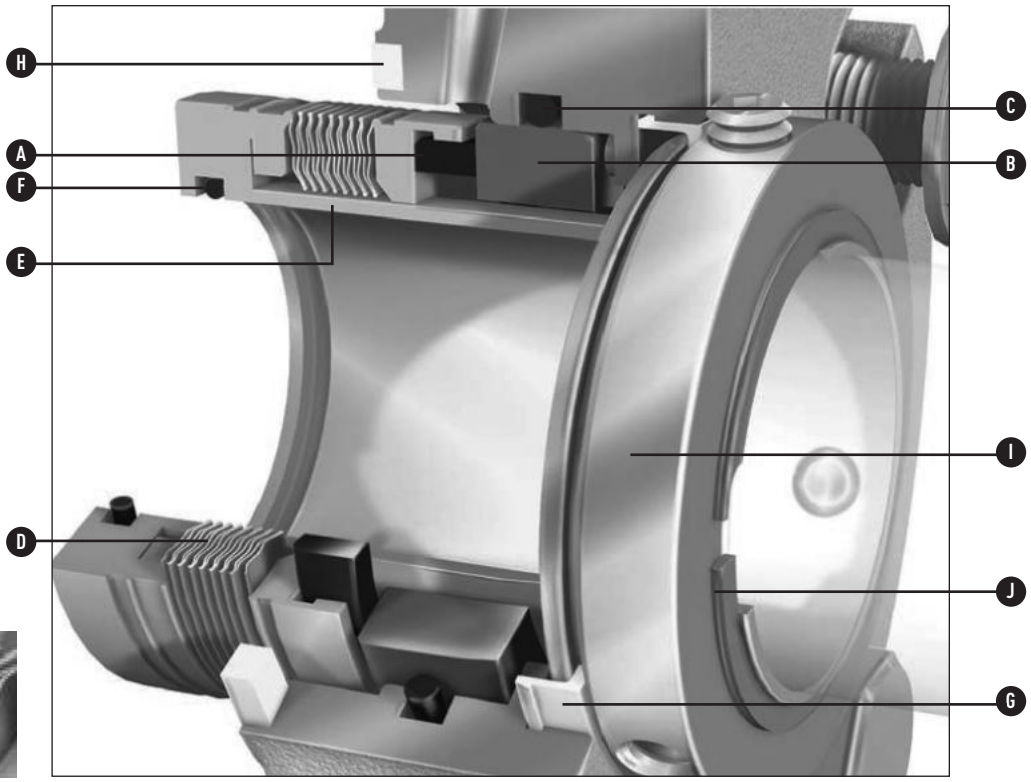
EZ-1®

CARTRIDGE-MOUNTED METAL BELLOWS SEAL

Technical Specification

A – Insert
B – Mating ring
C – O-ring
D – Bellows
E – Sleeve
F – O-ring
G – Centering bushing
H – Gland packing
I – Sleeve collar
J – Snap ring



Welded Metal Bellows

Product Description

- Standard product for general-purpose applications
- Target markets are chemicals; pulp and paper; waste-water; food processing; and power generation
- Available with a hard-face combination for abrasive applications
- Alloy C-276 (UNS N10276) is an optional bellows metallurgy (upon special request)

Design Features

- Compact and easy to install
- Only one moving part — the bellows
- Eliminates O-ring "hang-up" problems
- Self-cleaning bellows design
- No small springs to clog
- Flush-port versatility

Performance Capabilities

- Temperature: -20°F to 400°F / -30°C to 200°C
- Pressure: vacuum to 300 psig / 20 bar g
- Speed: up to 25 m/s / 4,500 fpm
- End play/axial float allowance 0.13 mm/0.005" F.I.M. max.
- Shaft runout: 0.001" per inch / 0.001 mm per mm of shaft diameter F.I.M. max.

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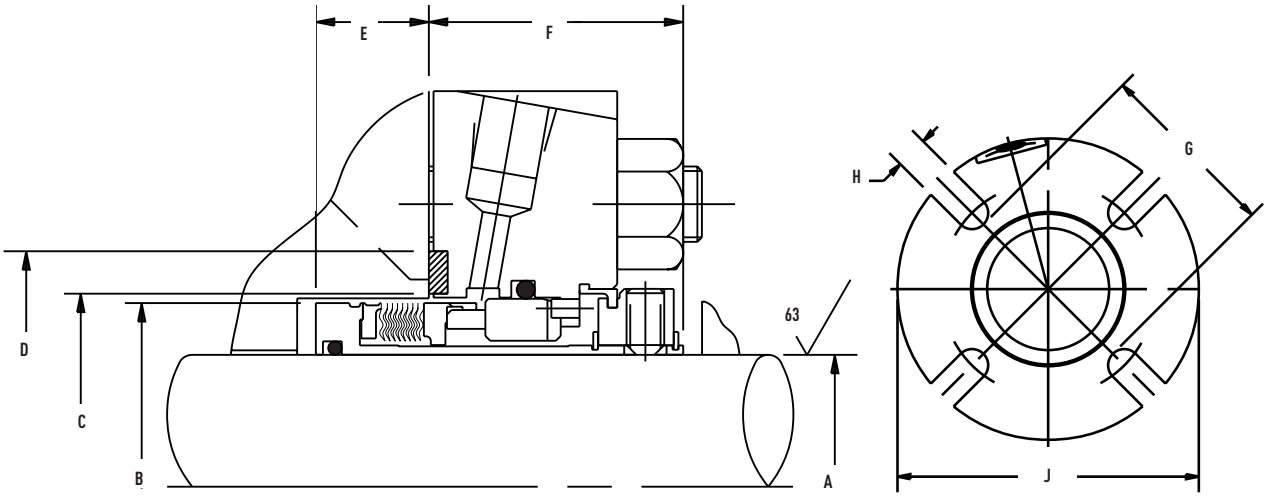
EZ-1 Seal Typical Arrangement



EZ-1 Seal Dimensional Data (inches)

Sealol Dash Number	Shaft Size A	B	C	D	E	F	G	H	J
-18	1 1/8	1.687	1.937	2.375	0.687	1.687	2.437	0.562	4.375
-18*	1 1/8	1.687	1.937	3.250	0.687	1.687	3.312	0.437	4.500
-22	1 3/8	1.937	2.062	2.375	0.687	1.562	2.437	0.562	4.375
-22*	1 3/8	1.937	2.812	3.250	0.687	1.562	3.437	0.500	5.250
-24	1 1/2	2.187	2.937	2.750	0.750	1.687	2.812	0.562	5.125
-26	1 5/8	2.312	2.437	2.812	0.750	1.687	2.875	0.562	5.250
-28	1 3/4	2.437	2.562	3.125	0.750	1.687	3.187	0.562	5.250
-28*	1 3/4	2.437	3.437	4.250	0.750	1.687	4.562	0.562	6.500
-30	1 7/8	2.562	2.687	3.250	0.750	1.687	3.312	0.562	5.375
-30*	1 7/8	2.562	3.562	4.250	0.750	1.687	4.437	0.562	6.500
-32	2	2.687	2.812	3.250	0.750	1.750	3.312	0.687	5.500
-34	2 1/8	2.812	2.937	3.500	0.875	1.687	3.562	0.687	5.437
-40	2 1/2	3.312	3.437	4.250	1.000	1.687	4.312	0.812	6.250
-40*	2 1/2	3.312	4.375	5.500	1.000	1.687	5.625	0.750	8.000
-42	2 5/8	3.437	3.562	4.375	1.187	1.625	4.437	0.562	6.500
-42*	2 5/8	3.437	4.375	5.375	1.187	1.625	5.437	0.565	7.000
-44	2 3/4	3.625	3.750	4.500	1.062	1.625	4.562	0.750	7.000
-48	3	3.875	4.000	4.812	1.125	1.656	4.875	0.812	7.750
-52	3 1/4	4.125	4.250	4.937	1.125	1.656	5.000	0.812	7.500
-56	3 1/2	4.375	4.687	5.625	1.250	1.656	5.687	0.812	8.500

EZ-1 Seal Dimensional Data (mm)

Sealol Dash Number	Shaft Size A	B	C	D	E	F	G	H	J
-028	28	42.8	49.2	60.3	17.4	42.9	61.9	14.3	111.1
-033	33	49.2	52.4	60.3	17.4	39.7	61.9	14.3	106.0
-035	35	49.2	52.4	60.3	17.4	39.7	61.9	14.3	106.0
-038	38	55.5	58.7	69.8	19.0	42.9	71.5	14.3	130.2
-040	40	58.7	61.9	71.4	19.1	42.8	73.0	14.3	133.4
-043	43	61.9	65.7	79.4	19.1	42.9	81.0	14.3	133.4
-045	45	61.9	65.1	79.4	19.1	42.9	81.0	14.3	133.4
-048	48	65.1	68.3	82.6	19.0	44.5	84.2	17.4	139.7
-050	50	68.2	71.4	82.6	19.0	44.5	84.2	17.4	138.0
-053	53	71.4	74.6	88.9	22.2	42.9	90.5	17.4	138.0
-055	55	71.4	74.6	88.9	22.2	42.9	90.5	17.4	138.0
-060	60	80.9	84.1	96.8	25.4	41.3	98.4	17.4	158.8
-065	65	87.3	90.5	109.5	30.2	41.2	111.1	17.4	177.8
-070	70	92.1	95.2	114.3	27.0	41.2	115.9	17.5	190.0
-075	75	98.4	101.6	122.2	28.5	42.1	123.8	20.6	196.9
-080	80	104.8	108.0	125.4	28.5	42.1	127.0	19.1	190.0
-085	85	108.0	111.1	125.4	31.7	42.1	127.0	19.1	203.2
-100	100	128.6	131.8	154.0	34.9	42.1	155.6	22.2	228.6

*Enlarged seal chamber version.

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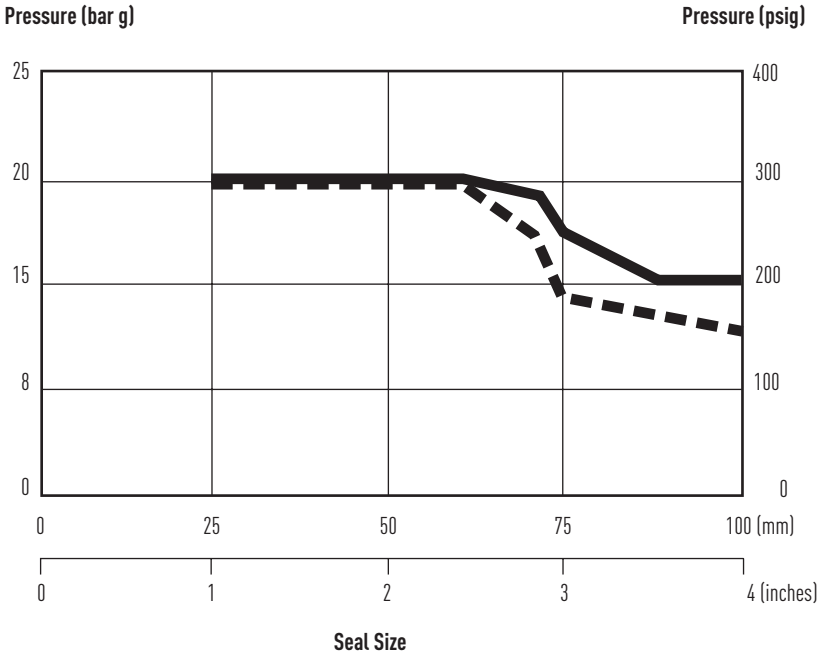
Pressure Ratings



To determine the maximum operating pressure for the size of the EZ-1 seal required, multiply the maximum pressure indicated on the graph above by the factors in the chart below. Consult John Crane for applications outside of these limits.

Multiplier Factors

	Selection Considerations	Multiplier Factor	
		Carbon vs. SiC	SiC vs. SiC
Speed	Between 400 and 3600 rpm Below 400 or above 3600 rpm	x 1.00 (see Note 1)	x 1.00 (see Note 1)
Sealed Fluid Lubricity	Petrol/Gasoline, Kerosene, or Better Water and Aqueous Solutions (<80°C/176°F) Light Hydrocarbons (see Note 2)	x 1.00 x 0.75 x 0.60	x 1.00 x 0.75 (see Note 3)
Sealed Fluid Temperature (see Note 4)	Up to 80°C/175°F Up to 150°C/300°F Up to 200°C/400°F	x 1.00 x 0.85 x 0.70	x 1.00 x 1.00 x 1.00

Notes:

1. Contact John Crane for more information.
2. Specific gravity >0.6 and ratio of sealed pressure to vapor pressure >1.5.
3. More details regarding the fluid and the operating conditions are required.
4. Temperature at the seal faces includes effects of flush, quench, and cooling.

Example for Determining Dynamic Pressure Rating:

Seal: 50mm/2" EZ-1

Product: water

Face materials: carbon vs. sealide

Temperature: 21°C/70°F

Speed: 3,000 rpm

Find the maximum operating pressure for the applications.

20 bar g/300 psig x 1.00 x 0.75 x 1.00 = 15 bar g/ 225 psig.

At 3,000 rpm with the service conditions noted, a 50mm/2" diameter EZ-1 seal has a maximum operating limit of 15 bar g/225 psig.

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Materials of Construction

SEAL COMPONENTS	MATERIALS	
Description	**Standard**	**Options**
Insert	Carbon	Sealide (sintered silicon carbide)
Mating ring	Sealide (sintered silicon carbide)	—
Sleeve	316 L stainless steel	—
Sleeve collar	303 stainless steel	—
Gland	316 stainless steel	—
Centering bushing	PTFE	—
Snap ring	302 stainless steel	—
Set screws	416 stainless steel (hardened)	Hardened steel*
Bellows	Alloy 20 (UNS N08020)	Alloy C-276 (UNS N10276)
Mating ring O-ring	PTFE-encapsulated fluorocarbon	—
Sleeve O-ring	Fluorocarbon (installed)	AFLAS®, EPR, PTFE-encapsulated fluorocarbon**
Gland gasket	Glass-filled PTFE	—

Notes:

* Hardened-steel set screws provided with seal. 416 stainless-steel screws are installed at the factory.

** These O-rings are provided with each seal so that the sleeve O-ring can be changed prior to seal installation in order to meet your specific application requirements.

Sealol Welded Metal Bellows

Design features

- Optimum 45° tilt angle
- Three-sweep radius
- Nesting ripple plate design
- Static secondary seal
- Light spring loads

Bellows benefits

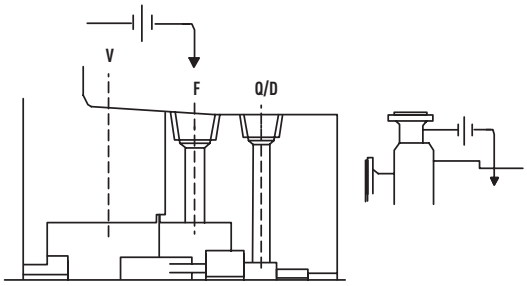
- Uniform plate rigidity and stress distribution
- Enhanced fatigue strength
- Self-cleaning through centrifugal action
- Pressure balanced by design
- Less heat
- Low-power consumption

Recommended Flush Flow Rates

Seal Size	Flow Rate
25 to 50 mm/1" to 2"	4 to 6 Liter/Min./1 to 11/2 GPM
53 to 76 mm/21/8" to 3"	6 to 8 Liter/Min./11/2 to 2 GPM
79 to 102 mm/31/8" to 4"	8 to 12 Liter/Min./2 to 3 GPM

Piping Plans

The EZ-1 bellows cartridge seal provides a means of recirculating the product, flushing or removing air from the seal chamber to extend seal life. The most popular piping plans are shown below for your reference.

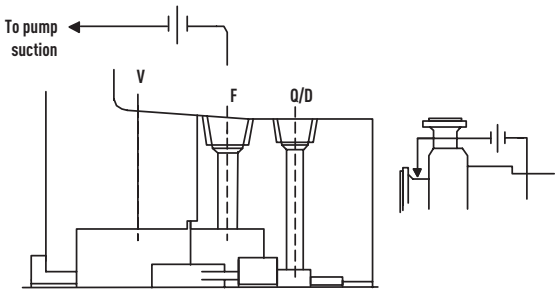


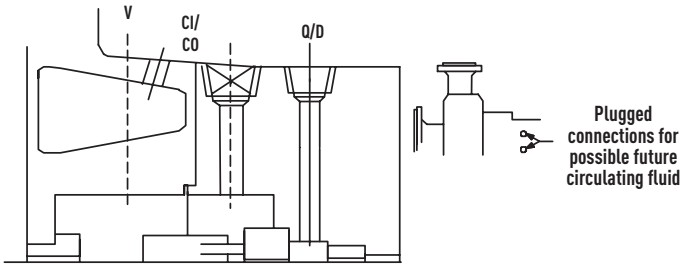
ANSI Plan 7311 (API Plan 11)

This plan requires installation of a recirculation line from the pump case discharge through an orifice to the gland flush connection. The primary purpose of this plan is to dissipate heat generated at the seal faces and/or build seal chamber pressure.

ANSI Plan 7313 (API Plan 13)

This piping plan requires the installation of a recirculation line from the gland flush connection back to the pump suction. ANSI Plan 7313 is frequently used on vertical pumps to vent vapors from the seal chamber. It is also used in applications where the seal chamber pressure is at or near discharge pressure. When utilizing this piping plan on a horizontal pump, the flush connection should be located at the top of the gland to ensure that there are no air pockets in the seal chamber.



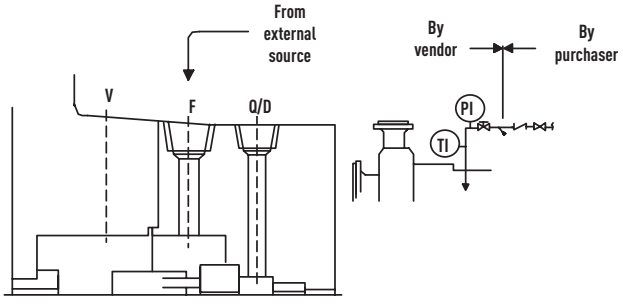


ANSI Plan 7302 (API Plan 02)

Normally specified for clean fluids, this plan calls for a dead-ended seal chamber with no circulation of flush fluid. The seal cavity may be jacketed, and a heating or cooling fluid can be circulated through the jacket. A throat bushing may be required when specified.

ANSI Plan 7332 (API Plan 32)

ANSI Plan 7332 requires the injection of a clean fluid from an external source to the seal. This flush can help to extend seal life. A close clearance throat bushing can be installed to further isolate the pumped product from the seal chamber and to minimize the amount of flush fluid required.



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FLUID CONTROL