



## Solutions for Rotary Applications

Custom-engineered  
High performance  
PTFE rotary lip seals

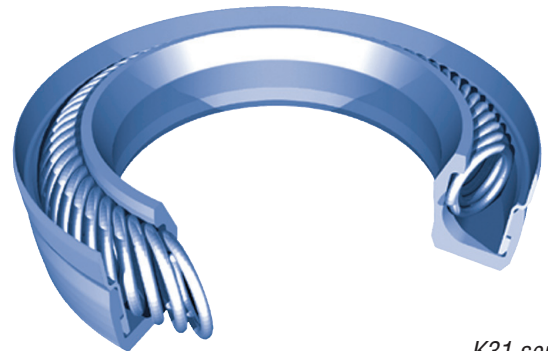
# Solutions for rotary applications

*Bal Seal Engineering is an industry leader providing custom-engineered sealing, connecting, conducting and shielding solutions to OEM product designers. Our engineers work closely with customers to provide valuable, innovative product designs. Whether you're looking for spring-energized PTFE seals, rotary lip seals, EMI shielding gaskets, electrical spring contacts or mechanical couplings, our spring and sealing solutions offer enhanced functionality, simplified designs and improved longevity for reduced downtime.*

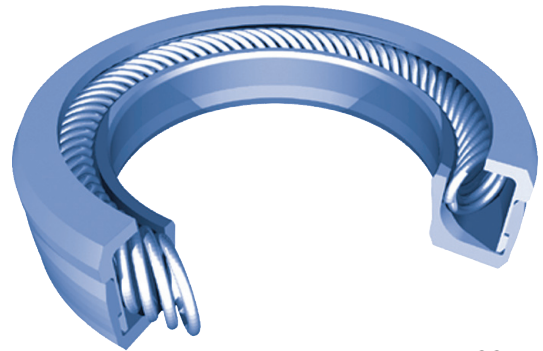
Bal Seal sealing solutions meet your unique reciprocating, rotating and static application needs. We can also offer your designers customized parts to meet demanding needs for applications requiring superior sealing performance in high vacuum pressures from  $1 \times 10^{-6}$  Torr, extreme high pressures up to 100,000 psi, or cryogenic temperatures from  $4^{\circ}$  K to  $600^{\circ}$  F with varying speed and pressure combinations (up to 1 million PV). Our dedicated engineering and prototype departments work in tandem to provide complete solutions for your needs, and designs and prototype parts can be supplied in a timely manner. To provide complete solutions, we can even include cartridge or housing/piston assemblies when necessary. And our seals are typically made from proprietary materials formulated and processed internally for complete quality control.

Bal Seal also offers a full line of unique and patented Canted-coil™ spring products for various applications in electrical-mechanical couplings and connecting devices. Our springs are fabricated from wire sizes of 0.002" to 0.080" and from coil sizes of 0.020" to 1.0". Production materials include stainless steel (302 and 316), high nickel alloys (such as MP35N®, Hastelloy®, and Inconel®), Beryllium Copper, Zirconium Copper and Titanium. Our custom spring products can be designed to provide specific insertion and removal forces, the proper housing groove and spring combination, and various electrical properties to simplify designs and solve conductivity issues.

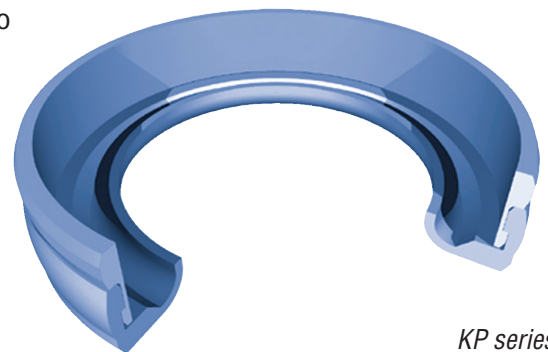
Bal Seal is a complete solutions provider. We not only offer spring and sealing solutions, but also offer design assistance, plastic and metal fabrication and component sub-assembly to provide you with a one-stop design engineering and production facility. So whether you're trying to protect sophisticated electronic computing and communications equipment from RF interference, connect implantable medical devices or carry high current in switchgear, Bal Seal has the right solution for you. Call us today to discuss your specific requirements.



K31 series



KSS series



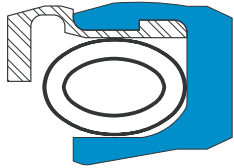
KP series

## DESIGN FEATURES

Rotary BalSeal® designs have notable performance-boosting features:

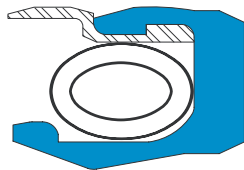
- Patented Canted-coil™ technology that provides positive, constant-force seal energizing
- Unique locking ring designs that securely retain seals through temperature cycling and pressure environments while providing ease of installation
- Exclusive seal jacket configurations that are optimized to provide best sealing and life performance

## SEAL TYPES WITH METAL LOCKING RINGS



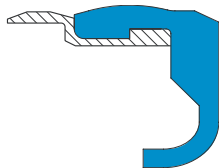
### KSS/KS Series

- Locking ring retention
- Canted-coil spring energizing
- Reduced lip length for optimum sealing loads
- Medium speeds and pressures



### K31/KF31 Series

- Locking ring retention
- Canted-coil spring energizing
- Full lip for increased versatility of assembly
- Medium speeds and pressures

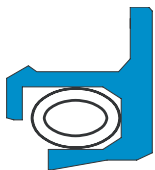


### KP/KPF Series

- Locking ring retention
- Memory lip energizing
- High speeds and very low pressures

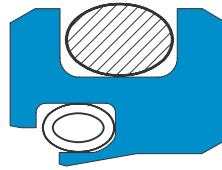


## OTHER ROTARY SEAL TYPES



### RS31 Series

- Flange mounted retention
- Canted-coil spring energizing
- Reduced lip length for optimum sealing loads
- Medium speeds and pressures



### 71 Series

- 'O' Ring retention
- Canted-coil spring energizing
- Reduced lip length for optimum sealing loads
- Low speeds and pressures



### S31 Series









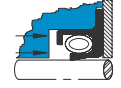



- Press-in mounting
- Canted-coil spring energizing
- Reduced lip length for optimum sealing loads
- Very low speeds and pressures



### PB Series

- Press-in mounting
- Memory lip energizing
- Medium speeds and very low pressures

# Rotary Bal Seal Selection Guide

Seal Type	Series Code**	Standard Seal Cross Sections Available	Seal Inside Diameter Available	Suggested Operating Conditions				Features and Benefits
				Pressure Range		Temperature Range	Surface Speed	
				Uncaptivated Seal Gland  (Kg/Cm2)	Captivated Seal Gland  (Kg/Cm2)			
		Inch	Inch			°F (°C)	Ft/Min (M/Sec.)	
	KSSx (50-621)	From 0.063 thru 0.125	From 0.125 to 1.000	Pressure* Differential From 15 (1) ↓	Vacuum to 3000 (211) ↓	Continuous -65° to +350° (-54° to +177°) ----- Intermittent to +550° (+288) ↓	to 3000 (15) ↓	• Low insertion force • Autoclavable • Best Sealing at high temperature • Longest seal life
	KSx (50-403)	From 0.125 thru 0.500	From 1.000 to 34.00					
	K31x (50-389)	From 0.031 thru 0.125	From 0.063 to 1.000				to 2000 (10) ↓	
	KF31x (50-389)	From 0.125 thru 0.500	From 1.000 to 34.00					
	KPx (50-416)	From 0.031 thru 0.188	From 0.063 to 1.000	From 7 (0.5) ↓	to 15 (1) ↓		to 7500 (38) ↓	• Low friction • Long life • Good sealing • High Temperature
	KPFx (50-416)	From 0.094 thru 0.500	From 1.000 to 14.00					
	RS31x (50-615)	From 0.031 thru 0.500	From 0.063 to 75.00	Not applicable	Vacuum to 3000 (211)		to 3000 (15)	• Better sealing • Lower cost • Requires retaining
	S31X (50-611)	From 0.016 thru 0.500	From 0.020 to 12.00	Not Recommended ↓	to 25 (1.8)		to 250 (1.3)	
	71x (50-551)	From 0.063 thru 0.500	From 0.063 to 14.00		Vacuum to 60 (4)	Continuous -20° to +200° (-29° to +93°) ----- Intermittent to +250° (+121°) ↓	to 750 (4)	• Moderate cost • Good sealing
	PBx (50-599)	From 0.063 thru 0.500	From 0.063 to 14.00		to 15 (1)		to 1000 (5)	

(\*) Pressure differential varies depending on seal diameter and cross section. The larger the diameter and cross section the lower the pressure differential. Consult technical sales for assistance.

(\*\*) 'x' indicates the seal series cross section. Where: 1=1/32 (0.031"); 0=1/16 (0.062"); 4=3/32 (0.094") 5=1/8 (0.125"), 6=3/16 (0.188"), 7=1/4 (0.250"), 8=3/8 (0.375"), 9=1/2 (0.500").

(1) The selection guide listed above represents a small portion of the many rotary seal solutions that we offer. Consult our technical sales for prompt design proposals and assistance.

(2) Values of pressure, temperature and surface speed represent the maximum independent operating conditions, such maximum values should not be combined with each other.

(3) For sizes larger than 1.000 inch, a backup ring may be required.

## Typical Materials for Rotary Bal Seals

SEAL MATERIALS Code and Descriptions	Temperature Range (°F)      (°C)		Wear Resistance	FDA Compatibility	Chemical Compatibility
<b>GFP55</b> GRAPHITE FIBER REINFORCED PTFE Severe service conditions. Excellent performance in applications with high pressure, low speed and high temperature. Color=Black.	-320 to +500	-196 to +260	Very High	No	Very Good
<b>SP45</b> POLYMER-FILLED PTFE General service applications. Good wear resistance in liquids. Low abrasion to dynamic mating surfaces. Suitable for high speed, low pressure. Color=Light Brown.	-450 to +500	-268 to +260	Very High	Yes	Good
<b>SP50</b> POLYMER-PTFE BLEND General service applications. Excellent wear resistance in gases, air and vacuum. Limited wear resistance in water. Low abrasion to dynamic surfaces. Suitable for high speed low pressure. Color=Gray.	-450 to +500	-268 to +260	Very High	Yes	Good
<b>UPC10</b> POLYETHYLENE BLEND Commercial grade. Aqueous service. Excellent wear resistance at low temperatures. High extrusion resistance, but high friction. FDA compliant <sup>1</sup> . Color = White/Translucent	-450 to +180	-268 to +82	Highest (Water-only)	Yes	Very Good
<b>T</b> VIRGIN PTFE Very light duty service. Low friction. Excellent chemical compatibility. FDA approved. Low wear resistance. Low cost. Color=White.	-320 to +350	-196 to +177	Lowest	Yes	Excellent
<b>P41</b> HIGH PERFORMANCE POLYMER Suitable for sealing adhesives, viscous, abrasive materials where scraping action is required. Limited surface speed. Color=Beige.	-70 to +550	-57 to +288	Highest	Yes	Good

Other seal materials are available to meet special conditions and design requirements.

### SPRING MATERIALS

302, 316, 316L Stainless Steel, Hastelloy®, Inconel® and others.

### LOCKING RING MATERIALS

303, 304, 316, 316L Stainless Steel, Aluminum, Mild Steel and others.

## Material Wear Factor

The wear factor "K" of the material is an important consideration in material selection. Various wear factors are shown to aid in seal material selection. The wear is affected substantially by the media in which it is used.

### WEAR FACTOR 'K' FOR VARIOUS PTFE BAL SEAL® MATERIALS IN OIL, WATER AND AIR

#### Wear Rate at 100,000 PV

Low Speed (100fpm) - High Pressure (1,000psi)

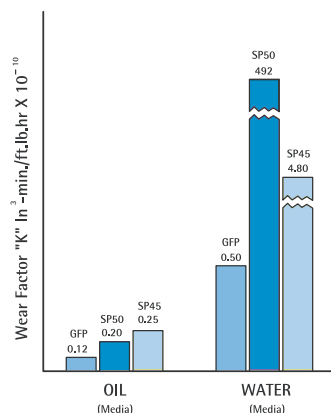


FIGURE 1.

#### Wear Rate at 100,000 PV

High Speed (1,000fpm) - Low Pressure (100psi)

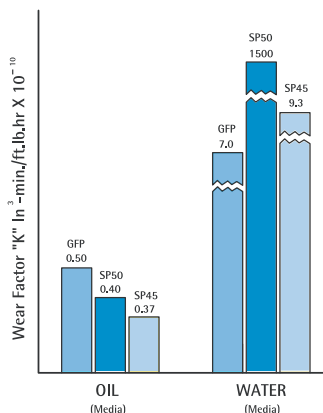


FIGURE 2.

#### Wear Rate at 50,000 PV \*

Speed (75fpm) - Pressure (667psi)

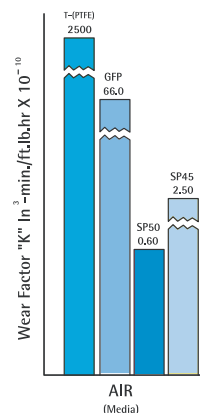


FIGURE 3.

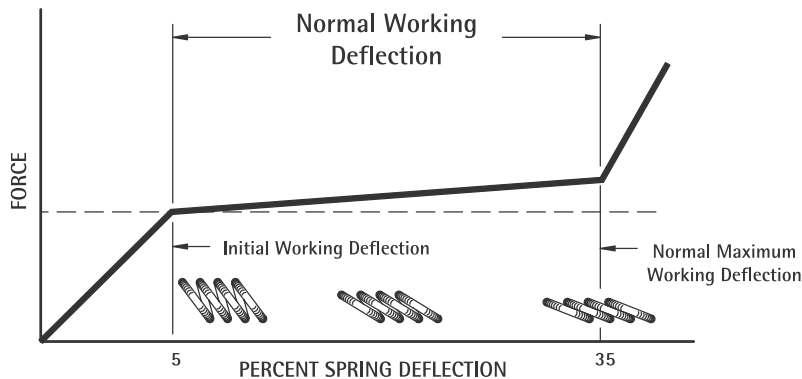
\* Maximum recommended PV value for air is 50,000 (50-439)

<sup>1</sup> Material has received an FDA approval.

### Canted-coil springs For Better Sealing Reliability in a Compact Package

The large working deflection range and the constant force exerted by the patented spring within the working deflection makes this the seal of choice for rotary service. Where sealing reliability is an important consideration, rotary service requires seals that can withstand high eccentricities, angular misalignment, low seal wear and maintain the constant sealing force necessary for long life and maximum sealing ability.

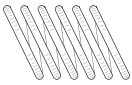


Figure 4 below shows a plot of force vs. deflection showing the unique property of the Canted-coil Bal Springs: Constant force developed over the normal working deflection of the spring.



Canted-coil™ springs  
**FIGURE 4.**

### Springs with Different Sealing Forces

In rotary sealing applications, Canted-coil springs with a variety of loading characteristics can be employed. Figure 5 describes various properties and typical usages.

Spring Load P/N Code	Friction	Spring Loading	Expected Wear	High Speed	Vacuum/ Gas	High Pressure	Low Temperature	Large Tolerances
 Light LB	LOW	LOWEST	LOW	E	NR	NR	NR	F
 Medium Light MC	MODERATE	MODERATE	MODERATE	G	F	F	G	G
 Medium MB	HIGH	HIGH	HIGH	F	E	E	E	E

Rating Symbols: E=Excellent, G=Good, F=Fair, NR=Not Recommended.

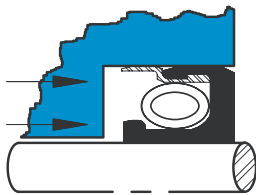
**FIGURE 5.**

An increase in the spring force generally results in better sealing, but with higher friction and seal wear. When media pressure is applied, the pressure and the energizing load of the Bal Spring combine to add additional sealing force, which also increases the sealing ability.

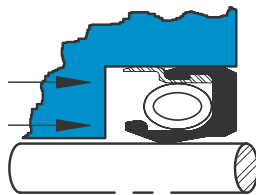


## Recommended Size Ranges for Selected Series

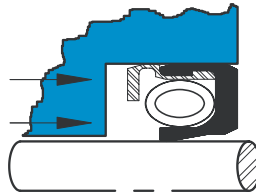
**K31xCC SERIES**



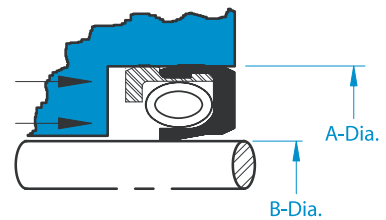
**K31x SERIES**



**KSSx SERIES**



**KSx SERIES**



## Common Sizes

SIZE No. Call out	B Shaft Diameter (inches)	A Bore Diameter (inches)
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### K311CC Series

1/32-inch Nominal Cross Section

	+0.0000 -0.0005	+0.0005 -0.0000
(0.020)	0.0200	0.0825
(0.031)	0.0313	0.0938
(0.063)	0.0625	0.1250

### K311 Series

1/32-inch Nominal Cross Section

	+0.0000 -0.0005	+0.0005 -0.0000
-002	0.0625	0.1250
-003	0.0938	0.1563
-004	0.1250	0.1875
-005	0.1875	0.2500*

### KSS0 and K310 Series

1/16-inch Nominal Cross Section

	+0.0000 -0.0007	+0.0007 -0.0000
-06	0.1250	0.2500
-08	0.1875	0.3125
-010	0.2500	0.3750
-011	0.3125	0.4375*
-012	0.3750	0.5000*

### KSS4 and K314 Series

3/32-inch Nominal Cross Section

	+0.0000 -0.0005	+0.0007 -0.0000
-104	0.1250	0.3125
-106	0.1875	0.3750
	+0.0000 -0.0007	+0.0007 -0.0000
-107	0.2188	0.4063
-108	0.2500	0.4375
-110	0.3750	0.5625

SIZE No. Call out	B Shaft Diameter (inches)	A Bore Diameter (inches)
-------------------------	------------------------------------	-----------------------------------

### KSS4 and K314 Series

3/32-inch Nominal Cross Section

	+0.000 -0.001	+0.001 -0.000
-112	0.500	0.688
-114	0.625	0.813
-116	0.750	0.938
-118	0.875	1.063*

### KSS5 and K315 Series

1/8-inch Nominal Cross Section

	+0.0000 -0.0005	+0.001 -0.000
-201	0.1875	0.437
-202	0.2500*	0.500
-204	0.3750*	0.625
	+0.000 -0.001	+0.001 -0.000
-206	0.500	0.750
-212	0.875	1.125*
-214	1.000	1.250*
-216	1.125*	1.375*

### KS6 and K316 Series

3/16-inch Nominal Cross Section

	+0.0000 -0.0015	+0.0015 -0.0000
(1.000)	1.0000*	1.3750
(1.250)	1.1250	1.5000
-325	1.5000	1.8750
-329	2.0000	2.375*
	+0.000 -0.002	+0.002 -0.000
-330	2.125	2.500
-333	2.500	2.875
-337	3.000	3.375
-345	4.000*	4.375*

SIZE No. Call out	B Shaft Diameter (inches)	A Bore Diameter (inches)
-------------------------	------------------------------------	-----------------------------------

### KS7 and K317 Series

1/4-inch Nominal Cross Section

	+0.0000 -0.0015	+0.002 -0.000
-403	1.7500	2.250
-405	2.0000	2.200
	+0.0000 -0.0020	+0.0020 -0.0000
-407	2.250	2.750
-409	2.500	3.000
-417	3.500	4.000*
	+0.000 -0.003	+0.003 -0.000
-421	4.000	4.500
-429	5.000	5.500
-437	6.000	6.500*
	+0.000 -0.004	+0.004 -0.000
-439	6.500	7.000
-443	7.500	8.000

### KS8 and K318 Series

3/8-inch Nominal Cross Section

(3.00)	3.00*	3.75*
to	to	to
(24.00)	24.00*	24.75*

### KS9 and K319 Series

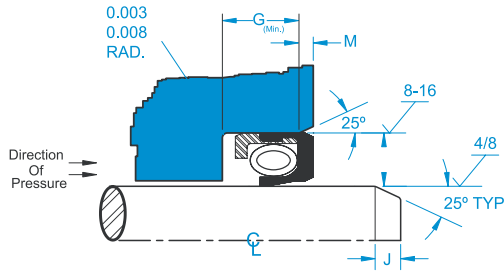
1/2-inch Nominal Cross Section

(3.50)	3.50*	4.00*
to	to	to
(34.00)	34.00*	34.50*

Consult technical sales for fast and complete recommendations with proposals.

(\*) = See page-7 for tolerances.

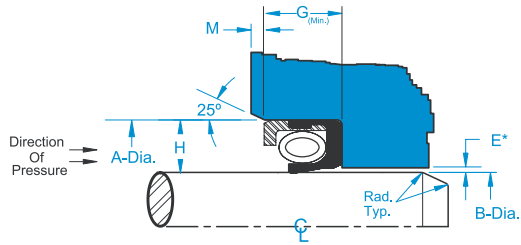
## Recommended Installation Dimensions



**Uncaptivated Seal Gland**

(UNCAPTIVATED: Seal can be forced out under direction of pressure)

**FIGURE 6.**



**Captivated Seal Gland**

(CAPTIVATED: Seal cannot be forced out under direction of pressure)

**FIGURE 7.**

Seal Series	Nominal Cross-Section W (inches)	Gland Height H (inches)	Gland Width G (Min.) (inches)	Shaft Chamfer J (inches)	Housing Chamfer M (inches)
1	0.031 (1/32)	0.031 / 0.032	0.060	0.031 ±0.004	0.010 ±0.003
0	0.063 (1/16)	0.062 / 0.063	0.110	0.062 ±0.005	0.015 ±0.004
4	0.093 (3/32)	0.093 / 0.094	0.150	0.093 ±0.006	0.020 ±0.004
5	0.125 (1/8)	0.125 / 0.127	0.195	0.125 ±0.008	0.030 ±0.005
6	0.188 (3/16)	0.187 / 0.189	0.275	0.187 ±0.010	0.040 ±0.005
7	0.250 (1/4)	0.250 / 0.252	0.365	0.250 ±0.012	0.050 ±0.005
8	0.375 (3/8)	0.375 / 0.377	0.530	0.375 ±0.015	0.060 ±0.006
9	0.500 (1/2)	0.500 / 0.502	0.730	0.500 ±0.020	0.070 ±0.007

(50-688)

### SUGGESTED SHAFT AND HOUSING TOLERANCES

Diameter Range (inches)	Shaft Tolerances (inches)	Housing Tolerances (inches)	Diameter Range (inches)	Shaft Tolerances (inches)	Housing Tolerances (inches)
0.0200 to 0.1875	+0.0000 / -0.0005	+0.0005 / -0.0000	2.001 to 3.500	+0.000 / -0.002	+0.002 / -0.000
0.1876 to 0.3750	+0.0000 / -0.0007	+0.0007 / -0.0000	3.501 to 6.000	+0.000 / -0.003	+0.003 / -0.000
0.3751 to 1.0000	+0.0000 / -0.0010	+0.0010 / -0.0000	6.001 to 15.000	+0.000 / -0.004	+0.004 / -0.000
1.0001 to 2.0000	+0.0000 / -0.0015	+0.0015 / -0.0000	15.001 to 34.000	+0.000 / -0.005	+0.005 / -0.000

(50-606-1)

### RADIAL CLEARANCE "E" (inches) @ 70° F (21° C)

Code	Cross Section	Pressure (psi)			
		150	300	500	1000
1	1/32" (0.031)	0.004	0.003	0.0025	0.002
0	1/16" (0.063)	0.005	0.004	0.0025	0.003
4	3/32 (0.094)	0.006	0.005	0.004	0.003
5	1/8 (0.125)	0.007	0.006	0.005	0.004
6	3/16 (0.188)	0.007	0.006	0.005	0.004
7	1/4 (0.250)	0.008	0.007	0.006	0.005
8	3/8 (0.375)	0.010	0.008	0.007	0.006
9	1/2 (0.500)	0.012	0.010	0.008	0.007

Request TR-94 for a report on factors affecting rotary Bal Seal performance.



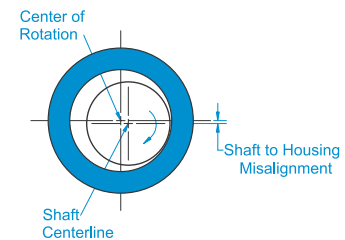
## Dynamic Alignment

Seal Series	Seal Cross Section Height W	Typical Diameter Range (inches)	Allowable Runout (TIR)* at various surface speeds (FPM) (with corresponding RPM at Average Diameter Range)				
			50 FPM	500 FPM	1,000 FPM	2,500 FPM	5,000 FPM
1	0.031 (1/32)	0.062–0.188 (0.125 Avg.)	0.0015" (1528-RPM)	0.0010" (15,279-RPM)	0.0005" (30,558-RPM)	NR (76,394-RPM)	NR (152,788-RPM)
0	0.063 (1/16)	0.125–0.500 (0.313 Avg.)	0.0025" (610-RPM)	0.0015" (6,102-RPM)	0.001" (12,204-RPM)	0.0005" (30,508-RPM)	NR (61,018-RPM)
4	0.094 (3/32)	0.125–1.000 (0.563 Avg.)	0.0035" (339-RPM)	0.0025" (3,392-RPM)	0.0020" (6,785-RPM)	0.0010" (16,961-RPM)	NR (33,923-RPM)
5	0.125 (1/8)	0.188–2.500 (1.344 Avg.)	0.0045" (142-RPM)	0.0035" (1,421-RPM)	0.0030" (2,842-RPM)	0.0015" (7,105-RPM)	NR (14,210-RPM)
6	0.188 (3/16)	1.000–4.000 (2.500 Avg.)	0.0050" (76-RPM)	0.0040" (764-RPM)	0.0035" (1,528-RPM)	0.0020" (3,820-RPM)	NR (7,639-RPM)
7	0.250 (1/4)	1.750–7.500 (2.500 Avg.)	0.0060" (41-RPM)	0.0050" (413-RPM)	0.0045" (826-RPM)	0.0030" (2,065-RPM)	0.0020" (4,129-RPM)
8	0.375 (3/8)	2.00–10.00 (6.00 Avg.)	0.0070" (32-RPM)	0.0060" (318-RPM)	0.0055" (637-RPM)	0.0040" (1,592-RPM)	0.0030" (3,183-RPM)
9	0.500 (1/2)	3.00–14.00 (8.50 Avg.)	0.0075" (22-RPM)	0.0070" (225-RPM)	0.0065" (449-RPM)	0.0050" (1,123-RPM)	0.0040" (2,247-RPM)

(\*)=Specified TIR is for spring loaded seals. For non spring loaded seal, the allowable runout is 20% lower.  
NR = Not recommended Consult Bal Seal.

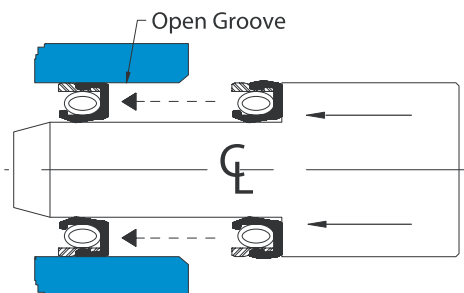
### Shaft To Bore Misalignment at the seal area (STBM)

Shaft Diameter (inches)	STBM (inches)
0.000 to 0.750	0.0020
0.751 to 1.500	0.0025
1.501 to 3.000	0.0030
3.001 to 6.000	0.0035
6.001 to 10.000	0.0045

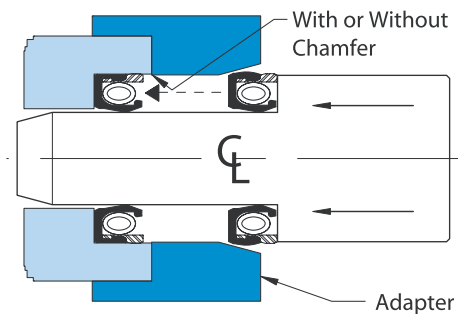


Shaft to Bore Misalignment  
FIGURE 8.

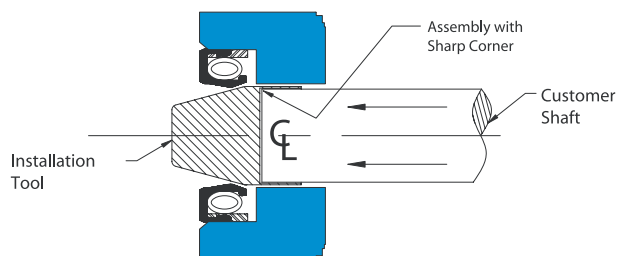
## Installation Configurations



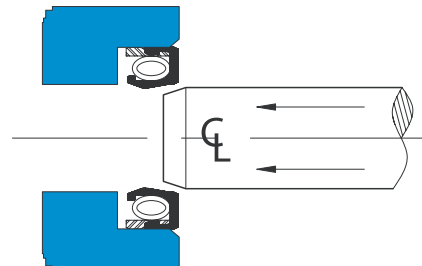
Assembly in an Open Gland  
FIGURE 9.



An Open Gland With Sharp Entry Corner  
FIGURE 10.



Assembly of Shaft From Forward Direction  
FIGURE 11.



Assembly of Shaft From Rear of Seal  
FIGURE 12.

Other specialized assembly methods are available. Consult Technical Sales.  
Request TR-94 for complete technical data on Bal Seal rotary seals; request TR-97 on "Tools for Removing 'K' Series Rotary Bal Seals"

# ROTARY SEAL APPLICATION DATA SHEET

Bal Seal provides immediate technical support. We encourage you to complete the application in as much detail as possible and fax it to our Technical Sales Department at 949.460.2300. Bal Seal will be able to provide the best solution possible to meet your requirements by means of a seal design proposal and technical information.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Company: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

Dept.: \_\_\_\_\_

City, State & Zip: \_\_\_\_\_

Telephone: \_\_\_\_\_

Email: \_\_\_\_\_

Fax: \_\_\_\_\_

## PRODUCT DATA:

Product Name: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Annual Usage: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Application is for:

- ☐ Prototype  
☐ Production  
☐ Retrofit  
☐ Other: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## SERVICE:

- ☐ Rotary – Continuous  
☐ Rotary – Intermittent  
☐ Oscillating/Dithering  
☐ Other: \_\_\_\_\_  
 \_\_\_\_\_

## SPEED:

- ☐ fpm(m/s) \_\_\_\_\_  
☐ rpm \_\_\_\_\_  
☐ cpm \_\_\_\_\_  
☐ Hz \_\_\_\_\_

## CRITICAL FACTORS:

- |   | Not Important            | Very Important           |
|---|--------------------------|--------------------------|
| <input type="checkbox"/> Friction: _____          | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Life: _____              | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Cost Target: _____       | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Compatibility: _____     | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Other: _____             | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Allowable Leakage: _____ | <input type="checkbox"/> | <input type="checkbox"/> |

## TEMPERATURE:

Intermittent:  
 \_\_\_\_\_ Max. ☐ °F ☐ °C ☐ °K  
 \_\_\_\_\_ Min.

Continuous:  
 \_\_\_\_\_ Max.  
 \_\_\_\_\_ Min.

Cycling: \_\_\_\_\_

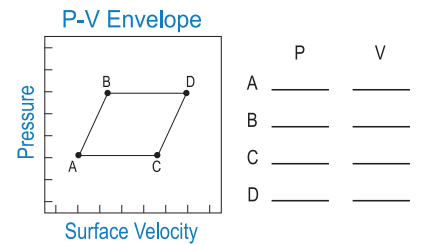
Other: \_\_\_\_\_

## MEDIA TYPE:

- Select one: ☐ Gas ☐ Solids ☐ Corrosive  
☐ Water ☐ Abrasives ☐ Contamination  
☐ Oil ☐ Viscous ☐ Solid Particles  
☐ Cycling Temperature: \_\_\_\_\_  
☐ Other: \_\_\_\_\_  
 Description of gas, liquid, solid media: \_\_\_\_\_  
 \_\_\_\_\_

- ☐ Specific Gravity: \_\_\_\_\_  
☐ Volatiles: \_\_\_\_\_  
☐ Relative Humidity (RH): \_\_\_\_\_ %  
☐ Viscosity: \_\_\_\_\_

## PV ENVELOPE:



## TORQUE LIMITS:

- ☐ inches ☐ lbs. ☐ N-M  
☐ Break away: \_\_\_\_\_  
☐ Running: \_\_\_\_\_

## PRESSURE:

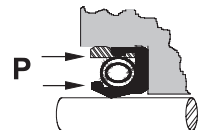
- Max: \_\_\_\_\_ ☐ psi ☐ MPa ☐ kg/cm<sup>2</sup>; bar  
 Operating: \_\_\_\_\_  
 Minimum: \_\_\_\_\_  
 Splash/No Pressure: \_\_\_\_\_  
 Reverse Pressure: \_\_\_\_\_  
 Vacuum: ☐ inches Hg ☐ Pa ☐ Torr  
 Cycling Pressure: ± \_\_\_\_\_ ☐ psi ☐ MPa ☐ kg/cm<sup>2</sup>; bar @ \_\_\_\_\_ (rate)

## CONFIGURATION:

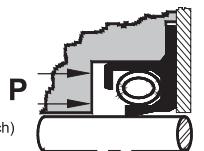
- ☐ Uncaptivated Seal Gland



- ☐ Captivated Seal Gland



- ☐ Flanged



- ☐ Other (attach sketch)

## SHAFT DATA:

Diameter: \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 Tolerance: \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 Material: \_\_\_\_\_  
 Hardness: \_\_\_\_\_ Rc  
 Surface Finish: \_\_\_\_\_ ☐ Ra ☐ RMS ☐ Ry  
 Plating/Coating: \_\_\_\_\_  
 Eccentricity: TIR \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 STBM \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 Total Runout TIR: \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 Can the dimensions be modified?: ☐ Yes ☐ No

## GLAND / BORE DATA:

Gland I.D.: \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 Tolerance: \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 Gland Width: \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 Tolerance: \_\_\_\_\_ ☐ inches \_\_\_\_\_ ☐ mm  
 Material: \_\_\_\_\_  
 Surface Finish: \_\_\_\_\_ Ra/RMS  
 Plating/Coating Type: \_\_\_\_\_  
 Can the seal gland/bore be modified? ☐ Yes ☐ No

- ☐ Will Supply Shaft/Bore/Gland Drawings

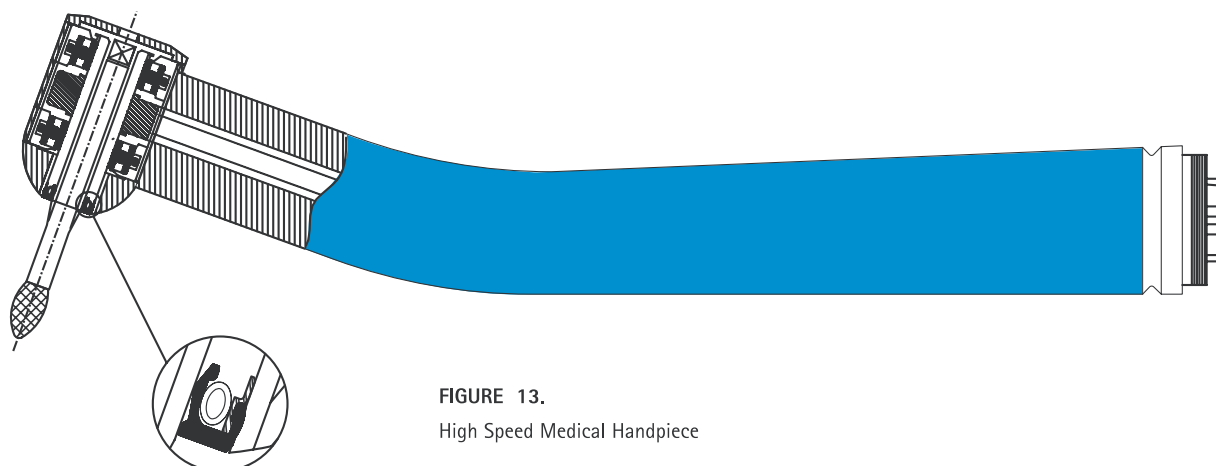


FIGURE 13.  
High Speed Medical Handpiece

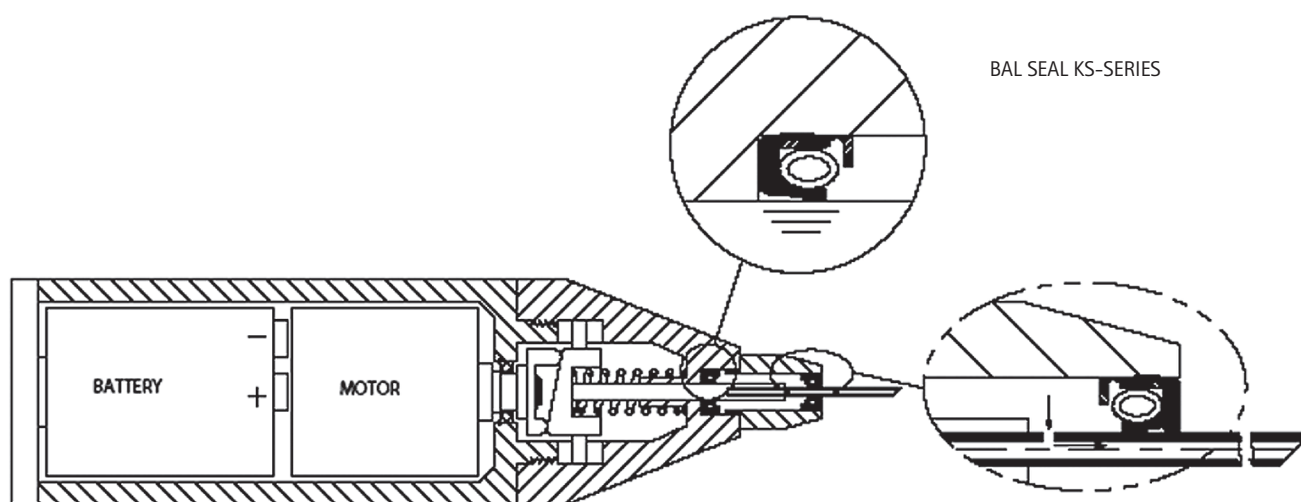
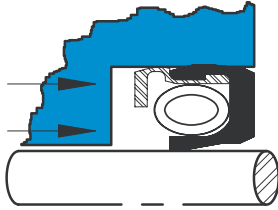


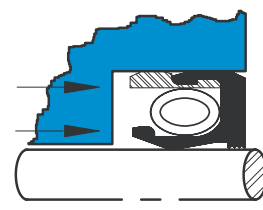
FIGURE 14.  
TATTOOING DEVICE



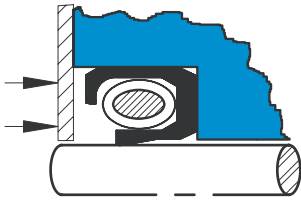
**FIGURE 15.**  
Low Pressure with Good  
Sealing Ability



**FIGURE 16.**  
Viscous Fluids at Low Speeds



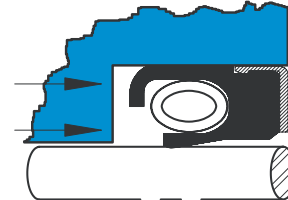
**FIGURE 17.**  
Medium Pressure, Dust Exclusion



**FIGURE 18.**  
Good Sealing Ability with  
low Dead Volume



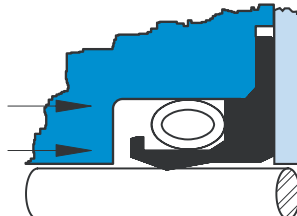
**FIGURE 19.**  
Bi-directional at Low Pressure



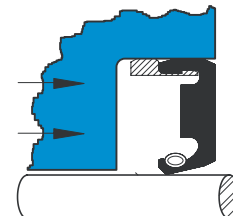
**FIGURE 20.**  
Higher Uncaptivated Pressures  
than KS-series



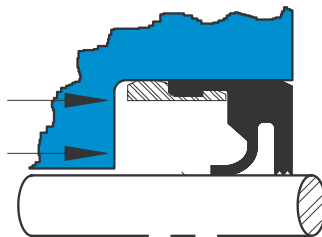
**FIGURE 21.**  
High Pressures



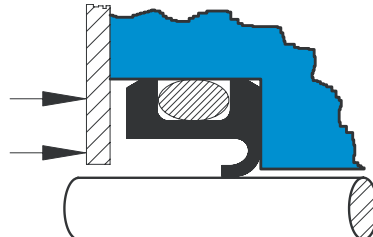
**FIGURE 22.**  
Cryogenic, Very Low Pressure



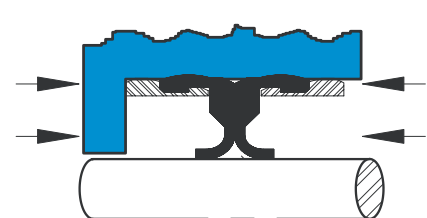
**FIGURE 23.**  
Large Cross-Section, Medium  
Pressure and Medium Speed



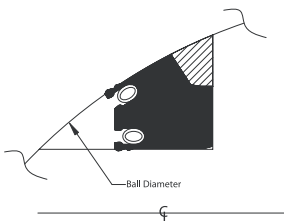
**FIGURE 24.**  
Low pressure, Dust Exclusion



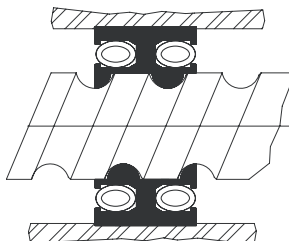
**FIGURE 25.**  
Low Speed, Low Pressure



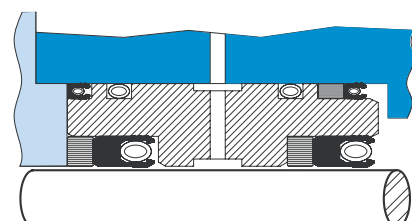
**FIGURE 26.**  
Bi-directional, Low Pressure



**FIGURE 27.**  
Ball Valve Seal



**FIGURE 28.**  
Ball Screw Seal



**FIGURE 29.**  
Bearing-Seal Package

## IMPORTANT INFORMATION

**CLEANING:** Customer/End User is advised that Bal Seal products may require cleaning and/or sterilization prior to usage, depending on the application (LE-110B).

### **WARNING:**

**It is essential that the customer perform testing under actual service conditions with a sufficient safety factor to determine if the proposed, supplied, or purchased Bal Seal products are suitable for the intended purpose.**

Welded springs have an increased probability of breaking or failing at or adjacent to the weld as opposed to other areas of the spring. This probability is increased further if the spring is used in an application involving extension of the spring. Temperature affects the properties (*i.e.*, tensile, elongation, etc.) of the spring. Failure of Bal Seal Engineering, Inc. products can cause equipment failure, property damage, personal injury, and/or death. Equipment containing Bal Seal products must be designed to provide for the safe handling of any eventually that may result from a partial or total failure of said Bal Seal products. Bal Seal products must be tested with a sufficient safety factor after installation. A program of regular maintenance and inspection must be performed. The user, through its own analysis and testing, is solely responsible for making the final selection of the products and for assuring that all performance, safety and warning requirements of the application are met (LE-110A).

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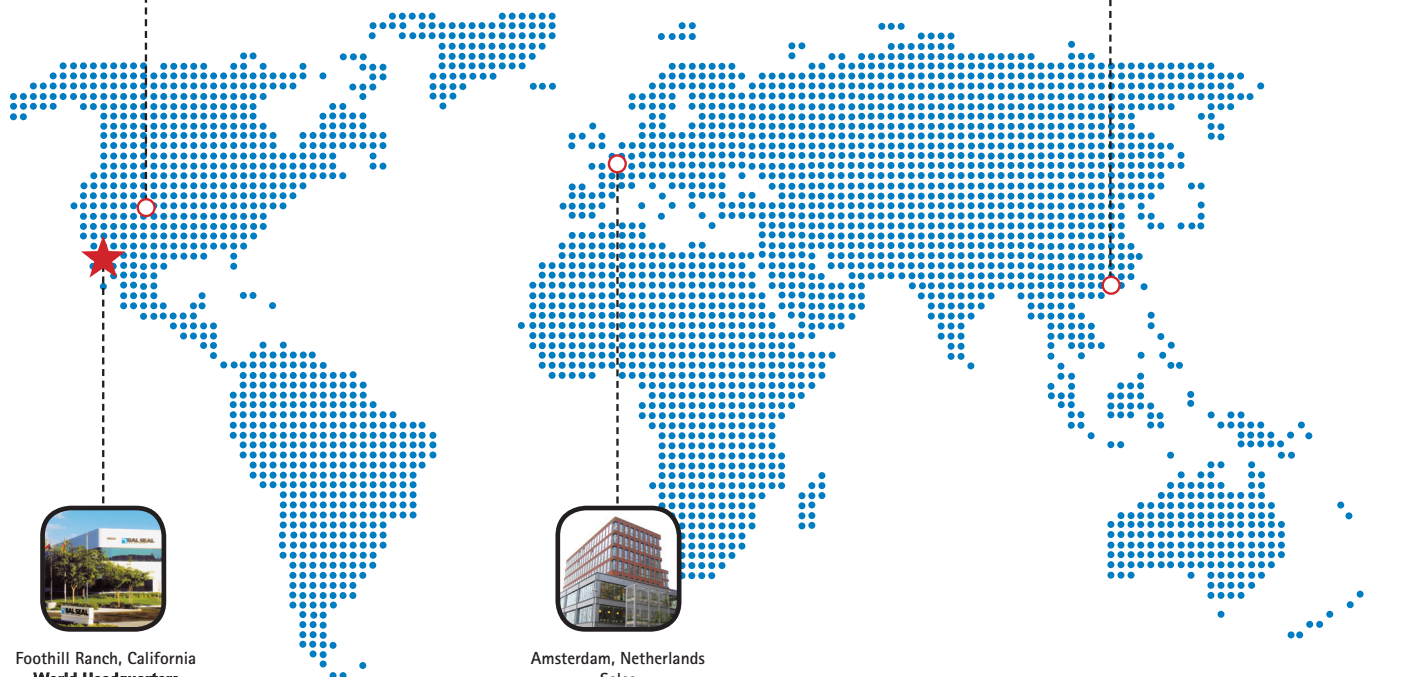
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certification since 1999.

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Manufacturing



Hong Kong, China  
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Foothill Ranch, California  
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