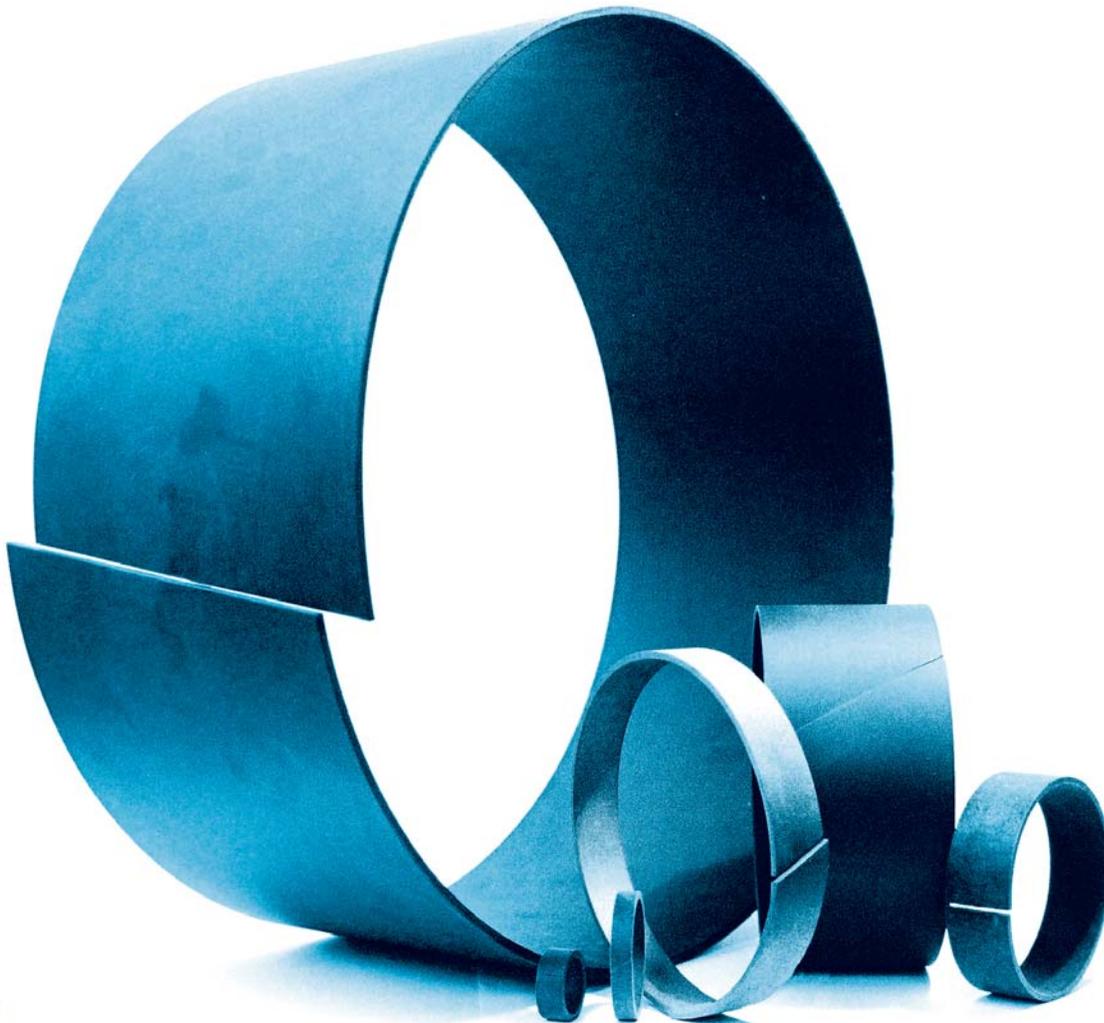




**MACROTECH POLYSEAL, INC.**

*Service, Solutions, Performance*

# **Precision Close Tolerance Wear Guides**



REV #102003

WGT-1000

# Manufacturing Capacity

Macrotech Polyseal produces high precision Wear Guides in high strength reinforced materials in sizes from as small as one inch diameter to as large as eighteen inches in diameter and fourteen inches in length. Smaller diameters are available in other materials. Our ISO 9001 facility provides the same repeatable quality for all sizes. Macrotech Polyseal has been producing high precision Wear Guides since 1990 and has shipped over 2.5 million rings worldwide

Macrotech Polyseal Wear Guides are available in simple butt cut form, angle cuts or step cut for more demanding use. Several standard sizes of radial C/S width are available from 1/16" to 3/16". Most commonly used are 1/8" C/S and 2,5 mm C/S. Consult with MPI engineering or customer service for special sizes.



# Part Numbering

## Standard Part Numbering

**WGT - 125 - 01.750 - 500**

Style                      Cross Section                      Nominal OD                      Nominal Width

Example: nominal size, 1.500" ID x 1.750" OD x .500" HT  
C/S thickness tolerance: .123/.125"

## Metric Part Numbering

**MPS - 080 - 086 - 050 - WGT**

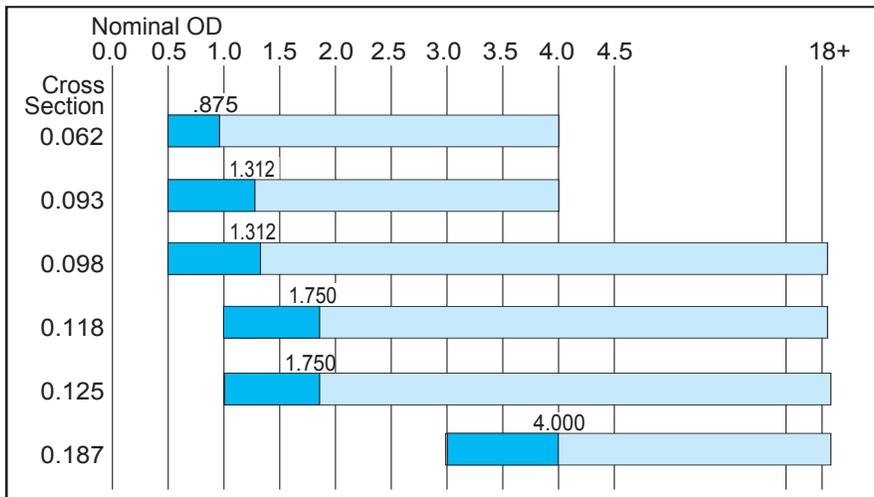
I.D.                      O.D.                      Nominal Width                      Style

Example: nominal size, 80mm ID x 86 mm OD  
C/S thickness tolerance: 3,00/2,95

Macrotech Polyseal wear guides are designed to fit either rod or piston applications. For applications where installation is a concern a Rod or Piston style wear guide can be specified. To do this, an R or P can be

added to the end of the part number for either Rod or Piston, respectively. This will assure a free state gap that is conducive for installation purposes.

# Recommended Radial Cross Section versus Diameter



Light sections of chart indicate that installation may be more simple for blind rod glands. An increased axial length will increase complexity during installation. Consult MPI engineering for specific concerns.

Non-standard cross sections are available upon request. Consult MPI engineering for wear guides smaller than 1" nominal OD.

# Joint Styles

	Advantages	Installation	Performance
 <b>WGT - Butt Cut</b>	Easiest joint style to install in many applications.	 Easy                      More Complex	 Good                      Best
 <b>WAT - Angle Cut</b>	Improves bearing stress at the gap.	 Easy                      More Complex	 Good                      Best
 <b>WST - Step Cut</b>	More difficult to install. Improves bearing stress at gap Better resistance to contaminants & spike loads	 Easy                      More Complex	 Good                      Best
WST style not available in 3/16 cross section.			

# Why Choose Precision Close Tolerance Wear Guides?

Macrotech Polyseal Wear Guides replace metallic bearings in hydraulic cylinders and other applications providing a contact surface for reciprocating cylinder rods and pistons - reducing the cost of the metal components. When wear guides are used, metal components can be produced from low cost materials that may not be suitable for bearing service. Since metal surface finishes may require less control, metal machining speeds may be faster - resulting in further cost savings

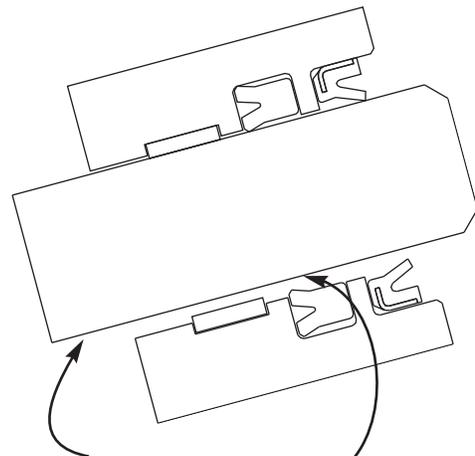
MPI Wear Guides are finish machined to a thickness tolerance of  $\pm .001$  inches unless specified otherwise. The state-of-the-art manufacturing process assures that only a small portion of the tolerance band is used, with process Cpk's generally above 3.5. The result is much higher repeatability than commercial grade wear rings. This provides better control of seal extrusion gaps and reduction of cylinder or apparatus bending loads. MPI High Precision Wear Guides are the better choice for demanding applications.

MPI Wear Guides are available in two high strength Polyimide materials; P-2551 and internally lubricated P-2552. See page 5 for physical properties. MPI can also provide wear guides in special service materials such as Bronze filled PTFE and Acetal. Contact MPI engineering for assistance with these more specialized materials.

Precision Wear Guides assure minimum clearances and maximum bearing contact to eliminate deflection under load. When compared to commercial grade rings, Macrotech Wear Guides reduce seal extrusion clearance significantly.

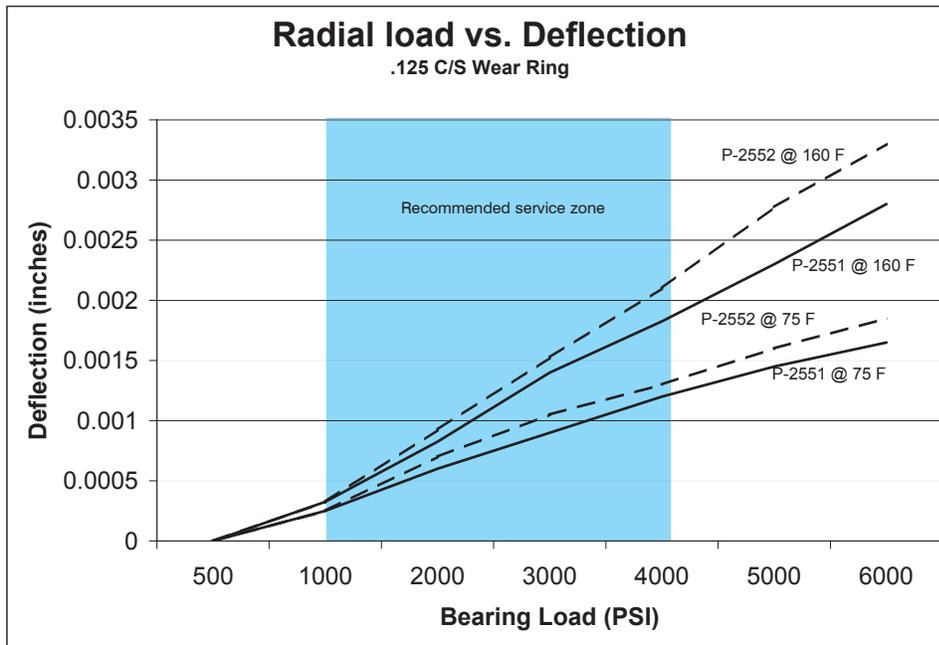


Q. Why choose WGT High Precision Wear Guides?



A: Tighter wear guide thickness control assures less eccentricity and e-gap, meaning longer life.

# Deflection Under Load



## Deflection

Material deflection under load for Glass-Filled Nylon at 160°F and 75°F.

# Materials Properties

Typical Physical Properties			
Property	ASTM Test	P-2551	P-2552
Hardness, Rockwell R	D-785	120	120
Ultimate Elongation @ break	D-638	2.5%	2-3%
Ultimate Tensile Strength, PSI	D-638	25,000	23,000
Heat Deflection Temp. @ 66 PSI	D-648	420°F	410°F
Heat Deflection Temp. @ 264 PSI	D-648	400°F	400°F
Impact Strength – Notched ft. lbs./in.	D-256	2.50	2.00
Water Absorption, 24 hr @ 73°F	D-570	1.2%	1.0%
Flexural Strength, PSI	D-790	39,000	34,000
Flexural Modulus, PSI	D-790	1.4X10 <sup>6</sup>	1.35X10 <sup>6</sup>
Compressive Strength, PSI	D-685	23,000	20,000

## Properties

Typical physical properties for both P-2551 & P-2552. P-2551 is for general duty applications while P-2552 is for friction and/or wear sensitive applications.

Also available in other materials such as bronze filled PTFE, Acetal, UHMWPE and PEEK.

Test information is based on specific conditions and limited sample size, and is only for general guidance. It does not supercede published data for the product. Customer must decide suitability for his purpose. Information applies at room temperature unless specified otherwise.

# Piston Application

## Groove Dimensions

1. Subtract .001" from minimum bore (B min) to allow for ovality and assembly clearance.
2. Subtract twice maximum Wear Guide thickness (T max). The result is the maximum groove diameter (G max).
3. Subtract piston machining tolerance to obtain G min.
4. To G minimum, add twice minimum Wear Guide thickness (T min) to obtain minimum installed Wear Guide O.D.
5. Subtract twice minimum desired radial piston-to-bore clearance to obtain maximum piston diameter (P max). Subtract piston machining tolerance to obtain P min.
6. Groove Length (L) is equal to nominal Wear Guide width (W) plus .010/020.

## Seal Extrusion Gap

Maximum seal extrusion gap (E max) without cylinder bore expansion can be estimated by:

$$E \text{ max} = B \text{ max} - \frac{(G \text{ min} + T \text{ min} + P \text{ min} - G \text{ min})}{2}$$

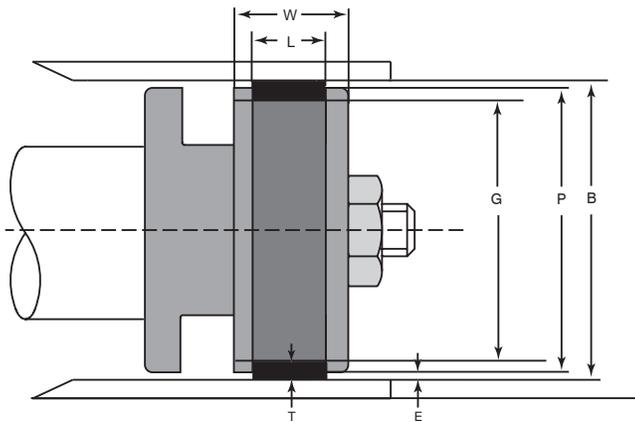
## Example

Example bore is 3.000/3.003. Wear Guide is .123/.125 thick and 1/2" wide. Piston machining tolerance is a total of .002. Minimum desired radial piston-to-bore clearance is .005.

1.  $3.000 - .001 = 2.999$
2.  $2.999 - (2 \times .125) = 2.749$  (G max)
3.  $2.749 - .002 = 2.747$  (G min)
4.  $2.747 + (2 \times .123) = 2.993$
5.  $2.993 - (2 \times .005) = 2.983$  (P max)  
 $2.983 - .002 = 2.981$  (P min)
6.  $.500 + (.010/.020) = .510/520$  (L)

## Seal Extrusion Gap

$$3.003 - \frac{(2.747 + .123 + 2.981 - 2.747)}{2} = .016"$$



# Rod Application

## Groove Dimensions

1. Add .001" from maximum rod (R max) to allow for assembly.
2. Add twice maximum Wear Guide thickness (T max). The result is the minimum groove diameter (D min).
3. Add machining tolerance to obtain D max.
4. From D max, subtract twice the minimum Wear Guide thickness (T min) to obtain maximum installed Wear Ring I.D.
5. Add twice the minimum desired radial rod-to-gland clearance to obtain minimum gland bore diameter (H min). Add gland machining tolerance to obtain H max.
6. Groove length (L) is equal to nominal Wear Guide width (W) plus .010/020.

## Seal Extrusion Gap

Maximum seal extrusion gap (F max) for new assembly can be estimated by:

$$E \text{ max} = (H \text{ max} + \frac{D \text{ max} + H \text{ max}}{2}) - (T \text{ min} + R \text{ min})$$

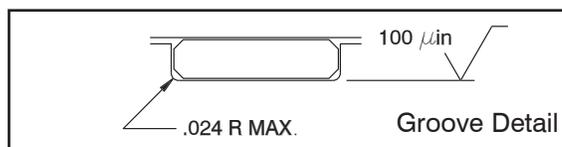
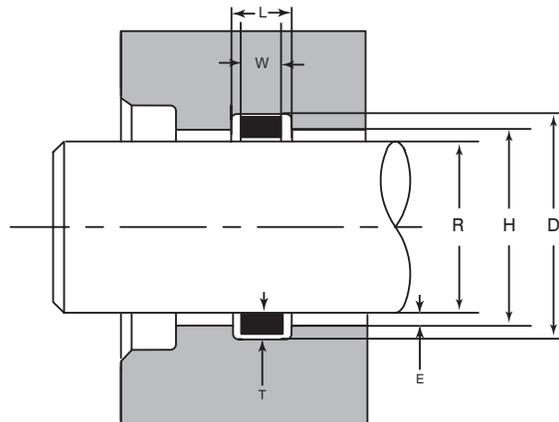
## Example

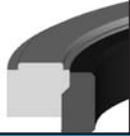
Example rod is 1.500 /1.499. Wear Guide is .123 / .125 thick and 1/2" wide. Rod Gland machining tolerance is a total of .002. Minimum desired rod-to-gland clearance is .005.

1.  $1.500 + .001 = 1.501$
2.  $1.501 + (2 \times .125) = 1.751$  (D min)
3.  $1.751 + .002 = 1.753$  (D max)
4.  $1.753 - (2 \times .123) = 1.507$
5.  $1.507 + (2 \times .005) = 1.517$  (H min)  $1.517 + .002 = 1.519$  (H max)
6.  $.500 + .010/.020 = .510/520$

## Seal Extrusion Gap

$$(1.519 + \frac{1.753 - 1.519}{2}) - (.123 + 1.499) = .014"$$



ROD SEALS		PISTON SEALS		ROD WIPERS	
<b>UBR/ZBR Seal</b>		<b>Locking Capped T-Seal</b>		<b>SH Wiper</b>	
	HEAVY DUTY MOBILE HYDRAULIC		HEAVY DUTY MOBILE HYDRAULIC		HEAVY DUTY MOBILE HYDRAULIC
<b>Unsymmetrical U-CUP</b>		<b>Capped T-Seal®</b>		<b>MC Wiper</b>	
	MOBILE HYDRAULIC AGRICULTURAL GENERAL INDUSTRIAL		HEAVY DUTY MOBILE HYDRAULIC		HEAVY DUTY MOBILE HYDRAULIC
<b>Type B Polyseal</b>		<b>Grooved Piston Seal</b>		<b>H-Wiper</b>	
	MOBILE HYDRAULIC AGRICULTURAL GENERAL INDUSTRIAL		ACCUMULATORS HEAVY DUTY MOBILE HYDRAULIC GEN. MACHINE		AGRICULTURAL GENERAL CYLINDER MOBILE HYDRAULIC
<b>Deep Z-Seal</b>		<b>PTFE Piston Seal</b>		<b>DT-Wiper</b>	
	HEAVY DUTY MOBILE HYDRAULIC TELESCOPIC CYLINDER		AGRICULTURAL HEAVY DUTY MOBILE HYDRAULIC GEN. MACHINE		GENERAL CYLINDER MOBILE HYDRAULIC
<b>Deep Z-Seal with Delta Anti-Extrusion Ring</b>		<b>PTFE Piston S-Ring</b>		<b>WEAR GUIDES</b>	
	HEAVY DUTY MOBILE HYDRAULIC HIGH PRESSURE		MEDIUM OPERATION MOBILE HYDRAULIC		
<b>R Style Buffer Seal</b>		<b>Crown Seal®</b>		<b>WGT Wear Guide</b>	
	LOW FRICTION HEAVY DUTY MOBILE HYDRAULIC		AGRICULTURAL HEAVY DUTY MOBILE HYDRAULIC		HEAVY DUTY MOBILE HYDRAULIC
<b>RB Style Buffer Seal</b>		<b>Unsymmetrical U-Cup</b>		<b>PTFE Wear Guide</b>	
	HEAVY DUTY MOBILE HYDRAULIC HIGH PRESSURE		AGRICULTURAL GENERAL INDUSTRIAL		LOW FRICTION GENERAL CYLINDER MOBILE HYDRAULIC GENERAL INDUSTRIAL
<b>RS Style Buffer Seal</b>					
	HEAVY DUTY MOBILE HYDRAULIC				
<b>Spectraseal®</b>					
	PETRO-CHEMICAL LOW FRICTION EXTREME TEMPERATURES CORROSIVE FLUIDS				

### Important Notice

We reserve the right to make changes without notice in our products and in the information content of this brochure. The statements and information in the brochure are intended to serve only as guides. They are not warranties or binding descriptions of the products.

Requests for more information are welcome. In particular, we will be glad to provide samples for you to inspect and test in your assemblies and plant before you make a final decision for your application.

### Notice of Exclusive Warranty and Remedy

Briefly, our exclusive warranty is against defects in materials and workmanship at the time of shipment. It is in lieu of all other warranties. There is no implied warranty of merchantability or fitness for a particular purpose. The exclusive remedy is replacement of defective products, or at our option, refund of their purchase price. All damages exceeding the purchase price are excluded, whether consequential or otherwise and regardless of cause. The terms and conditions on our printed quotation contain a much more complete statement of our Exclusive Warranty and Remedy.



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