

# *Bellofram*

DIAPHRAGM DIVISION



## A HIGHER SEALING

ORIGINATOR OF THE ROLLING DIAPHRAGM.  
LEADER IN ANTI-FRICTION SEALS.

[www.belloframdiaphragm.com](http://www.belloframdiaphragm.com)



# WORKING ENGINEER-TO-ENGINEER TO CREATE VALUE

Critical applications call for diaphragms with precisely engineered tolerances, premium performance, and long-lasting durability. Our engineers work in partnership with your product design engineers to develop a solution just right for your needs.

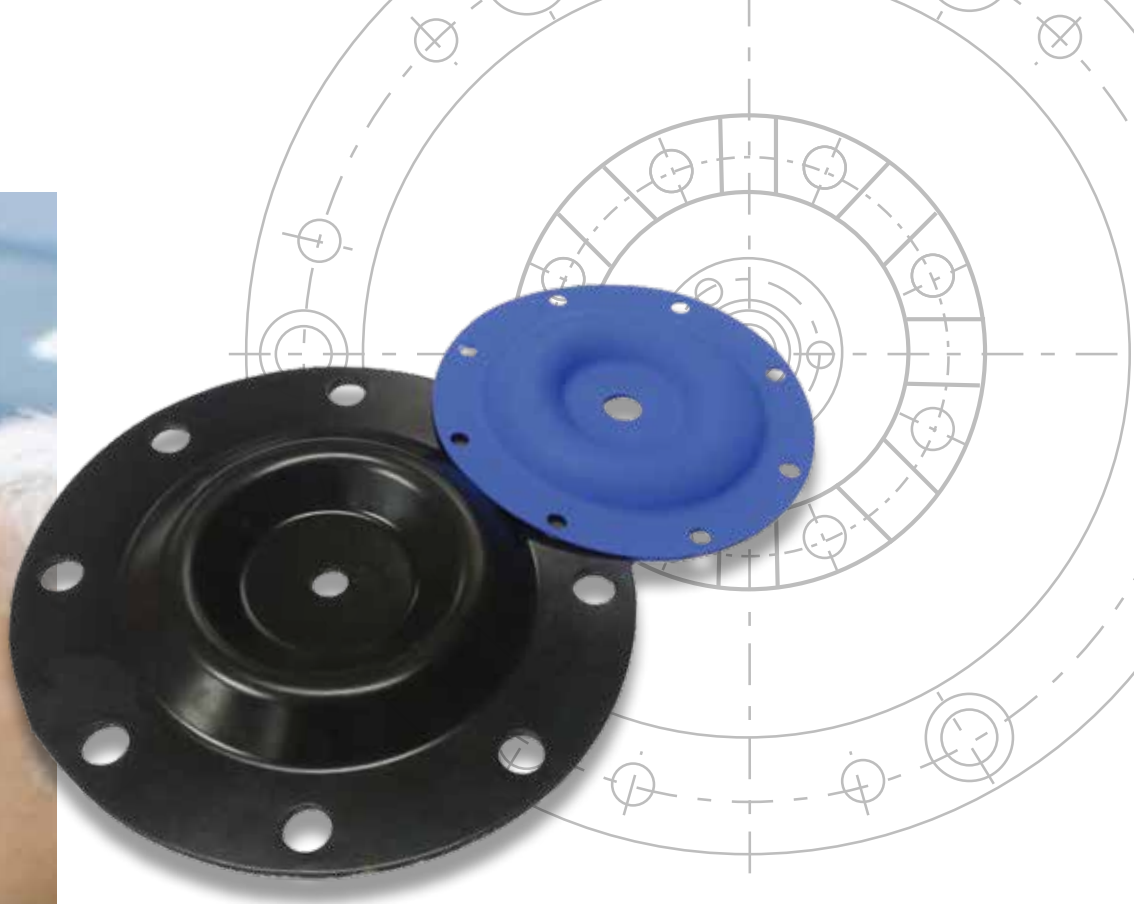
**Nothing we do is off the shelf.** Each product is specifically engineered and manufactured for its destination use. In other cases, we have a wide selection of standard sizes that are adaptable to meet required performance characteristics. Tooling is kept in-house on all custom units.

**We synthesize your precise dimensions,** maximum pressure, stroke, media or materials the diaphragm will touch, and application temperature ranges, **then design a product that matches those needs perfectly.**

## Types of Diaphragms We Manufacture

- Single Coat–Rubber/Fabric
- Double Coat–Rubber/Fabric/Rubber
- All Rubber
- Plastic Inserts
- Metal Inserts





### **We've Been There**

In our history, we've provided solutions for thousands of OEM customers, covering everything from parts for the space shuttle on down to everyday barbecue grill regulators. Our longevity and experience carry real benefit for the customers of today, because we've seen it all and bring our know-how to your supply chain. It's been a key advantage for more than 80 years.



With our vast library of past research, engineering, and designs as a resource, we can dramatically reduce product development time for new application-specific solutions.

Our application engineers are also available to evaluate your in-progress projects and advise on best practices for successful outcomes.

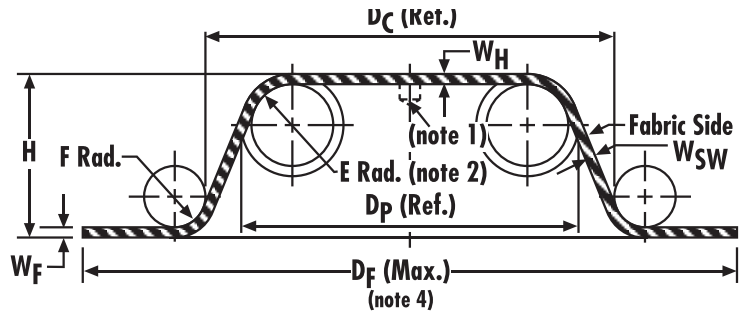
# CLASS 4 DIAPHRAGMS

This is the most common diaphragm design, offering economical hardware design and developed for installation in mechanisms with flat mating surfaces between the cylinder and its cap or bonnet.

In these cases, the flange of the diaphragm primarily serves as a gasket to prevent leakage at these parting surfaces. Class 4 diaphragms can be used to seal high pressures since the fabric overlay is in intimate contact with the clamped metal surfaces, thus providing secure retention across a large sealing surface.



## DIMENSIONS AND TOLERANCES



DC	.25 to .99	1.00 to 2.50	2.51 to 4.00	4.01 to 8.00	8.01 and up
H	As required to yield design stroke (See standard size tables and Note 3 below.)				
DC	Tolerances on DC and DP are $\pm .010$ " per inch of diameter but the tolerance will be no less than $\pm .010$ " or greater than $\pm .060$ "				
Dp					
WH & WF	.020 $\pm$ .005	.020 $\pm$ .005	.030 $\pm$ .005	.035 $\pm$ .005	.045 $\pm$ .007
WSW	.015 $\pm$ .003 (Code "B")	.017 $\pm$ .003 (Code "C")	.024 $\pm$ .004 (Code "D")	.035 $\pm$ .005 (Code "F")	.045 $\pm$ .007 (Code "H")
E	3/32 R.	1/8 R.	5/32 R.	1/4 R.	1/4 R.
F	1/32 R.	1/16 R.	3/32 R.	1/8 R.	1/8 R.
DF	DC + 3/4" See Note 4	DC + 1" See Note 4	DC + 1-1/2" See Note 4	DC + 2" See Note 4	DC + 2" See Note 4

### NOTES:

- Standards are supplied with a button on the pressure side. 1/8" diameter x 3/32" high on bore sizes 1" and over.
- This radius is not the piston radius since the head corner will be inverted at assembly.
- Height should not exceed the bore (DC). Tolerance on height to be no less than  $\pm .015$ " or greater than  $\pm .015$ " per inch of height.

### 4. Trim tolerances.

Hole Diameter	OD Trim Tolerances
0 - 1.00"	$\pm .010$ "
1.01 - 3.01"	$\pm .015$ "
over 3.01"	$\pm .020$ "

- Dimensions and tolerances pertain to Bellofram Rolling Diaphragms as manufactured and not to dimensions and tolerances of mating parts.

## DIAPHRAGM APPLICATIONS

Our application engineers are here to customize or help originate your project. 800-727-5646



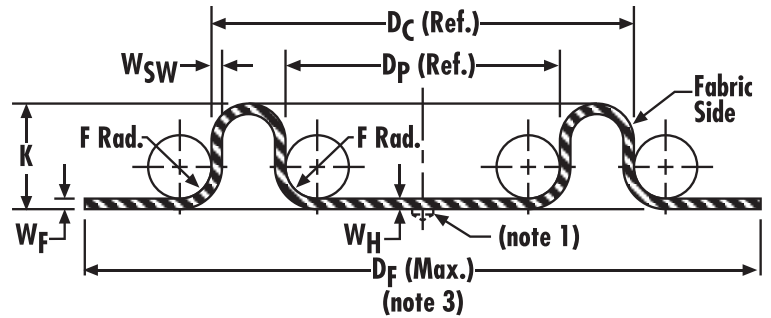
# CLASS 4C DIAPHRAGMS

Similar to the Class 4, but with the convolution molded in. Because it is molded in the "as-installed" configuration, the Class 4C diaphragm doesn't need to be inverted at installation.

The pre-convoluted design has a small spring gradient, or centering effect, which tends to return the diaphragm to its "as-molded," or neutral plane, position. The design can be fastened to the piston with a flat retainer plate. Stroke of these diaphragms is limited.



## DIMENSIONS AND TOLERANCES



$D_C$	.26 to .99	1.00 to 2.50	2.51 to 4.00	4.01 to 8.00	8.01 and up
H	As required to yield design stroke (See standard size tables and Note 2 below.)				
$D_C$	Tolerances on $D_C$ and $D_P$ are $\pm .010$ " per inch of diameter but the tolerance will be no less than $\pm .010$ " or greater than $\pm .060$ "				
$D_P$					
$W_H$ & $W_F$	$.020 \pm .003$	$.020 \pm .004$	$.030 \pm .004$	$.035 \pm .005$	$.045 \pm .007$
$W_{SW}$	$.015 \pm .003$ (Code "B")	$.017 \pm .003$ (Code "C")	$.024 \pm .004$ (Code "D")	$.035 \pm .005$ (Code "E")	$.045 \pm .007$ (Code "H")
F	1/32 R.	1/16 R.	3/32 R.	1/8 R.	1/8 R.
$D_F$	$D_C + 3/4$ " See Note 3	$D_C + 1$ " See Note 3	$D_C + 1-1/2$ " See Note 3	$D_C + 2$ " See Note 3	$D_C + 2$ " See Note 3

### NOTES:

1. Standards are supplied with a button on the pressure side. 1/8" diameter x 3/32" high on bore sizes 1" and over.

2. Height tolerance is  $\pm .015$

3. Trim tolerances

Hole Diameter OD Trim

Diameter Tolerances

0 - 1.00"  $\pm .010$ "

1.01 - 3.01"  $\pm .015$ "

over 3.01"  $\pm .020$ "

4. Dimensions and tolerances pertain to Bellofram Rolling Diaphragms as manufactured and not to dimensions and tolerances of mating parts.

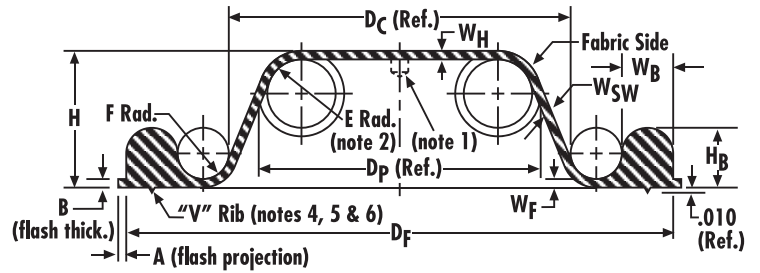


# CLASS 3 DIAPHRAGMS

A beaded flange, similar to an O-ring, seals the diaphragm via axial compression of the D-shaped bead. The bead is installed in a housing with a mating groove, eliminating the need for perforations in the diaphragm flange.



## DIMENSIONS AND TOLERANCES



DC	.37 to .99	1.00 to 2.50	2.51 to 4.00	4.01 to 8.00	8.01 and up
H	As required to yield design stroke (See standard size tables and Note 3 below.)				
DC	Tolerances on DC and DP are $\pm .010$ " per inch of diameter but the tolerance will be no less than $\pm .010$ " or greater than $\pm .060$ "				
Dp					
WH & WF	.020 $\pm$ .005	.020 $\pm$ .005	.030 $\pm$ .005	.035 $\pm$ .005	.045 $\pm$ .007
WSW	.015 $\pm$ .003 (Code "B")	.017 $\pm$ .003 (Code "C")	.024 $\pm$ .004 (Code "D")	.035 $\pm$ .005 (Code "F")	.045 $\pm$ .007 (Code "H")
A	.025 Max.	.025 Max.	.035 Max.	.040 Max.	.056 Max.
B	.025 Max.	.025 Max.	.035 Max.	.040 Max.	.056 Max.
E	3/32 R.	1/8 R.	5/32 R.	1/4 R.	1/8 R.
F	1/32 R.	1/16 R.	3/32 R.	1/8 R.	1/8 R.
Df	DC + 5/16"	DC + 1/2"	DC + 3/4"	DC + 1"	DC + 1"
WB	.094 $\pm$ .003	.125 $\pm$ .003	.187 $\pm$ .003	.250 $\pm$ .003	.250 $\pm$ .004
Hh	.095 $\pm$ .004	.135 $\pm$ .004	.200 $\pm$ .005	.270 $\pm$ .007	.270 $\pm$ .008

### NOTES:

- Standards are supplied with a button on the pressure side. 1/8" diameter x 3/32" high on bore sizes 1" and over.
- The radius is not the piston radius since the head corner will be inverted at assembly.
- Height should not exceed the bore (DC). Tolerance on height to be no less than  $\pm .015$ " per inch of height.
- This "V" rib is for diaphragm processing only. It may not appear on all diaphragms. It is not functional and need not be completely filled. Rib is normally on rubber side of diaphragm.
- Two "V" ribs may be used on beads that are .25 or larger in width.

6. Number, size, spacing and location of "V" ribs may be modified to suit specific beads, or may be left off altogether.

### 7. Trim tolerances:

Hole Diameter OD Trim Diameter	Tolerances
0-1.00"	$\pm .010$ "
1.01 - 3.00"	$\pm .015$ "
over 3.00"	$\pm .020$ "

8. Dimensions and tolerances pertain to Bellofram Rolling Diaphragms as manufactured and not to dimensions and tolerances of mating parts.

## DIAPHRAGM APPLICATIONS

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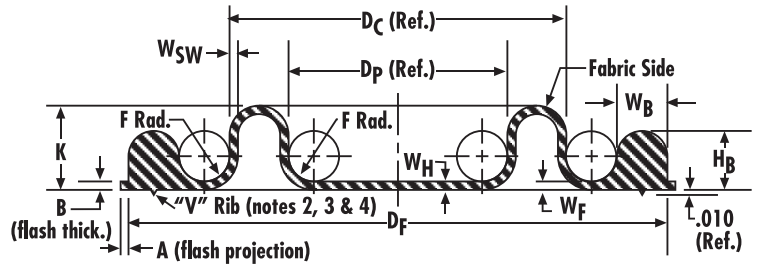


# CLASS 3C DIAPHRAGMS

Similar to the Class 3, except the convolution is molded in. Since this diaphragm is made in the "as-installed" shape with a permanent convolution, it does not require inversion at assembly. A small centering force returns the diaphragm to its neutral plane position.



## DIMENSIONS AND TOLERANCES



D	.37 to .99	1.00 to 2.50	2.51 to 4.00	4.01 to 8.00	8.01 and up
K	As required to yield design stroke (See standard size tables and Note 1 below.)				
DC	Tolerances on DC and DP are $\pm .010$ " per inch of diameter but the tolerance will be no less than $\pm .010$ " or greater than $\pm .060$ "				
DP	Tolerances on DC and DP are $\pm .010$ " per inch of diameter but the tolerance will be no less than $\pm .010$ " or greater than $\pm .060$ "				
WH & WF	.020 $\pm$ .003	.020 $\pm$ .004	.030 $\pm$ .004	.035 $\pm$ .005	.045 $\pm$ .007
WSW	.015 $\pm$ .003 (Code "B")	.017 $\pm$ .003 (Code "C")	.024 $\pm$ .004 (Code "D")	.035 $\pm$ .005 (Code "F")	.045 $\pm$ .007 (Code "H")
A	.025 Max.	.025 Max.	.035 Max.	.040 Max.	.056 Max.
B	.025 Max.	.025 Max.	.035 Max.	.040 Max.	.056 Max.
F	1/32 R.	1/16 R.	3/32 R.	1/8 R.	1/8 R.
Df	DC + 5/16"	DC + 1/2"	DC + 3/4"	DC + 1"	DC + 1"
WB	.093 $\pm$ .003	.125 $\pm$ .003	.187 $\pm$ .003	.250 $\pm$ .003	.250 $\pm$ .004
HB	.094 $\pm$ .004	.135 $\pm$ .004	.200 $\pm$ .005	.270 $\pm$ .006	.270 $\pm$ .008

### NOTES:

1. Height tolerance is  $\pm .015$ "
2. This "V" rib is for diaphragm processing only and it may not appear on all diaphragms. It is not functional and need not be completely filled. Rib is normally on rubber side of diaphragm.
3. Two "V" ribs may be used on beads that are .25 or larger in width.
4. Number, size, spacing and location of "V" ribs may be modified to suit specific beads, or may be left off altogether.

### 5. Trim tolerances

Hole Diameter	OD Trim	Diameter	Tolerances
0-1.00"			$\pm .010$ "
1.01-3.00"			$\pm .015$ "
over 3.01"			$\pm .020$ "

6. Dimensions and tolerances pertain to Bellofram Rolling Diaphragms as manufactured and not to dimensions and tolerances of mating parts.



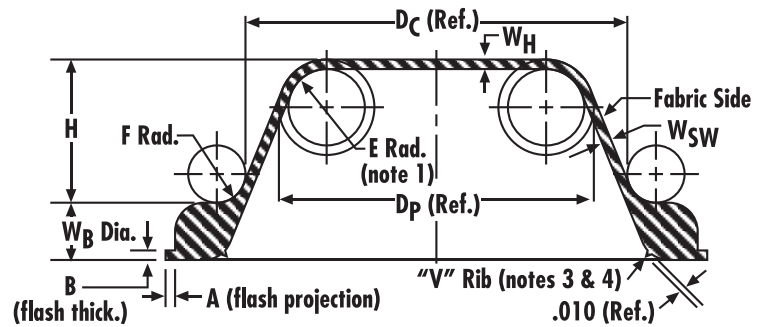
# CLASS 1A DIAPHRAGMS

The Class 1A Bellofram Rolling Diaphragm includes an O-ring type bead around the entire circumference of its mounting edge. It is designed for installations requiring minimum outside flange diameter.

This construction eliminates the need for wide flanges and, in some cases, also eliminates the need for flange bolts or flange studs. It requires no perforations or bolt holes through the flange of the diaphragm.



## DIMENSIONS AND TOLERANCES



DC	1.00 to 2.50	2.51 to 4.00	4.01 to 8.00	8.01 and up
H	As required to yield design stroke (See standard size tables and Note 2 below.)			
DC	Tolerances on DC and DP are $\pm .010$ " per inch of diameter but the tolerance will be no less than $\pm .010$ " or greater than $\pm .060$ "			
DP	Tolerance on height to be no less than $\pm .015$ " per inch of height.			
WH	$.020 \pm .005$	$.030 \pm .005$	$.035 \pm .005$	$.045 \pm .007$
WSW	$.017 \pm .003$ (Code "C")	$.024 \pm .004$ (Code "D")	$.035 \pm .005$ (Code "F")	$.045 \pm .007$ (Code "H")
A	.025 Max.	.035 Max.	.040 Max.	.056 Max.
B	.025 Max.	.035 Max.	.040 Max.	.056 Max.
E	1/16 R.	3/32 R.	1/8 R.	1/8 R.
F	1/32 R.	3/64 R.	1/16 R.	1/16 R.
WB Dia.	$.121 \pm .005$	$.151 \pm .005$	$.242 \pm .010$	$.242 \pm .010$

1. This radius is not the piston radius since the head corner will be inverted at assembly.
2. Height should not exceed the bore (DC). Tolerance on height to be no less than  $\pm .015$ " per inch of height.
3. This "V" rib is for diaphragm processing only. It may not appear on all diaphragms. It is not functional and need not be completely filled. Rib is normally on rubber side of diaphragm.
4. Number, size, spacing and location of "V" ribs may be modified to suit specific beads, or may be left off altogether.

5. Trim tolerances  
Hole Diameter OD Trim  
Diameter Tolerances  
0-1.00"  $\pm .010$ "  
1.01-3.00"  $\pm .015$ "  
over 3.01"  $\pm .020$ "
6. Dimensions and tolerances pertain to Bellofram Rolling Diaphragms as manufactured and not to dimensions and tolerances of mating parts.

## DIAPHRAGM APPLICATIONS

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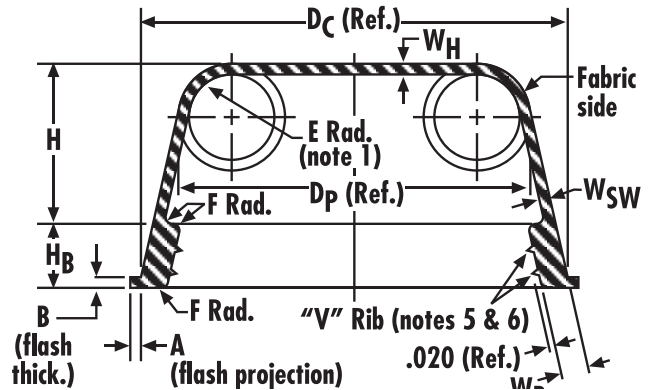
# CLASS 1B DIAPHRAGMS

The Class 1B design utilizes a rectangular-shaped bead around the entire circumference of its mounting edge, allowing the flange bead to be clamped inside the cylinder bore. This design offers a minimum outside housing diameter that is slightly larger than the diaphragm cylinder bore.

In some cases, this design eliminates the need for flange bolts or flange studs. It requires no bolt holes or perforations through the flange of the diaphragm.



## DIMENSIONS AND TOLERANCES



D <sub>C</sub>	1.00 to 2.50	2.51 to 4.00	4.01 to 8.00	8.01 and up
H	As required to yield design stroke ( See standard size tables and Note 2 below.)			
D <sub>C</sub> D <sub>P</sub>	Tolerances on DC and DP are ± .010" per inch of diameter but the tolerance will be no less than ± .010" or greater than ± .060"			
W <sub>H</sub>	.020 ± .005	.030 ± .005	.035 ± .005	.045 ± .007
W <sub>SW</sub>	.017 ± .003 (Code "C")	.024 ± .004 (Code "D")	.035 ± .005 (Code "F")	.045 ± .007 (Code "H")
A	.025 Max	.035 Max.	.040 Max.	.056 Max.
B	.025 Max.	.035 Max.	.040 Max.	.056 Max.
E	1/16 R.	3/32 R.	1/8 R.	1/8 R.
F	1/32 R.	3/64 R.	1/16 R.	1/16 R.
W <sub>B</sub>	.080 ± .003	.100 ± .003 See note 3	.120 ± .003 See note 3	.160 ± .003 See note 3
H <sub>B</sub>	.150 ± .005	.200 ± .005	.260 ± .005	.300 ± .005

1. This radius is not the piston radius since the head corner will be inverted at assembly
2. Height should not exceed the bore (DC). Tolerance on height to be no less than ±.015" per inch of height.
3. This tolerance does not include sidewall variation
4. Trim tolerances  
Hole Diameter OD Trim  
Diameter Tolerances  
0-1.00" ±.010"  
1.01-3.00" ±.015"  
over 3.01" ±.020"

5. This "V" rib is for diaphragm processing only. It may not appear on all diaphragms. It is not functional and need not be completely filled. Rib is normally on rubber side of diaphragm.
6. Number, size, spacing and location of "V" ribs may be modified to suit specific beads, or may be left off altogether.
7. Dimensions and tolerances pertain to Bellofram Rolling Diaphragms as manufactured and not to dimensions and tolerances of mating parts.





# MADE RIGHT HERE.

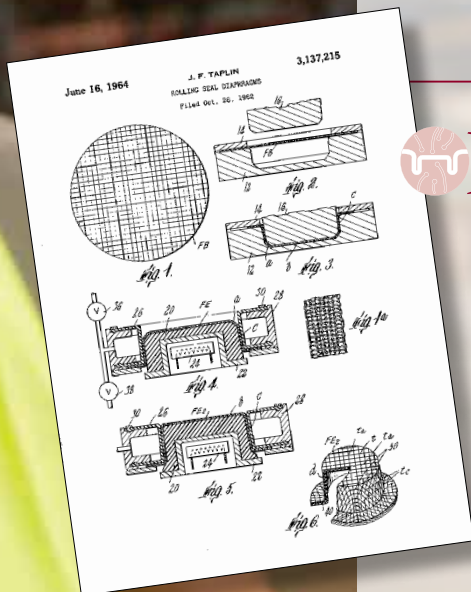
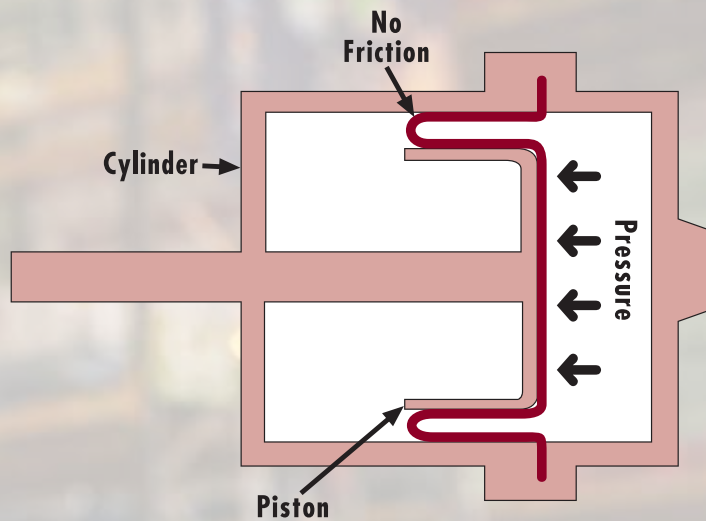
BELLOFRAM DIAPHRAGM  
IS FAST, ACCURATE, AND  
CONSISTENT. THAT SAYS A LOT  
ABOUT WHERE OUR  
PRODUCTS ARE MADE.

Made in the USA is not the end of our story, but it is the beginning. High-performance products, short lead times, and pricing that's fiercely competitive: It all adds up to the most reliable partner you can choose.





*Our American ingenuity is also our legacy. The rolling diaphragm rolls and unrolls alternately on piston skirt and cylinder wall. The rolling action is smooth and eliminates sliding contact and breakaway friction. It forms a perfect barrier, preventing blow-by leakage and pressure loss.*



We invented the rolling diaphragm and patented it in 1950.



# CONQUERING FRICTION

The Bellofram Rolling Diaphragm is a tough, flexible seal with a unique configuration that permits relatively long piston strokes while completely eliminating sliding friction.

It was designed and invented by American ingenuity, and to this day is still made with pride in the USA.



Why have we been the choice for critical applications for more than 80 years?

Depending on materials and geometry, Bellofram Rolling Diaphragms can handle applied pressures of 3000 PSI.

Operating temperatures may range from -120°F to +600°F. Diaphragms are available that are highly resistant to oil, ozone, acids, alkalis, steam, and other corrosive fluids. Our engineers will work with you to create exactly the sealing solution you need.

## DIAPHRAGM APPLICATIONS

Process Control Valves

Air Pressure Regulators

Displacement Pumps

Liquid Dispensing Equipment

Valve Positioners

Automatic Choke Controls

Distributor Vacuum Advance Mechanisms

Irrigation Valves

Aircraft Environmental Controls

Belt Guide Actuators

Automotive Locking Hubs

Anti-Scald Devices

Truck Brake Actuators

Automotive Emission Controls

Geothermal Pumps

Automatic Door Locks

Tank Truck Valves

Water Conditioning Valves

Pneumatic Relays

Dancer Roll Actuators

Industrial Brakes

Expansion Chambers

Automatic Transmission Modulators

LP Gas Regulators

Timing Chain Tensioners

Pressure Switches

Flow Control Valves

Fire Sprinkler Alarms

Domestic Hot Water Regulators

Waste Gate Actuators

Fuel Pressure Controls

Vacuum Switches

Pressure Transducers

Vacuum Regulators

Gauge Isolators

Linear Actuators

Flush Valves



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