Manufacturing Company Limited
8238 – 129th Street
Surrey, B.C. Canada V3W 0A6
Telephone: 604-572-3935
Fax: 604-590-8313
http://www.kobelt.com

BASIC OPERATING PRINCIPLE

OF

KOBELT PNEUMATIC PARTS

"Leaders in Quality Marine Controls, Steering Gear, and Disc Brakes."

NOTES ON WARRANTY

Kobelt Manufacturing provides installation and maintenance instructions for its products. If these guidelines are not followed, the warranty will be voided.

For detailed instructions, please contact our Distributors or go to our website at http://www.kobelt.com

BASIC OPERATING PRINCIPLES OF KOBELT PNEUMATIC COMPONENTS

The purpose of this section is to remove the mystery of how pneumatic components function. We feel that this will of great benefit to all personnel involved with Kobelt pneumatic control components. All the illustrations show only the most essential parts in order to provide a better and clearer view of the basic operating principles.

The color scheme chosen is to show the pressure level in individual section. The darker gray denotes a higher pressure and the lighter color denotes a lower pressure.

Some control systems and machinery packages can be very complex in their design. However, if the basic principles of operation for each component are understood, any person with some mechanical aptitude should be able to work their way through the system and provide a clear overview for troubleshooting and maintenance. In many instances a failure in control response could be due to a malfunction in associated equipment and a good service technician can then point out to the customer precisely where the problem lies.

3-WAY AND 4-WAY VALVES

Kobelt control valves and pneumatic devices are all designed around the poppet valve principle. The poppet valve is the least sensitive to dirt, leakage and sticking. Since our primary aim is to provide a trouble free system, we have chosen this type of valve.

3-Way Valve

The 3-way valve illustrated in Figure 1 is shown in the closed position with the control stem outward. The air entering the "IN" port is trapped behind the seat and the poppet and has no way of going past these two parts. Any accumulated air in the "OUT" line is allowed to exhaust via the hollow stem through the "EXHAUST" port to atmosphere.

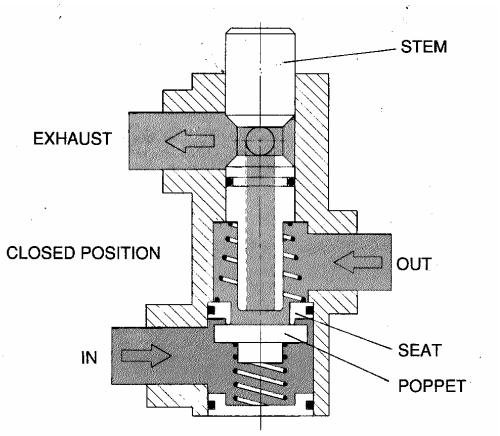

FIGURE 1

The 3-way valve illustrated in Fig. 2 is shown with the stem moved inward to an open position and permits air flow from the "IN" port to the "OUT" port therefore energizing the actuator attached to this valve. The hollow stem is seated against the inner portion of the poppet and does not permit exhaust of air to atmosphere while the valve is in this position.

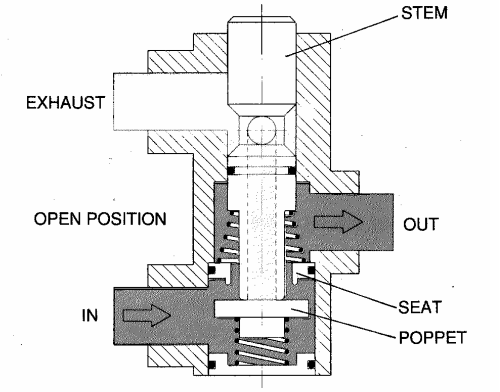

FIGURE 2

4-Way Valve

The Kobelt 4-way valve consists of two 3-way valves combined into one housing with a common supply. These valves are not pressure compensating but, are intended strictly for on/off use.

The poppet in this type of valves should provide at least 10-15 years of quality service. The "O" ring on the stem should normally last a minimum of 6 years. After dismantling this valve, be sure to re-install all components properly (refer to product sheet). It is important that no foreign matter enters the system or the valve.

SHUTTLE VALVE

The purpose of the Shuttle Valve is to provide a common resulting line from two different sources of supply. For example if two 3-way valves are used to control a common cylinder and these two units are inter-connected with an ordinary Tee fitting, the control air pressure from one control could exhaust out from the exhaust port of the second control. Consequently a device such as a 2-way check valve or Shuttle Valve is required to prevent this from happening.

Figure 1 shows the control air pressure coming in from “LINE 1” and going out the “RESULTING LINE”. The air pressure causes the shuttle to slide towards “LINE 2” and seal against the “RUBBER WASHER” thus preventing air from leaking out through the device attached at the end of Line two.

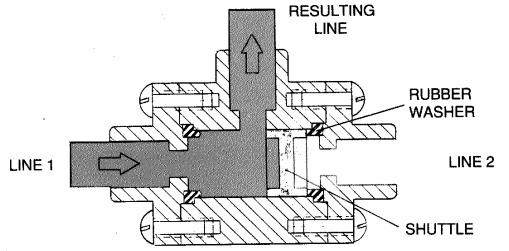

FIGURE 1

Figure 2 shows the Shuttle Valve with full line pressure entering “LINE 2” and partial line pressure in “LINE 1”. The higher air pressure in “LINE 2” is capable of moving the shuttle against the “RUBBER WASHER” thus preventing air from leaking past this seal into “LINE !”.

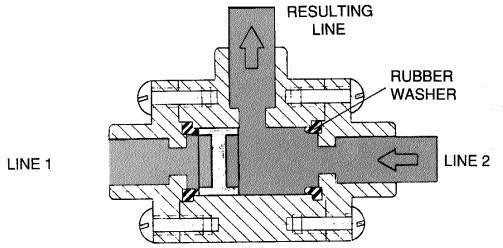

FIGURE 2

Figure 3 shows an equal air pressure coming from two sources of supply and also going downstream via a “RESULTING LINE”. Please note that the cylindrical bore for the resulting line is opened up to allow air passage with the shuttle sitting mid position (Model 3010).

However, with a regular Shuttle Valve such as a model 3009 (without the internal relief on either side), the shuttle would seal the port of the resulting line prohibiting air flow to the controlled device.

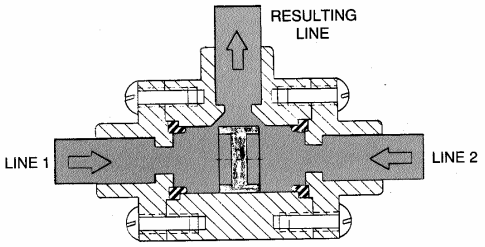

FIGURE 3

An important factor to remember is that ***the supply line to a shuttle valve should never be plugged***. Plugging of a supply line (line 1 or 2) will result in a gradual accumulation of pressure which will eventually reach maximum line pressure. This will render the Shuttle Valve inoperative and cause loss of control.

The Shuttle Valve should ***always be installed with the cylindrical bore in a horizontal position***. The rubber seals are the only parts that require replacement after approximately 6-10 years of use. If the system is kept clean no metal parts should ever be required.

QUICK RELEASE VALVE

The Quick Release Valve serves as a device in a control circuit for exhausting air without returning it to the original source of supply. The name itself defines its function very clearly. Its main purpose is to dump air quickly.

In Figure 1, the valve is illustrated with high pressure coming from the control device to the "IN" port. This is causing the outer rim of the diaphragm to deflect downward, pushing the spring and retainer plate down in the same direction, which will permit air flow to the "OUT" ports.

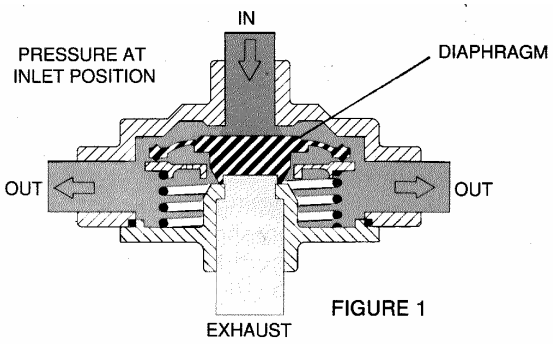

FIGURE 1

In the equilibrium position shown in Figure 2 the outgoing pressure is now equal to the supply pressure. The diaphragm is returned to its original position sealing against both the "EXHAUST" and the "SUPPLY" seat.

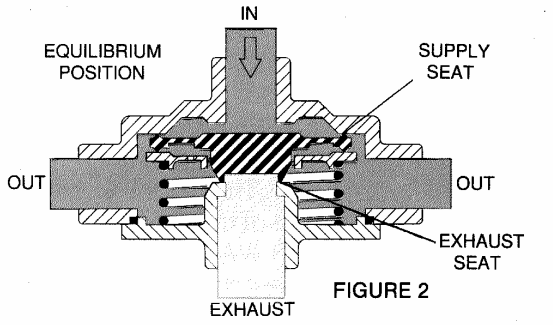

FIGURE 2

In Figure 3 the Quick Release Valve is shown with the supply pressure vented to atmosphere. The accumulated air in the system now forces the diaphragm against the "INNER SEAT" of the "IN" port, which permits venting of the system to atmosphere via the "EXHAUST" port of the Quick Release Valve.

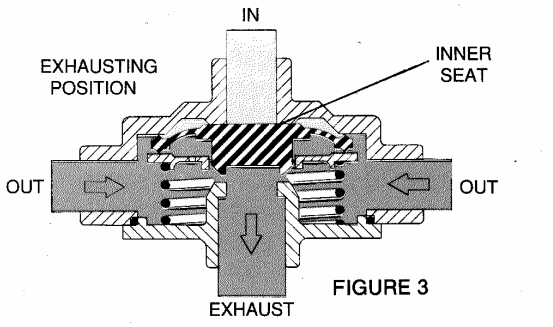

FIGURE 3

The Quick Release Valve as illustrated in Figure 2 shows its natural position. In this position the rubber diaphragm must make contact at the upper edges of the supply cavity and at the exhaust seat without deflecting the diaphragm in an upward position. There should be no clearance between the exhaust portion of the diaphragm and the Quick Release housing cap.

The Quick Release Valve should always be ***installed with the exhaust port facing down*** to avoid dirt entering the valve. The only replacement parts required in this valve is the diaphragm, which normally provides 6-10 years of trouble free service.

RELAY VALVE

The basic purpose of a Relay valve in pneumatic control circuitry is to provide interlocks and delays of various pneumatic actions. The pilot line, which is the control element of the relay, overcomes the adjustable spring setting to either open or close. It is important that the spring setting conforms to the requirements of the system. Setting a normally open relay valve spring too low will result in the valve remaining closed at all times. At the same time, setting a normally closed relay valve spring above the available air pressure will result in the valve not opening. A flow control valve used in conjunction with an accumulator tank will further assist the timing range of these adjustable relays.

It is recommended that the valve be mounted with the adjusting means at the top and the supply and outlet ports at the bottom.

The Relay Valve illustrated on this page is a normally open type. It is basically the same as a mechanically operated 3-way valve with its in, out and exhaust ports (as illustrated on 3-Way Valve section).

In Figure 1 the valve is shown in its open position with the spring forcing the stem down. This permits flow of air from the "IN" port to the "OUT" port. Air cannot escape out of the "EXHAUST" port since the lower part of the stem is sealed against the poppet.

Figure 2 illustrates the valve in its closed position. The pilot air pressure is accumulated under the diaphragm which causes the spring to compress and in turn retract the stem which causes the poppet to seat. This stops the flow of air from the supply to the valve. At the same time any accumulated air in the "OUT" line and attached components is permitted to enter the hollow stem and exhaust to atmosphere via the "EXHAUST" port.

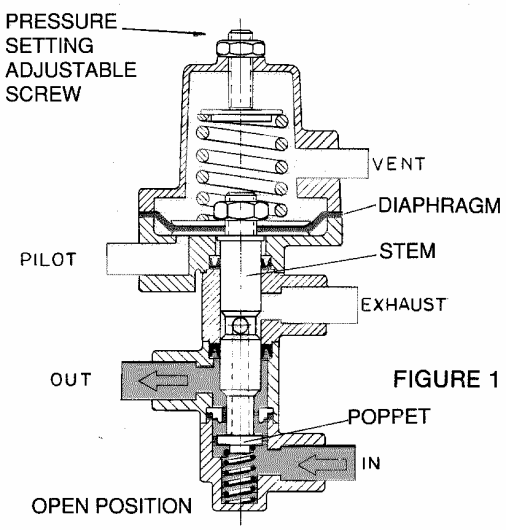

FIGURE 1

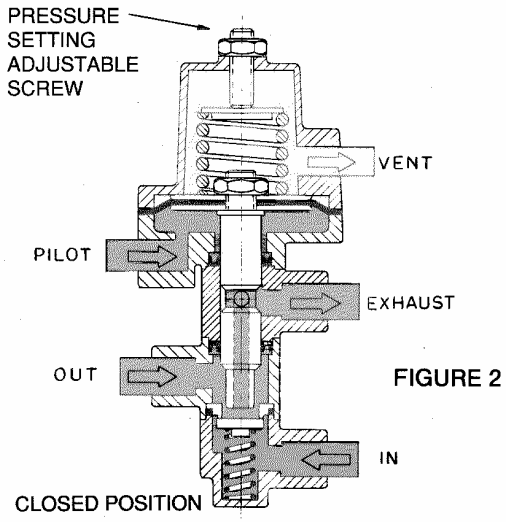

FIGURE 2

It is important to remember that *the* ***vent port must not be plugged*** in order to allow the diaphragm to move without back pressure. The pressure setting screw on top of the valve will permit in-field fine adjustment of the valve pressure setting point. Several springs are available which will provide a complete range of pressure settings from 15 to 140 psi.

The synthetic rubber parts in all Kobelt Relay Valves should provide 6-10 years of service. When dismantling valves of this nature, it is important to ***avoid dirt and foreign matter from entering the control system and valve***.

RELAY VALVE

The valve illustrated on this page is normally closed. It is basically the same as the valve shown on the preceding page but with function of the valve reversed.

Figure 1 shows the valve in its normally closed position with the spring pulling the diaphragm stem up which allows the valve stem to follow. This stops the flow of air through the valve and will permit all accumulated air in the “OUT” line to exhaust via the “EXHAUST” port.

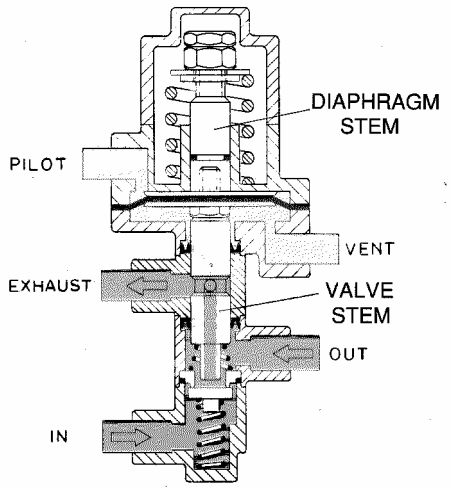

FIGURE 1

Figure 2 shows the valve with sufficient pilot pressure entering the diaphragm cavity to overcome the spring thus depressing the valve stem downward and permitting flow of air from the “IN” port to the “OUT” port. The “EXHAUST” port at this point is sealed.

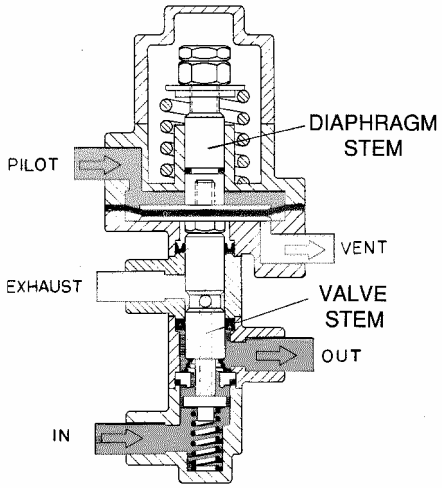

FIGURE 2

Figure 3 illustrates a normally open relay valve with two diaphragms. These relay valves are used for dual piloting and can be extremely useful in interlocking circuits. The reason for the two diaphragms is to avoid double deflection of the diaphragm which could result in premature failure. Also, in case of diaphragm failure, the pilot pressure cannot be cross-fed back into the system, since the spacer piece provides for venting to atmosphere.

The basic operating principles of this valve are the same as the foregoing valves. It is also available in a normally closed version.

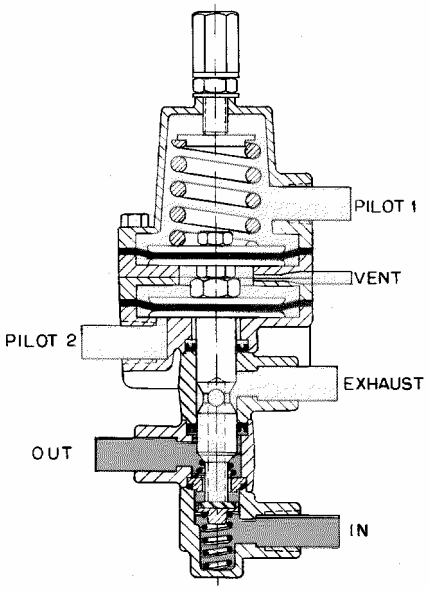

FIGURE 3

KOBELT

PRESSURE COMPENSATING REGULATOR VALVE

The purpose of the pressure compensating regulator is to provide an infinitely variable output pressure signal. There is a direct relation between the mechanical input stem position and the amount of accumulated air in the control system. The balance is obtained with air pressure against a reactor spring. The rolling diaphragm makes these valves very accurate due to the low friction.

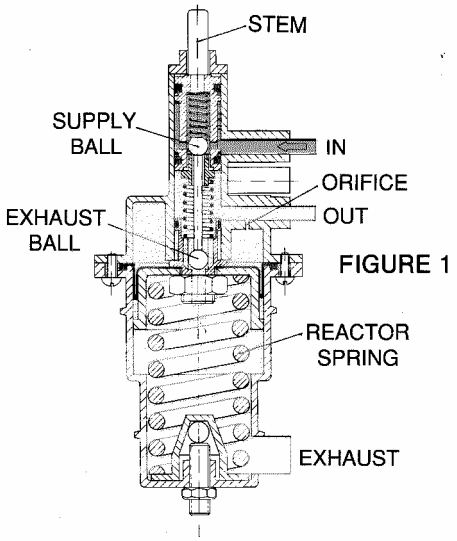

FIGURE 1

The air pressure entering the “IN” port is held in check until the “STEM” is depressed downward (see Fig. 1). This downward movement will create an opening between the supply ball and the seat thus allowing air to flow to the “OUT” port (see Fig. 2). Air pressure goes to the “OUT” port and via the orifice to the piston chamber, then compresses the reactor spring at the bottom of the valve until such a point that both supply and exhaust valve balls are seated into their respective seats. This will cause an equilibrium point whereby no air flow will take place. Allowing the “STEM” to move upwards will cause the exhaust ball to lift itself from its respective seat and permit exhaust of air to atmosphere. This will allow the main reactor spring to push the seat upwards until the valve is in a balanced position again.

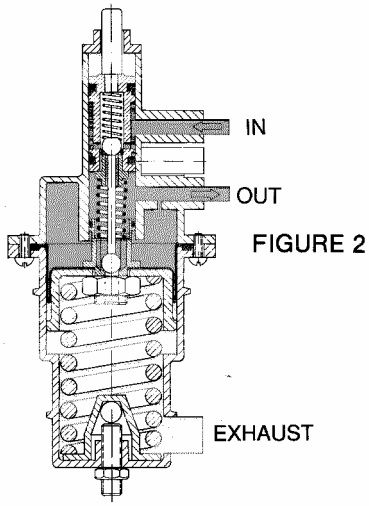

FIGURE 2

These valves are manufactured in three different pipe sizes, 1/8”, 1/4” and 1/2” N.P.T. ***It is important to keep these valves free from dirt and foreign matter since the valve seat and the valve ball are quite sensitive to dirt*.** **Caution should be taken to avoid dirt entering the pneumatic control system during installation and operation.**

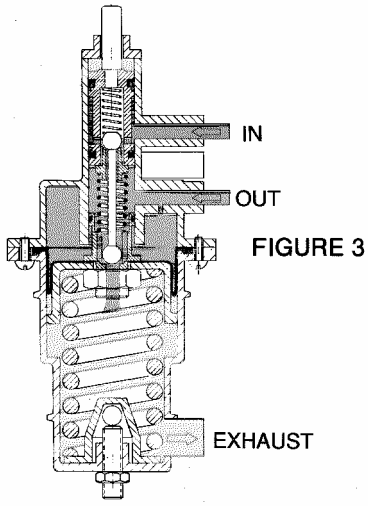

FIGURE 3

A filter in the supply line is essential. Steel and iron tubing are not recommended. This valve should operate for 6-10 years without problems. Only synthetic rubber parts and diaphragms will be required for overhaul.

KOBELT

PNEUMATIC POSTIONERS

Single direction positioning units (Figures 1 and 2) are required for the control of engine speed, etc. Two direction control devices (Figures 3 and 4) are used for such applications such as variable delivery hydraulic pumps, controllable pitch propellers and many other applications where two direction positioning is required.

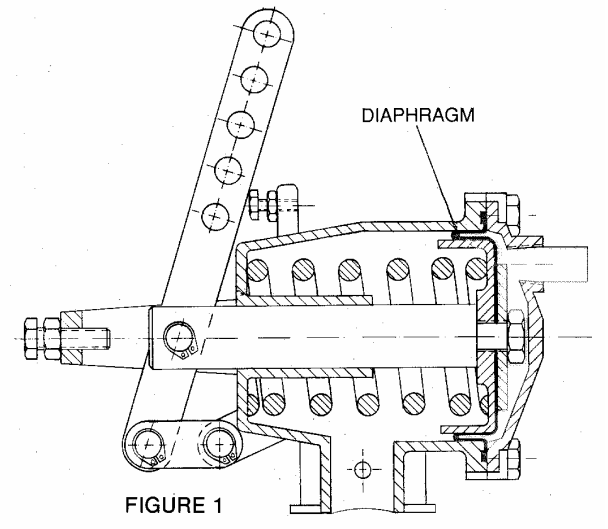

FIGURE 1

Figure 1 shows atmospheric pressure behind the spring and diaphragm assembly. The piston rod and output linkage are in their most retracted position.

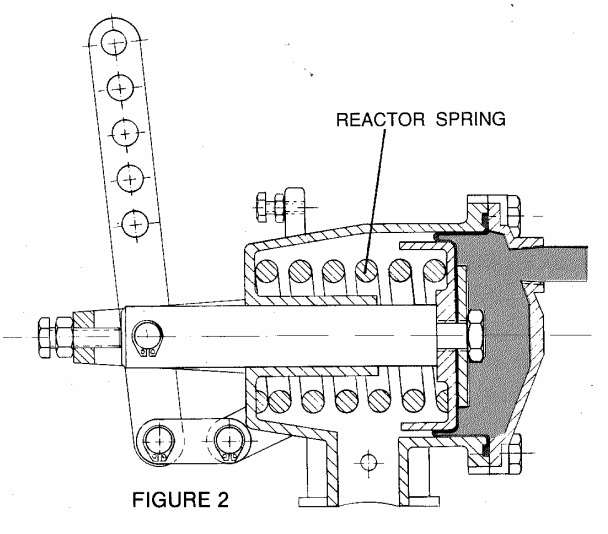

FIGURE 2

In Figure 2, increasing the air pressure will cause a compression of the reactor spring, which in turn causes the piston rod and linkage to move outward proportionally to the input pressure.

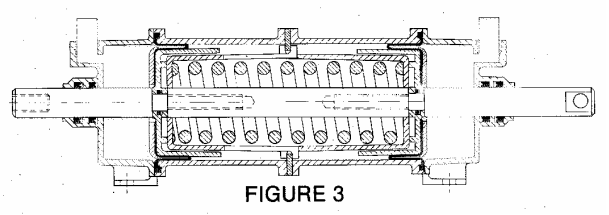
FIGURE 3

Figure 3 shows a positioning device in its neutral and relaxed position and atmospheric pressure at both ends of the cylinder.

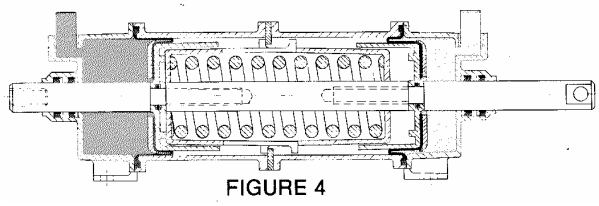
FIGURE 4

Figure 4 shows the cylinder with air pressure accumulated at the left hand side behind the diaphragm and piston assembly. This causes the piston rod to move to the right. The spring is retained by a spring housing which is caged behind a center ring. Again a rolling diaphragm and spring permits infinite positioning in both directions. In order to prevent premature damage to the diaphragm, it is recommended to maintain a 2-3 psi pressure at all times at both end of the cylinder.