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Diaphragm Design Guidebook

WWW.DIACOM.COM

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603.880.1900

DIA·COM CORPORATION

Providing Superior Diaphragms for
Consumer Products • Automotive • Aerospace
Medical • Industrial • Water Control/ Irrigation

Dia•Com developed the unique program, Dia•Soft 3.0, to guide users step-by-step through the design process of molded elastomeric diaphragm seals. This new and improved version of Dia•Soft offers many new features and capabilities not available on Dia•Soft 2.0. The minimum operating requirements for Dia•Soft 3.0 are IE 6.0 or greater, MAC OSX 10.4.7 or greater, or Firefox 1.5 or greater

Dia•Com has advanced the "do it yourself" design concept to the next level. Not only can you create your own diaphragm, the software now transfers your specifications from the application data form to a fully dimensioned drawing.

The software also has a screening room allowing users to view the diaphragm in motion. Enhanced 3D animation allows users to visualize the movement of a rolling diaphragm and isolate the movement in any point during the stroke.

Other special features include: direct link to our E-mail and Web site; formulas that calculate burst, stroke, and height requirements; complete pressure and metric conversions; new available sizes and hardware design considerations; a fabric information table and a comprehensive fluid resistance chart for elastomer selection.

Dia•Soft 3.0 is now completely web based and can be used free of charge! Simply visit **Dia-Soft.net** and fill out the form to enable your user profile.

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Dia•Com Corporation

Since its founding in 1983, Dia•Com has been committed to a single goal – the design and production of the finest molded diaphragm seals available for industrial applications.

Today we produce, and distribute worldwide, one of the industry's broadest lines of standard and custom diaphragms. Built and tested to exacting standards, these quality products are widely used in the automotive, industrial, aerospace, food and water processing, medical instrument and other industries where high-performance, fabric-¬reinforced and homogeneous elastomeric seals are critical to the operation of essential systems and equipment.

The utilization of lean manufacturing principles, statistical process control, microprocessor-based production monitoring and control systems, and other advanced manufacturing, testing and QA techniques ensures Dia•Com's position at the leading edge of the technology.

Dia•Com is proud of its reputation for delivering the finest, state-of-the-art products, on time and at reasonable cost. Our rapidly expanding worldwide customer base testifies to the success of our efforts.

Molded Diaphragms...Ideal Solution to Tough Sealing Problems

The molded elastomeric diaphragm is a tough, versatile, dynamic seal that eliminates virtually all of the problems and limitations associated with other sealing methods such as U-Cups, O-Rings, metal bellows and flat, die-cut diaphragms.

Unlike alternative techniques, molded diaphragms do not leak, offer no friction, have exceptional sensitivity, and display a hysteresis that is, in most cases, negligible. They can withstand pressures up to 6000 PSI over a temperature range of -65^{O}F to 600^{O}F, require no maintenance or lubrication, and are extremely cost-effective in most applications.

Dia•Com molded diaphragms are available in two forms: contoured, annular disks that provide high sensitivity and freedom of motion in short-stroke applications, and rolling diaphragms for frictionless, leak-proof sealing in cylinders and other applications requiring a long piston stroke.

These molded diaphragm features ensure **unmatched** performance:

- Minimum hysteresis – accurate, repeatable positioning
- No spring rate (rolling diaphragms)
- Long stroke length capabilities
  - No lubrication
  - No break-away or sliding friction
  - Long cycle life
    - Effective in harsh environments
    - Constant effective pressure area
    - Low assembly and associated hardware costs

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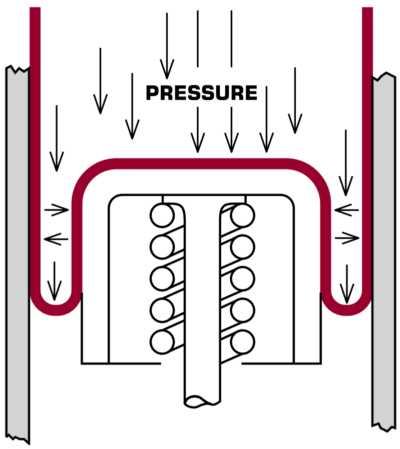
* Teflon is a registered trademark of DuPont Corporation

Dia•Com Rolling Diaphragm Theory

Theory

Figure 1 illustrates pressure reaction on the diaphragm. It can be seen that almost the entire pressure load is supported by the piston head, and only a small amount of the liquid or gas pressure is supported by the narrow convolution of the diaphragm. Also note in Figure 1 that the lines of unit pressure (acting in horizontal planes because they must be normal to the surface) force the diaphragm against the piston and cylinder sidewalls on that portion of the diaphragm in contact with the cylinder wall and piston skirt.

Figure 1



The lines of force acting on that part of the diaphragm not in contact with the cylinder or piston skirt (the semicircular segment of the convolution) are shown in Figure 2.

Each line of unit pressure (Pr) acts normal to the semicircular segment; thus any one of the pressure lines can be replaced by its horizontal and vertical component. The horizontal components, acting in opposition, cancel out each other.

The sum of the vertical components of the unit pressures acting on this semicircular segment add up to the total pressure force (F) and is equal to the normal pressure on the projection of this segment.

Considering a unit (1 inch) of circumferential length of the diaphragm, the foregoing is:

1. F = Pr x 1 x C or F = Pr x C where

   F = total pressure force (lbs.)

   Pr = normal loading or applied pressure (psi)
   C = convolution width (inches)

The total force F is supported equally by the fabric reinforcement of the diaphragm on the piston and cylinder wall (see Figure 2). Therefore tension force, F_T (lbs.), in either wall is simply one-half the value of F or

2. $2F_T = F$ or $F_T = \frac{F}{2}$

   However, as

3. F = Pr x C then

4. $F_T = \frac{Pr \times C}{2}$

Where F_T is the tension force on the diaphragm sidewall for each unit of circumferential length. Since tensile force F_T and fabric stress S_F are identical, equation 4 can be expressed in terms of fabric stress:

5. $Sf = \frac{Pr \times C}{2}$ where

   Sf = fabric stress (lbs. per inch)

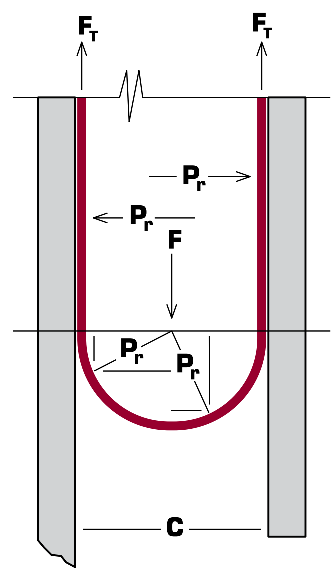
   Pr = normal loading or applied pressure (psi)

   C = convolution width (inches)

Fabric stress can be computed using equation 5. For example, if a 3-inch diameter diaphragm with an effective pressure area of 6.35 sq. in. and a convolution width of .156 is subjected to a loading pressure of 100 psi, the resulting total thrust is 635 lbs. However, fabric stress on the narrow convolution is only:

6. $Sf = \frac{100 \times .156}{2} = 7.8$ lbs. per inch

Figure 2



Fabric materials are available in tensile strengths greater than 7.8 lbs. per inch. Therefore, the very narrow convolution widths with resulting low stress values in the fabric fibers enable diaphragms to be used in applications involving high working pressures.

In effect, Dia•Com Rolling Diaphragms are pressure vessels having a variable volume and flexible moving sidewalls. As in any other pressure vessel, its strength should be considered with respect to safety factors. Generally, diaphragms can be designed with a large safety factor. In effect, this means the maximum safe working pressure will be a fraction of the pressure that would cause failure in the convolution area. (In some aircraft applications where working pressures are as high as 1000 psi, and total cycle requirements are low, safety factors are substantially increased.)

Actual stress analysis and selection of fabrics will be recommended by the Dia•Com engineering department for each application.

Hardware

Convolution Width – The clearance between the cylinder wall and piston skirt. By decreasing the convolution width, higher working pressures may be achieved. Generally, the convolution width should measure at least four times the diaphragm's sidewall thickness. (See page 4 for standard convolution widths.)

Cylinder Diameter (Bore) – The inside diameter of the cylinder into which the diaphragm will fit and by which the outside diameter of the convolution will be supported.

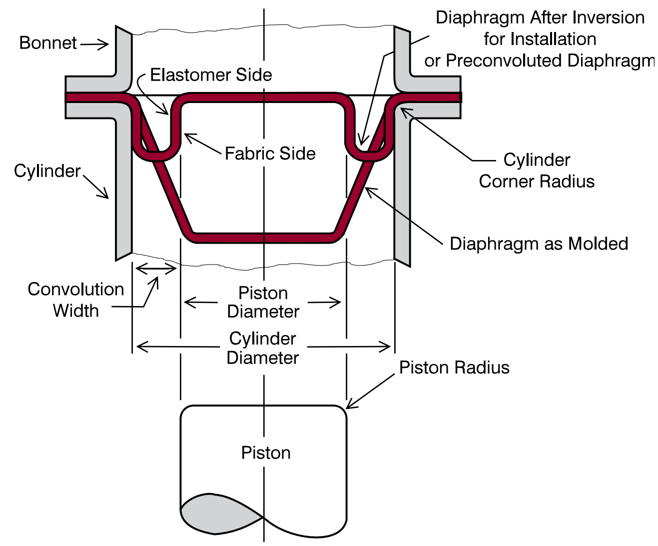
Cylinder Radius – The blend radius between the cylinder wall and the flange.

Piston Cap – A plate which attaches to the piston, sandwiching the piston area of the diaphragm insuring the diaphragm stays in convolution.

Piston Diameter – Diameter of the piston measured across piston head, including radius.

Piston Radius – The blending radius between the piston head and the piston skirt.

Piston Skirt – The sidewall area of the piston which supports the inside diameter of the convolution.



Diaphragm

Cylinder Diameter – The diameter across the diaphragm between the tangent points of the sidewall and cylinder radius. Measured on the fabric or low pressure side of the diaphragm.

Fabric Side – Surface of single coat diaphragm where fabric is visible. Always on low pressure side, generally on outside of diaphragm.

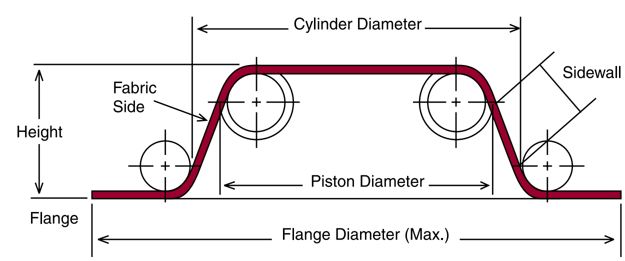
Height – The height of top hat and preconvoluted diaphragm is measured from the bottom of the flange to the top of the head or convolution.

Piston Diameter – The diameter across the diaphragm between the tangent points of the sidewall and piston radius. Measured on the fabric or low pressure side of the diaphragm.

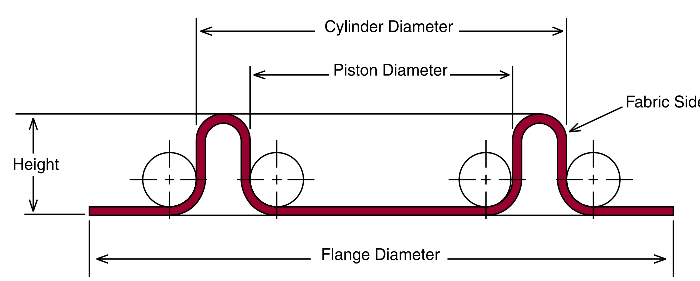
Preconvoluted – A diaphragm which has its convolution molded in. No hand forming is necessary before installation.

Sidewall – That area of the diaphragm between the flange and piston areas.

Top Hat – A diaphragm molded in standard "hat" shape that must be formed into convolution before installation.



Top Hat Diaphragm



Preconvoluted Diaphragm

Glossary of Terms

Function

Bleedthrough – A defect in a diaphragm caused during manufacturing where the fabric is pulled through the rubber to the high pressure side of the diaphragm. When pressure is put on the diaphragm, the rubber will be blown away from the fabric and rupture.

Blowthrough – This occurs when the pressure on the diaphragm reaches a level high enough to blow a piece of the rubber through the threads of the fabric, causing a leak. This is the result of selecting a weave of fabric that is too open for the diaphragm's thickness.

Double Coat – This is a type of diaphragm construction where the fabric is inserted between two layers of rubber.

Effective Pressure Area – The area of the diaphragm inside of an imaginary circle to the convolution midpoint on which the pressure introduced is transmitted to the opposite side of the diaphragm.

Overstroke – Exceeding the designed stroke of the diaphragm causing it to come out of convolution. This can be avoided by designing mechanical stops into your hardware.

Reverse Pressure – When the pressure on the low pressure side of the diaphragm exceeds the pressure on the high pressure side of the diaphragm. This will cause the convolution to collapse and wrinkle. This wrinkle will cause scrubbing and lead to premature failure.

Single Coat – This is a type of diaphragm construction where there is rubber on the high pressure side and fabric on the low pressure side.

Spring Rate – This refers to the forces caused by the rubber trying to return to its as-molded position. This is generally only found in preconvoluted and dish-shaped diaphragms.

Strikethrough – This refers to the amount of rubber that comes through the fabric to either fully or partially encapsulate the fabric during manufacturing.

Diaphragm Design Formulas

Formulas

Note: See page 22 for Fabric Tensile Strength Data

Burst Pressure (PSI) $= \dfrac{\text{Fabric Tensile Strength x 2}}{\text{Convolution Width}}$

Effective Pressure Area $= \pi \left(\dfrac{\text{Piston Diameter + Cylinder Diameter}}{4}\right)^2$

Fabric Tensile Required $= \dfrac{\text{Convolution Width x Burst Pressure}}{2}$

Half-Stroke (Preconvoluted) $= \text{2 x Height - } \left[2\left(\text{Flange Radius}\right) + \text{Convolution Width} + 2\left(\text{Flange Gauge}\right)\right]$

Half-Stroke (Top Hat) $= \text{Height - } \left[\text{Flange Gauge} + 2\left(\text{Flange Radius}\right) + 1.56\left(\text{Convolution Width}\right) + \text{Safety Factor}^{*}\right]$

Height (Preconvoluted) $= 1/2\left[\text{Convolution Width} + 2\left(\text{Flange Radius}\right) + 2\left(\text{Flange Gauge}\right) + \text{Half-Stroke}\right]$

Height (Top Hat) $= \text{Half-Stroke} + \left[\text{Flange Gauge} + 2\left(\text{Flange Radius}\right) + 1.56\left(\text{Convolution Width}\right) + \text{Safety Factor}^{*}\right]$

Piston Skirt Length $= \dfrac{\text{Height + Half-Stroke}}{2}$

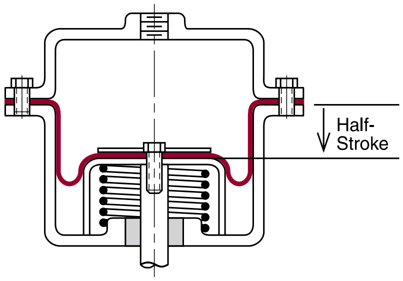
Safe Working Pressure (PSI) $= \dfrac{\text{Burst Pressure}}{4}$

Cylinder Diameter	.33 - .99	8.38 - 25.15	1.00 - 2.50	25.40 - 63.50	2.51 - 4.00	63.75 - 101.60	4.01 - 8.00	101.85 - 203.20
* Safety Factor	.060	1.52	.100	2.54	.120	3.05	.140	3.56

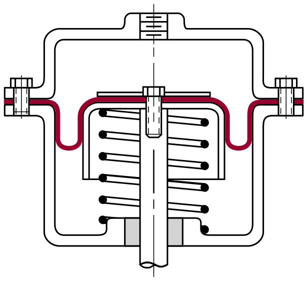
Millimeters in Red

General Hardware Information

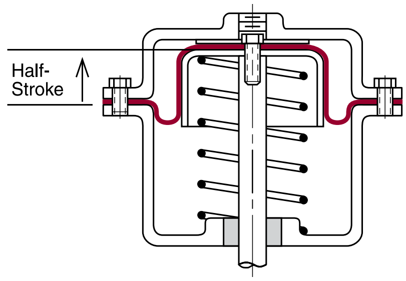
Diaphragm Strokes



Down-Stroke Position

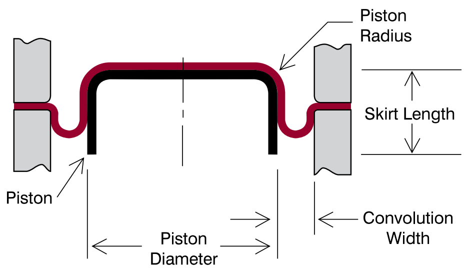


Neutral Plane Position



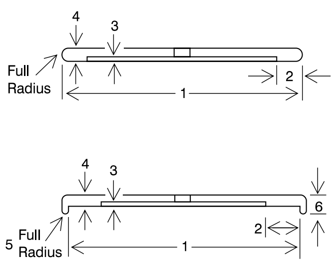
Up-Stroke Position

Piston and Standard Convolution Width Dimensions



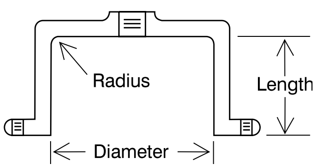
Diaphragm Cylinder Diameter		Piston Skirt Length 'Top Hat'	Piston Skirt Length 'Pre-Convoluted'	Piston Radius		Standard Convolution Width	
.37 to .99	9 to 25	$\frac{\text{Height + Half-Stroke}}{2}$	$\text{Height} + \frac{\text{Half-Stroke}}{2}$	.0312	.080	.0625	1.59
1.00 to 2.50	25 to 64	$\frac{\text{Height + Half-Stroke}}{2}$	$\text{Height} + \frac{\text{Half-Stroke}}{2}$	.0625	1.59	.0937	2.38
2.51 to 4.00	64 to 102	$\frac{\text{Height + Half-Stroke}}{2}$	$\text{Height} + \frac{\text{Half-Stroke}}{2}$	.0937	2.38	.1562	3.97
4.01 to 8.00	102 to 205	$\frac{\text{Height + Half-Stroke}}{2}$	$\text{Height} + \frac{\text{Half-Stroke}}{2}$	.125	3.18	.250	6.35

Piston Cap Dimensions



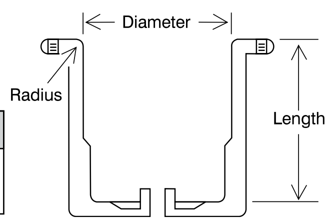
Diaphragm Cylinder Diameter		1	2	3		4		5		6	
.37 to .99	9 to 25	Piston +2 (Diaphragm Thickness)	Not required	Not Required	Not Required	.063	1.59	.008	0.20	.125	3.18
1.00 to 2.50	25 to 64	Piston +2 (Diaphragm Thickness)	.15 x Piston Diameter	.010	0.25	.094	2.39	.012	0.31	.187	4.75
2.51 to 4.00	64 to 102	Piston +2 (Diaphragm Thickness)	.15 x Piston Diameter	.015	0.38	.109	2.78	.015	0.38	.218	5.54
4.01 to 8.00	102 to 205	Piston +2 (Diaphragm Thickness)	.15 x Piston Diameter	.015	0.38	.125	3.18	.015	0.38	.250	6.35

Bonnet Dimensions



Minimum Diameter	Length	Maximum Radius
Piston Diameter + 8X (Diaphragm Gauge)	Diaphragm Upstroke	$\frac{\text{Convolution Width}}{2}$

Cylinder Dimensions

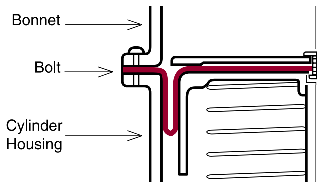


Diaphragm Cylinder Diameter		Length	Radius	
.25 to .99	6 to 25	Downstroke + Piston Skirt	.031	.079
1.00 to 2.50	25 to 64	Downstroke + Piston Skirt	.063	1.60
2.51 to 4.00	64 to 102	Downstroke + Piston Skirt	.094	2.39
4.01 and up	102 and up	Downstroke + Piston Skirt	.125	3.18

Millimeters in Red

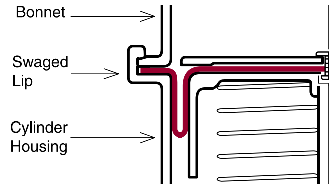
General Hardware Information

Flange Retention Methods for Type F and FC Diaphragms



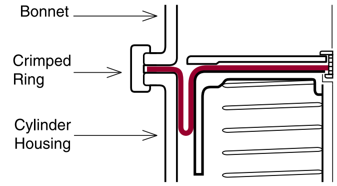
Bolted Flange

Most common flange retention method. Bolt holes should be at least 15% larger than the bolt. Allow sufficient number of bolt holes to eliminate bowing or distortion of flange, providing a tight seal and preventing the diaphragm flange from pulling out between the bolts.



Swaged Lip

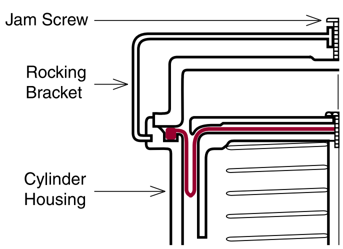
Lending itself to high volume/low cost, the swaged lip resembles the crimp ring in design except that the lip is an integral part of the cylinder or bonnet. Lip should be flexible and thin to insure proper flange retention.



Crimped Ring

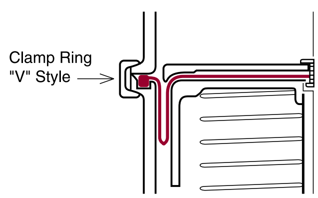
This method lends itself to high volume and low cost manufacture. It utilizes a separate metal crimp ring and is assembled to unit with special crimping tools. These crimp rings are made of thin, ductile materials so that the force required to form the lip will not overcompress the diaphragm flange area.

Flange Retention Methods for Type D and DC Diaphragms



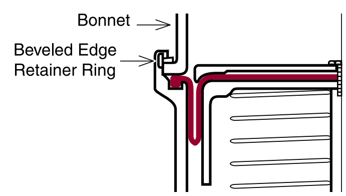
Pivoted Rocking Bracket

Provides quick assembly and disassembly. The pivoted rocking bracket is attached to the housing flange and the central jam screw secures the bonnet against the mating flange.



Ring Clamp

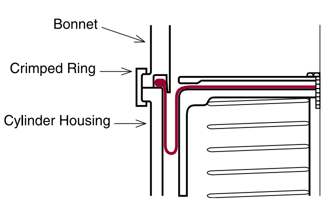
"V" style clamp rings can be disassembled quickly by removing a clamp lever. A retainer plate is removed by turning it 90 degrees where two "wings" and a retaining screw drop into a keyhole.



Beveled Edge Retainer Plate

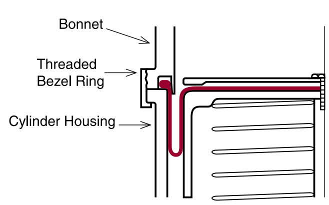
Eliminates the need for flange bolts as a beveled edge ring is snapped into a groove in the extension of the cylinder housing flange. This loads the bonnet assembly onto the mating bead, generally producing low clamping forces.

Flange Retention Methods for Type O and OA Diaphragms



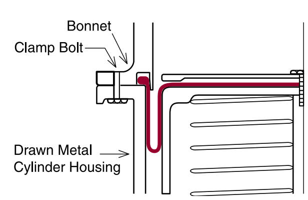
Crimped Ring

Used in high volume, low cost applications, this method eliminates typical flange construction and flange bolts.



Bezel Ring

This common method provides minimum clearance of the housing outside diameter. Male threads are machined on the cast bonnet to utilize drawn sheet metal cylinder housings, reducing costs.



Grooved Bonnet

This method requires sufficient number of circumferential clamp bolts so distortion does not occur between flange bolts. It is advisable to make provisions for the bead groove in the cast or molded bonnet.

Rubber to Metal Bonding

Dia•Com has capabilities to bond metal or plastics to diaphragms during the molding process. Mechanical bonding is generally the least expensive and simplest method to achieve. This process is accomplished by designing the insert with projections or holes. During the molding process the insert becomes totally or partially encapsulated by the elastomer creating a strong mechanical interlock. Figure 1 illustrates a mechanical bond.

Chemical or adhesive bonding utilizes a commercial adhesive applied to the non-elastomeric component. The component is then attached to the elastomer during or after vulcanization depending on the type of bond required and geometry of the diaphragm. Figure 2 illustrates an adhesive bond.

When designing the metal insert it is recommended to avoid sharp projections extending into the elastomer or sharp corners at the junction line between the two materials.

Steel is the most prevalent insert material used but brass, stainless steel, aluminum, and nylon are also used. Certain elastomers and insert materials can also develop a cohesive bond through molecular attraction. This is most commonly accomplished with the use of brass and a sulfur-cured nitrile.

By bonding inserts to diaphragms, costly assembly operations can be reduced or eliminated. Additionally, rivet, screw or other fastening methods which might create leakpaths through the diaphragm would be eliminated with a bonded insert.

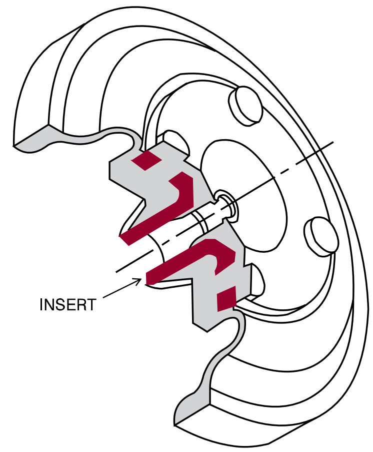


Figure 1

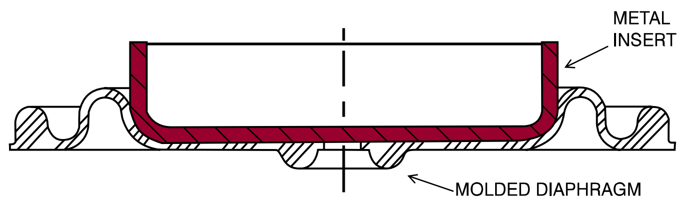
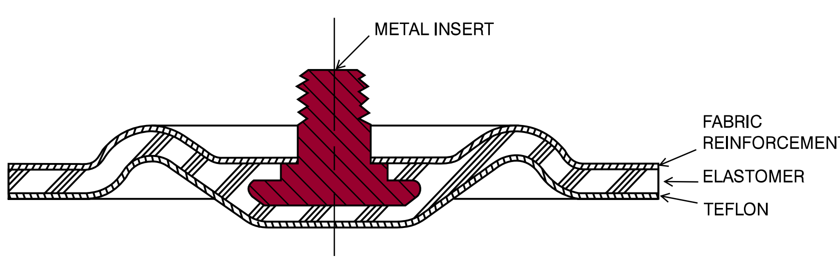


Figure 2

*Teflon / Elastomeric Seals

Dia•Com has capabilities to design and manufacture composite diaphragms made from ***TEFLON/ELASTOMERIC MATERIALS**. Dia•Com's process bonds ***TEFLON** to rubber using ***TEFLON** as thin as .002" thick. Dia•Com's unique process and construction produces a diaphragm that is compatible with harsh environments without limiting the life and responsiveness of the diaphragm. For additional strength, fabric may be added to the Teflon/Elastomer composite. Benefits include:

- Excellent Chemical Resistance
- Temperature Extremes (–450/400 degrees F)
- FDA Approved Materials
- Low Permeation Rate
- Low Co-Efficient of Friction



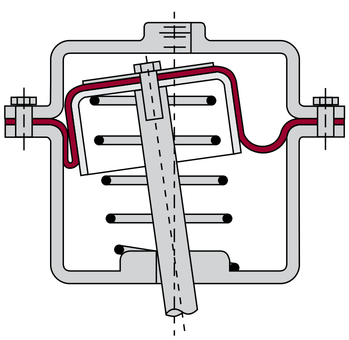
* Teflon is a registered trademark of DuPont Corporation

Diaphragm Life Design Considerations

When designing a diaphragm a prime consideration is what can be done to extend the life of the part. The factors that contribute the most to early failure of a diaphragm are; ***sharp edges, abrasion, back pressure, and circumferential compression.*** The first step is in the hardware design itself.

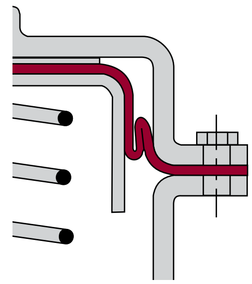
The obvious considerations are the elimination of burrs and sharp edges that may come in contact with the diaphragm. These flaws will cut and tear at both fabric and elastomer resulting in premature failure.

Not so obvious is the ***finish*** of the hardware. When pressure is constantly applied then relieved the diaphragm does rub against the supporting hardware. If the surface of the hardware is rough it can abrade the fabric causing an earlier than expected failure. It is recommended that these surfaces be no rougher than ***32 micro inches*** and if necessary be finished to 16 micro inches in higher cycle applications. Although diaphragms do not require lubrication they may be coated with a molybdenum disulfide prior to installation to aid in the reduction of abrasive wear. The piston may also be coated with Teflon to reduce friction when the diaphragm shifts against it, or with an elastomer coating which will prevent the diaphragm from shifting resulting in the elimination of abrasion.



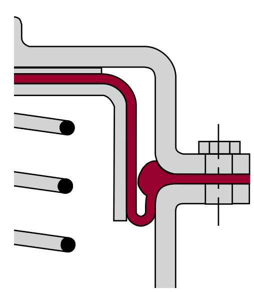
Cocked Piston

The quickest failure occurs when the sidewall of the diaphragm comes in contact with itself. When this happens the two rubber surfaces lock together while the piston continues to travel. This generally results in the sidewall of the diaphragm being jammed between the piston and cylinder wall with the elastomer and fabric torn. There are generally two causes for this. The first is the ***alignment between the piston and cylinder***. There is usually no problem at high pressure where the pressure itself equalizes on the diaphragm helping to center the piston. However at low pressure gravity can take over and pull the piston to one side causing a problem. This can be avoided with a bushing for the piston or some other way of keeping the piston centered throughout its stroke. The second cause of this type of failure is ***backpressure***. Generally, diaphragms can only take a high differential in one direction If the pressure gets higher on the low pressure side of the diaphragm the sidewall collapses causing failure. The problems with back pressure usually occur when the user is unaware that it even exists. Since most diaphragm applications are in closed actuators there must be a means to adjust for the change in gas or fluid volume above and below the diaphragm as it is stroked up and down. This is usually not a problem on the high pressure side of the diaphragm since the change in volume here is what is counted on for the apparatus to operate and perform its function. The problem occurs on the low pressure side where the volume of gas or fluid must be removed and replaced with each stroke of the diaphragm. Vent holes must be sized correctly to allow enough volume to pass through in the amount of time it takes to stroke the diaphragm. It is also important to remember this when actuation sequences are increased during accelerated testing or simply faster cycling of your device.



Reverse Pressure

Another cause of failure is ***over-clamping*** the diaphragm in the hardware during assembly. For the diaphragm to seal properly, compression of the diaphragm material is expected and required. Care must be taken, however, as rubber material will act as an incompressible fluid and your design must allow for this condition. With proper diaphragm design and assembly techniques, this condition is not a concern. If over-



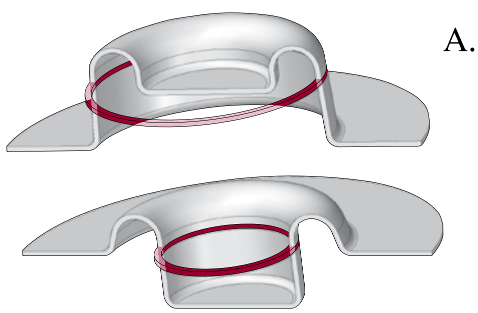
Over Clamping

* Teflon is a registered trademark of DuPont Corporation

Observing prudent guidelines can greatly extend service cycles

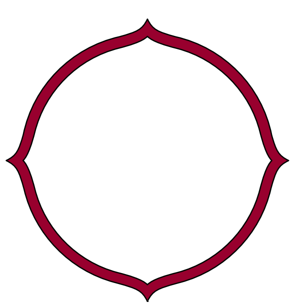
clamping exists, the rubber material may bulge into the working area of the diaphragm, precipitating early diaphragm failure.

The final cause of failure is ***circumferential compression***. This is a term used to describe the larger diameter sections of the diaphragm sidewall being compressed around the piston. As seen in the diaphragm sketches **below,** a ring section of material in view A is larger in diameter than the same ring section in view B. In view A, the diaphragm is rolling onto the cylinder wall while in view B, the diaphragm is rolling onto the piston skirt. It appears that the ring of material is smaller when the diaphragm is rolling onto the piston skirt.



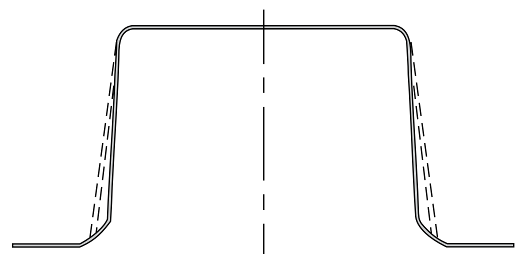
Circumferential Compression

In actuality, the ring of material doesn't vary in size. As the ring of material rolls onto the piston, it forms an axial fold in the sidewall, allowing the diaphragm to conform to the piston. Because the fabric used for support has a square pattern the folds occur at the four points that the warp and fill threads are perpendicular to the convolution. This condition can be seen in the sketch **below** which shows a top view of the ring of material when the diaphragm has rolled onto the piston. This condition is most often referred to as "four cornering" and is not something that can be eliminated but rather controlled. The continuous folding at the same location eventually leads to a break in a cross thread leading to a rupture of the elastomer.



Four Cornering

There are several ways to reduce this circumferential compression. The first is to only use the bottom half of the diaphragms stroke. Using the bottom half of the stroke limits the section of the sidewall that must be compressed around the piston to the top. This is the section of the sidewall with the smallest circumference difference with the piston which means the folds will be smaller and not as sharp. The result of this is longer diaphragm life. Another way to accomplish this and still keep the total stroke capability of the diaphragm is the ***double tapered diaphragm***.



Double Tapered Diaphragm

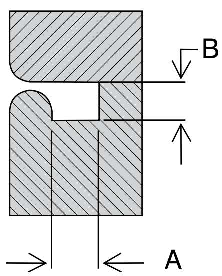
On a standard top hat diaphragm the sidewall of the diaphragm is a straight line tangent to the flange and piston radii. On a double tapered top hat the sidewall is a line tangent to the cylinder radius running at a 45 to 60 degree angle to a point approximately 60% of the way through the convolution width. At this point it wraps around a small radius then straight to a point tangent to the piston radius. This makes the sidewall at a much steeper angle for the usable length of the sidewall which in turn reduces the circumference. The same effect can be obtained in a preconvoluted diaphragm by molding the diaphragm as an offset pre-convoluted diaphragm. This is simply put a pre-convoluted diaphragm molded in the full up position. This puts the total amount of working sidewall at the piston circumference virtually eliminating circumferential compression. A final means of reducing the circumferential compression is with a tapered piston. This simply increases the piston circumference as the sidewall circumference increases. This is probably the least desirable means to solving the problem because while adjusting the circumference helps it also decreases the effective pressure as the pressure decreases and tightens the convolution width as the pressure increases. Both of these effects must be considered and tested before this solution is used.

Bead Design Considerations

A simple and effective solution, but fit must be precise

One of the most popular flange designs in diaphragms is the Beaded Type. This style of flange enables the designer to control the amount of squeeze applied to the diaphragm's flange without concern for the amount of force applied to the flange during assembly. Controlling this squeeze avoids the three most common types of premature failures ; 1.) Not enough squeeze resulting in flange leakage, or 2.) Over squeezing the flange and cutting the diaphragm or 3.) Flowing the elastomer into the working area of the diaphragm causing the diaphragm to distort and fail prematurely. These benefits can be lost if the bead and the bead groove are not designed in conjunction with each other.

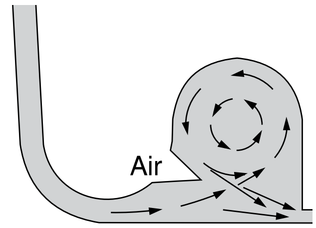
Figure 1



The first consideration is how much to deflect the rubber to effect a seal. This number may change for some compounds but generally we recommend a minimum of 20% deflection of the elastomer (*B dim Fig.1*). This number insures that the seal will be maintained even after the elastomer takes its compression set. Since the flange thickness and the hardware dimensions need tolerances, the design should be calculated at 25% +/- 5%. This generally is enough to allow for normal tolerancing of the hardware to insure a good seal. However, there are those situations where the variation in elastomer thickness, or hardware dimensioning is such that it is impossible to keep everything in the range to maintain the 20% to 30% deflection. In cases such as these we recommend that the deflection exceeds the 30% rather than go below the 20%.

The key point that must be remembered when designing a bead and bead groove is that the elastomer is incompressible. When you deflect it 25% to form a seal the elastomer needs a place to go. If you haven't provided that room in the groove area of your hardware, then the elastomer will flow out of the groove into the working area of the diaphragm. This can cause cracking in the flange radius area of the diaphragm or

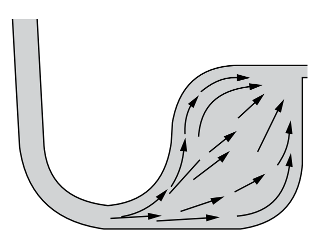
Figure 2



enough distortion in the diaphragm to cause the two sidewalls to come together, resulting in failure. To avoid these problems, simply design your bead groove so that when the hardware is assembled the volume of the groove is such that it can contain the largest bead the spec. will allow (*A dim Fig.1*).

Another point to consider when designing beads on diaphragms is to make it as manufacturable as possible. This will insure a better product as well as more price stability. The main problem experienced in the manufacture of beaded diaphragms is air entrapment. This "trapped air" displaces elastomer in the bead resulting in a reduction of bead volume. Generally, air entrapment is not a problem on standard "D-Bead" parts where the fabric is on the same side of the part as the bead. The reason for this is that the fabric acts as a leak path out of the mold for the air, enabling the elastomer to completely fill the bead area. However, when there is no fabric in the bead as in a homogenous part or one that the bead is designed onto the elastomer side of the diaphragm there is no way of insuring that all the air will be forced out of the bead. This is due to the fact that the bead's geometry prevents the elastomer from moving in a straight path (*Fig.2*) keeping the air in front of it. To solve this problem we recommend moving the parting line to the opposite side of the bead (*Fig.3*). This enables the elastomer to move in a straight path keeping all the air in front it and insuring that the volume and height of your bead remain constant. There are no special bead groove requirements for this because there is no increase in volume of elastomer. It is important to remember that you are obtaining the seal by deflecting the bead from top to bottom, not side to side.

Figure 3

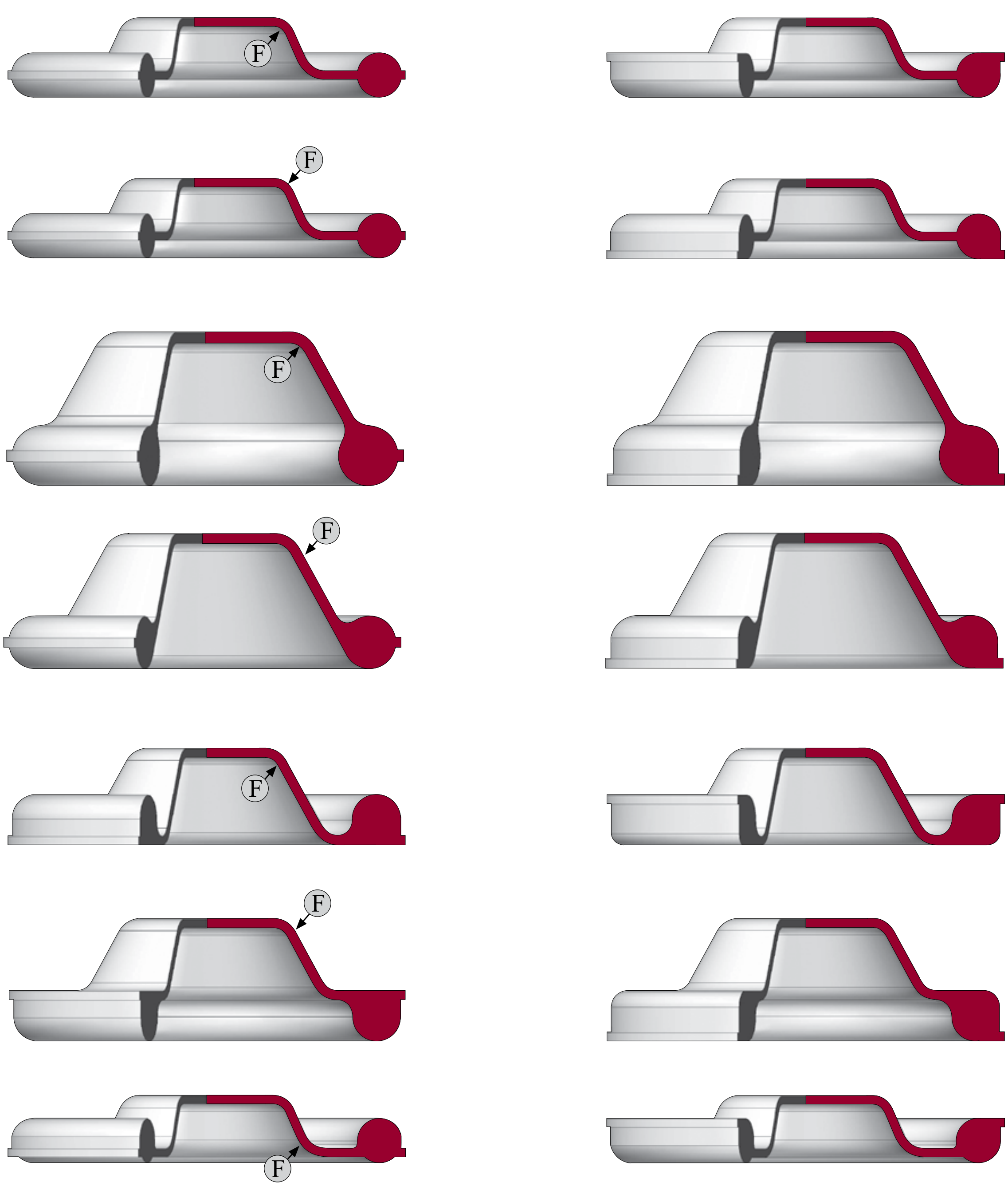


Beads

Beads can be added to the diaphragm in an almost infinite variety of shapes and sizes. However, there are many things to consider before adding beads to the diaphragm design, not the least of which is the impact on the cost of the diaphragm. Most beads are added to a diaphragm to be used as the sealing mechanism in the final application.

Beads are formed during the molding operation by flowing rubber into the mold cavity, filling the bead area while driving out the air. There are several limitations on bead design that must be considered due to this rubber flow. Bead location, shape, size, mold parting line, etc. all must be carefully considered. The examples below illustrate some of the changes that can improve the quality of the diaphragms. These design changes are often driven by the location of the fabric reinforcement (the location of the fabric is shown below by the F symbol), but these design recommendations also apply to homogeneous (all-rubber) as well as double-coated diaphragms.

AS DESIGNED | **RECOMMENDED**



Type F Diaphragms

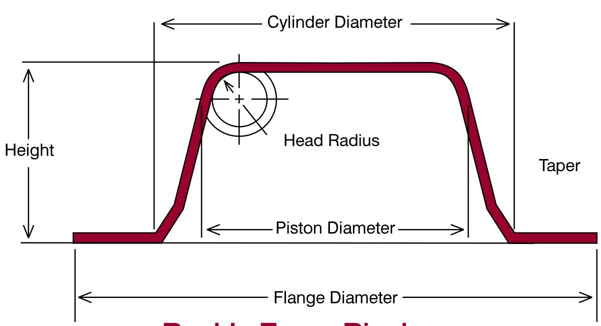
General Description

The Type F is commonly referred to as the "top hat" diaphragm. It exhibits all of the benefits that are associated with rolling diaphragms. These diaphragms have the longest stroke-to-bore ratio, zero spring rate, no breakaway friction, constant effective pressure area, and long life. Some of the drawbacks to Type F diaphragms are additional assembly time required when inverting the top head corner radius during installation, and an inability to withstand reverse pressure.

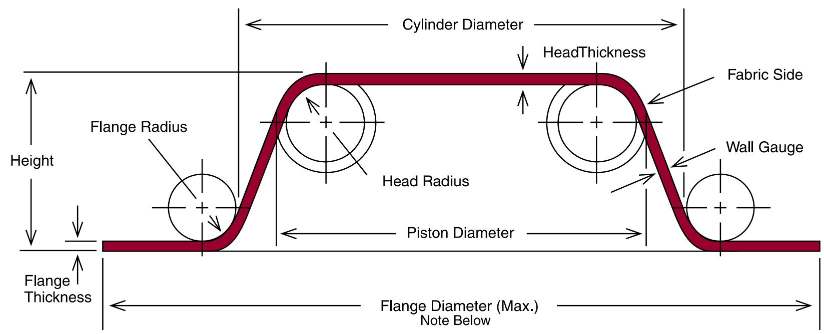
The flange of the Type F diaphragm is designed to seal like a gasket between the two flat surfaces of the cylinder and bonnet. The outside edge and bolt holes can be cut into any configuration desired. An effective seal should be obtained by compressing the flange area 20–30% by thickness.

To extend cycle life and reduce "four-cornering" of the diaphragm, a double taper design may be utilized (see Figure 1). This design reduces the diameter of the bottom end of the diaphragm which minimizes excess material in this area and relieves circumferential compressive stress.

Dimensions and Tolerances



Double Taper Diaphragm
Figure 1



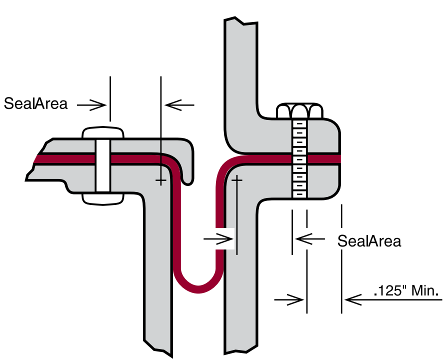
Top Hat Diaphragm

Cylinder Diameter	.25 to .99	6 to 25	1.00 to 2.50	25 to 64	2.51 to 4.00	64 to 102	4.01 to 8.00	102 to 205	8.01 & up	205 & up
Height	See available sizes table.									
Cylinder Diameter / Piston Diameter	Tolerances on Cylinder Diameter and Piston Diameter are ± .010" per inch of diameter but the tolerance will be no less than ± .010" or greater than ± .060"									
Head Thickness & Flange Thickness	.015 ± .003	0.38 ± 0.08	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Wall Gauge	.015 ± .003	0.38 ± 0.08	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Piston Radius	.094	2.39	.125	3.18	.156	3.96	.250	6.35	.250	6.35
Flange Radius	.031	0.79	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Flange Diameter	Cyl Diam. +.750	Cyl Diam. +19.05	Cyl Diam. +1"	Cyl Diam. +25.40	Cyl Diam. +1.500	Cyl Diam. +38.10	Cyl Diam. +2"	Cyl Diam. +50.80	Cyl Diam. +2"	Cyl Diam. +50.80

Diaphragm Flange Diameter and Hole Trim Tolerances:					
Diameter		*Size*		*Position*	
0 - 1.00"	.0 - 25.40	± .010"	0.25	.010	0.25
1.01 - 3.00"	25.65 - 76.20	± .020"	0.51	.020	0.51
over 3.01"	76.45	± .030"	0.76	.030	0.76

Angular relationship of holes: ± 1/2 degree.

Hole Spacing for Type F and FC Diaphragms



Max. Working Pressure (P.S.I)/KPA	(0-50)	0-350	(51-150)	357-1050	(151-300)	1057-2100	(301-500)	2107-3500
Seal Area Minimum (Inches)	.100	2.54	.150	3.81	.200	5.08	.250	6.35

Hole Spacing:

Perforations through the head or the flange should be located so that there is at least .100 inches minimum between the edges of holes. Also, holes should be located so that there is at least .125 inches between the edge of a hole and the trim periphery. It is also important to arrange the hole pattern so that the radial distance from the edge of the hole to the start of the blend radius at either the piston head or cylinder clamp flange is at least as far as indicated in the chart above.

Millimeters in Red

Type F Diaphragms

Available Sizes

Dia•Com Part No.	Cylinder Diameter		Piston Diameter		Height		Gauge (approx.)		Convolution Width		* Effective Pressure Area		Maximum Half-Stroke	
F - 34 - 39	0.34	9	0.22	6	0.39	10	.015	0.38	.060	1.5	0.06	0.4	0.17	4.3
F - 37 - 31	0.37	9	0.25	6	0.31	8	.015	0.38	.060	1.5	0.08	0.5	0.09	2.3
F - 44 - 44	0.44	11	0.31	8	0.44	11	.015	0.38	.065	1.7	0.11	0.7	0.21	5.3
F - 62 - 50	0.62	16	0.50	13	0.50	13	.015	0.38	.060	1.5	0.25	1.6	0.28	7.1
F - 62 - 65	0.62	16	0.47	12	0.65	17	.024	0.61	.075	1.9	0.23	1.5	0.47	11.9
F - 75 - 38	0.75	19	0.62	16	0.38	10	.010	0.25	.065	1.7	0.37	2.4	0.12	3.0
F - 75 - 62	0.75	19	0.62	16	0.62	16	.011	0.28	.065	1.7	0.37	2.4	0.36	9.1
F - 75 - 62	0.75	19	0.62	16	0.62	16	.015	0.38	.065	1.7	0.52	3.4	0.36	9.1
F - 89 - 58	0.89	23	0.71	18	0.58	15	.015	0.38	.090	2.3	0.50	3.3	0.21	5.3
F - 100 - 44	1.00	25	0.81	21	0.44	11	.010	0.25	.095	2.4	0.64	4.1	0.06	1.5
F - 100 - 62	1.00	25	0.81	21	0.62	16	.017	0.43	.095	2.4	0.64	4.1	0.24	6.1
F - 100 - 100	1.00	25	0.81	21	1.00	25	.017	0.43	.095	2.4	0.64	4.1	0.62	15.7
F - 112 - 44	1.12	28	0.94	24	0.44	11	.017	0.43	.090	2.3	0.83	5.4	0.07	1.8
F - 112 - 69	1.12	28	0.94	24	0.69	18	.017	0.43	.090	2.3	0.83	5.4	0.32	8.1
F - 118 - 53	1.18	30	0.97	25	0.53	13	.017	0.43	.105	2.7	1.30	8.3	0.22	5.6
F - 137 - 112	1.37	35	1.19	30	1.12	28	.017	0.43	.090	2.3	1.29	8.3	0.75	19.1
F - 150 - 62	1.50	38	1.31	33	0.62	16	.017	0.43	.095	2.4	1.55	10.0	0.24	6.1
F - 150 - 75	1.50	38	1.31	33	0.75	19	.017	0.43	.095	2.4	1.55	10.0	0.37	9.4
F - 150 - 94	1.50	38	1.31	33	0.94	24	.020	0.51	.095	2.4	1.55	10.0	0.56	14.2
F - 156 - 141	1.56	40	1.38	35	1.41	36	.017	0.43	.060	1.5	1.63	10.5	1.04	26.4
F - 162 - 44	1.62	41	1.44	37	0.44	11	.017	0.43	.090	2.3	1.84	11.9	0.07	1.8
F - 162 - 46	1.62	41	1.47	37	0.46	12	.020	0.51	.075	1.9	2.26	12.1	0.07	1.8
F - 162 - 69	1.62	41	1.44	37	0.69	18	.017	0.43	.090	2.3	1.84	11.9	0.32	8.1
F - 175 - 106	1.75	44	1.56	40	1.06	27	.017	0.43	.095	2.4	2.15	13.9	0.68	17.3
F - 175 - 175	1.75	44	1.56	40	1.75	44	.015	0.38	.095	2.4	2.15	13.9	1.37	34.8
F - 200 - 75	2.00	51	1.81	46	0.75	19	.017	0.43	.095	2.4	2.85	18.4	0.37	9.4
F - 200 - 100	2.00	51	1.81	46	1.00	25	.016	0.41	.095	2.4	2.85	18.4	0.62	15.7
F - 200 - 162	2.00	51	1.81	46	1.62	41	.017	0.43	.095	2.4	2.85	18.4	1.24	31.5
F - 200 - 200	2.00	51	1.81	46	2.00	51	.017	0.43	.095	2.4	2.85	18.4	1.62	41.1
F - 212 - 131	2.12	54	1.94	49	1.31	33	.017	0.43	.090	2.3	3.23	20.9	0.94	23.9
F - 225 - 62	2.25	57	2.06	52	0.62	16	.020	0.43	.095	2.4	3.65	23.5	0.26	6.6
F - 225 - 94	2.25	57	2.06	52	0.94	24	.017	0.43	.095	2.4	3.65	23.5	0.56	14.2
F - 225 - 137	2.25	57	2.06	52	1.37	35	.017	0.43	.095	2.4	3.65	23.5	0.99	25.1
F - 250 - 142	2.50	64	2.31	59	1.42	36	.017	0.43	.095	2.4	4.54	29.3	1.04	26.4
F - 250 - 150	2.50	64	2.31	59	1.50	38	.017	0.43	.095	2.4	4.54	29.3	1.12	28.4
F - 250 - 153	2.50	64	2.00	51	1.53	39	.018	0.46	.250	6.4	3.97	25.6	1.10	27.9
F - 275 - 112	2.75	70	2.44	62	1.12	28	.024	0.61	.155	3.9	6.62	34.1	0.57	14.5
F - 300 - 119	3.00	76	2.69	68	1.19	30	.024	0.61	.155	3.9	6.35	41.0	0.64	16.3
F - 300 - 300	3.00	76	2.69	68	3.00	76	.024	0.61	.155	3.9	6.35	41.0	2.42	61.5
F - 319 - 100	3.19	81	2.88	73	1.00	25	.024	0.61	.155	3.9	8.78	46.7	0.45	11.4
F - 325 - 131	3.25	83	2.94	75	1.31	33	.024	0.61	.155	3.9	7.52	48.5	0.76	19.3
F - 328 - 148	3.28	83	2.75	70	1.48	38	.017	0.43	.265	6.7	7.14	46.0	0.76	19.3
F - 350 - 212	3.50	89	3.18	81	2.12	54	.030	0.76	.160	4.1	8.76	56.5	1.72	43.7
F - 375 - 132	3.75	95	3.44	87	1.32	34	.022	0.56	.155	3.9	10.15	65.5	0.77	19.6
F - 375 - 225	3.75	95	3.44	87	2.25	57	.024	0.61	.155	3.9	10.15	65.5	1.70	43.2
F - 400 - 400	4.00	102	3.69	94	4.00	102	.024	0.61	.155	3.9	11.61	74.9	3.45	87.6
F - 402 - 154	4.02	102	3.70	94	1.54	39	.032	0.81	.160	4.1	11.70	75.5	0.88	22.4
F - 450 - 275	4.50	114	4.00	102	2.75	70	.035	0.89	.250	6.4	14.18	91.5	1.97	50.0
F - 460 - 450	4.60	117	4.00	102	4.50	114	.040	1.02	.300	7.6	14.51	93.6	3.60	91.4
F - 475 - 82	4.75	121	4.37	111	0.82	21	.035	0.89	.190	4.8	16.32	105.3	0.10	2.5
F - 475 - 187	4.75	121	4.27	108	1.87	47	.035	0.89	.240	6.1	15.97	103.0	1.09	27.7
F - 500 - 300	5.00	127	4.50	114	3.00	76	.035	0.89	.250	6.4	17.71	114.3	2.22	56.4
F - 531 - 256	5.31	135	4.13	105	2.56	65	.039	0.99	.590	15.0	17.49	112.8	1.35	34.3
F - 550 - 175	5.50	140	5.00	127	1.75	44	.035	0.89	.250	6.3	21.64	139.6	0.97	24.6
F - 550 - 337	5.50	140	5.00	127	3.37	86	.035	0.89	.250	6.3	21.64	139.6	2.59	65.8
F - 600 - 513	6.00	152	5.50	140	5.13	130	.040	1.02	.250	6.3	30.66	167.4	4.35	110.5
F - 675 - 232	6.75	171	6.25	159	2.32	59	.035	0.89	.250	6.3	33.17	214.0	1.54	39.1
F - 700 - 414	7.00	178	6.50	165	4.14	105	.040	1.02	.250	6.4	35.77	230.8	3.01	76.5
F - 750 - 150	7.50	191	7.00	178	1.50	38	.035	0.89	.250	6.4	41.26	266.2	0.72	18.3
F - 800 - 400	8.00	203	7.50	191	4.00	102	.035	0.89	.250	6.3	47.15	304.2	3.22	81.8
F - 1000 - 200	10.00	254	9.25	235	2.00	51	.050	1.27	.375	9.5	72.72	469.2	1.02	25.9
F - 1000 - 225	10.00	254	9.50	241	2.25	57	.035	0.89	.250	6.4	74.62	481.4	1.47	37.3
F - 1000 - 412	10.00	254	9.50	241	4.12	105	.040	1.02	.250	6.4	82.47	532.1	3.34	84.8
F - 1188 - 538	11.88	302	11.38	289	5.38	137	.040	1.02	.250	6.3	106.18	685.0	4.60	116.8

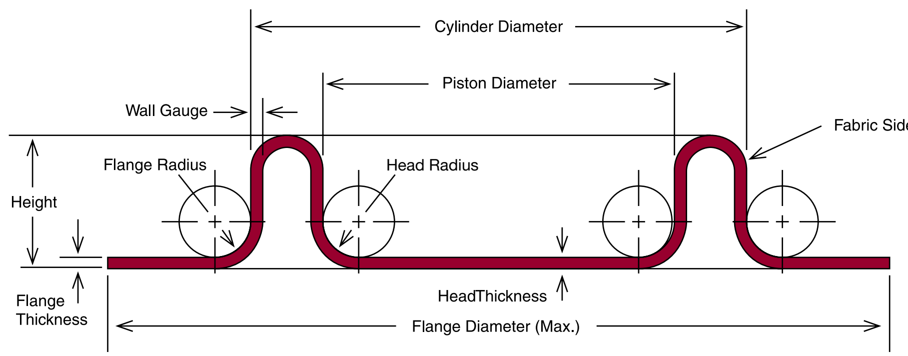
Millimeters in Red / *Metric Effective Pressure Area shown in Square Centimeters

Type FC Diaphragms

General Description

In this style, the piston and the flange are molded on the same plane. The benefit of this style is that the handwork of forming the convolution is eliminated, which greatly reduces the assembly time. This would be of importance in high volume applications. The drawbacks to this type of diaphragm are: a built-in spring rate, due to the molded-in convolution, which must be considered during the design stage, and a limited stroke-to-bore ratio. To improve this ratio, an offset pre-convoluted diaphragm can be designed (see FC Offset figure at bottom of page). In this shape, the piston head and flange are molded offset to each other, thereby putting all the additional stroke capabilities on one side of the convolution. This provides a longer stroking diaphragm which still maintains the assembly ease of a preconvoluted diaphragm.

Dimensions and Tolerances



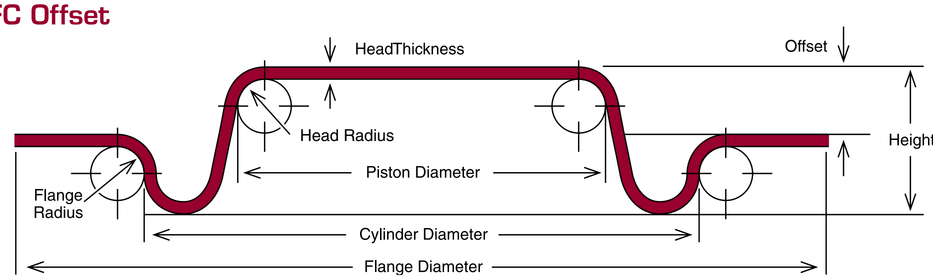
Cylinder Diameter	.25 to .99	6 to 25	1.00 to 2.50	25 to 64	2.51 to 4.00	64 to 102	4.01 to 8.00	102 to 205	8.01 & up	205 & up
Height	See available sizes table.									
Cylinder Diameter / Piston Diameter	Tolerances on Cylinder Diameter and Piston Diameter are ± .010" per inch of diameter but the tolerance will be no less than ± .010" or greater than ± .060"									
Head Thickness & Flange Thickness	.015 ± .003	.038 ± 0.08	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Wall Gauge	.015 ± .003	.038 ± 0.08	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Piston and Flange Radius	.031	0.79	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Flange Diameter	Cyl Diam. +.750	Cyl Diam. +19.05	Cyl Diam. +1"	Cyl Diam. +25.40	Cyl Diam. +1.500	Cyl Diam. +38.10	Cyl Diam. +2"	Cyl Diam. +50.80	Cyl Diam. +2"	Cyl Diam. +50.80

Diaphragm Flange Diameter and Hole Trim Tolerances:					
Diameter		*Size*		*Position*	
0 - 1.00"	.0 - 25.40	± .010"	.254	.010	.254
1.01 - 3.00"	25.65 - 76.20	± .020"	.508	.020	.508
over 3.01"	over 76.45	± .030"	.762	.030	.762

Angular relationship of holes: ± 1/2 degree.

Note: See Page 12 (Type F Diaphragms) for Hole Spacing Information

FC Offset



Millimeters in Red

Available Sizes

Dia•Com Part No.	Cylinder Diameter		Piston Diameter		Height		Gauge (approx.)		Convolution Width		* Effective Pressure Area		Maximum Half-Stroke	
FC - 38 - 12	0.38	10	0.25	6	0.12	3	.013	0.33	.065	1.7	0.08	0.5	0.11	2.8
FC - 51 - 08	0.50	13	0.31	8	0.08	2	.015	0.38	.095	2.4	0.13	0.8	0.01	0.3
FC - 50 - 10	0.50	13	0.31	8	0.10	3	.020	0.51	.095	2.4	0.13	0.8	0.01	0.3
FC - 50 - 10	0.50	13	0.38	10	0.10	3	.015	0.38	.060	1.5	0.15	1.0	0.05	1.3
FC - 56 - 06	0.56	14	0.50	13	0.06	2	.016	0.41	.030	0.8	0.22	1.4	0.01	0.3
FC - 62 - 07	0.62	16	0.44	11	0.07	2	.015	0.38	.090	2.3	0.22	1.4	0.04	1.0
FC - 62 - 10	0.62	16	0.50	13	0.10	3	.015	0.38	.060	1.5	0.25	1.6	0.07	1.8
FC - 71 - 15	0.71	18	0.53	13	0.16	4	.018	0.46	.090	2.3	0.30	1.9	0.10	2.5
FC - 72 - 04	0.72	18	0.52	13	0.04	1	.015	0.38	.100	2.5	0.30	1.9	0.01	0.3
FC - 72 - 09	0.72	18	0.52	13	0.09	2	.015	0.38	.100	2.5	0.30	1.9	0.06	1.5
FC - 75 - 15	0.75	19	0.45	11	0.15	4	.017	0.43	.150	3.8	0.28	1.8	0.03	0.8
FC - 75 - 10	0.75	19	0.62	16	0.10	3	.015	0.38	.065	1.7	0.37	2.4	0.07	1.8
FC - 75 - 10	0.75	19	0.63	16	0.10	3	.015	0.38	.060	1.5	0.37	2.4	0.07	1.8
FC - 87 - 10	0.87	22	0.75	19	0.10	3	.015	0.38	.060	1.5	0.52	3.3	0.07	1.8
FC - 88 - 10	0.88	22	0.66	17	0.10	3	.017	0.43	.110	2.8	0.47	3.0	0.01	0.3
FC - 100 - 15	1.00	25	0.81	21	0.15	4	.017	0.43	.095	2.4	0.64	4.1	0.08	2.0
FC - 100 - 15	1.00	25	0.81	21	0.15	4	.015	0.38	.095	2.4	0.64	4.1	0.08	2.0
FC - 102 - 06	1.02	26	0.80	20	0.06	2	.008	0.20	.110	2.8	0.65	4.2	0.01	0.3
FC - 106 - 06	1.06	27	0.94	24	0.06	2	.012	0.30	.060	1.5	0.79	5.1	0.01	0.3
FC - 107 - 12	N/A													
FC - 107 - 15	1.07	27	0.88	22	0.15	4	.013	0.33	.095	2.4	0.75	4.8	0.08	2.0
FC - 116 - 15	1.16	29	0.98	25	0.15	4	.013	0.33	.090	2.3	0.90	5.8	0.08	2.0
FC - 117 - 12	1.17	30	0.87	22	0.12	3	.020	0.51	.150	3.8	0.82	5.3	0.01	0.3
FC - 118 - 18	1.18	30	0.91	23	0.18	5	.025	0.64	.135	3.4	0.86	5.5	0.01	0.3
FC - 125 - 09	1.25	32	1.03	26	0.09	2	.017	0.43	.110	2.8	1.02	6.6	0.01	0.3
FC - 125 - 15	1.25	32	1.06	27	0.15	4	.017	0.43	.095	2.4	1.05	6.8	0.08	2.0
FC - 132 - 10	1.32	34	1.08	27	0.10	3	.020	0.51	.120	3.0	1.13	7.3	0.01	0.3
FC - 137 - 15	1.37	35	1.19	30	0.15	4	.020	0.51	.090	2.3	1.29	8.3	0.08	2.0
FC - 138 - 18	1.38	35	1.06	27	0.18	5	.025	0.64	.160	4.1	1.17	7.5	0.01	0.3
FC - 150 - 12	1.50	38	0.94	24	0.13	3	.022	0.56	.280	7.1	1.17	7.5	0.01	0.3
FC - 150 - 05	1.50	38	1.25	32	0.05	1	.010	0.25	.125	3.2	1.48	9.6	0.01	0.3
FC - 150 - 15	1.50	38	1.31	33	0.15	4	.017	0.43	.095	2.4	1.55	10.0	0.08	2.0
FC - 155 - 15	1.55	39	1.30	33	0.15	4	.020	0.51	.125	3.2	1.59	10.3	0.01	0.3
FC - 160 - 09	1.60	41	1.33	34	0.09	2	.013	0.33	.135	3.4	1.68	10.9	0.01	0.3
FC - 161 - 09	1.61	41	1.33	34	0.09	2	.020	0.51	.140	3.6	1.70	10.9	0.01	0.3
FC - 162 - 15	1.62	41	1.44	37	0.15	4	.017	0.43	.090	2.3	1.84	11.9	0.08	2.0
FC - 163 - 09	1.63	41	1.44	37	0.09	2	.015	0.38	.095	2.4	1.85	11.9	0.01	0.3
FC - 170 - 28	1.70	43	1.27	32	0.28	7	.030	0.76	.215	5.5	1.73	11.2	0.10	2.5
FC - 173 - 09	1.73	44	1.50	38	0.09	2	.013	0.33	.115	2.9	2.05	13.2	0.01	0.3
FC - 173 - 09	1.73	44	1.50	38	0.09	2	.020	0.51	.115	2.9	2.05	13.2	0.01	0.3
FC - 175 - 15	1.75	44	1.56	40	0.15	4	.013	0.33	.095	2.4	2.15	13.9	0.08	2.0
FC - 199 - 12	1.99	51	1.54	39	0.12	3	.020	0.51	.225	5.7	2.45	15.8	0.01	0.3
FC - 200 - 15	2.00	51	1.81	46	0.15	4	.017	0.43	.095	2.4	2.85	18.4	0.08	2.0
FC - 212 - 12	2.12	54	1.88	48	0.12	3	.018	0.46	.120	3.0	3.14	20.3	0.04	1.0
FC - 225 - 15	2.25	57	2.06	52	0.15	4	.017	0.43	.095	2.4	3.65	23.5	0.08	2.0
FC - 250 - 15	2.50	64	2.31	59	0.15	4	.017	0.43	.095	2.4	4.54	29.3	0.08	2.0
FC - 295 - 12	2.95	75	2.70	69	0.12	3	.017	0.43	.125	3.2	6.26	40.4	0.01	0.3
FC - 300 - 25	3.00	76	2.69	68	0.25	6	.024	0.61	.155	3.9	6.35	41.0	0.15	3.8
FC - 308 - 12	3.08	78	2.70	69	0.12	3	.017	0.43	.190	4.8	6.56	42.3	0.01	0.3
FC - 325 - 12	3.25	83	3.00	76	0.12	3	.017	0.43	.125	3.2	7.67	49.5	0.01	0.3
FC - 402 - 27	4.02	102	3.66	93	0.27	7	.035	0.89	.180	4.6	11.58	74.7	0.11	2.8
FC - 425 - 37	4.25	108	3.75	95	0.37	9	.035	0.89	.250	6.4	12.56	81.0	0.24	6.1
FC - 600 - 37	6.00	152	5.50	140	0.37	9	.035	0.89	.250	6.4	25.95	167.4	0.24	6.1
FC - 1150 - 50	11.50	292	11.00	279	0.50	13	.045	1.14	.250	6.4	99.35	641.0	0.37	9.4

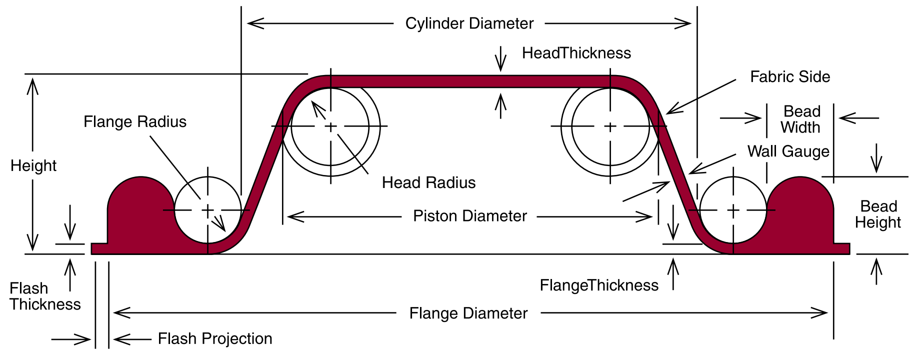
Millimeters in Red / *Metric Effective Pressure Area shown in Square Centimeters

Type D Diaphragms

General Description

This style diaphragm is the same as the Type F in all respects except flange mounting. The parts are molded with what equates to half of an O-ring on the flange rather than a large flat surface. This O-Ring half fits into a groove machined into the cylinder half of the hardware. Sealing is achieved by squeezing the bead into a properly sized groove (see table at bottom of page). The cylinder and bonnet can then be designed to make positive contact when assembled, eliminating the need for a closely controlled assembly torque. It also reduces the overall diameter of the diaphragm, reducing the hardware diameter.

Dimensions and Tolerances



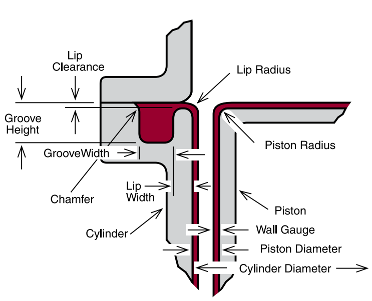
Cylinder Diameter	.37 to .99	9 to 25	1.00 to 2.50	25 to 64	2.51 to 4.00	64 to 102	4.01 to 8.00	102 to 205	8.01 & up	205 & up
Height	See available sizes table.									
Cylinder Diameter Piston Diameter	Tolerances on Cylinder Diameter and Piston Diameter are ± .010" per inch of diameter but the tolerance will be no less than ± .010" or greater than ± .060"									
Head Thickness & Flange Thickness	.015 ± .003	0.38 ± 0.08	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Wall Gauge	.015 ± .003	0.38 ± 0.08	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Flash Projection	.025 Max	0.64 Max	.025 Max	0.64 Max	.035 Max	0.89 Max	.040 Max	1.02 Max	.056 Max	1.42 Max
Flash Thickness	.025 Max	0.64 Max	.025 Max	0.64 Max	.035 Max	0.89 Max	.040 Max	1.02 Max	.056 Max	1.42 Max
Piston Radius	.094	2.39	.125	3.18	.156	3.96	.250	6.35	.250	6.35
Flange Radius	.031	0.79	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Flange Diameter	Cyl Diam. +.313	Cyl Diam. +7.95	Cyl Diam. +.500	Cyl Diam. +12.70	Cyl Diam. +.750	Cyl Diam. +19.05	Cyl Diam. +1"	Cyl Diam. +25.40	Cyl Diam. +1"	Cyl Diam. +25.40
Bead Width	.094 ± .003	2.39 ± 0.08	.125 ± .003	3.18 ± 0.08	.187 ± .003	4.75 ± 0.08	.250 ± .003	6.35 ± 0.08	.250 ± .004	6.35 ± 0.10
Bead Height	.095 ± .004	2.41± 0.10	.135± .004	3.43 ± 0.10	.200 ± .005	5.08 ± 0.13	.270 ± .007	6.86± 0.18	.270 ± .008	6.86 ± 0.20

Diaphragm Flange Diameter and Hole Trim Tolerances:

Diameter		*Size*		*Position*	
.0 - 1.00"	.0 - 25.40	± .010"	0.25	.010	0.25
1.01 - 3.00"	25.65 - 76.20	± .020"	0.51	.020	0.51
over 3.01"	over 76.45	± .030"	0.76	.030	0.76

Angular relationship of holes: ± 1/2 degree.

Hardware Recommendations



Cylinder Diameter	.25 - .99	6 - 25	1.00 - 2.50	25 - 64	2.51 - 4.00	64 - 102	4.01 - 8.00	102 - 205	8.01 & up	205 & up
Groove Width ± .003 0.08±	.109	2.77	.141	3.58	.219	5.56	.281	7.14	.281	7.14
Groove Height ± .002 0.05±	.076	1.93	.108	2.74	.160	4.06	.216	5.49	.216	5.49
Lip & Piston Corner Radii	.031	0.79	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Lip Width ± .003 0.08±	.062	1.57	.125	3.18	.187	4.75	.250	6.35	.250	6.35
Lip Clearance ± .003 0.08±	.021	0.53	.021	0.53	.031	0.79	.036	0.91	.048	1.22

Millimeters in Red

Available Sizes

Dia•Com Part No.	Cylinder Diameter		Piston Diameter		Height		Gauge (approx.)		Convolution Width		* Effective Pressure Area		Maximum Half-Stroke	
D - 50 - 38	0.50	13	0.37	9	0.38	10	.015	0.38	.065	1.7	0.15	1.0	0.15	3.8
D - 62 - 51	0.62	16	0.47	12	0.51	13	.015	0.38	.075	1.9	0.23	1.5	0.25	6.4
D - 62 - 50	0.62	16	0.50	13	0.50	13	.015	0.38	.060	1.5	0.25	1.6	0.28	7.1
D - 62 - 68	0.62	16	0.50	13	0.68	13	.015	0.38	.060	1.5	0.25	1.6	0.41	10.4
D - 79 - 79	0.79	20	0.59	15	0.79	20	.017	0.43	.100	2.5	0.37	2.4	0.66	16.8
D - 81 - 69	0.81	21	0.69	18	0.69	18	.016	0.41	.060	1.5	0.44	2.8	0.47	11.9
D - 87 - 31	0.87	22	0.75	19	0.31	8	.015	0.38	.060	1.5	0.52	3.3	0.09	2.3
D - 94 - 81	0.94	24	0.81	21	0.81	21	.017	0.43	.065	1.7	0.60	3.4	0.58	14.7
D - 100 - 48	1.00	25	0.81	21	0.48	12	.012	0.30	.095	2.4	0.64	4.1	0.10	2.5
D - 100 - 81	1.00	25	0.81	21	0.81	21	.020	0.51	.095	2.4	0.64	4.1	0.43	10.9
D - 100 - 100	1.00	25	0.81	21	1.00	25	.017	0.43	.095	2.4	0.64	4.1	0.62	15.7
D - 112 - 94	1.12	28	0.94	24	0.94	24	.017	0.43	.090	2.3	0.83	5.4	0.57	14.5
D - 118 - 71	1.18	30	0.98	25	0.71	18	.017	0.43	.100	2.5	0.92	5.9	0.31	7.6
D - 128 - 74	1.28	33	1.08	27	0.74	19	.017	0.43	.100	2.5	1.09	7.0	0.34	8.6
D - 137 - 44	1.37	35	1.19	30	0.44	11	.017	0.43	.090	2.3	1.29	8.3	0.07	1.8
D - 137 - 56	1.37	35	1.19	30	0.56	14	.017	0.43	.090	2.3	1.29	8.3	0.18	4.6
D - 137 - 137	1.37	35	1.19	30	1.37	35	.017	0.43	.090	2.3	1.29	8.3	1.00	25.4
D - 138 - 110	1.38	35	1.18	30	1.10	28	.017	0.43	.100	2.5	1.29	8.3	0.97	24.6
D - 150 - 44	1.50	38	1.31	33	0.44	11	.017	0.43	.095	2.4	1.55	10.0	0.06	1.5
D - 150 - 125	1.50	38	1.31	33	1.25	32	.017	0.43	.095	2.4	1.55	10.0	0.87	22.1
D - 160 - 135	1.60	41	1.40	36	1.35	34	.015	0.38	.100	2.5	1.77	11.4	1.22	31.0
D - 162 - 69	1.62	41	1.25	32	0.69	18	.014	0.36	.185	4.7	1.62	10.4	0.16	4.1
D - 167 - 66	1.67	42	1.42	36	0.66	17	.017	0.43	.125	3.2	1.87	12.1	0.22	5.6
D - 175 - 52	1.75	44	1.56	40	0.52	13	.017	0.43	.095	2.4	2.15	13.9	0.14	3.6
D - 175 - 75	1.75	44	1.56	40	0.75	19	.017	0.43	.095	2.4	2.15	13.9	0.37	9.4
D - 200 - 81	2.00	51	1.81	46	0.81	21	.020	0.51	.095	2.4	2.85	18.4	0.43	10.9
D - 200 - 125	2.00	51	1.81	46	1.25	32	.017	0.43	.095	2.4	2.85	18.4	0.87	22.1
D - 200 - 200	2.00	51	1.81	46	2.00	51	.017	0.43	.095	2.4	2.85	18.4	1.62	41.1
D - 225 - 181	2.25	57	2.06	52	1.81	46	.017	0.43	.095	2.4	3.65	23.5	1.42	36.1
D - 225 - 94	2.25	57	2.06	52	0.94	24	.017	0.43	.095	2.4	3.65	23.5	0.56	14.2
D - 225 - 137	2.25	57	2.06	52	1.37	35	.017	0.43	.095	2.4	3.65	23.5	0.99	25.1
D - 225 - 211	2.25	57	2.06	52	2.11	54	.017	0.43	.095	2.4	3.65	23.5	1.73	43.9
D - 250 - 106	2.50	64	2.31	59	1.06	27	.017	0.43	.095	2.4	4.54	29.3	0.68	17.3
D - 250 - 150	2.50	64	2.31	59	1.50	38	.017	0.43	.095	2.4	4.54	29.3	1.12	28.4
D - 250 - 212	2.50	64	2.31	59	2.12	54	.017	0.43	.095	2.4	4.54	29.3	1.74	44.2
D - 260 - 84	2.60	66	2.40	61	0.84	21	.017	0.43	.100	2.5	4.91	31.7	0.71	18.0
D - 300 - 175	3.00	76	2.69	68	1.75	44	.024	0.61	.155	3.9	6.35	41.0	1.20	30.5
D - 300 - 300	3.00	76	2.69	68	3.00	76	.024	0.61	.155	3.9	6.35	41.0	2.45	62.2
D - 325 - 194	3.25	83	2.94	75	1.94	49	.024	0.61	.155	3.9	7.52	48.5	1.39	35.3
D - 375 - 225	3.75	95	3.44	87	2.25	57	.024	0.61	.155	3.9	10.15	65.5	1.70	43.2
D - 375 - 375	3.75	95	3.44	87	3.75	95	.024	0.61	.155	3.9	10.15	65.5	3.20	81.3
D - 386 - 400	3.86	98	3.54	90	4.00	102	.030	0.76	.160	4.1	10.75	69.3	3.80	96.5
D - 400 - 400	4.00	102	3.44	87	4.00	102	.030	0.76	.280	7.1	10.86	70.1	3.23	82.0
D - 400 - 100	4.00	102	3.69	94	1.00	25	.024	0.61	.155	3.9	11.61	74.9	0.45	11.4
D - 550 - 175	5.50	140	5.00	127	1.75	44	.035	0.89	.250	6.4	21.64	139.6	0.97	24.6
D - 800 - 187	8.00	203	7.50	191	1.87	47	.035	0.89	.250	6.4	47.15	304.2	1.09	27.7
D - 800 - 450	8.00	203	7.50	191	4.50	114	.035	0.89	.250	6.4	47.15	304.2	3.72	94.5
D - 1200 - 100	12.00	305	11.50	292	1.00	25	.045	1.14	.250	6.4	108.38	699.2	0.22	5.6
D - 1350 - 100	13.50	343	13.00	330	1.00	25	.045	1.14	.250	6.4	137.82	889.1	0.22	5.6
D - 1500 - 100	15.00	381	14.50	368	1.00	25	.045	1.14	.250	6.4	170.79	1101.8	0.22	5.6

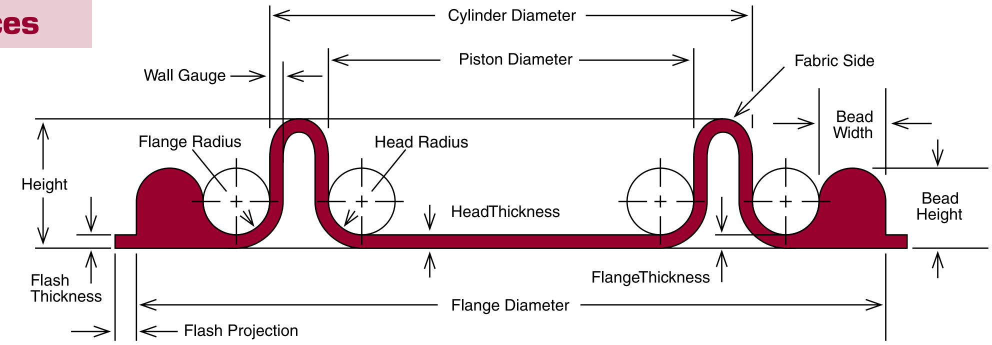
Millimeters in Red / *Metric Effective Pressure Area shown in Square Centimeters

Type DC Diaphragms

General Description

This style diaphragm is similar in function to the Type FC diaphragm, while the sealing and hardware designs are the same as the Type D.

Dimensions and Tolerances



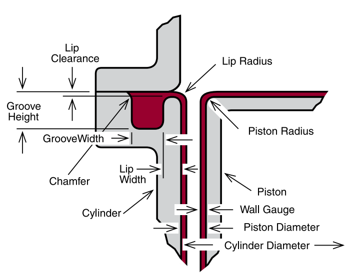
Cylinder Diameter	.37 to .99	9 to 25	1.00 to 2.50	25 to 64	2.51 to 4.00	64 to 102	4.01 to 8.00	102 to 205	8.01 & up	205 & up
Height	See available sizes table.									
Cylinder Diameter Piston Diameter	Tolerances on Cylinder Diameter and Piston Diameter are ± .010" per inch of diameter but the tolerance will be no less than ± .010" or greater than ± .060"									
Head Thickness & Flange Thickness	.015 ± .003	0.38 ± 0.08	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Wall Gauge	.015 ± .003	0.38 ± 0.08	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Flash Projection	.025 Max	0.64 Max	.025 Max	0.64 Max	.035 Max	0.89 Max	.040 Max	1.02 Max	.056 Max	1.42 Max
Flash Thickness	.025 Max	0.64 Max	.025 Max	0.64 Max	.035 Max	0.89 Max	.040 Max	1.02 Max	.056 Max	1.42 Max
Piston/Flange Radius	.031	.79	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Flange Diameter	Cyl Diam. +.313	Cyl Diam. +7.95	Cyl Diam. + .500	Cyl Diam. +12.70	Cyl Diam. + .750	Cyl Diam. +19.05	Cyl Diam. +1"	Cyl Diam. +25.40	Cyl Diam. +1"	Cyl Diam. +25.40
Bead Width	.094 ± .003	2.39 ± 0.08	.125 ± .003	3.18 ± 0.08	.187 ± .003	4.75 ± 0.08	.250 ± .003	6.35 ± 0.08	.250 ± .004	6.35 ± 0.10
Bead Height	.095 ± .004	2.41± 0.10	.135± .004	3.43 ± 0.10	.200 ± .005	5.08 ± 0.13	.270 ± .006	6.86± 0.15	.270 ± .008	6.86 ± 0.20

Diaphragm Flange Diameter and Hole Trim Tolerances:

Diameter		*Size*		*Position*	
0 - 1.00"	.0 - 25.40	± .010"	0.25	.010	0.25
1.01 - 3.00"	25.65 - 76.20	± .020"	0.51	.020	0.51
over 3.01"	over 76.45	± .030"	0.76	.030	0.76

Angular relationship of holes: ± 1/2 degree.

Hardware Recommendations



Cylinder Diameter	.25 - .99	6 - 25	1.00 - 2.50	25 - 64	2.51 - 4.00	64 - 102	4.01 - 8.00	102 - 205	8.01 & up	205 & up
Groove Width ± .003 0.08±	.109	2.77	.141	3.58	.219	5.56	.281	7.14	.281	7.14
Groove Height ± .002 0.05±	.076	1.93	.108	2.74	.160	4.06	.216	5.49	.216	5.49
Lip & Piston Corner Radii	.031	0.79	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Lip Width ± .003 0.08±	.062	1.57	.125	3.18	.187	4.75	.250	6.35	.250	6.35
Lip Clearance ± .003 0.08±	.021	0.53	.021	0.53	.031	0.79	.036	0.91	.048	1.22

Available Sizes

Dia•Com Part No.	Cylinder Diameter		Piston Diameter		Height		Gauge (approx.)		Convolution Width		* Effective Pressure Area		Maximum Half-Stroke	
DC - 37 - 12	0.37	9	0.27	7	0.12	3	.017	0.43	.050	1.3	0.08	0.5	0.09	2.3
DC - 62 - 10	0.62	16	0.50	13	0.10	3	.020	0.51	.060	1.5	0.25	1.6	0.07	1.8
DC - 91 - 15	0.91	23	0.72	18	0.15	4	.020	0.51	.095	2.4	0.52	3.4	0.10	2.5
DC - 125 - 15	1.25	32	1.05	27	0.15	4	.017	0.43	.100	2.5	1.04	6.7	0.04	1.0
DC - 150 - 15	1.50	38	1.31	33	0.15	4	.017	0.43	.095	2.4	1.55	10.0	0.05	1.3
DC - 175 - 15	1.75	44	1.56	40	0.15	4	.017	0.43	.095	2.4	2.15	13.9	0.05	1.3

Millimeters in Red / *Metric Effective Pressure Area shown in Square Centimeters

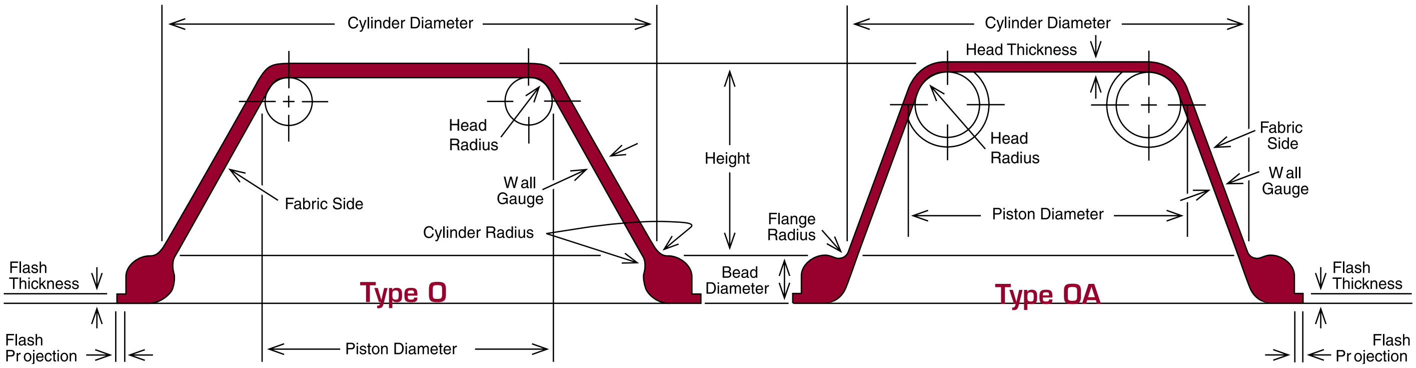
Type O and OA Diaphragms

General Description

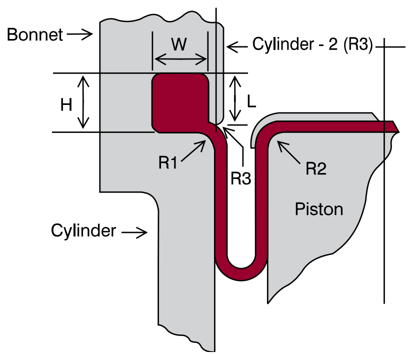
Type O – This type of diaphragm has no flange. An O-ring is molded to the bottom of the sidewall. Unlike the other types of diaphragms, the Type O is put into convolution by folding the sidewall back onto itself. The bead is then squeezed into a groove machined into the bonnet half of the hardware. This type enables the greatest reduction in hardware diameter, while keeping a full stroke potential.

Type OA – This diaphragm type is a second generation to the Type O. It fits into identical hardware. It differs from the Type O in that its sidewall attaches to the inside diameter of the O-ring and the fabric is on the outside, requiring the head corner radius to be inverted for installation. The Type OA tends to be easier to install, but basically the difference is personal preference.

Dimensions and Tolerances



Hardware Design



Cylinder Diameter	1.00 to 2.50	25 to 64	2.51 to 4.00	64 to 102	4.01 to 8.00	102 and up
Bead Diameter	.121	3.07	.151	3.84	.242	6.15
Convolution Width	.094	2.39	.156	3.96	.250	6.35
Flash Projection	0.020 MAX	0.51 MAX	0.030 MAX	0.76 MAX	0.040 MAX	1.02 MAX
Flash Thickness	0.020 MAX	0.51 MAX	0.030 MAX	0.76 MAX	0.040 MAX	1.02 MAX
Wall Gauge	.017	0.43	.024	0.61	.035	0.89
Piston Radius	.063	1.60	.094	2.39	.125	3.18
Piston Diameter	Cyl Diam. less .188"	Cyl Diam. less 4.78	Cyl Diam. less .313"	Cyl Diam. less 7.95	Cyl Diam. less .500"	Cyl Diam. less 12.70
Flange Radius	.032	0.81	.047	1.19	.063	1.60

Cylinder Diameter		Bead Groove Width = W		Bead Groove Height = H		Flange & Piston Corner Radii =R1 & R2		Lip Radius R3		Lip Height L	
1.00 - 2.50	25 to 64	.134	3.18	.096	2.43	.063	1.60	.025	0.63	.100	2.54
2.51 - 4.00	64 to 102	.165	3.96	.122	3.10	.094	2.39	.032	0.81	.130	3.30
4.01 - 8.00	102 to 205	.263	6.35	.196	4.98	.125	3.18	.045	1.14	.204	5.18
8.01 and up	205 and up	.263	6.35	.196	4.98	.125	3.18	.045	1.14	.190	4.83

Available Sizes

Dia•Com Part No.	Cylinder Diameter		Piston Diameter		Height		Gauge (approx.)		Convolution Width		* Effective Pressure Area		Maximum Half-Stroke	
O - 137 - 87	1.37	35	1.19	30	0.87	22	.017	0.43	.090	2.3	1.29	8.3	0.52	13.2
O - 150 - 62	1.50	38	1.31	33	0.62	16	.017	0.43	.095	2.4	1.55	10.0	0.29	7.4
O - 150 - 94	1.50	38	1.31	33	0.94	24	.017	0.43	.095	2.4	1.55	10.0	0.61	15.5
O - 175 - 144	1.75	44	1.56	40	1.44	37	.017	0.43	.095	2.4	2.15	13.9	1.13	28.7
O - 180 - 144	1.80	46	1.38	35	1.44	37	.025	0.64	.210	5.3	1.98	12.8	0.80	20.3
O - 187 - 150	1.87	47	1.69	43	1.50	38	.017	0.43	.090	2.3	2.49	16.0	1.15	29.2
O - 200 - 162	2.00	51	1.81	46	1.62	41	.017	0.43	.095	2.4	2.85	18.4	1.27	32.3
O - 200 - 200	2.00	51	1.87	47	2.00	51	.017	0.43	.065	1.7	2.94	19.0	1.64	41.7
O - 250 - 200	2.50	64	2.31	59	2.00	51	.017	0.43	.095	2.4	4.54	29.3	1.65	41.9
O - 275 - 112	2.75	70	2.44	62	1.12	28	.024	0.61	.155	3.9	5.29	34.1	0.57	14.5
O - 400 - 238	4.00	102	3.69	94	2.38	60	.035	0.89	.155	3.9	11.61	74.9	1.83	46.5
O - 500 - 312	5.00	127	4.50	114	3.12	79	.035	0.89	.250	6.4	17.71	114.3	2.28	57.9
O - 600 - 440	6.00	152	5.50	140	4.40	112	.035	0.89	.250	6.4	25.95	167.4	3.56	90.4
OA - 75 - 85	0.75	19	0.55	14	0.85	22	.017	0.43	.100	2.5	0.33	2.1	0.46	11.7
OA - 106 - 145	1.06	27	0.94	24	1.45	37	.017	0.43	.060	1.5	0.79	5.1	1.12	28.4
OA - 112 - 69	1.12	28	0.94	24	0.69	18	.017	0.43	.090	2.3	0.83	5.4	0.33	8.4
OA - 137 - 53	1.37	35	1.19	30	0.53	13	.017	0.43	.090	2.3	1.29	8.3	0.17	4.3
OA - 200 - 58	2.00	51	1.81	46	0.58	15	.017	0.43	.095	2.4	2.85	18.4	0.20	5.1
OA - 283 - 160	2.83	72	2.52	64	1.60	41	.024	0.61	.155	3.9	5.62	36.2	1.09	27.7
OA - 462 - 350	4.62	117	4.00	102	3.50	89	.035	0.89	.310	7.9	14.58	94.1	2.86	72.6
OA - 475 - 225	4.75	121	4.25	108	2.25	57	.017	0.43	.250	6.4	15.90	102.6	1.22	31.0

Millimeters in Red / *Metric Effective Pressure Area shown in Square Centimeters

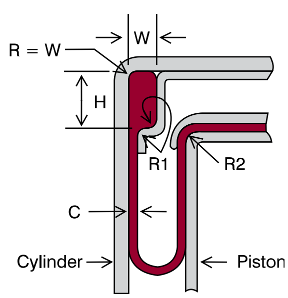
Type OB Diaphragms

General Description

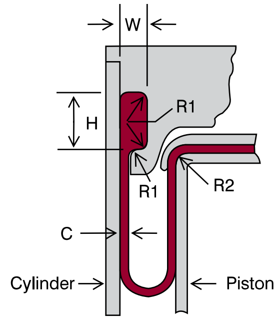
This type of diaphragm has a rectangular bead molded inside the cylinder wall. This design requires the smallest hardware diameter of any diaphragm type. This type of diaphragm has only half the stroke capability of other diaphragm styles of the same height. Because the clamping and sealing of this style diaphragm is against the inside wall of the cylinder, the stroke is restricted to the lower half of the diaphragm.

Hardware Design

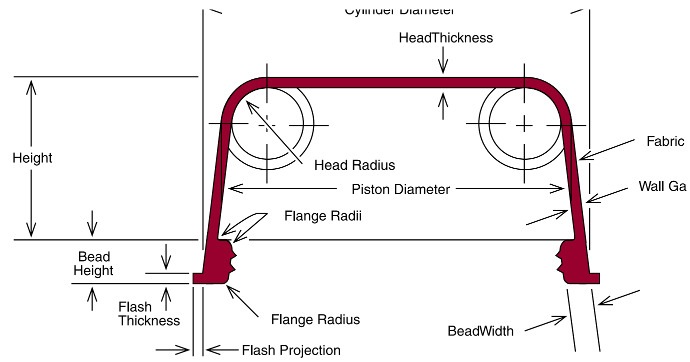
Stamped Retainer Plate Sealing Via Axial Compression



Cast Machined Retainer Plate Sealing Via Radial Compression



Dimensions and Tolerances



Cylinder Diameter	1.00 - 2.50	25 - 64	2.51 - 4.00	64 to 102	4.01 - 8.00	102 - 205	8.01 & up	205 & up
Height	See available sizes table.							
Cylinder Diameter	Tolerances on Cylinder Diameter and Piston Diameter are ± .010" per inch of diameter but the tolerance will be no less than ± .010" or greater than ± .060"							
Piston Diameter								
Piston Radius	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Head Thickness	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Wall Gauge	.017 ± .004	0.43 ± 0.10	.024 ± .004	0.61 ± 0.10	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Flash Projection	.025 Max	0.64 Max	.035 Max	0.89 Max	.040 Max	1.02 Max	.056 Max	1.42 Max
Flash Thickness	.025 Max	0.64 Max	.035 Max	0.89 Max	.040 Max	1.02 Max	.056 Max	1.42 Max
Flange Radius	.031	0.79	.047	1.19	.063	1.60	.063	1.60
Bead Width	.080 ± .003	2.03 ± 0.08	.100 ± .003	2.54 ± 0.08	.120 ± .003	3.05 ± 0.08	.160 ± .003	4.06 ± 0.08
Bead Height	.150± .005	3.81 ± 0.13	.200 ± .005	5.08 ± 0.13	.260± .005	6.60± 0.13	.300 ± .007	7.62 ± 0.18

Cylinder Diameter		Bead Groove Width = W		Bead Groove Height = H		Lip Radius R1		Piston Corner Radius = R2		Lip Clearance C
1.00 - 2.50	25 to 64	.080	2.03	.150	3.81	.030	0.76	.063	1.60	Sidewall Thickness +.003
2.51 - 4.00	64 to 102	.100	2.54	.200	5.08	.040	1.02	.094	2.39	
4.01 - 8.00	102 to 205	.120	3.05	.260	6.60	.050	1.27	.125	3.18	
8.01 and up	205 and up	.160	4.06	.300	7.62	.060	1.52	.188	4.78	

Available Sizes

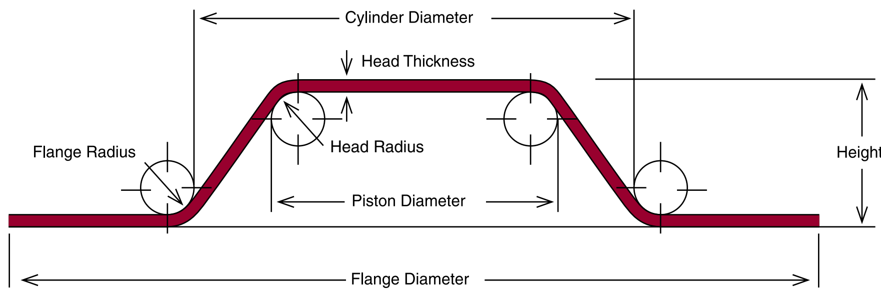
Dia•Com Part No.	Cylinder Diameter		Piston Diameter		Height		Gauge (approx.)		Convolution Width		* Effective Pressure Area		Maximum Half-Stroke	
OB - 250 - 178	2.50	64	2.13	54	1.78	45	.035	0.89	.185	4.7	4.21	27.1	1.39	35.3
OB - 250 - 225	2.50	64	2.13	54	2.25	57	.035	0.89	.185	4.7	4.21	27.1	1.86	47.2
OB - 250 - 258	2.50	64	2.06	52	2.58	66	.035	0.89	.220	5.6	4.08	26.3	2.14	54.4
OB - 300 - 284	3.00	76	2.56	65	2.84	72	.035	0.89	.220	5.6	6.07	39.1	2.39	60.7
OB - 300 - 284	3.00	76	2.63	67	2.84	72	.035	0.89	.185	4.7	6.22	40.1	2.45	62.2
OB - 306 - 338	3.06	78	2.63	67	3.38	86	.035	0.89	.215	5.5	6.35	41.0	2.95	74.9
OB - 362 - 340	3.62	92	3.12	79	3.40	86	.035	0.89	.250	6.4	8.92	57.5	2.33	59.2
OB - 362 - 351	3.62	92	3.12	79	3.51	89	.035	0.89	.250	6.4	8.92	57.5	2.44	62.0
OB - 363 - 406	3.62	92	3.12	79	4.06	103	.035	0.89	.250	6.4	8.92	57.5	3.09	78.5
OB - 388 - 406	3.88	99	3.38	86	4.06	103	.035	0.89	.250	6.4	10.34	66.7	3.09	78.5
OB - 388 - 413	3.88	99	3.33	85	4.13	105	.035	0.89	.275	7.0	10.20	65.8	3.12	79.2
OB - 416 - 195	4.16	106	3.66	93	1.95	50	.035	0.89	.250	6.4	12.00	77.4	0.95	24.1
OB - 416 - 353	4.16	106	3.66	93	3.53	90	.035	0.89	.250	6.4	12.00	77.4	2.53	64.3
OB - 416 - 481	4.16	106	3.66	93	4.81	122	.035	0.89	.250	6.4	12.00	77.4	3.81	96.8
OB - 475 - 374	4.75	121	4.25	108	3.74	95	.035	0.89	.250	6.4	15.90	102.6	2.61	66.3
OB - 475 - 541	4.75	121	4.25	108	5.41	137	.035	0.89	.250	6.4	15.90	102.6	4.28	108.7

Millimeters in Red / *Metric Effective Pressure Area shown in Square Centimeters

General Description

This diaphragm type, commonly referred to as dish-shaped, has a sidewall that slopes gradually from the cylinder to the piston. This diaphragm is designed to be flexed in both directions to its full height. It may be double-coated to take pressure in both directions. Due to its wide convolution and gradual sidewall slope, the total travel and ability to withstand high pressures are limited. The effective pressure also varies through its stroke.

Dimensions and Tolerances



Cylinder Diameter	1.00 - 2.50	25 - 64	2.51 - 4.00	64 to 102	4.01 - 8.00	102 - 205	8.01& up	205 & up
Height	See available sizes table.							
Cylinder Diameter Piston Diameter	Tolerances on Cylinder Diameter and Piston Diameter are ± .010" per inch of diameter but the tolerance will be no less than ± .010" or greater than ± .060"							
Piston Radius	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Head & Flange Thickness	.017 ± .005	0.43 ± 0.13	.024 ± .005	0.61 ± 0.13	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Wall Gauge	.017 ± .005	0.43 ± 0.13	.024 ± .005	0.61 ± 0.13	.035 ± .005	0.89 ± 0.13	.045 ± .007	1.14 ± 0.18
Flange Radius	.063	1.60	.094	2.39	.125	3.18	.125	3.18
Flange Diameter	Cyl Diam. +1"	Cyl Diam. +25.40	Cyl Diam. +1.500	Cyl Diam. +38.10	Cyl Diam. +2"	Cyl Diam. +50.80	Cyl Diam. +2"	Cyl Diam. +50.80

Available Sizes

Dia•Com Part No.	Cylinder Diameter		Piston Diameter		Height		Gauge (approx.)		Convolution Width		* Effective Pressure Area		Maximum Half-Stroke	
P - 106 - 16	1.06	27	1.00	25	0.16	4	.017	0.4	0.03	0.8	0.83	5.4	0.16	4.1
P - 134 - 39	1.34	34	0.91	23	0.39	10	.017	0.4	0.22	5.5	0.99	6.4	0.39	9.9
P - 144 - 40	1.44	37	0.69	18	0.40	10	.010	0.3	0.38	9.5	0.89	5.7	0.40	10.2
P - 206 - 50	2.06	52	1.06	27	0.50	13	.060	1.5	0.50	12.7	1.91	12.3	0.50	12.7
P - 250 - 50	2.50	64	1.50	38	0.50	13	.060	1.5	0.50	12.7	3.14	20.3	0.50	12.7
P - 275 - 50	2.75	70	1.75	44	0.50	13	.060	1.5	0.50	12.7	3.97	25.6	0.50	12.7
P - 275 - 53	2.75	70	1.75	44	0.53	13	.025	0.6	0.50	12.7	3.97	25.6	0.53	13.5
P - 288 - 37	2.88	73	1.88	48	0.37	9	.030	0.8	0.50	12.7	4.45	28.7	0.37	9.4
P - 300 - 50	3.00	76	2.00	51	0.50	13	.060	1.5	0.50	12.7	4.91	31.7	0.50	12.7
P - 325 - 52	3.25	83	1.77	45	0.52	13	.025	0.6	0.74	18.8	4.95	31.9	0.52	13.2
P - 400 - 60	4.00	102	2.75	70	0.60	15	.025	0.6	0.63	15.9	8.94	57.7	0.60	15.2
P - 797 - 62	7.97	202	6.22	158	0.62	16	.080	2.0	0.88	22.2	39.52	254.9	0.62	15.7

Elastomer and Fabric Data

Fabrics

Generally, fabric reinforcement is required when pressure differentials exceed 5 psi across the diaphragm. Some applications may require elastomeric coatings on both sides of the fabric. These materials are available from stock. Due to the many application variables, it is recommended that a Dia•Com representative be consulted to ensure proper selection.

The chart on page 22 lists some of Dia•Com's common fabric styles, as well as some general physical characteristics of various fabric fibers.

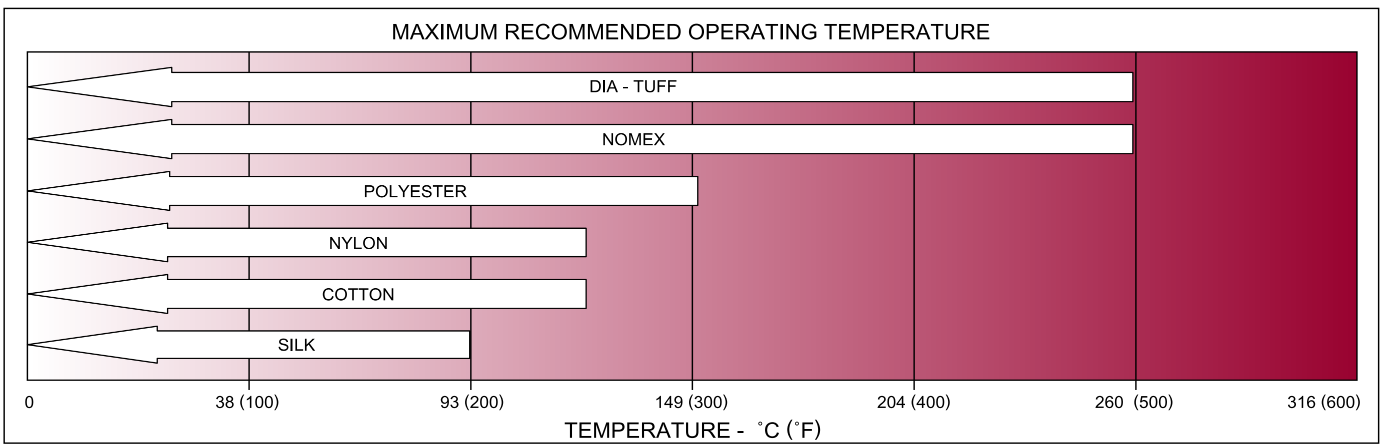
Elastomers

The chart on page 23 lists common elastomers, some physical properties, and compatibility to common chemicals. Other Dia•Com specialty elastomer compounds are available. These include FDA, NSF, and UL-approved compounds used in potable water, food, drug, propane and natural gas applications. Additionally, elastomeric silicone/fluorosilicone blends are available for automotive use. This is a general chart and is in no way intended as the final guide to material selection. Contact a Dia•Com representative for proper elastomer selection.

Millimeters in Red / *Metric Effective Pressure Area shown in Square Centimeters

Typical Fabric Characteristics

DiaCom Fabric Style	Fabric Type	Fabric Gauge (Inches)	Maximum Recommended Operating Temperature	Fabric Tensile Strength (Pounds/Inch)	General Physical Properties
FA-0321	Polyester	.0031 -.0040	150ºC (302ºF)	34	Light weight, special applications
FA-0503	Polyester	.0020 -.0052	150ºC (302ºF)	66	General purpose, high stability, good processability
FA-0708	Polyester	.0078 -.0086	150ºC (302ºF)	154	Heavy duty, high stability
FA-0801	Polyester	.0085 -.0105	150ºC (302ºF)	35	Light to medium duty, good formability
FA-0806	Polyester	.0085 -.0105	150ºC (302ºF)	35	Light to medium duty, good formability
FA-0919	Polyester	.0075 -.0095	150ºC (302ºF)	80	Tight weave, high-strength
FA-0920	Polyester	.0075 -.0095	150ºC (302ºF)	80	Tight weave, high-strength
FA-1202	Polyester	.0088 -.0128	150ºC (302ºF)	114	Heavy duty, good formability
FA-1601	Polyester	.0140 -.0160	150ºC (302ºF)	70	Medium duty, good formability
FA-1602	Polyester	.0140 -.0159	150ºC (302ºF)	69	Medium duty, good formability
FA-2309	Polyester	.0220 -.0250	150ºC (302ºF)	390	Open weave, heavy duty, good formability
FB-0408	Nylon	.0030 -.0050	120ºC (250ºF)	65	Good sensitivity, medium strength, unbalance weave
FB-0812	Nylon	.0060 -.0090	120ºC (250ºF)	210	High strength, limited formability
FB-1111	Nylon	.0142 -.0154	120ºC (250ºF)	275	High strength, good formability
FB-2806	Nylon	.0250 -.0280	120ºC (250ºF)	825	Extreme heavy duty, good abrasion resistance
FC-0604	Nomex	.0068 -.0077	260ºC (500ºF)	115	High temperature, heavy duty
FC-0702	Nomex	.0073 -.0091	260ºC (500ºF)	42	High temperature, light to medium duty, good formability
FC-0905	Nomex	.0084 -.0096	260ºC (500ºF)	105	High temperature, heavy duty, limited formability
FV-1001	DiaTuff	.0090 -.0130	260ºC (500ºF)	600	Extreme heavy duty, good formability
FCDA-1015	Viton Coated Polyester	.0090 -.0120	150ºC (302ºF)	50	Medium duty, good chemical resistance
FCGB-0806	Nitrile Coated Nylon	.0075 -.0085	120ºC (250ºF)	150	Medium duty, good formability
FCGB-1325	Nitrile Coated Nylon	.0110 -.0150	120ºC (250ºF)	150	Medium duty, good formability
FCGB-1330	Nitrile Coated Nylon	.0110 -.0150	120ºC (250ºF)	150	Medium duty, good formability
FCGB-1251	Nitrile Coated Nylon	.1130 -.1370	120ºC (250ºF)	350	High strength, good formability
FCGB-8513	Nitrile Coated Nylon	.0820 -.0900	120ºC (250ºF)	350	High strength, limited formability
FCGD-0602	Nitrile Coated Silk	.0050 -.0065	100ºC (212ºF)	28	Ultra sensitive, fuel resistant
FCGE-1032	Nitrile Coated Cotton	.0080 -.0120	150ºC (302ºF)	55	Medium duty, good formability
FCGA-0605	Nitrile Coated Polyester	.0050 -.0070	120ºC (250ºF)	100	Medium duty, good formability



GENERAL CHEMICAL COMPATABILITY						
PROPERTY	**SILK**	**COTTON**	**NYLON**	**POLYESTER**	**NOMEX**	**DIA-TUFF**
RELATIVE TENSILE STRENGTH	MODERATE	MODERATE	VERY HIGH	HIGH	HIGH	EXTREME
RESISTANCE TO:						
HEAT DEGRADATION	LOW	GOOD	VERY GOOD	VERY GOOD	EXCELLENT	EXCELLENT
MILDEW	FAIR	POOR - FAIR	GOOD	GOOD	EXCELLENT	EXCELLENT
ALKALIS	POOR	GOOD	GOOD	FAIR	GOOD	GOOD
WEAK ACIDS	FAIR	GOOD	FAIR	GOOD	FAIR	EXCELLENT
STRONG ACIDS	POOR	POOR	POOR	FAIR -GOOD	POOR	EXCELLENT
OXIDIZING AGENTS	POOR	FAIR	FAIR	GOOD	POOR	EXCELLENT
ORGANIC SOLVENTS	POOR	EXCELLENT	VERY GOOD	GOOD	GOOD	EXCELLENT
RELATIVE COST	MOD - HIGH	MODERATE	MODERATE	MODERATE	HIGH	VERY HIGH

The data shown in these charts and tables is based upon information from material suppliers and careful examination of available publications and is believed to be accurate and reliable; however, it is the user's responsibility to determine suitability for use. You should thoroughly test any proposed use of our materials and independently conclude satisfactory performance in your application.

For more information call the DiaCom Corporation, 5 Howe Drive, Amherst, NH 03031 - Tel. 603-880-1900

Chemical Compatibility Table

	BUTYL	ETHYLENE PROPYLENE	FLUORO-CARBON	FLUORO-SILICONE	HYDRIN	NATURAL RUBBER	NEOPRENE	NITRILE	SILICONE	STYRENE BUTADYENE
	IIR	EPDM	FKM	FVMQ	CO / ECO	NR	CR	NBR	VMQ	SBR
PHYSICAL PROPERTIES										
COMPRESSION SET RESISTANCE	GOOD	FAIR	GOOD - EXCEL.	FAIR - GOOD	FAIR - GOOD	GOOD	FAIR - GOOD	GOOD	GOOD - EXCEL.	GOOD
DUROMERTER RANGE (SHORE A)	30 - 100	30 - 90	50 - 95	35 - 80	30 - 95	30 - 100	40 - 95	20 - 90	25 - 90	40 - 100
ELONGATION %	300 - 800	200 - 800	100 - 450	100 - 500	300 - 400	300 - 500	650 - 850	400 - 600	90 - 900	400 - 550
TENSILE STRENGTH (PSI)	2,000+	1,500 - 3,000	1,500 - 3,000	350 - 850	1,500 - 2,000	4,000 +	2,000 - 3,000	1,000 - 3,500	600 - 1,500	2,000 +
NITROGEN PERMEABILITY RESISTANCE	EXCELLENT	GOOD	EXCELLENT	POOR	EXCELLENT	GOOD	FAIR	GOOD	POOR	FAIR
RESILIENCE	EXCELLENT	GOOD	FAIR	GOOD	GOOD	EXCELLENT	EXCELLENT	GOOD	POOR - EXCEL.	GOOD
MECHANICAL RESISTANCE PROPERTIES										
ABRASION	GOOD	GOOD	GOOD	FAIR	FAIR - GOOD	EXCELLENT	GOOD	EXCELLENT	POOR - EXCEL.	EXCELLENT
ELECTRICAL PROPERTIES - INSULATING	GOOD	EXCELLENT	FAIR	EXCELLENT	POOR - FAIR	EXCELLENT	FAIR	FAIR	EXCELLENT	EXCELLENT
- CONDUCTIVE	FAIR	POOR	EXCELLENT	POOR	EXCELLENT	POOR	FAIR	FAIR	POOR	POOR
IMPACT	GOOD	GOOD	POOR - GOOD	FAIR	GOOD	EXCELLENT	GOOD	FAIR	POOR - GOOD	EXCELLENT
TEAR	GOOD	POOR	POOR - GOOD	FAIR	GOOD	EXCELLENT	GOOD	GOOD	POOR - GOOD	FAIR
TEMPERATURE RESISTANCE PROPERTIES										
COLD TEMPERATURE FLEXIBILITY	GOOD	GOOD	FAIR - GOOD	GOOD	GOOD	GOOD	FAIR	GOOD	EXCELLENT	GOOD
FLAME RETARDANCE	POOR	POOR - FAIR	EXCELLENT	OUTSTANDING	FAIR	POOR	GOOD	POOR - FAIR	FAIR - POOR	POOR
HEAT AGING	GOOD	EXCELLENT	OUTSTANDING	OUTSTANDING	EXCELLENT	GOOD	GOOD	GOOD	EXCELLENT	GOOD
ENVIRONMENTAL RESISTANCE PROPERTIES										
OZONE GOOD		EXCELLENT	OUTSTANDING	OUTSTANDING	EXCELLENT	POOR	EXCELLENT	POOR	EXCELLENT	POOR
RADIATION	FAIR - GOOD	POOR	FAIR - GOOD	GOOD - EXCEL.	FAIR	FAIR - GOOD	FAIR - GOOD	FAIR - GOOD	FAIR - EXCEL.	GOOD
WEATHER EXCELLENT		EXCELLENT	EXCELLENT	OUTSTANDING	GOOD	FAIR	EXCELLENT	GOOD	EXCELLENT	FAIR
CHEMICAL RESISTANCE PROPERTIES										
ACID - DILUTE CONCENTRATION	FAIR	GOOD - EXCEL.	FAIR - GOOD	GOOD - EXCEL.	FAIR - GOOD	FAIR - GOOD	GOOD - EXCEL.	FAIR - GOOD	FAIR - GOOD	FAIR - GOOD
ALIPHATIC HYDROCARBONS	POOR	POOR	EXCELLENT	EXCELLENT	EXCELLENT	POOR	GOOD	EXCELLENT	POOR - FAIR	POOR
ALKALI - DILUTE CONCENTRATION	FAIR-GOOD	GOOD - EXCEL.	GOOD - EXCEL.	GOOD - EXCEL.	FAIR - GOOD	FAIR - GOOD	GOOD - EXCEL.	GOOD - EXCEL.	GOOD - EXCEL.	FAIR - GOOD
AROMATIC HYDROCARBONS	POOR	POOR	EXCELLENT	GOOD - EXCEL.	EXCELLENT	POOR	FAIR	FAIR - GOOD	POOR	POOR
ATF TYPE A	POOR	POOR	EXCELLENT	EXCELLENT	GOOD	POOR	GOOD	EXCELLENT	GOOD	POOR
CHLORINATED HYDROCARBONS	POOR	POOR	EXCELLENT	GOOD - EXCEL.	GOOD - EXCEL.	POOR	POOR	FAIR - GOOD	POOR	POOR
DIESEL OIL	POOR	POOR	EXCELLENT	GOOD	EXCELLENT	POOR	FAIR	GOOD - EXCEL.	POOR	POOR
DIESTER LUBRICANTS	POOR	POOR	EXCELLENT	EXCELLENT	GOOD	POOR	POOR	FAIR - GOOD	POOR	POOR
EP LUBICANTS	POOR	POOR	EXCELLENT	EXCELLENT	POOR	POOR	POOR - FAIR	FAIR	GOOD	POOR
ETHYL ALCOHOL	FAIR	GOOD - EXCEL.	EXCELLENT	EXCELLENT	GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	FAIR
ETHYLENE GLYCOL	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	GOOD - EXCEL.	EXCELLENT	EXCELLENT	EXCELLENT	GOOD
ETHYLENE GLYCOL/WATER	FAIR - GOOD	GOOD	GOOD	GOOD	FAIR	FAIR - GOOD	GOOD	GOOD	EXCELLENT	GOOD
GASOLINE	POOR	POOR	EXCELLENT	EXCELLENT	GOOD - EXCEL.	POOR	FAIR	GOOD - EXCEL.	POOR	POOR
HYDRAULIC FLUIDS - PETROLEUM BASE	POOR	POOR	EXCELLENT	EXCELLENT	EXCELLENT	POOR	POOR - FAIR	FAIR - GOOD	POOR	POOR
- SILICATE ESTER	FAIR	POOR	EXCELLENT	OUTSTANDING	FAIR - GOOD	POOR	GOOD	GOOD	POOR	POOR - FAIR
- PHOSPHATE ESTER	GOOD	GOOD	POOR	POOR	POOR	POOR - FAIR	FAIR	POOR	GOOD	POOR
KETONES	GOOD	FAIR - EXCEL.	POOR	POOR	FAIR	FAIR - GOOD	FAIR	POOR	FAIR - GOOD	GOOD
LUBICATING OILS - HIGH ANILINE	FAIR	POOR	EXCELLENT	EXCELLENT	EXCELLENT	POOR	GOOD	GOOD - EXCEL.	GOOD	POOR
- LOW ANILINE	GOOD	POOR	EXCELLENT	EXCELLENT	EXCELLENT	POOR	FAIR	FAIR - EXCEL.	POOR - FAIR	POOR
SILICONE OIL	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	FAIR - GOOD	EXCELLENT	GOOD	POOR	GOOD
STEAM - ABOVE 121˚C (250˚f)	POOR - FAIR	EXCELLENT	FAIR	POOR - FAIR	POOR	POOR	FAIR	FAIR	POOR - FAIR	POOR - FAIR
WATER - 100˚C (212˚F)	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	EXCELLENT

The compatability data shown in this chart is based upon information from material suppliers and careful examination of available publications and is believed to be accurate and reliable; however, it is the user's responsibility to determine suitability for use. You should thoroughly test any proposed use of our materials and independently conclude satisfactory performance in your application.

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DIA•COM CORPORATION
The Diaphragm Company

Application Data Form

THANK YOU for your request for engineering assistance. Answers to the following questions will provide our Engineering Department with information to assist in the analysis for your specific application. Please make a photocopy of this page and telefax completed form to the FAX number listed below. **Where possible, please provide prints**, **layouts, or sketches** of the proposed diaphragm and installation.

Type of Mounting ________________

Piston Diameter ________________ Inches

Up-Stroke* ________________ Inches

Down-Stroke* ________________ Inches

Total Stroke ________________ Inches

Minimum Pressure ________________ P.S.I.

Normal Pressure ________________ P.S.I.

Maximum Pressure** ________________ P.S.I.

Reverse Pressure ________________ P.S.I.

Pressure Differential ________________ P.S.I.

Cylinder Bore Diameter ________________ Inches

Height ________________ Inches

Minimum Operating Temperature ________ °F

Normal Operating Temperature ________ °F

Maximum Temperature ________________ °F

Time Interval at High Temperature ________

*Stroke as measured from flange

**Operating and Surge

Fluid or Gas in Contact with Diaphragm on High Pressure Side ________________________

Fluid or Gas in Contact with Diaphragm on Low Pressure Side ________________________

Estimated # of Cycles Required for Satisfactory Performance ________ Approx. Cycle Rate ____________

Trim and Perforation Requirements ________________________________

(Submit sketch or drawing if special trim/perforation requirements.)

Annual Quantity Requirements ________________ Delivery / Release Requirements ________________

Customer Part or Print No. ________________

If this is a current production part, please indicate any quality or performance problems you may be encountering. If appropriate, submit a sample part for Engineering Evaluation.

Please list any special requirements or environmental considerations not covered above:

Please Print Below:

Date ________________________________

Name ________________________________ Title ________________

Company ________________________________ Phone ________________

Street ________________________________ Fax ________________

City ________________________________ State ________ Zip ________

Country ________________________________

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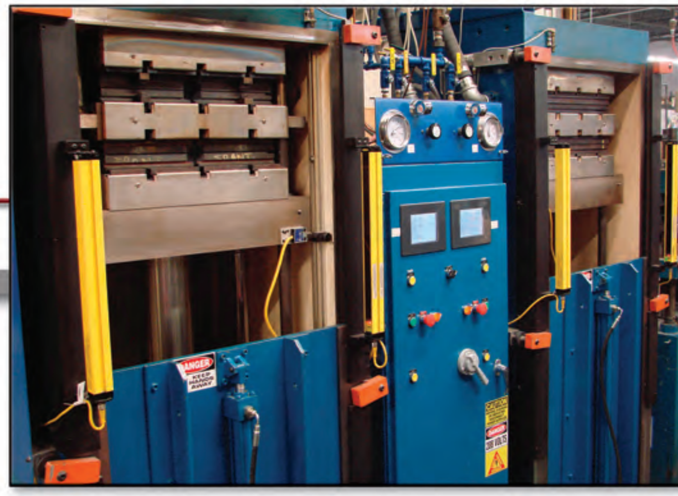
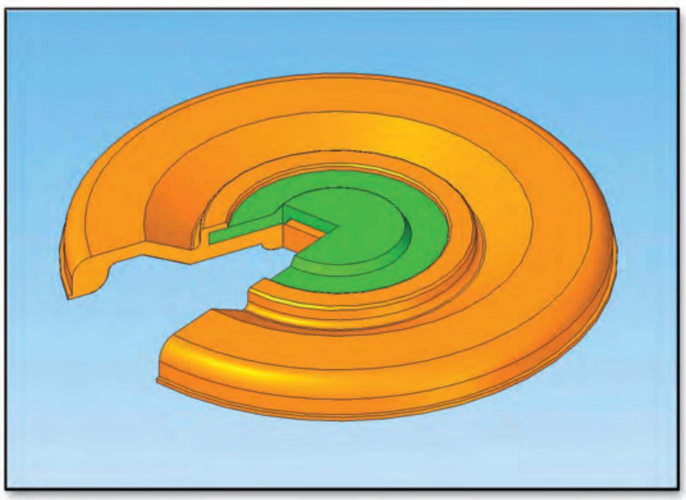


Dia•Com's Quality Systems are certified to the ISO/TS16949:2002 Quality Management System, an International Standard developed to supercede the QS-9000 Quality system. ISO/TS16949:2002 uses a process approach when developing, implementing, and improving the effectiveness of a quality management system, to enhance customer satisfaction by meeting customer requirements. Dia•Com's "Diatrac" system enables 100% lot traceability. SPC, FMEA's, 8D analysis, Process Control Plans, and Process Capability Studies are routinely used in accordance with automotive and industrial requirements. Zero-Defect sampling and continual in-process quality audits insure dimensional and material integrity.

Microprocessor-Controlled Production Presses designed specifically for the production of fabric-reinforced and homogeneous elastomeric diaphragms. Our new production presses are built with high strength components. The microprocessors closely control the vulcanization process, thus assuring precise, repeatable control of the molding process. The result is high quality, low cost diaphragm production.

Dia•Com utilizes unique compression and transfer molding processes to maximize efficiencies and insure the dimensional integrity of each part.



Computer Aided Drafting electronically enhances Dia•Com's abilities to provide accurate custom tooling designs on a timely basis. Dia•Com's application engineers routinely assist customers in the design of 3D drawings, standard or special diaphragms. Dia•Com uses only high strength steel for production and prototype molds. Dia•Com's internal tool shop has complete CNC machining capabilities that allows for quick turnaround on prototype and production tooling.

Dia•Com's International Corporate Headquarters was specifically designed and constructed for state-of-the-art molded elastomeric diaphragm design and manufacturing. The 30,000 square foot facility, completed during the spring of 1994, had detailed planning and consideration given to material flow, HVAC and electrical systems, as well as future expansion.

DIA·COM CORPORATION
603 880.1900 • 800 632.5681
www.diacom.com • www.dia-soft.net
An ISO/TS 16949:2002 Certified Company

MOLDED DIAPHRAGMS – IDEAL SOLUTIONS TO TOUGH SEALING PROBLEMS

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