

**THORSEALS FROM
THORDON BEARINGS**

Thorseal Hydraulic Seals

**The Modern Solution To
An Age Old Problem**



Hydraulic Cylinder Sealing - An Age Old Problem

Since the development of hydraulic cylinders as a prime mover in machinery of all types, the technician responsible for their maintenance has been faced with a wide range of challenges.

External leaks create hazardous working conditions and require continual replenishing of expensive fluids. Today, even the disposal of hydraulic fluid can be a major environmental consideration.

Internal leakage results in poor equipment performance, cylinder drift and over-heating of the hydraulic fluid.

Continual adjustments are necessary to minimize leakage and prolong the inevitable, a shutdown for repairs.

Fabric or composite seal components can tear and abrade, clogging filters and control valves.

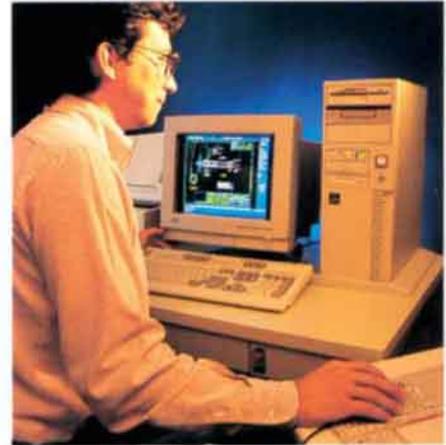
Repairs are extremely costly when lost productivity, replacement fluid costs and repair parts are all accounted for.

Efficient operation and minimal down time of hydraulic cylinders is the goal today. The seal is the most important single element involved in accomplishing this goal.

Thorseals from Thordon Bearings - The Modern Solution

By investigating numerous cylinder seal failures and working closely with maintenance personnel, a list of requirements for the ideal seal was developed. Long life and low maintenance were at the top of the list. Using Thordon's engineering and design expertise, combined with years of experience producing high performance elastomers, the unique Thorseal polymer was developed. Tough, strong, abrasive resistant, self-lubricating and unaffected by most common fluids, the Thorseal polymer has all the properties industry is looking for.

Positive sealing over a wide range of operating pressures and simplicity of design are two of the key elements of the Thorseal design. The built-in memory and strength of the Thorseal polymer, together with the unique one piece design incorporating a tapered lip ensures fast cycling, reduced chatter, and less drag and cylinder wear. Capable of sealing over a pressure range from 0 to 103 MPa (15,000 psi), Thorseals do not require pre-loading, O-ring reinforcement or other adjustments.



Thorseal Offers Proven Benefits

LONG WEAR LIFE: Thorseals' superior wear life is a result of their high strength. The tensile strength of a seal material is a commonly used indicator of wear resistance. Materials with higher tensile strengths offer superior performance. Chart 1 shows the superior tensile strength of the Thorseal polymer compared to other common seal materials.

STABILITY IN HYDRAULIC FLUIDS: Thorseals' non-absorbent oil resistant polymer will not fail due to swelling, softening or extrusion as a result of hydraulic fluid absorption.

LIFETIME SELF-LUBRICATING: Friction, stick-slip, heat generation and both seal and cylinder wear are all reduced by compounding molydisulphide into the Thorseal polymer. Uniformly mixed through the polymer, this lubricant works throughout the life of the seal.

HIGH STRENGTH AND TOUGHNESS: Extrusion due to shock loads and high pressures is not a problem and even the tapered seal lips are resistant to nicks or tears. This strength is characteristic of the polymer and is obtained without the need for reinforcing fabrics which can de-laminate into the hydraulic fluid and contaminate the system.

INDEFINITE SHELF LIFE: Thorseals do not suffer from storage problems in the way many other seals do. Rubber seals can become ozone aged and be totally unusable, or fail prematurely if installed after an extended storage period. Thorseals perform as well after years of storage as the day they were produced.

EASILY INSTALLED: High tensile strength and ability to retain their original shape make Thorseals less susceptible to damage during installation compared to rubber, leather or many other types of seals.

Thorseal - A Family of Products

THORSEAL SINGLE RING SEALS for reciprocating rods, rams or pistons, seat themselves and will not move in the gland regardless of stuffing box depth. Often used to replace nested V-ring packing sets, no axial compression or periodic adjustment is necessary. Sizes range up to 2540 mm (100 inches) in diameter.



THORWIPERS keep piston rods and the primary rod seal free from dirt and abrasives. Thorwipers are rugged enough to withstand abrasion, yet flexible enough to conform to rods that wander.



THORCUP SEALS for reciprocating pistons feature a reinforcing metallic disc molded into the base to prevent failures caused by distortion, heel wear and to ensure accurate centering to the piston. Inventory can be reduced by stocking Thorcups in the correct cylinder bore and cutting the center hole to fit.



THORPAK are sets of nested V-rings for rod and piston stuffing boxes. The Thorpak design incorporates up to 50% more seal lips per set versus other V-rings to minimize leakage. Thorpak sets can be supplied in a split configuration, eliminating the need for machine disassembly. Periodic adjustments after installation are not necessary.

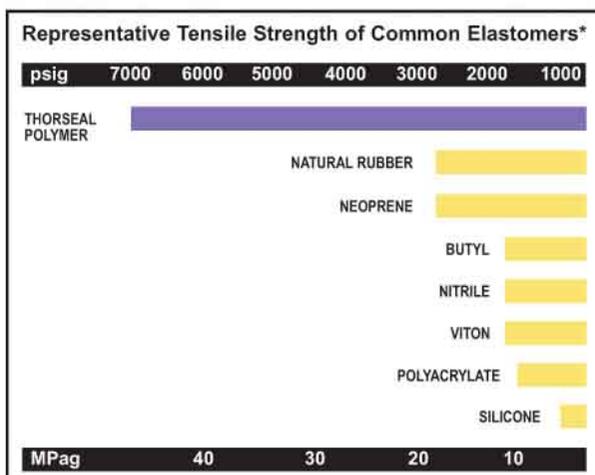


FLEXLIP SEALS are designed for modified cylinders, custom sizes or low volume specialized seal requirements and can be provided quickly by precision machining from stock Thorseal tubes. Flexlip offers all the performance advantages of our standard family of seals in sizes up to 1500 mm (60 inch) in diameter.



We're always willing to deal with special requirements in a timely and cost-effective manner. In many instances our Flexlip solution and quick delivery have saved customers thousands of dollars in plant downtime.

CHART 1



*Tensile strength can be used as a guide to wear resistance. Materials with higher tensile strength typically offer superior service and more positive control.



Our customers tell us of outstanding results using Thorseals. They report up to ten times longer life as well as smoother, faster cycling of equipment; positive sealing over a range of pressures without adjustments and dramatically reduced cylinder wear. All these benefits result in greatly reduced maintenance costs.

CHART 2

Thorseal Design Information		
Operating Pressure	0-15,000 psi	0-103 MPa
Operating Temperature* ¹	-60°F to 195°F	-50°C to 90°C
Maximum Reciprocating Velocity	185 ft./min.	0.95 m/sec
Maximum Rotational Velocity	100 ft./min.	0.50 m/sec
Recommended Surface Finish (Static Surfaces)	30 - 45 μ in.	0.75 - 1.13 μ metres
Recommended Surface Finish (Dynamic Surfaces)	15 - 25 μ in.	0.38 - 0.63 μ metres
Maximum Ram to Gland Clearances* ² (Diametrical)	0.030 in.	0.75 mm
Maximum Piston to Cylinder Clearances* ² (Diametrical)	0.030 in.	0.75 mm
Operating Medium* ³	Petroleum based and other hydraulic fluids, water and air	

*¹ Formulation for higher temperatures available.
*² For pressures up to 20.7 MPa (3000 psi) consult Thordon for clearances for higher pressures.
*³ Not recommended for phosphate esters.



CHART 3

Thorseal Polymer Physical Properties		
Tensile Strength	7,100 psi	49.0 MPa
Hardness - Shore A	95	95
Tensile Modulus at 100% Extension	2,300 psi	15.9 MPa
Tensile Modulus at 300% Extension	5,800 psi	40.0 MPa
Elongation at Break	400%	400%
Tear Strength - Die C	700 lb/in	122.5 kN/m
Compression Set -Method B, 22 hours at 70°C (158°F)	40%	40%
Abrasion Resistance - NBS Index	300	300
Torsional Stiffness- Clash-Berg Method at 24°C (75°F)	2,400 psi	16.8 MPa

Customer Focused To Support Your Immediate ... And Future Needs

MANUFACTURING: With over 30 years of experience producing elastomeric polymers, Thordon specifies and controls the molding and machining of every seal we make. Highly stable stainless steel molds are used to ensure accurate, precise and consistent finished dimensions. All seals are produced from machine mixed components to guarantee the uniformity of each and every seal.



APPLICATION DESIGN: Thordon engineers are available to offer custom design application assistance and are continuously involved in the on-going process of polymer and design improvements based on continual testing and customer feedback.

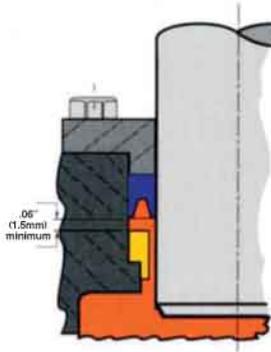
QUALITY: Thorseals are produced to the **ISO 9001:2000 Quality System** ensuring world class performance. Our compounding and molding operations are under constant Quality Control and each seal is individually inspected to assure that we comply with customer requirements.

SUPPLY AND SERVICE: Thordon is geared for quick response to your needs. We recognize the importance of extended seal life, quick delivery and reduced downtime. Standard seals are stocked by Thordon distributors and custom seals can be ordered and machined to your exact requirements. Thorseals can be shipped quickly throughout the world.

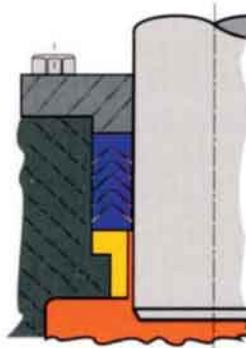


Application and Mounting Guide

STUFFING BOXES AND GLANDS



Thorseal or Flexlip mounted in a typical stuffing box for a hydraulic press or cylinder.



Thorpak mounted in a typical stuffing box for a hydraulic press or cylinder.

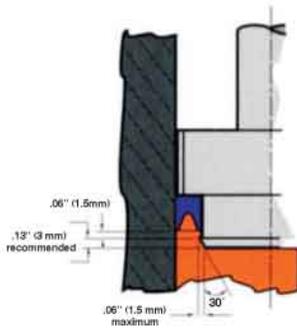


Thorwiper groove mounted in the gland or stuffing box.

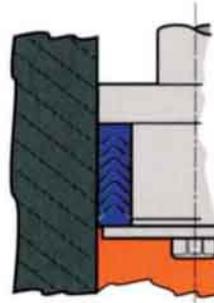
Thorseal or Flexlip groove mounted in the gland or cylinder wall.

SINGLE ACTING PISTONS

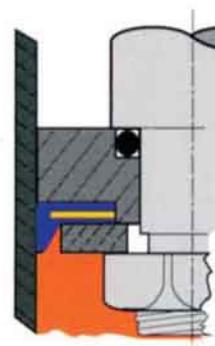
Thorseal or Flexlip in a single acting piston.



A snap over ridge, which is the preferred method of retention for piston mounting is illustrated.



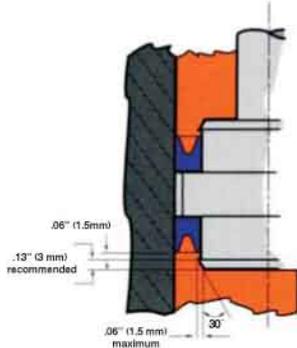
Thorpak mounted in a single acting piston application. A bolted cover plate is used for retention.



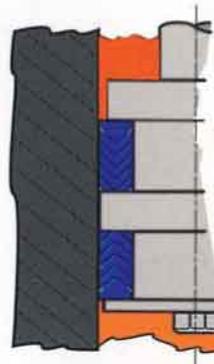
Thorcup mounted in a single acting piston application.

DOUBLE ACTING PISTONS

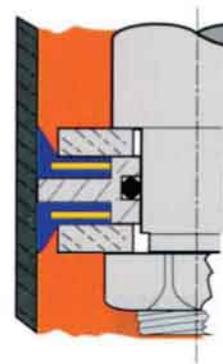
Thorseal or Flexlip in a double acting piston.



The seals are shown retained by the preferred snap over ridge method but other methods such as bolted cover plates, snap rings or other similar retainers can be used.



Thorpak mounted in a double acting piston application.



Thorcup mounted in a double acting piston application.

THORDON

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