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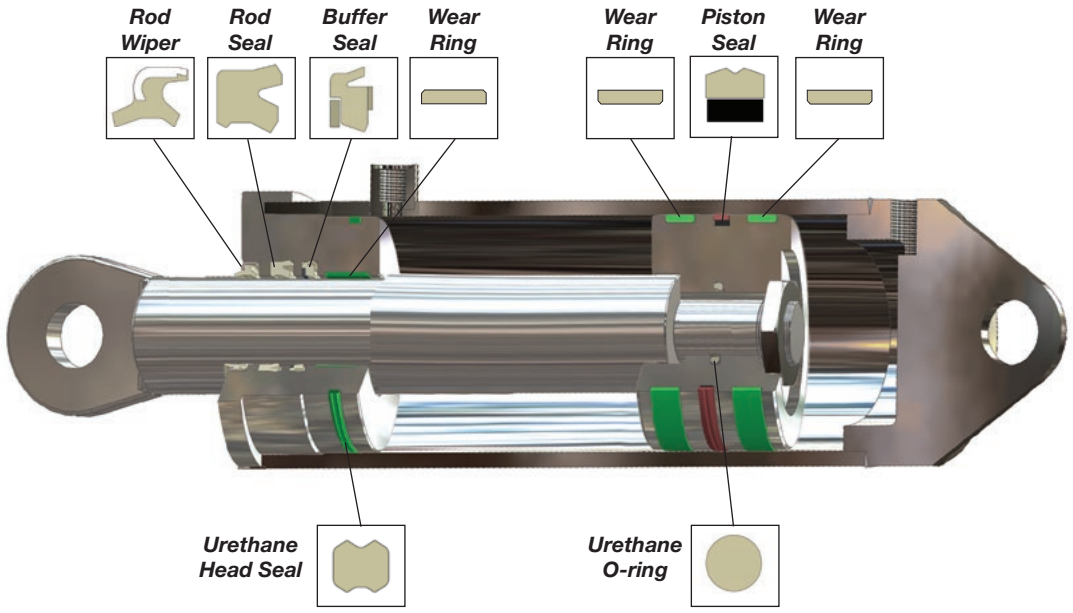
Wear Rings / Bearings

Contents

Wear Rings / Bearings

Parker offers a complete line of wear ring and bearing products to fit any application. Expertise in both engineered hard plastics and in PTFE makes Parker the global leader for reciprocating bearing materials. By incorporating premium material blends with precision machining tolerances (down to ±.001"), Parker meets the full spectrum of needs, from heavy-duty hydraulic cylinders operating under the highest temperatures and pressures to pneumatic applications requiring low friction, long life and self-lubrication. Parker wear rings are the best way to combine high performance with value.

Typical Hydraulic Cylinder



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Quality Assurance

All Parker wear ring product lines are manufacatured at ISO 9000 registered operations. As such, wear ring production is governed by rigorous quality standards and procedures through a highly trained and qualified workforce. With the assistance of precise, accurate measurement systems and detailed workmanship criteria, Parker delivers first class quality and consistency in every shipment.

Manufacturing Excellence

Parker wear rings utilize a precision manufacturing process that achieves precise flatness on the bearing surfaces, whereas conventional net-molded bearings can form “dog bone” cross-sections. The result is optimal bearing contact area and compressive strength. The cross-sections shown in Figure 9-1 illustrate the differences between these manufacturing methods.

Additionally, available sizing is not limited to existing tooling. *Our processes allow for virtually any width to be produced without assessing a setup charge.*

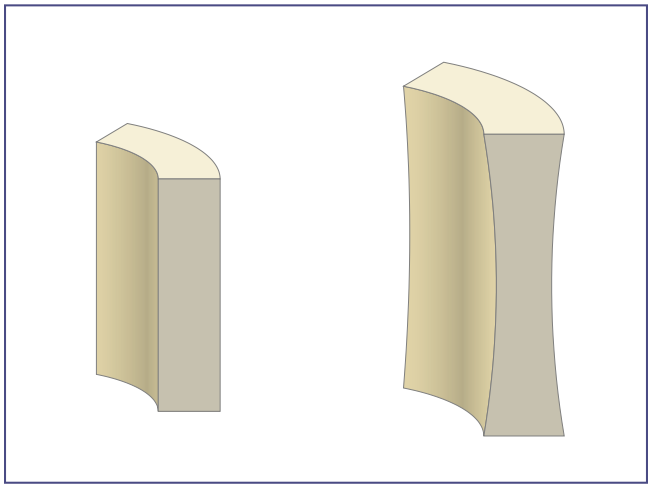

Figure 9-1. Illustrated cross section of Parker wear rings produced by precision manufacturing (left) vs. conventional net molding (right).

Features, Advantages and Benefits

Table 9-1.

Feature	Advantage	Benefit
Dynamic bearing surface contact	Eliminates metal-to-metal contact between components	Prevents rod, piston and seal damage due to scoring and reduces warranty costs
Precision manufactured cross-section	Enables tighter hardware clearances than conventional wear rings	Increases seal life by reducing extrusion gaps associated with conventional wear rings
Low-friction, premium materials	Reduces frictional heat build-up	Lowers operating temperature and increases seal life
Precise flatness on bearing surface	Maximizes bearing contact area and compressive strength, eliminating the “dog bone” effect of conventional net molded wear rings	Prolongs cylinder life through uniform sideload resistance
Advanced, high performance, polymeric materials	Metal particulates and other contaminants can be imbedded in the wear ring material	Protects seals from contamination

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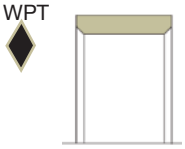
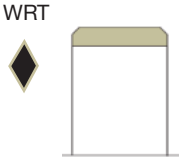
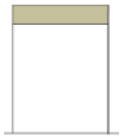
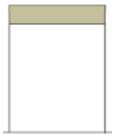
Wear Rings / Bearings Product Offering

Product Line

No matter what the application demands, Parker's diverse bearing product line ensures that performance requirements are met with maximized value. When pressure and temperature reach their extremes, WPT and WRT profiles help reduce the seal extrusion gap, assuring the utmost seal performance and leakage control. When frictional forces must be kept to a minimum in pneumatic applications, PTFE bearing profiles PDT and PDW provide precision fitting and minimal frictional losses.

Profiles

Table 9-2: Product Profiles

Series	Description	Application (Duty)				Page
		Light	Medium	Heavy	Pneumatic	
WPT 	Tight-Tolerance Piston Wear Rings					9-8
WRT 	Tight-Tolerance Rod Wear Rings					9-12
PDT 	PTFE Wear Strip for Rod and Piston					9-16
PDW 	PTFE Machined Wear Rings for Rod and Piston					9-20

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Wear Rings / Bearings Engineering

FAQs

There are many factors to consider when designing a system. Following are the frequently asked questions regarding bearing design and choosing the right wear ring.

What is the performance difference between standard-tolerance and tight-tolerance wear rings?

Standard-tolerance wear rings have a radial wall tolerance that is held to ±.0025", while tight-tolerance wear rings are held to ±.001" (under 6"). Tight-tolerance wear rings allow for a more precise fit of components, resulting in less dimensional "play." This allows the extrusion gap to be smaller for tight-tolerance wear rings, thus increasing the seal's pressure rating beyond that of standard-tolerance wear rings. This becomes very important at high temperatures, where pressure ratings of materials can further be reduced. Although it is critical to consider every aspect of each application, a general guideline for product selection can be found in Table 9-2 on page 9-3.

Wear ring grooves call for larger extrusion gaps. How does this affect the seals' pressure rating?

Since wear rings are used to eliminate metal-to-metal contact between moving parts, there must be a larger gap between them, thus causing a wider extrusion gap. As a result, the seal's pressure ratings will decrease. Pre-established gland dimensions outlined in this catalog always result in a minimum 0.005" clearance for metal components. As such, standard-tolerance wear rings can reduce a seal's pressure capability by up to 50%. Using tight-tolerance wear rings enables the extrusion gaps to be held closer, and the seal's pressure ratings are only reduced by up to 30%. In either case, it is important to select proper seal and back-up materials to accommodate the increased extrusion gaps. Alternatively, Parker Integrated Pistons™ boost performance by providing all of the benefits of wear rings without any increase in extrusion gap whatsoever.

For applications where the seals will be stressed toward their maximum capabilities, gland dimensions can be developed using the equations that accompany each profile. Use these equations to apply desired machining tolerances and clearances. It is critical when determining metal-to-metal clearances to consider the material's compressive properties, which can be found on page 9-7. It is equally important to evaluate how the applied tolerances will affect the seals' extrusion gap. Please contact Parker or your authorized distributor for assistance in developing alternate gland dimensions.

How is a proper bearing width selected?

When selecting a bearing width, it is crucial to evaluate the side loads that the bearings will have to withstand. Figure 9-2 shows the total pressure area, A_P, that a radial force from a side load will affect. Area, A_P is calculated as follows:

$$A_p = \varnothing D \times W$$

where D is the bearing O.D. for pistons or the bearing I.D. for rods, and W is the bearing width.

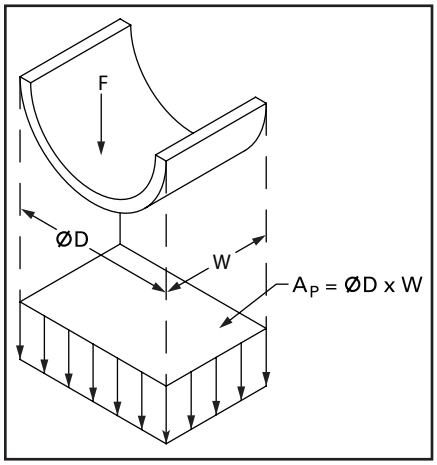

Figure 9-2: Total affected pressure area, A_P

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It is important to note that the pressure distribution will not be equally dispersed across this area. Instead, the pressure profile takes the form shown in Figure 9-3. The assumed load-bearing area, A_L, can be calculated as follows:

$$A_L = \frac{A_p}{5} = \frac{ØD \times W}{5}$$

To calculate the allowable radial force, F, simply multiply the load-bearing area, A_L, by the permissible compressive load (compressive strength) of the material, q, and divide by the desired factor of safety, FS.

To calculate the proper bearing width, W, based on a known radial force:

$$W = \frac{5 \times F}{ØD \times q} \times FS$$

Once W is calculated, round up to the next nominal width (1/8" increments).

To calculate the allowable radial force, F, based on a known bearing width:

$$F = \frac{A_L \times q}{FS} = \frac{ØD \times W \times q}{5 \times FS}$$

Compressive Strength, q, can be found in the material properties tables on page 9-7. This value is based upon known material deflection at 73°F and at a specified load. Parker recommends a factor of safety, FS, of at least 3 to account for changes in physical properties due to increases in system temperature. If additional assistance is required, please contact Parker or your authorized distributor.

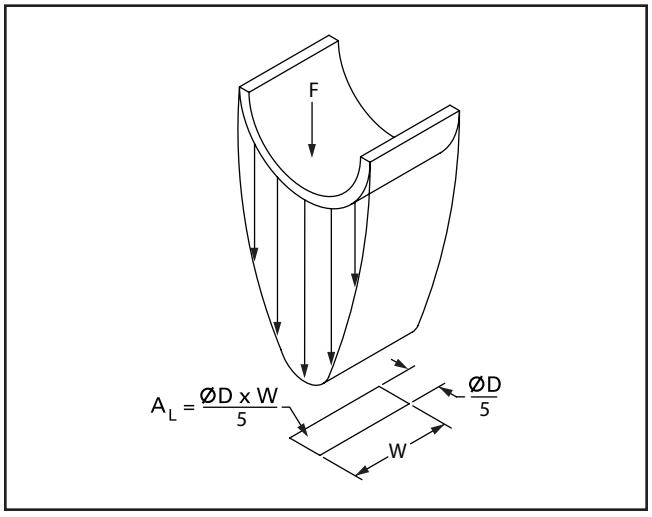

Figure 9-3: Load distribution of radial force, F, and effective load area, A_L

What about fluid compatibility and wear rings?

MolyGard® and WearGard™ compounds are compatible with petroleum-based hydraulic fluids, transmission fluids, phosphate esters, and many other fluids. PTFE compounds 0401, 0307, and others have outstanding chemical compatibility with a wide range of fluids. Please contact Parker for specific inquiries.

How does moisture affect wear rings?

Due to nylon's inherent swelling in water, it is recommended that WearGard and MolyGard not be used in applications where water or moisture is present. Filled PTFE compounds or other alternative materials such as polyacetal and composite resins are recommended in such scenarios and are available from Parker.

Where should the wear ring be installed relative to the seals?

Wear rings should always be installed on the lubrication (wet) side of the seal for best performance. For rod glands, the wear ring should be on the pressure side of the rod seal. For pistons, if only one bearing is to be used, it should be on the side of the piston opposite the rod. This arrangement keeps the piston wear ring further away from the rod wear ring. This becomes critical when the rod is at full extension and provides better leveraging of the two bearing surfaces.

Which end cut should be used?

There are three types of end cuts available: butt cut, angle cut (skive cut) and step cut. The butt cut is the most common and most economical cut. Angle cuts and step cuts provide added performance by ensuring bearing area overlap at the wear ring's gap. In certain applications, step cut wear rings can be used as buffer seals, protecting the seal from pressure spikes. Figure 9-4 illustrates these options.

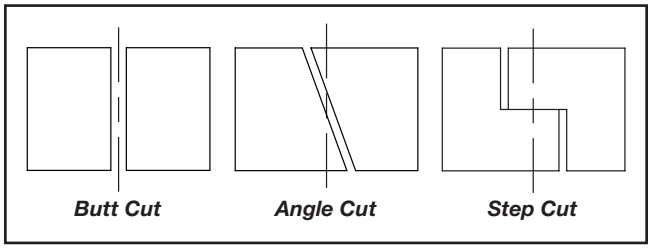

Figure 9-4: End cuts

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Parker Wear Ring / Bearing Materials

Parker's material offering for wear ring and bearing materials materials is anchored by over 50 years of manufacturing and material science expertise. We have specifically engineered our W4733 WearGard™ for strength to meet or exceed the characteristics of many metals which have traditionally been used in wear rings.

While many compounds are available, the most commonly used bearing materials are WearGard and filled PTFE.

Parker also offers other engineered bearing materials for specialized applications demanding higher temperatures and sideloads. Parker's W4738 UltraComp™ CGT (PEEK) provides high temperature bearing performance up to 500°F. Composite, fabric-reinforced resins are also available to accommodate sideloads far more severe than glass-loaded nylon compounds can withstand. Composite resins also resist moisture swell in water-glycol emulsions and other water-based fluids. Polyacetal, nylons, molybdenum disulfide, and many different PTFE filler combinations are also available for specialized applications. Please contact Parker or your authorized distributor for assistance in selecting alternative bearing materials.

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Table 9-3. Physical and Mechanical Properties of Engineered Plastics

Property	Unit	W4733	W4738	Test Method
		WearGard™ 35% Glass-Reinforced Nylon	UltraCOMP™ CGT (PEEK®) Carbon-, Graphite-, PTFE-filled	
Compressive Strength, *q*	psi	21500	21700	ASTM D695, 73°F
Tensile Strength	psi	18300	20400	ASTM D638, 73°F
Tensile Modulus	Kpsi	899	—	ASTM D638, 73°F
Shear Strength	psi	9820	—	ASTM D732, 73°F
Flexural Strength	psi	25500	33400	ASTM D790, 73°F
Flexural Modulus	Kpsi	1100	1175	ASTM D790, 73°F
Notched IZOD Impact Strength	Ft-Lbs/in	1.15	1.69	ASTM D256, 73°F
Deformation Under Load	%	0.40	—	ASTM D621, 24 hrs @ 4000 psi, 73°F
Water Absorption	%	0.50 to 0.70	0.06	24 hour immersion, ASTM D570, 73°F
Temperature Range	°F	-65 to +275	-65 to +500	—
Rockwell Hardness	M Scale	87	100	ASTM D785
	R Scale	117	—	ASTM D785

Table 9-4. Physical and Mechanical Properties of PTFE Compounds

Property	Unit	0401	0307	Test Method
		40% Bronze-Filled PTFE	23% Carbon-, 2% Graphite-Filled PTFE	
Compressive Strength, *q*	psi	9400	3600	ASTM D695, 73°F
Tensile Strength	psi	3200	2250	ASTM D1457-81A
Elongation	%	250	100	ASTM D4894
Deformation Under Load	%	4.4	2.5	ASTM D621, 24 hrs @ 2000 psi, 70°F
Coefficient of Friction	—	0.18 - 0.22	0.08 - 0.11	ASTM D3702
Temperature Range	°F	-200 to +575	-360 to +575	—
Shore D Hardness	—	63	64	ASTM D2240-75

Table 9-5. Physical and Mechanical Properties of Composite Fabric-Reinforced Resins

Property	Unit	0810	0811	0812	0813	Test Method
		Standard Polyester Based with PTFE	Graphite-Filled Polyester Based	MoS_2- Filled Polyester Based	PTFE-Filled Polyester Based	
Compressive Strength, *q*	psi	50000	50000	50000	50000	ASTM D695, 73°F
Tensile Strength	psi	11000	11000	11000	11000	ASTM D638, 73°F
Tensile Modulus	Kpsi	500	500	500	500	ASTM D638, 73°F
Coefficient of Friction	—	0.13 - 0.20	0.15 - 0.20	0.15 - 0.20	0.13 - 0.20	ASTM D790, 73°F
Water Absorption	%	0.1	0.1	0.1	0.1	24 hour immersion, ASTM D570, 73°F
Temperature Range	°F	-40 to +200	-40 to +200	-40 to +400	-40 to +400	—
Rockwell M Hardness	—	100	100	100	100	ASTM D785

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Wear Ring / Bearing
WPT Profile ♦ Preferred Profile

WPT Profile, Tight-Tolerance Piston Wear Ring

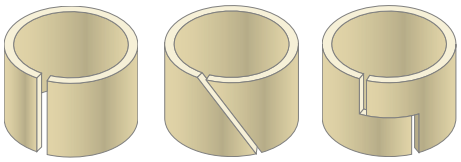
WPT profile tight-tolerance piston wear rings are the premier bearings for light- to heavy-duty hydraulic applications. WPT profile wear rings are available in standard sizes from 1" up to 12" bore diameters (larger sizes upon request). WPT profile wear rings feature chamfered corners on the I.D. and are designed to snap closed during assembly to hold tight against the piston, eliminating bore interference and simplifying installation.

Technical Data

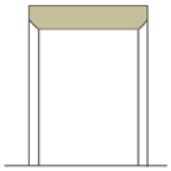
Standard Material
W4733 WearGard™

Radial Tolerance
+.000"/ -.002" (up to 6" O.D.); +.000/-.003" (6" to 12" O.D.)

End Cuts
Butt Cut, Angle Cut (Skive Cut), Step Cut

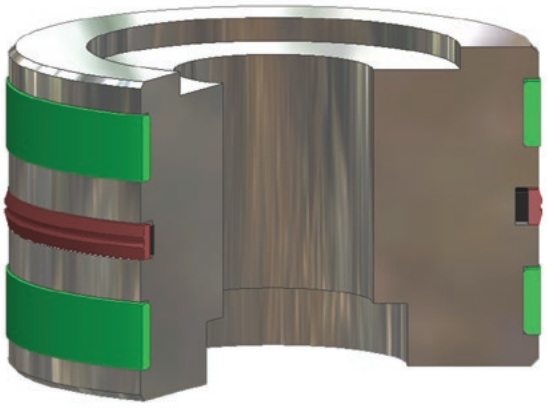


Butt Cut *Angle Cut* *Step Cut*



WPT Cross-Section

Options
Virtually any width can be produced without assessing a setup charge. Additionally, other cross-sections not shown are available when required.



Piston sealing system comprised of WPT wear rings and BP bi-directional piston seal

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Part Number Nomenclature — WPT Profile

Table 9-6. WPT Profile

4	7	3	3	WPT	1	2	5	–	0	4	0	0	0	–	0	5	0	0				

Material
4 Digit Material Code
Example:
4733 = WearGard™
(4733 only for WPT)

Profile

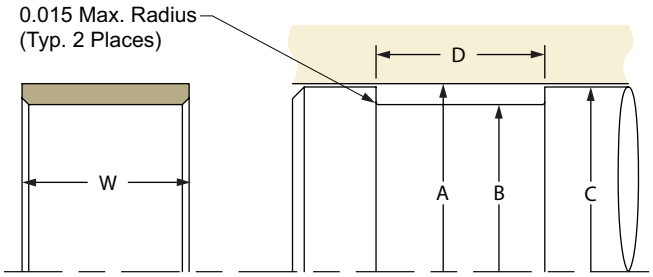
Max. Cross-Section
Example: 125 = 1/8"

Nominal Bore Diameter
(A) (x1000)
Example:
4.000" X 1000 = 04000

Nominal Width (W) (x1000)
Example: 0.500" X 1000 = 0500
(0125 to 2000 or larger)

End Cut
Example:
Blank = Butt Cut
($KIV, $TEP)

Gland Dimensions — WPT Profile



Please refer to Engineering Section 2, page 2-8 for surface finish and additional hardware considerations.

Table 9-7. WPT Profile — Piston Gland Calculation

A Bore Diameter		B Groove Diameter		C Piston Diameter		D Groove Width
Range	Tol.	Calculation	Tol.	Calculation	Tol.	Calculation
.125 Cross Section						
1.000 - 4.875	+.002/-.000	Dia. A - .251	+.000/-.002	Dia. A - .017	+.000/-.002	D = W + 0.010
5.000 - 7.500	+.004/-.000	Dia. A - .251	+.000/-.003	Dia. A - .018	+.000/-.003	D = W + 0.010
7.500 - 12.000	+.006/-.000	Dia. A - .251	+.000/-.004	Dia. A - .021	+.000/-.004	D = W + 0.010
.062 Cross Section						
0.875 - 5.625	+.002/-.000	Dia. A - .125	+.000/-.002	Dia. A - .017	+.000/-.002	D = W + 0.010

For custom groove calculations, see Appendix C.

NOTE: For sizes larger than those shown in the table, please contact your local Parker representative.

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Gland Dimensions — WPT Profile

Table 9-8. WPT Profile — Piston Gland Dimensions, ♦Parker Standard Sizes

Hardware Dimensions				Part Number
A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	
+.002/-.000	+.000/-.002	+.000/-.002	+.010/-.000	
1.000	0.875	0.983	D = W + 0.010	4733WPT062-01000-XXXX
1.125	1.000	1.108	D = W + 0.010	4733WPT062-01125-XXXX
1.250	1.125	1.233	D = W + 0.010	4733WPT062-01250-XXXX
1.375	1.250	1.358	D = W + 0.010	4733WPT062-01375-XXXX
1.500	1.375	1.483	D = W + 0.010	4733WPT062-01500-XXXX
1.625	1.500	1.608	D = W + 0.010	4733WPT062-01625-XXXX
1.750	1.625	1.733	D = W + 0.010	4733WPT062-01750-XXXX
1.875	1.750	1.858	D = W + 0.010	4733WPT062-01875-XXXX
2.375	2.250	2.358	D = W + 0.010	4733WPT062-02375-XXXX
2.625	2.500	2.608	D = W + 0.010	4733WPT062-02625-XXXX
+.002/-.000	+.000/-.002	+.000/-.002	+.010/-.000	
1.000	0.749	0.983	D = W + 0.010	4733WPT125-01000-XXXX
1.125	0.874	1.108	D = W + 0.010	4733WPT125-01125-XXXX
1.250	0.999	1.233	D = W + 0.010	4733WPT125-01250-XXXX
1.375	1.124	1.358	D = W + 0.010	4733WPT125-01375-XXXX
1.500	1.249	1.483	D = W + 0.010	4733WPT125-01500-XXXX
1.625	1.374	1.608	D = W + 0.010	4733WPT125-01625-XXXX
1.750	1.499	1.733	D = W + 0.010	4733WPT125-01750-XXXX
1.875	1.624	1.858	D = W + 0.010	4733WPT125-01875-XXXX
+.002/-.000	+.000/-.002	+.000/-.002	+.010/-.000	
2.000	1.749	1.983	D = W + 0.010	4733WPT125-02000-XXXX
2.125	1.874	2.108	D = W + 0.010	4733WPT125-02125-XXXX
2.250	1.999	2.233	D = W + 0.010	4733WPT125-02250-XXXX
2.375	2.124	2.358	D = W + 0.010	4733WPT125-02375-XXXX
2.500	2.249	2.483	D = W + 0.010	4733WPT125-02500-XXXX
2.625	2.374	2.608	D = W + 0.010	4733WPT125-02625-XXXX
2.750	2.499	2.733	D = W + 0.010	4733WPT125-02750-XXXX
2.875	2.624	2.858	D = W + 0.010	4733WPT125-02875-XXXX
3.000	2.749	2.983	D = W + 0.010	4733WPT125-03000-XXXX
3.125	2.874	3.108	D = W + 0.010	4733WPT125-03125-XXXX
3.250	2.999	3.233	D = W + 0.010	4733WPT125-03250-XXXX
3.375	3.124	3.358	D = W + 0.010	4733WPT125-03375-XXXX
3.500	3.249	3.483	D = W + 0.010	4733WPT125-03500-XXXX
3.625	3.374	3.608	D = W + 0.010	4733WPT125-03625-XXXX
3.750	3.499	3.733	D = W + 0.010	4733WPT125-03750-XXXX
3.875	3.624	3.858	D = W + 0.010	4733WPT125-03875-XXXX
3.937	3.687	3.920	D = W + 0.010	4733WPT125-03937-XXXX

Above table reflects recommended cross-sections for bore diameters shown. Alternate cross-sections and additional sizes may be considered. Consult www.parker.com/eps/FluidPower for additional cross-sections and sizes, hardware specifications, and part number availability. Contact your Parker representative for assistance.

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Gland Dimensions — WPT Profile

Table 9-8. WPT Profile — Piston Gland Dimensions, ♦Parker Standard Sizes (cont'd)

Hardware Dimensions				Part Number
A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	
4.000	3.749	3.983	D = W + 0.010	4733WPT125-04000-XXXX
4.125	3.874	4.108	D = W + 0.010	4733WPT125-04125-XXXX
4.250	3.999	4.233	D = W + 0.010	4733WPT125-04250-XXXX
4.375	4.124	4.358	D = W + 0.010	4733WPT125-04375-XXXX
4.500	4.249	4.483	D = W + 0.010	4733WPT125-04500-XXXX
4.625	4.374	4.608	D = W + 0.010	4733WPT125-04625-XXXX
4.750	4.499	4.733	D = W + 0.010	4733WPT125-04750-XXXX
4.875	4.624	4.858	D = W + 0.010	4733WPT125-04875-XXXX
+.004/-.000	**+.000/-.003**	**+.000/-.003**	**+.010/-.000**	
5.000	4.749	4.982	D = W + 0.010	4733WPT125-05000-XXXX
5.125	4.874	5.107	D = W + 0.010	4733WPT125-05125-XXXX
5.250	4.999	5.232	D = W + 0.010	4733WPT125-05250-XXXX
5.375	5.124	5.357	D = W + 0.010	4733WPT125-05375-XXXX
5.500	5.249	5.482	D = W + 0.010	4733WPT125-05500-XXXX
5.625	5.374	5.607	D = W + 0.010	4733WPT125-05625-XXXX
5.750	5.499	5.732	D = W + 0.010	4733WPT125-05750-XXXX
6.000	5.749	5.980	D = W + 0.010	4733WPT125-06000-XXXX
6.250	5.999	6.230	D = W + 0.010	4733WPT125-06250-XXXX
6.500	6.249	6.480	D = W + 0.010	4733WPT125-06500-XXXX
6.750	6.499	6.730	D = W + 0.010	4733WPT125-06750-XXXX
7.000	6.749	6.980	D = W + 0.010	4733WPT125-07000-XXXX
7.500	7.249	7.480	D = W + 0.010	4733WPT125-07500-XXXX
+.006/-.000	**+.000/-.004**	**+.000/-.004**	**+.010/-.000**	
8.000	7.749	7.979	D = W + 0.010	4733WPT125-08000-XXXX
8.500	8.249	8.479	D = W + 0.010	4733WPT125-08500-XXXX
+.006/-.000	**+.000/-.004**	**+.000/-.004**	**+.010/-.000**	
9.000	8.749	8.979	D = W + 0.010	4733WPT125-09000-XXXX
9.500	9.249	9.479	D = W + 0.010	4733WPT125-09500-XXXX
10.000	9.749	9.979	D = W + 0.010	4733WPT125-10000-XXXX
10.500	10.249	10.479	D = W + 0.010	4733WPT125-10500-XXXX
+.006/-.000	**+.000/-.004**	**+.000/-.004**	**+.010/-.000**	
11.000	10.749	10.979	D = W + 0.010	4733WPT125-11000-XXXX
11.500	11.249	11.479	D = W + 0.010	4733WPT125-11500-XXXX
12.000	11.749	11.979	D = W + 0.010	4733WPT125-12000-XXXX

Above table reflects recommended cross-sections for bore diameters shown. Alternate cross-sections and additional sizes may be considered. Consult www.parker.com/eps/FluidPower for additional cross-sections and sizes, hardware specifications, and part number availability. Contact your Parker representative for assistance.

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Wear Ring / Bearing
WRT Profile

WRT Profile, Tight-Tolerance Rod Wear Ring

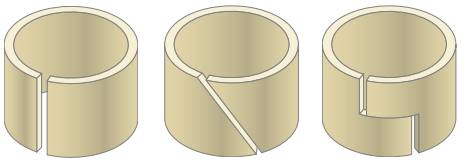
WRT profile tight-tolerance rod wear rings, when combined with the WPT profile, complete the premier cylinder bearing system. Recommended for light- to heavy-duty hydraulic applications, they are available in standard sizes from 7/8" up to 7" rod diameters (larger sizes upon request). WRT profile wear rings feature chamfered corners on the O.D. and are designed to snap open during assembly to hold tight against the head gland, eliminating rod interference and simplifying installation.

Technical Data

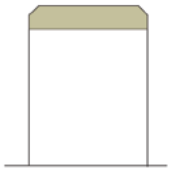
Standard Material
W4733 WearGard™

Radial Tolerance
+.000"/-.002" (up to 5-3/4" I.D.); +.000/-.003" (5-3/4" to 7" I.D.)

End Cuts
Butt Cut, Angle Cut (Skive Cut), Step Cut

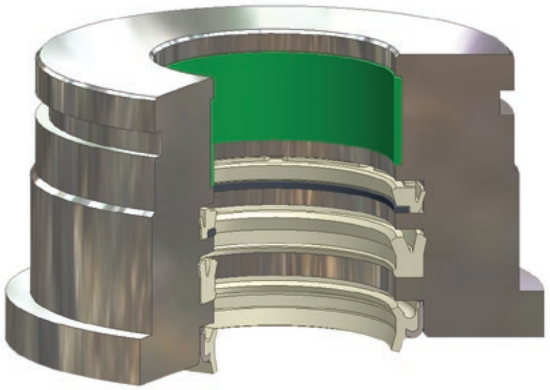


Butt Cut *Angle Cut* *Step Cut*



WRT Cross-Section

Options
Virtually any width can be produced without assessing a setup charge. Additionally, other cross-sections not shown are available when required.



Rod sealing system comprised of
WRT wear ring, BR buffer ring assembly, BT u-cup and AH canned wiper

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Part Number Nomenclature — WRT Profile

Table 9-9. WRT Profile

4	7	3	3	WRT	1	2	5	–	0	2	0	0	0	–	0	7	5	0				

Material
4 Digit Material Code
Example:
4733 = WearGard™
(4733 only for WRT)

Profile

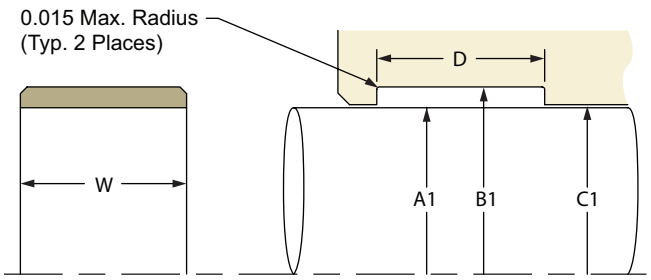
Max. Cross-Section
Example: 125 = 1/8"

Nominal Rod Diameter
(x1000) (A1)
Example:
2.000" X 1000 = 02000

Nominal Width (x1000) (W)
Example: 0.750" X 1000 = 0750
(0125 to 2000 or larger)

End Cut
Example:
Blank = Butt Cut
($KIV, $TEP)

Gland Dimensions — WRT Profile



Please refer to Engineering Section 2, page 2-8 for surface finish and additional hardware considerations.

Table 9-10. WRT Profile — Rod Gland Calculation

A1 Rod Diameter		B1 Groove Diameter		C1 Throat Diameter		D Groove Width
Range	**Tol.**	**Calculation**	**Tol.**	**Calculation**	**Tol.**	**Calculation**
.125 Cross Section						
.750-5.625	+.000/-.002	Dia. A + .251	+.002/-.000	Dia. A + .017	+.002/-.000	D = W + 0.010"
5.625-7	+.000/-.004	Dia. A + .251	+.003/-.000	Dia. A + .020	+.003/-.000	D = W + 0.010"
7-12	+.000/-.006	Dia. A + .251	+.004/-.000	Dia. A + .021	+.004/-.000	D = W + 0.010"
.062 Cross Section						
0.875 - 5.625	+.002/-.000	Dia. A + .125	+.002/-.000	Dia. A + .017	+.002/-.000	D = W + 0.010"

For custom groove calculations, see Appendix C.

NOTE: For sizes larger than those shown in the table, please contact your local Parker representative.

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Gland Dimensions — WRT Profile

Table 9-11. WRT Profile — Rod Gland Dimensions, ♦Parker Standard Sizes

Hardware Dimensions				Part Number
A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	
+.000/-.002	+.002/-.000	+.002/-.000	+.010/-.000	
0.875	1.000	0.892	D = W + 0.010	4733WRT062-00875-XXXX
1.000	1.125	1.017	D = W + 0.010	4733WRT062-01000-XXXX
1.125	1.250	1.142	D = W + 0.010	4733WRT062-01125-XXXX
1.250	1.375	1.267	D = W + 0.010	4733WRT062-01250-XXXX
1.375	1.500	1.392	D = W + 0.010	4733WRT062-01375-XXXX
1.500	1.625	1.517	D = W + 0.010	4733WRT062-01500-XXXX
1.625	1.750	1.642	D = W + 0.010	4733WRT062-01625-XXXX
1.750	1.875	1.767	D = W + 0.010	4733WRT062-01750-XXXX
2.250	2.375	2.267	D = W + 0.010	4733WRT062-02250-XXXX
2.500	2.625	2.517	D = W + 0.010	4733WRT062-02250-XXXX
+.000/-.002	+.002/-.000	+.002/-.000	+.010/-.000	
0.750	1.001	0.767	D = W + 0.010	4733WRT125-00750-XXXX
0.875	1.126	0.892	D = W + 0.010	4733WRT125-00875-XXXX
1.000	1.251	1.017	D = W + 0.010	4733WRT125-01000-XXXX
1.125	1.376	1.142	D = W + 0.010	4733WRT125-01125-XXXX
1.250	1.501	1.267	D = W + 0.010	4733WRT125-01250-XXXX
1.375	1.626	1.392	D = W + 0.010	4733WRT125-01375-XXXX
1.500	1.751	1.517	D = W + 0.010	4733WRT125-01500-XXXX
1.625	1.876	1.642	D = W + 0.010	4733WRT125-01625-XXXX
1.750	2.001	1.767	D = W + 0.010	4733WRT125-01750-XXXX
1.875	2.126	1.892	D = W + 0.010	4733WRT125-01875-XXXX
+.000/-.002	+.002/-.000	+.002/-.000	+.010/-.000	
2.000	2.251	2.017	D = W + 0.010	4733WRT125-02000-XXXX
2.125	2.376	2.142	D = W + 0.010	4733WRT125-02125-XXXX
2.250	2.501	2.267	D = W + 0.010	4733WRT125-02250-XXXX
2.375	2.626	2.392	D = W + 0.010	4733WRT125-02375-XXXX
2.500	2.751	2.517	D = W + 0.010	4733WRT125-02500-XXXX
2.625	2.876	2.642	D = W + 0.010	4733WRT125-02625-XXXX
2.750	3.001	2.767	D = W + 0.010	4733WRT125-02750-XXXX
2.875	3.126	2.892	D = W + 0.010	4733WRT125-02875-XXXX
3.000	3.251	3.017	D = W + 0.010	4733WRT125-03000-XXXX
3.125	3.376	3.142	D = W + 0.010	4733WRT125-03125-XXXX
3.250	3.501	3.267	D = W + 0.010	4733WRT125-03250-XXXX
3.375	3.626	3.392	D = W + 0.010	4733WRT125-03375-XXXX
3.500	3.751	3.517	D = W + 0.010	4733WRT125-03500-XXXX
3.625	3.876	3.642	D = W + 0.010	4733WRT125-03625-XXXX
3.750	4.001	3.767	D = W + 0.010	4733WRT125-03750-XXXX

Above table reflects recommended cross-sections for rod diameters shown. Alternate cross-sections and additional sizes may be considered. Consult www.parker.com/eps/FluidPower for additional cross-sections and sizes, hardware specifications, and part number availability. Contact your Parker representative for assistance.

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Gland Dimensions — WRT Profile

Table 9-11. WRT Profile — Rod Gland Dimensions, ♦Parker Standard Sizes (cont'd)

Hardware Dimensions				Part Number
A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	
+.000/-.002	+.002/-.000	+.002/-.000	+.010/-.000	
3.875	4.126	3.892	D = W + 0.010	4733WRT125-03875-XXXX
3.937	4.188	3.954	D = W + 0.010	4733WRT125-03937-XXXX
4.000	4.251	4.017	D = W + 0.010	4733WRT125-04000-XXXX
4.125	4.376	4.142	D = W + 0.010	4733WRT125-04125-XXXX
4.250	4.501	4.267	D = W + 0.010	4733WRT125-04250-XXXX
4.375	4.626	4.392	D = W + 0.010	4733WRT125-04375-XXXX
4.500	4.751	4.517	D = W + 0.010	4733WRT125-04500-XXXX
4.625	4.876	4.642	D = W + 0.010	4733WRT125-04625-XXXX
4.750	5.001	4.767	D = W + 0.010	4733WRT125-04750-XXXX
4.875	5.126	4.892	D = W + 0.010	4733WRT125-04875-XXXX
5.000	5.251	5.017	D = W + 0.010	4733WRT125-05000-XXXX
5.125	5.376	5.142	D = W + 0.010	4733WRT125-05125-XXXX
5.250	5.501	5.267	D = W + 0.010	4733WRT125-05250-XXXX
5.375	5.626	5.392	D = W + 0.010	4733WRT125-05375-XXXX
5.500	5.751	5.517	D = W + 0.010	4733WRT125-05500-XXXX
5.625	5.876	5.642	D = W + 0.010	4733WRT125-05625-XXXX
+.000/-.004	+.003/-.000	+.003/-.000	+.010/-.000	
5.750	6.001	5.770	D = W + 0.010	4733WRT125-05750-XXXX
6.000	6.251	6.020	D = W + 0.010	4733WRT125-06000-XXXX
6.250	6.501	6.270	D = W + 0.010	4733WRT125-06250-XXXX
6.500	6.751	6.520	D = W + 0.010	4733WRT125-06500-XXXX
6.750	7.001	6.770	D = W + 0.010	4733WRT125-06750-XXXX
7.000	7.251	7.020	D = W + 0.010	4733WRT125-07000-XXXX

Above table reflects recommended cross-sections for rod diameters shown. Alternate cross-sections and additional sizes may be considered. Consult www.parker.com/eps/FluidPower for additional cross-sections and sizes, hardware specifications, and part number availability. Contact your Parker representative for assistance.

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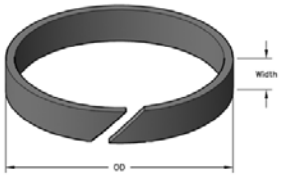
SIGNAL
INDUSTRIAL
PRODUCTS
CORPORATION

Signal Style CT Close Tolerance Wear Rings



Signal Industrial Products Style CT tight tolerance premium wear rings are manufactured from a highly engineered blend of premium nylon, glass fiber, and PTFE, that offers a high strength wear-ring for all cylinder applications, including those with minimal lubrication. The coefficient of friction is nearly 50% lower than standard glass filled products. Cylinders will run smoother and more efficiently than ever. These wear rings are fully machined with cross-section tolerances of only ±0.001”, chamfered corners, and angle-cut end gaps. Compared to standard tolerances of±0.0025”, this tightened tolerance improves the alignment and concentric operation of cylinder rods and pistons. The fully machined chamfered corners will better accommodate cylinder housing grooves, further improving piston and rod alignment. Lastly the scarf-cut end gap reduces the loss of bearing support that may occur during cylinder side-loading. When combined, these features reduce the tolerance stack-up within the components of the cylinder. As a result, your cylinders will operate more consistently and be capable of operarating at higher pressures and higher side loads than standard wear-ring products. Furthermore, with this improved cylinder operation, your seals will last longer and the life of your cylinder will be extended. These are available in all popular dimensions.

TEMPERATURERANGE -40° TO +275° \F
TENSILE STRENGTH 20,000 PSI
FLEXURAL STRENGTH 34,000 PSI
COMPRESSIVE STRENGTH 20,000 PSI

1601 Cowart Street - Chattanooga, TN 37408 - Phone 423-756-4980

6210 Enterprise Drive - Knoxville, TN 37909 - Phone 865-584-6175

213 Omohundro Place - Nashville, TN 37210 - Phone 615-254-0753

2046 Beltline Road S.W. - Suite 3 - Decatur, AL 35601 - Phone 256-355-0077

Wear Ring / Bearing
PDT Profile

PDT Profile, PTFE Wear Strip for Rod and Piston

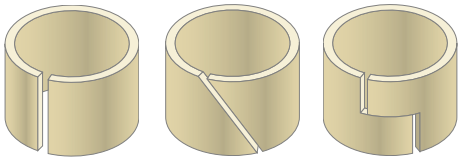
PDT profile wear strip is available in a variety of PTFE blends and provides excellent low-friction performance in pneumatics and light-duty hydraulics. PDT profile wear strip is available in cut-to-length versions as well as bulk strip. Cut-to-length part numbers reduce prep time by providing precision end cuts and ready-to-install diameters. Bulk strip offers versatility and reduces part number inventory by providing universal sizing in one part number.

Technical Data

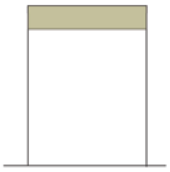
Standard Material
0401 – 40% Bronze-Filled PTFE
0307 – 23% Carbon, 2% Graphite-Filled PTFE
Others available upon request

Radial Tolerance
+.000"/-.004"

End Cuts
Butt Cut, Angle Cut (Skive Cut), Step Cut

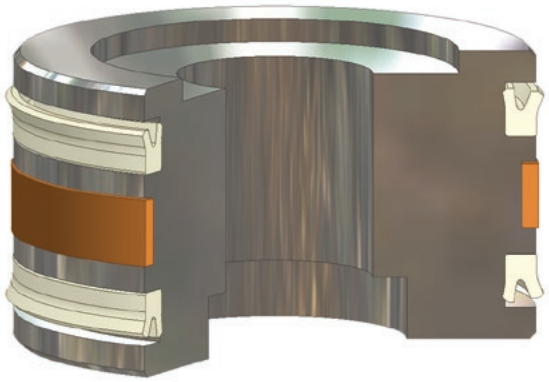


Butt Cut *Angle Cut* *Step Cut*

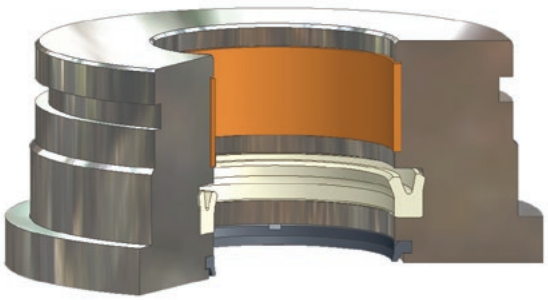


PDT Cross-Section

Options
Virtually any width, diameter and cross-section can be produced without assessing a setup charge.



Piston sealing system comprised of PDT wear strip and B7 piston u-cups



Rod sealing system comprised of PDT wear strip, B3 rod u-cup and SH959 wiper

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Part Number Nomenclature — PDT Profile

Table 9-12. PDT Profile — Cut-to-Length

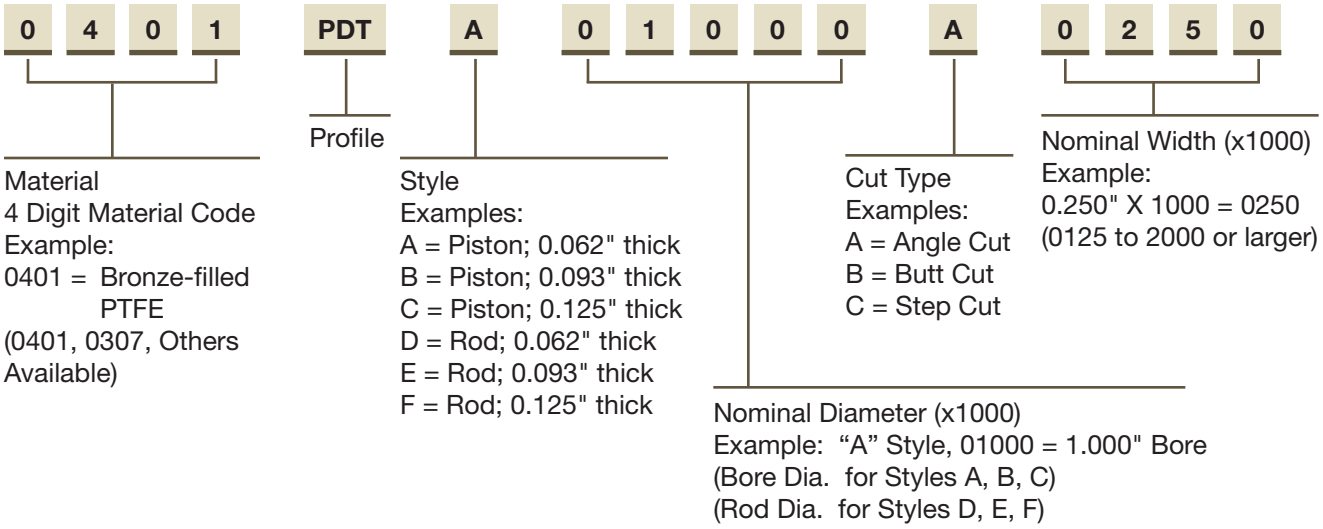
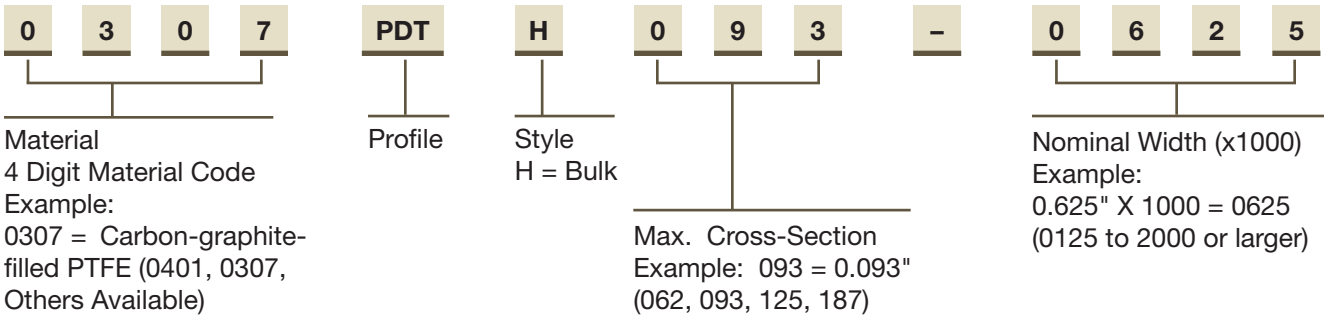


Table 9-13. PDT Profile — Bulk Strip



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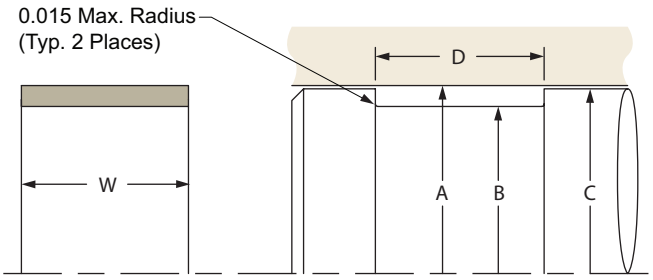
Gland Dimensions — PDT Profile, Piston (Cut-To-Length)



Please refer to Engineering Section 2, page 2-8 for surface finish and additional hardware considerations.

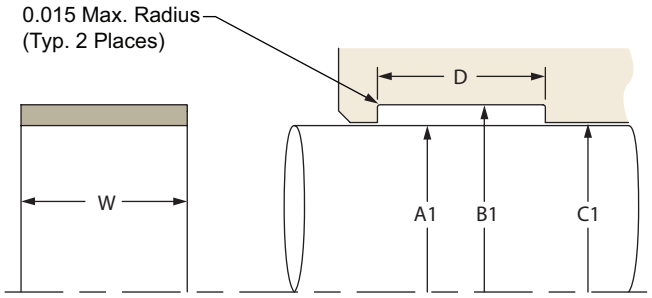
Table 9-14. PDT Profile — Piston Gland Calculation (Cut-to-Length)

Style (Thickness)	A Bore Diameter		B Groove Diameter		C Piston Diameter		D Groove Width
	Range	Tol	Calculation	Tol.	Calculation	Tol.	
A (.062)	1.000 - 2.000	+.002/-.000	Dia. A - .125	+.000/-.002	Dia. A - .021	+.000/-.002	D = W + .010
B (.093)	1.500 - 4.875	+.002/-.000	Dia. A - .187	+.000/-.002	Dia. A - .021	+.000/-.002	D = W + .010
	5.000 - 7.750	+.004/-.000	Dia. A - .187	+.000/-.003	Dia. A - .022	+.000/-.003	D = W + .010
	8.000 - 10.000	+.006/-.000	Dia. A - .187	+.000/-.004	Dia. A - .023	+.000/-.004	D = W + .010
C (.125)	2.000 - 4.875	+.002/-.000	Dia. A - .251	+.000/-.002	Dia. A - .021	+.000/-.002	D = W + .010
	5.000 - 7.750	+.004/-.000	Dia. A - .251	+.000/-.003	Dia. A - .022	+.000/-.003	D = W + .010
	8.000 - 16.000	+.006/-.000	Dia. A - .251	+.000/-.004	Dia. A - .023	+.000/-.004	D = W + .010

For custom groove calculations, see Appendix C.

NOTE: For sizes larger than those shown in the table, please contact your local Parker Seal representative.

Gland Dimensions — PDT Profile, Rod (Cut-To-Length)



Please refer to Engineering Section 2, page 2-8 for surface finish and additional hardware considerations.

Table 9-15. PDT Profile — Rod Gland Calculation (Cut-to-Length)

Style (Thickness)	A1 Rod Diameter		B1 Groove Diameter		C1 Throat Diameter		D Groove Width
	Range	Tol	Calculation	Tol.	Calculation	Tol.	
D (.062)	0.875 - 2.000	+.000/-.002	Dia. A + .125	+.002/-.000	Dia. A - .021	+.002/-.000	D = W + .010
E (.093)	1.500 - 5.000	+.000/-.002	Dia. A + .187	+.002/-.000	Dia. A - .021	+.002/-.000	D = W + .010
F (.125)	1.500 - 3.125	+.000/-.002	Dia. A + .187	+.002/-.000	Dia. A - .022	+.002/-.000	D = W + .010
	3.250 - 4.625	+.000/-.002	Dia. A + .251	+.002/-.000	Dia. A - .023	+.002/-.000	D = W + .010
	4.750 - 7.500	+.000/-.004	Dia. A + .251	+.002/-.000	Dia. A - .021	+.002/-.000	D = W + .010
	7.500 -10.000	+.000/-.006	Dia. A + .251	+.003/-.000	Dia. A - .022	+.003/-.000	D = W + .010

For custom groove calculations, see Appendix C.

NOTE: For sizes larger than those shown in the table, please contact your local Parker Seal representative.

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PDT Bulk Strip

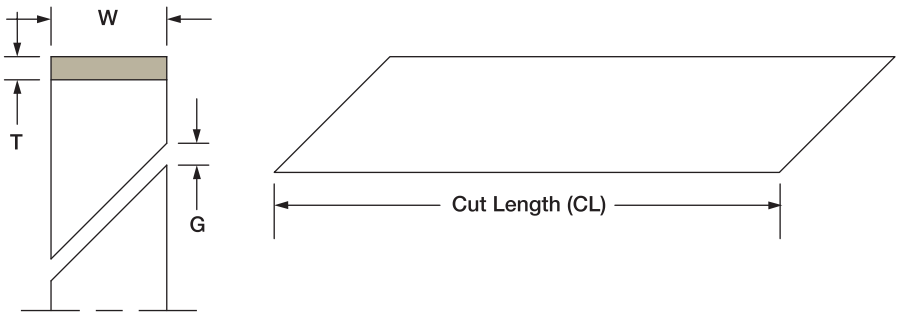


Table 9-16. PDT Bulk Strip Sizes

T Radial Cross-Section	W Width
0.062	0.250
	0.375
	0.500
	0.625
0.093	0.250
	0.375
	0.500
	0.625
0.125	0.250
	0.375
	0.500
	0.625
	0.750
	1.000

Table 9-17. Recommended Cutting Instructions

Rod or Bore Diameter	G Minimum Gap	CL ± Tolerance for Cut Length
0.500 - 1.750	0.075	± .010
1.751 - 3.125	0.140	± .016
3.126 - 4.000	0.175	± .024
4.001 - 5.000	0.230	± .032
5.001 - 6.000	0.260	± .040
6.001 - 7.000	0.320	± .047
7.001 - 8.500	0.380	± .055
8.501 - 10.500	0.480	± .063
10.501 - 13.000	0.620	± .071
13.001 - 16.000	0.750	± .079

NOTE: For sizes larger than those shown in the tables, please contact your local Parker representative.

Formula for Calculating Cut Length, CL

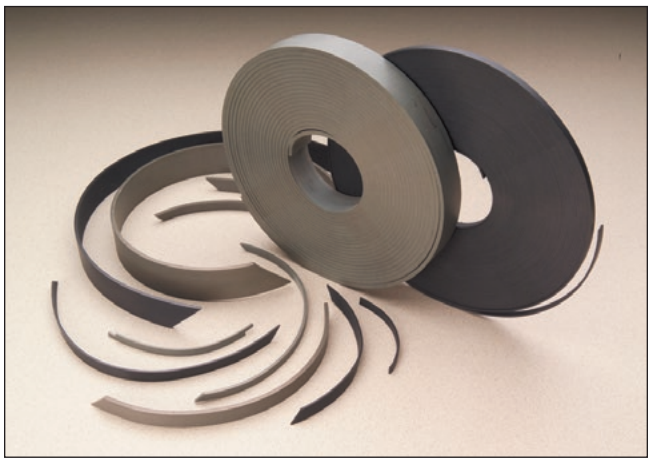
To calculate groove dimensions, use the values for "T" and "G" shown in Tables 9-16 and 9-17 in the following formulas for cut-to-length PDT strip.

For Pistons:

$$CL = [(Bore\ Diameter - T) \times \pi] - G$$

For Rods:

$$CL = [(Rod\ Diameter + T) \times \pi] - G$$



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Wear Ring / Bearing
PDW Profile

PDW Profile, Machined Wear Ring for Rod and Piston

PDW profile wear rings are precision machined PTFE bearings, lathe cut to exact size and shape. PDW profile wear rings offer precise fitting and easy installation. The wide range of available PTFE blends gives these machined wear rings versatility to accommodate any pneumatic or light-duty hydraulic application requiring low friction and high temperature capabilities.

Technical Data

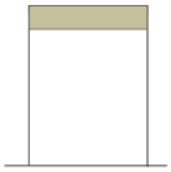
Standard Material
0401 – 40% Bronze-Filled PTFE
0307 – 23% Carbon, 2% Graphite-Filled PTFE

Alternate Materials (Composite Fabric-Reinforced Resins)
0810 – Standard Polyester-based with PTFE
0811 - Graphite-filled Polyester Based
0812 - MoS_2-filled Polyester Based
0813 - PTFE-Filled Polyester Based

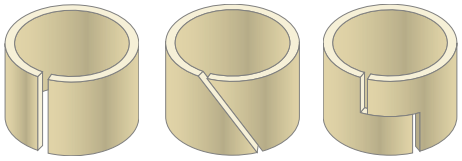
Additional materials available upon request.

Radial Tolerance
+.000"/-.004"

End Cuts
Butt Cut, Angle Cut (Skive Cut), Step Cut

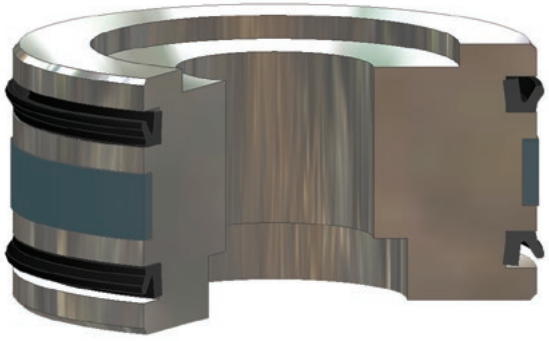


PDW Cross-Section

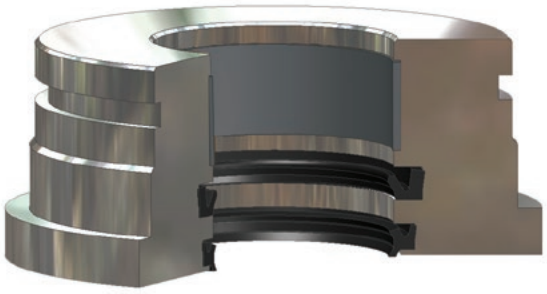


Butt Cut *Angle Cut* *Step Cut*

Options
Virtually any width, diameter and cross-section can be produced without assessing a setup charge.



Piston sealing system comprised of PDW machined wear rings and E4 piston u-cups



Rod sealing system comprised of PDW machined wear ring, E5 u-cup and 8600 wiper

06/01/2014

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Part Number Nomenclature — PDW Profile

Table 9-18. PDW Profile

0	4	0	1	PDW	C	0	4	5	0	0	B	0	5	0	0

Material
4 Digit Material Code
Example:
0401 = Bronze-filled PTFE
(0401, 0307, Others Available)

Profile

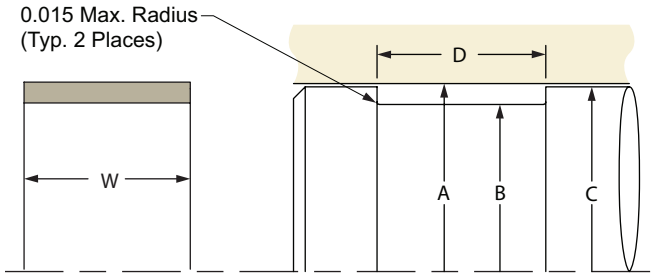
Wear Ring Radial Cross-Section Style
Examples:
A = Piston; 0.062" thick
B = Piston; 0.093" thick
C = Piston; 0.125" thick
D = Rod; 0.062" thick
E = Rod; 0.093" thick
F = Rod; 0.125" thick

Nominal Diameter (x1000)
Example: "C" Style, 04500 = 4.500"
Bore
(Bore Dia. for Styles A, B, C)
(Rod Dia. for Styles D, E, F)

Cut Type
Examples:
A = Angle Cut
B = Butt Cut
C = Step Cut

Wear Ring Nominal Width (W) (x1000)
Example:
0.500" X 1000 = 0500
(0125 to 2000 or larger)

Gland Dimensions — PDW Profile, Piston



Please refer to Engineering Section 2, page 2-8 for surface finish and additional hardware considerations.

Table 9-19. PDW Profile — Piston Gland Calculation

Style (Thickness)	A Bore Diameter		B Groove Diameter		C Piston Diameter		D Groove Width
	Range	Tol	Calculation	Tol.	Calculation	Tol.	
A (.062)	0.687 - 2.000	+.002/-.000	Dia. A - .125	+.000/-.002	Dia. A - .021	+.000/-.002	D = W + .010
B (.093)	1.500 - 4.999	+.002/-.000	Dia. A - .187	+.000/-.002	Dia. A - .021	+.000/-.002	D = W + .010
	5.000 - 7.999	+.004/-.000	Dia. A - .187	+.000/-.003	Dia. A - .022	+.000/-.003	D = W + .010
	8.000 - 10.000	+.006/-.000	Dia. A - .187	+.000/-.004	Dia. A - .023	+.000/-.004	D = W + .010
C (.125)	2.000 - 4.999	+.002/-.000	Dia. A - .251	+.000/-.002	Dia. A - .021	+.000/-.002	D = W + .010
	5.000 - 7.999	+.004/-.000	Dia. A - .251	+.000/-.003	Dia. A - .022	+.000/-.003	D = W + .010
	8.000 - 16.000	+.006/-.000	Dia. A - .251	+.000/-.004	Dia. A - .023	+.000/-.004	D = W + .010

For custom groove calculations, see Appendix C.

NOTE: For sizes larger than those shown in the table, please contact your local Parker representative.

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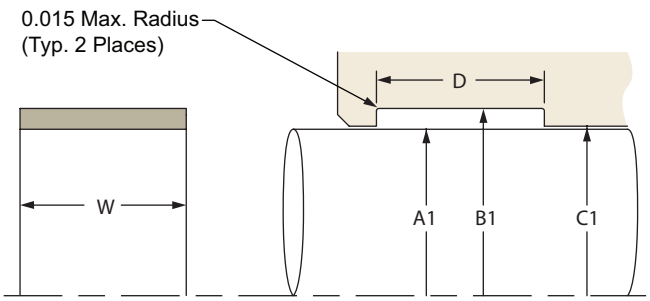
Gland Dimensions — PDW Profile, Rod



Please refer to Engineering Section 2, page 2-8 for surface finish and additional hardware considerations.

Table 9-20. PDW Profile — Rod Gland Calculation

Style (Thickness)	A1 Rod Diameter		B1 Groove Diameter		C1 Throat Diameter		D Groove Width
	Range	Tol.	Calculation	Tol.	Calculation	Tol.	
D (.062)	0.312 - 2.000	+.000/-.002	Dia. A + .125	+.002/-.000	Dia. A + .017	+.002/-.000	D = W + .010
E (.093)	1.500 - 5.000	+.000/-.002	Dia. A + .187	+.002/-.000	Dia. A + .021	+.002/-.000	D = W + .010
F (.125)	1.500 - 3.125	+.000/-.002	Dia. A + .187	+.002/-.000	Dia. A + .021	+.002/-.000	D = W + .010
	3.250 - 4.625	+.000/-.002	Dia. A + .251	+.002/-.000	Dia. A + .021	+.002/-.000	D = W + .010
	4.750 - 7.500	+.000/-.004	Dia. A + .251	+.003/-.000	Dia. A + .022	+.003/-.000	D = W + .010
	7.500 - 10.000	+.000/-.006	Dia. A + .251	+.004/-.000	Dia. A + .023	+.004/-.000	D = W + .010

For custom groove calculations, see Appendix C.

NOTE: For sizes larger than those shown in the table, please contact your local Parker representative.

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