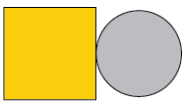
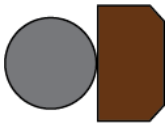
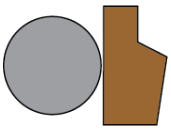
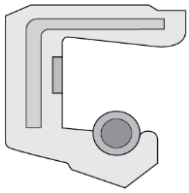
The Right Seal for Every Application

	**O-Rings** The O-ring's simple & inexpensive design remains a popular and universal choice for sealing static and dynamic hydraulic systems. It seals efficiently in both single and double-acting cylinders and can be manufactured in a wide range of elastomers and polymers. O-ring energizers can also be added to rod seals to increase resilience to further maintain sealing contact under low pressures or vacuum applications. One of their few drawbacks is their inability to withstand extreme temperatures. In colder temperatures, they can become brittle and even crystalize. Prolonged exposure to excessive heat forces the seal to contract and allow leaks. Nitrile, Ethylene-Propylene, & Silicone are the most common materials used in O-ring manufacturing but they can also be manufactured from high-performance elastomers. Temperature Range: (Elastomer)-76°F to 599°F & (PTFE) above -328°F
	**Head Seals** The symmetrical design of the Head Seal eliminates the potential for improper installation or damage during the process while making a marked improvement on efficiency with the standard use of O-rings and backups in cylinder heads. Cylinder head seal failure is often caused by O-ring back-up blow-out and pinched back-ups. The static head seal was designed to combat this issue to produce a better performing and dependable solution. Temperature Range: -65°F to +200°F
	**Gaskets** Gaskets create a reliable, cost-effective barrier between two seals in conjunction with mechanical seals to prevent leaks while under compression. Initially, asbestos was the standard material used for manufacturing gaskets in high pressure steam systems but due to the obvious health risks associated with asbestos, compressed non-asbestos fibers, (CNAF), were implemented to provide a better, healthier alternative. Gaskets are now available in a diverse amount of materials including Non-asbestos, cork, fiberglass, felt, foam, rubber, adhesive backed foam, closed cell sponge rubber, graphite, silicone, vegetable fibers and many more. Just keep in mind that the selection of material for the gasket in relation to the application is critical to its efficiency. Temperature Range is dependent upon material.
	**Piston Seals** Piston seals create a pressure barrier, preventing fluids from passing over the cylinder head while the pressure pushes down on the piston. This radial seal can be used as a single or double-acting seal and is vital for maintaining the position at rest (static) and controlling the motion of the cylinder. It can be combined with wear rings to provide a longer life and enhance leak prevention capabilities. On average, non-symmetrical

	piston seals are slightly smaller in diameter than the actual gland diameter so that as the seal stretches into the gland, a tighter seal is formed. Temperature Ranges vary upon design and material.
	**Rod Seals** Also referred to as a “shaft seal”, this seal is placed externally to the cylinder bore and is critical to the functionality of any type of power equipment. Its main function is to prevent fluids from leaking externally by forming a pressure barrier. It also maintains the operating fluid inside the cylinder by regulating the fluid film on the surface of the piston rod which prevents rod corrosion. This action subsequently lubricates the wiper seal, as well as the rod seal, and then receives the lubrication film upon retraction of the rod. Additionally, rod seals can be combined with a buffer or wiper seal for maximum sealing efficiency. Temperature Range: -22°F to 230°F depending on material and design
	**Buffer Seals** Buffer seals are uni-directional rod seals that safeguard & improve rod seal performance by reducing the fluctuation, or spikes, in pressures; allowing the rod seal to perform with a more consistent pressure change all while ensuring that the rod is adequately lubricated. They’re engineered to allow for a dependable seal within the sliding movement of the cylinder’s head and piston rod when used in conjunction with a secondary rod seal. Temperature Range: -40°F to 400°F depending on material
	**Wiper Seals** The Wiper Seal is also referred to as a “Scraper Seal”. This tight-fitting, effective seal is often used with secondary seals to enhance the seal-ability, reduce pressure traps and prevent outside contamination. Dirt, non-compatible fluids, and dust can damage cylinder seals in addition to the cylinder bore, rod & wall which will ultimately lead to cylinder failure. The main function of the wiper seal is to block those external contaminants from entering the hydraulic cylinder assembly altogether by wiping the rod clean while simultaneously accepting the lubrication film upon retraction. Temperature Range: -65°F to +200°F depending upon material
	**Guide Rings** Guide Rings, also known as “Wear Rings” are used to guide the rod and piston to prevent damage caused by metal to metal contact between cylinder components; subsequently reducing heat and pressure build-up. They maintain a centered position for the rod and piston while absorbing strong transverse forces; which is crucial to the performance of the hydraulic system. Additionally, they can dampen the mechanical vibrations and sound of noisy hydraulic systems. Guide rings also counter radial load caused by side loading and ensure a reduction in seal extrusion gaps to obtain optimal seal performance and leakage control. The most common materials for Guide rings are Nylon, bronze-filled PTFE & glass-filled PTFE and they are typically available in step, angle & butt cut styles.

	Temperature Range: Dependent upon material
	**Back-up Rings** Back-up rings are designed to reinforce primary seals to prevent extrusion into a clearance gap and improve system pressures. Although they are more commonly used to back-up O-rings, they can be used in conjunction with a multitude of sealing products and in static and dynamic systems. When used with Guide Rings, they effectively offset the effects of a reduced pressure rating and can increase seal life and performance at higher pressures. They can be manufactured in a variety of materials such as rubbers, polymers, elastomers, thermoplastics and even natural materials and are available in a spiral or solid design. Temperature Range: -325°F to +500°F depending on material.
	**Oil Seals / Rotary Shaft Seals** Oil seals, also known as Rotary Shaft Seals and Radial Lips Seals, are a very popular dynamic dual-lip seal used in a wide variety of pumps and motors for its ability to seal high speed rotating shafts and bores and applications with low pressure lubricants. The main purpose of the Oil Seal is to retain the bearing lubricant and repel contaminants and moisture that would compromise the hydraulic system. There are a multitude of style variations that generally utilize a rubber sealing lip to lightly contact the rotating shaft and a metal case to close the gaps between the stationary and moving components. They can be supplied in conjunction with a metal tensioning spring, secondary wiping lip, end caps or auxiliary devices. The most common materials used in manufacturing Oil Seals are Nitrile, PTFE, silicones, elastomers and Ethylene Propylene. Temperature Range: -58°F to 400°F depending on material

Materials Commonly Used in Seal Manufacturing

Polyurethane (TPU, EU,AU, HPU)
Polyurethane's wear, flexibility and extrusion resistance make it a popular choice in the industry. It is highly resistant to petroleum oils, hydrocarbon fuels, oxygen, ozone and weathering yet can deteriorate quickly when exposed to acids, ketones and chlorinated hydrocarbons. It can be sensitive to humidity & water over 200°F. It is a preferred choice for use in oil based hydraulic fluids and can withstand pressures up to 6000psi.
Temperature range: -65°F to +200°F 40 to 90 Hardness Shore A.

Ethylene Propylene (EPDM)
EPDM is a rubber-like elastomer that is typically used in systems with high water temperature, steam or brake fluid designs. It is also highly resistant to UV, ozone exposure and weathering which makes it an excellent choice for use where environmental elements are a consideration. The drawbacks to this compound is a low resistance to mineral oil based solvents found in oils, greases & fuels but its counterbalance is its excellent working temperature range.
Temperature Range: -40°F to 300°F 40 to 95 Hardness Shore A

Polymyte (Parker proprietary polyester elastomer).
Parker's trademarked elastoplastic material compound features an exceptionally high tear strength & abrasion resistance and can be utilized in applications with petroleum based fluids, water based fluids, phosphate ester fluids and some chlorinated fluid. Polymyte can be used in applications where extrusion is present due to its high durometer but it is not compatible with cresols, phenols and concentrated acids.
Temperature range: -65°F to +275°F

Natural Rubber (NR)
Derived from the juice of the Hevea (latex) tree, this material displays good resistance to organic acids and alcohols. It exhibits a low compression set and a high resilience, abrasion, and tensile strength in addition to a unique vibration dampening quality. However, wear is often compromised when considering the lack of resistance to sun and UV exposure as well as petroleum oils.
Temperature Range: -58°F to 158°F 40-90 Shore A Hardness

Nylon/Engineered Resins
Nylon is a very popular choice for engineered plastics for its excellent physical and mechanical properties. It features a high tensile and compressive strength juxtaposed with durability, heat deflection and abrasion resistance. It is food safe but used more often in wear rings for bearing support and in auxiliary devices for extrusion resistance.
Temperature Range: -58°F to 230°F

Nitrile (NBR)
Nitrile is a synthetic copolymer that exhibits excellent tensile strength & resistance to abrasion, compression, tears & extrusion. Its oil resistant properties make it a great choice for use in water based applications, (Steam below 212°F), and anywhere oil resistance is required. Its limiting factors include a low resistance to weathering, sunlight & ozone and has a shelf life of 15 years.
Temperature Range: -30°F to 250°F 40-90 Shore A Hardness

Fluorocarbon Elastomers (FKM, FPM)
Also known as Viton®, Fluorel®, Tecnoflon®; Fluorocarbon elastomers are the most resistant of all rubbers to chemical and heat exposure. They are suitable for use with most hydraulic fluids except ester-ether based fluids. With an outstanding resistance to UV rays and weathering, it exhibits phenomenal wear resistance and an unlimited shelf life.
They are generally compatible with hydrocarbons but are incompatible with ketones and organic acids such as acetic acid.
Temperature ranges -20°F to - 446°F 55-90 Shore A Hardness

Fluorosilicone (FK)
Fluorosilicone provides the temperature stability of silicone with an impeccable resistance to hydrocarbon fuels, petroleum oils, and diester based lubricants which is why it's widely used in jet fuel applications when dry-heat resistance is necessary. Fluorosilicone also features an extremely low compression set and an unlimited shelf life.
Temperature Range: -75°F to 400°F 40 to 80 Shore A Hardness

Polytetrafluoroethylene (PTFE)
Demonstrating a low coefficient of friction, this material eliminates the possibility of stick-slip effects in dynamic sealing applications. The wide temperature range of PTFE, also known as

Teflon®, allows for continuous use even at temperatures up to +600°F. Equally impressive is its strong chemical resistance even at elevated temperatures and pressures. Combining those features with its capability to be utilized in dry running applications through its self-lubricating feature makes it a great all-around choice for sealing components.
Temperature Range: -95°F to +480°F

Silicone (MQ, PMQ, VMQ)
Silicone is an elastomer used widely in the food and medical industry for its lack of taste and odor. Its excellent compression set resistance; wide temperature range and superior flexibility make it a great choice for a multitude of applications. Silicone is resistance to sunlight, UV exposure and weathering in addition to most mineral, vegetable, engine and transmission oils.
Temperature Range: -85°F to 400°F 20 to 80 Shore A Hardness

Neoprene® (NEO)
This synthetic rubber compound features a good resistance to petroleum oils, low compression set and good tensile strength. It resistance to weathering, sun and ozone as well as ammonia, freon and oxygen make it a popular choice for refrigeration and cooling systems when considering its ability to maintain flexibility in a wide range of temperatures
Temperature Range: -65°F to 300°F

(James Walker Elastomer Engineering Guide, 2016) https://www.jameswalker.biz/de/pdf_docs/148-elastomer-engineering-guide
(Fluid Power Seal Design Guide,2015) https://www.parker.com/literature/Engineered%20Polymer%20Systems/5370.pdf