Parker Seals

FlexiSeal™

Spring Energized Polon® Polymer Seals

ISO 9001 / QS 9000 / AS 9000
Registered

Catalog EPS-5315 USA

FlexiSeal ™ Spring Energized Polon® Polymer Seals

Offer of Sale

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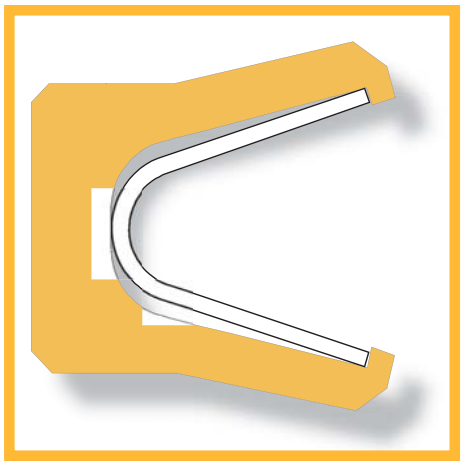

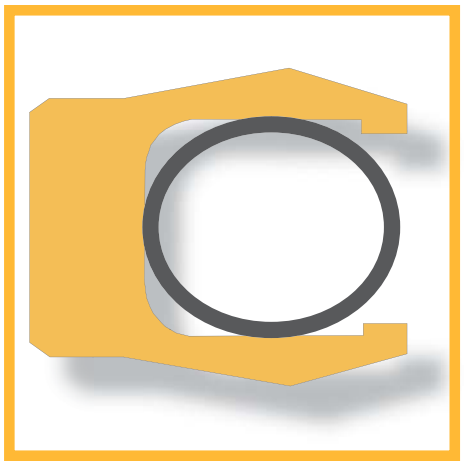

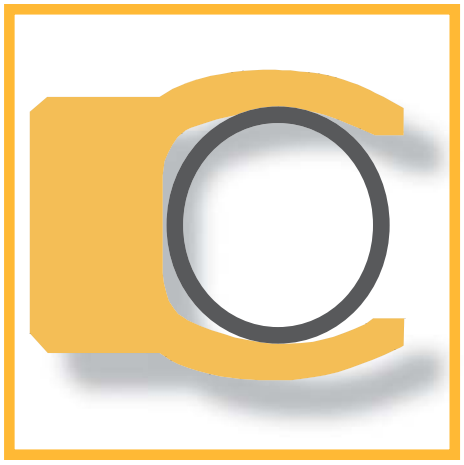

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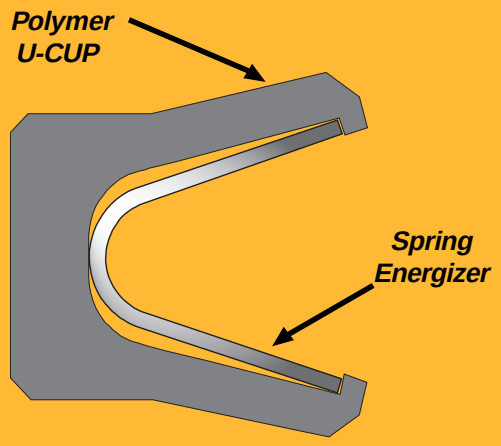
What is a FlexiSeal ?

The Parker FlexiSeal is a U-Cup lip seal geometry energized by a metallic spring. The seal is made from PTFE, and PTFE composites or other high performance polymer plastics. Three different spring energizer designs are made from corrosion resistant metal alloys including Stainless Steel, Elgiloy® and Hastelloy® .

Standard FlexiSeals are precision machined to fit inch fractional MIL-G-5514 and AS4716 glands in radial rod, piston and axial face seal configurations. Custom sizes and geometries are available from 1/8" to 72" diameters without tooling charges.

FlexiSeals are used in dynamic and static applications where elastomer seals cannot meet the extreme operating conditions of harsh environments.

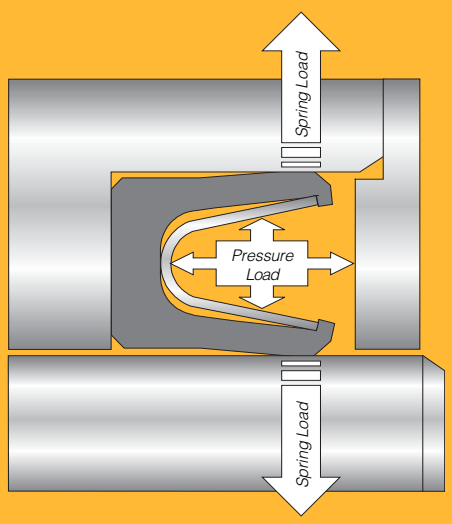
FlexiSeal Components



Elgiloy® is a registered mark of Elgiloy Specialty Metals, Elgin, IL.
Hastelloy® is a registered mark of Haynes International Inc., Kokomo, IN.

- ***Virtually chemically inert***
- ***Vacuum to 10,000 psi (specials to 30,000 psi)***
- ***Immune to aging and embrittlement***
- ***Surface speeds to 1000 feet per minute***
- ***Temperature range -450˚F + 600˚F***
- ***Low breakaway & running friction***
- ***Dry running and abrasive media capability***
- ***Near zero compression set***

FlexiSeal Design Function



How The FlexiSeal Works

The FlexiSeal lips and spring energizer are compressed when installed into the seal gland. The resilient spring responds with constant force, pushing out the sealing lips, creating a gas tight seal. As pressure is introduced in the system, the seal expands increasing the sealing force.

In dynamic applications, the spring expands, compensating for seal wear while continuing to provide load. In conditions that see thermal cycling, the spring continues to energize the seal lips without taking a compression set or becoming too soft or hard.

The flexible spring provides a wide tolerance range that can help overcome hardware misalignment and eccentricity, without causing excess friction or the inability to seal. Three different FlexiSeal designs are available that provide individual attributes for each application.

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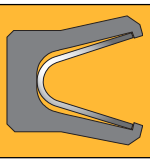
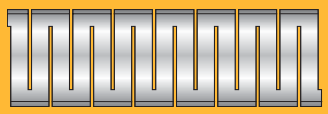
V Series / Cantilever





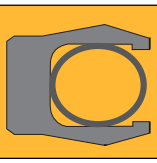
Features

- V Shaped Spring With Moderate Load vs Deflection
- Standard Inch Fractional and MIL-G-5514 Sizes
- Standard 300 Series Stainless Steel Springs
- NACE Compliant Elgiloy® Springs Available
- Stock Sizes (VS-100 Series) From 1/8” to 3” Diameters
- Temperature Range from -100° F to 600° F
- Vacuum to 3000 psi Standard / 10,000 Extended
- Scraper Lip Designs for Abrasive Medias
- Available As External & Internal Pressure Face Seals

Recommended Applications

- Reciprocating Rod and Piston
- Rotary Shafts < 300 sfpm
- Wide Tolerance and Misaligned Glands (static)
- Abrasive Medias (when scraper lip is designated)
- Dynamic Applications above 450° F

C Series / Canted Coil



Features

- Canted Coil Spring With Flat Load vs Deflection
- Light, Medium and Heavy Load Springs Standard
- Standard Inch Fractional and MIL-G-5514 Sizes
- Standard 302 Series Stainless Steel Springs
- Hastelloy® Springs Available
- Temperature Range from -100° F to 450° F
- Vacuum to 3000 psi Standard / 10,000 Extended
- Available As External & Internal Pressure Face Seals

Recommended Application

- Reciprocating Rod and Piston Seals
- Rotary Shafts < 300 sfpm
- Wide Tolerance and Misaligned Glands
- Friction Critical Applications
- Dynamic Applications Below 450° F
- Diameters <1/2” and Cross Sections <3/32”

H Series / Helical

Features

- Helical Wound Ribbon Spring With High Load vs Deflection
- Standard Inch Fractional and MIL-G-5514 Sizes
- Standard 17/7 ph Stainless Steel Springs
- NACE Compliant Elgiloy® Springs Available
- Temperature Range from -360° F to 600° F
- Vacuum to 3000 psi Standard / 10,000 Extended
- Available As External & Internal Pressure Face Seals

Recommended Applications

- Static Rod and Piston Seals
- Static Internal & External Pressure Face Seals
- Very Slow Dynamic Seals < 10 sfpm
- Vacuum Sealing
- Applications below -100° F

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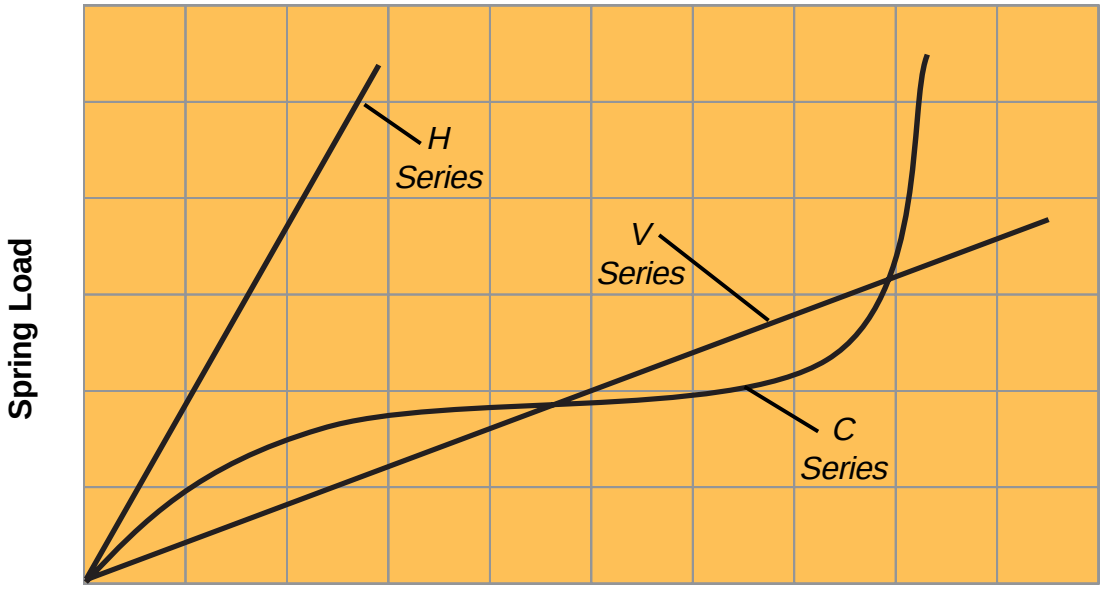
FlexiSeal Spring Energizers

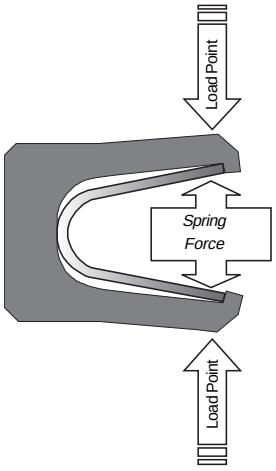


Cantilever Spring / V Series

The FlexiSeal Cantilever spring is made from flat metal strip stock of 300 Series stainless steel or Elgiloy as an option. The strip stock is punched or chemically etched into a serpentine pattern and formed into a rounded "V" shape. The finished spring produces a moderate load versus deflection range as depicted above, that is suitable in most applications.

The Cantilever spring is intended for dynamic applications involving rotary or reciprocating motion. It can also be used in static conditions when there is need for a higher deflection spring due to wide gland tolerance, excessive expansion and contraction or lift off due to high pressure.

The long beam leg design puts the spring load out at the leading edge of the seal, creating the best load location for the FlexiSeal to act as a scraper or excluder seal when the optional scraper lip is selected.



Compressed

Nominal Cross Section	Minimum Diameters			
	Rod Shaft Dia.	Piston Bore Dia.	Int Press (Seal OD)	Ext Press (Seal ID)
1/16	.125	.250	.750	.500
3/32	.187	.375	1.250	.875
1/8	.375	.625	1.750	1.125
3/16	.875	1.250	2.250	2.000
1/4	1.625	2.125	3.500	3.000

The geometry of the Series V cantilever spring provides flexibility by utilizing individual tabs, separated by small gaps. This shape allows the spring to flex into radial and axial seal designs. The spring tabs can overlap on the ID and spread apart on the OD when the cross section is too large for the diameter.

The chart on the left provides the minimum diameters for Series V springs for rod and piston seals, as well as internal and external pressure face seals. For diameters smaller than those listed, it is recommended to utilize Series C or Series H spring designs.

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Canted Coil Spring / C Series

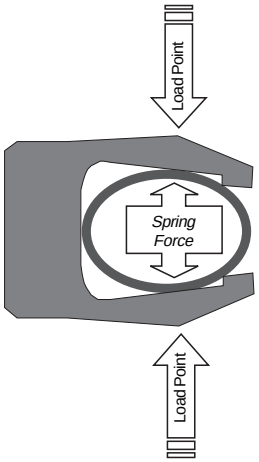
The FlexiSeal C Series spring is made from round wire that is coiled and formed into a canted or slanted shape. The result is a radial compression spring with a very flat load versus deflection curve as illustrated in the graph on the facing page. Standard material is 302 stainless steel with Hastelloy C-276 as an option, and is available in three different spring loads.

The canted-coil spring is intended for dynamic reciprocating and rotary applications. It is also used in static applications when wide gland tolerance or misalignment is present. The flat load curve of this design makes it an ideal choice for friction sensitive applications.

The C Series spring can be fit into small seal diameters without overlapping the individual spring coils. Because the ID coils tend to butt up to each other, the spring has very small gaps providing maximum spring contact. This geometry is well suited for dynamic rod seal applications less than 1/ 2"diameter.

The C Series spring produces compression load near the center of the seal. The standard beveled lip seal geometry puts the point of contact slightly in front, forcing the spring back into the spring cavity. The lip design provides concentrated unit load at the sealing interface, and allows lubrication to the dynamic lip, increasing the wear life. Because of this geometry, the C Series is not the best choice for abrasive medias. For abrasive conditions the FlexiSeal V Series is recommended. See page 9 for details.

Individual coils provide the compression load to the sealing interface of the C Series spring. Because the rounded coils provide a point contact, the spring can embed itself into the seal material at elevated temperatures. Applications above 450° F should use the V Series for dynamic conditions or the H Series for static situations.



Compressed

The C Series spring is available in three load ranges; Light, Medium and Heavy.

Light: Applications that require extremely low break-out and running friction when sealing ability is less important than friction.

Medium: General application. Low friction but reliable sealing capability. Normally the starting point for new applications. Balance functions of friction, sealing ability and dynamic wear.

Heavy: Generally static sealing applications only where optimum resilience is required due to hardware separation. Accelerated seal material wear in dynamic applications. Used when sealing is primary and friction and/or wear is second.

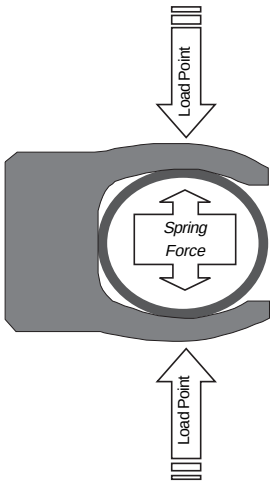
Helical / H Series

The H series spring is made from flat ribbon metal strip stock that is formed into a helix shape. The standard material is 17/7 ph stainless steel, and Elgiloy is offered as an option. The finished spring produces a very high load versus deflection curve as shown on the facing page.

The helical spring design is intended for static applications due to the high unit load. It can be used in very slow or infrequent dynamic conditions when friction and wear are secondary concerns to positive sealing.

The H series spring produces evenly distributed load across each individual band, with very small gaps between the coils, This tight spacing provides near continuous load, reducing potential leak paths. This combined with the high unit load makes the H series well suited for vacuum and cryogenic applications or when pressure is to low to energize the seal.

The load provided by the H Series spring is directly through it's center line. The lip design of the seal is a full radius at the sealing interface, providing maximum load to the contact points to effect a tight seal. The spring is welded at the ends and is retained in the seal by parallel side cuts in the spring cavity. When the seal is compressed into the hardware, the spring cavity is designed to allow the axial growth of the spring.



Compressed

The relatively small deflection range of the H Series spring prevents it from being used in applications having wide gland tolerances, eccentricity or misalignment. The V or C Series FlexiSeal should be considered for these conditions.

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Polon® FlexiSeal Materials

Polon Material Code	Material Description & Application	Color	Temp. Range (°F)	Wear Resistance 1 = Low 10 = High	Chemical Compatability A = Excellent B = Fair C = Limited	Hardware Dynamic Surface Hardness Min. (Rc)	FDA / NSF Compliant
110	**Virgin PTFE:** Best for static applications requiring positive sealing. Good in vacuum with low gas permeability. Low particulate generation. Excellent in cryogenics. Can be used in slow, infrequent dynamics.	White	-450° to +425°	1	A	No Min.	Yes
102	**Mineral filled PTFE:** Improved upper temperature and wear over virgin PTFE with very low abrasion to soft surfaces. Intended for light dynamic applications.* Ingredients are FDA / NSF compliant and can pass many requirements.	White	-360° to +550°	4	A	25	No*
08	**Proprietary carbon fiber filled PTFE:** Excellent all purpose material. Best for dynamic applications running on moderate to hard surfaces. High wear material with low abrasion.	Brown	-360° to +550°	8	A	25	No
106	**Polymer PTFE:** A dynamic material for softer surfaces and a static material for high temperatures. Excellent wear resistance without abrasion. Not recommended in steam.	Tan	-360° to +600°	7	A	No Min.	No
114	**UHMWPE:** Ultra High Molecular Weight Polyethylene. High wearing plastic for use in abrasive medias. Excellent in water based medias, but restricted chemical and heat resistance. Intended for reciprocating applications, or very slow rotary.	Trans-lucent	-360° to +180°	10	B	30	Yes
149	**Proprietary carbon/PPS filled PTFE:** Abrasion resistant high wearing material for use on very hard surfaces. Intended for severe service dynamic applications involving high PV values and / or high temperature. Not recomended for use in oxidizing agents, or ethers above 200° F.	Black	-360° to +575°	10	A	35	No
299	**Thermoplastic Elastomer (TPE):** An abrasion resistant polyester elastomer with high wear properties. Recommended for reciprocating, very slow rotary and static applications that require extremely low leakage. Excellent in gases and most hydraulic fluids. Limited Chemical compatibil-ity and temperature range.	Black	-65° to +275°	9	C	30	No

Parker processes over 100 material blends. See page 6 for a partial list of additional compounds available

Note: Material ratings on this page are intended only as a guide for the users initial selection. Actual values may vary based on application parameters including, pressure, temperature and media. Other factors including hardware surface finish, hardness, alignment and clearance gaps, also affect overall material performance. Actual testing in the specific application is the responsibility of the user to determine final material selection and approval. Please call Application Engineering with any questions regarding material selection at (847) 783-4300.

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Seal Materials

Seal material selection is based on several factors including dynamics, temperature, speed and hardware. First determine if your application is static or dynamic. If it's dynamic you must ***1).*** Determine the surface hardness of the dynamic section of your hardware material (rod or bore) ***2).*** Determine the operating temperature range and ***3).*** Calculate the dynamic speed in surface feet per minute. Use the *Dynamic Seal Material* matrix below to determine the recommended material. If the application is static, determine the operating temperature and use the *Static Seal Materials* chart. Make sure to consult the material chart on page 5 and the chemical compatibility guides on pages 25-27 as necessary for further details. Additional seal materials are listed in the chart below right, should you be looking for a specific blend. Parker EPS offers over 100 compounds in addition to these. If you are not sure of the proper material for your application, please call Application Engineering at (847) 783-4300.

Dynamic Seal Materials

(1) **Dynamic Surface Hardness Min. Rc**	***(2)*** **Temperature Range °F (low to high)**	**Material(s) Recomended**	
		(3) **Rotary** < 10 sfpm **Reciprocating** < 50 sfpm	***(3)*** **Rotary** > 10 sfpm **Reciprocating** > 50 sfpm
25	-450° to -250°	110	110
	-250° to +180°	102 114*	102
	+180° to +250°	102 299**	102
	+250° to +400°	102	102
35	-250° to +575°	106	106
45	-250° to +550°	08	08
65	-250° to +575°	149	149

* Suggested for applications involving abrasive media. Refer to the chemical compatability charts on pages 25-27 to determine suitability in your specific application.

**Recommended for abrasive media, vaccum applications and when hardware surface finishes are greater than 32 Ra. Refer to the chemical compatibility charts on pages 25-27 to determine suitability in your specific application.

Physical Properties

Polon Material Code	**Tensile Strength** (psi)	**Elongation** (%)	**Specific Gravity**	**Hardness** (Shore D)	**Coefficient of Friction**
110	4500	350	2.15	60	.06
102	3400	325	2.22	62	.08
08	3200	250	2.09	67	.10
106	3200	200	2.04	67	.10
114	6000	250	0.93	62	.20
149	2200	300	2.00	67	.12
299	5000	450	1.20	55	.45

Static Seal Materials

Temperature Range °F (low to high)	**Material**
-450° to -65°	110
-65° to +275°	299** 110
+275° to +400°	110
+400° to +600°	106

Additional Polon® Materials

Polon Material Code	**Description**
06	10% Carbon Fiber / PTFE
07	10% Carbon Graphite / PTFE
09	Red Pigmented UHMW PE
100	15% Glass / 5% Moly / PTFE
105	25% Carbon Graphite / PTFE
117	5% Carbon / 5% PPS / PTFE
125	5% Moly / PTFE
132	Gold Pigmented PTFE
245	10% Graphite / PTFE
246	15% Graphite / PTFE
254	10% Carbon / PTFE
257	5%Glass 5% Moly / PTFE
309	72 Durometer TPE
314	15% Polyimid / PTFE
330	Turquoise Pigmented PTFE

The physical properties listed are nominal values. Contact the factory for detailed Material Specification Test Reports listing all measured values and methods.

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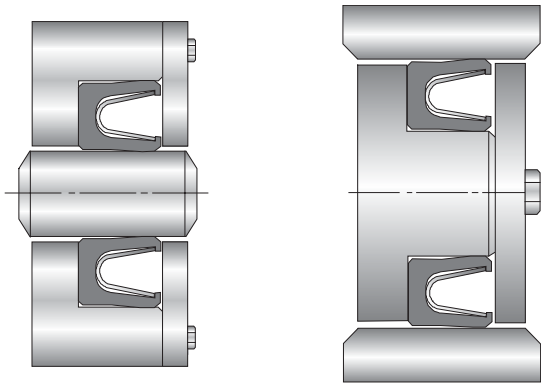
Rod & Piston Seals

Two Piece Gland: Parker FlexiSeals are rigid in comparison to elastomer seals such as O-rings and u-cups. They can be damaged if stretched or compressed beyond their material limitations. It is recommended that a two piece, split gland design be utilized when ever possible. This allows easy installation or removal of the FlexiSeal without the need for additional tools, and will greatly reduce the risk of damage to the seal.

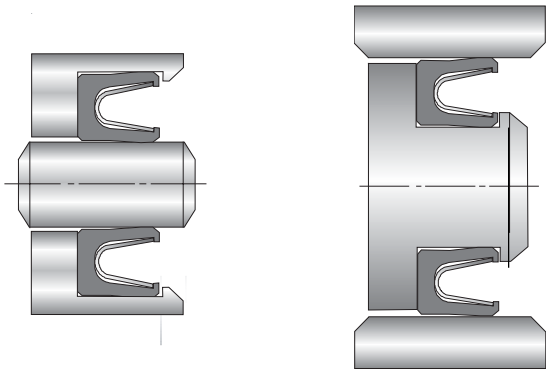
Lead in chamfers that are blended and very smooth are necessary to prevent damage to the seal during installation. Full dimensions details and surface finish recommendations are described on pages 8 and 13.



Step Cut Gland: An alternative to the two piece gland is the step cut design. This solid one piece configuration has a reduced wall on the pressure side of the groove. This allows the seal to snap into the groove without the need for a separate retainer or installation tools.

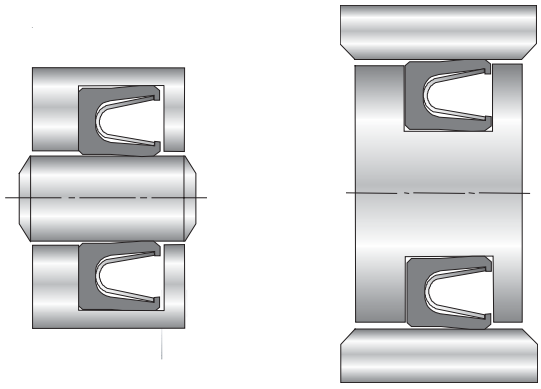
The step is designed to hold the seal in the groove during final assembly and under dynamic conditions such as low pressure return strokes in reciprocating applications. In pressurized conditions, the FlexiSeal is naturally held into the back of the groove.

The step cut gland can be utilized for both rod and piston seals Complete dimensions for this design are supplied on page 14.



Closed Gland: The least desirable gland design for the FlexiSeal is the closed Gland design. The seal cross section, diameter and material are all factors that determine whether the FlexiSeal can be stretched into a solid piston groove or compressed into a rod seal housing. FlexiSeals are more easily stretched into piston grooves than compressed into rod seal housings.

The table below left is a guide for piston seal minimum diameters that can be used in solid grooves utilizing installation and re-sizing tools. The table on the lower right is for minimum rod seal diameters. Tools are not generally used to install rod seals into the gland housing. Tools to re-size the rod seals after installation into the housing are used. Contact EPS for information on seal installation tooling for your application.



Rod Seals

Dash Series	Nominal Cross Section	Minimum Rod Diameter		
		V Series	C Series	H Series
000	1/16	1.500	1.000	1.250
100	3/32	2.500	2.000	2.250
200	1/8	6.000	5.000	5.500
300	3/16	11.000	10.000	10.500
400	1/4	16.000	14.000	15.000

Piston Seals

Dash Series	Nominal Cross Section	Minimum Bore Diameter		
		V Series	C Series	H Series
000	1/16	1.250	.750	1.000
100	3/32	1.750	1.000	1.500
200	1/8	2.500	2.000	2.250
300	3/16	4.000	3.000	3.500
400	1/4	6.000	5.000	5.500

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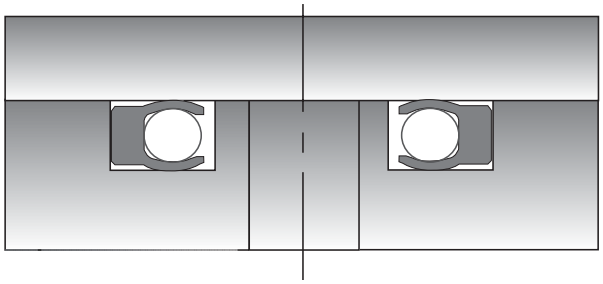
Internal / External Pressure Face Seals

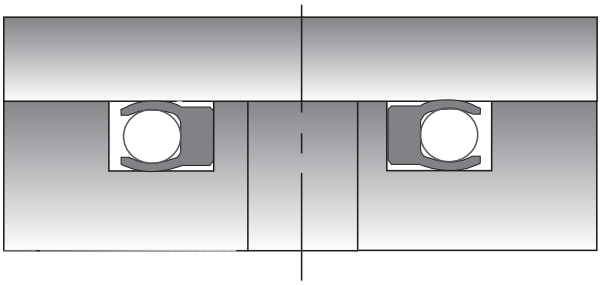
Face seal glands can be one piece machined grooves because seal installation does not require excessive stretching or compressing. The FlexiSeal is designed to have a clearance or slight interference fit on the back of the seal (non-pressure side) so it will press easily into the groove.

The grooves for face seals can be enclosed or open to the pressure side. Because the FlexiSeal is somewhat rigid, it will hold its position in the gland and not normally drift out. If any back pressure is expected in the application, a closed groove should be used.

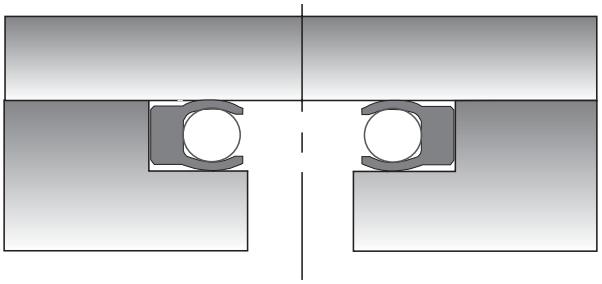
Internal Pressure / Closed Groove



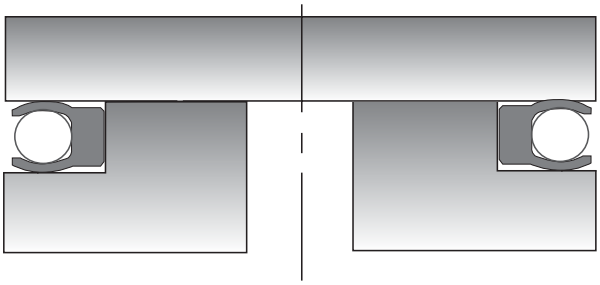
External Pressure / Closed Groove



Internal Pressure / Open Groove

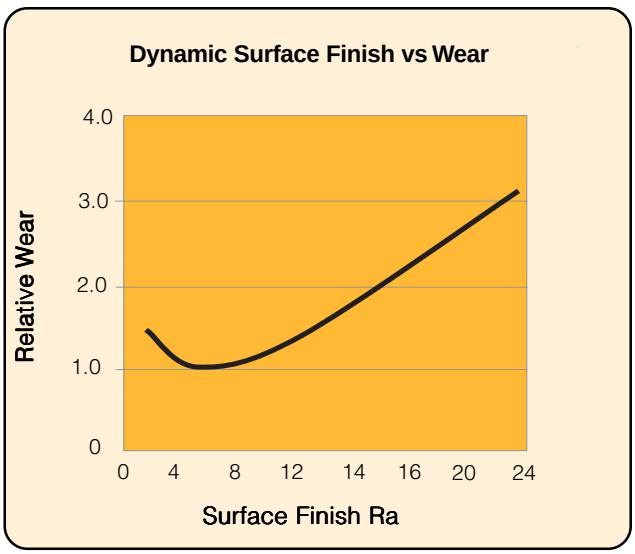


External Pressure / Open Groove



Surface Finish

Proper surface finish of the seal gland is critical to insure positive sealing, and achieve the longest seal life possible in dynamic applications. Mating surfaces that are too rough can create leak paths and can be very abrasive to the seal. Unlike elastomer contact seals, Polon® PTFE based FlexiSeals can run on very smooth surfaces with or without lubrication. The optimum surface finish for FlexiSeals is 32 Ra or better on the static side, and 4-8 Ra on dynamic areas.



Dynamic Surface Hardness

Most dynamic applications require a hard running surface on the dynamic portion of the hardware. The harder surface allows the use of higher reinforced seal materials that will increase the seal and hardware life. Softer running surfaces must use lower wear resistant materials that will not damage the hardware, and normally yield shorter seal life.

A balance between seal material and dynamic surface hardness must be met to insure that the seal remains the sacrificial component. The charts on page 5-6 show minimum recommended surface hardness for Parker materials in dynamic applications, based on temperature, motion and speed.

When the dynamic surface hardness is below 45 Rc, most seal materials will polish the running surface of the hardware and the seal. This initial break-in period will cause seal wear to taper off over a period of time depending on the seal material, surface finish and PV of the application. When hardness exceeds 45 Rc, the initial surface finish is very important since the surface is much harder to polish and the time to achieve break-in is much longer. Surface hardness above 65 Rc will generally not polish and therefore the initial surface finish is critical to seal life.

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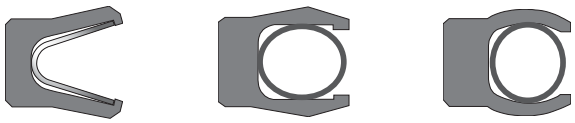
Lip Designs

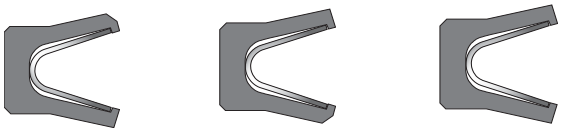
Chamfered Lips: The standard FlexiSeal lip is chamfered or back beveled on the ID and OD for Series V and C, and radiused on the Series H. This design allows for ease of installation and permits lubrication to nest under the lip and feed through in dynamic applications. The result is a microscopic thin film of lubrication that increases seal and mating surface hardware life.



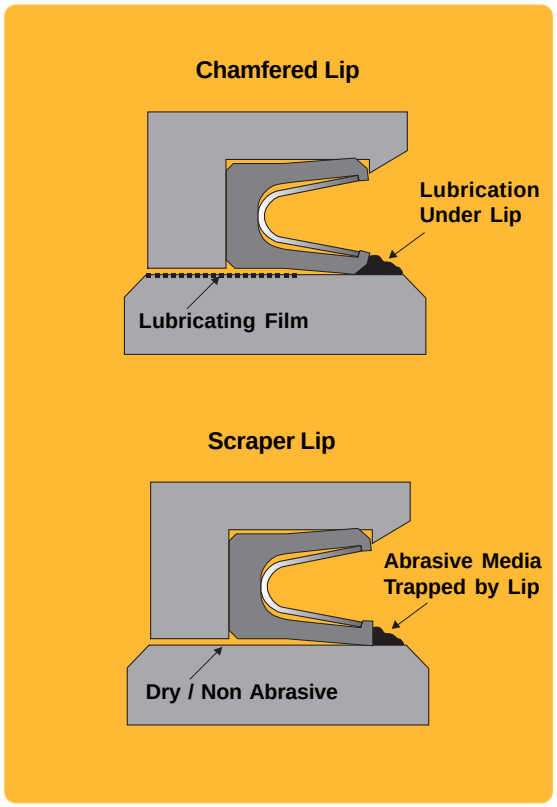
Series V **Series C** **Series H**

Scraper Lips: Applications often involve abrasive medias that can get between the seal lip and the mating hardware. This increases wear to both the seal and the dynamic mating surface. To prevent particles from accumulating, the V Series is offered with a scraper lip design in both standard and extended sizes.

The V Series spring geometry puts the load point out at the end of the beam, directly over the sharp sealing lip (see page 3). This position prevents contaminates from being trapped under the seal. The scraper lip is available in rod, piston and dual lip designs.



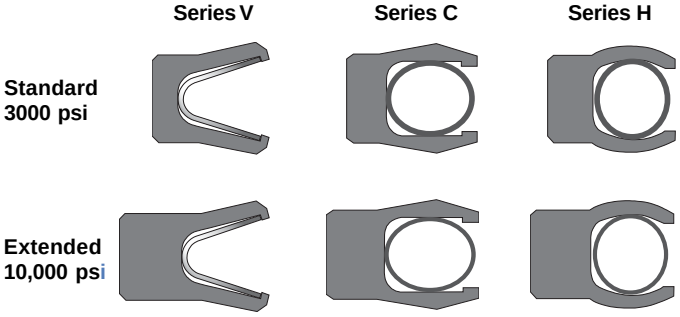
Rod Scraper **Piston Scraper** **Dual Scraper**

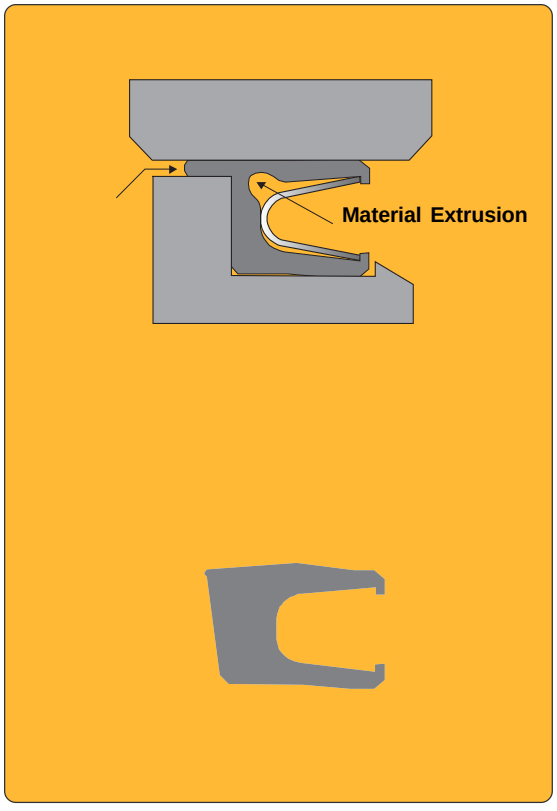


High Pressure Seals

Pressure capabilities are a function of temperature, seal material, extrusion or clearance gaps and seal design. The standard FlexiSeal is rated to 3000 psi when used in glands conforming to the dimensions supplied in this guide, using materials that meet the temperature requirements of the application. An extended version is available for all radial FlexiSeals series that increases the pressure range to 10,000 psi under the same conditions.

The extended FlexiSeal design prevents seal extrusion by increasing the material at the back of the seal. This extra material acts as a built-in back-up ring and fills the gap before damage is done to the rest of the seal. In applications that have excessive clearance gaps and/or pressures above 10,000 psi, it may be necessary to use separate back-up device(s) or special seal designs to reduce the gap. Consult Parker EPS for more information.





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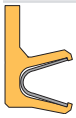
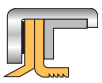
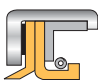
More FlexiSeal Profiles

	Seal Profile Type	*FlexiSeal Series*	*Pressure Rating (psi)*	*Temp Range ˚F*	*Application*
	Standard Cantilever Spring	VS	3,000 psi	-300˚ to 600˚F	Static, reciprocating, dynamic applications above 450˚F and rotary service < 300 SFPM. 301 Stainless & Elgiloy® springs.
	Standard Canted Coil Spring	CS	3,000 psi	-300˚ to 450˚F	Reciprocating, dynamic applications below 450˚F and rotary service < 300 SFPM. Friction critical applications, misaligned glands. Light, medium, heavy load 302/316 Stainless and Elgiloy springs.
	Standard Helical Spring	HS	3,000 psi	-360˚ to 600˚F	Static rod/piston seals, internal/external face seals and low speed dynamic < 10 SFPM. 17-7PH Stainless & Elgiloy springs.
	Extended Heel Cantilever Spring	VS	10,000 psi	-300˚ to 600˚F	High-pressure static/dynamic applications providing greater extrusion resistance at higher pressure and temperatures. CS and HS springs also available.
	Flanged Cantilever Spring	VS	4,000 psi	-300˚ to 450˚F	Rotary service to 2,500 SFPM depending on temperature and pressure. Axially clamped OD flange (two-piece seal gland) prevents rotation with the shaft and creates a positive static seal surface.
	Flanged Canted Coil Spring	CS	3,000 psi	-300˚ to 450˚F	Rotary service requiring low breakaway and dynamic torque. Speeds to 2,500 SFPM depending on temperature and pressure. Axially clamped OD flange (two-piece seal gland) prevents rotation with the shaft and creates a positive static seal surface.
	O-Ring Cantilever Spring	VS	1,000 psi	-65˚ to 400˚F	Rotary service to 1,000 SFPM depending on temperature and pressure where canned FlexiSeals cannot be used. OD O-ring prevents seal rotation with shaft and creates positive static seal.
	O-Ring Canted Coil Spring	CS	1,000 psi	-65˚ to 400˚F	Rotary service requiring low breakaway and dynamic torque. Speeds up to 1,000 SFPM depending on temperature and pressure where canned FlexiSeals cannot be used. OD O-ring prevents seal rotation with shaft and creates positive static seal.

FlexiCase™ and FlexiLip™ Profiles

	Seal Profile Type	*Seal Series*	*Pressure Rating* *Operating*	*Spike*
	FlexiCase. Double lip with excluder. Medium pressure	45	500 psi	1500 psi
	FlexiCase. Single lip with hydrodynamic pattern. Oil seal applications	55	75 psi	200 psi
	FlexiCase. Single lip with garter spring. High runout applications	65	75 psi	200 psi
	FlexiCase. Double lip with excluder. Added backup used for elevated pressures	75	750 psi	2500 psi
	FlexiCase. Single lip with internal FlexiSeal for harsh media compatibility (no rubber gasket)	Custom		

	Seal Profile Type	*Seal Series*	*Pressure Rating* *Operating*	*Spike*
	FlexiLip. Double lip with excluder	40	250 psi	1500 psi
	FlexiLip. Single lip with excluder	50	75 psi	200 psi
	FlexiLip. Single lip with garter spring. High runout applications	60	75 psi	200 psi
	FlexiLip for aero-space application	Custom		
	FlexiLip. Double lip design with O-ring, breather port separators	Custom		

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Fluid Power Seal Profiles

	Seal Profile Type	*Seal Series*	*Pressure Rating (psi)*	*Temperature Range*	*Application*
	Rod Wipers	E	200 psi	-65° to 400 °F	For positive exclusion of external contaminates as a wiper alone or a wiper with secondary sealing capability to 200 psi. Speeds to 50 SFPM.
	Uni-directional Rod / Piston Buffer Seals	S	3,000 psi	-65° to 400 °F	Inch/metric seal design has a point contact foot print, which provides high unit loading for very low leakage rate. Speeds to 50 SFPM. Used in hydraulics cylinders as buffer seals.
	Bi-directional Rod / Piston Seals	G	3,000 psi	-65° to 400 °F	Inch/metric seal design offers low breakout / running friction and high wear resistance. Used in hydraulic cartridge/spool valves and actuators. Speeds to 50 SFPM.
	Bi-directional Rod / Piston Seals	D	3,000 psi	-65° to 400 °F	Seal design to retrofit standard inch fractional, metric or aerospace O-ring glands. Speeds to 50 SFPM.
	Bi-directional Rod / Piston Rotary Seals	R	3,000 psi	-65° to 400 °F	Inch/metric seal design that offers low breakout and running torque, high wear resistance. Also available in space-saving narrow gland widths. Speeds to 300 SFPM.
	Rod / Piston Wear Strip Wear Ring Bearings	W	3,000 psi	-65° to 450 °F	PTFE and composite bearings which can be cut to size by the factory or machined for your specific size. Bronze filled PTFE is typically used in lubricated, less demanding applications. PTFE impregnated, polyester fabric reinforced composite materials are used in more demanding applications. Carbon/graphite filled PTFE is typically used in pneumatic applications.

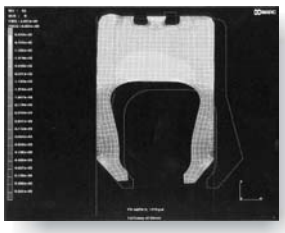
Capabilities

Parker is a recognized leader in PTFE sealing technology, using state-of-the-art systems to provide customers with quality products and impeccable service, including:

- Design and application engineering
- Custom compound development
- CAD/CAM technology
- Precision machining
- Spring fabrication
- Metal spinning
- EDM capability
- Material test lab
- Functional test lab
- Statistical process control
- Lean manufacturing practices
- Wide range of molding capabilities -- isostatic, compression, automatic
- High volume, long run production capabilities

Precision machining

- Finite Element Analysis (FEA)
  FEA is a computer aided simulation program that:
  - Accurately predicts and evaluates product performance in a variety of materials/media prior to manufacture.
  - Provides greater flexibility to explore cost/design options
  - Accelerates speed time to market



FEA plot of FlexiSeal™

- Quality Registrations
  Parker EPS Chicago is registered to the following quality standards:
  - ISO 9001
  - QS 9000
  - AS 9000

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Accredited by the RvA, Dutch Council for Accreditation

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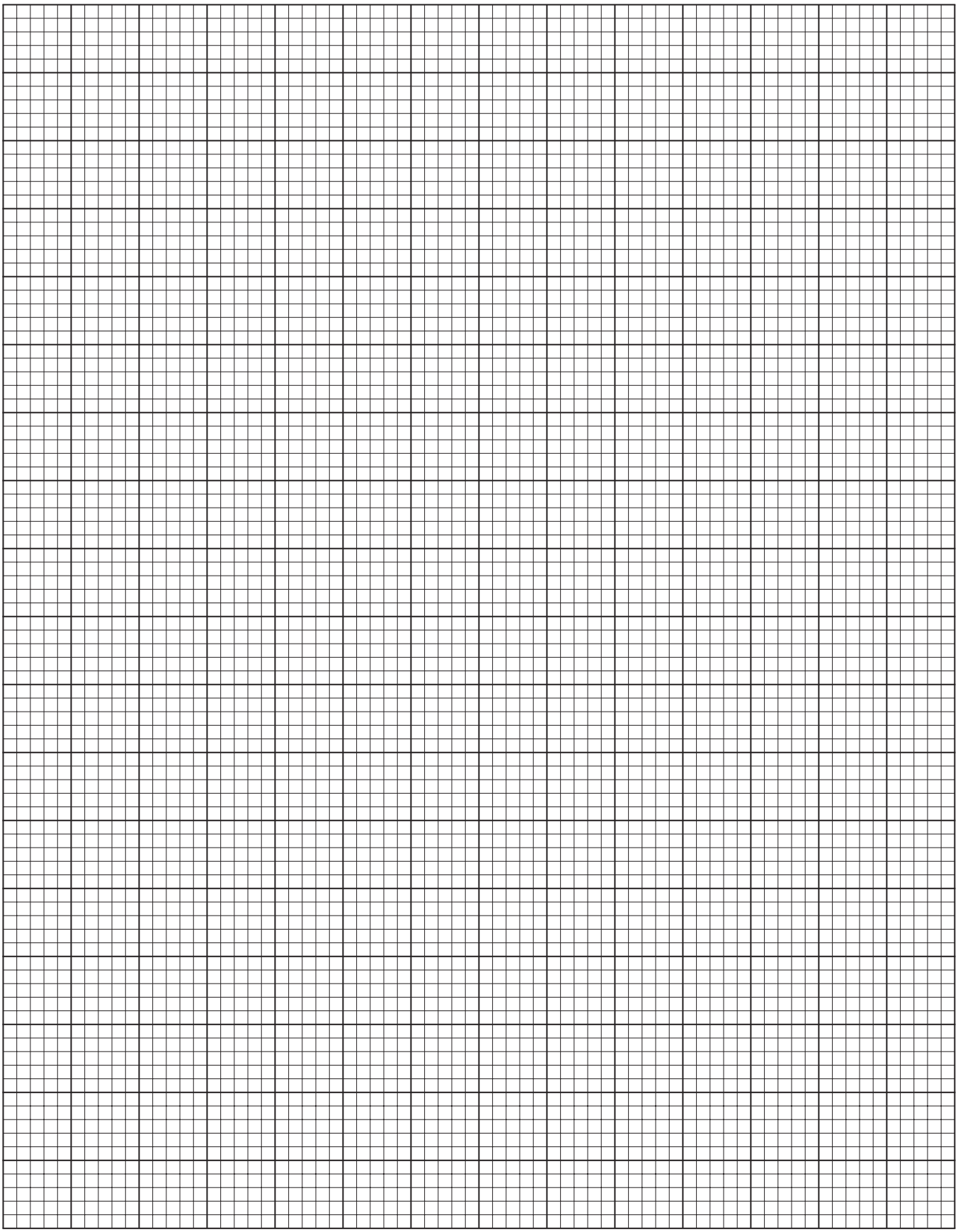
Notes



Parker Seals

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1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgements, acceptance and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the day of invoice of the items purchased hereunder. Parker reserves the right to charge interest on all past due amounts. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyerís receipt of the shipment.

3. Delivery: Unless otherwise provided in the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty. Seller warrants that the items sold hereunder shall be free from defects in material or workmanship at the time of delivery. THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING, BUT NOT LIMITED TO, MERCHANTIBILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.

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5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLERíS SOLE OPTION, IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING, BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges buy Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Sellerís possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereunder "Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after the Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an items sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, place or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in party by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgements resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Any special requirements for items to be provided by Seller hereunder including without limitation; compliance with military specifications, special documentation, or testing requirements, must be communicated to Seller in writing at the time the items are first requested. Any such requests that are communicated to Seller after preparation to manufacture an item has commenced may result in additional charges for rework or remanufacture of the item.

13. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either more than two (2) years after the cause of action accrues.

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- FlexiCase™ Seals
- FlexiLip™ Seals
- PTFE Components
- FlexiTube™ Seals

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