

# Introduction to O-rings, Rotary and Fluid Power Seals



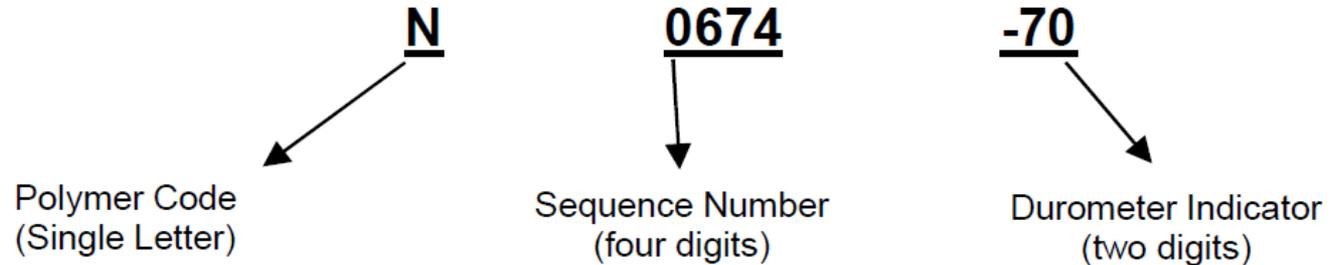
ENGINEERING YOUR SUCCESS.

Part numbering and how to order

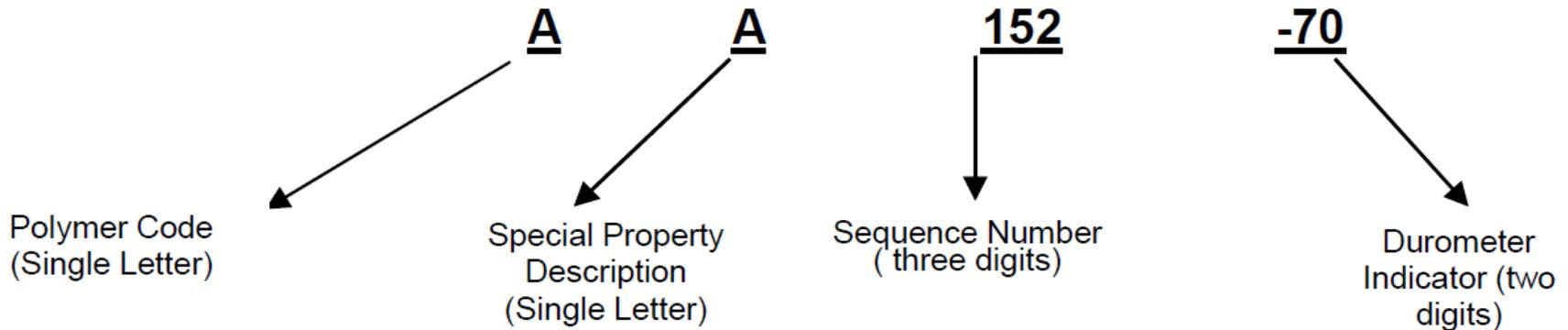
# O-RINGS

# O-Rings

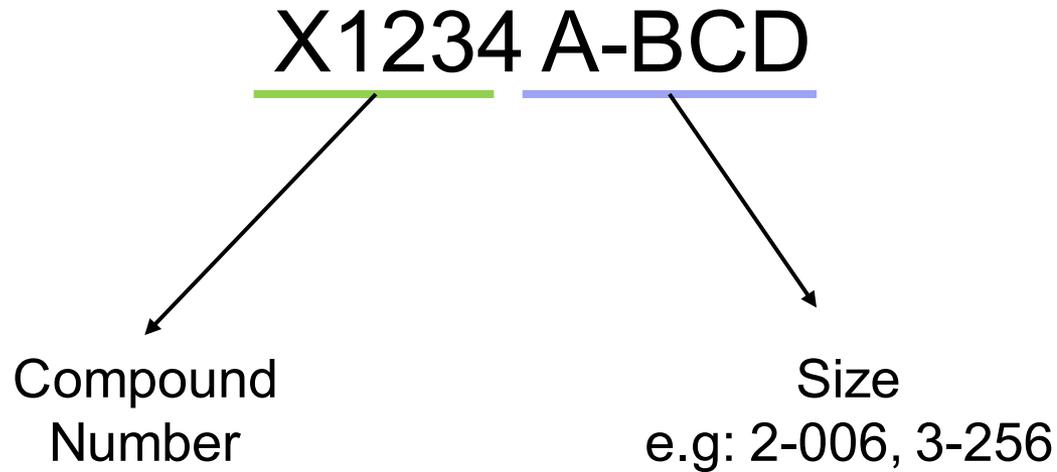
## TYPE I COMPOUND NUMBERING



## TYPE II COMPOUND NUMBERING



# O-Rings



Example: N0164 2-007

# O-Ring Quiz

What would you recommend if a customer requires an O-ring with ID of 126.67mm and C/S of 2.62mm for use in a drinking water filter?

## NSF61 certification

E1561-60  
E1512-70  
E1549-70  
N0757-70  
....

? - 159

2 - ???

**E1512 2-159**

## E1512-70

Chloramine Resistant Sealing Material (EPDM)



### Excellent Resistance:

Parker's E1512-70, chloramine resistant ethylene propylene, offers improved resistance to chloramine degradation and swelling providing a significantly longer seal life. This improvement can reduce potential warranty claims when used in plumbing fixtures and potable water handling equipment where chloramine is present.

### The Need For Change:

As technology advances, we change and promote a safer, more efficient way to live. This progression however, directly effects existing standards and methods, forcing them to acclimate to a new environment, creating a new industry need.



### Contact Information:

Parker Hannifin Corporation  
O-Ring Division  
2960 Palumbo Dr.  
Lexington, KY 40509  
  
phone 859 299 2354  
fax 859 335 5128  
email@parker.com  
  
www.parker.com

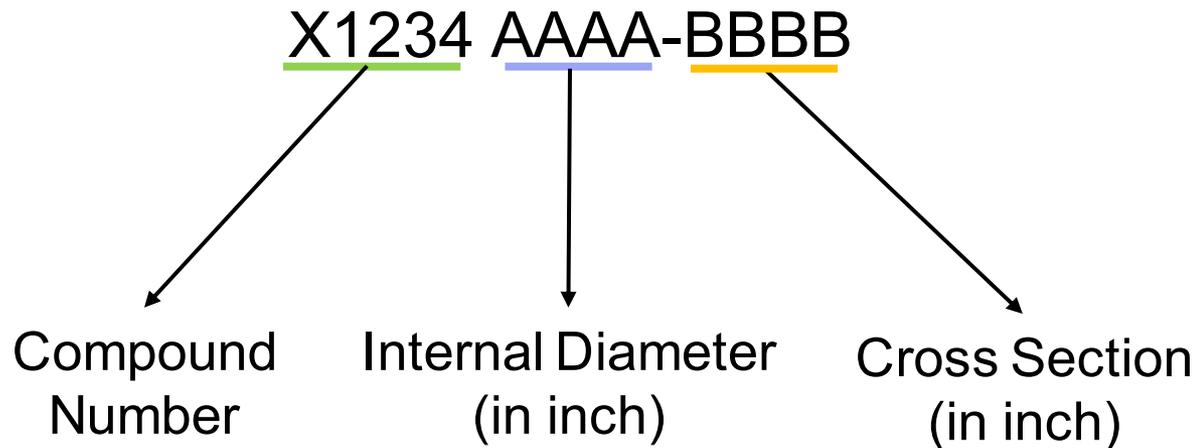
### Product Features:

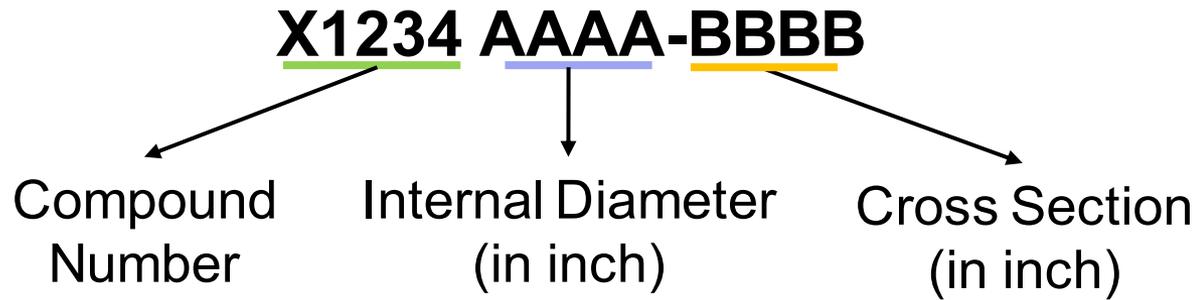
- Internally Lubed; providing low friction
- Zero degradation and minimal swelling in chloramine and chlorine
- Low compression set
- Compound is globally available
- NSF approved



# Additional Parker O-ring Codes in JDE

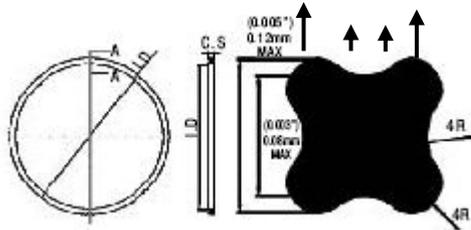
- In addition to the standard Parker O-ring codes, there is another set of codes for O-ring in JDE.
- These are non-standard sizes but already have existing tools available for use





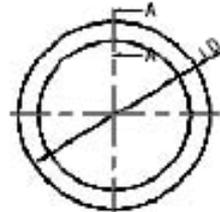
- Compound Number is per Parker compound code
- Internal Diameter is expressed in inches:
  - ❖ 2.5" → 0250
  - ❖ 11.75" → 1175
  - ❖ 34.5mm → 0136
  - ❖ 8.45mm → 0033
- Cross Section is also expressed in inches:
  - ❖ 0.103" → 0103
  - ❖ 0.210" → 0210
  - ❖ 4.5mm → 0177
  - ❖ 1.25mm → 0049
- Example:
  - N0674 0250-0103
  - V0747 0136-0049

# Static seal profile alternatives



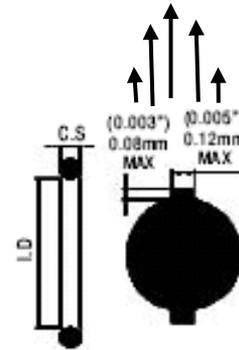
## X-Ring

Less concentrated sealing force profile, center void area allow for lubrication on dynamic applications. Behaves somewhat like lip seal.



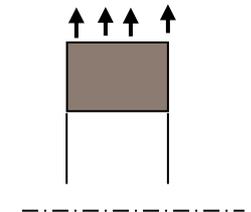
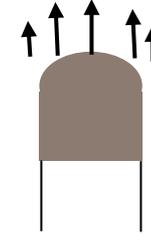
## O-Ring

More concentrated sealing force profile.



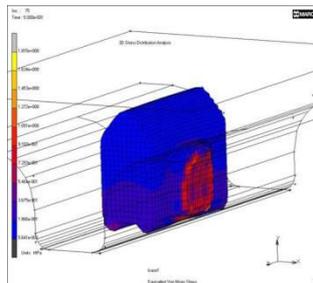
## D-Ring

Less concentrated sealing force profile, but wider footprint. Flat ID can prevent rolling.

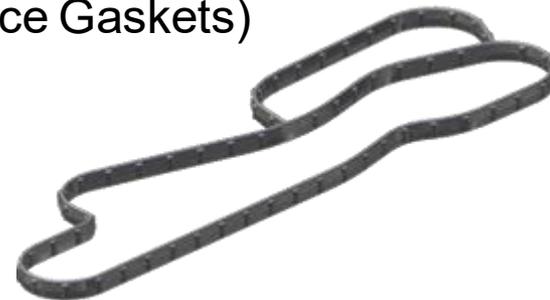


## Square Ring

Least concentrated sealing force profile, but wider footprint. Flat ID can prevent rolling.



## PIP (Push-in-Place Gaskets)



**QUESTIONS?**

Part numbering and how to order

# **ROTARY AND FLUID POWER SEALS**

# Applications

- Application of Rotary Seals

- Motors
- Pumps
- Blowers
- Turbines
- Gearboxes
- Bearings
- Mill rolls



- Application of Fluid Power Seals

- Mobile/Industrial hydraulic applications
- Shocks
- Accumulators
- Valves/Spool Valves
- Pneumatic Cylinders



# Rotary Seals

- What is a rotary seal
- What is the purpose of a rotary seal
- How does a rotary seal work
- Sealing Systems
- Rotary Seal Materials
- Types of rotary seals
- How to order Parker rotary seals

# Rotary Seals

What is a rotary seal?

**Radial shaft seals**, also known as **lip seals**, are used to seal rotary elements, such as a shaft or rotating bore.



# Rotary Seals

## What is the purpose of a rotary seal?

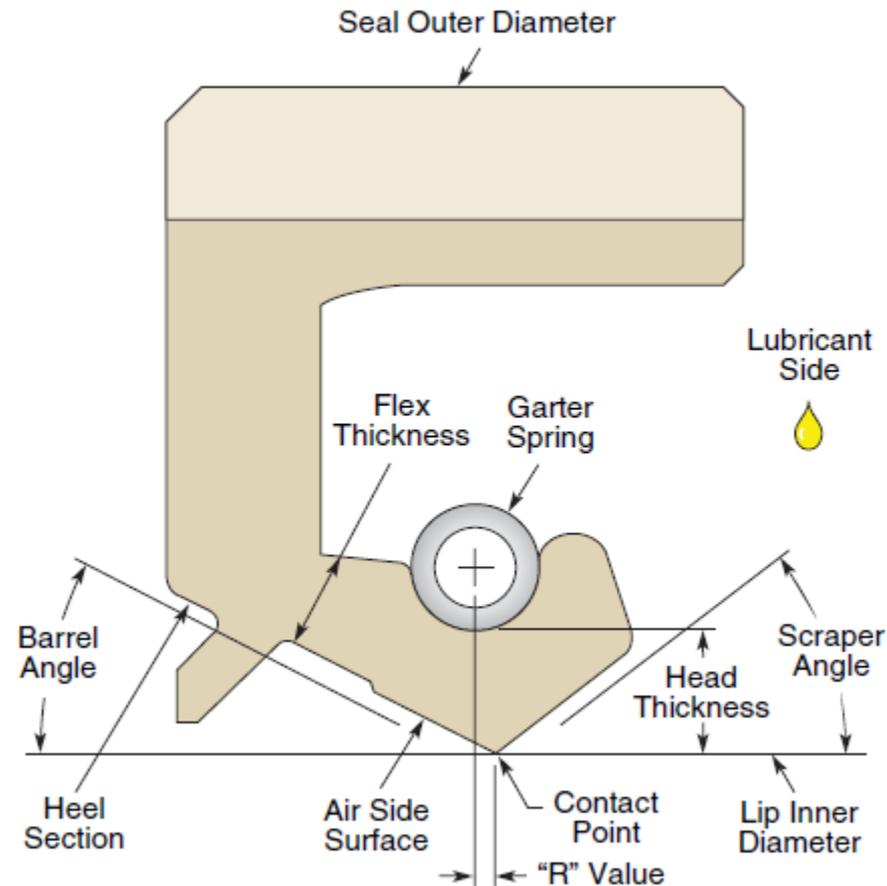
The main purposes of a rotary seal is to **protect the bearing** that is used to support a shaft in a rotating application. **Retaining the bearing lubricant** and **keeping it clean** ensures maximum bearing life and increases the overall service life of the equipment.

Such applications include automotive wheels, electric motors, pumps, gearboxes and large rolls used in steel and paper manufacturing.

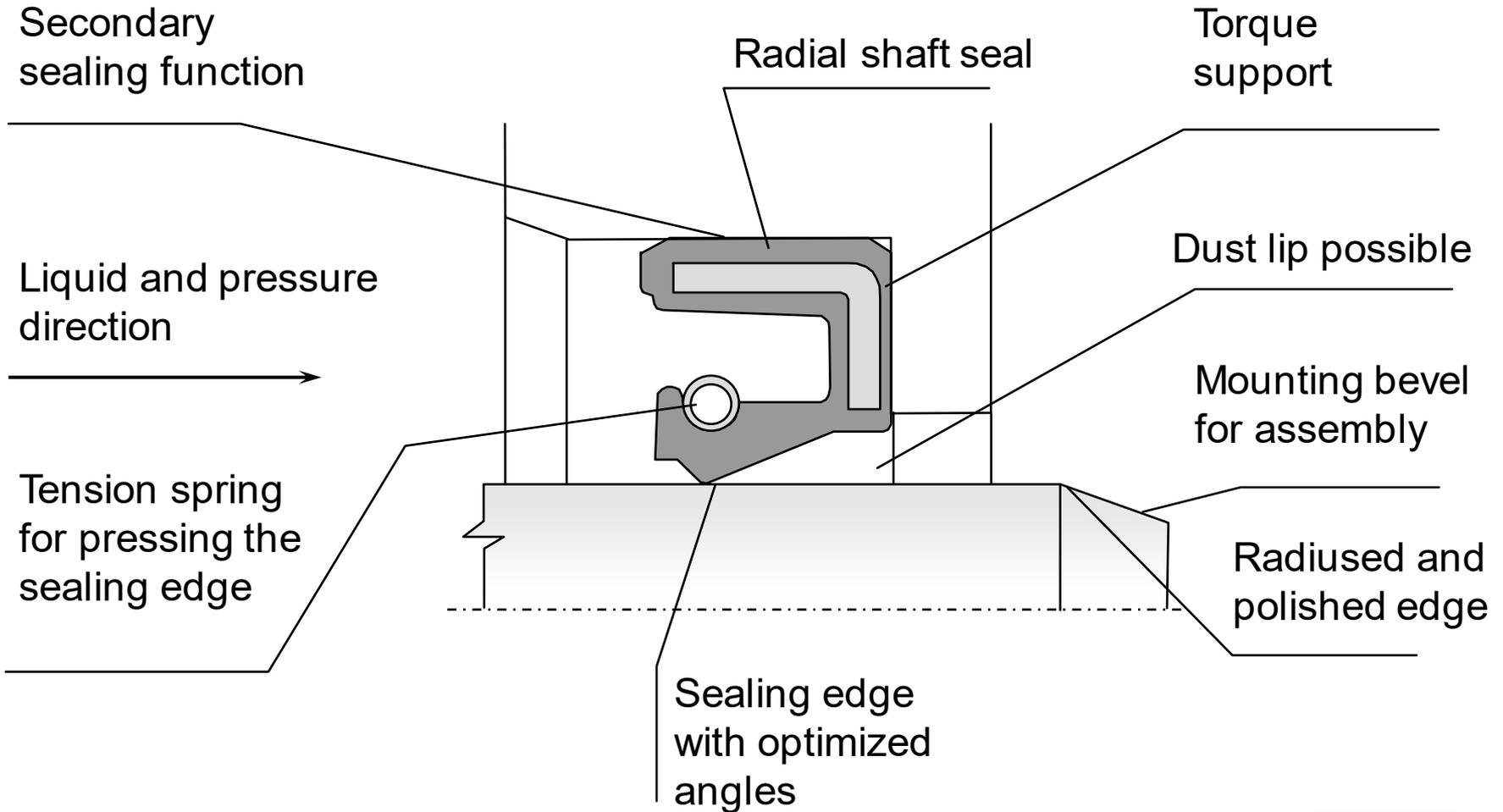
*!! They can be found in anything that has a rotating shaft !!*

# Rotary Seals

## Parts of the seal



# Rotary Seals

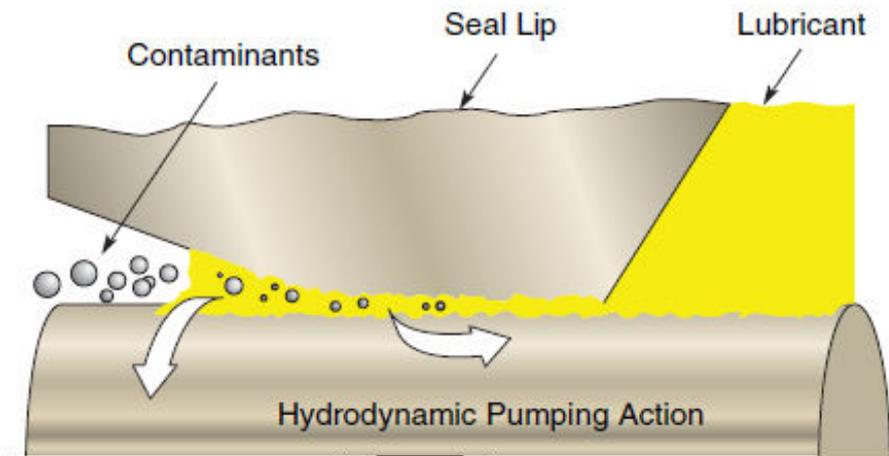


# Rotary Seals

## How does a rotary seal work?

Rotary shaft seals work by squeezing and maintaining the lubricant in a thin layer between the lip and shaft.

Sealing is further aided by the hydrodynamic action caused by the rotating shaft, which creates a slight pumping action.

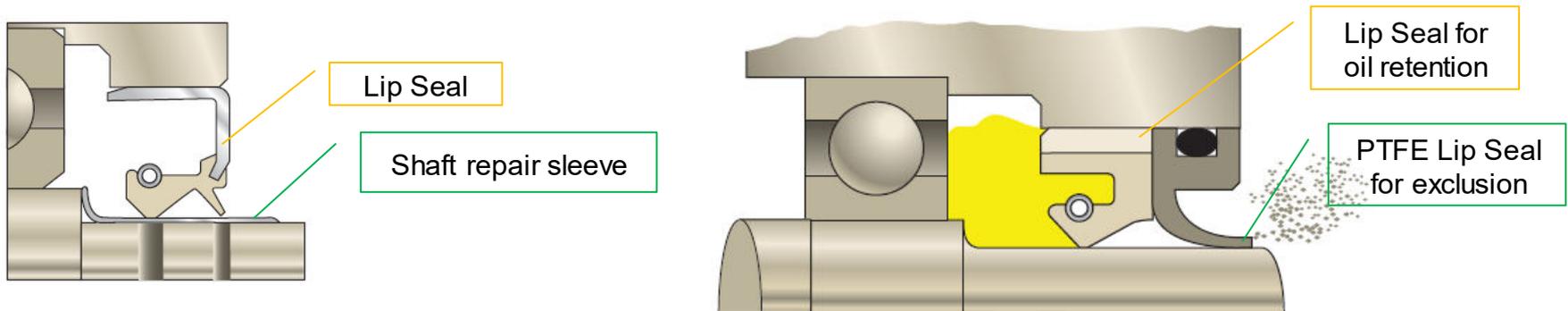


# Rotary Seals

## Sealing Systems

Parker's range of rotary seals allows customers to further improve performance by utilizing a system of seals (i.e. more than 1 seal) if operating conditions exceed the capabilities of a single seal.

Examples:



# Rotary Seals

## Rotary seal materials

- **Lip Material**

- NBR (H1L5, H1L7)
- Low temp NBR (H1L50, H1L70)
- Carboxylated NBR (H1L20)
- Hydrogenated NBR (H1L30)
- FKM (H5L16, H5L89)
- PTFE (N/P, F/P)
- EPDM (H1L21)
- ACM
- VMQ
- CR (H1L8)

- **Case Material**

- Neoprene/Aramid Composite (H1, H3)
- Flouoroelastomer/Aramid Composite (H5)
- Metal Case
- Rubber Covered

- **Spring Material**

- Carbon Steel
- Monel 400
- Inconel 750
- Phosphor Bronze
- 302/304 Stainless Steel
- 316 Stainless Steel
- Hastelloy ®
- Elgiloy ®

# Rotary Seals

## Types of Parker rotary seals

- Clipper ® Oil Seal
- Parker Oil Seal
- Shaft Repair Sleeves
- ProTech ™ Bearing Isolators
- FlexiSeal ®
- FlexiLip ™
- FlixCase ™
- PTFE Seals
- Slings & Excluders

**QUESTIONS?**

# FLUID POWER SEALS

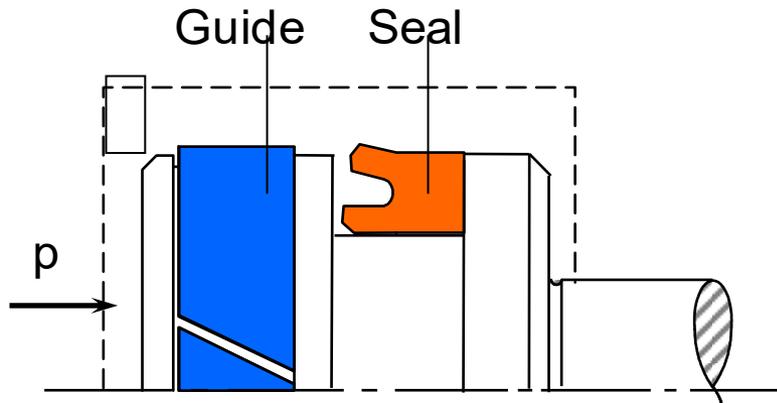
# Fluid Power Seals

- What are fluid power seals?
- Where do we see fluid power seals?
- Sealing Systems
- Fluid Power Seal Materials
- Types of fluid power seals
- How to order Parker rotary seals

# Seal types

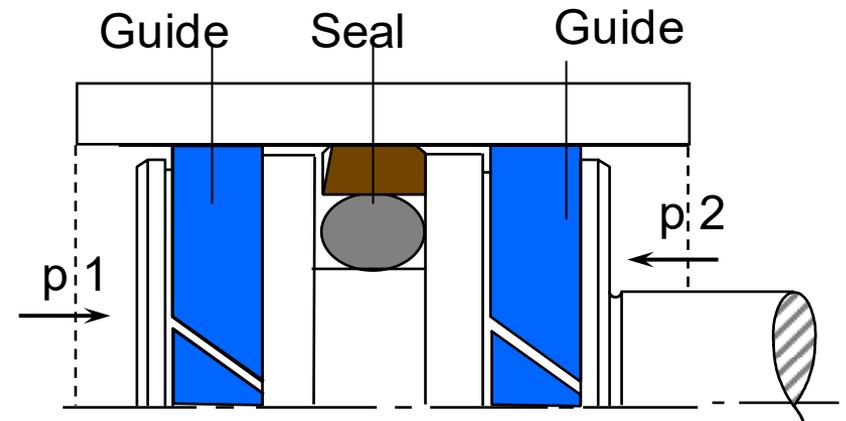
## Sealing system piston seals

Piston seal,  
single-acting  
separate guide



The piston back stroke is performed by means of a spring or, if installed vertically, through loads or external forces.

Piston seal,  
double-acting  
separate guide

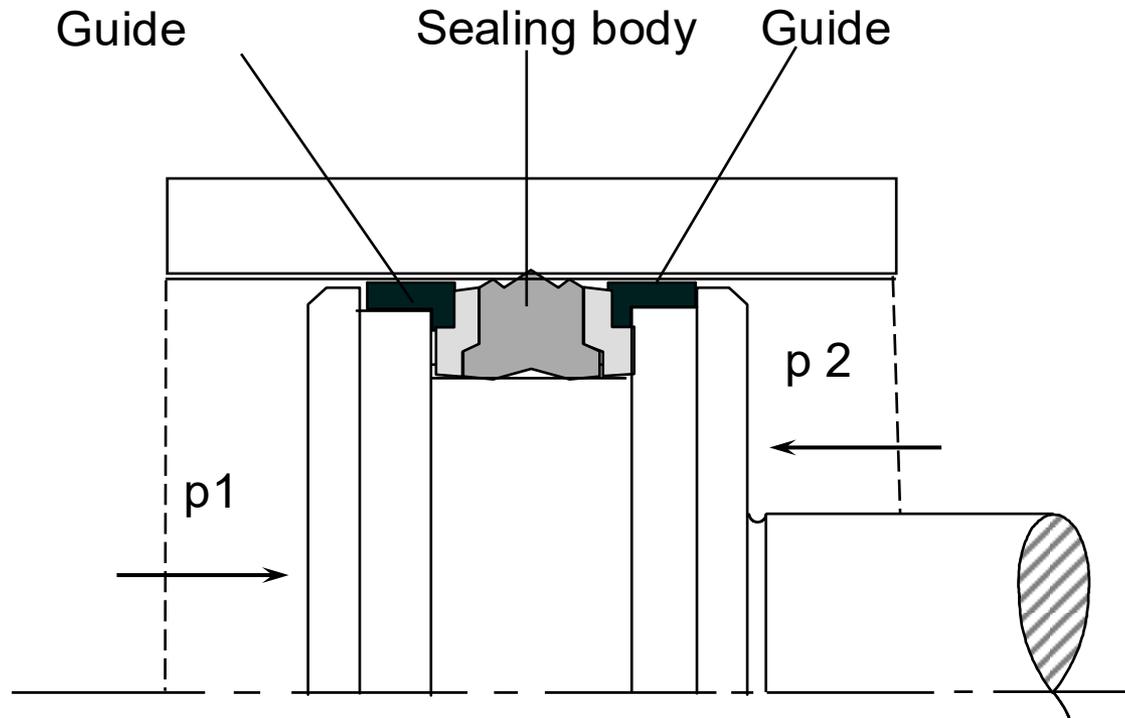


The piston back stroke is controlled by the working pressure.

# Seal types

## Sealing system piston compact seals

Piston compact seal, double-acting  
integrated guide

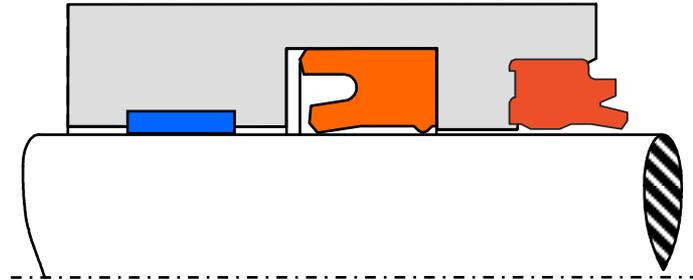


# Seal types

## Rod Seals and Guide Elements

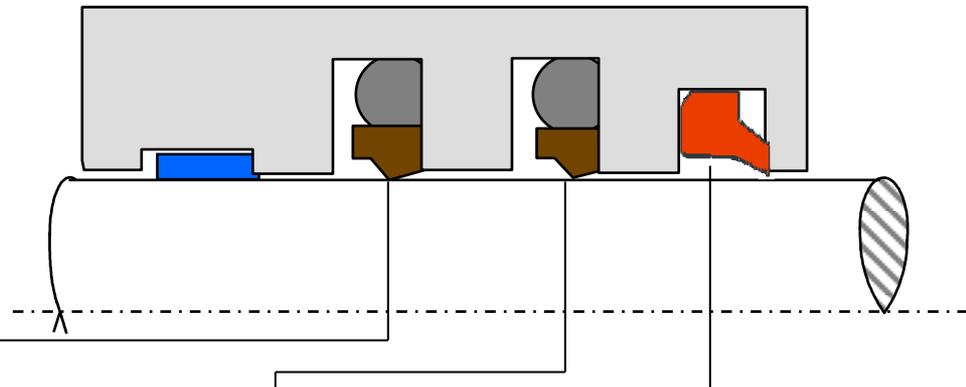
### Individual seal

- + design
- + overall height
- + costs



### Sealing system

- + service life
- + tightness
- design
- overall height
- costs



### Primary seal

(buffer seal)

- high pressure
- wear, limited leakage
- return capacity

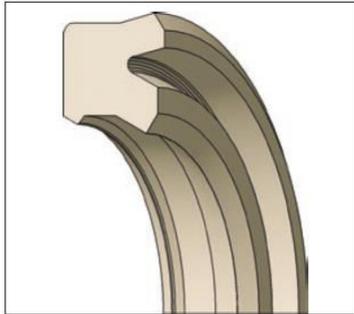
### Secondary seal

- low pressure
- low wear
- high degree of tightness

### Wiper

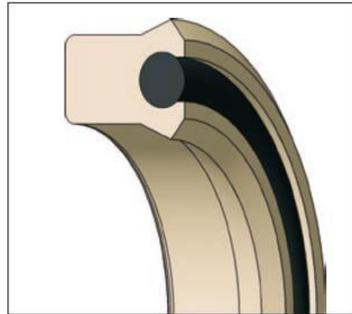
Single- or  
double-acting

# Fluid Power Seals



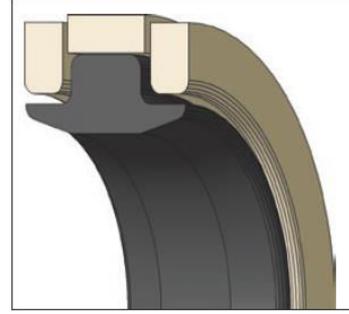
## Rod Seals

- Guard against external leakage
- Most critical component of a seal system



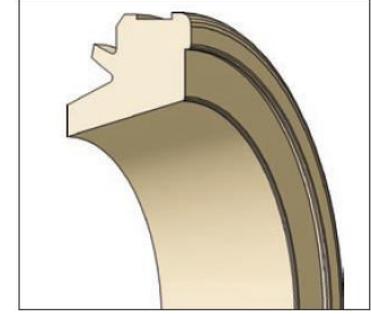
## Symmetrical Seals

- Act as both Piston or Rod seals
- PolyPak®
- 8400 U-Cup



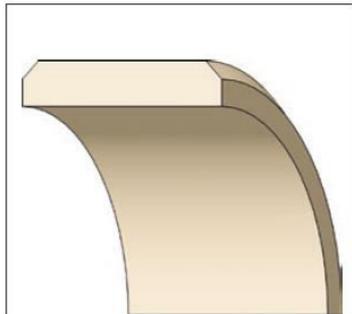
## Piston Seals

- Uni/Bi directional pressure
- Low friction
- Easy installation



## Wipers

- To keep contamination out

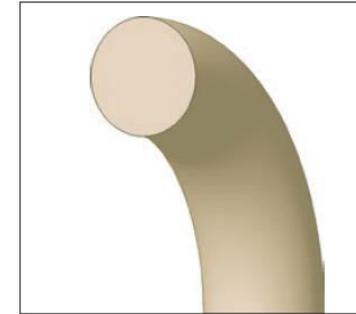


## Wear Ring & Bearings



## Back-up Rings

- To increase system pressure
- Solve extrusion problem



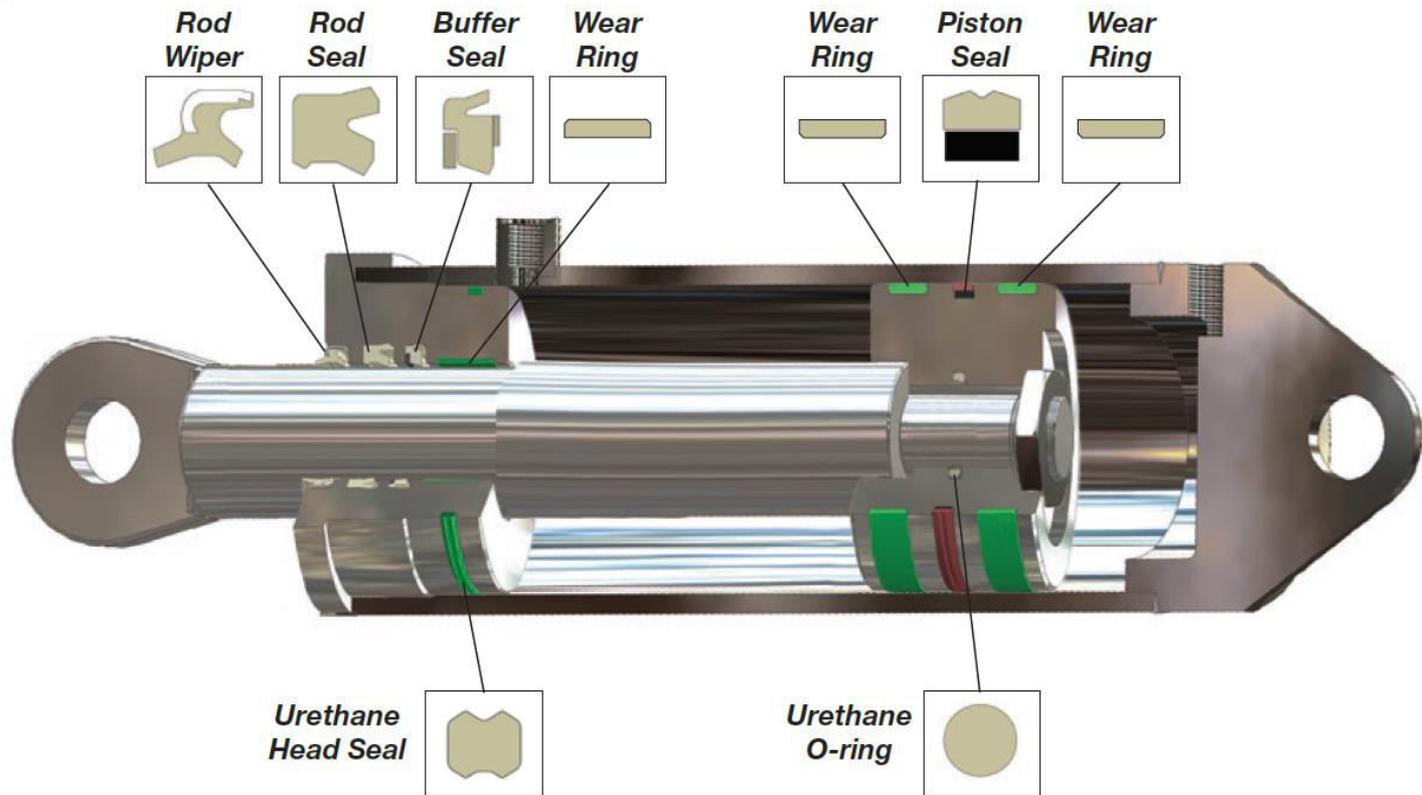
## PU O-, D-rings & Head seals

- For high temp environment
- Eliminate need for back-up rings

# Fluid Power Seals

## Sealing Systems for leakage control

*Typical Hydraulic Cylinder*



# Fluid Power Seals

## Mobile Hydraulic Applications

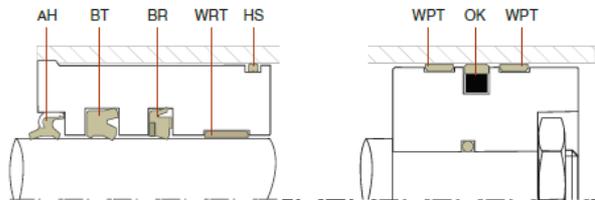
### Excavators



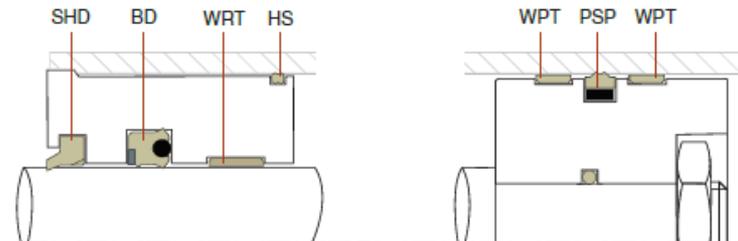
### Agricultural Equipment



Rod				Static	Piston	
Wiper	Primary	Buffer	Wear Ring	Head Seal	Wear Ring	Primary
AH Canned (non-vented design)	BT	BR	WRT	HS	WPT	OK
<b>Materials</b>						
4300	4300	4300	4733	4700	4733	4650



Rod			Static	Piston	
Wiper	Primary	Wear Ring	Head Seal	Wear Ring	Primary
SHD	BD	WRT	HS	WPT	PSP
<b>Materials</b>					
5065	5065	4733	4700	4733	4622



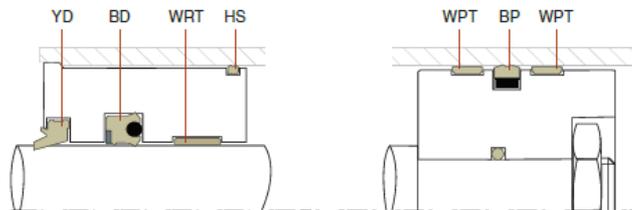
# Fluid Power Seals

## Mobile Hydraulic Applications

### Aerial Man Lifts



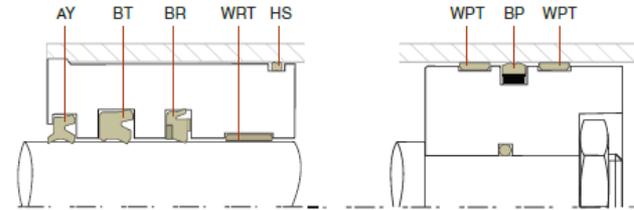
Wiper	Rod		Static	Piston	
	Primary	Wear Ring	Head Seal	Wear Ring	Primary
YD	BD	WRT	HS	WPT	BP
<b>Materials</b>					
4300	4300	4733	4700	4733	4304



### Fork Lifts



Wiper	Rod			Static	Piston	
	Primary	Buffer	Wear Ring	Head Seal	Wear Ring	Primary
AY	BT	BR	WRT	HS	WPT	BP
<b>Materials</b>						
4300	4300	4300	4733	4700	WPT	4304



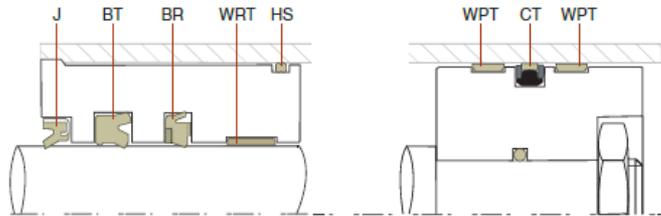
# Fluid Power Seals

## Mobile Hydraulic Applications

### Wheel Loaders/Bulldozers/Backhoes



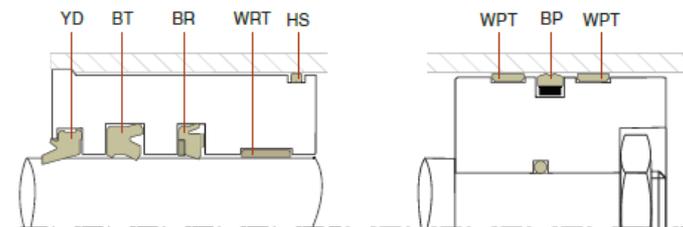
Rod				Static	Piston	
Wiper	Primary	Buffer	Wear Ring	Head Seal	Wear Ring	Primary
J	BT	BR	WRT	HS	WPT	CT
Materials						
4700	4300	4300	4733	4700	4733	0401



### Skid Steers



Rod				Static	Piston	
Wiper	Primary	Buffer	Wear Ring	Head Seal	Wear Ring	Primary
YD	BT	BR	WRT	HS	WPT	BP
Materials						
4300	4300	4300	4733	4700	4733	4304



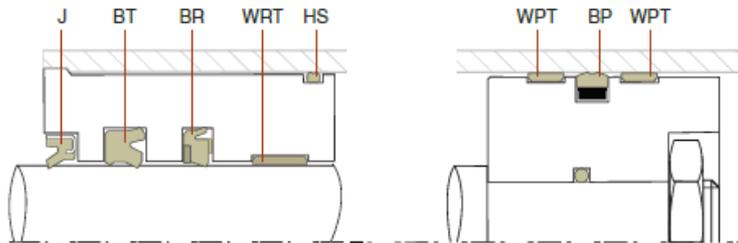
# Fluid Power Seals

## Mobile Hydraulic Applications

### Mining Truck Struts/Shocks



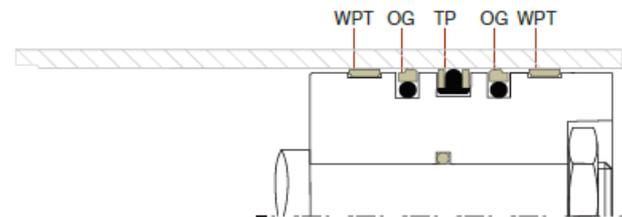
Rod				Static	Piston	
Wiper	Primary	Buffer	Wear Ring	Head Seal	Wear Ring	Primary
J	BT	BR	WRT	HS	WPT	BP
Materials						
4300	4300	4300	4733	4700	4733	4304



### Accumulators



Piston		
Wear Ring	Primary	
WPT	OG	TP
Materials		
4733	0401	4115, B001



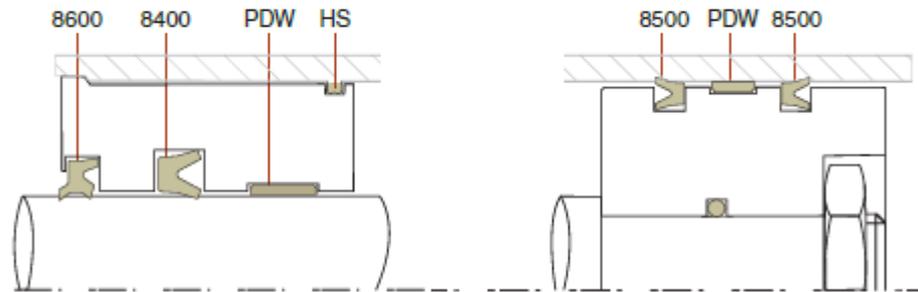
# Fluid Power Seals

## Pneumatic Applications

### Pneumatic Cylinders



Rod			Static	Piston	
Wiper	Primary	Wear Ring	Head Seal	Primary	Wear Ring
8600	8400	PDW	HS	8500	PDW
Materials					
4181	4180	0307	4700	4180	0307



# Fluid Power Seals

## Pneumatic Applications

- Cylinders
- Valves
- Filters, regulators, lubricators
- Mobile pneumatics
- Compressors
- Power tools
- Dental equipment



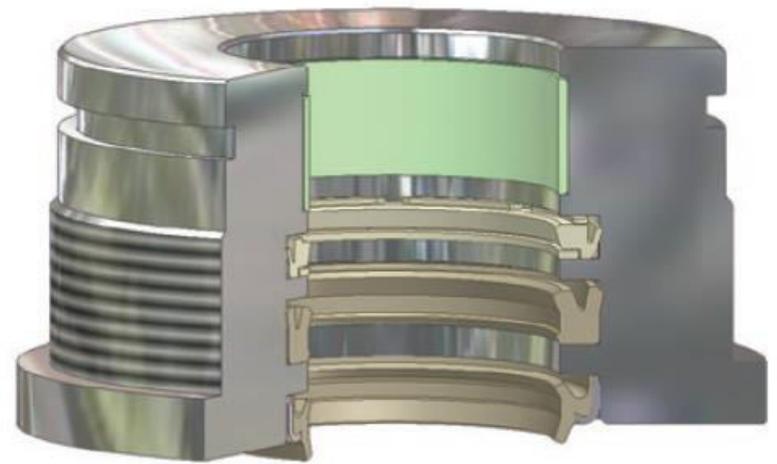
# Fluid Power Seals

Application Parameter	Hydraulic			Pneumatic	
	 Light Duty	 Medium Duty	 Heavy Duty	 Light Duty	 Heavy Duty
Pressure Range	<1200 psi (<83 bars)	<3500 psi (<241 bars)	>3500 psi (>241 bars)	1 to 200 psi (0 to 14 bar)	Above 200 psi (Above 14 bars)
Pressure Spikes	None or low	Not to exceed twice the system pressure. Short duration such as valve shifting.	Pressure spikes that may be several times the system pressure and of a longer duration. These are often mechanically induced by forcing the rod in or out.	Because of the compressive nature of gases pressure spikes are typically not a problem.	Because of the compressive nature of gases pressure spikes are typically not a problem.
Temperature Range	0°F to +160°F (-18°C to +71°C)	-20°F to +200°F (-29°C to +93°C)	-45°F to +225°F (-43°C to +107°C)	0°F to +72°F (-18°C to +22°C)	Cryogenic to +450°F (+232°C)
Contamination	Low or non existing	Moderate with cylinder in horizontal or inverted position.	Moderate to high with the cylinder upright – vertical	Low or non existing	Moderate to high with the cylinder upright – vertical
Side Loading	None to light with shorter stroke and vertical cylinder mount.	Moderate side load with cylinder mounted towards the vertical position. Medium stroke.	Longer stroke lengths. Cylinder mounted horizontal, heavy side loading.	None to light with shorter stroke and cylinder mount vertical.	Longer stroke lengths. Cylinder mounted horizontal, heavy side loading.

Table 1-1: General Application Guidelines (Page 1-9)

# Fluid Power Seals

## Sealing Systems for leakage control

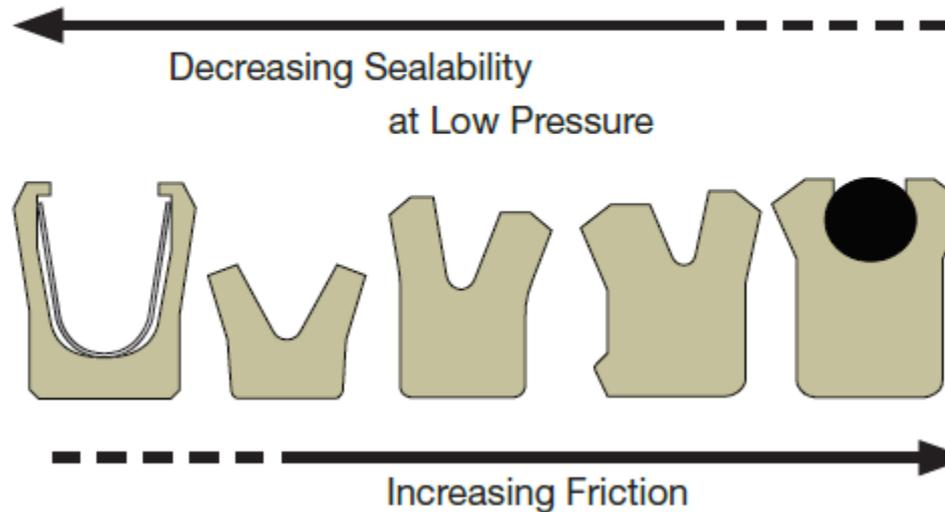


BR, BT and AH sealing system for leakage control

# Fluid Power Seals

## Lip Seals vs Squeeze Seals

### Lip vs. Squeeze Seal



#### Lip Seals:

- Low Friction
- Low Wear
- Poor low pressure sealability
- Good for Pneumatic applications

#### Squeeze Seals:

- High Friction
- High Wear
- Good low pressure sealability
- Good for Hydraulic applications

# Fluid Power Seals

## Materials available

- Polyurethanes
  - P430xx, P45xx, P46xx, P50xx, P6000
- Polymyte ®
  - Z46xx
- Nylons
  - W46xx
- UltraCOMP™ (PEEK)
  - W46xx, W47xx
- Rubber
  - N4xxx, E4xxx, V1xxx etc.
- PTFE
  - 01xx, 02xx, 03xx, 04xx, 05xx, 06xx
- Composite Resins
  - 08xx

# Fluid Power Seals

## Types of Fluid Power Seals

- Rod Seals
  - BD, BT, BR, B3, BS, UR, E5, TR, ON, CR, OC, OD, V6, OR etc.
- Symmetrical Seals for Rod or Piston
  - SPP, DPP, BPP, 8400, 8500, SL, US etc.
- Piston Seals
  - BP, PSP, CT, OK, PIP, B7, UP, E4, BMP, TP, S5, R5, CQ, OE, OG, CP, OA, OQ etc.
- Wipers
  - YD, SHD, SH959, AH, J, AY, H/8600, AD etc.
- Wear Rings/Bearings
  - WPT, WRT, PDT, PDW
- Back-ups
  - MB, 8700, 5100, PAB, PDB, WB
- Urethane O-rings/D-Rings/Head Seals
  - 568 Resilon ®, DG, HS

**REFER TO CATALOGUE FOR  
DECISION TREE**

# Reference Design Guides

- Refer to:
  - ORD 5700 – O-ring Handbook
  - ORD 5712 – O-ring Materials
  - EPS 5370 – Fluid Power Seal Design Guide
  - EPS 5350 – Rotary Seal Design Guide
  - EPS 5340 – PTFE Lip Seal Design Guide
  - PTD 3350 - Hydraulic Seals
  - PTD 3351 – Pneumatic Seals
  - PTD 3354 – PTFE Seals
  - STA Fluid Power Seals

**QUESTIONS?**

**THANK YOU**