



Quantum™ PTFE Products



Quantum™ PTFE Seals

Simrit, the industrial division of Freudenberg–NOK, strives to meet today’s ever-increasing demand for high-performance materials. Polytetrafluoroethylene (PTFE) plays a key role in providing superior performance in the most demanding applications.

PTFE is an integral part of our daily lives, from semiconductors and chemical processing to industrial and fluid power applications. PTFE is an extremely stable polymer which is chemically inert and functions in a very wide range of temperatures (–328°F to +500°F). It has the lowest friction coefficient of any solid and can be used in both static and dynamic applications, with or without lubrication. The strength and wear characteristics of virgin PTFE can be improved by adding fillers such as bronze particles, fiberglass fibers, and carbon fibers to provide a durable material with outstanding thermal and chemical resistance.

Freudenberg-NOK continues to pioneer material development and product design in PTFE products. As the Technology Specialist, we employ premier **Quantum** PTFE materials and designs to provide cost-effective solutions to the most demanding engineering applications.

Simrit provides our customers with highly qualified application engineers who offer on-site technical support and a diagnosis of our clients’ entire systems, not just the individual parts. Our support teams are specialized by product lines to match optimal design, materials and processes to your specific requirements.

Many common PTFE seals and shapes can be shipped immediately from stock. Other custom designs can be manufactured on our **Simrit Xpress™** equipment and shipped in as little as 24 hours. If your application calls for PTFE, call Simrit today at 866-2SIMRIT for expert sealing solutions and superior customer service.

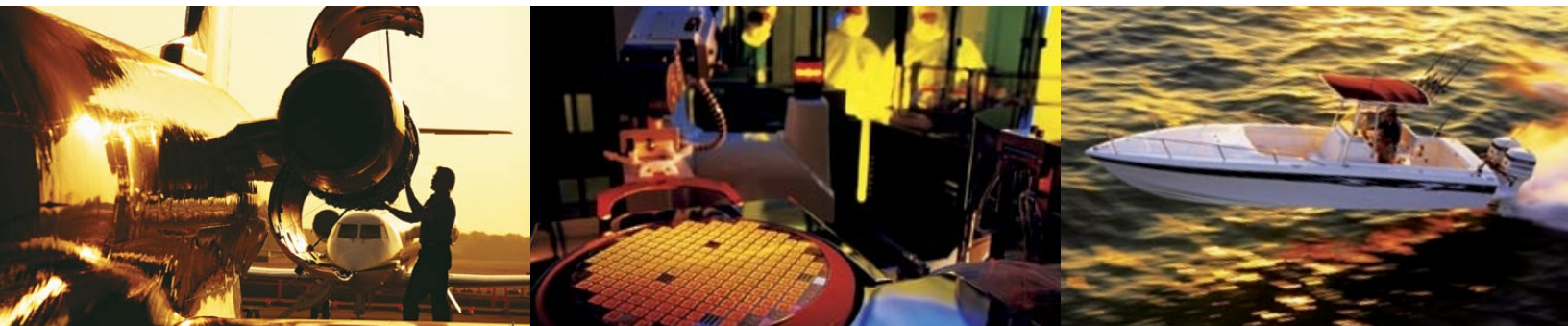
Markets and Applications

Due to its unique performance characteristics, PTFE is used in a wide variety of markets, including:

- Aerospace
- Appliance
- Automotive
- Chemical Process
- Industrial Equipment
- Medical
- Mobile Machinery
- Oil Field
- Recreation
- Semiconductor
- Transportation

Typical **Quantum** PTFE Sealing Applications:

- Anti-extrusion Devices
- Bearings
- Bellows
- Bushings
- Compressors
- Crankshafts
- Cryogenics
- Flange/Cover Gaskets
- HVAC
- Hydraulic & Pneumatic Actuators
- Piston Pump
- Power Steering
- Rotary Shafts
- Shock Absorber
- Steel Mills
- Swivel Joints
- Transmissions
- Valves



Manufacturing Competency

COMPRESSION MOLDING

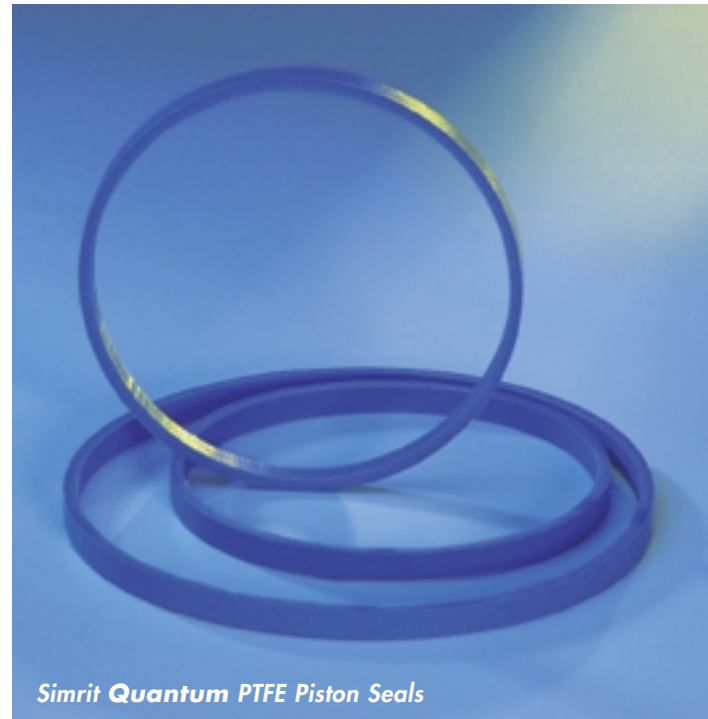
- Zero material waste process for high-volume parts.
- Premium physical properties
- Lean one-piece-flow process.
- Commonly used when unique geometry is required.
- Common uses include: seals for power steering units, transmissions, rotary valves, and compressors.
- **Compression Molding Specifications:**
 - ▶ Diameter: Up to 6 inches (152 millimeters)
 - ▶ Quantity: Up to 40 million
 - ▶ Profiles: Square Rings, Rectangular Rings, V-Rings
 - ▶ Materials: All **Quantum** materials

EXTRUSION

- **Extrusion Specifications:**
 - ▶ Diameter: Up to 2 inches (50 millimeters)
 - ▶ Quantity: 1 million minimum
 - ▶ Profiles: Square Rings, Rectangular Rings
 - ▶ Materials: All **Quantum** materials

PRECISION MOLDING

- Provides ability for high-volume precision screw machining.
- Enables production of complex shapes.
- **Precision Molding Specifications:**
 - ▶ Diameter: Up to 60 inches (1524 millimeters)
 - ▶ Quantity: All
 - ▶ Profiles: Wide ranging complex geometry
 - ▶ Materials: All **Quantum** materials



COLD FORMING

- A low-cost alternative to machining.
- Commonly used as an effective, lower cost alternative to o-ring energized piston rings.
- **Cold Forming Specifications:**
 - ▶ Diameter: Up to 6 inches (152 millimeters)
 - ▶ Quantity: All
 - ▶ Profiles: U-Cups, V-Rings
 - ▶ Materials: All **Quantum** materials

Simrit offers PTFE products in its Xpress rapid and prototype production cell. Simrit's Xpress capabilities are designed to be a cost-effective solution for low quantity production of an almost limitless list of products. With Xpress, you can design your own products on-line quickly and easily, then have them shipped to you within 24 hours guaranteed!



Manufacturing Competency—continued

QUALITY AND LEAN SYSTEMS

- Automated Statistical Process Control systems give operators the red–yellow–green status of a run.
- Automated problem alert systems measure critical part dimensions, e-mailing engineers if there is a problem.
- **Quality Systems Specifications:**
 - ▶ ISO-14000
 - ▶ TS16949

PISTON BANDING

- PTFE over-molded pistons.
- Commonly used for automotive struts and shocks in autos, recreational vehicles, and heavy trucks.
- **Piston Banding Specifications:**
 - ▶ Quantity: All
 - ▶ Materials: All **Quantum** materials

CUSTOM IDENTIFICATION

- Color coding available for easy identification.
- PTFE allows etching identification.



TAPE SKIVING

- Tape to 6 inches wide provides an alternate manufacturing method to reduce cost where applicable.
- Common uses include guide bands and complex geometric shapes.
- **Tape Skiving Specifications:**
 - ▶ Materials: All **Quantum** materials

Quantum PTFE Characteristics

- PTFE operates under a wide range of temperatures (can range between -328°F and $+500^{\circ}\text{F}$).
- The coefficient of friction is extremely low. Under certain conditions PTFE may operate without lubrication.
- Electrical insulating properties are extremely good.
- Chemical resistance is excellent; PTFE is resistant to almost all chemicals and exhibits no signs of aging. Only alkali metals and elemental fluorines will attack PTFE material.
- PTFE offers low gas permeability and is outstanding for sealing gas.
- PTFE is particularly suitable in applications that require water to be sealed.

A Fortunate Accident: PTFE was discovered on April 6, 1938, at DuPont's Jackson Laboratory in New Jersey. DuPont chemist Dr. Troy J. Plunkett was working with gases related to Freon™ refrigerants, another DuPont product. Upon checking a frozen, compressed sample of tetrafluoroethylene, he and his associates discovered that the sample had polymerized spontaneously into a white, waxy solid to form PTFE.



Quantum PTFE Materials Guide


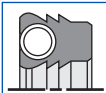
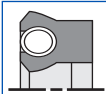


Quantum Premium Alloys	
Compound	Description
1043	Proprietary compound, formulated to have exceptional wear and extrusion resistance in severe duty dynamic applications on hardened metals.
1044	Similar to compound 1043, this alloy is excellent for high pressure and wear applications with improved chemical resistance.
1045	This compound is designed for high durability applications on hardened metals where PV values are high and long life is essential.
1046	Tailored for wear-resistant dynamic applications running on soft metals.
1047	Similar to compound 1046, this compound is designed for dynamic applications using soft metals. Has increased creep and extrusion resistance.

Quantum Standard Alloys		
Compound	Description	Applications
1001	Unfilled PTFE has minimum friction and gas permeability, excellent chemical resistance.	Static or light-duty dynamic applications, with low-pressure speed and abrasion. FDA approved.
1010	Light glass-fiber reinforced PTFE has improved pressure, wear, and dimensional stability over unfilled PTFE.	Seals for typical hydraulic operation. Fillers are not alkali-resistant.
1023	Medium glass-fiber reinforced PTFE. Similar properties to compound 1010 with improved creep, wear and pressure resistance.	For high pressure and temperature dynamic applications and on hardened metals.
1033	Medium bronze-filled PTFE. Bronze filler provides excellent wear and pressure resistance, as well as excellent thermal conductivity.	Heavy-duty dynamic applications on hardened metals. Bronze may be attacked by some media. Not suitable for acidic or water environments.
1036	Heavy-fill bronze PTFE with internal lubricant. Similar properties to compound 1033 bronze-filled with increased pressure and wear resistance from additional filler.	Used with bearings and seals for hardened metals. Severe duty applications with medium speed and high pressures.
1039	Graphite-filled PTFE. Internal lubricant allows lower friction than most PTFE alloys while providing improved creep resistance and thermal conductivity over unfilled PTFE.	High speed and light/medium pressure applications with poor lubrication. Good wear characteristics with soft metals. Suitable for water applications. FDA approved.
1042	Carbon- and graphite-reinforced PTFE. Carbon fiber reinforcement provides good temperature, pressure and abrasion resistance characteristics.	Good for dynamic seal and bearing applications with good chemical resistance. Suitable for hot water applications. Fillers may be attacked by oxidizing media.
1048	Polyimide reinforcement provides a much stronger wear, temperature range, and abrasion resistance than graphite-filled alloys.	High-temperature dynamics using soft metals. Not suitable for hot water applications.



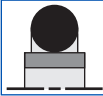



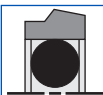

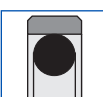
Quantum PTFE Products

Simrit offers a broad line of PTFE products, including spring-energized seals, rod seals, piston seals, rotary and swivel seals, and dirt wipers in a variety of compounds. A large number of these products are available from stock and can be ordered through our on-line catalog at www.simrit.com. Many prototypes and custom designs can be produced within 24 hours using **Simrit Xpress**. *For additional information, please contact Simrit at 866-2SIMRIT.*

Materials Key		Applications Key		Specifications			Materials				Applications					
■ Standard	■ Consult Factory	□ Non-Standard	● Acceptable	● Consult Factory	● Unacceptable	Maximum Speed, ft./sec.	Maximum Pressure, psi	Temperature Range, °F	Bronze	Carbon	Glass	Virgin	Heavy Duty	Light Duty	Swivel/Rotary	Reciprocation
Spring-Energized Seals—Available in Rod/Piston Orientation																
FORSEAL FOA Piston U-cup/FOI Rod U-cup		 <p>The Forseal FOA Spring-Energized Rod U-cup offers the benefits of extreme operating conditions with low pressure pre-loading. The seal is composed of a filled PTFE, usually glass, and a stainless steel spring. This seal offers exceptional temperature range and chemical compatibility, and can also be used in some swivel applications. The sealing and spring material is available in a variety of compounds. For a piston version, use the Forseal FOI Rod U-cup.</p>		-320°F to 450°F	6500 psi	32 ft./sec.	■	■	■	■	●	●	●	●	●	●
FORSEAL XTM		 <p>The Forseal XTM Spring-Energized Rod U-cup can be used in higher pressures and extreme operating conditions with low pressure pre-loading. The seal has a high pre-load for gasses or viscous media. This seal offers exceptional temperature range and chemical compatibility, and can also be used in some swivel applications. The seal and spring assembly are available in various compounds, polymer and metallurgical combinations.</p>		-320°F to 450°F	6500 psi	8 ft./sec.	■	■	■	-	●	●	●	●	●	●
FORSEAL LSU		 <p>The Forseal LSU Spring-Energized Rod U-cup seal is composed of a filled PTFE and a stainless steel spring. This seal offers exceptional temperature range and chemical compatibility for dynamic and static applications. The seal and spring assembly are available in various compounds, polymer and metallurgical combinations.</p>		-320°F to 450°F	5800 psi	10 ft./sec.	■	■	■	■	●	●	●	●	●	●
Rod Seals																
OMEGAT OMS-MR Single-Acting Rod Seal		 <p>This low-friction, single-acting, two-part rod seal is made from a PTFE profile ring and an o-ring energizer. This seal has a low break-away force and can be used in pairs or where precision control is required. Features include: very high pressure stability under load, very good extrusion strength, low friction, and low stick-slip.</p>		-22°F to 400°F	5800 psi	16 ft./sec.	■	□	■	-	●	●	●	●	●	●
OMEGAT OMS-S Single-Acting Heavy Duty Rod Seal		 <p>This is a heavier version of the Omevat OMS-MR seal. It maintains the benefits of a low-friction seal, while being more capable of higher pressures and harsher environments. Features include: heavy duty applications, very high pressure stability under load, very good extrusion strength, low friction, and low stick-slip.</p>		-22°F to 400°F	5800 psi	16 ft./sec.	■	□	■	-	●	●	●	●	●	●

WARNING: Properties/applications shown throughout this brochure are typical. Your specific application should not be undertaken without independent testing and evaluation for suitability. For specific application recommendations consult Simrit. Failure to select the proper sealing products could result in property damage and/or serious personal injury. Performance data published in this brochure has been developed from field testing, customer field reports, and/or laboratory testing. While the utmost care has been used in compiling this brochure, we assume no responsibility for errors. Specifications are subject to change without notice.

Quantum PTFE Products—continued

Materials Key		Applications Key		Specifications			Materials				Applications					
■ Standard	■ Consult Factory	□ Non-Standard	● Acceptable	● Consult Factory	○ Unacceptable	Maximum Speed, ft./sec.	Maximum Pressure, psi	Temperature Range, °F	Bronze	Carbon	Glass	Virgin	Heavy Duty	Light Duty	Swivel/Rotary	Reciprocation
Rod Seals—continued																
OMEGAT TFMI Double-Acting Rod Seal																
	The Omevat TFMI is a double-acting rod seal requiring a very small groove and can typically be used in valves and hydraulic applications. This seal can be supplied with various o-ring energizer materials. Features include: good pressure stability under load, extrusion resistance, low friction, and low stick-slip.			-22°F to 400°F	2300 psi	6 ft./sec.	■	□	■	□	●	●	●	●	●	●
OMEGAT SPNC Double-Acting Light Duty Rod Seal																
	The Omevat SPNC is designed to fit into the standard dynamic AS568, or MIL-G-5514F, and AS4716 grooves for light duty applications. It requires a very small groove and can typically be used in valves. This seal can be supplied with various o-ring energizer materials. Features include: low to moderate pressures, moderate extrusion resistance, low friction, and low stick-slip.			350°F	2300 psi	6 ft./sec.	■	□	■	□	●	●	●	●	●	●
Piston Seals																
OMEGAT OMK-MR Double-Acting Piston Seal																
	This low-friction, double-acting, two-part piston seal is made from a PTFE profile ring and an o-ring energizer. This seal has a low break-away force and can be used where precision control is required. Features include: very high pressure stability under load, very good extrusion strength, low friction, and low stick-slip.			-22°F to 450°F	5800 psi	16 ft./sec.	■	□	■	-	●	●	●	●	●	●
OMEGAT OMK-S Double-Acting Heavy Duty Piston Seal																
	This is a heavier duty version of the Omevat OMK-MR Piston Seal. It maintains the benefits of a low-friction seal, while being capable in higher pressures and harsher environments. Features include: heavy duty applications, very high pressure stability under load, very good extrusion strength, low friction, and low stick-slip.			-22°F to 450°F	5800 psi	16 ft./sec.	■	□	■	-	●	●	●	●	●	●
OMEGAT OMK-E Single-Acting Piston Seal																
	This low-friction, single-acting, two-part piston seal is made from a PTFE profile ring and an o-ring energizer. This seal has a low break-away force and can be used in pairs when supplied with pressure relief grooves. Features include: very high pressure stability under load, very good extrusion strength, low friction, and low stick-slip.			-22°F to 450°F	5800 psi	16 ft./sec.	■	□	■	-	●	●	●	●	●	●
OMEGAT OMK-ES Single-Acting Heavy Duty Piston Seal																
	This low-friction, single-acting, two-part piston seal is made from a PTFE profile ring and an o-ring energizer. This seal has a low break-away force and can be used in pairs when supplied with pressure relief grooves. Features include: very high pressure stability under load, very good extrusion strength, low friction, and low stick-slip.			-22°F to 450°F	5800 psi	16 ft./sec.	■	□	■	-	●	●	●	●	●	●
OMEGAT TFMA Double-Acting Piston Seal																
	The Omevat TFMA is a double-acting piston seal requiring a very small groove and can typically be used in valves and pneumatic, as well as hydraulic, applications. This seal can be supplied with various o-ring energizer materials. Features include: good pressure stability under load, extrusion resistance, low friction, and low stick-slip.			-22°F to 450°F	2300 psi	6 ft./sec.	■	□	■	□	●	●	●	●	●	●

For additional information, please contact Simrit at 866-2SIMRIT.

Quantum PTFE Products—continued

Materials Key

- Standard
- Consult Factory
- Non-Standard

Applications Key

- Acceptable
- Consult Factory
- Unacceptable

Specifications

Maximum Speed, ft./sec.

Maximum Pressure, psi

Temperature Range, °F

Materials

Bronze

Carbon

Glass

Virgin

Applications

Heavy Duty

Light Duty

Swivel/Rotary

Reciprocation

Piston Seals—continued

OMEGAT SPGC Double-Acting Light Duty Piston Seal

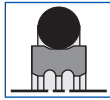


Similar to the Omegat TFMA, but is designed to fit in standard dynamic AS568, or MIL-G-5514F, and AS4716 grooves for light duty applications. It requires a very small groove and can typically be used in valves. This seal can be supplied with various o-ring energizer materials. Features include: low to moderate pressures, moderate extrusion resistance, low friction, and low stick-slip.

350°F	2500 psi	6 ft./sec.	■	□	■	□	●	●	●	●
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Rotary & Swivel Seals

ROTOMATIC M-15 Energized Rotary Shaft Seal



The Rotomatic M-15 Rotary Shaft Seal is designed for low-friction and high-pressure sealing. It is often used in hydraulic swivel applications, and is offered in a variety of PTFE and o-ring compounds. It can be used in moderate rotating and multi-axis transitional movement.

-22°F to 400°F	5800 psi	2 ft./sec.	■	□	■	-	●	●	●	○
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ROTOMATIC M-16 Energized Piston Rotary Shaft Seal



The Rotomatic M-16 Piston Rotary Shaft Seal is designed for low-friction and high-pressure sealing. It is often used in hydraulic swivel applications, and is offered in a variety of PTFE and o-ring compounds. It can be used in moderate rotating and multi-axis transitional movement.

-22°F to 400°F	5800 psi	2 ft./sec.	■	□	■	-	●	●	●	○
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FORSEAL SWV Energized Rotary Union and Swivel Seal



The Forseal SWV Seal is designed for rotary unions, swivel seals, and face seals. This seal is used in couplings and lower-pressure applications.

-320°F to 450°F	3000 psi	3 ft./sec.	■	□	■	-	●	●	●	○
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FORSEAL FLN Energized Rotary Flange Seal



The Forseal FLN Trans-Rotational Seal is designed for sealing reciprocating applications that also allow for rotation, such as injection molders and industrial equipment. The flange on the OD will allow the seal to be clamped and remain rotationally static. This seal can be used in a wide range of pressures and media.

-320°F to 450°F	2100 psi	6 ft./sec.	■	□	■	-	●	●	●	○
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XB1 Rotary Shaft Seal



The XB1 Rotary Shaft Seal is used where higher rotary speeds and low friction are required. The seal is not designed to work under higher pressures; used typically with 40 psi or less. It is often used to retain grease or to keep out dust.

-320°F to 450°F	40 psi	6 ft./sec.	■	□	■	-	●	●	●	○
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XB2 Finger Spring-Loaded Seal

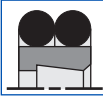
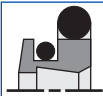






Like the Rotary XB1 Shaft Seal, the XB2 seal is also used where higher rotary speeds and low friction are required. The seal is not designed to work under higher pressures; can be used with approximately 150 psi under certain conditions. The o-ring will aid in statically sealing the seal and the garter spring will keep the seal energized throughout the life of the seal as well as aid in sealing under no- or low-pressure situations.

-22°F to 400°F	150 psi	6 ft./sec.	■	□	■	-	●	●	●	○
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Quantum PTFE Products—*continued*

Materials Key		Applications Key		Specifications			Materials				Applications						
■ Standard	■ Consult Factory	□ Non-Standard	● Acceptable	● Consult Factory	○ Unacceptable	Maximum Speed, ft./sec.	Maximum Pressure, psi	Temperature Range, °F	Bronze	Carbon	Glass	Virgin	Heavy Duty	Light Duty	Swivel/Rotary	Reciprocation	
Dirt Wipers																	
PT 1 Double Wiper				Low-friction wiper consisting of one profile ring with a sealing edge and a wiper edge, as well as two o-rings as pre-load components. A wiper for improvement of overall tightness, PT 1 is fitted preferably in combination with our rod seals. No pressure release is needed for these seals with a good pump-back action. Where there is a combination of seals without sufficient pump-back capability, a pressure-relieving hole is required.			-22°F to 400°F	–	16 ft./sec.	■	–	■	–	●	●	○	●
PT 2 Double Wiper				Low-friction wiper consisting of one profile ring with a sealing edge and a wiper edge, as well as two o-rings as sealing and pre-load components. A wiper for improvement of overall tightness, PT 2 is fitted mainly in combination with our OMS-S rod seals. A pressure-relieving hole is provided between seal and wiper.			-22°F to 400°F	–	16 ft./sec.	■	–	■	–	●	●	○	●
W16 Double Wiper				This double-acting, low-friction dirt wiper utilizes an o-ring energizer. This wiper offers superior wiping action without high friction or stick-slip action. A pressure-relief hole may be required to reduce pressure build-up between the wiper and the rod seal. This seal also allows for pump-back capability, and works well in higher temperature applications.			-22°F to 400°F	–	16 ft./sec.	■	–	■	–	●	●	○	●
W15 Low-Friction Wiper				This low-friction dirt wiper utilizes an o-ring energizer. This wiper offers superior wiping action without high friction or stick-slip action. It also allows for pump-back capability and works well in higher temperature applications.			-22°F to 400°F	–	16 ft./sec.	■	–	■	–	●	●	○	●
Guide Bands and Backup Rings																	
SF/KF PTFE Guide Strip				Guide T-Band shape material is designed for hydraulic and pneumatic equipment. Its unique design prevents equipment seizures which can arise with other forms of guidance materials. Guide strips offer extremely low friction and break-away forces. This material is also resistant to all hydraulic fluids, and is suitable for temperatures up to 250°F (120°C). This guide strip is not intended for high sideloads.			250°F	–	–	■	□	□	■	●	●	○	●
SRI/SRA PTFE Backup Rings				Backup rings are used to prevent extrusion of o-rings and packings, and to improve the pressure resistance of seals. Use SRI Backup Rings for rod applications, SRA Backup Rings for piston applications.			400°F	4000 psi	2 ft./sec.	■	□	□	■	●	●	○	●

For additional information, please contact Simrit at 866-2SIMRIT.



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