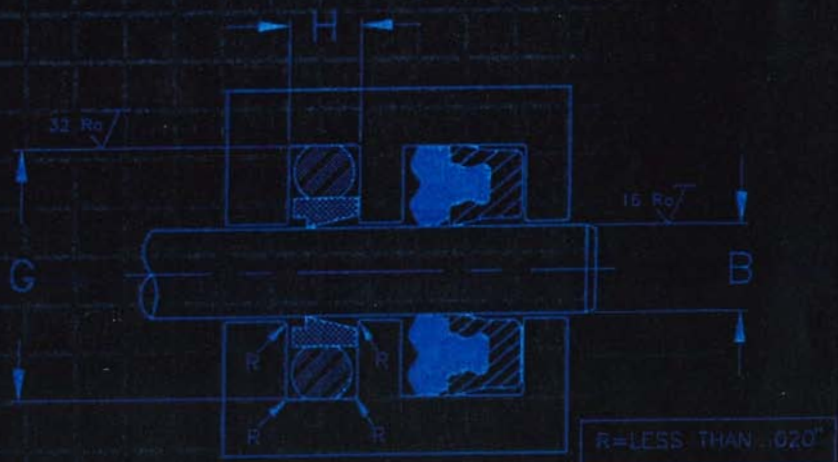
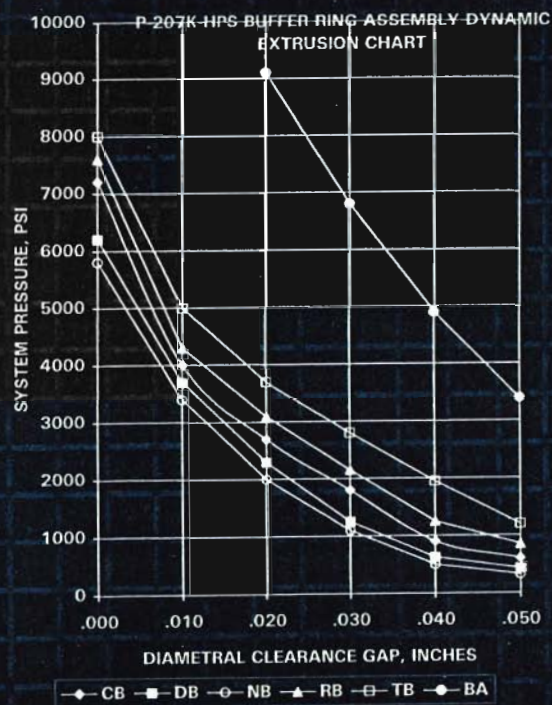


HPS INC

Leaders in Seal Technology

BUFFER RINGS



WHY ARE BUFFER RINGS USED?

Buffer rings are a sealing device used primarily as a "buffer" to reduce the impact of pressure spikes before they reach the critical primary seal. Tests have shown that the use of buffer rings has significantly increased the life of rod seals. They are rarely used as a single primary seal, but function as an auxiliary device - assisting and protecting the primary seal from the damaging effects of high pressure, system contaminants and dieseling.

HPS buffer rings function as an important part of a total sealing system. The proper design of a complete sealing system provides optimum leakage control. Each component within this sealing system is chosen with regard to both its geometry and the physical properties of the seal material.

WHY DIFFERENT TYPES OF BUFFER RINGS?

HPS has designed entirely different styles of buffer rings to meet the wide spectrum of potential application requirements. However, most importantly, all series fit exactly the same glands. This allows complete interchangeability - while keeping space and cost requirements at a minimum.

The demands of today's rapidly expanding equipment technologies place increasing requirements on product reliability, cost and performance. Leading manufacturers of equipment from around the world have learned to depend on HPS quality, reliability and design innovation.

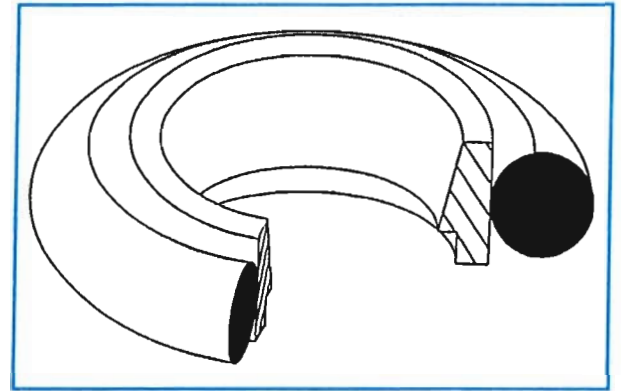
BUFFER RINGS

HPS, Inc.

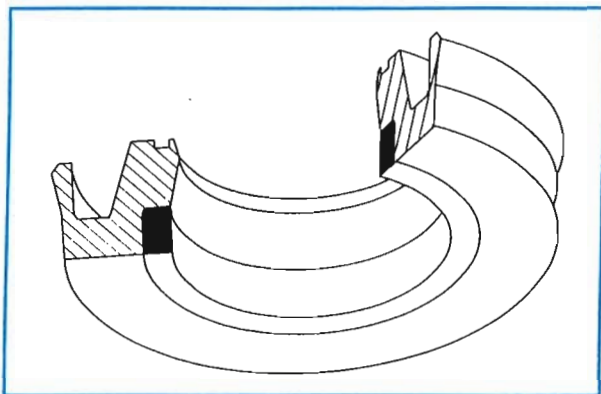
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The BFR buffer ring consists of two elements; a dynamic seal element of Hydra-Lon™ PTFE and an O-ring energizer. Both elements are available in a wide range of compounds, which allows the designer to customize the buffer ring assembly for specific application needs.

The dynamic profile ring is uniquely shaped to cushion pressure spikes instantly and then to exhaust immediately to prevent a pressure trap between it and the primary seal. The Hydra-Lon™ PTFE blends used give it extra lubricity along with sufficient rigidity to resist cold flow. The energizer, usually an O-ring, gives the profile ring memory, keeping it loaded against the dynamic surface. At the same time, it serves as the static surface seal.



BFR BUFFER RING



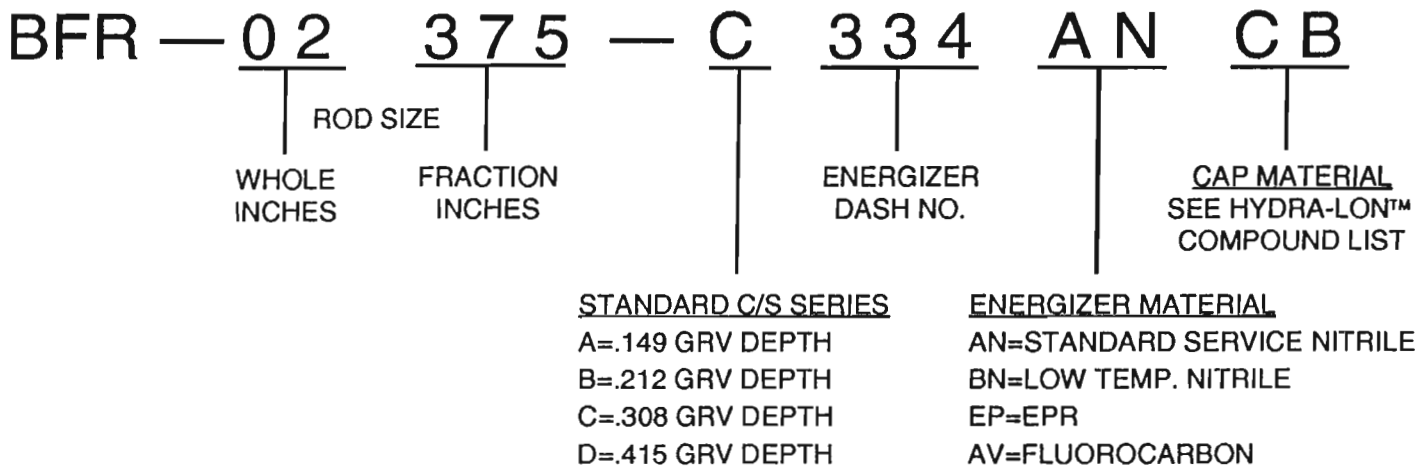
BUF BUFFER RING

The BUF is a modified U-shape designed specifically to operate as a buffer ring. It is manufactured from a high performance thermoplastic backed by a Hydra-Lon™ rigid plastic anti-extrusion ring. Its purpose and performance is the same as the BFR (cushions shock pressures and then relieves instantly to prevent pressure traps). However, the BUF is for heavier duty applications. When pressures and/or E-gaps exceed the capabilities of the

BFR, the BUF takes over. Here again various material combinations are available to customize for specific applications.

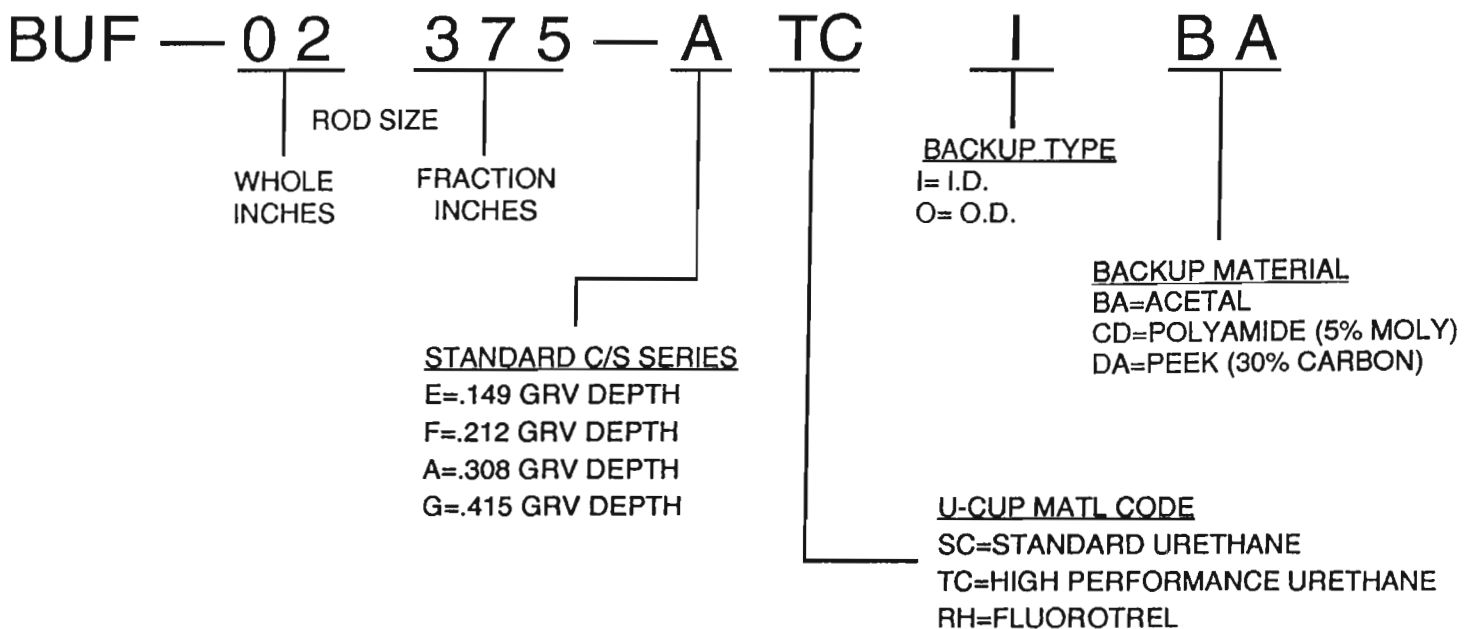
THE BFR BUFFER RING ASSEMBLY

PART NUMBERING SYSTEM



THE BUF BUFFER RING ASSEMBLY

PART NUMBERING SYSTEM

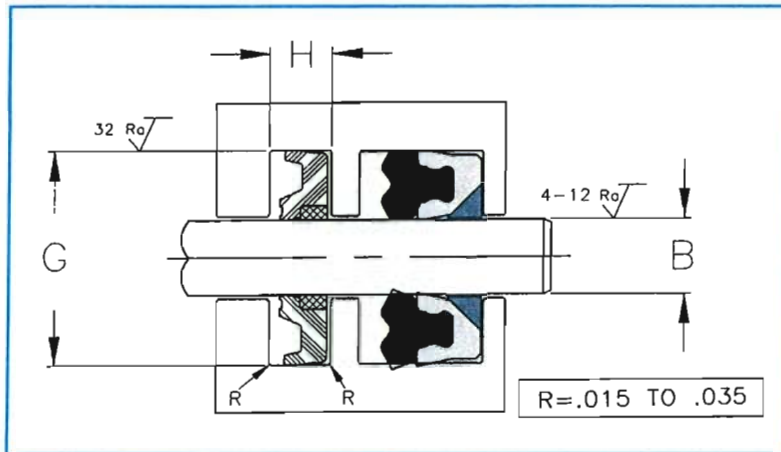


TECHNICAL DATA

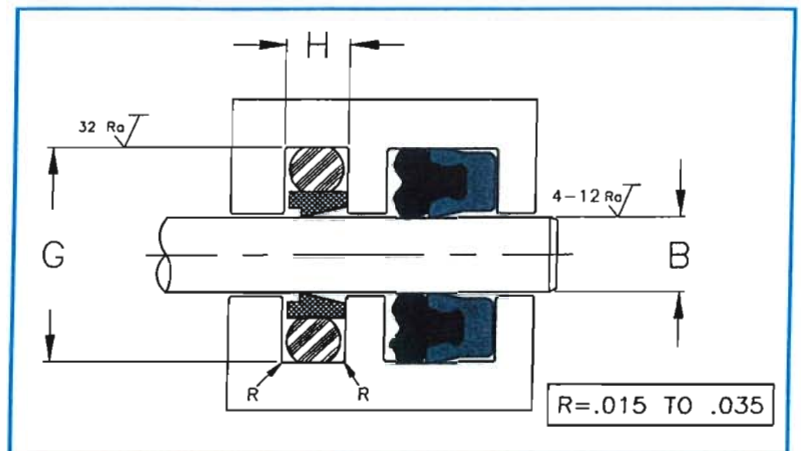
GLAND DIMENSIONS - BUF AND BFR BUFFER RINGS

B ROD DIAMETER	TOLERANCE RANGE	BUFFER RING C/S SERIES		G GROOVE DIAMETER	TOLERANCE RANGE	H GROOVE WIDTH $+.010/-0.000$
		BFR	BUF			
.310 TO 1.500"	+.000/-0.002	A	E	B MAX + .298	+.003/-0.000	.126
.500 TO 2.500"	+.000/-0.003	B	F	B MAX + .424	+.004/-0.000	.166
1.000 TO 8.000"	+.000/-0.004	C	A	B MAX + .616	+.005/-0.000	.247
4.25 TO 12.000"	+.000/-0.005	D	G	B MAX+ .830	+.006/-0.000	.320

MAXIMUM DIAMETRAL CLEARANCE - CONSULT MATERIAL EXTRUSION CHART
CHECK PRESSURE AGAINST SEAL AND/OR BACK UP RING CAPABILITIES.



BUF ROD BUFFER RING



BFR BUFFER ASSEMBLY

ENERGIZERS* FOR BFR ROD BUFFER SEALS

SIZE BFR-	O-RING	SIZE BFR-	O-RING	SIZE BFR-	O-RING
00313-A	-111	02000-C	-331	07000-C	-366
00375-A	-112	02250-B	-229	07000-D	-442
00438-A	-113	02250-C	-333	07250-C	-367
00500-A	-114	02500-B	-231	07250-D	-443
00500-B	-209	02500-C	-335	07500-C	-368
00563-A	-115	02750-C	-337	07500-D	-444
00563-B	-210	03000-C	-339	07750-C	-369
00625-A	-116	03250-C	-341	07750-D	-445
00625-B	-211	03500-C	-343	08000-C	-370
00688-A	-117	03750-C	-345	08000-D	-445
00688-B	-212	04000-C	-347	08250-D	-446
00750-A	-118	04250-C	-349	08500-D	-446
00750-B	-213	04250-D	-426	08750-D	-447
00875-A	-120	04500-C	-351	09000-D	-447
00875-B	-215	04500-D	-428	09250-D	-448
01000-A	-122	04750-C	-353	09500-D	-448
01000-B	-217	04750-D	-430	09750-D	-449
01000-C	-322	05000-C	-355	10000-D	-449
01125-A	-124	05000-D	-432	10250-D	-450
01125-B	-219	05250-C	-357	10500-D	-450
01125-C	-324	05250-D	-434	10750-D	-451
01250-A	-126	05500-C	-359	11000-D	-451
01250-B	-221	05500-D	-436	11250-D	-452
01250-C	-325	05750-C	-361	11500-D	-452
01375-A	-128	05750-D	-437	11750-D	-453
01375-B	-222	06000-C	-362	12000-D	-453
01375-C	-326	06000-D	-438		
01500-A	-130	06250-C	-363		
01500-B	-223	06250-D	-439		
01500-C	-327	06500-C	-364		
01750-B	-225	06500-D	-440		
01750-C	-329	06750-C	-365		
02000-B	-227	06750-D	-441		

*Recommended energizers for rod applications shown, using HPS standard energizer compound AN-70A NBR and CB-702 (15% Glass/5% Moly) filed PTFE BFR Cap.

BFR PRIMARY SEAL PHYSICAL PROPERTIES

FILLER COMMENTS HPS COMPOUND CODE	ASTM	15% GLASS 5% MoS ² GENERAL PURPOSE	25% CARBON GRAPHITE HIGH PRESSURE/TEMP. WATER, STEAM, HYDRAULICS	55% BRONZE 5% MoS ² HIGH SPEED LOW WEAR	40% BRONZE HIGH SPEED RECIPROCATING & ROTARY	
		CB	DB	TB	RB	
Hardness, Shore D, Pts	D-2240-76	62	63	69	65	
Tensile Strength, psi*	D-1457-81A	Axial	2,200	1,800	2,200	2,800
		Radial	3,000	2,200	2,600	3,100
Elongation, %*	D-1457-81A	Axial	230	80	90	180
		Radial	250	100	70	200
Specific Gravity		2.21	2.09	3.86	3.30	
Deformation under Load, 24 Hr @ 2000 psi	D-792-79	Axial	7.9	4.6	4.6	8.6
	D-621-76	Radial	7.9	4.7	3.6	7.0
Permanent Deformation After 24 Hr Relaxation	D-621	Axial	3.5	1.5	1.9	4.4
		Radial	3.5	1.6	1.7	3.1
Compressive Strength, 0.2% Strain psi	D-695-80	1,540	1,650	1,700	1,400	
Compressive Modulus, psi	D-695-80	102,000	87,000	150,000	110,000	
Flexural Strength, psi	D-790-80	2,100	2,100	3,300	3,200	
Coefficient of Linear Thermal Expansion, X 10 ⁵ in/in/°F	D-696	Axial	6.9	6.6	6.1	6.5
		Radial	4.9	5.9	4.9	5.6
Coefficient of Friction, Dry	D-1894					
		Static (Stiction)	0.06	0.09	0.13	0.13
		Dynamic (Friction)	0.05	0.08	0.08	0.05
Limiting PV @ 100 fpm	ACC Mthd	12,000	17,000	12,000	12,500	
Wear Factor, K X 10 ¹⁰ in ³ -min/lb/ft-hr	ACC Mthd	6	22	5	6	
Temperature Range, °F		-100/+500	-100/+500	-100/+550	-100/+550	

BUF BACK UP MATERIAL PROPERTIES

POLYMER TYPE FILLER HPS COMPOUND CODE	ASTM	ACETAL BA	PEEK 30% CARBON DA	
Hardness, Shore R, Pts	D792	80M	124	
Ult. Tensile Strength, psi	D638	8,800	30,000	
Compressive Strength, psi	D695-80	4,500	35,000	
Flexural Strength, psi	D-790-80	13,000	46,000	
Flexural Modulus, psi	D-790	375,000	1,800,000	
Shear Strength, psi	D-732	7,700	14,000	
Elongation, %	D-638		1.3	
Specific Gravity	D-792-79	1.41	1.44	
Deformation under Load, % 122°F, 24 Hr @ 4,000 psi	D-621-76	1.0		
Coefficient of Linear Thermal Expansion, X 10 ⁵ in/in/°F	D-696	4.7	1.5	
Coefficient of Friction, at 150°F	D-696			
		Static (Stiction)	0.22	0.19
		Dynamic (Friction)	0.14	0.13
Wear Factor, K, 10 ¹⁰ 3 min, ft/lb/hr		6.5	6.0	
Water Absorption, % —24 Hrs @ 73°F	D570	0.22	0.1	
Temperature Range, °F		-65/+230	-65/+550	

NOTE: The typical physical property values on these charts are based on specific conditions and limited sample size, and is only for general guidance. It does not supersede published data for the specific product. Customer must decide suitability for their specific purpose. Information applies at room temperature unless otherwise specified. Source of data: Manufacturer's literature, compound manual, typical physical property data sheet of Resin Manufacturers values.

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Leaders in Seal Technology

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Upon proper and timely notification of a defective material claim, and after our inspection of the material in question, the HPS liability for breach of any and all warranties is limited to refunding our invoice price of the product deemed to have such defects in material and/or workmanship, or at our option, replacement of the material free of charge, including transportation to the location of original shipment, but in no case will cost of installation or downtime charges be the responsibility of HPS. The sale of our products under any other warranty, expressed or implied, is not authorized by our company.
