BAL SEAL® ENGINEERING, INC.

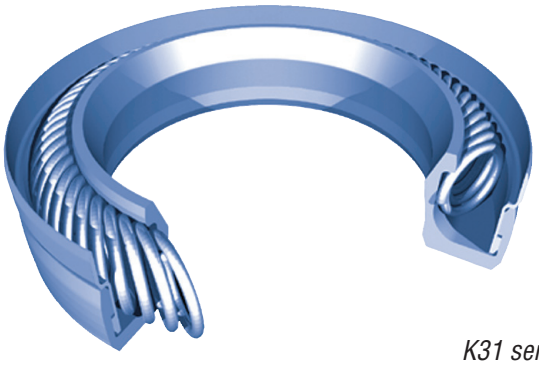
Rotary Seal Catalog
DM-5

Solutions for Rotary Applications

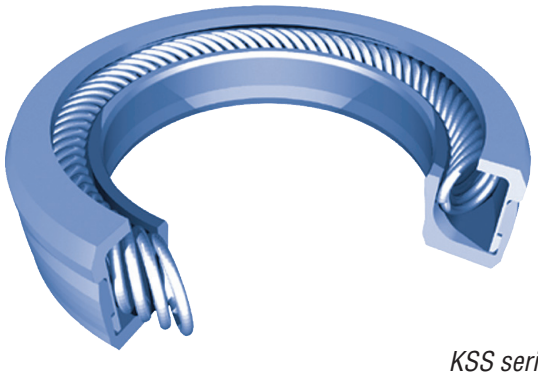
Custom-engineered
High performance
PTFE rotary lip seals

Solutions for rotary applications

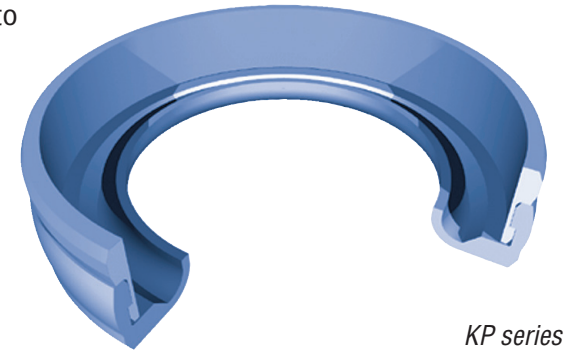
Bal Seal Engineering is an industry leader providing custom-engineered sealing, connecting, conducting and shielding solutions to OEM product designers. Our engineers work closely with customers to provide valuable, innovative product designs. Whether you're looking for spring-energized PTFE seals, rotary 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.



K31 series



KSS series



KP series

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 x 10–6 Torr, extreme high pressures up to 100,000 psi, or cryogenic temperatures from 4° K to 600° 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 proucts 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.

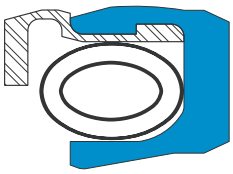
Bal Seal is a complete solutions provider. We not only offer spring and sealing solutions, but also offer design assistance, plastic and metal fabrication and component sub-assembly to provide you with a one-stop design engineering and production facility. So whether you're trying to protect sophisticated 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.

DESIGN FEATURES

Rotary Bal Seal® designs have notable performance-boosting features:

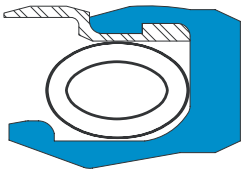
- Patented Canted-coil™ technology that provides positive, constant-force seal energizing
- Unique locking ring designs that securely retain seals through temperature cycling and pressure environments while providing ease of installation
- Exclusive seal jacket configurations that are optimized to provide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

SEAL TYPES WITH METAL LOCKING RINGS



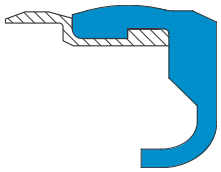
KSS/KS Series

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



K31/KF31 Series

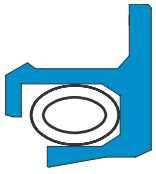
- Locking ring retention
- Canted-coil spring energizing
- Full lip for increased versatility of assembly
- Medium speeds and pressures



KP/KPF Series

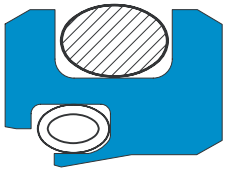
- Locking ring retention
- Memory lip energizing
- High speeds and very low pressures

OTHER ROTARY SEAL TYPES



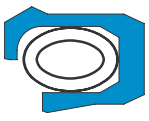
RS31 Series

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



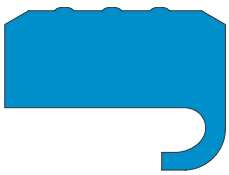
71 Series

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



S31 Series

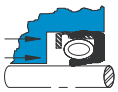
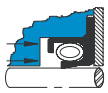
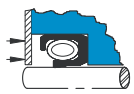
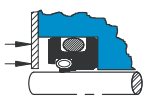
- Press-in mounting
- Canted-coil spring energizing
- Reduced lip length for optimum sealing loads
- Very low speeds and pressures



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 Inch	Seal Inside Diameter Available Inch	Suggested Operating Conditions Pressure Range Uncaptivated Seal Gland (Kg/Cm2)	Captivated Seal Gland (Kg/Cm2)	Temperature Range °F (°C)	Surface Speed Ft/Min (M/Sec.)	Features and Benefits
	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)	Continuous -20° to +200° (-29° to +93°) Intermittent to +250° (+121°)	to 250 (1.3)	
	71x (50-551)	From 0.063 thru 0.500	From 0.063 to 14.00		Vacuum to 60 (4)		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)	• Compatibility with most fluids • Lowest cost • Low friction

(*) 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)	Temperature Range (°C)	Wear Resistance	FDA Compatibility	Chemical Compatibility
GFP55 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
SP45 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
SP50 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
UPC10 POLYETHYLENE BLEND Commercial grade. Aqueous service. Excellent wear resistance at low temperatures. High extrusion resistance, but high friction. FDA compliant[1]. Color = White/Translucent	-450 to +180	-268 to +82	Highest (Water-only)	Yes	Very Good
T 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
P41 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	LOCKING RING MATERIALS
302, 316, 316L Stainless Steel, Hastelloy®, Inconel® and others.	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)

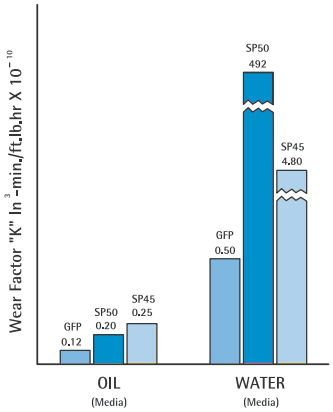


FIGURE 1.

Wear Rate at 100,000 PV
High Speed (1,000fpm) - Low Pressure (100psi)

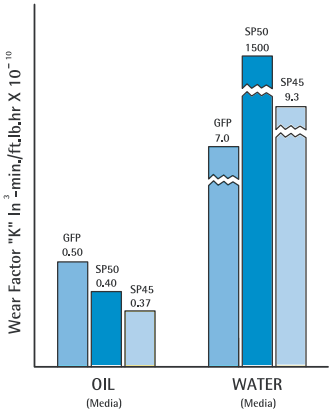


FIGURE 2.

Wear Rate at 50,000 PV*
Speed (75fpm) - Pressure (667psi)

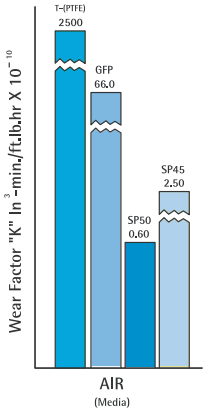


FIGURE 3.

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

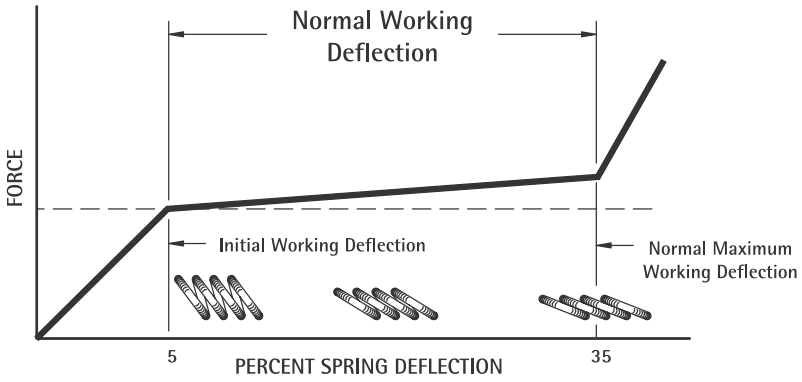
[1] Material has received an FDA approval.

Bal Seal Canted-coil™ Seal Energizers

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.

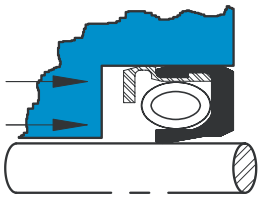
An increase in the spring force generally results in better sealing, but with higher friction and seal wear. When media pressure is applied, the pressure and the energizing load of the Bal Spring combine to add additional sealing force, which also increases the sealing ability.

Recommended Size Ranges for Selected Series

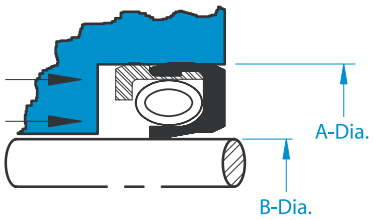
K31xCC SERIES

K31x SERIES

KSSx SERIES



KSx SERIES



Common Sizes

K311CC Series
1/32-inch Nominal Cross Section

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

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

KSSO and K310 Series
1/16-inch Nominal Cross Section

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

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

KSS4 and K314 Series
3/32-inch Nominal Cross Section

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

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

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

KS7 and K317 Series
1/4-inch Nominal Cross Section

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

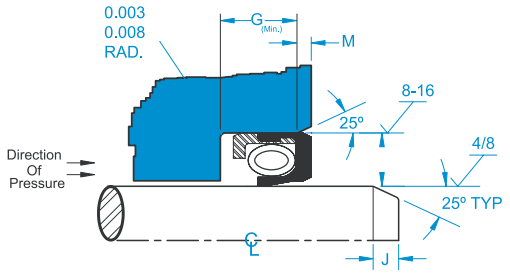
KS9 and K319 Series
1/2-inch Nominal Cross Section

(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.

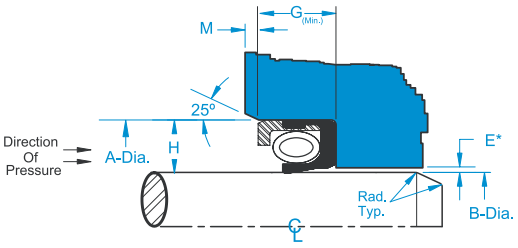
(*) = See page-7 for tolerances.

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

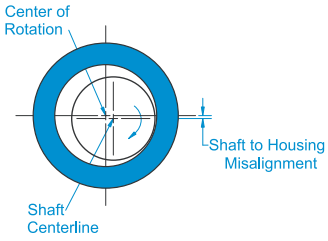
Request TR-94 for a report on factors affecting rotary Bal Seal performance.

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 1.750-7.500	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)

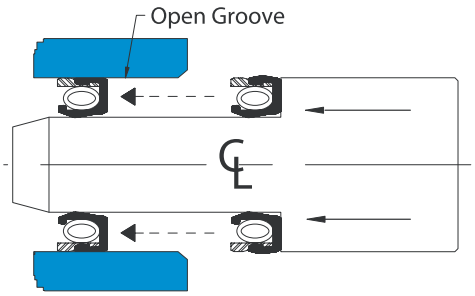
(*)=Specified TIR is for spring loaded seals. For non spring loaded seal, the allowable runout is 20% lower.
NR = Not recommended. Consult Bal Seal.

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

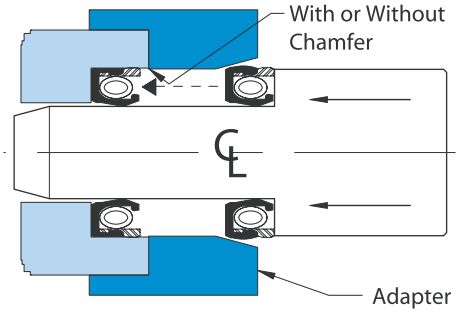


Shaft to Bore Misalignment
FIGURE 8.

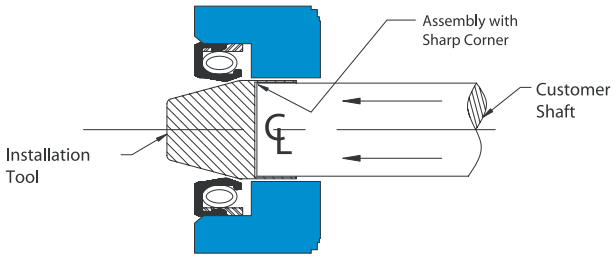
Installation Configurations



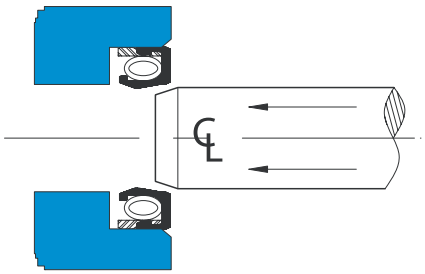
Assembly in an Open Gland
FIGURE 9.



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"

FORM: 0-994 Rev. B
REPORT: 205-1-5
DATE: 11/09/10

ROTARY SEAL APPLICATION DATA SHEET

Bal Seal provides immediate technical suport. 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
☐ Friction: _____	☐	☐	☐	☐	☐
☐ Life: _____	☐	☐	☐	☐	☐
☐ Cost Target: _____	☐	☐	☐	☐	☐
☐ Compatibility: _____	☐	☐	☐	☐	☐
☐ Other: _____	☐	☐	☐	☐	☐
☐ Allowable Leakage: _____	☐	☐	☐	☐	☐

TEMPERATURE:

Intermittent:
_____ Max. ☐°F ☐°C ☐°K
_____ Min.

Continuous:
_____ Max.
_____ Min.

Cycling: _____

Other: _____

MEDIA TYPE:

Select one:
- ☐ Gas
- ☐ Water
- ☐ Oil

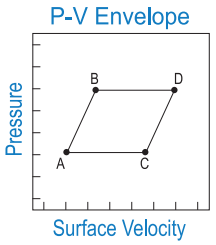
Other Factors:
- ☐ Solids
- ☐ Abrasives
- ☐ Viscous
- ☐ Corrosive
- ☐ Contamination
- ☐ Solid Particles

- ☐ Cycling Temperature: _____
- ☐ Other: _____

Description of gas, liquid, solid media:
_____

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

PV ENVELOPE:



	P	V
A		
B		
C		
D		

TORQUE LIMITS:

☐ inches ☐ lbs. ☐ N-M

- ☐ Break away: _____
- ☐ Running: _____

PRESSURE:

Max: _____ ☐ psi ☐ MPa ☐ kg/cm^2; bar

Operating: _____

Minimum: _____

Splash/No Pressure:

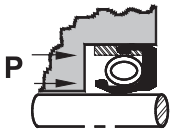
Reverse Pressure:

Vacuum: ☐ inches Hg ☐ Pa ☐ Torr

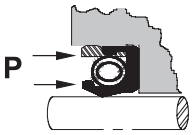
Cycling Pressure: ±____ ☐ psi ☐ MPa ☐ kg/cm^2; bar @____(rate)

CONFIGURATION:

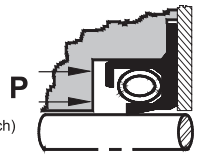
☐ **Uncaptivated Seal Gland**



☐ **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

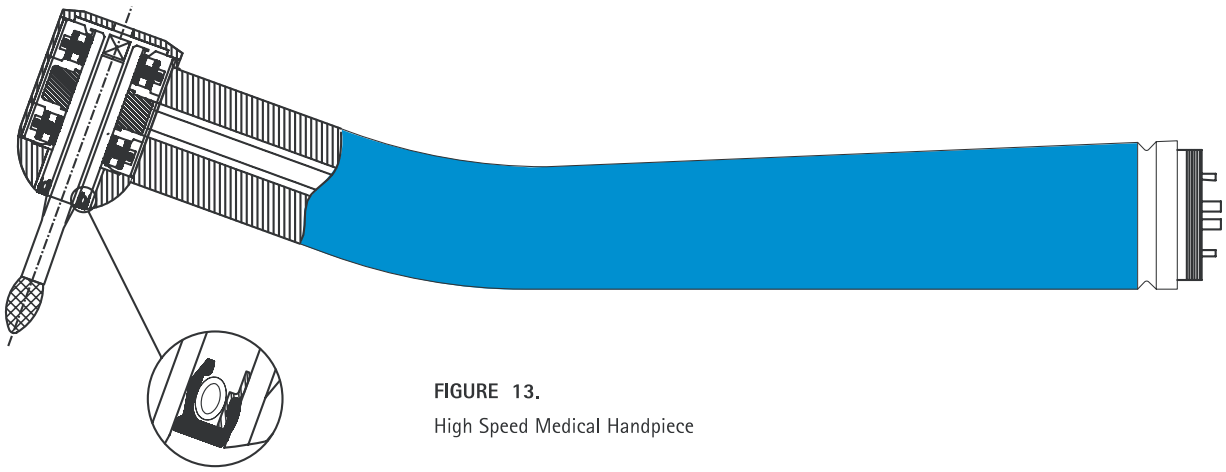
Can the dimensions be modified?: ☐ Yes ☐ No

GLAND / BORE DATA:

Gland I.D.: _____ ☐ inches _____ ☐ mm
Tolerance: _____ ☐ inches _____ ☐ mm
Gland Width: _____ ☐ inches _____ ☐ mm
Tolerance: _____ ☐ inches _____ ☐ mm

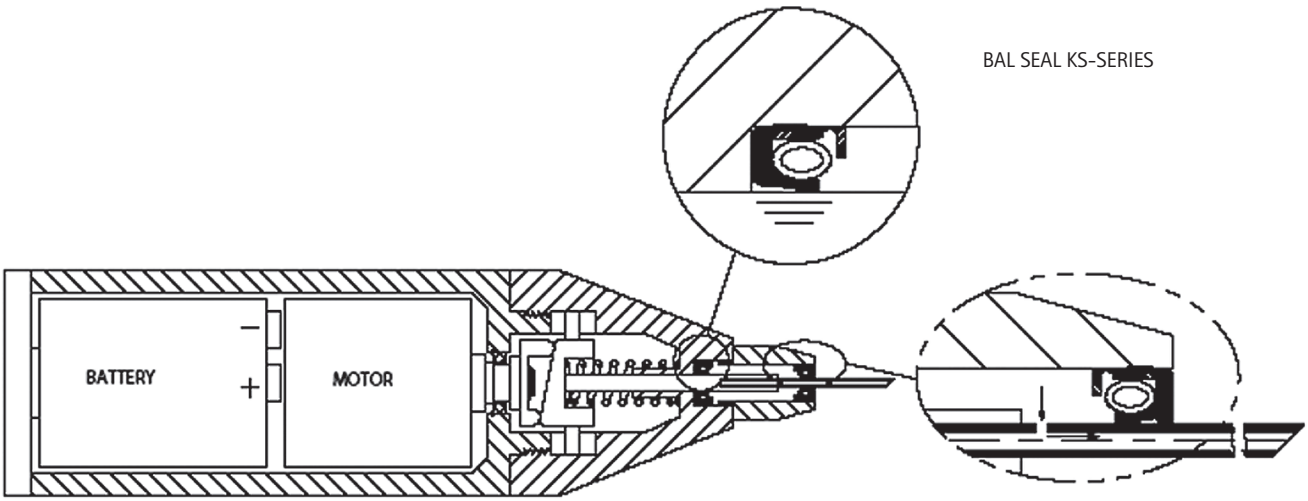
Material: _____
Surface Finish: _____ Ra/RMS
Plating/Coating Type: _____
Can the seal gland/bore be modified? ☐ Yes ☐ No

☐ **Will Supply Shaft/Bore/Gland Drawings**



WITH EXCLUDER
BAL SEAL K31-SERIES

FIGURE 13.
High Speed Medical Handpiece



BAL SEAL KS-SERIES

FIGURE 14.
TATTOOING DEVICE

BAL SEAL KSS-SERIES
WITH EXCLUDER

Customized solutions to suit your application

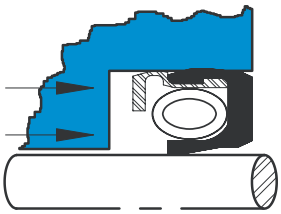


FIGURE 15.
Low Pressure with Good Sealing Ability

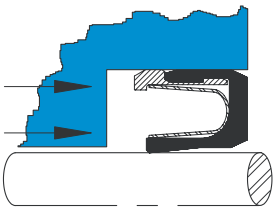


FIGURE 16.
Viscous Fluids at Low Speeds

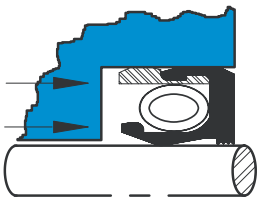


FIGURE 17.
Medium Pressure, Dust Exclusion

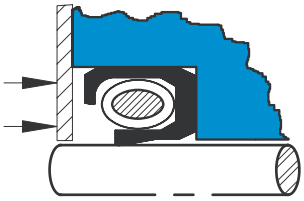


FIGURE 18.
Good Sealing Ability with low Dead Volume

FIGURE 19.
Bi-directional at Low Pressure

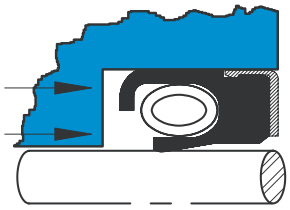


FIGURE 20.
Higher Uncaptivated Pressures than KS-series

FIGURE 21.
High Pressures

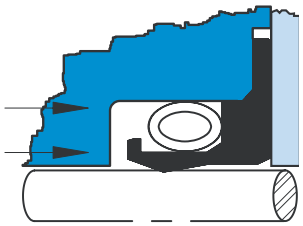


FIGURE 22.
Cryogenic, Very Low Pressure

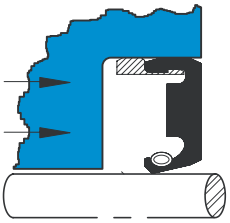


FIGURE 23.
Large Cross-Section, Medium Pressure and Medium Speed

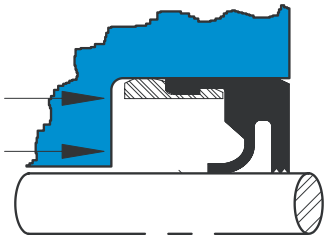


FIGURE 24.
Low pressure, Dust Exclusion

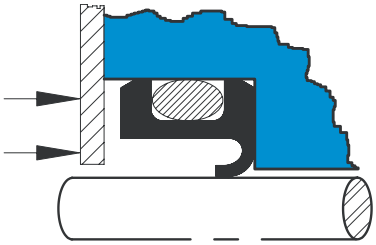


FIGURE 25.
Low Speed, Low Pressure

FIGURE 26.
Bi-directional, Low Pressure

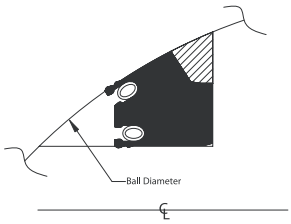


FIGURE 27.
Ball Valve Seal

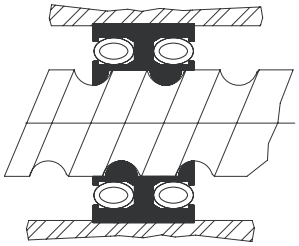


FIGURE 28.
Ball Screw Seal

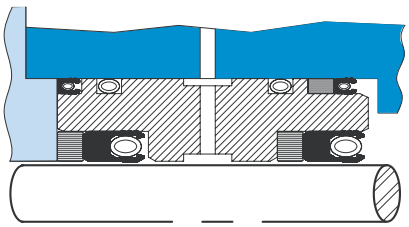


FIGURE 29.
Bearing-Seal Package

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 wiith 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, though 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).

DISCLAIMER OF ALL WARRANTIES: **The implied warranties of merchantability and fitness for a particular purpose and all warranties, implied or expressed, are excluded and shall not be implied to Bal Seal.**

All statements, technical information, and recommendations herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed. All such statements, technical information and recommendations shall not be the basis of any bargain with Bal Seal or any seller and do not constitute a warranty that the goods will conform to any statements, technical information, or recommendations. The use of any such statement, information or recommendation is solely for the purposes of identification or illustration and is not to be construed as a warranty that any goods will conform to such statements, information, or recommendations. No affirmation of fact or promise made by Bal Seal or any seller will constitute a warranty that any goods will conform to the affirmation of promise.

Before using any product, user shall determine the suitability of the product for its intended use and user assumes all risk and liability whatsoever in connection therewith. No one, including company representatives, wholesalers, distributors, salespersons, or employees of Bal Seal is authorized to make any warranty or representation and no customer or user may rely on any warranty or representation. Bal Seal reserves the right to make any changes without notice in our products and in the information and contents of this document/brochure. Such information can include, but is not limited to, dimensional data, force, torque, materials, pressures, temperatures, surface finishes, surface speed, etc.

Nothing contained herein or in any of our literature shall be considered a license or recommendation to use any process or to manufacture or to use any product in conflict with existing or future patents, covering any product or material or its use.

The buyer shall hold and save the company, its officers, agents, and employees, harmless from liability of any nature or kind for or on account of the use, sales or lease of any patented or unpatented invention, article, or appliance, furnished or used hereunder (LE-52).

LIMITATION OF LIABILITY/REMEDIES: **It is agreed that the liability of the seller and Bal Seal, whether as a result of breach of any warranty, if any warranty in fact be found to exist, negligence, other tort, breach of contract or otherwise shall be limited to replacing the non-conforming Bal Seal product or any part thereof, or, at seller's option, to the repayment to the buyer of the purchase price paid by buyer in respect of which damages are claimed upon return to the seller, freight prepaid, of the non-conforming product or part thereof. It is expressly agreed that buyer's remedy, as stated above, shall be exclusive and that seller shall not be liable in tort or in contract for any other damages, direct, indirect or consequential. Any claims must be made in writing within 28 days of shipment of goods to receive consideration (LE-52).**

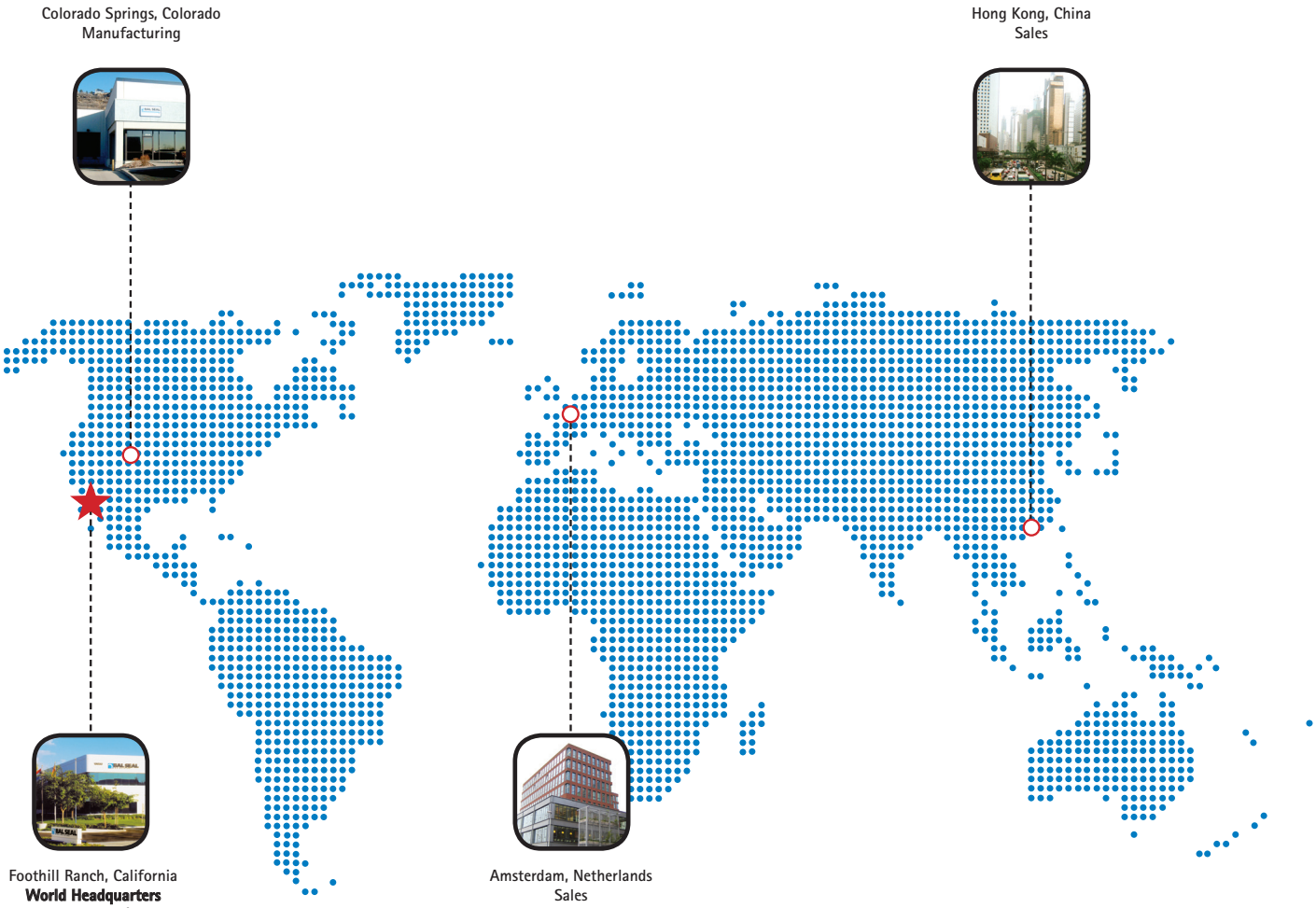
PATENTS: The items described in this catalog include products which are the subject of the following issued United States patents 5,979,904; 5,984,316; 5,994,856; 6,050,572; 6,161,838; 6,264,205 and others as well as foreign patents or products where patents are pending " (LE-88g).

Commitment to Quality

We have maintained our

ISO-9001

certification since 1999.



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