Wear Rings / Bearings

Catalog EPS 5276/USA

WEAR RINGS / BEARINGS

anything Parker Possible™

WARNING:

Failure, improper selection or improper use of the products and/or systems described herein or related items can cause death, personal injury or property damage.

For safe and trouble-free use of these products, it is important that you read and follow the Parker Seal Group Product Safety Guide. This Safety Guide can be referenced and downloaded free of charge at www.parkerseals.com and can be ordered, without charge, as Parker Publication No. PSG 5004 by calling 1-800-C-PARKER.

This document, along with other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors, provides product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through his or her own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

OFFER OF SALE

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance are governed by the provisions stated on the separate page of this document entitled “Offer of Sale.”

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Salt Lake City, UT
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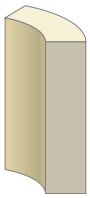
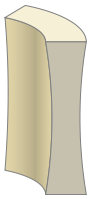
Fax: (801) 973-4019

Introduction

Contents



Parker's Precision-Manufactured Cross-Section



Conventional Net-Molded Cross-Section

Preventing metal-to-metal contact between moving components has never been easier or more economical.

Parker is pleased to offer a complete line of wear rings 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 economical value.

Quality Assurance

Parker's Engineered Polymer Systems Division is committed to providing customers with excellence in quality and service through continuous improvement of people, products and systems.

All Parker wear ring product lines are available from QS9000 certified operations in Salt Lake City, Utah and Elgin, Illinois. 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 at left 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*.

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Applications

Mobile Equipment — Heavy-Duty Hydraulics

- Construction Machinery
- Mining & Forestry Equipment
- Marine

Material Handling — Medium-Duty Hydraulics

- Agricultural Equipment
- Aerial Boom Lifts
- Forklifts
- Scissor Lifts

Industrial Cylinders — Light-Duty Hydraulics

- Industrial Cylinders
- Elevators
- Hydraulic Lifts

Pneumatic Applications

- Robotics
- Medical Devices
- Machine Tool Slideways

Features, Advantages and Benefits

Table 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 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	Increases cylinder life by helping to protect seals from contamination

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Product Selection Guide

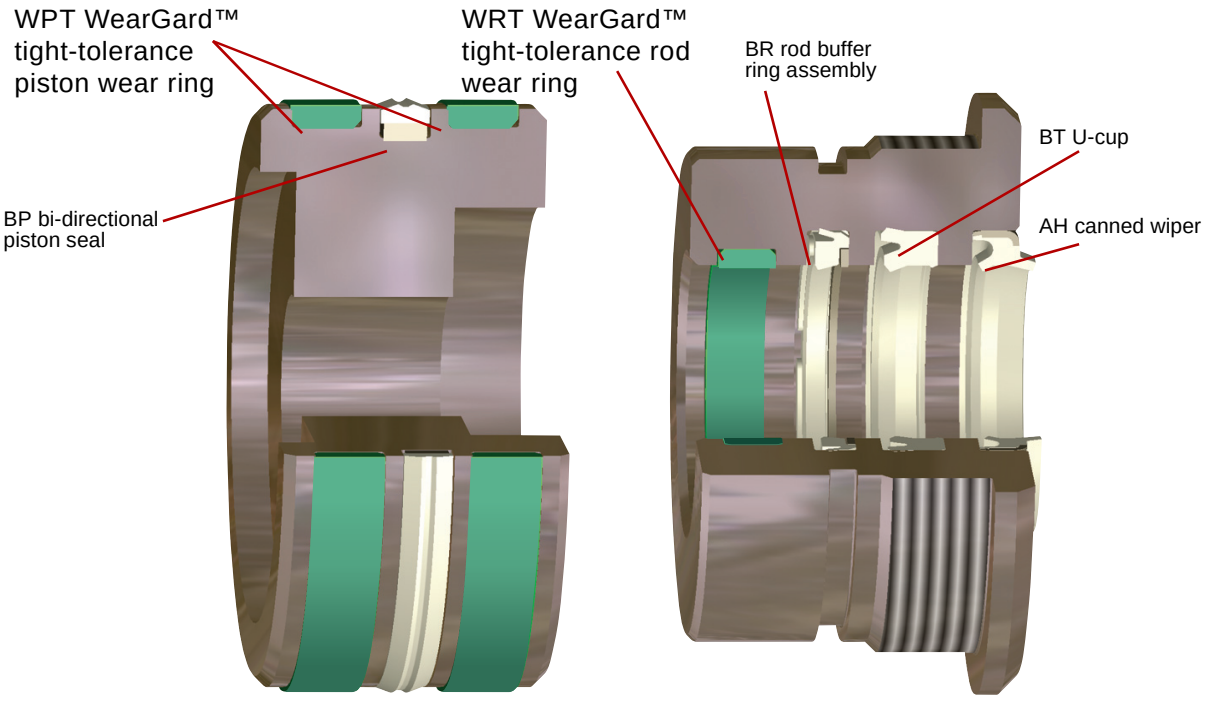
Table 2.

	Typical System Temperature	Typical System Pressure	Typical Sideloading	WPT	WRT	WN	PDT	PDW
Light Duty Hydraulic	150 °F	2500 psi	Light or Nonexistent	✔	✔	✔	✔	✔
Medium Duty Hydraulic	180 °F	3500 psi	Moderate	✔	✔	✔	—	—
Heavy Duty Hydraulic	220+ °F	5000+ psi	Heavy	✔	✔	—	—	—
Pneumatic	150 °F	120 psi	Light or Nonexistent	—	—	—	✔	✔

Sealing Systems

Parker's selection of products is the largest in the industry for hydraulic and pneumatic sealing systems, and our value-added services are unequalled.

Shown below is a complete sealing system featuring WearGard™ wear rings and Parker's premium Resilon™ rod, piston and wiper profiles.



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FAQs

There are many factors to consider when designing a system. Below is a list of the most frequently asked questions regarding bearing design and choosing the right wear ring.

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

A: 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 seals' 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 2**, on **Page 3**.

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

A: 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 seals' 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. See **Page 47** for additional information.

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 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.

Q: How is a proper bearing width selected?

A: When selecting a bearing width, it is crucial to evaluate the side loads that the bearings will have to withstand. **Figure 1** 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.

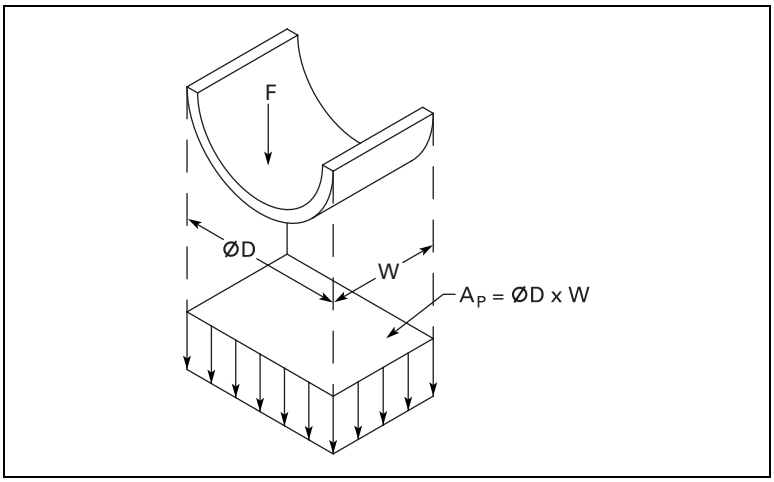

Figure 1. Total affected pressure area, A_P

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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 2**. The assumed load-bearing area, A_L, can be calculated as follows:

$$A_L = \frac{A_P}{5} = \frac{\varnothing D \times W}{5}$$

To calculate the allowable radial force, *F*, simply multiply the load-bearing area, A_L, by the permissible compressive load 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:

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

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:

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

Permissible compressive load, *q*, can be found in the material properties table on **Page 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.

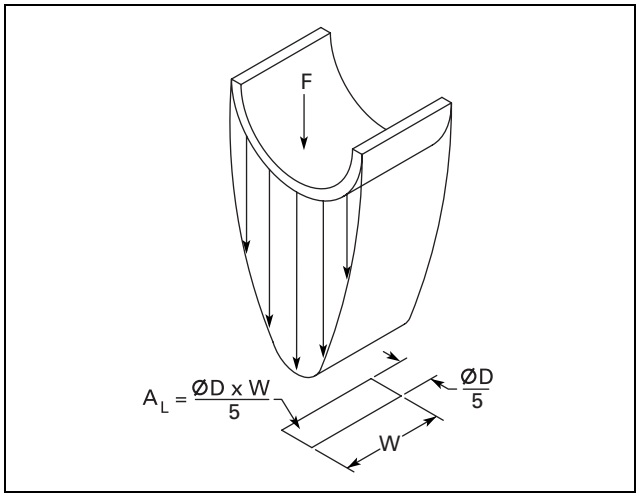

Figure 2. Load distribution of radial force, *F*, and effective load area, A_L

Q: What fluids are wear rings typically compatible with?

A: 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.

Q: How does moisture affect wear rings?

A: 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.

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

A: 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.

Q: Which end cut should be used?

A: There are three types of end cuts available: butt cut, angle 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 3** illustrates these three options.

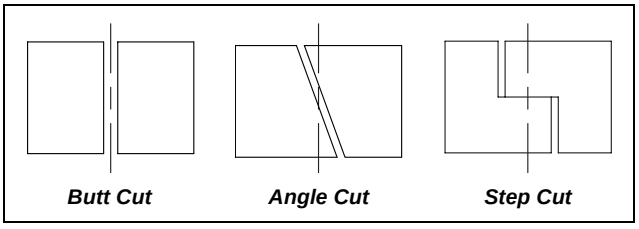

Figure 3. End Cuts

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Parker Bearing Materials

Parker bearing materials are backed by over 30 years of manufacturing expertise both in engineered hard plastics and PTFE. Our WearGard and MolyGard strength characteristics meet or exceed most metals traditionally used in wear rings. While many compounds are available, the most commonly used bearing materials are WearGard, MolyGard and filled PTFE (featured at right).

Parker also offers other engineered bearing materials for specialized applications demanding higher temperatures and sideloads. Parker's UltraComp™ CGT 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, Nylatron[1] 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.

[1] Nylatron is a registered trademark of The Polymer Corporation, Reading, PA.

W4733 — WearGard

Heat stabilized, internally lubricated, 35% glass-reinforced nylon for tight-tolerance wear rings. WearGard is the premium material for the most severe applications due to its dimensional stability, high compressive strength and Parker's proprietary internal lubrication for reduced friction. WearGard is an extremely high endurance compound, retaining its physical properties without degradation. WearGard also features Parker's distinctive green coloring and is available in the WPT and WRT profiles.

W4650 — MolyGard

Heat stabilized, internally lubricated, 30% glass-reinforced nylon for standard-tolerance wear rings. Very similar physical properties to WearGard, but with an economical advantage. MolyGard is for use in light to medium duty hydraulic applications. Available in the WN profile.

0401 — 40% Bronze-Filled PTFE

Primarily used in light duty hydraulic applications, this self-lubricated, long-wearing material offers superior frictional characteristics and high temperature capabilities. Not recommended for use with aluminum bores and soft metal rods or in applications involving moderate to heavy sideloading. Available in the PDT and PDW profiles.

0307 — 23% Carbon, 2% Graphite-Filled PTFE

The most popular material for pneumatic applications, this self-lubricated compound ensures long life, low friction and high temperature capabilities. The carbon-graphite fillers allow for outstanding performance without the risk of scratching or scoring soft metal surfaces. Available in the PDT and PDW profiles.

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Table 3. Physical and Mechanical Properties of Engineered Plastics

Property	Unit	W4733	W4650	W4738	0871 – 0874	Test Method
		WearGard 35% Glass-Reinforced Nylon	MolyGard 30% Glass-Reinforced Nylon	UltraCOMP CGT 10% Carbon, 10% Graphite, 10% PTFE Filled	Composite Fabric-Reinforced Resins	
Permissible Compressive Load, *q*	psi	21700	21700	—	65200	—
Tensile Strength	psi	18300	17500	20400	9500	ASTM D638, 73 °F
Tensile Modulus	Kpsi	899	952	—	470	ASTM D638, 73 °F
Compressive Strength	psi	21500	21000	21700	35000	ASTM D695, 73 °F
Shear Strength	psi	9820	9390	—	—	ASTM D732, 73 °F
Flexural Strength	psi	25500	22600	30500		ASTM D790, 73 °F
Flexural Modulus	Kpsi	1100	860	1175	280	ASTM D790, 73 °F
Notched IZOD Impact Strength	Ft-Lbs/in	1.15	1.37	1.69	10	ASTM D256, 73 °F
Deformation Under Load	%	0.4	0.6	—	4.0	ASTM D621, 24 hrs @ 4000 psi, 73 °F
Water Absorption	%	0.5	0.8	0.06	0.1	24 hour immersion, ASTM D570, 73 °F
Temperature Range	°F	-65 to +275	-65 to +275	-65 to +500	-40 to +250	—
Rockwell Hardness	M Scale	87	77	100	100	ASTM D785
	R Scale	117	114	—	—	ASTM D785

Table 4. Physical and Mechanical Properties of PTFE Compounds

Property	Unit	0401	0307	Test Method
		40% Bronze Filled PTFE	23% Carbon, 2% Graphite Filled PTFE	
Permissible Compressive Load, *q*	psi	9400	3600	—
Tensile Strength	psi	3200	2250	ASTM D1457-81A
Elongation	%	250	100	ASTM D4894
Deformation Under Load	%	3.1	2.5	ASTM D621, 24 hrs @ 2000 psi, 70 °F
Coefficient of Friction	—	0.23	0.24	ASTM D3702
Temperature Range	°F	-200 to +575	-360 to +575	—
Shore D Hardness	—	65	64	ASTM D2240-75

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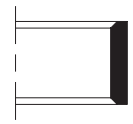
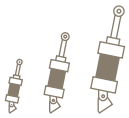
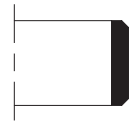
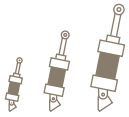
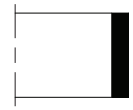
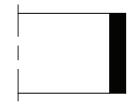
Product Offering

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. Conversely, in high volume, light-duty hydraulic cylinders, where pressure and temperature are not excessive, Parker's WN profile stands out as the most economical choice for long-lasting piston and rod bearings. 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 5. Product Profiles

Series	Description	Application	Page
WPT 	Tight-Tolerance Piston Wear Rings		**9**
WRT 	Tight-Tolerance Rod Wear Rings		**13**
WN 	Commercial Wear Rings for rod and piston		**17**
PDT 	PTFE Wear Strip for rod and piston		**22**
PDW 	PTFE Machined Wear Rings for rod and piston		**32**


Light Duty


Medium Duty


Heavy Duty


Pneumatic

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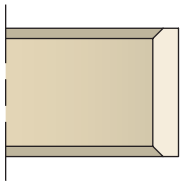
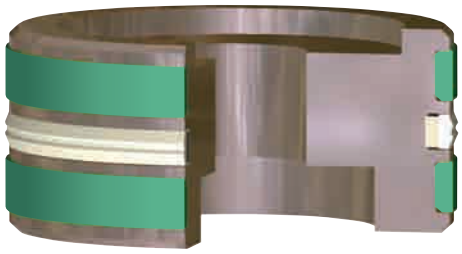
WPT Profile





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

WPT

WPT Tight-Tolerance Piston Wear Rings are the premier bearings for light to heavy duty hydraulic applications. WPTs are available in standard sizes from 1" up to 12" bore diameters (larger sizes upon request). WPT 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

Material

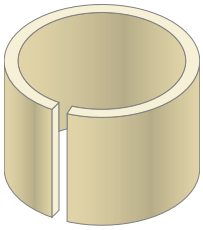
W4733 WearGard

Radial Tolerance

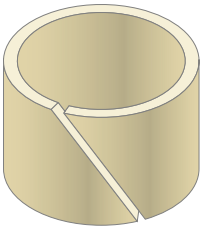
+.000"/ -.002" (up to 6" O.D.); +.000/-.003" (6" to 12" O.D.)

End Cuts

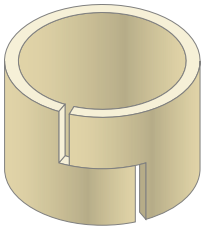
Butt Cut, Angle Cut, Step Cut



Butt Cut



Angle Cut



Step Cut

Options

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

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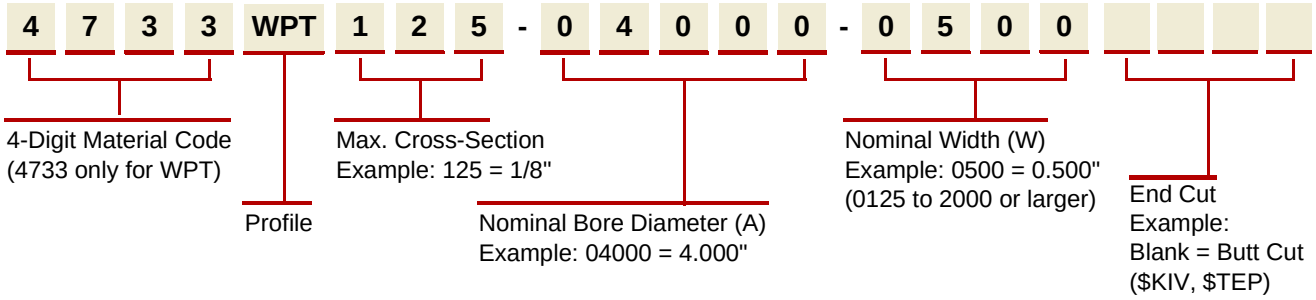
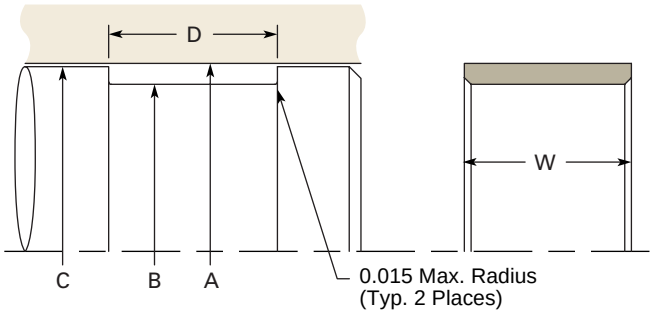
Part Number Nomenclature — WPT Profile

Table 6. WPT Profile



Gland Dimensions — WPT Profile

Table 7. WPT Gland Dimensions



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.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		**4733WPT062-01125-XXXX**
1.250	1.125	1.233		**4733WPT062-01250-XXXX**
1.375	1.250	1.358		**4733WPT062-01375-XXXX**
1.500	1.375	1.483		**4733WPT062-01500-XXXX**
1.625	1.500	1.608		**4733WPT062-01625-XXXX**
1.750	1.625	1.733		**4733WPT062-01750-XXXX**
1.875	1.750	1.858		**4733WPT062-01875-XXXX**
2.375	2.250	2.358		**4733WPT062-02375-XXXX**
2.625	2.500	2.608		**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		**4733WPT125-01125-XXXX**
1.250	0.999	1.233		**4733WPT125-01250-XXXX**
1.375	1.124	1.358		**4733WPT125-01375-XXXX**
1.500	1.249	1.483		**4733WPT125-01500-XXXX**
1.625	1.374	1.608		**4733WPT125-01625-XXXX**

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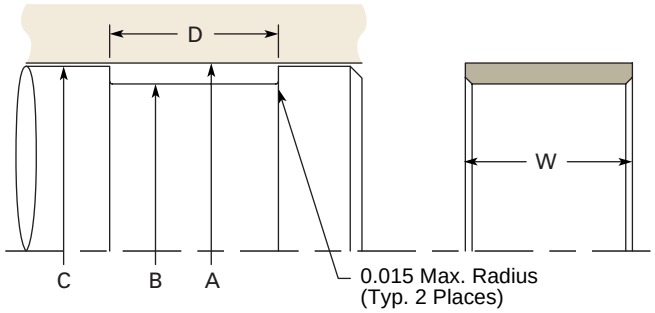
Table 7. WPT Gland Dimensions (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	
1.750	1.499	1.733	D = W + 0.010"	**4733WPT125-01750-XXXX**
1.875	1.624	1.858		**4733WPT125-01875-XXXX**
2.000	1.749	1.983		**4733WPT125-02000-XXXX**
2.125	1.874	2.108		**4733WPT125-02125-XXXX**
2.250	1.999	2.233		**4733WPT125-02250-XXXX**
2.375	2.124	2.358		**4733WPT125-02375-XXXX**
2.500	2.249	2.483		**4733WPT125-02500-XXXX**
2.625	2.374	2.608		**4733WPT125-02625-XXXX**
2.750	2.499	2.733		**4733WPT125-02750-XXXX**
2.875	2.624	2.858		**4733WPT125-02875-XXXX**
3.000	2.749	2.983		**4733WPT125-03000-XXXX**
3.125	2.874	3.108		**4733WPT125-03125-XXXX**
3.250	2.999	3.233		**4733WPT125-03250-XXXX**
3.375	3.124	3.358		**4733WPT125-03375-XXXX**
3.500	3.249	3.483		**4733WPT125-03500-XXXX**
3.625	3.374	3.608		**4733WPT125-03625-XXXX**
3.750	3.499	3.733		**4733WPT125-03750-XXXX**
3.875	3.624	3.858		**4733WPT125-03875-XXXX**
3.937	3.687	3.920		**4733WPT125-03937-XXXX**
4.000	3.749	3.983		**4733WPT125-04000-XXXX**
4.125	3.874	4.108		**4733WPT125-04125-XXXX**
4.250	3.999	4.233		**4733WPT125-04250-XXXX**
4.375	4.124	4.358		**4733WPT125-04375-XXXX**
4.500	4.249	4.483		**4733WPT125-04500-XXXX**
4.625	4.374	4.608		**4733WPT125-04625-XXXX**
4.750	4.499	4.733		**4733WPT125-04750-XXXX**
4.875	4.624	4.858		**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		**4733WPT125-05125-XXXX**
5.250	4.999	5.232		**4733WPT125-05250-XXXX**
5.375	5.124	5.357		**4733WPT125-05375-XXXX**

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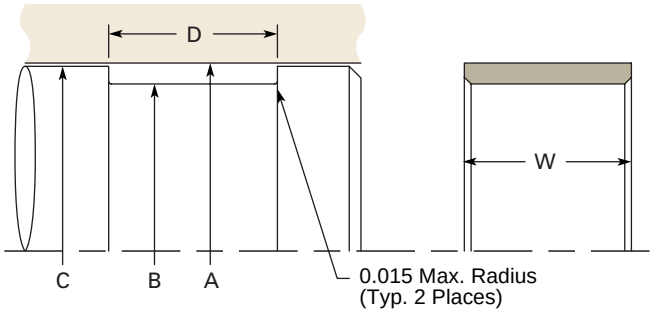
Table 7. WPT Gland Dimensions (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.004/-.000	**+.000/-.003**	**+.000/-.003**	**+.010/-.000**	
5.500	5.249	5.482	D = W + 0.010"	**4733WPT125-05500-XXXX**
5.625	5.374	5.607		**4733WPT125-05625-XXXX**
5.750	5.499	5.732		**4733WPT125-05750-XXXX**
6.000	5.749	5.980		**4733WPT125-06000-XXXX**
6.250	5.999	6.230		**4733WPT125-06250-XXXX**
6.500	6.249	6.480		**4733WPT125-06500-XXXX**
6.750	6.499	6.730		**4733WPT125-06750-XXXX**
7.000	6.749	6.980		**4733WPT125-07000-XXXX**
7.500	7.249	7.480		**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		**4733WPT125-08500-XXXX**
9.000	8.749	8.979		**4733WPT125-09000-XXXX**
9.500	9.249	9.479		**4733WPT125-09500-XXXX**
10.000	9.749	9.979		**4733WPT125-10000-XXXX**
10.500	10.249	10.479		**4733WPT125-10500-XXXX**
11.000	10.749	10.979		**4733WPT125-11000-XXXX**
11.500	11.249	11.479		**4733WPT125-11500-XXXX**
12.000	11.749	11.979		**4733WPT125-12000-XXXX**

WPT Groove Calculation

Formula for calculating WPT grooves using alternative extrusion gaps, metal-to-metal clearances and machining tolerances:

1. Maximum Groove Diameter, ***B***:

$$B = \text{Minimum Bore Diameter, } A - 0.001" - 2 \times (\text{max. cross-section})$$

2. Minimum Groove Diameter:

$$\text{Minimum Groove Diameter} = B - (\text{machining tolerances})$$

3. Maximum Piston Diameter, ***C***:

$$C = \text{Minimum Groove Diameter} + 2\left(\text{minimum cross-section}\right) - 2\left(\text{desired minimum radial metal-to-metal clearance}\right)$$

4. Minimum Groove Width:

$$D = (\text{Nominal Width, } W) + 0.010"$$

Notes

1. Tolerance for dimension *D* is +.010"/-.000".

2. Groove radii must not exceed 0.015" max.

3. Parker recommends a min. 0.005" radial metal-to-metal clearance. Using the above equations may result in metal-to-metal contact if the material's compressive properties are not considered. See **Page 4** for further details. Contact Parker if additional assistance is necessary.

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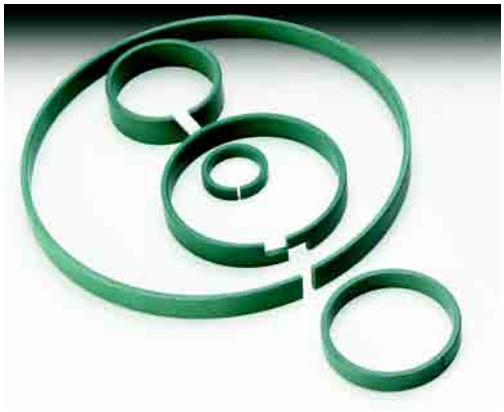
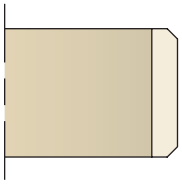
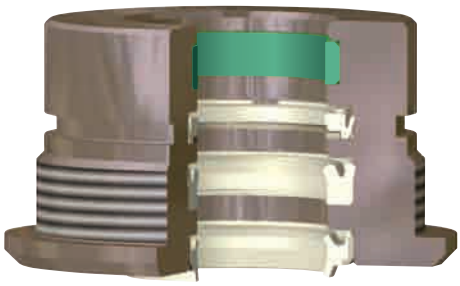
WRT Profile







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

WRT

WRT 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). WRTs 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

Material

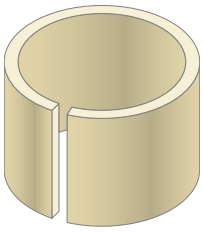
W4733 WearGard

Radial Tolerance

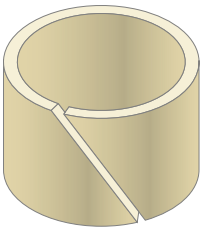
+.000/-.002" (up to 5-3/4" I.D.); +.000/-.003" (5-3/4" to 7" I.D.)

End Cuts

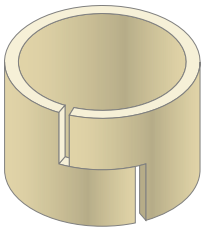
Butt Cut, Angle Cut, Step Cut



Butt Cut



Angle Cut



Step Cut

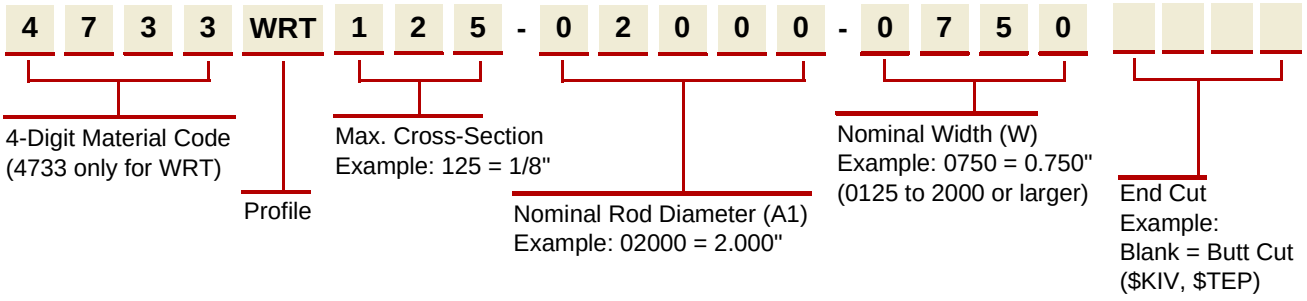
Options

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

08/17/05

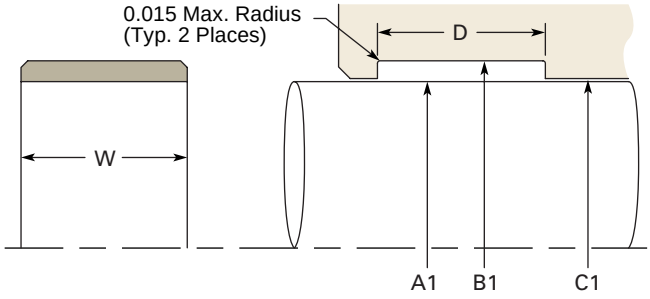
Part Number Nomenclature — WRT Profile

Table 8. WRT Profile



Gland Dimensions — WRT Profile

Table 9. WRT Gland Dimensions



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.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		**4733WRT062-01000-XXXX**
1.125	1.250	1.142		**4733WRT062-01125-XXXX**
1.250	1.375	1.267		**4733WRT062-01250-XXXX**
1.375	1.500	1.392		**4733WRT062-01375-XXXX**
1.500	1.625	1.517		**4733WRT062-01500-XXXX**
1.625	1.750	1.642		**4733WRT062-01625-XXXX**
1.750	1.875	1.767		**4733WRT062-01750-XXXX**
2.250	2.375	2.267		**4733WRT062-02250-XXXX**
2.500	2.625	2.517		**4733WRT062-02500-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		**4733WRT125-00875-XXXX**
1.000	1.251	1.017		**4733WRT125-01000-XXXX**
1.125	1.376	1.142		**4733WRT125-01125-XXXX**
1.250	1.501	1.267		**4733WRT125-01250-XXXX**
1.375	1.626	1.392		**4733WRT125-01375-XXXX**
1.500	1.751	1.517		**4733WRT125-01500-XXXX**
1.625	1.876	1.642		**4733WRT125-01625-XXXX**

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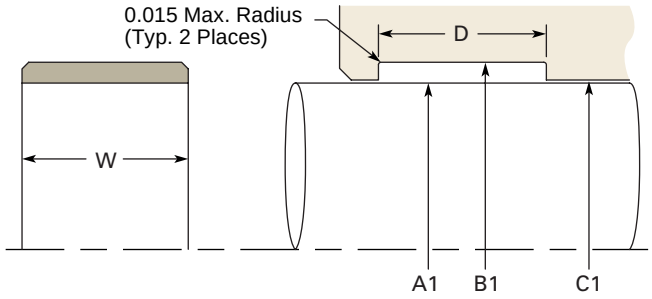
Table 9. WRT Gland Dimensions (Continued)



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.000/-.002	+.002/-.000	+.002/-.000	+.010/-.000	
1.750	2.001	1.767	D = W + 0.010"	4733WRT125-01750-XXXX
1.875	2.126	1.892		4733WRT125-01875-XXXX
2.000	2.251	2.017		4733WRT125-02000-XXXX
2.125	2.376	2.142		4733WRT125-02125-XXXX
2.250	2.501	2.267		4733WRT125-02250-XXXX
2.375	2.626	2.392		4733WRT125-02375-XXXX
2.500	2.751	2.517		4733WRT125-02500-XXXX
2.625	2.876	2.642		4733WRT125-02625-XXXX
2.750	3.001	2.767		4733WRT125-02750-XXXX
2.875	3.126	2.892		4733WRT125-02875-XXXX
3.000	3.251	3.017		4733WRT125-03000-XXXX
3.125	3.376	3.142		4733WRT125-03125-XXXX
3.250	3.501	3.267		4733WRT125-03250-XXXX
3.375	3.626	3.392		4733WRT125-03375-XXXX
3.500	3.751	3.517		4733WRT125-03500-XXXX
3.625	3.876	3.642		4733WRT125-03625-XXXX
3.750	4.001	3.767		4733WRT125-03750-XXXX
3.875	4.126	3.892		4733WRT125-03875-XXXX
3.937	4.188	3.954		4733WRT125-03937-XXXX
4.000	4.251	4.017		4733WRT125-04000-XXXX
4.125	4.376	4.142		4733WRT125-04125-XXXX
4.250	4.501	4.267		4733WRT125-04250-XXXX
4.375	4.626	4.392		4733WRT125-04375-XXXX
4.500	4.751	4.517		4733WRT125-04500-XXXX
4.625	4.876	4.642		4733WRT125-04625-XXXX
4.750	5.001	4.767		4733WRT125-04750-XXXX
4.875	5.126	4.892		4733WRT125-04875-XXXX
5.000	5.251	5.017		4733WRT125-05000-XXXX
5.125	5.376	5.142		4733WRT125-05125-XXXX
5.250	5.501	5.267		4733WRT125-05250-XXXX
5.375	5.626	5.392		4733WRT125-05375-XXXX
5.500	5.751	5.517		4733WRT125-05500-XXXX
5.625	5.876	5.642		4733WRT125-05625-XXXX

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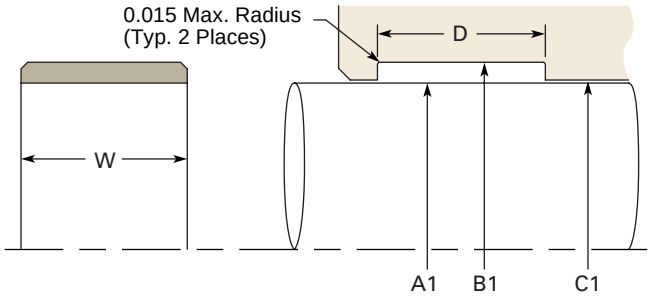
Table 9. WRT Gland Dimensions (Continued)



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.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		4733WRT125-06000-XXXX
6.250	6.501	6.270		4733WRT125-06250-XXXX
6.500	6.751	6.520		4733WRT125-06500-XXXX
6.750	7.001	6.770		4733WRT125-06750-XXXX
7.000	7.251	7.020		4733WRT125-07000-XXXX

WRT Groove Calculation

Formula for calculating WRT grooves using alternative extrusion gaps, metal-to-metal clearances and machining tolerances:

1. Minimum Groove Diameter, ***B1***:

$$B1 = \text{Maximum Rod Diameter, } A1 + 0.001" + 2 \times (\text{max. cross-section})$$

2. Maximum Groove Diameter:

$$\text{Maximum Groove Diameter} = B1 + (\text{machining tolerances})$$

3. Minimum Throat Diameter, ***C1***:

$$C1 = \text{Maximum Groove Diameter} - 2\left(\text{minimum cross-section}\right) + 2\left(\text{desired minimum radial metal-to-metal clearance}\right)$$

4. Minimum Groove Width:

$$D = (\text{Nominal Width, } W) + 0.010"$$

Notes

1. Tolerance for dimension *D* is +.010"/-.000".

2. Groove radii must not exceed 0.015" max.

3. Parker recommends a min. 0.005" radial metal-to-metal clearance. Using the above equations may result in metal-to-metal contact if the material's compressive properties are not considered. See **Page 4** for further details. Contact Parker if additional assistance is necessary.

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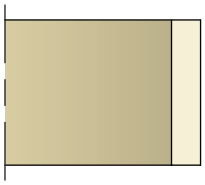
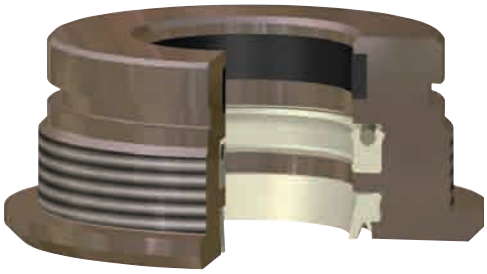
WN Profile



Piston sealing system comprised of WN wear rings and PSP bi-directional piston seal



Rod sealing system comprised of WN wear ring, BD Polypak and YD wiper

WN

WN Commercial Wear Rings can be used for either pistons or rods and are the most economical bearing solution for light to medium duty hydraulic applications. MolyGard bearing material offers the combination of long life and high strength. WNs are available in standard sizes (1/8" cross-section) from 3/4" up to 11-3/4" rod diameters and 1" to 12" bore diameters (larger sizes upon request).

Technical Data

Material

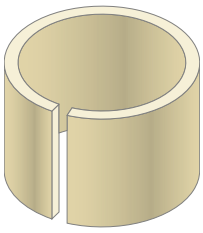
W4650 MolyGard

Radial Tolerance

+.000/-.005"

End Cuts

Butt Cut only



Butt Cut

Options

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

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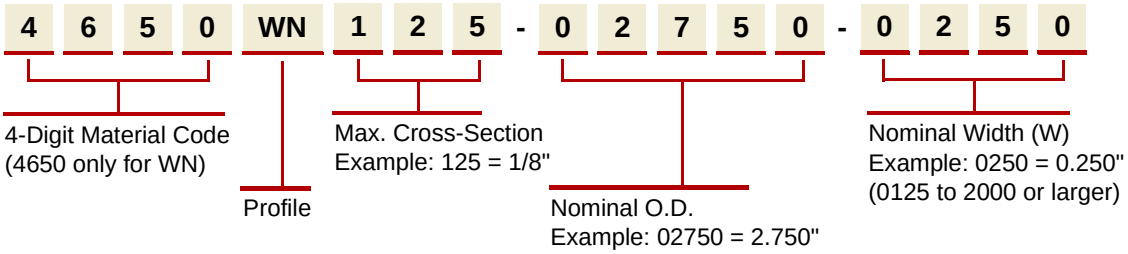
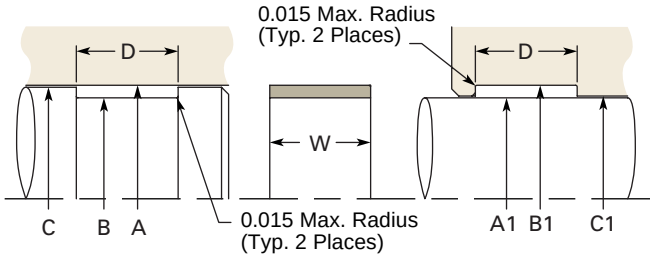
Part Number Nomenclature — WN Profile

Table 10. WN Profile



Gland Dimensions — WN Profile

Table 11. WN Gland Dimensions



Piston			Rod				Part Number
A Bore Diameter	B Groove Diameter	C Piston Diameter	A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	
+.002/-.000	+.000/-.002	+.000/-.002	+.000/-.002	+.002/-.000	+.002/-.000	+.010/-.000	
1.000	0.875	0.977	0.875	1.000	0.898	D = W + 0.010"	4650WN062-01000-XXXX
1.125	1.000	1.102	1.000	1.125	1.023		4650WN062-01125-XXXX
1.250	1.125	1.227	1.125	1.250	1.148		4650WN062-01250-XXXX
1.375	1.250	1.352	1.250	1.375	1.273		4650WN062-01375-XXXX
1.500	1.375	1.477	1.375	1.500	1.398		4650WN062-01500-XXXX
1.625	1.500	1.602	1.500	1.625	1.523		4650WN062-01625-XXXX
1.750	1.625	1.727	1.625	1.750	1.648		4650WN062-01750-XXXX
1.875	1.750	1.852	1.750	1.875	1.773		4650WN062-01875-XXXX
2.375	2.250	2.352	2.250	2.375	2.273		4650WN062-02375-XXXX
2.625	2.500	2.602	2.500	2.625	2.523		4650WN062-02625-XXXX
+.002/-.000	+.000/-.002	+.000/-.002	+.000/-.002	+.002/-.000	+.002/-.000	+.010/-.000	
1.000	0.749	0.977	0.750	1.001	0.773	D = W + 0.010"	4650WN125-01000-XXXX
1.125	0.874	1.102	0.875	1.126	0.898		4650WN125-01125-XXXX
1.250	0.999	1.227	1.000	1.251	1.023		4650WN125-01250-XXXX
1.375	1.124	1.352	1.125	1.376	1.148		4650WN125-01375-XXXX
1.500	1.249	1.477	1.250	1.501	1.273		4650WN125-01500-XXXX
1.625	1.374	1.602	1.375	1.626	1.398		4650WN125-01625-XXXX
1.750	1.499	1.727	1.500	1.751	1.523		4650WN125-01750-XXXX
1.875	1.624	1.852	1.625	1.876	1.648		4650WN125-01875-XXXX

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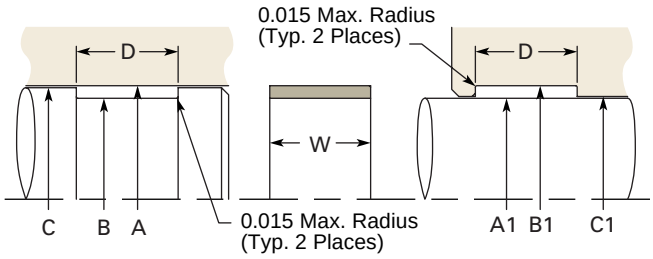
Table 11. WN Gland Dimensions (Continued)



Piston			Rod				Part Number
A Bore Diameter	B Groove Diameter	C Piston Diameter	A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	
+.002/-.000	+.000/-.002	+.000/-.002	+.000/-.002	+.002/-.000	+.002/-.000		
2.000	1.749	1.977	1.750	2.001	1.773		4650WN125-02000-XXXX
2.125	1.874	2.102	1.875	2.126	1.898		4650WN125-02125-XXXX
2.250	1.999	2.227	2.000	2.251	2.023		4650WN125-02250-XXXX
2.375	2.124	2.352	2.125	2.376	2.148		4650WN125-02375-XXXX
2.500	2.249	2.477	2.250	2.501	2.273		4650WN125-02500-XXXX
2.625	2.374	2.602	2.375	2.626	2.398		4650WN125-02625-XXXX
2.750	2.499	2.727	2.500	2.751	2.523		4650WN125-02750-XXXX
2.875	2.624	2.852	2.625	2.876	2.648		4650WN125-02875-XXXX
3.000	2.749	2.977	2.750	3.001	2.773		4650WN125-03000-XXXX
3.125	2.874	3.102	2.875	3.126	2.898		4650WN125-03125-XXXX
3.250	2.999	3.227	3.000	3.251	3.023		4650WN125-03250-XXXX
3.375	3.124	3.352	3.125	3.376	3.148		4650WN125-03375-XXXX
3.500	3.249	3.477	3.250	3.501	3.273	D = W + 0.010"	4650WN125-03500-XXXX
3.625	3.374	3.602	3.375	3.626	3.398		4650WN125-03625-XXXX
3.750	3.499	3.727	3.500	3.751	3.523		4650WN125-03750-XXXX
3.875	3.624	3.852	3.625	3.876	3.648		4650WN125-03875-XXXX
3.937	3.687	3.914	3.687	3.939	3.711		4650WN125-03937-XXXX
4.000	3.749	3.977	3.750	4.001	3.773		4650WN125-04000-XXXX
4.125	3.874	4.102	3.875	4.126	3.898		4650WN125-04125-XXXX
4.250	3.999	4.227	4.000	4.251	4.023		4650WN125-04250-XXXX
4.375	4.124	4.352	4.125	4.376	4.148		4650WN125-04375-XXXX
4.500	4.249	4.477	4.250	4.501	4.273		4650WN125-04500-XXXX
4.625	4.374	4.602	4.375	4.626	4.398		4650WN125-04625-XXXX
4.750	4.499	4.727	4.500	4.751	4.523		4650WN125-04750-XXXX
4.875	4.624	4.852	4.625	4.876	4.648		4650WN125-04875-XXXX
+.004/-.000	+.000/-.003	+.000/-.003	+.000/-.004	+.003/-.000	+.003/-.000	+.010/-.000	
5.000	4.749	4.976	4.750	5.001	4.774		4650WN125-05000-XXXX
5.125	4.874	5.101	4.875	5.126	4.899		4650WN125-05125-XXXX
5.250	4.999	5.226	5.000	5.251	5.024		4650WN125-05250-XXXX
5.375	5.124	5.351	5.125	5.376	5.149	D = W + 0.010"	4650WN125-05375-XXXX
5.500	5.249	5.476	5.250	5.501	5.274		4650WN125-05500-XXXX
5.625	5.374	5.601	5.375	5.626	5.399		4650WN125-05625-XXXX
5.750	5.499	5.726	5.500	5.751	5.524		4650WN125-05750-XXXX

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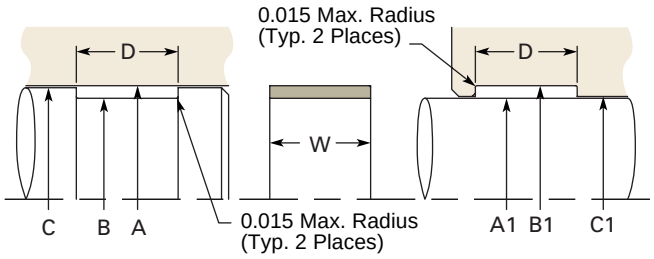
Table 11. WN Gland Dimensions (Continued)



Piston			Rod				Part Number
A Bore Diameter	B Groove Diameter	C Piston Diameter	A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	
+.004/-.000	+.000/-.003	+.000/-.003	+.000/-.004	+.003/-.000	+.003/-.000	+.010/-.000	
6.000	5.749	5.976	5.750	6.001	5.774		4650WN125-06000-XXXX
6.250	5.999	6.226	6.000	6.251	6.024		4650WN125-06250-XXXX
6.375	6.124	6.351	6.125	6.376	6.149		4650WN125-06375-XXXX
6.500	6.249	6.476	6.250	6.501	6.274		4650WN125-06500-XXXX
6.750	6.499	6.726	6.500	6.751	6.524		4650WN125-06750-XXXX
6.875	6.624	6.851	6.625	6.876	6.649	D = W + 0.010"	4650WN125-06875-XXXX
7.000	6.749	6.976	6.750	7.001	6.774		4650WN125-07000-XXXX
7.250	6.999	7.226	7.000	7.251	7.024		4650WN125-07250-XXXX
7.313	7.062	7.289	7.063	7.314	7.087		4650WN125-07312-XXXX
7.500	7.249	7.476	7.250	7.501	7.274		4650WN125-07500-XXXX
7.750	7.499	7.726	7.500	7.751	7.524		4650WN125-07750-XXXX
+.006/-.000	+.000/-.004	+.000/-.004	+.000/-.006	+.004/-.000	+.004/-.000	+.010/-.000	
8.000	7.749	7.975	7.750	8.001	7.775		4650WN125-08000-XXXX
8.250	7.999	8.225	8.000	8.251	8.025		4650WN125-08250-XXXX
8.500	8.249	8.475	8.250	8.501	8.275		4650WN125-08500-XXXX
8.750	8.499	8.725	8.500	8.751	8.525		4650WN125-08750-XXXX
9.000	8.749	8.975	8.750	9.001	8.775		4650WN125-09000-XXXX
9.250	8.999	9.225	9.000	9.251	9.025		4650WN125-09250-XXXX
9.500	9.249	9.475	9.250	9.501	9.275	D = W + 0.010"	4650WN125-09500-XXXX
10.000	9.749	9.975	9.750	10.001	9.775		4650WN125-10000-XXXX
10.500	10.249	10.475	10.250	10.501	10.275		4650WN125-10500-XXXX
10.625	10.374	10.600	10.375	10.626	10.400		4650WN125-10625-XXXX
11.000	10.749	10.975	10.750	11.001	10.775		4650WN125-11000-XXXX
11.500	11.249	11.475	11.250	11.501	11.275		4650WN125-11500-XXXX
12.000	11.749	11.975	11.750	12.001	11.775		4650WN125-12000-XXXX

08/17/05

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WN Groove Calculation

Formula for calculating WN grooves using alternative extrusion gaps, metal-to-metal clearances and machining tolerances:

For Pistons:

1. Maximum Groove Diameter, ***B***:

$$B = \text{Minimum Bore Diameter, } A - 0.001" - 2 \times (\text{max. cross-section})$$

2. Minimum Groove Diameter:

$$\text{Minimum Groove Diameter} = B - (\text{machining tolerances})$$

3. Maximum Piston Diameter, ***C***:

$$C = \text{Minimum Groove Diameter} + 2\left(\text{minimum cross-section}\right) - 2\left(\text{desired minimum radial metal-to-metal clearance}\right)$$

4. Minimum Groove Width:

$$D = (\text{Nominal Width, } W) + 0.010"$$

For Rods:

1. Minimum Groove Diameter, ***B1***:

$$B1 = \text{Maximum Rod Diameter, } A1 + 0.001" + 2 \times (\text{max. cross-section})$$

2. Maximum Groove Diameter:

$$\text{Maximum Groove Diameter} = B1 + (\text{machining tolerances})$$

3. Minimum Throat Diameter, ***C1***:

$$C1 = \text{Maximum Groove Diameter} - 2\left(\text{minimum cross-section}\right) + 2\left(\text{desired minimum radial metal-to-metal clearance}\right)$$

4. Minimum Groove Width:

$$D = (\text{Nominal Width, } W) + 0.010"$$

Notes

1. Tolerance for dimension *D* is +.010"/-.000".

2. Groove radii must not exceed 0.015" max.

3. Parker recommends a min. 0.005" radial metal-to-metal clearance. Using the above equations may result in metal-to-metal contact if the material's compressive properties are not considered. See **Page 4** for further details. Contact Parker if additional assistance is necessary.

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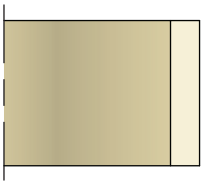
PDT Profile



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 AK wiper

PDT

PDT Wear Strip is available in a variety of PTFE blends and provides excellent low-friction performance in pneumatics and light-duty hydraulics. PDTs are 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 PDTs offer versatility and reduce part number inventory by providing universal sizing in one part number.

Technical Data

Material

0401 – 40% Bronze-Filled PTFE

0307 – 23% Carbon, 2% Graphite-Filled PTFE

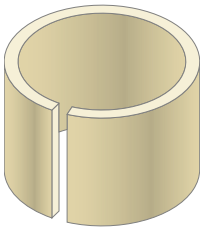
Others available upon request

Radial Tolerance

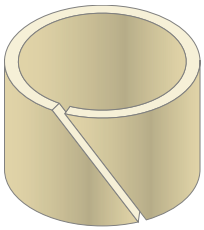
+.000"/–.004"

End Cuts

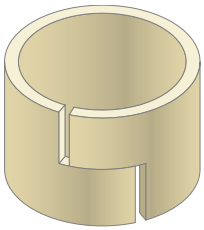
Butt Cut, Angle Cut, Step Cut



Butt Cut



Angle Cut



Step Cut

Options

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

08/17/05

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Part Number Nomenclature — PDT Profile

Table 12. PDT Profile — Cut-To-Length

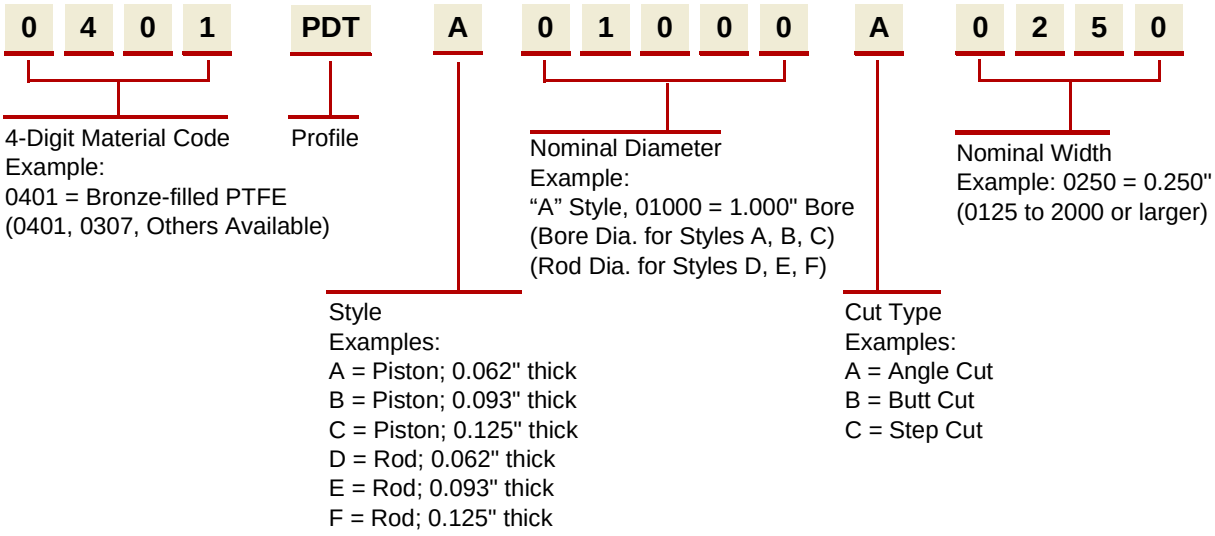
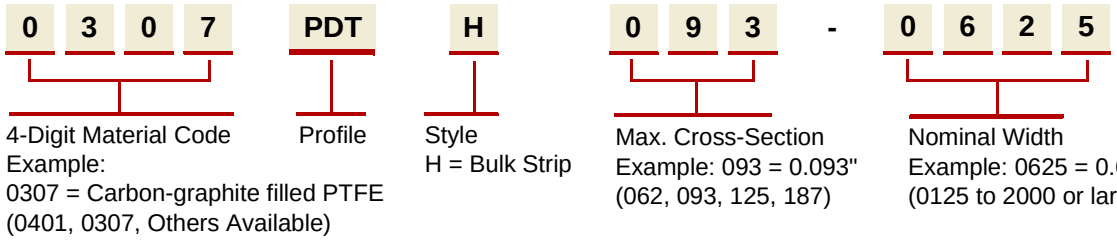
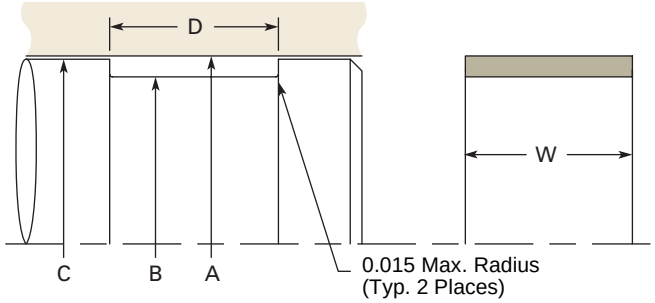


Table 13. PDT Profile — Bulk Strip



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

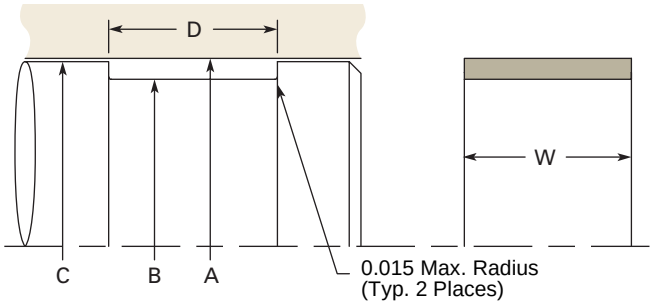
Table 14. PDT Gland Dimensions — Piston, Cut-To-Length



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.002/-.000	+.000/-.002	+.000/-.002	+.010/-.000	PDTA
1.000	0.875	0.979	D = W + 0.010"	XXXX PDTA 01000 X XXXX
1.062	0.937	1.041		XXXX PDTA 01062 X XXXX
1.125	1.000	1.104		XXXX PDTA 01125 X XXXX
1.187	1.062	1.166		XXXX PDTA 01187 X XXXX
1.250	1.125	1.229		XXXX PDTA 01250 X XXXX

08/17/05

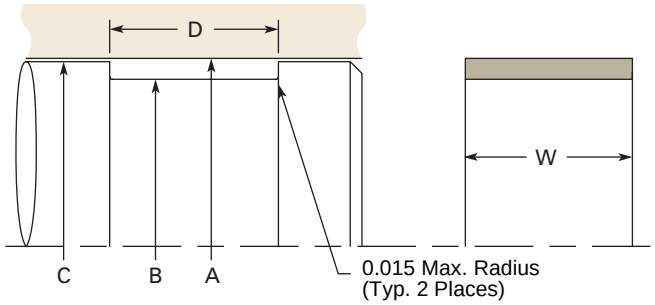
Table 14. PDT Gland Dimensions — Piston, Cut-To-Length (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	**PDTA**
1.312	1.187	1.291	D = W + 0.010"	**XXXX PDTA 01312 X XXXX**
1.375	1.250	1.354		**XXXX PDTA 01375 X XXXX**
1.437	1.312	1.416		**XXXX PDTA 01437 X XXXX**
1.500	1.375	1.479		**XXXX PDTA 01500 X XXXX**
1.562	1.437	1.541		**XXXX PDTA 01562 X XXXX**
1.625	1.500	1.604		**XXXX PDTA 01625 X XXXX**
1.687	1.562	1.666		**XXXX PDTA 01687 X XXXX**
1.750	1.625	1.729		**XXXX PDTA 01750 X XXXX**
1.875	1.750	1.854		**XXXX PDTA 01875 X XXXX**
2.000	1.875	1.979		**XXXX PDTA 02000 X XXXX**
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	**PDTB**
1.500	1.313	1.479	D = W + 0.010"	**XXXX PDTB 01500 X XXXX**
1.562	1.375	1.541		**XXXX PDTB 01562 X XXXX**
1.625	1.438	1.604		**XXXX PDTB 01625 X XXXX**
1.687	1.500	1.666		**XXXX PDTB 01687 X XXXX**
1.750	1.563	1.729		**XXXX PDTB 01750 X XXXX**
1.875	1.688	1.854		**XXXX PDTB 01875 X XXXX**
2.000	1.813	1.979		**XXXX PDTB 02000 X XXXX**
2.125	1.938	2.104		**XXXX PDTB 02125 X XXXX**
2.250	2.063	2.229		**XXXX PDTB 02250 X XXXX**
2.375	2.188	2.354		**XXXX PDTB 02375 X XXXX**
2.500	2.313	2.479		**XXXX PDTB 02500 X XXXX**
2.625	2.438	2.604		**XXXX PDTB 02625 X XXXX**
2.750	2.563	2.729		**XXXX PDTB 02750 X XXXX**
2.875	2.688	2.854		**XXXX PDTB 02875 X XXXX**
3.000	2.813	2.979		**XXXX PDTB 03000 X XXXX**
3.125	2.938	3.104		**XXXX PDTB 03125 X XXXX**
3.250	3.063	3.229		**XXXX PDTB 03250 X XXXX**
3.375	3.188	3.354		**XXXX PDTB 03375 X XXXX**
3.500	3.313	3.479		**XXXX PDTB 03500 X XXXX**
3.625	3.438	3.604		**XXXX PDTB 03625 X XXXX**
3.750	3.563	3.729		**XXXX PDTB 03750 X XXXX**
3.875	3.688	3.854		**XXXX PDTB 03875 X XXXX**
4.000	3.813	3.979		**XXXX PDTB 04000 X XXXX**
4.125	3.938	4.104		**XXXX PDTB 04125 X XXXX**
4.250	4.063	4.229		**XXXX PDTB 04250 X XXXX**
4.375	4.188	4.354		**XXXX PDTB 04375 X XXXX**
4.500	4.313	4.479		**XXXX PDTB 04500 X XXXX**

08/17/05

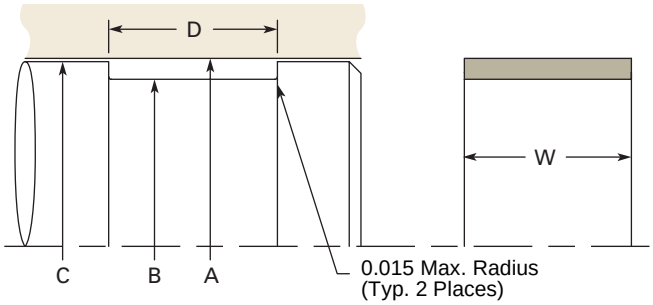
Table 14. PDT Gland Dimensions — Piston, Cut-To-Length (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	**PDTB**
4.625	4.438	4.604	D = W + 0.010"	**XXXX PDTB 04625 X XXXX**
4.750	4.563	4.729		**XXXX PDTB 04750 X XXXX**
4.875	4.688	4.854		**XXXX PDTB 04875 X XXXX**
+.004/-.000	**+.000/-.003**	**+.000/-.003**	**+.010/-.000**	**PDTB**
5.000	4.813	4.978	D = W + 0.010"	**XXXX PDTB 05000 X XXXX**
5.125	4.938	5.103		**XXXX PDTB 05125 X XXXX**
5.250	5.063	5.228		**XXXX PDTB 05250 X XXXX**
5.375	5.188	5.353		**XXXX PDTB 05375 X XXXX**
5.500	5.313	5.478		**XXXX PDTB 05500 X XXXX**
5.625	5.438	5.603		**XXXX PDTB 05625 X XXXX**
5.750	5.563	5.728		**XXXX PDTB 05750 X XXXX**
5.875	5.688	5.853		**XXXX PDTB 05875 X XXXX**
6.000	5.813	5.978		**XXXX PDTB 06000 X XXXX**
6.125	5.938	6.103		**XXXX PDTB 06125 X XXXX**
6.250	6.063	6.228		**XXXX PDTB 06250 X XXXX**
6.375	6.188	6.353		**XXXX PDTB 06375 X XXXX**
6.500	6.313	6.478		**XXXX PDTB 06500 X XXXX**
6.750	6.563	6.728		**XXXX PDTB 06750 X XXXX**
7.000	6.813	6.978		**XXXX PDTB 07000 X XXXX**
7.250	7.063	7.228		**XXXX PDTB 07250 X XXXX**
7.500	7.313	7.478		**XXXX PDTB 07500 X XXXX**
7.750	7.563	7.728		**XXXX PDTB 07750 X XXXX**
+.006/-.000	**+.000/-.004**	**+.000/-.004**	**+.010/-.000**	**PDTB**
8.000	7.813	7.977	D = W + 0.010"	**XXXX PDTB 08000 X XXXX**
8.250	8.063	8.227		**XXXX PDTB 08250 X XXXX**
8.500	8.313	8.477		**XXXX PDTB 08500 X XXXX**
9.000	8.813	8.977		**XXXX PDTB 09000 X XXXX**
9.500	9.313	9.477		**XXXX PDTB 09500 X XXXX**
10.000	9.813	9.977		**XXXX PDTB 10000 X XXXX**
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	**PDTC**
2.000	1.749	1.979	D = W + 0.010"	**XXXX PDTC 02000 X XXXX**
2.125	1.874	2.104		**XXXX PDTC 02125 X XXXX**
2.250	1.999	2.229		**XXXX PDTC 02250 X XXXX**
2.375	2.124	2.354		**XXXX PDTC 02375 X XXXX**
2.500	2.249	2.479		**XXXX PDTC 02500 X XXXX**
2.625	2.374	2.604		**XXXX PDTC 02625 X XXXX**
2.750	2.499	2.729		**XXXX PDTC 02750 X XXXX**
2.875	2.624	2.854		**XXXX PDTC 02875 X XXXX**

08/17/05

Table 14. PDT Gland Dimensions — Piston, Cut-To-Length (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	**PDTC**
3.000	2.749	2.979	D = W + 0.010"	**XXXX PDTC 03000 X XXXX**
3.125	2.874	3.104		**XXXX PDTC 03125 X XXXX**
3.250	2.999	3.229		**XXXX PDTC 03250 X XXXX**
3.375	3.124	3.354		**XXXX PDTC 03375 X XXXX**
3.500	3.249	3.479		**XXXX PDTC 03500 X XXXX**
3.625	3.374	3.604		**XXXX PDTC 03625 X XXXX**
3.750	3.499	3.729		**XXXX PDTC 03750 X XXXX**
3.875	3.624	3.854		**XXXX PDTC 03875 X XXXX**
4.000	3.749	3.979		**XXXX PDTC 04000 X XXXX**
4.125	3.874	4.104		**XXXX PDTC 04125 X XXXX**
4.250	3.999	4.229		**XXXX PDTC 04250 X XXXX**
4.375	4.124	4.354		**XXXX PDTC 04375 X XXXX**
4.500	4.249	4.479		**XXXX PDTC 04500 X XXXX**
4.625	4.374	4.604		**XXXX PDTC 04625 X XXXX**
4.750	4.499	4.729		**XXXX PDTC 04750 X XXXX**
4.875	4.624	4.854		**XXXX PDTC 04875 X XXXX**
+.004/-.000	**+.000/-.003**	**+.000/-.003**	**+.010/-.000**	**PDTC**
5.000	4.749	4.978	D = W + 0.010"	**XXXX PDTC 05000 X XXXX**
5.125	4.874	5.103		**XXXX PDTC 05125 X XXXX**
5.250	4.999	5.228		**XXXX PDTC 05250 X XXXX**
5.375	5.124	5.353		**XXXX PDTC 05375 X XXXX**
5.500	5.249	5.478		**XXXX PDTC 05500 X XXXX**
5.625	5.374	5.603		**XXXX PDTC 05625 X XXXX**
5.750	5.499	5.728		**XXXX PDTC 05750 X XXXX**
5.875	5.624	5.853		**XXXX PDTC 05875 X XXXX**
6.000	5.749	5.978		**XXXX PDTC 06000 X XXXX**
6.125	5.874	6.103		**XXXX PDTC 06125 X XXXX**
6.250	5.999	6.228		**XXXX PDTC 06250 X XXXX**
6.375	6.124	6.353		**XXXX PDTC 06375 X XXXX**
6.500	6.249	6.478		**XXXX PDTC 06500 X XXXX**
6.750	6.499	6.728		**XXXX PDTC 06750 X XXXX**
7.000	6.749	6.978		**XXXX PDTC 07000 X XXXX**
7.250	6.999	7.228		**XXXX PDTC 07250 X XXXX**
7.500	7.249	7.478		**XXXX PDTC 07500 X XXXX**
7.750	7.499	7.728		**XXXX PDTC 07750 X XXXX**

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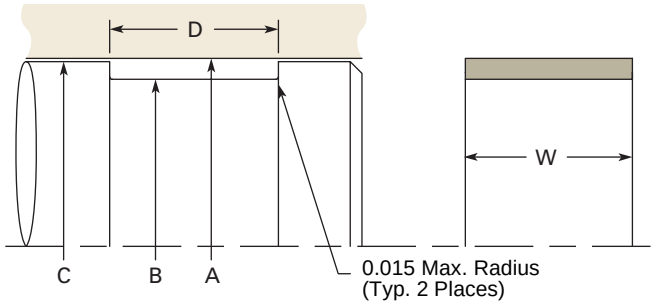
Table 14. PDT Gland Dimensions — Piston, Cut-To-Length (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.006/-.000	+.000/-.004	+.000/-.004	+.010/-.000	PDTC
8.000	7.749	7.977	D = W + 0.010"	XXXX PDTC 08000 X XXXX
8.250	7.999	8.227		XXXX PDTC 08250 X XXXX
8.500	8.249	8.477		XXXX PDTC 08500 X XXXX
9.000	8.749	8.977		XXXX PDTC 09000 X XXXX
9.500	9.249	9.477		XXXX PDTC 09500 X XXXX
10.000	9.749	9.977		XXXX PDTC 10000 X XXXX
10.500	10.249	10.477		XXXX PDTC 10500 X XXXX
11.000	10.749	10.977		XXXX PDTC 11000 X XXXX
11.500	11.249	11.477		XXXX PDTC 11500 X XXXX
12.000	11.749	11.977		XXXX PDTC 12000 X XXXX
12.500	12.249	12.477		XXXX PDTC 12500 X XXXX
13.000	12.749	12.977		XXXX PDTC 13000 X XXXX
13.500	13.249	13.477		XXXX PDTC 13500 X XXXX
14.000	13.749	13.977		XXXX PDTC 14000 X XXXX
14.500	14.249	14.477		XXXX PDTC 14500 X XXXX
15.000	14.749	14.977		XXXX PDTC 15000 X XXXX
15.500	15.249	15.477		XXXX PDTC 15500 X XXXX
16.000	15.749	15.977		XXXX PDTC 16000 X XXXX

PDT Piston Groove Calculation

Formula for calculating PDT piston grooves using alternative extrusion gaps, metal-to-metal clearances and machining tolerances:

1. Maximum Groove Diameter, ***B***:

$$B = \text{Minimum Bore Diameter, } A - 0.001" - 2 \times (\text{max. cross-section})$$

2. Minimum Groove Diameter:

$$\text{Minimum Groove Diameter} = B - (\text{machining tolerances})$$

3. Maximum Piston Diameter, ***C***:

$$C = \text{Minimum Groove Diameter} + 2\left(\text{minimum cross-section}\right) - 2\left(\text{desired minimum radial metal-to-metal clearance}\right)$$

4. Minimum Groove Width:

$$D = (\text{Nominal Width, } W) + 0.010"$$

Notes

1. Tolerance for dimension *D* is +.010"/-.000".

2. Groove radii must not exceed 0.015" max.

3. Parker recommends a min. 0.005" radial metal-to-metal clearance. Using the above equations may result in metal-to-metal contact if the material's compressive properties are not considered. See **Page 4** for further details. Contact Parker if additional assistance is necessary.

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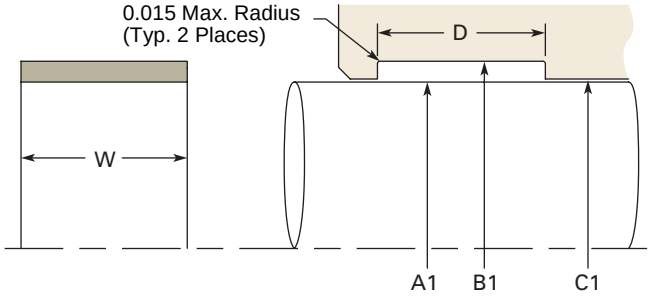
Gland Dimensions — PDT Profile, Rod (Cut-to-Length)

Table 15. PDT Gland Dimensions — Rod, Cut-To-Length



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDTD**
0.875	1.000	0.896		**XXXX PDTD 00875 X XXXX**
0.937	1.062	0.958		**XXXX PDTD 00937 X XXXX**
1.000	1.125	1.021		**XXXX PDTD 01000 X XXXX**
1.062	1.187	1.083		**XXXX PDTD 01062 X XXXX**
1.125	1.250	1.146		**XXXX PDTD 01125 X XXXX**
1.187	1.312	1.208		**XXXX PDTD 01187 X XXXX**
1.250	1.375	1.271		**XXXX PDTD 01250 X XXXX**
1.312	1.437	1.333	D = W + 0.010"	**XXXX PDTD 01312 X XXXX**
1.375	1.500	1.396		**XXXX PDTD 01375 X XXXX**
1.437	1.562	1.458		**XXXX PDTD 01437 X XXXX**
1.500	1.625	1.521		**XXXX PDTD 01500 X XXXX**
1.625	1.750	1.646		**XXXX PDTD 01625 X XXXX**
1.750	1.875	1.771		**XXXX PDTD 01750 X XXXX**
1.875	2.000	1.896		**XXXX PDTD 01875 X XXXX**
2.000	2.125	2.021		**XXXX PDTD 02000 X XXXX**
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDTE**
1.500	1.687	1.521		**XXXX PDTE 01500 X XXXX**
1.625	1.812	1.646		**XXXX PDTE 01625 X XXXX**
1.750	1.937	1.771		**XXXX PDTE 01750 X XXXX**
1.875	2.062	1.896		**XXXX PDTE 01875 X XXXX**
2.000	2.187	2.021		**XXXX PDTE 02000 X XXXX**
2.125	2.312	2.146		**XXXX PDTE 02125 X XXXX**
2.250	2.437	2.271		**XXXX PDTE 02250 X XXXX**
2.375	2.562	2.396		**XXXX PDTE 02375 X XXXX**
2.500	2.687	2.521		**XXXX PDTE 02500 X XXXX**
2.625	2.812	2.646		**XXXX PDTE 02625 X XXXX**
2.750	2.937	2.771	D = W + 0.010"	**XXXX PDTE 02750 X XXXX**
2.875	3.062	2.896		**XXXX PDTE 02875 X XXXX**
3.000	3.187	3.021		**XXXX PDTE 03000 X XXXX**
3.125	3.312	3.146		**XXXX PDTE 03125 X XXXX**
3.250	3.437	3.271		**XXXX PDTE 03250 X XXXX**
3.375	3.562	3.396		**XXXX PDTE 03375 X XXXX**
3.500	3.687	3.521		**XXXX PDTE 03500 X XXXX**
3.625	3.812	3.646		**XXXX PDTE 03625 X XXXX**
3.750	3.937	3.771		**XXXX PDTE 03750 X XXXX**
3.875	4.062	3.896		**XXXX PDTE 03875 X XXXX**
4.000	4.187	4.021		**XXXX PDTE 04000 X XXXX**

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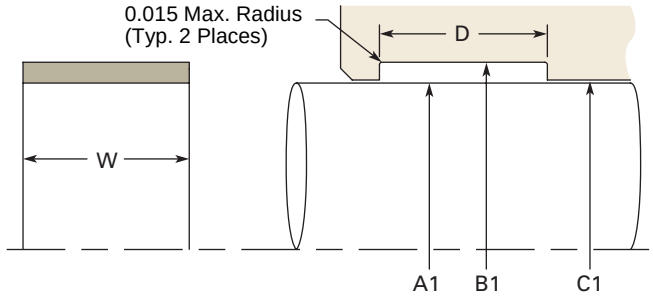
Table 15. PDT Gland Dimensions — Rod, Cut-To-Length (Continued)



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.000/-.002	**+.002/-.000**	**+.002/-.000**		**PDTE**
4.125	4.312	4.146	D = W + 0.010"	**XXXX PDTE 04125 X XXXX**
4.250	4.437	4.271		**XXXX PDTE 04250 X XXXX**
4.375	4.562	4.396		**XXXX PDTE 04375 X XXXX**
4.500	4.687	4.521		**XXXX PDTE 04500 X XXXX**
4.625	4.812	4.646		**XXXX PDTE 04625 X XXXX**
4.750	4.937	4.771		**XXXX PDTE 04750 X XXXX**
4.875	5.062	4.896		**XXXX PDTE 04875 X XXXX**
5.000	5.187	5.021		**XXXX PDTE 05000 X XXXX**
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDTF**
1.500	1.751	1.521	D = W + 0.010"	**XXXX PDTF 01500 X XXXX**
1.625	1.876	1.646		**XXXX PDTF 01625 X XXXX**
1.750	2.001	1.771		**XXXX PDTF 01750 X XXXX**
1.875	2.126	1.896		**XXXX PDTF 01875 X XXXX**
2.000	2.251	2.021		**XXXX PDTF 02000 X XXXX**
2.125	2.376	2.146		**XXXX PDTF 02125 X XXXX**
2.250	2.501	2.271		**XXXX PDTF 02250 X XXXX**
2.375	2.626	2.396		**XXXX PDTF 02375 X XXXX**
2.500	2.751	2.521		**XXXX PDTF 02500 X XXXX**
2.625	2.876	2.646		**XXXX PDTF 02625 X XXXX**
2.750	3.001	2.771		**XXXX PDTF 02750 X XXXX**
2.875	3.126	2.896		**XXXX PDTF 02875 X XXXX**
3.000	3.251	3.021		**XXXX PDTF 03000 X XXXX**
3.125	3.376	3.146		**XXXX PDTF 03125 X XXXX**
3.250	3.501	3.271		**XXXX PDTF 03250 X XXXX**
3.375	3.626	3.396		**XXXX PDTF 03375 X XXXX**
3.500	3.751	3.521		**XXXX PDTF 03500 X XXXX**
3.625	3.876	3.646		**XXXX PDTF 03625 X XXXX**
3.750	4.001	3.771		**XXXX PDTF 03750 X XXXX**
3.875	4.126	3.896		**XXXX PDTF 03875 X XXXX**
4.000	4.251	4.021		**XXXX PDTF 04000 X XXXX**
4.125	4.376	4.146		**XXXX PDTF 04125 X XXXX**
4.250	4.501	4.271		**XXXX PDTF 04250 X XXXX**
4.375	4.626	4.396		**XXXX PDTF 04375 X XXXX**
4.500	4.751	4.521		**XXXX PDTF 04500 X XXXX**
4.625	4.876	4.646		**XXXX PDTF 04625 X XXXX**
+.000/-.004	**+.003/-.000**	**+.003/-.000**	**+.010/-.000**	**PDTF**
4.750	5.001	4.772	D = W + 0.010"	**XXXX PDTF 04750 X XXXX**
4.875	5.126	4.897		**XXXX PDTF 04875 X XXXX**

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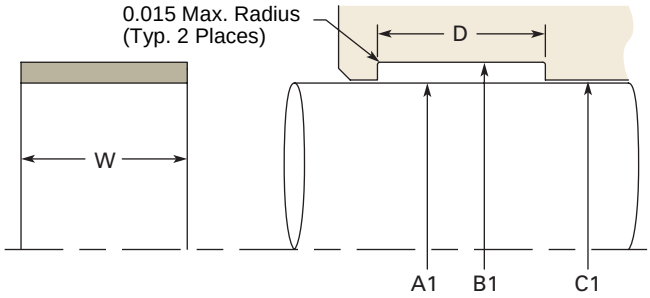
Table 15. PDT Gland Dimensions — Rod, Cut-To-Length (Continued)



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDTF**
5.000	5.251	5.022	D = W + 0.010"	**XXXX PDTF 05000 X XXXX**
5.125	5.376	5.147		**XXXX PDTF 05125 X XXXX**
5.250	5.501	5.272		**XXXX PDTF 05250 X XXXX**
5.375	5.626	5.397		**XXXX PDTF 05375 X XXXX**
5.500	5.751	5.522		**XXXX PDTF 05500 X XXXX**
5.625	5.876	5.647		**XXXX PDTF 05625 X XXXX**
5.750	6.001	5.772		**XXXX PDTF 05750 X XXXX**
5.875	6.126	5.897		**XXXX PDTF 05875 X XXXX**
6.000	6.251	6.022		**XXXX PDTF 06000 X XXXX**
6.250	6.501	6.272		**XXXX PDTF 06250 X XXXX**
6.500	6.751	6.522		**XXXX PDTF 06500 X XXXX**
6.750	7.001	6.772		**XXXX PDTF 06750 X XXXX**
7.000	7.251	7.022		**XXXX PDTF 07000 X XXXX**
7.250	7.501	7.272		**XXXX PDTF 07250 X XXXX**
7.500	7.751	7.522		**XXXX PDTF 07500 X XXXX**
+.000/-.006	**+.004/-.000**	**+.004/-.000**	**+.010/-.000**	**PDTF**
7.750	8.001	7.773	D = W + 0.010"	**XXXX PDTF 07750 X XXXX**
8.000	8.251	8.023		**XXXX PDTF 08000 X XXXX**
8.500	8.751	8.523		**XXXX PDTF 08500 X XXXX**
9.000	9.251	9.023		**XXXX PDTF 09000 X XXXX**
9.500	9.751	9.523		**XXXX PDTF 09500 X XXXX**
10.000	10.251	10.023		**XXXX PDTF 10000 X XXXX**

PDT Rod Groove Calculation

Formula for calculating PDT rod grooves using alternative extrusion gaps, metal-to-metal clearances and machining tolerances:

1. Minimum Groove Diameter, ***B1***:

$$B1 = \text{Maximum Rod Diameter, } A1 + 0.001" + 2 \times (\text{max. cross-section})$$

2. Maximum Groove Diameter:

$$\text{Maximum Groove Diameter} = B1 + (\text{machining tolerances})$$

3. Minimum Throat Diameter, ***C1***:

$$C1 = \text{Maximum Groove Diameter} - 2\left(\text{minimum cross-section}\right) + 2\left(\text{desired minimum radial metal-to-metal clearance}\right)$$

4. Minimum Groove Width:

$$D = (\text{Nominal Width, } W) + 0.010"$$

Notes

1. Tolerance for dimension *D* is +.010"/-.000".
2. Groove radii must not exceed 0.015" max.
3. Parker recommends a min. 0.005" radial metal-to-metal clearance. Using the above equations may result in metal-to-metal contact if the material's compressive properties are not considered. See **Page 4** for further details. Contact Parker if additional assistance is necessary.

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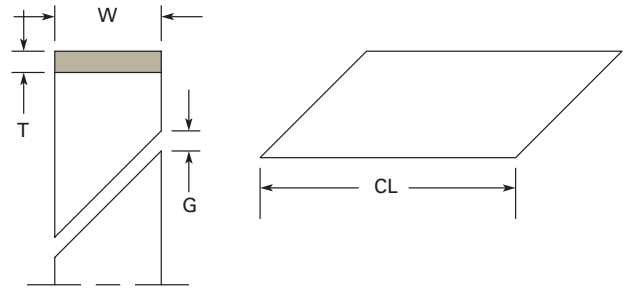
PDT Bulk Strip

Table 16. PDT Bulk Strip Standard Sizes



T Radial Cross-Section	W Width	Part Number
062		
0.062	0.250	**XXXX PDTH 062-0250**
0.062	0.375	**XXXX PDTH 062-0375**
0.062	0.500	**XXXX PDTH 062-0500**
0.062	0.625	**XXXX PDTH 062-0625**
093		
0.093	0.250	**XXXX PDTH 093-0250**
0.093	0.375	**XXXX PDTH 093-0375**
0.093	0.500	**XXXX PDTH 093-0500**
0.093	0.625	**XXXX PDTH 093-0625**
125		
0.125	0.250	**XXXX PDTH 125-0250**
0.125	0.375	**XXXX PDTH 125-0375**
0.125	0.500	**XXXX PDTH 125-0500**
0.125	0.625	**XXXX PDTH 125-0625**
0.125	0.750	**XXXX PDTH 125-0750**
0.125	1.000	**XXXX PDTH 125-1000**

Cutting Instructions

Table 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

Formula for calculating cut length, CL:

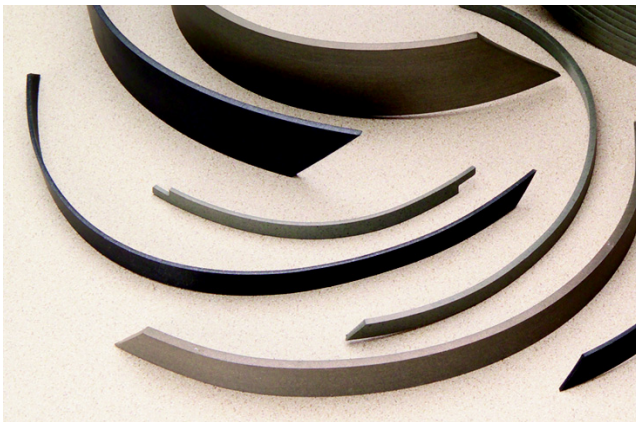
For Pistons:

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

For Rods:

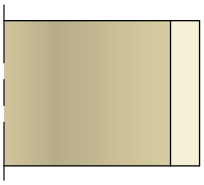
$$CL = [(\text{Rod Diameter} + T) \times \pi] - G$$

To calculate groove dimensions, use either the pre-established values or the formulas for cut-to-length PDT strip found on **Pages 23** through **30**.



08/17/05

PDW Profile



Piston sealing system comprised of PDW machined wear rings and E4 Piston U-Cups

Rod sealing system comprised of PDW machined wear ring, 8400 U-cup and 8600 wiper

PDW

PDW Wear Rings are precision machined PTFE bearings, lathe cut to exact size and shape. PDWs 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

Material

0401 – 40% Bronze-Filled PTFE

0307 – 23% Carbon, 2% Graphite-Filled PTFE

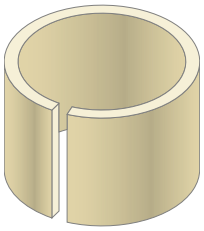
Others available upon request

Radial Tolerance

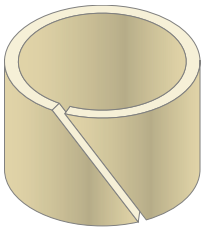
+.000"/–.004"

End Cuts

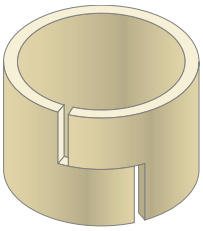
Butt Cut, Angle Cut, Step Cut



Butt Cut



Angle Cut



Step Cut

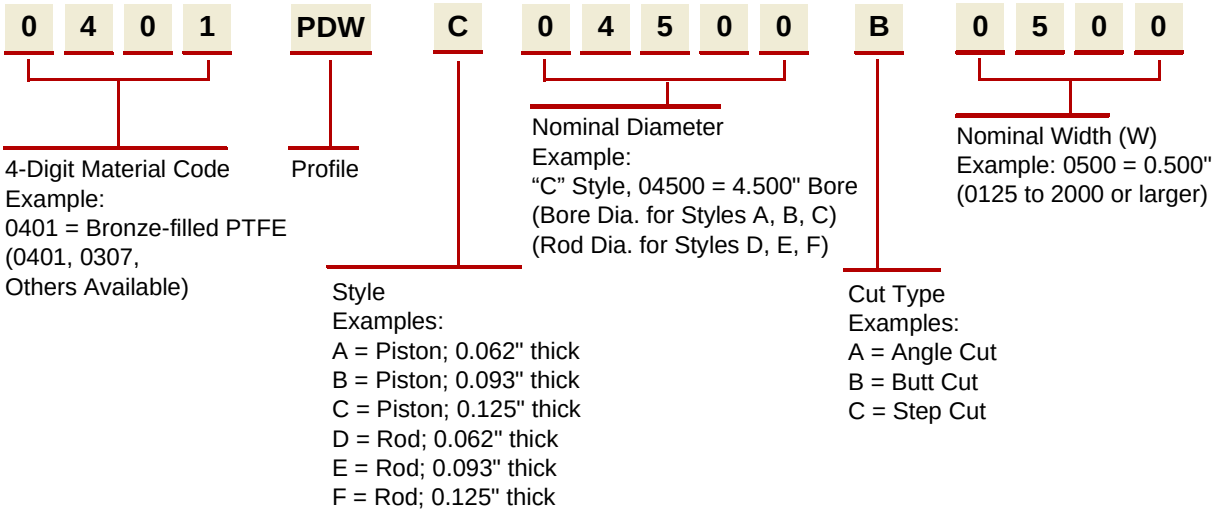
Options

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

08/17/05

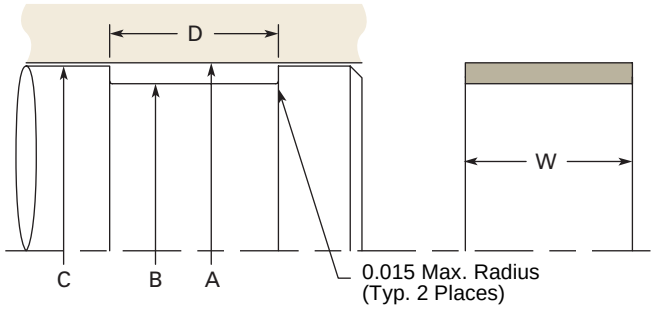
Part Number Nomenclature — PDW Profile

Table 18. PDW Profile



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

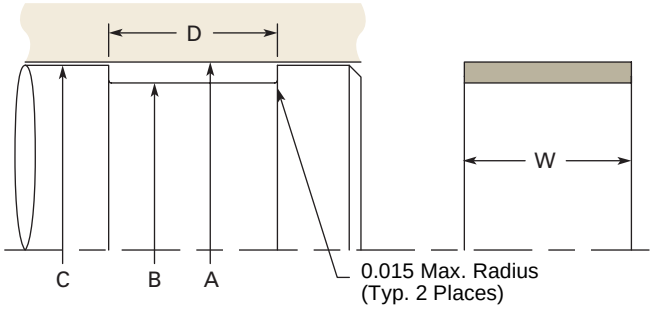
Table 19. PDW Gland Dimensions — Piston, Cut-To-Length



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.002/-.000	+.000/-.002	+.000/-.002	+.010/-.000	PDWA
0.687	0.562	0.666	D = W + 0.010"	XXXX PDWA 00687 X XXXX
0.750	0.625	0.729		XXXX PDWA 00750 X XXXX
0.812	0.687	0.791		XXXX PDWA 00812 X XXXX
0.875	0.750	0.854		XXXX PDWA 00875 X XXXX
0.937	0.812	0.916		XXXX PDWA 00937 X XXXX
1.000	0.875	0.979		XXXX PDWA 01000 X XXXX
1.062	0.937	1.041		XXXX PDWA 01062 X XXXX
1.125	1.000	1.104		XXXX PDWA 01125 X XXXX
1.187	1.062	1.166		XXXX PDWA 01187 X XXXX
1.250	1.125	1.229		XXXX PDWA 01250 X XXXX
1.312	1.187	1.291		XXXX PDWA 01312 X XXXX
1.375	1.250	1.354		XXXX PDWA 01375 X XXXX
1.437	1.312	1.416		XXXX PDWA 01437 X XXXX
1.500	1.375	1.479		XXXX PDWA 01500 X XXXX

08/17/05

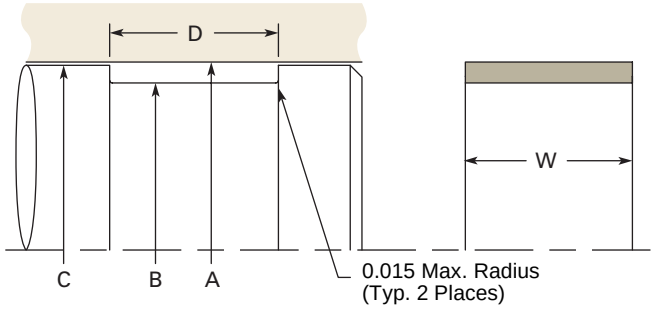
Table 19. PDW Gland Dimensions — Piston, Cut-To-Length (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	**PDWA**
1.562	1.437	1.541	D = W + 0.010"	**XXXX PDWA 01562 X XXXX**
1.625	1.500	1.604		**XXXX PDWA 01625 X XXXX**
1.687	1.562	1.666		**XXXX PDWA 01687 X XXXX**
1.750	1.625	1.729		**XXXX PDWA 01750 X XXXX**
1.875	1.750	1.854		**XXXX PDWA 01875 X XXXX**
2.000	1.875	1.979		**XXXX PDWA 02000 X XXXX**
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	**PDWB**
1.500	1.313	1.479	D = W + 0.010"	**XXXX PDWB 01500 X XXXX**
1.562	1.375	1.541		**XXXX PDWB 01562 X XXXX**
1.625	1.438	1.604		**XXXX PDWB 01625 X XXXX**
1.687	1.500	1.666		**XXXX PDWB 01687 X XXXX**
1.750	1.563	1.729		**XXXX PDWB 01750 X XXXX**
1.875	1.688	1.854		**XXXX PDWB 01875 X XXXX**
2.000	1.813	1.979		**XXXX PDWB 02000 X XXXX**
2.125	1.938	2.104		**XXXX PDWB 02125 X XXXX**
2.250	2.063	2.229		**XXXX PDWB 02250 X XXXX**
2.375	2.188	2.354		**XXXX PDWB 02375 X XXXX**
2.500	2.313	2.479		**XXXX PDWB 02500 X XXXX**
2.625	2.438	2.604		**XXXX PDWB 02625 X XXXX**
2.750	2.563	2.729		**XXXX PDWB 02750 X XXXX**
2.875	2.688	2.854		**XXXX PDWB 02875 X XXXX**
3.000	2.813	2.979		**XXXX PDWB 03000 X XXXX**
3.125	2.938	3.104		**XXXX PDWB 03125 X XXXX**
3.250	3.063	3.229		**XXXX PDWB 03250 X XXXX**
3.375	3.188	3.354		**XXXX PDWB 03375 X XXXX**
3.500	3.313	3.479		**XXXX PDWB 03500 X XXXX**
3.625	3.438	3.604		**XXXX PDWB 03625 X XXXX**
3.750	3.563	3.729		**XXXX PDWB 03750 X XXXX**
3.875	3.688	3.854		**XXXX PDWB 03875 X XXXX**
4.000	3.813	3.979		**XXXX PDWB 04000 X XXXX**
4.125	3.938	4.104		**XXXX PDWB 04125 X XXXX**
4.250	4.063	4.229		**XXXX PDWB 04250 X XXXX**
4.375	4.188	4.354		**XXXX PDWB 04375 X XXXX**
4.500	4.313	4.479		**XXXX PDWB 04500 X XXXX**
4.625	4.438	4.604		**XXXX PDWB 04625 X XXXX**

08/17/05

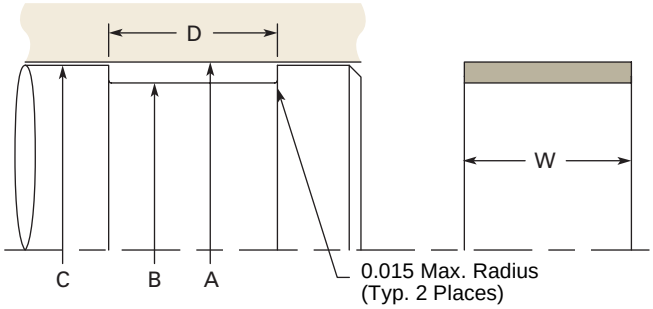
Table 19. PDW Gland Dimensions — Piston, Cut-To-Length (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.004/-.000	**+.000/-.003**	**+.000/-.003**	**+.010/-.000**	**PDWB**
4.750	4.563	4.729	D = W + 0.010"	**XXXX PDWB 04750 X XXXX**
4.875	4.688	4.854		**XXXX PDWB 04875 X XXXX**
5.000	4.813	4.978		**XXXX PDWB 05000 X XXXX**
5.125	4.938	5.103		**XXXX PDWB 05125 X XXXX**
5.250	5.063	5.228		**XXXX PDWB 05250 X XXXX**
5.375	5.188	5.353		**XXXX PDWB 05375 X XXXX**
5.500	5.313	5.478		**XXXX PDWB 05500 X XXXX**
5.625	5.438	5.603		**XXXX PDWB 05625 X XXXX**
5.750	5.563	5.728		**XXXX PDWB 05750 X XXXX**
5.875	5.688	5.853		**XXXX PDWB 05875 X XXXX**
6.000	5.813	5.978		**XXXX PDWB 06000 X XXXX**
6.125	5.938	6.103		**XXXX PDWB 06125 X XXXX**
6.250	6.063	6.228		**XXXX PDWB 06250 X XXXX**
6.375	6.188	6.353		**XXXX PDWB 06375 X XXXX**
6.500	6.313	6.478		**XXXX PDWB 06500 X XXXX**
6.750	6.563	6.728		**XXXX PDWB 06750 X XXXX**
7.000	6.813	6.978		**XXXX PDWB 07000 X XXXX**
7.250	7.063	7.228		**XXXX PDWB 07250 X XXXX**
7.500	7.313	7.478		**XXXX PDWB 07500 X XXXX**
7.750	7.563	7.728		**XXXX PDWB 07750 X XXXX**
+.006/-.000	**+.000/-.004**	**+.000/-.004**	**+.010/-.000**	**PDWB**
8.000	7.813	7.977	D = W + 0.010"	**XXXX PDWB 08000 X XXXX**
8.250	8.063	8.227		**XXXX PDWB 08250 X XXXX**
8.500	8.313	8.477		**XXXX PDWB 08500 X XXXX**
9.000	8.813	8.977		**XXXX PDWB 09000 X XXXX**
9.500	9.313	9.477		**XXXX PDWB 09500 X XXXX**
10.000	9.813	9.977		**XXXX PDWB 10000 X XXXX**
+.002/-.000	**+.000/-.002**	**+.000/-.002**	**+.010/-.000**	**PDWC**
2.000	1.749	1.979	D = W + 0.010"	**XXXX PDWC 02000 X XXXX**
2.125	1.874	2.104		**XXXX PDWC 02125 X XXXX**
2.250	1.999	2.229		**XXXX PDWC 02250 X XXXX**
2.375	2.124	2.354		**XXXX PDWC 02375 X XXXX**
2.500	2.249	2.479		**XXXX PDWC 02500 X XXXX**
2.625	2.374	2.604		**XXXX PDWC 02625 X XXXX**
2.750	2.499	2.729		**XXXX PDWC 02750 X XXXX**
2.875	2.624	2.854		**XXXX PDWC 02875 X XXXX**

08/17/05

Table 19. PDW Gland Dimensions — Piston, Cut-To-Length (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.002/-.000	**+.000/-.002**	**+.000/-.002**		**PDWC**
3.000	2.749	2.979	D = W + 0.010"	**XXXX PDWC 03000 X XXXX**
3.125	2.874	3.104		**XXXX PDWC 03125 X XXXX**
3.250	2.999	3.229		**XXXX PDWC 03250 X XXXX**
3.375	3.124	3.354		**XXXX PDWC 03375 X XXXX**
3.500	3.249	3.479		**XXXX PDWC 03500 X XXXX**
3.625	3.374	3.604		**XXXX PDWC 03625 X XXXX**
3.750	3.499	3.729		**XXXX PDWC 03750 X XXXX**
3.875	3.624	3.854		**XXXX PDWC 03875 X XXXX**
4.000	3.749	3.979		**XXXX PDWC 04000 X XXXX**
4.125	3.874	4.104		**XXXX PDWC 04125 X XXXX**
4.250	3.999	4.229		**XXXX PDWC 04250 X XXXX**
4.375	4.124	4.354		**XXXX PDWC 04375 X XXXX**
4.500	4.249	4.479		**XXXX PDWC 04500 X XXXX**
4.625	4.374	4.604		**XXXX PDWC 04625 X XXXX**
4.750	4.499	4.729		**XXXX PDWC 04750 X XXXX**
4.875	4.624	4.854		**XXXX PDWC 04875 X XXXX**
+.004/-.000	**+.000/-.003**	**+.000/-.003**	**+.010/-.000**	**PDWC**
5.000	4.749	4.978	D = W + 0.010"	**XXXX PDWC 05000 X XXXX**
5.125	4.874	5.103		**XXXX PDWC 05125 X XXXX**
5.250	4.999	5.228		**XXXX PDWC 05250 X XXXX**
5.375	5.124	5.353		**XXXX PDWC 05375 X XXXX**
5.500	5.249	5.478		**XXXX PDWC 05500 X XXXX**
5.625	5.374	5.603		**XXXX PDWC 05625 X XXXX**
5.750	5.499	5.728		**XXXX PDWC 05750 X XXXX**
5.875	5.624	5.853		**XXXX PDWC 05875 X XXXX**
6.000	5.749	5.978		**XXXX PDWC 06000 X XXXX**
6.125	5.874	6.103		**XXXX PDWC 06125 X XXXX**
6.250	5.999	6.228		**XXXX PDWC 06250 X XXXX**
6.375	6.124	6.353		**XXXX PDWC 06375 X XXXX**
6.500	6.249	6.478		**XXXX PDWC 06500 X XXXX**
6.750	6.499	6.728		**XXXX PDWC 06750 X XXXX**
7.000	6.749	6.978		**XXXX PDWC 07000 X XXXX**
7.250	6.999	7.228		**XXXX PDWC 07250 X XXXX**
7.500	7.249	7.478		**XXXX PDWC 07500 X XXXX**
7.750	7.499	7.728		**XXXX PDWC 07750 X XXXX**

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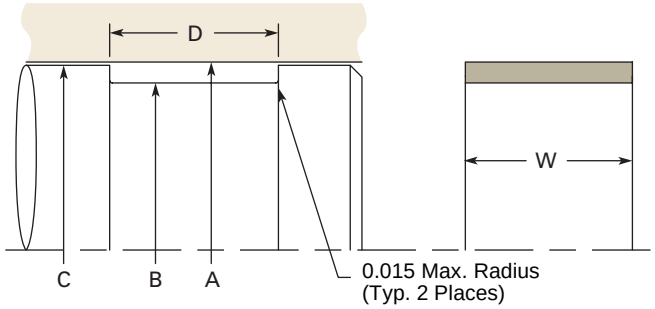
Table 19. PDW Gland Dimensions — Piston, Cut-To-Length (Continued)



A Bore Diameter	B Groove Diameter	C Piston Diameter	D Groove Width	Part Number
+.006/-.000	+.000/-.004	+.000/-.004	+.010/-.000	PDWC
8.000	7.749	7.977	D = W + 0.010"	XXXX PDWC 08000 X XXXX
8.250	7.999	8.227		XXXX PDWC 08250 X XXXX
8.500	8.249	8.477		XXXX PDWC 08500 X XXXX
9.000	8.749	8.977		XXXX PDWC 09000 X XXXX
9.500	9.249	9.477		XXXX PDWC 09500 X XXXX
10.000	9.749	9.977		XXXX PDWC 10000 X XXXX
10.500	10.249	10.477		XXXX PDWC 10500 X XXXX
11.000	10.749	10.977		XXXX PDWC 11000 X XXXX
11.500	11.249	11.477		XXXX PDWC 11500 X XXXX
12.000	11.749	11.977		XXXX PDWC 12000 X XXXX
12.500	12.249	12.477		XXXX PDWC 12500 X XXXX
13.000	12.749	12.977		XXXX PDWC 13000 X XXXX
13.500	13.249	13.477		XXXX PDWC 13500 X XXXX
14.000	13.749	13.977		XXXX PDWC 14000 X XXXX
14.500	14.249	14.477		XXXX PDWC 14500 X XXXX
15.000	14.749	14.977		XXXX PDWC 15000 X XXXX
15.500	15.249	15.477		XXXX PDWC 15500 X XXXX
16.000	15.749	15.977		XXXX PDWC 16000 X XXXX

PDW Piston Groove Calculation

Formula for calculating PDW piston grooves using alternative extrusion gaps, metal-to-metal clearances and machining tolerances:

1. Maximum Groove Diameter, ***B***:

$$B = \text{Minimum Bore Diameter, } A - 0.001" - 2 \times (\text{max. cross-section})$$

2. Minimum Groove Diameter:

$$\text{Minimum Groove Diameter} = B - (\text{machining tolerances})$$

3. Maximum Piston Diameter, ***C***:

$$C = \text{Minimum Groove Diameter} + 2\left(\text{minimum cross-section}\right) - 2\left(\text{desired minimum radial metal-to-metal clearance}\right)$$

4. Minimum Groove Width:

$$D = (\text{Nominal Width, } W) + 0.010"$$

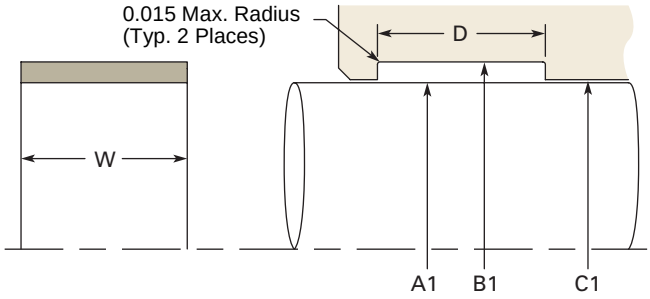
Notes

1. Tolerance for dimension *D* is +.010"/-.000".
2. Groove radii must not exceed 0.015" max.
3. Parker recommends a min. 0.005" radial metal-to-metal clearance. Using the above equations may result in metal-to-metal contact if the material's compressive properties are not considered. See **Page 4** for further details. Contact Parker if additional assistance is necessary.

08/17/05

Gland Dimensions — PDW Profile, Rod (Cut-to-Length)

Table 20. PDW Gland Dimensions — Rod, Cut-To-Length



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDWD**
0.312	0.437	0.333	D = W + 0.010"	**XXXX PDWD 00875 X XXXX**
0.375	0.500	0.396		**XXXX PDWD 00375 X XXXX**
0.437	0.562	0.458		**XXXX PDWD 00437 X XXXX**
0.500	0.625	0.521		**XXXX PDWD 00500 X XXXX**
0.562	0.687	0.583		**XXXX PDWD 00562 X XXXX**
0.625	0.750	0.646		**XXXX PDWD 00625 X XXXX**
0.687	0.812	0.708		**XXXX PDWD 00687 X XXXX**
0.750	0.875	0.771		**XXXX PDWD 00750 X XXXX**
0.812	0.937	0.833		**XXXX PDWD 00812 X XXXX**
0.875	1.000	0.896		**XXXX PDWD 00875 X XXXX**
0.937	1.062	0.958		**XXXX PDWD 00937 X XXXX**
1.000	1.125	1.021		**XXXX PDWD 01000 X XXXX**
1.062	1.187	1.083		**XXXX PDWD 01062 X XXXX**
1.125	1.250	1.146		**XXXX PDWD 01125 X XXXX**
1.187	1.312	1.208		**XXXX PDWD 01187 X XXXX**
1.250	1.375	1.271		**XXXX PDWD 01250 X XXXX**
1.312	1.437	1.333		**XXXX PDWD 01312 X XXXX**
1.375	1.500	1.396		**XXXX PDWD 01375 X XXXX**
1.437	1.562	1.458		**XXXX PDWD 01437 X XXXX**
1.500	1.625	1.521		**XXXX PDWD 01500 X XXXX**
1.625	1.750	1.646		**XXXX PDWD 01625 X XXXX**
1.750	1.875	1.771		**XXXX PDWD 01750 X XXXX**
1.875	2.000	1.896		**XXXX PDWD 01875 X XXXX**
2.000	2.125	2.021		**XXXX PDWD 02000 X XXXX**
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDWE**
1.500	1.687	1.521	D = W + 0.010"	**XXXX PDWE 01500 X XXXX**
1.625	1.812	1.646		**XXXX PDWE 01625 X XXXX**
1.750	1.937	1.771		**XXXX PDWE 01750 X XXXX**
1.875	2.062	1.896		**XXXX PDWE 01875 X XXXX**
2.000	2.187	2.021		**XXXX PDWE 02000 X XXXX**
2.125	2.312	2.146		**XXXX PDWE 02125 X XXXX**
2.250	2.437	2.271		**XXXX PDWE 02250 X XXXX**
2.375	2.562	2.396		**XXXX PDWE 02375 X XXXX**

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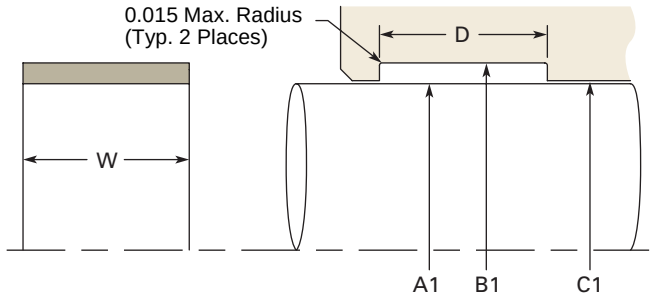
Table 20. PDW Gland Dimensions — Rod, Cut-To-Length (Continued)



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDWE**
2.500	2.687	2.521	D = W + 0.010"	**XXXX PDWE 02500 X XXXX**
2.625	2.812	2.646		**XXXX PDWE 02625 X XXXX**
2.750	2.937	2.771		**XXXX PDWE 02750 X XXXX**
2.875	3.062	2.896		**XXXX PDWE 02875 X XXXX**
3.000	3.187	3.021		**XXXX PDWE 03000 X XXXX**
3.125	3.312	3.146		**XXXX PDWE 03125 X XXXX**
3.250	3.437	3.271		**XXXX PDWE 03250 X XXXX**
3.375	3.562	3.396		**XXXX PDWE 03375 X XXXX**
3.500	3.687	3.521		**XXXX PDWE 03500 X XXXX**
3.625	3.812	3.646		**XXXX PDWE 03625 X XXXX**
3.750	3.937	3.771		**XXXX PDWE 03750 X XXXX**
3.875	4.062	3.896		**XXXX PDWE 03875 X XXXX**
4.000	4.187	4.021		**XXXX PDWE 04000 X XXXX**
4.125	4.312	4.146		**XXXX PDWE 04125 X XXXX**
4.250	4.437	4.271		**XXXX PDWE 04250 X XXXX**
4.375	4.562	4.396		**XXXX PDWE 04375 X XXXX**
4.500	4.687	4.521		**XXXX PDWE 04500 X XXXX**
4.625	4.812	4.646		**XXXX PDWE 04625 X XXXX**
4.750	4.937	4.771		**XXXX PDWE 04750 X XXXX**
4.875	5.062	4.896		**XXXX PDWE 04875 X XXXX**
5.000	5.187	5.021		**XXXX PDWE 05000 X XXXX**
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDWF**
1.500	1.751	1.521	D = W + 0.010"	**XXXX PDWF 01500 X XXXX**
1.625	1.876	1.646		**XXXX PDWF 01625 X XXXX**
1.750	2.001	1.771		**XXXX PDWF 01750 X XXXX**
1.875	2.126	1.896		**XXXX PDWF 01875 X XXXX**
2.000	2.251	2.021		**XXXX PDWF 02000 X XXXX**
2.125	2.376	2.146		**XXXX PDWF 02125 X XXXX**
2.250	2.501	2.271		**XXXX PDWF 02250 X XXXX**
2.375	2.626	2.396		**XXXX PDWF 02375 X XXXX**
2.500	2.751	2.521		**XXXX PDWF 02500 X XXXX**
2.625	2.876	2.646		**XXXX PDWF 02625 X XXXX**
2.750	3.001	2.771		**XXXX PDWF 02750 X XXXX**
2.875	3.126	2.896		**XXXX PDWF 02875 X XXXX**

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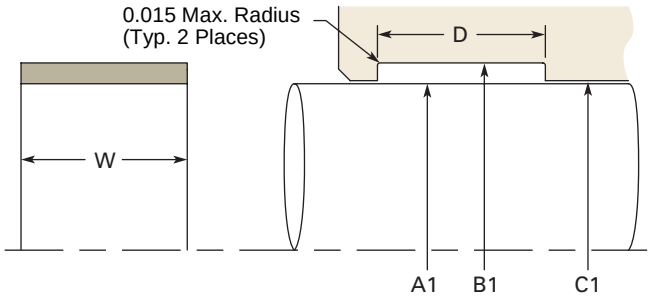
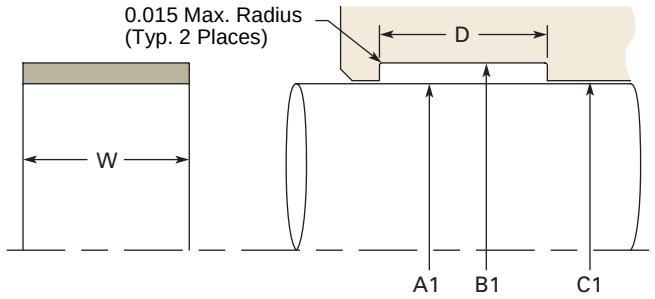
Table 20. PDW Gland Dimensions — Rod, Cut-To-Length (Continued)



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.000/-.002	**+.002/-.000**	**+.002/-.000**	**+.010/-.000**	**PDWF**
3.000	3.251	3.021	D = W + 0.010"	**XXXX PDWF 03000 X XXXX**
3.125	3.376	3.146		**XXXX PDWF 03125 X XXXX**
3.250	3.501	3.271		**XXXX PDWF 03250 X XXXX**
3.375	3.626	3.396		**XXXX PDWF 03375 X XXXX**
3.500	3.751	3.521		**XXXX PDWF 03500 X XXXX**
3.625	3.876	3.646		**XXXX PDWF 03625 X XXXX**
3.750	4.001	3.771		**XXXX PDWF 03750 X XXXX**
3.875	4.126	3.896		**XXXX PDWF 03875 X XXXX**
4.000	4.251	4.021		**XXXX PDWF 04000 X XXXX**
4.125	4.376	4.146		**XXXX PDWF 04125 X XXXX**
4.250	4.501	4.271		**XXXX PDWF 04250 X XXXX**
4.375	4.626	4.396		**XXXX PDWF 04375 X XXXX**
4.500	4.751	4.521		**XXXX PDWF 04500 X XXXX**
4.625	4.876	4.646		**XXXX PDWF 04625 X XXXX**
+.000/-.004	**+.003/-.000**	**+.003/-.000**	**+.010/-.000**	**PDWF**
4.750	5.001	4.772	D = W + 0.010"	**XXXX PDWF 04750 X XXXX**
4.875	5.126	4.897		**XXXX PDWF 04875 X XXXX**
5.000	5.251	5.022		**XXXX PDWF 05000 X XXXX**
5.125	5.376	5.147		**XXXX PDWF 05125 X XXXX**
5.250	5.501	5.272		**XXXX PDWF 05250 X XXXX**
5.375	5.626	5.397		**XXXX PDWF 05375 X XXXX**
5.500	5.751	5.522		**XXXX PDWF 05500 X XXXX**
5.625	5.876	5.647		**XXXX PDWF 05625 X XXXX**
5.750	6.001	5.772		**XXXX PDWF 05750 X XXXX**
5.875	6.126	5.897		**XXXX PDWF 05875 X XXXX**
6.000	6.251	6.022		**XXXX PDWF 06000 X XXXX**
6.250	6.501	6.272		**XXXX PDWF 06250 X XXXX**
6.500	6.751	6.522		**XXXX PDWF 06500 X XXXX**
6.750	7.001	6.772		**XXXX PDWF 06750 X XXXX**
7.000	7.251	7.022		**XXXX PDWF 07000 X XXXX**
7.250	7.501	7.272		**XXXX PDWF 07250 X XXXX**
7.500	7.751	7.522		**XXXX PDWF 07500 X XXXX**

08/17/05

Table 20. PDW Gland Dimensions — Rod, Cut-To-Length (Continued)



A1 Rod Diameter	B1 Groove Diameter	C1 Throat Diameter	D Groove Width	Part Number
+.000/-.006	+.004/-.000	+.004/-.000	+.010/-.000	PDWF
7.750	8.001	7.773	D = W + 0.010"	XXXX PDWF 07750 X XXXX
8.000	8.251	8.023		XXXX PDWF 08000 X XXXX
8.500	8.751	8.523		XXXX PDWF 08500 X XXXX
9.000	9.251	9.023		XXXX PDWF 09000 X XXXX
9.500	9.751	9.523		XXXX PDWF 09500 X XXXX
10.000	10.251	10.023		XXXX PDWF 10000 X XXXX

PDW Rod Groove Calculation

Formula for calculating PDW rod grooves using alternative extrusion gaps, metal-to-metal clearances and machining tolerances:

1. Minimum Groove Diameter, ***B1***:

$$B1 = \text{Maximum Rod Diameter, } A1 - 0.001" + 2 \times (\text{max. cross-section})$$

2. Maximum Groove Diameter:

$$\text{Maximum Groove Diameter} = B1 + (\text{machining tolerances})$$

3. Minimum Throat Diameter, ***C1***:

$$C1 = \text{Maximum Groove Diameter} - 2\left(\text{maximum cross-section}\right) + 2\left(\text{desired minimum radial metal-to-metal clearance}\right)$$

4. Minimum Groove Width:

$$D = (\text{Nominal Width, } W) + 0.010"$$

Notes

1. Tolerance for dimension *D* is +.010"/-.000".
2. Groove radii must not exceed 0.015" max.
3. Parker recommends a min. 0.005" radial metal-to-metal clearance. Using the above equations may result in metal-to-metal contact if the material's compressive properties are not considered. See **Page 4** for further details. Contact Parker if additional assistance is necessary.

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Design Action Request Form

NEED HELP? If you need assistance, please photocopy these two pages. Fill out the required information and fax to (801) 973-4019. Use the information below and other information in this catalog to determine the dimensions needed. We will contact you to discuss your specific application and make recommendations. If you need help filling out this form, please call Applications Engineering at (801) 972-3000.

ENGINEERED POLYMER SYSTEMS DIVISION
DESIGN ACTION REQUEST

EPS Division
2220 South 3600 West
Salt Lake City, UT
Tel: (801) 972-3000
Fax: (801) 973-4019

Applications Engineering Use:
Project #_____
Date Entered _____
Date Required _____
Prepared by _____
Territory Mgr. _____
Distributor _____
_____
Dist. Sales _____

Referred by _____
Lead # _____

COMPANY: _____ FAX NUMBER: _____
ADDRESS: _____ P.O. BOX: _____ MAIL STOP: _____
CITY: _____ STATE: _____ ZIP: _____ COUNTRY: _____
CONTACT: _____ TITLE: _____ PHONE: _____ EXT: _____
ALT. CONTACT: _____ TITLE: _____ PHONE: _____ EXT: _____
E-MAIL: _____

EQUIPMENT/MANUFACTURER: _____ MODEL NO.: _____
EXISTING SEAL MANUFACTURER: _____ PART NO.: _____
REASON FOR CHANGE: ☐ PERFORMANCE ☐ DELIVERY ☐ NEW APPLICATION ☐ PRICE
CURRENT PRICE: _____ @ _____ PCS. MONTHLY USAGE: _____ HOURS OPERATION: _____ HOURS SERV. LIFE: _____
TARGET PRICE: _____ @ _____ PCS. QUOTE QTY.: _____ PROTO QTY.: _____ DATE PROTO REQ'D.: _____
SPECIAL INSPECTION REQUIREMENTS: ☐ YES ☐ NO SPECIAL PACKAGING REQUIREMENTS: ☐ YES ☐ NO
EXPLAIN: _____

MOTION

☐ STATIC ☐ RECIPROCATING ☐ OSCILLATORY ☐ ROTARY

PRODUCT TYPE

NON-ROTARY

☐ ROD/SHAFT ☐ WIPER
☐ PISTON ☐ BEARING
☐ INTERNAL FACE ☐ VANE
☐ EXTERNAL FACE ☐ NON-SEAL

ROTARY

☐ SOLID SEAL ☐ PTFE LIP SEAL
☐ SPLIT SEAL ☐ ELASTOMER LIP SEAL
☐ BEARING ISOLATOR

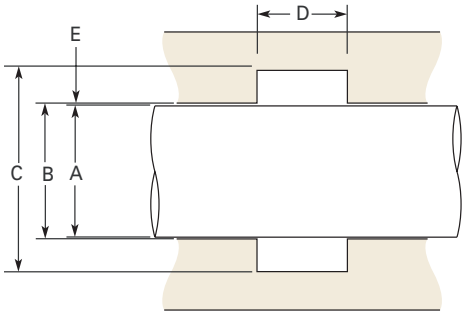
08/17/05

Design Action Request Form

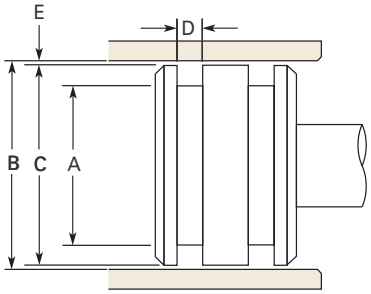
OPERATING PARAMETERS	UNIT (CIRCLE ONE)	MINIMUM	OPERATING	MAXIMUM
TEMPERATURE:	°K °F °C			
PRESSURE:	PSI BAR MPA			
STROKE LENGTH (RECIPROCATING):	INCH MM			
CYCLE RATE:	/MIN. /HR. HZ			
DEGREE OF ARC (OSCILLATING):	DEGREES			
VELOCITY:	FT/MIN. MM/MIN.			
VACUUM:	IN HG TORR			

MEDIA TO BE SEALED: _____

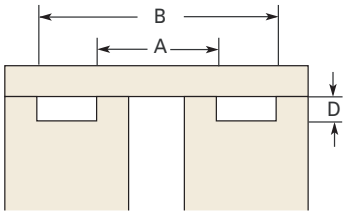
☐ **Rod**



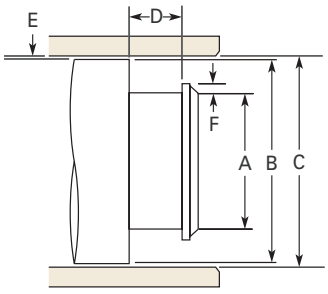
☐ **Piston**



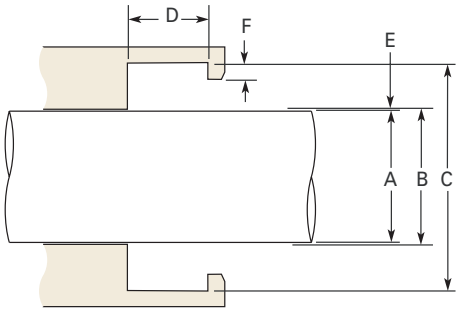
☐ **Face Seal**



☐ **Other Piston**



☐ **Other Rod**



HARDWARE SPECIFICATIONS

HARDWARE DRAWINGS INCLUDED WITH DAR: ☐ 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. _____	CAN HARDWARE BE CHANGED? ☐ YES ☐ NO		
E RADIAL CLEARANCE:	MIN. _____	MAX. _____	HOW? _____		
F ROD / PISTON STEP HEIGHT:	MIN. _____	MAX. _____			
RUN OUT (TIR):	MIN. _____	MAX. _____			
ECCENTRICITY:	MIN. _____	MAX. _____			

SIDE LOAD (LBS. NEWTONS): _____

MIL-G-5514 O-RING DASH #: _____ BACK-UP WIDTH ____

AS4716 O-RING DASH #: _____ BACK-UP WIDTH ____

GLAND TYPE

____ SPLIT ____ OPEN

____ SOLID ____ STEPPED

METRIC

☐ YES

☐ NO

PERFORMANCE REQUIREMENTS

(CIRCLE ONE)

FRICTION: LBS OZ GMS BREAKOUT ____ DYNAMIC ____

TORQUE: FT/LB IN/OZ GM/CM BREAKOUT ____ DYNAMIC ____

EXPECTED LIFE: CYC HRS YRS _____

MAX. LEAKAGE: DROPS CC/MIN _____

MOST CRITICAL ASPECT: _____

CONTAMINATION: _____

08/17/05

Parker Hannifin Corporation

www.parkerseals.com

EPS Division
Salt Lake City, UT
Tel: (801) 972-3000
Fax: (801) 973-4019

Notes

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Other Parker EPS Products

Parker EPS Division

Parker EPS Division designs and manufactures engineered elastomeric, polymeric and plastic seals and sealing systems for dynamic applications. EPS Division has a worldwide sealing network consisting of manufacturing locations in Utah, Texas, New York, Illinois and Baja, Mexico; and more than 200 distributor and service center locations in nine countries.

Catalog Services

EPS Division's catalogs and technical bulletins are available through Parker's Catalog Services. To order catalogs and have them shipped directly, call 1-800-C-PARKER, or send your requests via e-mail to: catalogs@parker.com.

Technical Support

Parker product engineers are available to address temperature, pressure, gland design, surface finish and all other seal design considerations, and can often optimize an existing design or propose cost-effective alternatives. Our in-house hydraulic and pneumatic test and R&D laboratories enable us to quickly develop and perform appropriate test protocols for our customers.

Rod Seals

Parker is the premiere manufacturer of quality rod sealing products both in standard inch as well as metric sizes, in a wide range of urethane and traditional elastomer compounds.

See: Catalog EPS 3800 & 5225

Piston Seals

Parker is pleased to provide a diverse offering of piston seal profiles to suit a broad range of applications. Various cap materials extend service to a broad range of application pressures and temperatures.

See: Technical Bulletins EPS 5212, 5206, 5238, 5301, 5302

Rod Wipers & Scrapers

Parker is the leading manufacturer of rod wipers and scrapers in a variety of geometries to suit any rod application. Parker's rod wipers are offered in a wide range of urethanes as well as traditional elastomers in standard inch and metric sizes.

See: Catalog PPD 3600

U-Cups Seals

Parker's U-cup seals are compact and versatile. Varying lip design configurations coupled with the broad range of available Parker materials mean versatility in U-cup sealing, both in hydraulic and pneumatic applications.

See: Catalog PPD 5225

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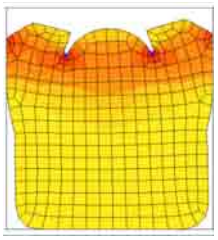
Finite Element Analysis & Seal Design Optimization

Using sophisticated Finite Element Analysis (FEA) software, Parker engineers can analyze critical design information, such as stress concentration, heat transfer, fluid flow and electromagnetic properties of new and existing seal geometry. This streamlines tooling and production processes, and helps ensure the selection of the right material and geometry for your application. Using FEA technology, our engineers can determine:



FEA plot of a Parker Seal geometry under compression

- Deformation (deformed shape)
- Volume/void ratios, gland fill %
- Stress distribution
- Load - Deflection
- Stability analysis
- Friction force
- Thermal effects
- Material evaluation
- Seal life prediction

PTFE Seals: FlexiSeal™, Radyne®, and FlexiCase™

Parker manufactures a wide range of PTFE seals to meet the unique temperature, chemical and low friction requirements of high-performance systems. Products are available in standard inch, metric and custom designs.

See: Catalog EPS 5300, 5315 & 5303

Integrated Piston Assembly

Parker's Integrated Piston combines the piston, bearing and seal into a self-contained package for low, medium and high pressure hydraulic cylinder applications.

See: Catalog EPS 5220

ProTech Bearing Isolators

ProTech bearing isolators are the ultimate in bearing protection with unitized, two-piece, non-contact design. ProTech provides zero lubricant leakage and total exclusion of contaminants.

See: Catalog EPS 5275

Rotary Shaft Oil Seals

Parker offers a complete line of oil seal products including the proprietary Clipper® Oil Seal design with integrally molded rubber/fiber outer case and elastomeric inner lip. Varying profiles include factory split, MIST, single-lip, dual-lip, excluder and molded-in spring. Parker Oil Seals are elastomer-lipped, metal-retained rotary shaft seals available in a multitude of configurations.

See: Catalog EPS 5208

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About Parker Hannifin Corporation

Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,200 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic and electromechanical motion-control solutions. Our company has the largest distribution network in its field, with over 7,500 distributors serving more than 400,000 customers worldwide.

The Aerospace Group
is a leader in the development, design, manufacture and servicing of control systems and components for aerospace and related high-technology markets, while achieving growth through premier customer service.

The Climate & Industrial Controls Group
designs, manufactures and markets system-control and fluid-handling components and systems to refrigeration, air-conditioning and industrial customers worldwide.

The Fluid Connectors Group
designs, manufactures and markets rigid and flexible connectors, and associated products used in pneumatic and fluid systems.

The Seal Group
designs, manufactures and distributes industrial and commercial sealing devices and related products by providing superior quality and total customer satisfaction.

The Hydraulics Group
designs, produces and markets a full spectrum of hydraulic components and systems to builders and users of industrial and mobile machinery and equipment.

The Filtration Group
designs, manufactures and markets quality filtration and clarification products, providing customers with the best value, quality, technical support and global availability.

The Automation Group
is a leading supplier of pneumatic and electromechanical components and systems to automation customers worldwide.

The Instrumentation Group
is a global leader in the design, manufacture and distribution of high-quality critical flow components for worldwide process instrumentation, ultra-high-purity, medical and analytical applications.

Parker's Charter

To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

Product Information

North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In Europe, call 00800-C-PARKER-H (00800-2727-5374).

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Offer of Sale

The items described in this document are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in this document, when communicated to Parker Hannifin Corporation, its subsidiary or any authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgements, acceptances 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 date of invoice of the items purchased hereunder. Seller 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.

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.

NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

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 therefor 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 (hereinafter "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.

anything Parker Possible™

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