement for pumping equipment. In some applications, government regulations have resulted in a need for zero leakage. In other applications, ease of maintenance is the top priority. Chemical compatibility also plays an important role when selecting the best seal for the application. With this in mind, Roper Pump Company has expanded its sealing options over the years. In 2008 we introduced the Triple Lip Seal which has been widely vetted and reputed as a great zero-leakage option. Now, based on feedback from the field, we are proud to announce the newest member to the Roper sealing family- the cartridge seal option. This option will now facilitate users to install a variety of cartridge seals.

Whether basic packing will suffice or something more elaborate such as a cartridge seal, Roper is ready to provide solutions and the information in this guide is designed to help.

Sealing Options in Roper Pumps

Pump Series	Packing			Triple Lip Seal	Cartridge Seal	Mechanical Seal	
	PTFE/ Graphite	PTFE	DSA			Type 9 Single	Type 21
3600 Series	3500			X			
	3600	X ¹	X	X			
	3700					X ³	X
	3500C					X ³	
	3700C					X ³	
Other Pump Series	2835	X ²	X				X
	5600	X ²			X	X ³	X
	9622		X			X ³	X
	A	X ²	X			X ³	X
	Bulk	X ²					X
	F	X ²	X			X	X
	PC	X ²	X			X	X
	ROC		X			X	X
Z				X	X	X	X

**1- Standard: Graphite Filament 2- Standard: PTFE Impregnated
3-With Modified Backplate**

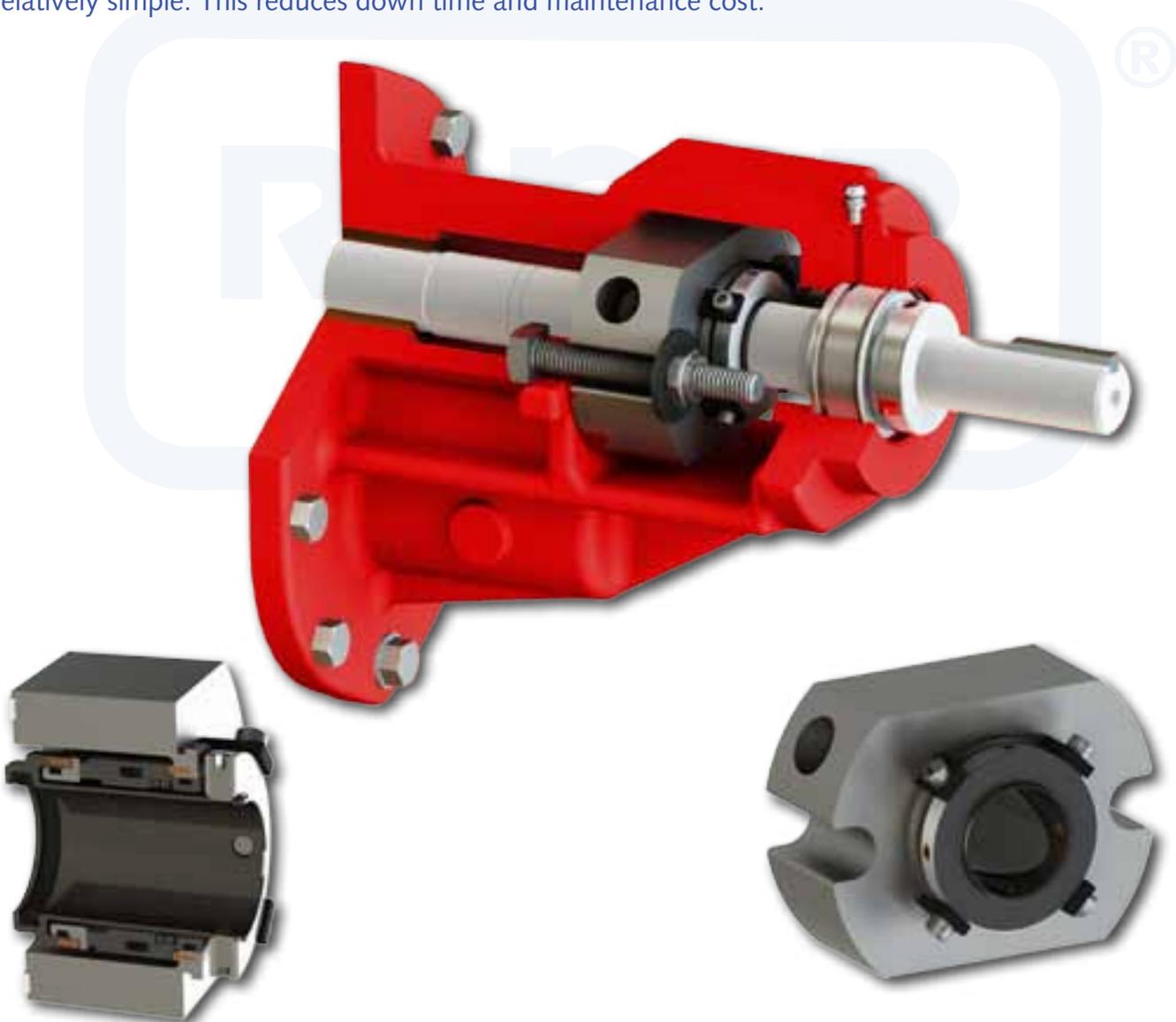
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Cartridge Seal

For pumping everything from abrasive slurries to the strongest chemicals, cartridge seals are designed to handle the harshest most demanding pumping environments. Cartridge seals consist of several components packaged in a single unit. Cartridge seals typically consist of sealing lips and/or a set of primary and secondary sealing faces, much like Roper's triple lip seal or a mechanical seal.

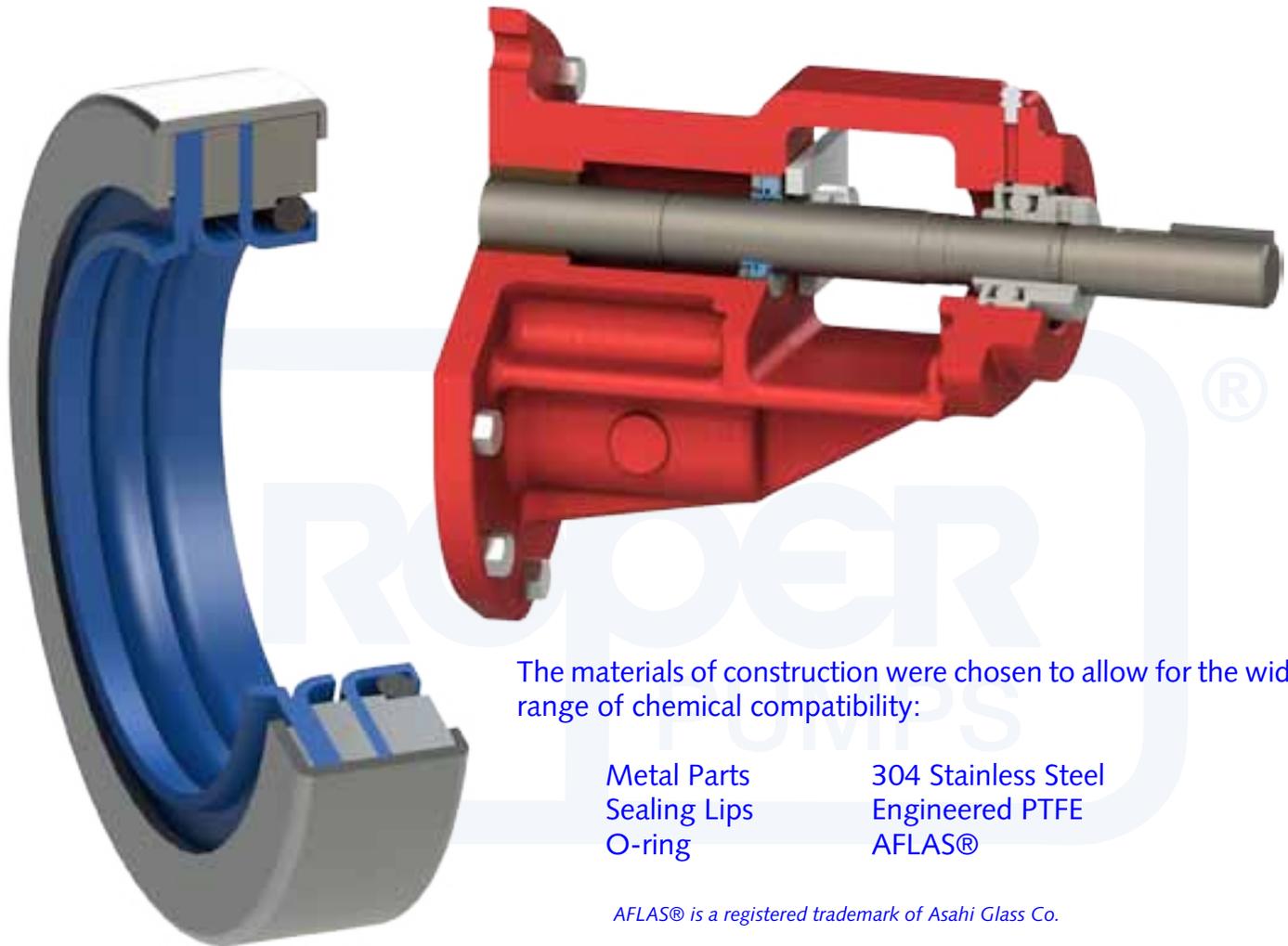
The major difference is the seal faces (or sealing lips) are installed into a housing gland and seal against a hardened rotating shaft sleeve. This hardened rotating sleeve not only ensures proper alignment between the cartridge seal and the drive shaft, but prevents damage in the sealing area of the shaft by the product pumped.

Cartridge seals are available in a wide range of material options for the primary and secondary sealing faces (e.g. Silicon Carbide, Tungsten Carbide, Carbon, etc.) and secondary sealing elastomers. This diversity in material options allows the user to select the best combination of material for maximum performance and longevity for particular applications. The cartridge seal can be provided with or without flushing capability. Because the components are packaged into a single unit, the installation and removal of the cartridge seal is relatively simple. This reduces down time and maintenance cost.



Triple Lip Seal

The Roper Triple Lip Seal is designed to handle the diverse applications faced by our gear pumps. The Triple Lip Seal is pressed into the existing stuffing box and requires no adjustment. It is retained by the flat seal retainer plate used in a mechanical seal pump so there is no packing gland or adjustment hardware. Three sealing lips contact the shaft while two inner lips are formed to keep the product in the pump. The outer lip is designed to keep outside contaminants away from the main sealing lips.



The materials of construction were chosen to allow for the widest range of chemical compatibility:

Metal Parts	304 Stainless Steel
Sealing Lips	Engineered PTFE
O-ring	AFLAS®

AFLAS® is a registered trademark of Asahi Glass Co.

The Roper Triple Lip Seals can be retrofitted into existing 3600/3700 and 5658BH series pumps. It should be noted that the sealing lips grab the shaft very tightly and can be easily damaged when sliding them over the retaining ring groove in the shaft.

Notice that the triple lip seal has a unique “O-Spring” o-ring that squeezes the main sealing lip to the shaft regardless of any shaft “play” that might occur due to external forces such as misaligned shafts, or internal forces such as high bushing wear. The Triple Lip Seal is capable of operating to the maximum pressure rating of the pump, and at temperatures from -10 to 400 degrees F.

Mechanical Seals



Mechanical Seals – Type 9

A wedge seal with pusher design. PTFE or flexible wedge used as a secondary seal. Positive drive by the use of two or more set screws which transmit shaft torque directly to the sealing faces.

Standard materials of construction: 316SS hardware, Carbon vs. Ceramic seal faces and **PTFE**. Viton elastomers.



Mechanical Seals – Type 21

An elastomer bellows with non-pusher design. Seal rotates with the shaft against a stationary mating face. A single coil spring acts as the force to maintain sealing. Standard materials of construction: 316SS hardware, Carbon vs. Ceramic faces and Viton elastomers.

Packing Options

Packing is the oldest sealing method and is sometimes called “rope packing” because in the past it was essentially rope coiled around a pump shaft to prevent leakage. Today’s packing is similar in principle, but much more effective in minimizing leaks. Most packing today is a tightly braided yarn that encapsulates a lubricating material. Roper packing sets are die formed rings, precut and sized to match the pump stuffing box bore. This allows the sets to be installed faster and to seat better. The pre-compression of the ring sets allows them to better distribute the mechanical pressure evenly along the entire shaft, reducing wear and subsequent leakage. The (5) packing types offered by Roper and outlined below have some unique characteristics that may make them more suitable for specific applications.



Graphite Filament



Graphite Impregnated



PTFE Impregnated



Pure PTFE

Garlock DSA - A virtually dry running, leak free packing. The cup and cone design expands radially to form a positive seal against both the shaft and packing gland. This coupled with excellent memory means that after the initial installation and adjustment, it does not require re-adjusting. Material of construction: Flexible graphite.



Dry Run, Self Adjust Packing

Seal Compatibility



<i>Seal Type</i>	<i>Leakage</i>	<i>Works Well With</i>	<i>Doesn't Work Well With</i>
Graphite Filament Packing	Some	Hydrocarbons and most chemicals.	Does not work well in abrasive applications or pumping "sticky" liquids like glues.
PTFE Impregnated Packing	Some	Hydrocarbons, solvents, mild chemicals and moderate abrasives.	Has a tendency to harden over time resulting in more frequent adjustment and shaft wear.
Graphite Impregnated PTFE Packing	Some	Most acids, caustics, solvents, and oils.	Has a tendency to harden over time resulting in more frequent adjustment and shaft wear.
Pure PTFE Packing	Some	Food Service Applications, some chemicals	Frequent adjustments and replacements
Dry run, Self Adjust (DSA)	Minimal	Truck mounted pumps that are used to pump clean, low viscosity fluids like gasoline and fuel oil.	Not as chemical resistant as packing with PTFE. Even though leakage is minimal, some applications may require "zero leakage".
Type 9 Mechanical Seal	None	Chemical processing, food processing, marine, nuclear service, offshore oil and refinery, petrochemical processing, pharmaceutical, power generation, pulp and paper, wastewater, and water desalination industries.	Transport applications or others subject to shock / excessive vibration.
Type 21 Mechanical Seal	None	Pulp & paper, water, food processing, wastewater treatment, and other general applications.	Transport applications or others subject to shock / excessive vibration.
Triple Lip Seal	None	Just about anything.	Some Abrasives.
Cartridge Seal	None	Just about anything.	Highest Cost.



THE LEADING FORCE behind liquids™ since 1857



Roper Pump Company is a global supplier of high quality positive displacement pumps, designed to handle a broad range of industrial applications. In addition to helical gear pumps and progressing cavity pumps, we design and develop numerous custom pumps for customers with unique and demanding applications.

From a small pump company founded in 1857, Roper Pump Company has grown into a global innovation & technology company. With a large installed base, we have both the knowledge and experience to help you solve your most challenging pumping problems...and our strong global distribution network ensures that your needs are met on time, every time.

Our Markets



INDUSTRIAL

Roper Pump Company's rugged and dependable range of positive displacement pumps provides versatile pumping solutions for even the most challenging industrial applications.



TRANSPORT

With over a century of experience in liquid cargo transfer, Roper Pump Company has always been trusted to load and unload your tankers quickly and safely.



POWER GENERATION

For reliable operation of engines, compressors and turbines, thousands of customers depend on Roper Pump Company fuel pumps, lube pumps and liquid fuel flow dividers.



OIL & GAS

Roper Pump Company has numerous pumping solutions from the well to the refinery. Our industry leading DuraTorque® Power Sections allow mud motors to run longer at unprecedented temperatures and depths.



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