



Industrial Piston and Rod T-Seals

ISO 9001 Certified

Catalog PPD-3001A/USA



Industrial Piston and Rod T-Seals



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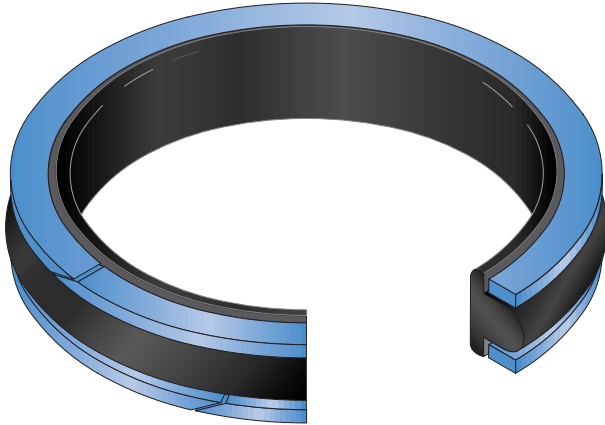
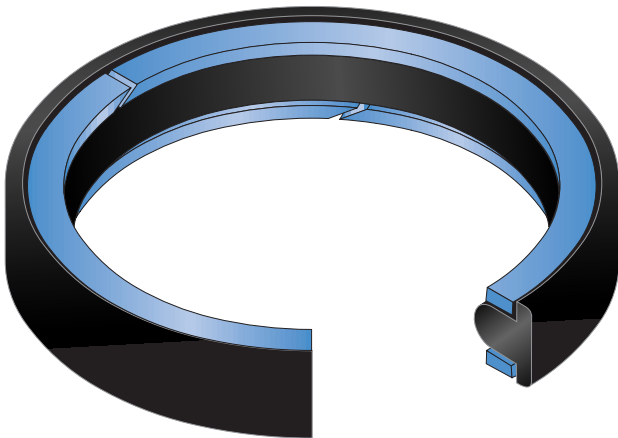


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PARKER T-SEALS

A SEAL USABLE IN STANDARD O-RING GROOVES WITH BUILT-IN RESISTANCE TO SPIRALLING AND EXTRUSION



T-seals were originally developed to preserve advantages of O-rings in dynamic fluid power applications while ending two of their most serious reliability problems: (1) extrusion through the gap between static and dynamic surfaces, and (2) instability in their grooves, which led to spiral or twisting failure. The T-seal eliminates both of these problems while retaining the space-saving attributes of the compact O-ring groove. Above all, the T-seal meets or exceeds the O-ring's outstanding ability to seal at all pressures and temperatures.

Parker T-seals have been developed to replace existing O-ring seals in long-lived hydraulic and pneumatic systems. Their ability to fit into existing grooves means that a retrofit can be made with no re-machining or major revisions to the existing hardware design. This simplifies both field changes and new equipment manufacturing.

The T-seals' distinctive cross-section is extremely functional. The elastomeric seal element (see Figure 1) consists of a flange and a body, each of which has a multiple purpose. The flange provides the static seal against the bottom of the groove, provides positive

radial actuation of the back-up rings, and stabilizes the seal against rolling in the grooves. The body provides the squeeze or interference seal against the dynamic surface, loads the flange to enhance the static seal against the groove, and contributes elastomeric mass to the downstream flange to displace the back-up ring radially. The squeeze effected during installation duplicates that of an O-ring, giving the T-seal its ability to seal at the lowest pressures. Finally, the square or rectangular shape of the T-seal assembly with its back-up rings eliminates the spiral failure mode characteristic of O-rings. Parker T-seals cannot spiral fail. (see Figure 2).

Fig. 1

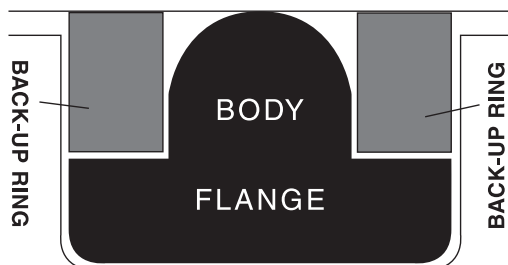
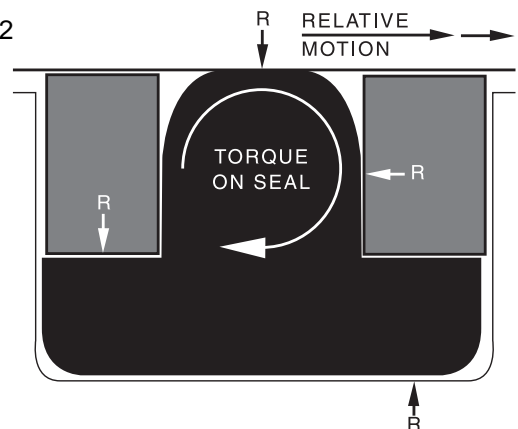
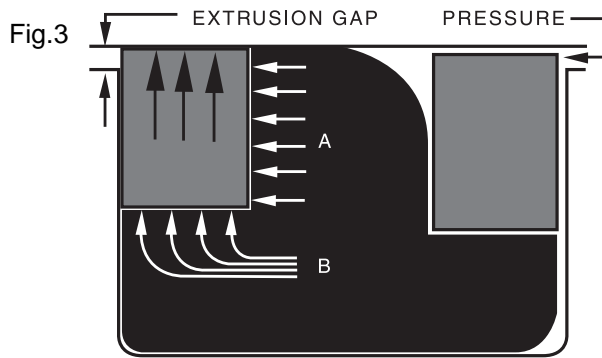


Fig. 2

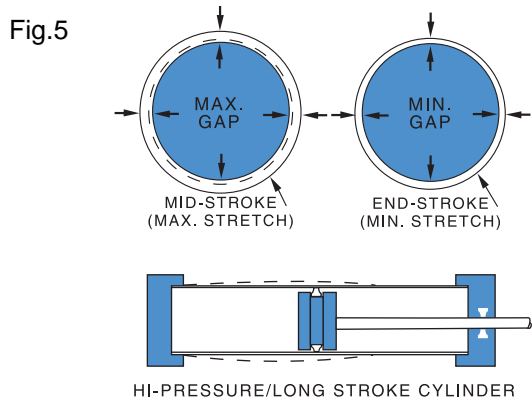
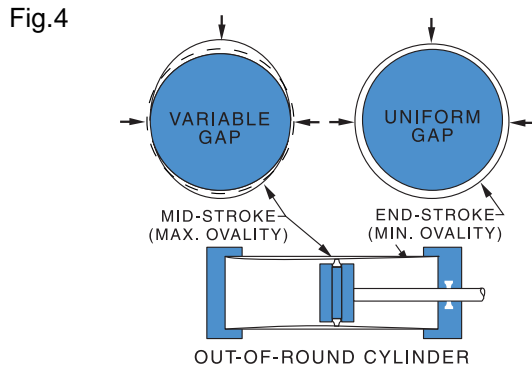


Back-up rings are on the outside diameters of piston T-seals, and the inside diameters of rod T-seals. The unique "hydraulic" loading of the back-up rings by the T-seal flanges that occurs when the installed seal assembly is exposed to differential pressure causes positive back-up ring actuation. It is the positive actuation that allows the T-seal back-up rings to

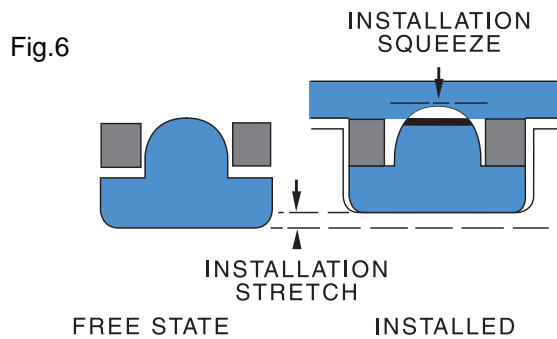
respond more rapidly than the plastic deformation that causes O-ring back-up rings to close an extrusion gap. For this reason T-seals adapt to wider gaps, and respond to shocks and pressure surges immediately by increasing the radial force against the dynamic surface (see Figure 3).



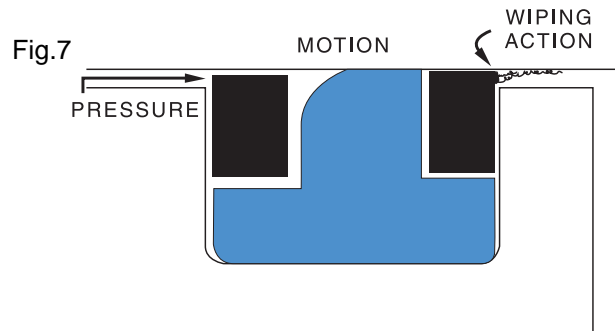
It should be remembered that extrusion gaps are seldom constant throughout a stroke. The gap may vary due to uneven wear along a rod or bore, it may vary as system pressure rises (breathing) and distance from end restraints changes (thereby changing the stretch of cylinder walls). Ovality of cylinder tubes or rod glands due to side-load is not necessarily constant throughout the stroke, and out-of-round tubes may assume a near-perfect circular shape where restrained by the end caps (see Figures 4 & 5).



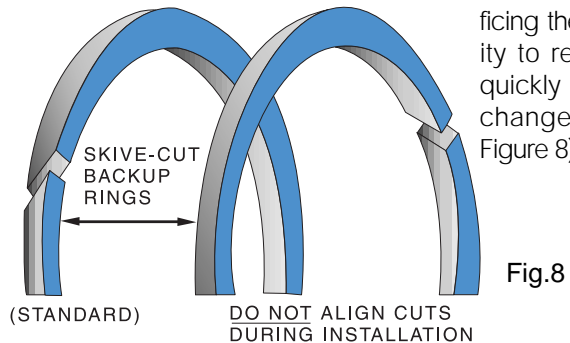
These numerous possible sources of changing extrusion gaps make Parker T-seals' speed of response extremely valuable. Despite rapid strokes, lateral shock loads, pressure surges, and uneven wear or stretching, Parker T-seals maintain zero extrusion gaps. In the free state, back-up rings appear quite loose on their seal element. This slack is taken up during installation, however, since the interference fit of the seal in standard O-ring grooves either stretches (piston seals) or compresses (rod seals) the element to seat the backups. Parker T-seals are easy to assemble and may be inserted into their grooves manually without special assembly tools (see Figure 6).



The Parker T-seal back-up rings' ability to follow changing dynamic surfaces rapidly also makes them very effective wipers, keeping contaminants away from the sealing line (see Figure 7).



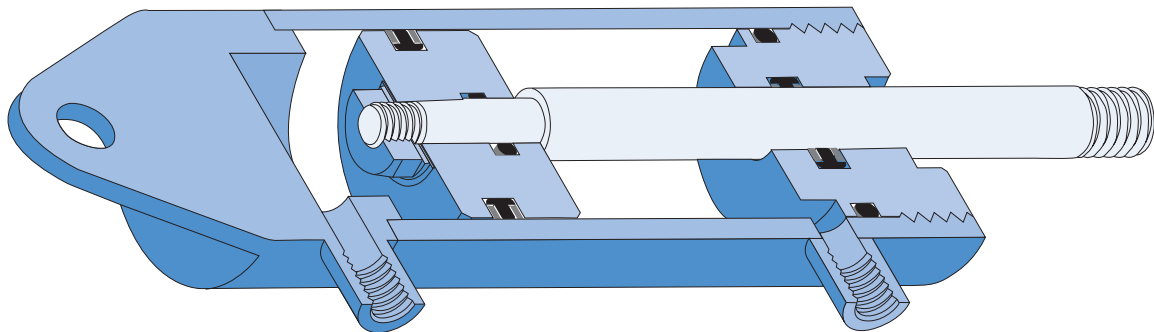
Standard to Parker T-seals are skive-cut back-up rings. Skive-cut rings are simple to install and allow harder and more extrusion-resistant materials to be used without sacrificing their ability to respond quickly to gap changes (see Figure 8).



Hydraulic Fluids

There are so many types of hydraulic fluids that no single compound can be used to seal all of them. Consult Parker's Applications Engineers if compatibility issues between seal element and fluids arise. It is important to select a seal compound having a temperature range that is suitable for the application. Materials used for Parker T-seal assemblies are chosen for their abrasion resistance, fluid compatibility and temperature range, but the seal element and back-up

rings have additional requirements unique to themselves. The seal element, for example, must have a high resistance to compression set, possess high tear resistance, and long retention of its resilience. Back-up rings, in addition to the common requirements, must also have high shear strength and sufficient hardness to bridge large gaps without extrusion. (See Table A-3 on pages 5-6 for specific service conditions.)



T-Seal Design

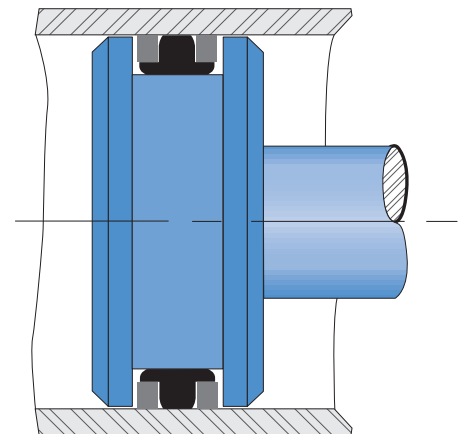
The Parker T-seal is designed for installation in standard industrial O-ring grooves. Designs should allow for proper lead-in angle. Attention should also be given to the chamfering and/or recessing of shoulders, ports and threads, which might damage the seal at installation or during operation (see Figure 9).

Surface finish should be held to 32 RMS maximum in grooves, and **10-16** RMS on dynamic surfaces against which the seal operates.

Finishes of contacting surfaces have much to do with the life of T-Seals. Surface roughness values less than 5 RMS are not recommended for hydraulic dynamic seals, inasmuch as an extending rod, for instance, will be wiped completely dry and will not be lubricated when it retracts. The surface must be rough enough to hold minute amounts of oil. Ideally, a microscopic "orange peel" type of surface is best, presenting smooth rounded surfaces for the T-Seal rubber element to slide. The smooth, rounded surfaces have small crevices between them that act as oil reservoirs. This

kind of surface is approximated by peening with metal shot or glass beads. The most desirable surface finish is from 10 to 16 RMS.

Fig.9



Parker's industrial T-seals are available to fit no, one and two back-up width O-ring grooves (See Figures 10 and 11). The standard groove width for Parker T-seals is the "no back-up" O-ring groove design. One and two back-up widths are available, but availability is limited. All Parker industrial T-seal assemblies have two back-ups regardless of the gland width design. See Design Table A-4 for recommended gland dimensions for no back-up, one (1) back-up, and two (2) back-up industrial O-ring grooves.

Fig.10

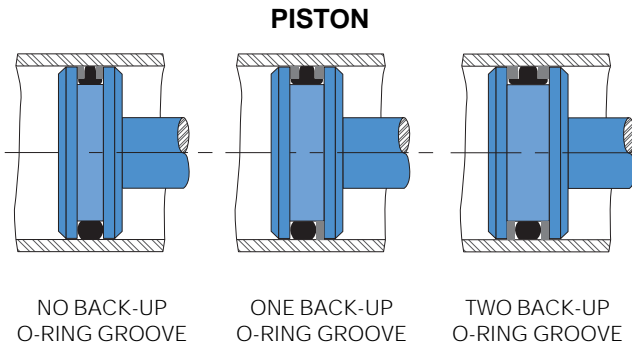
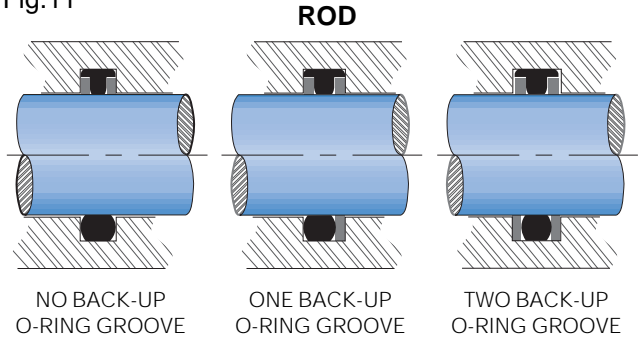


Fig.11



When substituting Parker T-seals for one or two back-up industrial groove widths, use the following part number designation:

Groove Width
 0 B/U = 0
 1 B/U = 1
 2 B/U = 2

No back-up industrial O-ring groove **4115T0P3264731**

One back-up industrial O-ring groove **4115T1P3264731**

Two back-up industrial O-ring groove **4115T2P3264731**

(Examples shown are for Piston T-seal in compounds 4115 and 4731. See page 7 for details on part numbering.)

Comparison of Common Seal Types

A number of common seal types -- T-Seals, O-rings, U and V cup packings and other devices, have been and are used for dynamic and static seals. When compared with a T-seal, one or another of these other types may show disadvantages which are overcome

by use of the Parker T-Seal. As an aid in assessing the relative merits of a T-Seal, Table A-1 lists several of the factors which must be considered in the selection of a seal type.

Table A-1

TYPE	APPLICATIONS		PERIODIC ADJUSTMENT REQUIRED	MOVING FRICTION	TOLERANCES REQUIRED (Dynamic Seals)	GLAND ADAPTERS REQUIRED	SPACE REQUIREMENTS
	STATIC	DYNAMIC					
Parker T-Seal	X	X	No	Medium	Close	No	Small
Parker O-Ring	X	X	No	Medium	Close	No	Small
U-Packing			No	Low	Close	No	Small
V-Packing			Yes	Medium	Fairly Close	Yes	Large
Cup Type Packing			No	Medium	Close	Yes	Medium
Flat Gasket		X	Yes	-	-	No	Large
Compression or Jam Packing		X	Yes	High	Fairly Close	Yes	Large

Materials

In designing a T-seal, first determine the compound. The primary factor dictating the elastomer to be used is the fluid to be sealed. Also, the selected elastomer must be capable of maintaining good physical properties through the full temperature range expected. In dynamic applications, it must have the resilience and abrasion resistance that are so important in reciprocating and rotary applications. In some instances where two or more fluids may be used, it

may be necessary to compromise abrasion resistance on a compound having the best overall resistance to all the fluids involved. When two or more compounds are suitable for an application, price and availability become determining factors.

The following Table (A-3) lists the available Parker compounds for the T-seal sealing element and back-up rings.

Table A-3

Elastomeric Seal Element				
Base Elastomer	Compound Number	Duro-meter	Temperature Range °F	Service & Applications
Standard Materials[†]				
Nitrile	4115	75	-40 to +225	<ul style="list-style-type: none"> Petroleum based fluids Pneumatic applications
	4008	75	-65 to +275	
Carboxylated Nitrile	4010	85	-20 to +250	<ul style="list-style-type: none"> Long wearing, (ELF) extremely low friction Pneumatic applications Water-based fluids, Petroleum based fluids
Fluorocarbon	4205	75	-20 to +400	<ul style="list-style-type: none"> High temperature oils, aromatic solvents Industrial phosphate esters

[†]While these are standard materials, check with the factory for alternate materials and tooling availability on needed sizes.

Optional Materials (May require tooling. Call the factory.)				
Fluorocarbon	4208	90	-20 to +400	<ul style="list-style-type: none"> High temperature oils, aromatic solvents Industrial phosphate esters
Ethylene Propylene	4183	80	-65 to +300	<ul style="list-style-type: none"> Brake Fluids Phosphate esters Skydrol¹ Water
	4259	80	-65 to +300	
	4011	80	-65 to +300	
AFLAS™	4276	85	-20 to +400	<ul style="list-style-type: none"> Amines, H²S, steam, water based fluids High temperatures
Hifluor™	3819	75	-15 to +400	<ul style="list-style-type: none"> Better resistance to aggressive chemicals Ketones, amines, acids and bases
	8534	90	-15 to +400	
Parofluor™	8545	75	-15 to +500/550	<ul style="list-style-type: none"> Extreme chemical resistance. Extreme temperature resistance.
	8588	90	-15 to +500/550	

¹TM © Monsanto Co.

Table A-3 (cont'd)

Back-up Ring				
Base Material	Compound Number	Pressure Rating (psi)	Temperature Range °F	Service & Applications
Standard Materials				
Stabak™	4731	5,000	-65 to +275	<ul style="list-style-type: none"> • Excellent chemical resistance • Low moisture absorption • Dimensionally stable
Optional Materials (May require tooling. Call the factory.)				
Nylatron	4655	5,000	-65 to +250	<ul style="list-style-type: none"> • Excellent chemical resistance
PTFE (virgin)	0110	3,000	-65 to +425	<ul style="list-style-type: none"> • Low friction
PTFE (15%glass)	0134	3,500	-65 to +500	<ul style="list-style-type: none"> • Extreme chemical resistance • Extreme temperature resistance
PEEK (virgin)	4685	10,000	-65 to +500	<ul style="list-style-type: none"> • Extreme temperature resistance
PEEK (30%glass)	4686	10,000	-65 to +450	<ul style="list-style-type: none"> • Extreme chemical resistance • Extreme pressure resistance

Ordering Information

The Parker T-seal is an assembly consisting of an elastomeric seal element — the “T” and back-up rings. The seal will not function without all parts. When ordering, specify the piston or rod T-seal (AS-568) dash size from Table A-5 on pages 9-12. Both the back-up ring material and T-seal element material should be called out (See page 7 for part numbering). Orders or inquiries with only a size given will be processed using standard 4115 seal element & 4731 back-up ring materials.

OVER AND UNDER SIZE GLANDS

Parker T-seals are designed to fit the gland dimensions shown in this catalog. Because of the resilience of both the seal and back-up ring materials they can accommodate slight variations in either direction from the dimensions shown. The extent to which such variation can be tolerated is dependent on the seal size, diameter and cross section, extrusion gap and

pressures. In most instances a diametral change of ten thousandths can be accommodated without adverse effects.

Very often special diameter T-seals can be provided. Please consult Parker Applications Engineers for specific information on individual applications.

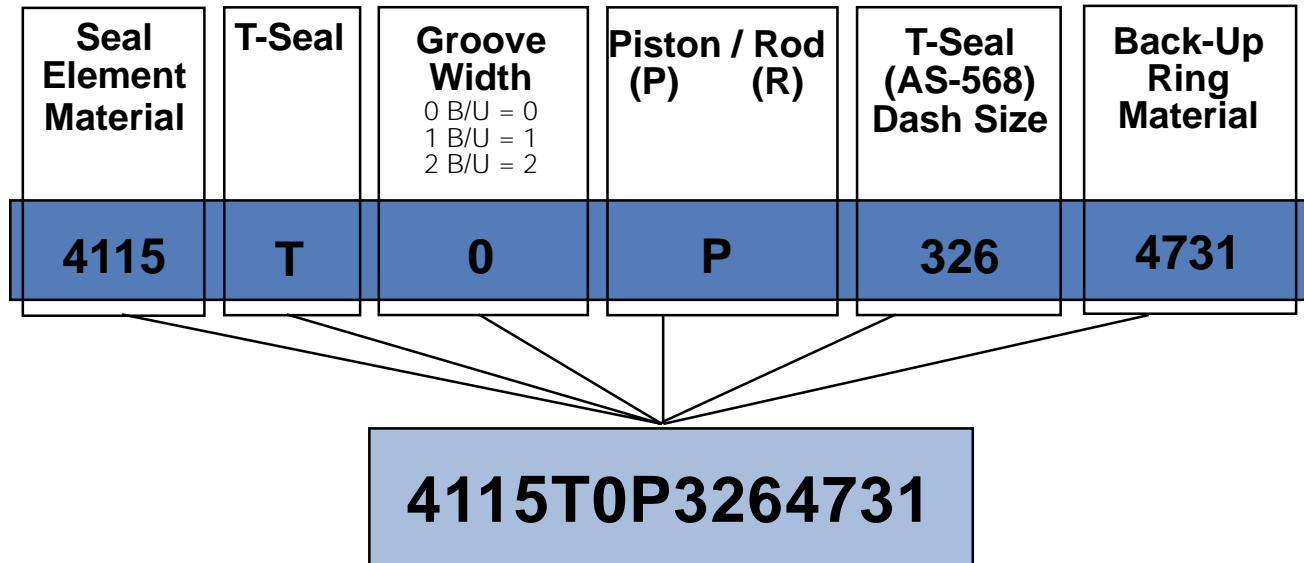
The Parker T-seal element and back-up rings are only sold as an assembly.

Elastomeric elements and back-up rings cannot be ordered separately.

T-Seal Part Numbers:

The T-seal is intended for use as a single seal. Multiple installation tends to produce pressure lock with resultant reduced seal life. In the rather unusual cases where multiple seals are called for, venting should be provided between seals.

Industrial T-seals are available to fit three groove widths. When specifying T-seals for industrial o-ring grooves, use the part number designation based upon the T-Seal (AS-568) dash size as shown below.

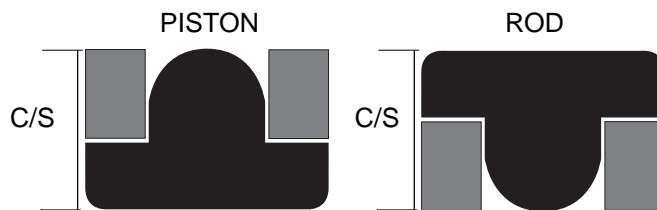
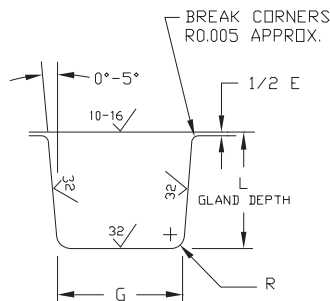
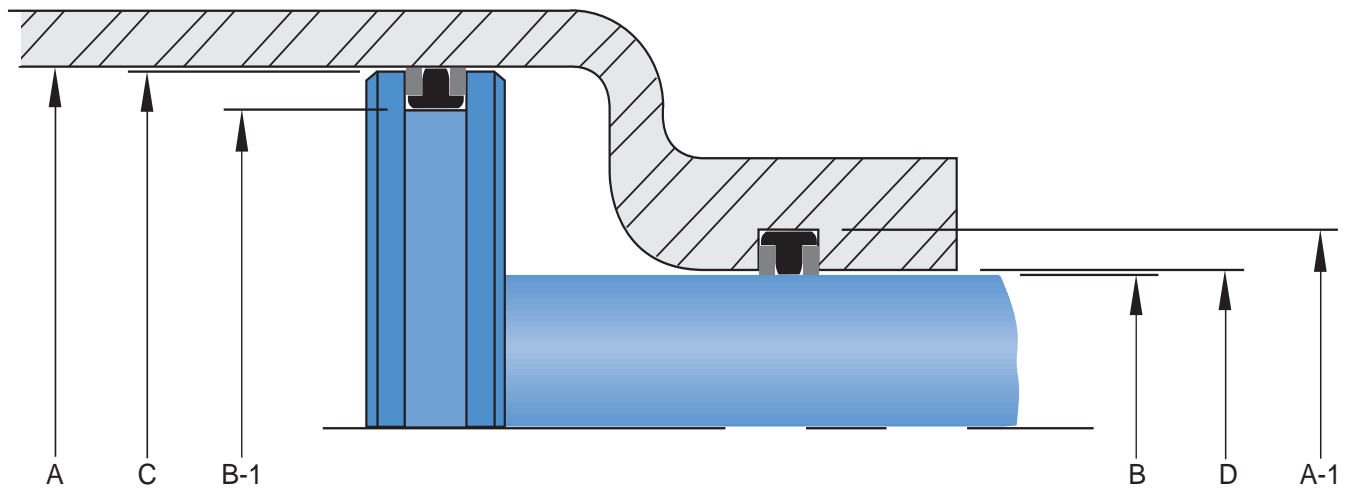


The effective part number for a Parker T-Seal consists of six components:

- 1: Seal Element Material
- 2: "T" for T-Seal designation
- 3: Groove Width (0 = 0 B/U; 1 = 1 B/U; 2 = 2 B/U)
- 4: Piston (P) or Rod (R) Designation
- 5: T-Seal (AS-568) Dash Size
- 6: Back-up Ring Material

Design Table A-4 on page 8 provides a basis for determining the appropriate T-Seal size. Table A-5, on pages 9-12 contains recommended gland dimensions for the standard T-Seal sizes. In the event it is necessary to deviate from the dimensions listed, please call Parker's Applications Engineers. Procedures for using Table A-5 are outlined as follows:

IF DESIRED DIMENSION IS KNOWN FOR:	SELECT DIMENSION IN COLUMN	READ HORIZONTALLY IN COLUMN	TO DETERMINE DIMENSIONS FOR
Bore Dia of Cylinder	A	B-1	Groove Dia of piston
		C	OD of piston
		G	Groove width
OD of Piston	C	A	Bore Dia of cylinder
		B-1	Groove Dia of piston
		G	Groove width
OD of Rod	B	A-1	Groove Dia for rod
		D	Bore ID for rod
		G	Groove width
Bore Dia for Rod	D	A-1	Groove Dia for rod
		B	OD of rod
		G	Groove width



Design Table A-4 for Industrial Reciprocating T-Seal Packing Glands.

T-SEAL (AS-568) SIZE	L GLAND DEPTH	E (a) DIAMETRAL CLEARANCE	G GROOVE WIDTH			R GROOVE RADIUS	ECCEN- TRICITY MAX (b)
			NO BACKUP GROOVE	ONE BACKUP GROOVE	TWO BACKUP GROOVE		
104	.088	.002	.140	.171	.238	.005	.002
through 116	to .090	to .005	to .145	to .176	to .243	to .015	
201	.121	.003	.187	.208	.275	.010	.003
through 222	to .123	to .006	to .192	to .213	to .280	to .025	
309	.185	.003	.281	.311	.410	.020	.004
through 349	to .188	to .006	to .286	to .316	to .415	to .035	
425	.237	.004	.375	.408	.538	.020	.005
through 460	to .240	to .007	to .380	to .413	to .543	to .035	

(a) Clearance (extrusion gap) must be held to a minimum consistent with design requirements for temperature variation. When using wear rings, diametral clearance and pressure ratings will change.

(b) Total indicator reading between groove and adjacent bearing surface.

Table A-5 Gland Dimensions for Industrial Reciprocating T-Seals

SEAL DIMENSIONS				GLAND DIMENSIONS									
T-SEAL (AS-568) DASH NUMBER	NOMINAL SIZE			A	A-1	B	B-1	C	D	G† GROOVE WIDTH			R
				BORE DIA. (CYLINDER)	GROOVE DIA. (ROD GLAND)	ROD DIAMETER	GROOVE DIA. (PISTON)	OD (PISTON)	BORE DIA (ROD)	NO BACK-UP WIDTH	ONE BACK-UP WIDTH	TWO BACK-UP WIDTH	GROOVE RADIUS
	ID	OD	C/S	+0.02 -0.00	+0.02 -0.00	+0.00 -0.02	+0.00 -0.02	+0.00 -0.01	+0.001 -0.000	+0.005 -0.000	+0.005 -0.000	+0.005 -0.000	+0.010 -0.000
104	1/8	5/16	3/32	.312	.300	.124	.136	.310	.126	↑	↑	↑	↑
105	3/32	11/32	3/32	.343	.331	.155	.167	.341	.157	↑	↑	↑	↑
106	3/16	3/8	3/32	.374	.362	.186	.198	.372	.188	↑	↑	↑	↑
107	7/32	13/32	3/32	.406	.394	.218	.230	.404	.220	↑	↑	↑	↑
108	1/4	7/16	3/32	.437	.425	.249	.261	.435	.251	↑	↑	↑	↑
109	5/16	1/2	3/32	.499	.487	.311	.323	.497	.313	↑	↑	↑	↑
110	3/8	9/16	3/32	.562	.550	.374	.386	.560	.376	.140	.171	.238	.005
111	7/16	5/8	3/32	.624	.612	.436	.448	.622	.438	↓	↓	↓	↓
112	1/2	11/16	3/32	.687	.675	.499	.511	.685	.501	↓	↓	↓	↓
113	9/16	3/4	3/32	.749	.737	.561	.573	.747	.563	↓	↓	↓	↓
114	5/8	13/16	3/32	.812	.800	.624	.636	.810	.626	↓	↓	↓	↓
115	11/16	7/8	3/32	.874	.862	.686	.698	.872	.688	↓	↓	↓	↓
116	3/4	15/16	3/32	.937	.925	.749	.761	.935	.751	↓	↓	↓	↓
201	3/16	7/16	1/8	.437	.427	.185	.195	.434	.188	↑	↑	↑	↑
202	1/4	1/2	1/8	.500	.490	.248	.258	.497	.251	↑	↑	↑	↑
203	5/16	9/16	1/8	.562	.552	.310	.320	.559	.313	↑	↑	↑	↑
204	3/8	5/8	1/8	.625	.615	.373	.383	.622	.376	↑	↑	↑	↑
205	7/16	11/16	1/8	.687	.677	.435	.445	.684	.438	↑	↑	↑	↑
206	1/2	3/4	1/8	.750	.740	.498	.508	.747	.501	↑	↑	↑	↑
207	9/16	13/16	1/8	.812	.802	.560	.570	.809	.563	↑	↑	↑	↑
208	5/8	7/8	1/8	.875	.865	.623	.633	.872	.626	↑	↑	↑	↑
209	11/16	15/16	1/8	.937	.927	.685	.695	.934	.688	↑	↑	↑	↑
210	3/4	1	1/8	1.000	.990	.748	.758	.997	.751	↑	↑	↑	↑
211	13/16	1 1/16	1/8	1.062	1.052	.810	.820	1.059	.813	.187	.208	.275	.010
212	7/8	1 1/8	1/8	1.125	1.115	.873	.883	1.122	.876	↑	↑	↑	↑
213	15/16	1 3/16	1/8	1.187	1.177	.935	.945	1.184	.938	↑	↑	↑	↑
214	1	1 1/4	1/8	1.250	1.240	.998	1.008	1.247	1.001	↑	↑	↑	↑
215	1 1/16	1 5/16	1/8	1.312	1.302	1.060	1.070	1.309	1.063	↑	↑	↑	↑
216	1 1/8	1 3/8	1/8	1.375	1.365	1.123	1.133	1.372	1.126	↑	↑	↑	↑
217	1 3/16	1 7/16	1/8	1.437	1.427	1.185	1.195	1.434	1.188	↑	↑	↑	↑
218	1 1/4	1 1/2	1/8	1.500	1.490	1.248	1.258	1.497	1.251	↑	↑	↑	↑
219	1 5/16	1 9/16	1/8	1.562	1.552	1.310	1.320	1.559	1.313	↑	↑	↑	↑
220	1 3/8	1 5/8	1/8	1.625	1.615	1.373	1.383	1.622	1.376	↑	↑	↑	↑
221	1 7/16	1 11/16	1/8	1.687	1.677	1.435	1.445	1.684	1.438	↑	↑	↑	↑
222	1 1/2	1 3/4	1/8	1.750	1.740	1.498	1.508	1.747	1.501	↓	↓	↓	↓

†The Standard Groove width for T-Seals is the No Back-Up o-ring groove design. One and two back-up widths are available, but availability is limited. All Industrial T-Seal assemblies have two back-ups regardless of the gland width design.

Table A-5 Gland Dimensions for Industrial Reciprocating T-Seals

SEAL DIMENSIONS				GLAND DIMENSIONS									
T-SEAL (AS-568) DASH NUMBER	NOMINAL SIZE			A	A-1	B	B-1	C	D	G [†] GROOVE WIDTH			R
				BORE DIA. (CYLINDER)	GROOVE DIA. (ROD GLAND)	ROD DIAMETER	GROOVE DIA. (PISTON)	OD (PISTON)	BORE DIA (ROD)	NO BACK-UP WIDTH	ONE BACK-UP WIDTH	TWO BACK-UP WIDTH	GROOVE RADIUS
	ID	OD	C/S	+0.02 -0.00	+0.02 -0.00	+0.00 -0.02	+0.00 -0.02	+0.00 -0.01	+0.01 -0.00	+0.05 -0.00	+0.05 -0.00	+0.05 -0.00	+0.15 -0.00
309	7/16	13/16	3/16	.812	.805	.435	.442	.809	.438				
310	1/2	7/8	3/16	.875	.868	.498	.505	.872	.501				
311	9/16	15/16	3/16	.937	.930	.560	.567	.934	.563				
312	5/8	1	3/16	1.000	.993	.623	.630	.997	.626				
313	11/16	1 1/16	3/16	1.062	1.055	.685	.692	1.059	.688				
314	3/4	1 1/8	3/16	1.125	1.118	.748	.755	1.122	.751				
315	13/16	1 3/16	3/16	1.187	1.180	.810	.817	1.184	.813				
316	7/8	1 1/4	3/16	1.250	1.243	.873	.880	1.247	.876				
317	15/16	1 5/16	3/16	1.312	1.305	.935	.942	1.309	.938				
318	1	1 3/8	3/16	1.375	1.368	.998	1.005	1.372	1.001				
319	1 1/16	1 7/16	3/16	1.437	1.430	1.060	1.067	1.434	1.063				
320	1 1/8	1 1/2	3/16	1.500	1.493	1.123	1.130	1.497	1.126				
321	1 3/16	1 9/16	3/16	1.562	1.555	1.185	1.192	1.559	1.188				
322	1 1/4	1 5/8	3/16	1.625	1.618	1.248	1.255	1.622	1.251				
323	1 5/16	1 11/16	3/16	1.687	1.680	1.310	1.317	1.684	1.313				
324	1 3/8	1 3/4	3/16	1.750	1.743	1.373	1.380	1.747	1.376	.281	.311	.410	.020
					+0.04 -0.00		+0.00 -0.04						
325	1 1/2	1 7/8	3/16	1.875	1.868	1.498	1.505	1.872	1.501				
326	1 5/8	2	3/16	2.000	1.993	1.623	1.630	1.997	1.626				
327	1 3/4	2 1/8	3/16	2.125	2.118	1.748	1.755	2.122	1.751				
328	1 7/8	2 1/4	3/16	2.250	2.243	1.873	1.880	2.247	1.876				
329	2	2 3/8	3/16	2.375	2.368	1.998	2.005	2.372	2.001				
330	2 1/8	2 1/2	3/16	2.500	2.493	2.123	2.130	2.497	2.126				
331	1 3/4	2 5/8	3/16	2.625	2.618	2.248	2.255	2.622	2.251				
332	2 1/8	2 3/4	3/16	2.750	2.743	2.373	2.380	2.747	2.376				
333	2 1/2	2 7/8	3/16	2-1/27	2.868	2.498	2.505	2.872	2.501				
334	2 5/8	3	3/16	8	2.993	2.623	2.630	2.997	2.626				
335	2 3/4	3 1/8	3/16	3.125	3.118	2.748	2.755	3.122	2.751				
336	2 7/8	3 1/4	3/16	3.250	3.243	2.873	2.880	3.247	2.876				
337	3	3 3/8	3/16	3.375	3.368	2.998	3.005	3.372	3.001				
338	3 1/8	3 1/2	3/16	3.500	3.493	3.123	3.130	3.497	3.126				
339	3 1/4	3 5/8	3/16	3.625	3.618	3.248	3.255	3.622	3.251				
340	3 3/8	3 3/4	3/16	3.750	3.743	3.373	3.380	3.747	3.376				
341	3 1/2	3 7/8	3/16	3.875	3.868	3.498	3.505	3.872	3.501				

†The Standard Groove width for T-Seals is the No Back-Up o-ring groove design. One and two back-up widths are available, but availability is limited. All Industrial T-Seal assemblies have two back-ups regardless of the gland width design.

Table A-5 Gland Dimensions for Industrial Reciprocating T-Seals

SEAL DIMENSIONS				GLAND DIMENSIONS									
T-SEAL (AS-568) DASH NUMBER	NOMINAL SIZE			A	A-1	B	B-1	C	D	G [†] GROOVE WIDTH			R
				BORE DIA. (CYLINDER)	GROOVE DIA. (ROD GLAND)	ROD DIAMETER	GROOVE DIA. (PISTON)	OD (PISTON)	BORE DIA (ROD)	NO BACK-UP WIDTH	ONE BACK-UP WIDTH	TWO BACK-UP WIDTH	GROOVE RADIUS
	ID	OD	C/S	+0.02 -0.00	+0.04 -0.00	+0.00 -0.02	+0.00 -0.04	+0.00 -0.01	+0.01 -0.00	+0.05 -0.00	+0.05 -0.00	+0.05 -0.00	+0.015 -0.00
342	3 5/8	4	3/16	4.000	3.993	3.623	3.630	3.997	3.626	↑	↑	↑	↑
343	3 3/4	4 1/8	3/16	4.125	4.118	3.748	3.755	4.122	3.751	↑	↑	↑	↑
344	3 7/8	4 1/4	3/16	4.250	4.243	3.873	3.880	4.247	3.876	↑	↑	↑	↑
345	4	4 3/8	3/16	4.375	4.368	3.998	4.005	4.372	4.001	↑	↑	↑	↑
346	4 1/8	4 1/2	3/16	4.500	4.493	4.123	4.130	4.497	4.126	↑	↑	↑	↑
347	4 1/4	4 5/8	3/16	4.625	4.618	4.248	4.255	4.622	4.251	↓	↓	↓	↓
348	4 3/8	4 3/4	3/16	4.750	4.743	4.373	4.380	4.747	4.376	↓	↓	↓	↓
349	4 1/2	4 7/8	3/16	4.875	4.868	4.498	4.505	4.872	4.501	↓	↓	↓	↓
425	4 1/2	5	1/4	5.002	4.971	4.497	4.528	4.998	4.501	↑	↑	↑	↑
426	4 5/8	5 1/8	1/4	5.127	5.096	4.622	4.653	5.123	4.626	↑	↑	↑	↑
427	4 3/4	5 1/4	1/4	5.252	5.221	4.747	4.778	5.248	4.751				
428	4 7/8	5 3/8	1/4	5.377	5.346	4.872	4.903	5.373	4.876				
429	5	5 1/2	1/4	5.502	5.471	4.997	5.028	5.498	5.001				
430	5 1/8	5 5/8	1/4	5.627	5.596	5.122	5.153	5.623	5.126				
431	5 1/4	5 3/4	1/4	5.752	5.721	5.247	5.278	5.748	5.251				
432	5 3/8	5 7/8	1/4	5.877	5.846	5.372	5.403	5.873	5.376				
433	5 1/2	6	1/4	6.002	5.971	5.497	5.528	5.998	5.501				
434	5 5/8	6 1/8	1/4	6.127	6.096	5.622	5.653	6.123	5.626				
435	5 3/4	6 1/4	1/4	6.252	6.221	5.747	5.778	6.248	5.751				
436	5 7/8	6 3/8	1/4	6.377	6.346	5.872	5.903	6.373	5.876				
437	6	6 1/2	1/4	6.502	6.471	5.997	6.028	6.498	6.001				
438	6 1/4	6 3/4	1/4	6.752	6.721	6.247	6.278	6.748	6.251				
439	6 1/2	7	1/4	7.002	6.971	6.497	6.528	6.998	6.501	↑	↑	↑	↑
440	6 3/4	7 1/4	1/4	7.252	7.221	6.747	6.778	7.248	6.751	↑	↑	↑	↑
441	7	7 1/2	1/4	7.502	7.471	6.997	7.028	7.498	7.001	↑	↑	↑	↑
442	7 1/4	7 3/4	1/4	7.752	7.721	7.247	7.278	7.748	7.251				
443	7 1/2	8	1/4	8.002	7.971	7.497	7.528	7.998	7.501				
444	7 3/4	8 1/2	1/4	8.252	8.221	7.747	7.778	8.248	7.751				
445	8	8 1/2	1/4	8.502	8.471	7.997	8.028	8.498	8.001				
446	8 1/2	9	1/4	9.002	8.971	8.497	8.528	8.998	8.501				
447	9	9	1/4	9.502	9.471	8.997	9.028	9.498	9.001				
448	9 1/2	10	1/4	10.002	9.971	9.497	9.528	9.998	9.501				
449	10	10 1/2	1/4	10.502	10.471	9.997	10.028	10.498	10.001				
450	10 1/2	11	1/4	11.002	10.971	10.497	10.528	10.998	10.501				
451	11	11 1/2	1/4	11.502	11.471	10.997	11.028	11.498	11.001	↓	↓	↓	↓

†The Standard Groove width for T-Seals is the No Back-Up o-ring groove design. One and two back-up widths are available, but availability is limited. All Industrial T-Seal assemblies have two back-ups regardless of the gland width design.

Table A-5 Gland Dimensions for Industrial Reciprocating T-Seals

SEAL DIMENSIONS				GLAND DIMENSIONS									
T-SEAL (AS-568) DASH NUMBER	NOMINAL SIZE			A	A-1	B	B-1	C	D	G [†] GROOVE WIDTH			R
				BORE DIA. (CYLINDER)	GROOVE DIA. (ROD GLAND)	ROD DIAMETER	GROOVE DIA. (PISTON)	OD (PISTON)	BORE DIA (ROD)	NO BACK-UP WIDTH	ONE BACK-UP WIDTH	TWO BACK-UP WIDTH	GROOVE RADIUS
	ID	OD	C/S	+0.02 -0.00	+0.04 -0.00	+0.00 -0.02	+0.00 -0.04	+0.00 -0.01	+0.01 -0.00	+0.05 -0.00	+0.05 -0.00	+0.05 -0.00	+0.015 -0.00
452	11 1/2	12	1/4	12.002	11.971	11.497	11.528	11.998	11.501				
453	12	12 1/2	1/4	12.502	12.471	11.997	12.028	12.498	12.001	↑	↑	↑	↑
454	12 1/2	13	1/4	13.002	12.971	12.497	12.528	12.998	12.501	↑	↑	↑	↑
455	13	13 1/2	1/4	13.502	13.471	12.997	13.028	13.498	13.001	↑	↑	↑	↑
456	13 1/2	14	1/4	14.002	13.971	13.497	13.528	13.998	13.501	.375	.408	.538	.020
457	14	14 1/2	1/4	14.502	14.471	13.997	14.028	14.498	14.001	↓	↓	↓	↓
458	14 1/2	15	1/4	15.002	14.971	14.497	14.528	14.998	14.501	↓	↓	↓	↓
459	15	15 1/2	1/4	15.502	15.471	14.997	15.028	15.498	15.001	↓	↓	↓	↓
460	15 1/2	16	1/4	16.002	15.971	15.497	15.528	15.998	15.501	↓	↓	↓	↓
462	16 1/2	17	1/4	17.002	16.971	16.497	16.528	16.998	16.501	↓	↓	↓	↓



†The Standard Groove width for T-Seals is the No Back-Up o-ring groove design. One and two back-up widths are available, but availability is limited. All Industrial T-Seal assemblies have two back-ups regardless of the gland width design.

Need Help? If you need assistance, please run a copy of this page and the facing page. Fill out the required information, and fax it to Packing Division at (801) 972-4777. Utilize the information below and other information in this guide to determine the dimensions needed. We will contact you to discuss your specific application and make recommendations. If you need help filling out the form, please call Packing Division Applications Engineers at (801) 972-3000.

**PACKING DIVISION
DATA REQUEST**

SALT LAKE CITY OPERATIONS
 2220 SOUTH 3600 WEST
 SALT LAKE CITY, UTAH
 PHONE (801) 972-3000
 FAX (801) 972-4777

GNP OPERATIONS
 41 W 195 RAILROAD STREET
 HAMPSHIRE, IL 60140-9729
 TOLL FREE 1-800-774-2394
 PHONE (847) 464-5202
 FAX (847) 464-4051

COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP _____
 CONTACT _____ TITLE _____
 PHONE _____ FAX _____
 E-MAIL _____
 ALT. CONTACT _____ TITLE _____
 PHONE _____ FAX _____
 E-MAIL _____

COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP _____
 CONTACT _____ TITLE _____
 PHONE _____ FAX _____
 E-MAIL _____
 ALT. CONTACT _____ TITLE _____
 PHONE _____ FAX _____
 E-MAIL _____

EQUIPMENT _____

MODEL: _____

COMPONENTS _____

PROBLEM: _____

EXISTING SEAL/PART NUMBER: _____ N/A

PRICE \$ _____ @ _____ PCS USAGE/YEAR: _____

TARGET \$ _____ @ _____ PCS QUOTE QTY: _____

PRODUCT POTENTIAL _____

PROBLEM PARTS INCLUDED YES NO

ISSUE: PRICING SEAL PROBLEM (Explain) _____

CUSTOMER P/N: _____

PROTO QTY: _____ DATE PROTO REQ'D: _____

SPECIAL INSPECTION REQUIREMENTS? YES NO

SPECIAL PACKAGING REQUIREMENTS? YES NO

PRODUCT TYPE

ROD / SHAFT

PISTON

INTERNAL FACE

EXTERNAL FACE

OPERATING

UNIT

PARAMETERS

(CIRCLE ONE)

MINIMUM

OPERATING

MAXIMUM

MOTION

TEMPERATURE

°K °F °C

STATIC

PRESSURE

PSI BAR MPA

RECIPROCATING

STROKE LENGTH

INCH MM

ROTARY

CYCLE RATE

/MIN. /HR HZ

OSCILLATORY

ROTATION

DEG. RAD.

RPM

PRESSURE DIRECTION

VELOCITY/

FT/MIN. MM/MIN.

UNIDIRECTIONAL

SURFACE SPEED

IN. HG TORR

BI-DIRECTIONAL

VACUUM

DIRECTION OF ROTATION

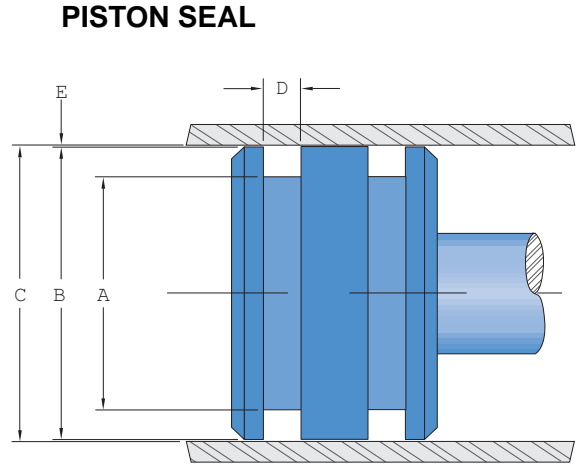
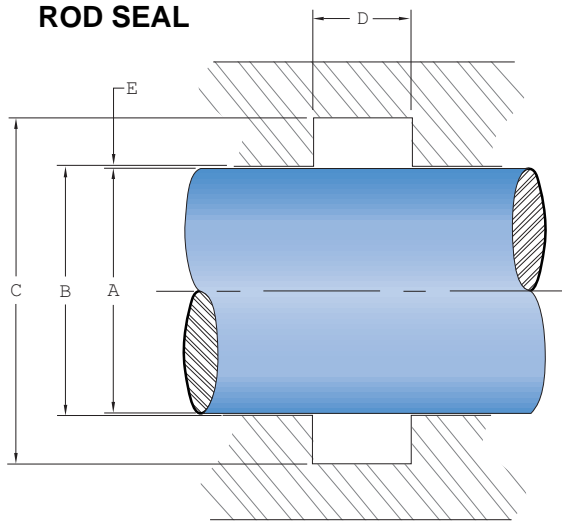
CLOCKWISE

COUNTER CLOCKWISE

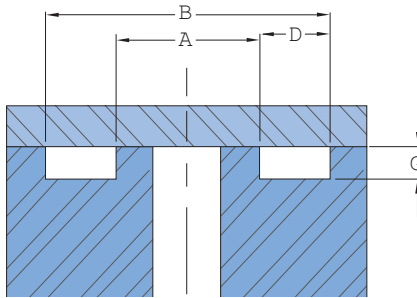
BI-DIRECTIONAL

MEDIA TO BE SEALED: _____

HARDWARE



FACE SEAL



HARDWARE DRAWINGS INCLUDED WITH DATA REQUEST YES NO

STEP CUT YES NO

A DIAMETER	MIN. _____	MAX. _____	HARDNESS _____	FINISH _____	MAT'L _____
B DIAMETER	MIN. _____	MAX. _____	HARDNESS _____	FINISH _____	MAT'L _____
C DIAMETER	MIN. _____	MAX. _____	HARDNESS _____	FINISH _____	MAT'L _____
D GROOVE WIDTH	MIN. _____	MAX. _____			
E RADIAL CLEARANCE	MIN. _____	MAX. _____			
F ROD/PISTON STEP HEIGHT	MIN. _____	MAX. _____			
G FACE SEAL GROOVE DEPTH	MIN. _____	MAX. _____			
H RUNOUT (TIR)	MIN. _____	MAX. _____			

GLAND TYPE		METRIC	
<input type="checkbox"/> SPLIT	<input type="checkbox"/> OPEN	<input type="checkbox"/> YES	<input type="checkbox"/> NO
<input type="checkbox"/> SOLID	<input type="checkbox"/> STEPPED	<input type="checkbox"/> YES	<input type="checkbox"/> NO

SIDE LOAD (LBS NEWTONS): _____
 AS-568 O-RING DASH # _____ BACK-UP WIDTH _____

PERFORMANCE REQUIREMENTS
(CIRCLE ONE)

FRICION _____	LBS _____	OZ _____	GMS _____	<input type="checkbox"/> BREAKOUT	<input type="checkbox"/> DYNAMIC
EXPECTED LIFE: _____	CYC _____	HRS _____	YRS _____		
MAX LEAKAGE: _____	DROPS _____		CC/MIN _____		

MOST CRITICAL ASPECT (check only one) SEAL LIFE PRICE LEAKAGE FRICTION OTHER (EXPLAIN)

CONTAMINATION: _____

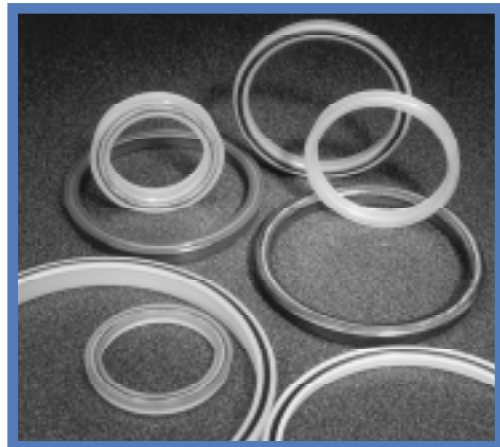


AEROSPACE T-SEALS

8400 / 8500 SERIES U-CUPS



POLYPAK™ SEALS



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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 Buyer's 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.

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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 SELLER'S 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 by 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 or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

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 Seller's 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 item 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 part 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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