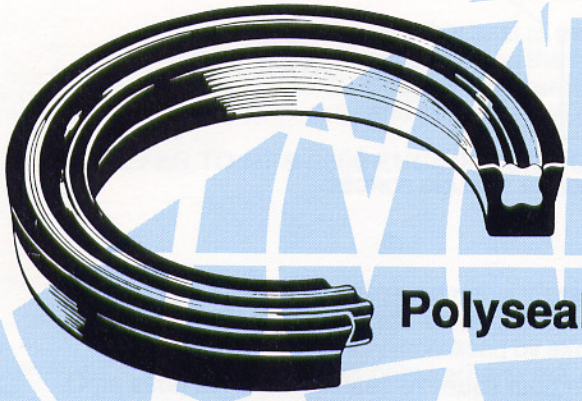
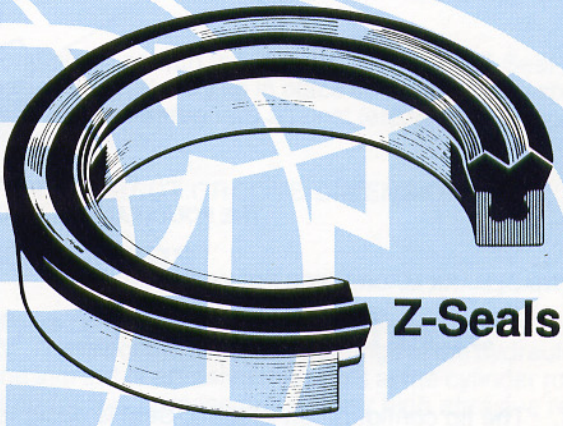
The EXTENDED RANGE

HYDRAULIC SEAL LINE



Polyseals



Z-Seals

FLUIDS	**All Hydraulic Fluids including All Fire Retardant Hydraulic Fluids.**
TEMPERATURE	**-65°F to +550°F**
PRESSURE	**Vacuum to over 10,000 psi.**
EXTREME ENVIRONMENT	**Abrasive, wet, chemical.**
SIZES	**1/32" I.D. to over 45" I.D.**

MACROTECH POLYSEAL, INC.

PER-1000 3/96

SEALING PRINCIPLES OF THE LUBRITHANE POLYSEAL

1. The Polyseal pre-loaded elastomeric spring, along with the mechanical advantage of its wedging action, give positive lip contact at low pressure and vacuum conditions.

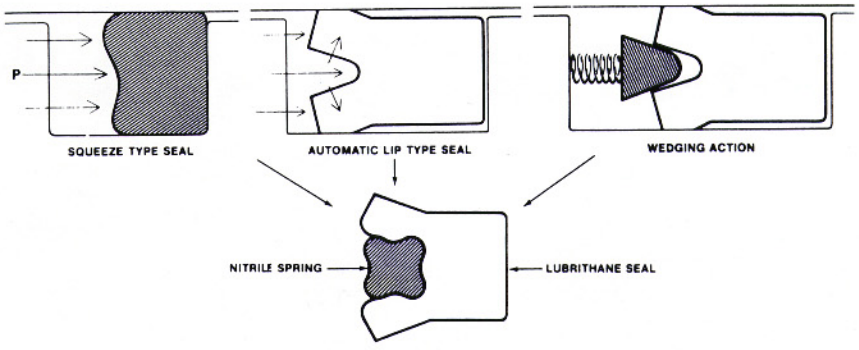
2. The hydrostatic transfer of pressure through the elastomeric spring to the sealing lips gives a positive seal at high pressure.

3. The wedging action of the elastomeric spring in the Polyseal prevents the sealing lips from collapsing away from the sealing surface under severe load changes or high cycle rates.

4. The elastomeric Nitrile rubber spring adds additional sealing life to the Polyseal due to the fact that Nitrile rubber has a lower compression set characteristic above 150 °F than does Urethane.

5. As a summary, the Polyseal combines the best of three sealing forces (see Figure 1).

FIGURE 1



THE POLYSEAL HAS A COMBINATION OF SEALING FORCES.

*TRADEMARK MACROTECH POLYSEAL, INC.

SEALING PRINCIPLES OF THE Z-SEAL/DEEP Z SEAL

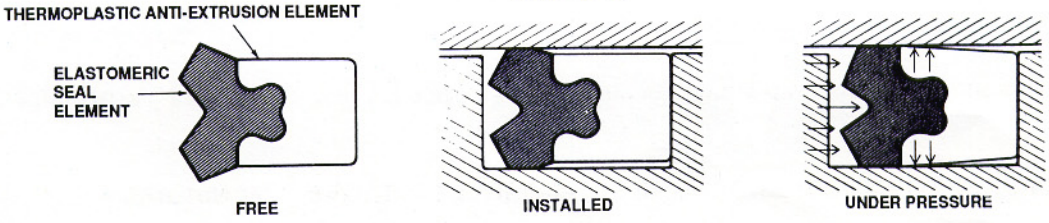
1. The lip configuration of the Z-Seal is designed to give both squeeze sealing force (as does an O-ring) and automatic lip sealing force (as does a U-cup). The Deep Z Seal offers redundant sealing lips for additional lip contact.

2. Due to the very low compression set characteristics of an elastomeric lip material such as Nitrile or Poly Vi*, there are no additional pre-loading devices required to insure the seal.

3. The base of the seal is made of either Fluorotrel* or Lubrithane*, relatively hard anti-extrusion materials. It has a lip-like configuration that spreads under pressure in order to close the extrusion gap behind the sealing lips, giving the seal a high pressure capability. Elastomeric seals gain extended life when properly backed up with a hard anti-extrusion device (see Figure 2).

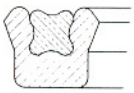
4. Both Poly-Vi and Fluorotrel are specifically compounded to give a higher temperature and chemical resistance than that of other elastomeric sealing materials.

FIGURE 2

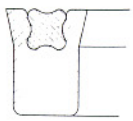


STYLE SELECTION

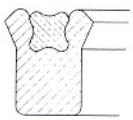
STANDARD POLYSEAL Use where low friction is required and where a light lubricating film of oil is desired.



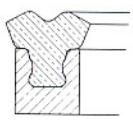
SQUARE B POLYSEAL Use where space is a premium but a dry seal is required. The beveled lip design increases the scraping action of the seal.



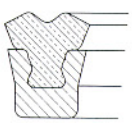
DEEP POLYSEAL Use where low friction is required. As with the Standard Polyseal, a light lubricating film of oil will be left on the metal sealing surface. The rectangular shape of the seal adds to its stability. This seal is an excellent choice for contaminated environments.



TYPE B POLYSEAL Use this seal whenever a dry seal is required. As with the Square B Polyseal, the beveled lip design increases its scraping action. When this seal is used, the bearing should be positioned on the wet side of the seal.



Z-SEAL Use this seal in extreme environmental conditions. The variety of seal materials offered gives this seal the widest range of both temperature and chemical resistance.



DEEP Z SEAL Use this seal in extreme conditions, as with the Z-Seal. The Deep Z Seal features a second lip on the base that keeps the primary lip in place during pressure spikes. This dual-lip configuration also serves as a safeguard against leakage past the primary lip and provides low pressure start-up sealing.

REFER TO MPS-2500 ENGINEERING GUIDE FOR CORRECT GROOVE DIMENSIONS.

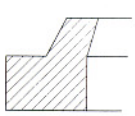
EXCLUDERS

The ultimate safeguard of a hydraulic cylinder and hydraulic system rests with the quality and performance of its anti-contamination devices. The life of the seals and bearings of the hydraulic cylinder can be substantially increased by excluding the ingress of abrasive materials at the cylinder rod. Wiper/scrapers made of polyurethane are outstanding for this purpose due to their high abrasive resistance.

Standard Polyseal

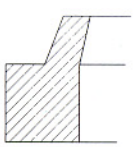
The Standard Polyseal can serve as a positively excluding wiper/scraper. The loaded lip design of the Polyseal ensures a positive seal and wiping action at both the I.D. of the gland groove as well as the O.D. of the hydraulic cylinder rod.

Use seal gland groove dimensions as shown for a Standard Polyseal. When ordering, use the Standard Polyseal part number.



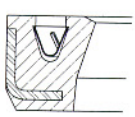
AN959 Wiper

This is a light-duty, snap-in wiper which will retrofit into glands as prescribed in MS-33675 for corresponding dash numbers of MS-28776.



D Wiper

This heavy section snap-in wiper/scraper is recommended for moderately contaminated environments as well as large diameter applications.

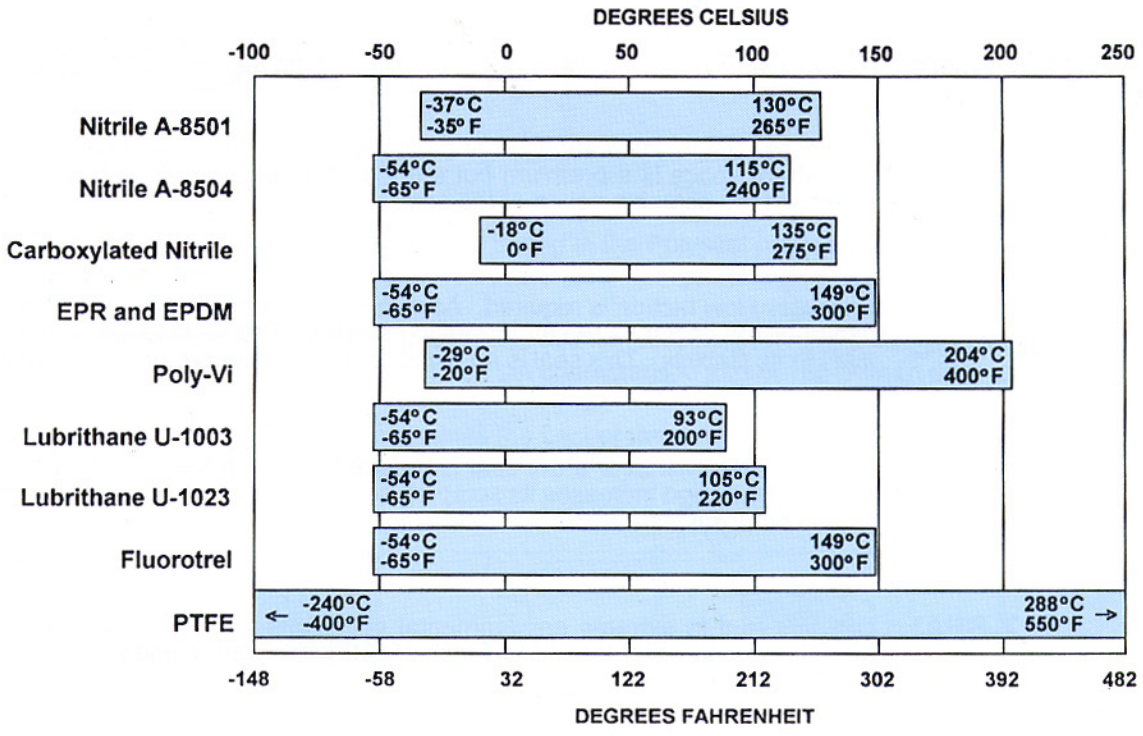


Metal Clad (MC) Wiper

This snap-in wiper/scraper offers superior performance to the D and 959 style wipers, featuring a metal can for excellent stability. Also, lower machining costs for a less complex groove are attained from the MC's square shape. Also available as **MCS** with steel spring energizer (pictured).

REFER TO EX-1000 BROCHURE FOR CORRECT GROOVE DIMENSIONS.

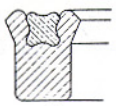
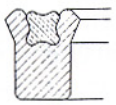
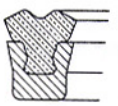
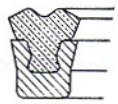
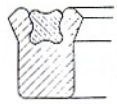
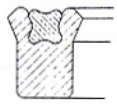
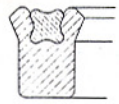
Temperature Range By Polymer



TEMPERATURE RANGE is determined by the type of base polymer from which compounds are made. The above chart depicts the maximum temperature range for each polymer, assuming continuous exposure. Short term or intermittent exposure extends high temperature potential, while adverse application conditions reduce temperature capabilities. Engineering assistance is available from Macrotech Polyseal on applications that exceed the temperature guidelines. The above chart does not take into consideration the fluid media to be sealed. Most chemical reactions increase with temperature rise; therefore, all seals should be tested at the temperature and in the fluid in which they are to be used.

FLUID COMPATIBILITY TABLE

KEY:

POLYSEAL LUBRITHANE BASE NITRILE ENERGIZER	POLYSEAL FLUOROTREL BASE POLY-VI ENERGIZER	DEEP Z SEAL NITRILE LIP FLUOROTREL BASE	DEEP Z SEAL ETHYLENE PROPYLENE LIP FLUOROTREL BASE
			
A	B	C	D
DEEP Z SEAL POLY-VI LIP FLUOROTREL BASE	POLYSEAL ETHYLENE PROPYLENE BASE AND ENERGIZER	POLYSEAL POLY-VI BASE AND ENERGIZER	POLYSEAL NITRILE BASE AND ENERGIZER
			
E	F	G	H

HYDRAULIC FLUIDS COMPATIBILITY, GENERAL

FLUIDS	RECOMMENDED SEAL
Petroleum based hydraulic fluids	A, C, E
Phosphate Ester fire-resistant hydraulic fluids	D**, E, B*
Water and Glycol fire-resistant hydraulic fluids	C, D**, E, A
Water and oil emulsion fire-resistant hydraulic fluids	C, E, A*
Automotive brake fluid	D, F
Automotive transmission fluid	A*, E, H, G

* Below 150°F only

** No contamination of Petroleum based fluid can be present.

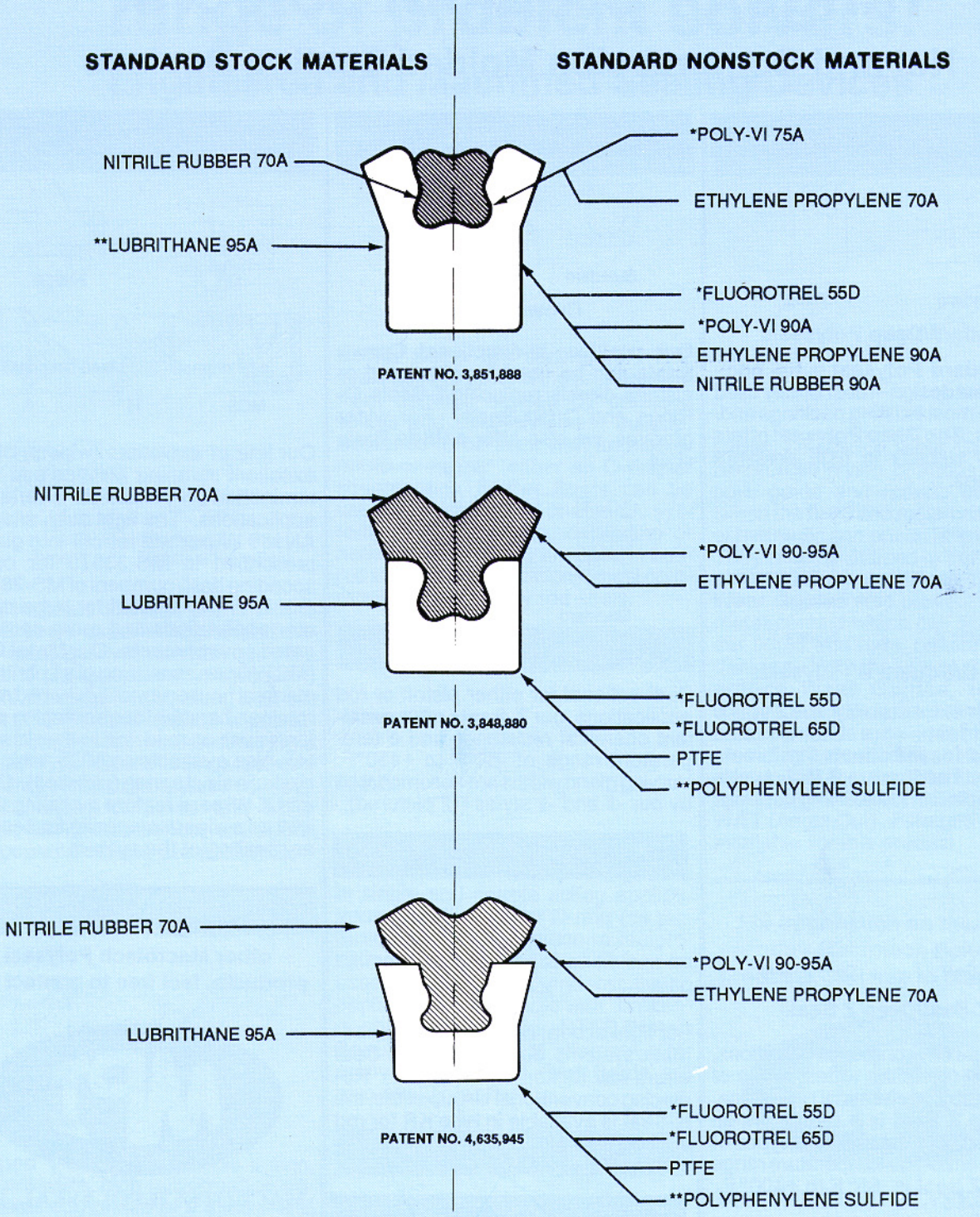
Note: When a mixture of various hydraulic fluids exists in the system, "E" should be selected as the seal. The Poly-Vi lip of this seal is generally more compatible with mixtures of fluids.

Most of Macrotech Polyseal's products consist of more than one material. Therefore, fluid compatibility is based on a judgment, thus putting greater emphasis on the material of the sealing lip.

The seal recommendations listed on the charts above are based on compatibility at relatively low temperatures. Since most chemical reactions increase with temperature rise, seals should be tested in the fluid medium and at the temperature under which they are expected to be used. As a rule of thumb, if the temperature is expected to exceed 180°F, and if the fluid compatibility with the lip material is not known, a test should be made at the higher temperature.

Where two or more material combinations are expected to work equally well, the order of recommendation is based on lowest cost. However, it is important to be aware that some material combinations are listed as Standard Non-Stock, and that the additional time to obtain the product may influence the selection of the seal.

AVAILABLE MATERIAL COMBINATIONS



*TRADEMARK MACROTECH POLYSEAL, INC.

POLY-VI (FLUOROELASTOMER)
LUBRITHANE (URETHANE)
FLUOROTREL (POLYESTER ELASTOMER)

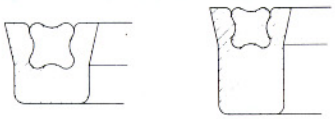
** TEMPERATURE AND CHEMICAL RESISTANCE OF THIS MATERIAL EXCEED THAT OF THE FLUOROTREL MATERIALS. CHECK WITH MACROTECH/POLYSEAL ENGINEERING ON SPECIFIC APPLICATIONS.

NOTE: METRIC SIZES ARE AVAILABLE FOR MOST MACROTECH POLYSEAL PRODUCTS.

Macrotech Polyseal has a full range of problem solvers.

Net and Compression Molded Sealing Devices

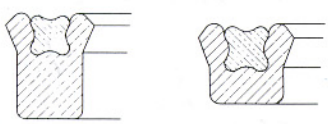
Hydraulic Rod Seals



Standard Deep

Standard/Deep Polyseals

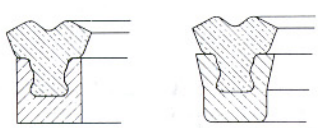
The **Standard Polyseal** is the original Polyseal design--most widely used to replace most existing packings and/or O-rings. The **Deep Polyseal** offers increased stability in high pressure applications.



Type B Square B

Type B/Square B Polyseals

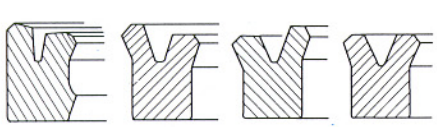
Along with extra stability, the **Type B Polyseal** features a back-beveled sealing lip for maximum film-breaking ability. The **Square B Polyseal** is sized to replace most existing packings and/or O-rings.



Z-Seal Deep Z Seal

Z-Seal/Deep Z Seal

For extreme environmental conditions, the **Z-Seal** offers the widest range of temperature and chemical resistance. The **Deep Z Seal** is a redundant-lip seal for rod applications in all types of environments. The temperature range of **Deep Z Seal** is -65° F to +400° F.

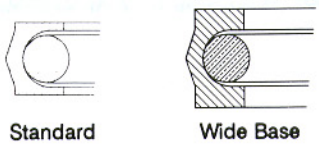


UBR UNR UPR US

U-Cups

Our line of **U-Cups** include **UBR**, **UNR** (rod), **UNP** (piston) and **US** (symmetrical) styles for an economical alternative in rod or piston sealing applications.

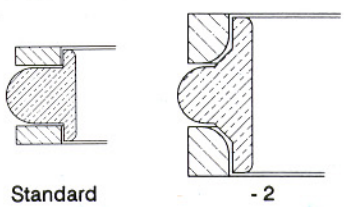
Hydraulic Piston Seals



Standard Wide Base

Crown Seals

Our positive, bi-directional **Crown Seals** can be used for either rod or pistons, directly replacing T-Seals, O-Rings and Quad Seals. For wider grooves, we also offer a **Wide Base** style.

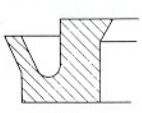


Standard -2

T-Seals

Bi-directional for either piston or rod applications, our **T-Seals** offer excellent chemical resistance and a temperature range of -65°F to +450°F. Varying gland widths are accomodated by our **-1** and **-2** styles (**-2** pictured).

Pneumatic Seals



K-Seals

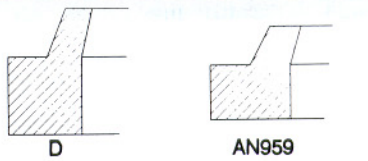
For light action, non-lubricated pneumatic systems, our Lubrithane **K-Seal** offers low friction and long life. Replacing conventional U-Cup seals, the **K-Seal** is available in type **KR** for rod applications and **KP** for piston applications.

Piston Cups

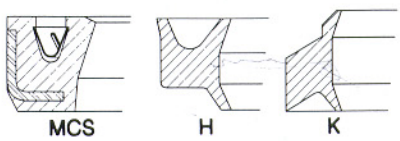
Standard Thin Wall

Our **Piston Cup** line includes a **Standard** style for general pneumatic and hydraulic applications, and a **Thin Wall** style that provides lower friction at light pressures.

Excluders



D AN959



MCS H K

Our line of excluders (wipers) offers excellent scraping abilities and contamination prevention for a variety of applications. The light duty, snap-in, **AN959 Wiper** will retrofit into glands prescribed in MS-33675 for corresponding dash numbers of MS-28776. Our **D Wiper** is ideal for large diameter applications and more contaminated environments. Our **Metal Clad (MC) Wiper**, consisting of a Lubrithane element housed in an "L" shaped metal retainer, handles tough scraping problems such as mud, ice and weld splatter--also available as **MCS**, which includes a steel spring (pictured). Our **H** and **K Wipers** feature a sealing lip as well as a wiper/scraper lip for secondary sealing of the system.

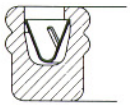
For information on these and other Macrotech Polyseal products, feel free to contact us.

MACROTECH POLYSEAL, INC.

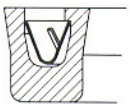
Macrotech Polyseal has a full range of problem solvers.

Engineered and Machined Sealing Devices

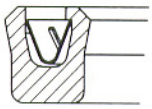
SpectraSeals



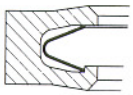
Standard Seal



Scraper Seal



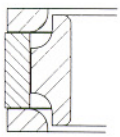
Type B



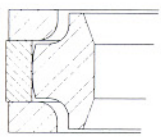
Internal Face Seal

SpectraSeals are high performance PTFE seals used in hostile and severe sealing environments. Custom made to precisely meet your requirements, **SpectraSeals**, along with our other PTFE seals, operate within an exceptionally wide temperature range of -400° F to +550° F. Shown above are some of the basic styles available. Combinations of these and other styles, along with almost any PTFE compound material, are available.

Capped T-Seals



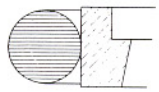
Standard



MK/EK

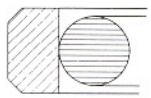
Capped T-Seals are double-acting, high pressure, high performance piston seals comprised of a filled PTFE cap (many compounds available) and an elastomeric energizer. These two components are protected from extrusion and foreign material by two plastic anti-extrusion rings. The excellent stability of **Capped T-Seals** accomodates larger extrusion gaps and oversize bores. Also available are **MK Capped T-Seals**, used in Metric-dimensioned J.I.S. cylinders, and **EK Capped T-Seals**, used in glands similar to **MK** applications except in Imperial (inch) sizes.

Buffer Seals



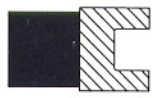
Buffer Seals are secondary PTFE seals used to protect the primary seal from damage caused by pressure spikes and excessive heat buildup. Designed to be used with an elastomeric energizer (either an O-ring or square ring), **Buffer Seals** can be used in hydraulic and pneumatic systems in reciprocating, oscillating or helical motion. They are used in both rod and piston applications, most commonly as secondary rod seals.

PTFE Piston Seals



PTFE Piston Seals are square or rectangular cross-sectioned rings used in single and double acting applications, usually with an O-ring (as pictured above). In addition to reciprocating situations, these seals can be used in slow rotary and oscillating applications. Available with "broken" or chamfered corners, **PTFE Piston Seals** are a low cost alternative for many uses. **PTFE Rod Seals** are also available.

Grooved Piston Ring



The Polyseal Grooved Piston Ring is a high performance bi-directional seal intended for use where extremely low leakage is required. Good seal stability is achieved by using a square cut elastomeric energizer. Macrotech Polyseal uses design criteria taken from many years experience in the machined plastics industry.

Wear Guides

WGT

WAT

Close Tolerance Wear Guides are Reinforced Nylon bearings that support, guide and reduce friction between the fixed and reciprocating parts of hydraulic and pneumatic cylinders. They may be utilized in both rod and piston applications. **Close Tolerance Wear Guides** also prevent metal-to-metal contact which can score cylinder bores and rods, resulting in seal damage. With the use of **Close Tolerance Wear Guides**, the overstressed condition on the seal due to excessive side loading is eliminated, providing extended seal life. Shown above are the two standard styles available, the **WGT** (Butt Cut) and **WAT** (Angle Cut). Filled PTFE is also available for this product.

For information on these and other Macrotech Polyseal products, feel free to contact us.

MACROTECH POLYSEAL, INC.