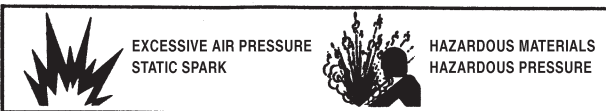




AIR DRIVEN DIAPHRAGM PUMPS

(1/4", 1/2", 1", 1 1/2" & 2")

OPERATION AND
SERVICE GUIDE
O-1210
AUG. 1998



Refer to Bulletin P-605 and Parts
List P-9120.

AIR DRIVEN, DOUBLE DIAPHRAGM PUMP MANUAL

Congratulations on purchasing one of the most durable and versatile pumps made anywhere. With the proper installation and maintenance the pump will provide years of great performance.

READ THESE WARNINGS AND SAFETY PRECAUTIONS PRIOR TO INSTALLATION OR OPERATION. FAILURE TO COMPLY WITH THESE INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND OR PROPERTY DAMAGE. RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE.

⚠ WARNING Before placing the pump in service make certain it is compatible with the fluid being pumped. Changes of temperature, concentrations or combinations of chemicals may vary resistance of material. Always consult Material Safety Data Sheets and Engineering Resistance Tables for chemical compatibility.

- Be certain all operators of this equipment have been trained for safe working practices.

⚠ DANGER HAZARDOUS MATERIAL: Protective eye wear and clothing should be used whenever pumping hazardous or toxic fluids.

- If a diaphragm ruptures, the pumped product can enter the air side of the pump and exit through the air exhaust. When the fluid is hazardous pipe exhaust away from the work area and personnel.
- When the fluid source is at a higher level than the pump (flooded suction), the exhaust should be piped to a higher level than the fluid source to prevent spills caused by siphoning if a diaphragm rupture should occur.

⚠ DANGER HAZARDOUS PRESSURE: Do not clean or service pump, hoses or dispensing valves when the system is pressurized - serious injury may result.

- Disconnect air supply line and relieve pressure from the system prior to disassembly.

⚠ DANGER STATIC WARNING: Pumping of flammable materials may cause a build-up of a static charge within the electrically non conductive pumps. Static spark can cause explosion resulting in severe injury or death. Ground pump and pumping systems when pumping flammable products or when used in a location where surrounding atmosphere is conducive to spontaneous combustion. Optional conductive non-metallic models are available when grounding is necessary. Use grounding lugs and always connect to a good ground source.

- Secure pump, connections and all contact points to avoid vibrations and generation of contact or static spark. Periodically verify continuity of electrical path to ground with an ohmmeter from each component.
- Consult local building codes and electrical codes for specific grounding requirements.
- Use hoses incorporating a static wire.
- Use proper ventilation
- Keep flammables away from heat, open flames and sparks.
- Keep containers closed when not in use.

⚠ WARNING Maximum temperatures are based on mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperature. Consult engineering guides for chemical compatibility and temperature limits.

- Always use minimum air pressure when pumping at elevated temperatures.

⚠ WARNING Excessive air pressure can cause pump damage, personal injury or property damage.

⚠ WARNING Pump must be reassembled properly after maintenance.

⚠ CAUTION Do not use the pump for the structural support of the piping system. Be certain the system components are supported to prevent stress on the pump parts.

- Flexible connections will avoid damage to piping due to vibration.

| | |
|------------------|---|
| ⚠ DANGER | = Immediate hazards which will result in severe personal injury or death. |
| ⚠ WARNING | = Hazards or unsafe practices which could result in severe personal injury, death or substantial property damage. |
| ⚠ CAUTION | = Hazards or unsafe practices which could result in minor personal injury, product or property damage. |

INSTALLATION

NOTICE: Re-torque fasteners prior to use. Refer to torque requirements listed in maintenance manual and attached to pump.

1. A lube-free, clean, dry, compressed air source (or any nonflammable, compressed gas) is recommended. Use a filter that is capable of filtering out particles larger than 50 microns.
2. All pumps should be mounted in an upright position with the exception of the 1/4" models which may be rotated 360° to suit the application.
3. When particles exceed the maximum particle specification of the pump or are sharp enough to cut elastomers install a particle fluid filter on the fluid suction line.
4. Fluid suction lines and air exhaust lines should never be smaller than specified pipe size of pump.
5. Apply Teflon tape to threads upon assembly to prevent leakage.
6. Never use pipe dope on air line connections.
7. Never use collapsible tube on fluid inlet.
8. Do not exceed 10 ft-pounds of torque on plastic pipe threads.
9. If changing to a different application reconfirm compatibility of fluid.

SUBMERGED APPLICATIONS

1. Fluid must be compatible with fasteners and with intermediate material.
2. Pipe exhaust above the level of the fluid.

HIGH VISCOSITY APPLICATIONS

1. Position the pump close to or below the level of the fluid source.
2. Suction lines should be increased in size - up to three times the size of the inlet manifold. Dual manifolds may be used when available.
3. Start the pump slowly using a valve on the air line.

LOW TEMPERATURE and UV EXPOSURE

1. Polypropylene tends to embrittle at freezing temperature. Pump must be insulated or heated, otherwise use pumps with different materials of construction.
2. If excessive icing occurs at the pump exhaust, air source must be dried using mechanical means or through the introduction of ethyl alcohol in the air line.
3. UV rays will damage polypropylene pumps, either shroud the pumps from UV rays or use pumps with UV stabilized materials.

GENERAL MAINTENANCE

1. Check periodically for product or air leakage. Tighten any joint where leakage is occurring.
2. When pumping hazardous or toxic materials, diaphragms should be replaced at regularly scheduled intervals based upon pump usage.
3. In freezing temperatures, the pump must be completely drained when idle.
4. When pumping highly abrasive fluids reduce discharge flow rate or reduce air pressure to prolong diaphragm life.
5. If you are pumping a material that will settle or compact the pump must be flushed before shut down.

TROUBLESHOOTING

Prior to requesting technical assistance, the following information must be known:

1. The serial number, model and date of installation.
2. The fluid, temperature and other parameters of the application.

PRIMING

When the pump is not priming, it is not pulling the fluid into the pump. The pump may be cycling, but no fluid transfer is taking place. Several factors could be affecting the pump.

1. Sludge or particles may have been sucked up into the pump and may be preventing the check valve from making a positive seal between ball and seat. *Solution:* Flush the pump, clean the check valves.
2. There may be a suction leak on one of the suction line fittings. This will also be indicated by poor flow rate mixed with lots of air in the discharge. *Solution:* Check all fittings with a soapy solution for any bubbling. Use Teflon® tape to seal fittings.
3. The suction lift specifications may be exceeded. *Solution:* Pump must be closer to the fluid. Wetting the valve seats by pouring some fluid in through the discharge will improve the suction lift. This may work if the application is continuous and the pump is not required to go through a dry lift process on a regular basis.
4. The fluid is highly viscous and the suction lines are the same size or smaller than the size of the manifold of the pump. *Solution:* Increase the size of the line (use a reducing fitting into the manifold) and start the pump slowly using the air flow control valve.

LEAKAGE

1. Make sure all nuts are secured to the proper torque. A torque wrench must be used.
2. If Teflon "O"-rings within the pump were not replaced during service, they may need to be replaced in order to make a more perfect seal.

LOW FLOW RATE

1. Check for obstructions in either fluid line. Line size should be the same size or larger than suction port.
2. Check for obstruction in air line.
3. Confirm air pressure at the air valve. Due to the friction and air usage elsewhere, line pressure can fluctuate widely between air compressor and pump.

PUMP WILL NOT CYCLE

1. Check for obstructions in the air line and fluid lines.
2. Air pressure must be at least 20 PSI. If there is discharge line pressure, the air pressure differential must be not only sufficient to start the pump, but must be great enough to produce the desired flow rate.

PREMATURE DESTRUCTION OF WETTED COMPONENTS

1. If there are small lines in the plastic coupled with actual cracking at the weld line, this is typical of chemical attack. Temperature and strength of fluid need to be re-examined.
2. If there is severe abrasion of the valve seats and premature rupture of diaphragms, the fluid is abrasive. Slow the velocity of the fluid and abrasion will be minimized.
3. Premature failure of diaphragms is generally due to

sharp objects in the fluid. Filtration of the suction line may be needed.

INSTALLATION AND PERIODIC MAINTENANCE

Each diaphragm pump is provided with torque requirements for all fasteners. Due to the flow of plastic, all fasteners should be retorqued prior to installation and periodically as part of a regular maintenance program. Diaphragms should also be checked to avoid rupture. Diaphragms get approximately 6 - 7 million cycles of life. This means that if the pump is pumping at 100 PSI, 24 hours a day, 7 days a week, the diaphragms should be checked in about 3 - 4 months for fatigue.

PRESSURE

Generally, start-up pressure of the pump is around 20 - 25 PSI. If the pumps are operated at higher than 100 PSI they will leak at the band clamps. This is a design feature for pressure relief. *The pump will not explode.*

REGULATING THE FLOW RATE

The pump's capacity can be regulated with a valve on the discharge of the pump, with air pressure (do not reduce to less than 20 PSI) if high discharge pressure is not needed, or by using a valve on the discharge of the pump. *Very important: The pump is not harmed if the air pressure is constant to the air valve and the fluid discharge valve is closed. This is a common way of operating the pump. Avoid valves on the fluid suction line.*

AIR LINE LUBRICATION

Each pump has a sticker applied that says "do not use air line lubrication". If the air line is centrally lubricated, it is best to filter out the oil. We do not recommend the use of an air line lubricator. There have been cases where the user has added an inappropriate lubrication which caused swelling to occur in the nitrile lip seals which effectively locked up the air valve.

DIAPHRAGM MATERIAL

The diaphragms listed as Buna-N are not a true nitrile. They are called Geolast and are a blend of nitrile and polypropylene. Due to the limited chemical resistance information on this compound, and the fact that they meet and exceed the chemical resistance of nitrile, they are listed as Buna-N (the trade name for nitrile). Santoprene®, which is used in the PP/TFE, Nylon/TFE and PVDF/TFE models (behind the TFE overlay) is a blend of EPDM and polypropylene. This diaphragm meets and exceeds the chemical resistance of EPDM and is used in the EPDM option. Again, due to limited resistance data, EPDM listings can be used. Santoprene and Geolast diaphragms have long cycle life and are resistant to abrasion.

Although the diaphragms are quite stiff (40 durometer), the pumps have no difficulty pumping. This is the recommended durometer for maximum cycle life and chemical resistance.

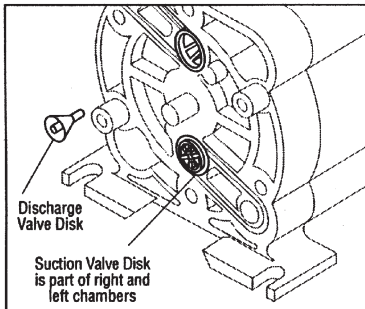
Optional elastomers include Viton and EPDM. Viton is currently not available for the 2" or 1/4" pumps.

1/4" MODELS

MAINTENANCE MANUAL

CHECK VALVE, GASKET and O-RING MAINTENANCE

1. Flush the pump to be certain all corrosives or hazardous materials are removed. Remove suction, discharge and air supply lines.
2. Remove the 1/4-20 nuts (item 28) and slide the six cap screws (item 27) that hold the pump together out of the pump. Remove the #8 screws (item 5) from the left and right manifold plates (items 1 and 19 respectively) and inspect the gaskets (item 2). The suction (or lower) check valves are an integral part of the left and right chambers and should not be dismantled. If replacement of the valve seats is necessary, items 6 and 8 which contain the valves must be replaced. The upper discharge valve disks (item 3) are not sealed into the chambers and may be inspected for wear. If any components are worn or scratched, replace. Note: Due to the distortion of gaskets under pressure, gaskets may need to be replaced after pump has been disassembled to assure a positive seal.
3. To inspect manifold tube o-rings (item 17) remove right chamber (item 18).
4. Both diaphragms (item 9) can be inspected after removing the right and left chamber (item 6). If diaphragms appear worn or ruptured go to step 7. If diaphragms do not need replacing, proceed with steps 5 and 6.
5. To reassemble: Insert the discharge valve disks into place. Press gaskets into groove in chambers.



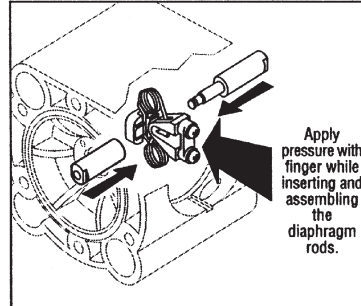
6. Align left and right manifolds on the bosses of the chambers. Secure to each chamber with the (5) #8 screws. Slide left chamber tubes through intermediate. Position o-rings on the end of the tubes. Lubricate o-rings and right chamber holes. Slide a flat washer (item 26) onto each of the (6) capscrews and insert through the entire assembly. Secure with a flat washer (item 26), and a tension washer (item 29) under each nut. Tighten to 5 ft-lbs (6,8N/m). Apply torque evenly.

DIAPHRAGM MAINTENANCE

7. Remove outer diaphragm plates (item 7) by holding one diaphragm plate and twisting off the other plate.
8. The diaphragm o-ring (item 8) is used only with Teflon diaphragms. Replace diaphragms if ruptured or worn. Inspect inner diaphragm plates (item 10). If diaphragm rod needs replacing go to step 10.
9. If no further inspection is necessary reassemble inner diaphragm plates and diaphragms onto stud of outer diaphragm plates and screw each assembly into diaphragm rod. (Make sure optional diaphragm o-ring is in position in the o-ring groove on either side of the intermediate if using Teflon diaphragms. When positioning teflon diaphragms make sure that the concave side is facing the wet ends of pump.)
Tighten outer diaphragm plates to 40 in-lbs (4,5 N/m)
Reassemble pump according to steps 5 and 6.

AIR VALVE and DIAPHRAGM ROD MAINTENANCE

10. To remove the diaphragm rod twist the two rod halves apart by using a 7/16" wrench on the flats at the end of each half. Pull each half out of the pump. Inspect for corrosion.
11. To inspect diaphragm rod lip seals (item 14) remove the two self tapping screws (item 12) from the retaining plates (item 13). Gently remove lip seals and inspect for damage. To reassemble, lubricate diaphragm rod lip seals (item 14) and insert into bore with the u-cup portion facing inward. Note: Since the diaphragm rod passes through the spring clip assembly (item 23), spring clip assembly must be removed prior to reinsertion of the diaphragm rod into bore in intermediate.
12. To remove spring clip assembly firmly pull air valve plug (item 25) from pump.
13. Inspect spring clip assembly and shuttle (item 22) for damage. Surface of intermediate around air ports and flat surface of shuttle must be smooth, no scratches or debris. Replace or clean if necessary.
14. Attach retainer plate with flat surface toward lip seals. Do not overtighten self-tapping screws.
15. To reinsert diaphragm rod halves, drop shuttle into intermediate over ports. Groove in shuttle should be aligned vertically in pump and should face outward. Insert spring side of spring clip assembly into groove in shuttle. At this point the assembly is not affixed to anything. Press down as shown below to insert long half of diaphragm rod (item 16) through spring clip assembly and position under spring ends.



19. Follow procedure for final assembly of pump in step 6.

16. While continuing to apply pressure to spring clip assembly, screw short half of diaphragm rod (item 11) into long half.
17. Follow instructions for assembly of diaphragms in step 9. Final tightening of diaphragm rod will occur when outer diaphragm plates are tightened.
18. Make sure valve plug o-ring (item 21) is well lubed, position o-ring and press air valve plug into the intermediate making sure that tab and indentation are aligned. If o-ring is not well lubricated, it will not permit reinsertion.

SPECIFICATIONS

CAPACITY:

Adjustable . . . 0 to 4.3 GPM (16,3 liters/min.)

MAXIMUM TEMPERATURE:

KN-025 Model 200°F (93°C)

Other Models 150°F (66°C)

MAXIMUM AIR PRESSURE:

All Models 100 PSI (6,8 bars)

DRY LIFT CAPACITY @ 100PSI (6,8 BARS):

Other Models 17 ft. (5 meters)

WEIGHT:

KN-025 Model 7 lbs. (3,2 kg.)

Other Models 5 lbs. (2,3 kg.)

Maximum Solids: 1/16" or (1,6 mm)

AIR SUPPLY:

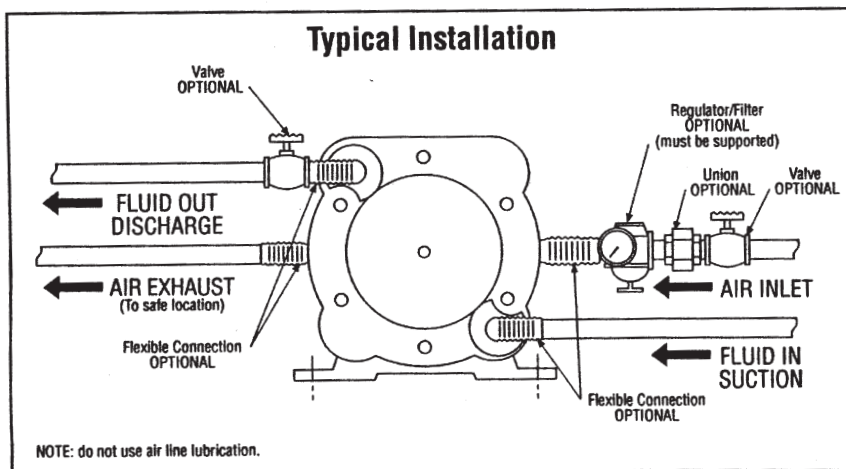
Inlet 1/4" NPSF Female

Outlet 1/4" NPSF Female

Fluid Inlet/Discharge: 1/4" NPSF

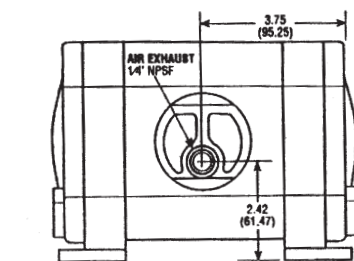
* Geolast properties are similar to that of
Nitrile (Buna-N)

1/4" MODELS

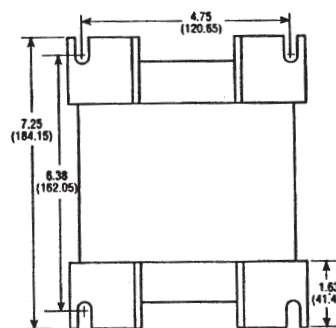


DIMENSIONS

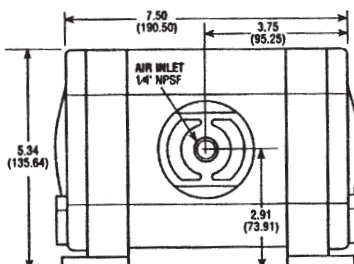
Dimensions in inches and (mm)



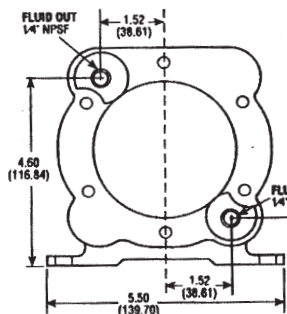
Rear View



Footprint



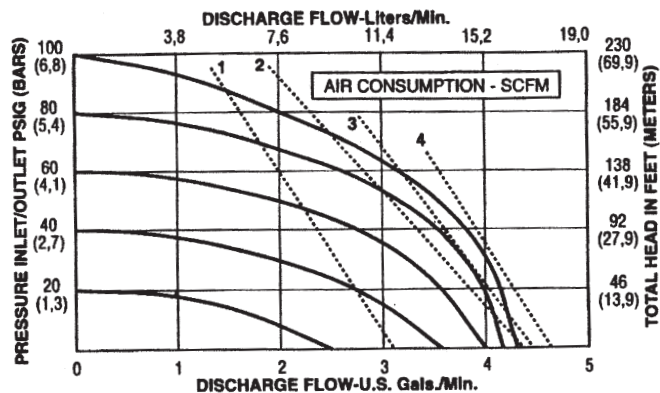
Front View



Side View

PERFORMANCE CURVE

(Based on water-flooded suction)



1/2" MODELS

MAINTENANCE MANUAL

CHECK VALVE AND O-RING MAINTENANCE

1. Flush and neutralize the pump to be certain all corrosives or hazardous materials are removed prior to any maintenance. This procedure should always be followed when returning pumps for factory service also.
2. Remove the nuts (19) and washers (10) from the four long pumping cap screws (35). Suction check valve seats and check balls (26, 27) are located inside of the bottom of the outer chamber (28). Gently remove and inspect for excessive wear, pitting or other signs of degradation. Inspect valve seat o-rings (38). Replace if necessary. Discharge check valves are located inside of the bottom of the discharge elbows (28). Repeat procedure for inspection of discharge check valves.
3. To inspect the manifold o-rings remove the eight sets of nuts, washers and bolts (10, 19, 20) from each manifold assembly and replace if necessary. Then reassemble, lightly tighten fasteners. Tighten all external fasteners to final torque requirement after pump is completely assembled. The check ball should fit into the curved portion of the valve seat and be facing upward when reinserted into the valve seat location.

NOTE: When using pumps built with Teflon o-rings always replace with new Teflon o-rings, since the original o-rings will not reseal the pump.

DIAPHRAGM AND PILOT SLEEVE ASSEMBLY MAINTENANCE

4. To inspect diaphragms remove the band clamps (16) from the outer pumping chambers (28). If replacement is necessary due to abrasion or rupture unscrew the outer diaphragm plates (29). Models that are built with Teflon elastomers will have a Teflon overlay (30) that faces the outer pumping chamber and a back-up diaphragm (31) on the air side of pump. Pumps without Teflon will contain only the back-up diaphragms.
5. If there has been a diaphragm rupture and corrosive or viscous fluid has entered the air side of pump the complete air system should be inspected. After removing diaphragms and inner diaphragm plate (33), the pilot sleeve assembly (14, 40, 42, 45-47) and diaphragm rod assembly (13, 15) may be removed by removing the retaining plates (41) (you may only need to remove one retaining plate) and pushing the entire unit out through the bore in the intermediate (34). Diaphragm rod assembly must be unscrewed to remove pilot sleeve.
NOTE: To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives. Carleton-Stuart MagnaLube G is recommended.
6. Clean or replace any components that have excessive wear, dirt build-up, or chemical attack. Lube all components prior to reassembling. Reassemble pilot sleeve spacers, o-rings and lip seals (40) within bore of intermediate. Make sure that the open side of the lip seals is facing outward toward the diaphragms. Also make sure that the end pilot spacers (14) are at the end on either side of the pilot sleeve assembly and all inner spacers (47) are separated by o-rings. Next carefully insert the diaphragm rod assembly with pilot sleeve inside the assembly in the bore. Reattach retaining plates. Do not overtighten self-tapping screws (24).
7. Take one diaphragm and invert (reverse the natural bow of the material) and with the curved side of the inner diaphragm plate facing the diaphragm assemble onto outer diaphragm plate stud and then screw assembly into diaphragm rod. Push diaphragm rod to opposite side of intermediate and add the opposite diaphragm assembly. Tighten the outer diaphragm plates to 70 in-lbs (7,91 NM) of torque.
NOTE: Inverting the first diaphragm aids reassembly.
8. Position outer diaphragm chambers onto intermediate making sure that witness lines are matching.
NOTE: If air valve has been removed, proper orientation of air system with fluid chambers must be observed. The top of the intermediate has a single vertical air passage slot on the air valve mounting face while the outer chamber check ball cavity should be pointing downward.
9. When positioning band clamps use soapy water or a compatible lubricating spray on the inside of band clamps to aid assembly. Tap with a mallet on the outside of clamp to help position the clamp while tightening the fasteners. The band clamp fasteners are stainless steel. To prevent galling always apply an anti-seize compound to the thread. Tighten all external fasteners to final torque requirement after pump is completely assembled.

10. Position the reassembled manifolds making sure of the proper orientation in relation to the air valve for your application. Also make sure that the valve seat o-rings do not shift from their grooves during reassembly. Flat washers should be placed under the head of each cap screw and nut. Tighten all external fasteners to final torque requirement after pump is completely assembled.

EXTERNAL FASTENER TORQUE REQUIREMENTS

NOTE: When reassembling loosely tighten all external fasteners adjusting and aligning and gradually, in an alternating fashion, tighten to torque requirements listed below.

BAND CLAMPS 13.3 ft-lbs (18,08 NM)

MANIFOLD BOLTS, 20 in-lbs (2,26 NM)

OUTER CHAMBER CAP SCREWS, 20 in-lbs (2,26 NM)

AIR VALVE MAINTENANCE

11. To evaluate air valve components, remove the four cap screws (11), washers, (25, 10) and nuts from the air valve body (7). The valve plate (5) and shuttle (6) may be inspected by removing them from their location in the slot in the back of the air valve. Inspect for scratches or surface irregularities. Replace if necessary. To remove the plug (1) at the bottom of the air valve, point the bottom of the air valve safely away from people, direct compressed air through one of the lower holes in the back of the air valve body and the plug will shoot out. Next push the air valve spool (2) out of the air valve body. Gently reach in and pull lip seals (43) out of inside bore of the air valve body. Check for cracks, splitting or scratches. Clean components if replacement is not necessary. Inspect plug o-ring (44) for any damage and replace if necessary and reinsert in o-ring groove.
NOTE: Make sure that the open side of the two lip seals face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.
12. Reinsert air valve spool inside of air valve body. Place shuttle on middle rib of air valve spool through the square slot in back of air valve. If using original valve plate lubricate side of plate that was facing the shuttle (or if new valve plate is used lubricate the lapped and polished side of plate) and place the lubricated side next to the shuttle in the slot. Press valve plug into air valve body, chamfered end first.
13. Check that gaskets (3, 4) are not cracked. If damaged replace.
14. After gaskets are pressed back into position align air valve onto intermediate and reinsert the four cap screws with lock washer and flat washers. Apply 60 in-lbs (6,78 NM) of torque to fasteners.

U.S. Patent Number 5232352

SPECIFICATIONS

CAPACITY:

Adjustable 0-14 GPM (53,2 LPM)

MAXIMUM TEMP:

PVDF models - 200°F (93°C)

Other models -150°F (66°C)

MAXIMUM AIR PRESSURE:

100 psi (6,8 bars)

MINIMUM AIR PRESSURE:

20 psi (1,3 bars)

DRY LIFT CAPACITY

@ 100 psi (6,8 bars):

Models with Teflon balls - 10 feet

(3 meters)

Other models - 15 feet (4,5 meters)

WEIGHT:

PVDF models - 11 pounds (5 kg)

Other models - 8 pounds (3,6 kg)

MAXIMUM SOLIDS:

1/8" (3,2 mm)

AIR SUPPLY:

Inlet - 1/4" NPT Female

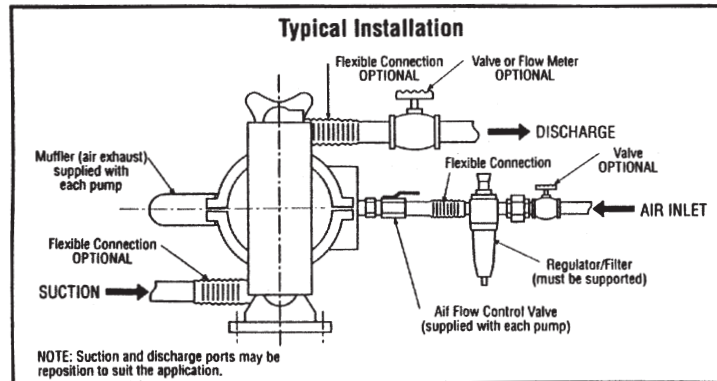
Outlet - 3/8" NPT Female

FLUID INLET/DISCHARGE:

1/2" NPS Female (BSP compatible)

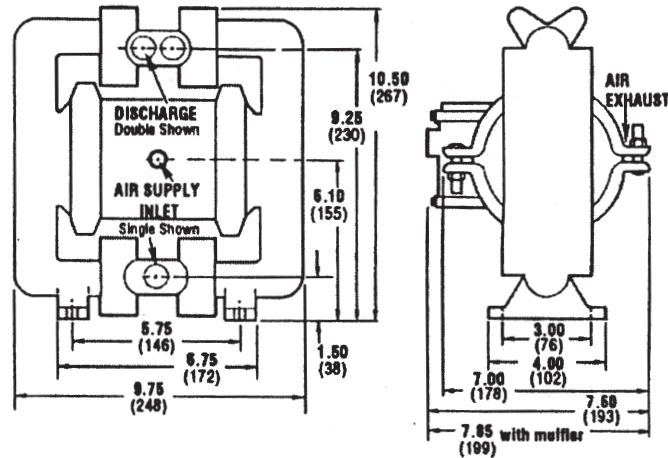
1/2" MODELS

DO NOT USE AIR LINE LUBRICATION



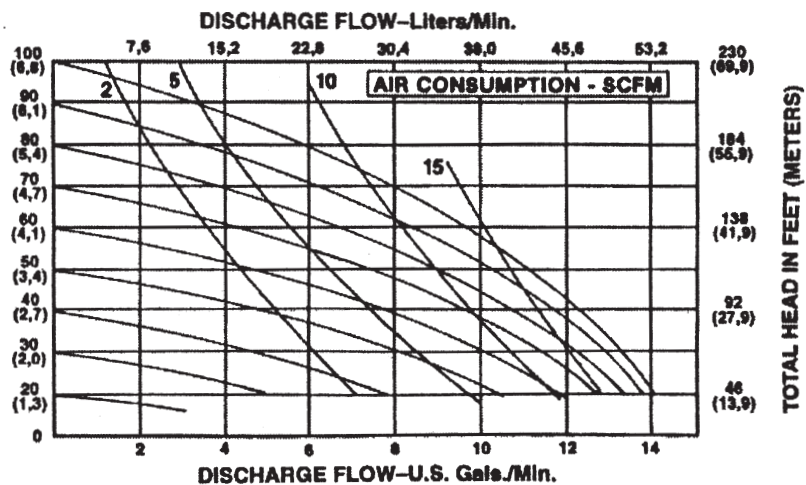
DIMENSIONS

Dimensions in inches and (mm)



PERFORMANCE CURVE

(Based on water-flooded suction)



1" MODELS

MAINTENANCE MANUAL

CHECK VALVE AND O-RING MAINTENANCE

1. Flush and neutralize the pump to be certain all corrosives or hazardous materials are removed prior to any maintenance. This procedure should always be followed when returning pumps for factory service also.
2. Remove the nuts (24) and washers (25) from the four long pumping cap screws (35). Suction check valve seats and check balls (26, 27) are located inside of the bottom of the outer chamber (28). Gently remove and inspect for excessive wear, pitting or other signs of degradation. Inspect valve seat o-rings (22). Replace if necessary. Discharge check valves are located inside of the bottom of the discharge elbows (32 non-metallic), (21 metallic). Repeat procedure for discharge check valves.
3. **NON-METALLIC PUMPS ONLY:** To inspect the manifold o-rings (22) remove the band clamps (20) on either side of the manifold (21) evaluate and replace if necessary. Then reassemble the manifold assemblies. Lightly tighten fasteners making sure that two tension washers (9) have been put into place under nuts. Concave side of tension washers should face each other. Tighten all external fasteners to final torque requirement after pump is completely assembled. The check ball should fit into the curved portion of the valve seat and be facing upward when reinserted into the valve seat location.
NOTE: When using pumps built with Teflon o-rings always replace with new Teflon o-rings, since the original o-rings will not reseal the pump. PVDF pumps need additional gaskets (34). These gaskets are adhesive backed. Remove paper backing and apply to upper surface of valve seats as shown.

DIAPHRAGM AND PILOT SLEEVE ASSEMBLY MAINTENANCE

4. To inspect diaphragms remove the band clamps (16) from the outer pumping chambers (28). If replacement is necessary due to abrasion or rupture unscrew the outer diaphragm plates (29). Models that are built with Teflon elastomers will have a Teflon overlay (30) that faces the outer pumping chamber and a back-up diaphragm (31) on the air side of pump. Pumps without Teflon will contain only the back-up diaphragms.
5. If there has been a diaphragm rupture and corrosive or viscous fluid has entered the air side of pump the complete air system should be inspected. After removing diaphragms and inner diaphragm plate (33), the pilot sleeve assembly (14, 42, 45-48) and diaphragm rod assembly (13, 15) may be removed by removing the retaining plates (49) (you may only need to remove one retaining plate) and pushing the entire unit out through the bore in the intermediate (41). Diaphragm rod assembly must be unscrewed to remove pilot sleeve.
NOTE: To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives. Carleton-Stuart MagnaLube G is recommended.
6. Clean or replace any components that have excessive wear, dirt build-up, or chemical attack. Lube all components prior to reassembling. Reassemble pilot sleeve spacers, o-rings and lip seals (48) within bore of intermediate. Make sure that the open side in the lip seals is facing outward toward the diaphragms. Also make sure that the end pilot spacers (14) are at the end on either side of the pilot sleeve assembly and all inner spacers (47) are separated by o-rings (46). Next carefully insert the diaphragm rod assembly with pilot sleeve inside the assembly in the bore. Reattach retaining plates. Screws (38) are self-tapping. Do not overtighten.
7. Assemble diaphragm (and optional Teflon overlay) and inner diaphragm plate onto outer diaphragm plate stud. Then screw assembly into diaphragm rod. Push diaphragm rod to opposite side of intermediate and add the opposite diaphragm assembly. Apply 165 in-lbs. (18.65 NM) of torque to outer diaphragm plates.
8. Position outer diaphragm chambers onto intermediate making sure that witness lines are matching.
NOTE: If air valve has been removed, proper orientation of air system with fluid chambers must be observed. The top of the intermediate has a single vertical air passage slot on the air valve mounting face while the outer chamber check ball cavity should be pointing downward.
9. When positioning band clamps use soapy water or a compatible lubricating spray on the inside of band clamps to aid assembly. Tap with a mallet on the outside of clamp to help position the clamp while tightening the fasteners. The band clamp fasteners are stainless steel. To prevent galling always apply an anti-seize compound to the thread. Apply light torque to fasteners and level and realign pump prior to applying final torque.
10. Position the reassembled manifolds making sure of the proper orientation in relation to the air valve for your application. Also make sure that the valve seat o-rings do not shift from their grooves during reassembly. Lightly tighten fasteners on long pumping chamber bolts making sure that two tension washers (9) have been put into place under nuts. Concave side of tension washers used in non-metallic pumps only should face each other.

- clamp to help position the clamp while tightening the fasteners. The band clamp fasteners are stainless steel. To prevent galling always apply an anti-seize compound to the thread. Apply light torque to fasteners and level and realign pump prior to applying final torque.
10. Position the reassembled manifolds making sure of the proper orientation in relation to the air valve for your application. Also make sure that the valve seat o-rings do not shift from their grooves during reassembly. Lightly tighten fasteners on long pumping chamber bolts making sure that two tension washers (9) have been put into place under nuts. Concave side of tension washers used in non-metallic pumps only should face each other.

EXTERNAL FASTENER TORQUE REQUIREMENTS

NOTE: When reassembling loosely tighten all external fasteners adjusting and aligning and gradually, in an alternating fashion, tighten to torque requirements listed below.

BAND CLAMPS (Outer Chamber), 16.7 ft-lbs (18,65 NM)

BAND CLAMPS (Manifolds), 80 in-lbs (9,04 NM)

OUTER CHAMBER CAP SCREWS, 40 in-lbs (4,52 NM)

ELBOW TO CHAMBER BOLTS (metal pumps), 16 ft-lbs (21,8 MN)

AIR VALVE MAINTENANCE

11. To evaluate air valve components, remove the four cap screws (11), washers, (8, 10) and nuts from the air valve body (7). The valve plate (5) and shuttle (6) may be inspected by removing them from their location in the slot in the back of the air valve. Inspect for scratches or surface irregularities. Replace if necessary. To remove the plug (1) at the bottom of the air valve, point the bottom of the air valve safely away from people, direct compressed air through one of the lower holes in the back of the air valve body and the plug will shoot out. Next push the air valve spool (2) out of the air valve body. Gently reach in and pull lip seals (43) out of inside bore of the air valve body. Check for cracks, splitting or scratches. Clean components if replacement is not necessary. Inspect plug o-ring (44) for any damage and replace if necessary and reinsert in o-ring groove.
NOTE: Make sure that the open side of the two lip seals face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.
12. Reinsert air valve spool inside of air valve body. Place shuttle on middle rib of air valve spool through the square slot in back of air valve. If using original valve plate lubricate the matted and polished side of plate) and place the lubricated side ne to the shuttle in the slot. Press valve plug into air valve body, chamfered end first.
13. Check that gaskets (3, 4) are not cracked. If damaged replace.
14. After gaskets are pressed back into position align air valve onto intermediate and reinsert the four cap screws with lock washer and flat washers. Apply 60 in-lb (6,78 NM) of torque to fasteners.

DUAL MANIFOLD CAPABILITY (Non-Metallic Pumps Only)

1. Remove the four long pumping chamber cap screws along the sides of the pump.
 2. Remove existing manifolds.
Note: There is a female 1" NPT thread inside the elbows.
 3. Rotate elbows 180° and realign and secure pumping chamber cap screws.
 4. Pump is now ready for dual side suction and discharge through the elbows.
- U.S. Patent Number 5232352

SPECIFICATIONS

CAPACITY:
Adjustable 0-40 GPM (152 LPM)

MAXIMUM TEMP:

PVDF models - 200°F (93°C)

Other models -150°F (66°C)

Metallic models - 200°F (93°C)

MAXIMUM AIR PRESSURE:

PVDF models - 70 psi (4,8 bars)

Other Models - 100 psi (6,8 bars)

MINIMUM AIR PRESSURE:

30 psi (2 bars)

DRY LIFT CAPACITY

@ 100 psi (6,8 bars):

Models with Teflon balls - 10 feet (3 meters)

Other models - 15 feet (4,5 meters)

WEIGHT:

PVDF - 22 pounds (9,9 kg)

Other Non-Metallic - 19 pounds (8,6 kg)

Stainless Steel - 42 pounds (19,1 kg)

Aluminum - 19 pounds (8,6 kg)

MAXIMUM SOLIDS:

1/4" (3,2 mm)

AIR SUPPLY:

Inlet - 1/4" NPT Female

Outlet - 3/4" NPT Female

FLUID INLET/DISCHARGE:

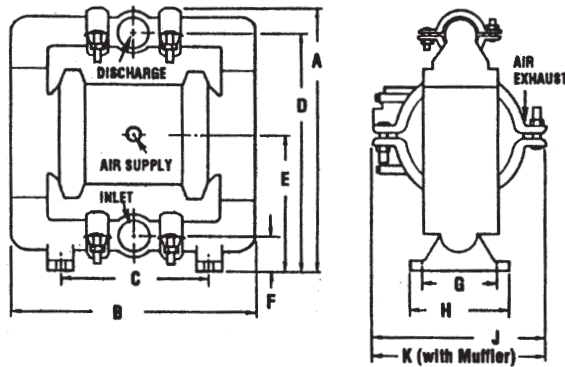
1" NPT (or BSP) Female

Typical Installation

The diagram illustrates the typical installation of a pump. The pump is shown with a central vertical axis. The **SUCTION** port is on the left, and the **DISCHARGE** port is on the right. The **AIR INLET** is on the right, and the **AIR FLOW CONTROL VALVE** (supplied with each pump) is located between the discharge port and the air inlet. The **REGULATOR/FILTER** (must be supported) is located between the air flow control valve and the air inlet. The **MUFFLER (air exhaust)** is supplied with each pump and is located on the left side of the pump. The **FLEXIBLE CONNECTION** is optional and is located between the pump and the discharge port. The **VALVE OR FLOW METER** is optional and is located between the flexible connection and the discharge port. The **VALVE** is optional and is located between the air flow control valve and the regulator/filter.

NOTE: Suction and discharge ports may be reposition to suit the application.

| | Non-metallic | Metallic |
|---|----------------|----------------|
| A | 15.00 (381) | 12.69 (322) |
| B | 12 (305) | 12 (305) |
| C | 5.75 (146) | 6.75 (171) |
| D | 13.50 (343) | 11.78 (299) |
| E | 8.30 (211) | 5.68 (144) |
| F | 2.00 (51) | 1.44 (37) |
| G | 5.0 (127) | 4.18 (106) |
| H | 6.0 (152) | 5.0 (127) |
| J | 9.9 (251) | - (-) |
| K | 11.56 (293) | 11.56 (293) |

[illegible]

1 1/2" MODELS

MAINTENANCE MANUAL

CHECK VALVE AND O-RING MAINTENANCE

1. Flush and neutralize the pump to be certain all corrosives or hazardous materials are removed prior to any maintenance. This procedure should always be followed when returning pumps for factory service also.
2. Remove the elbow to outer pumping chamber band clamps (35). Suction check valve seats and check balls (26, 27) are located inside of the bottom of the outer chamber (28). Gently remove and inspect for excessive wear, pitting or other signs of degradation. Inspect valve seat o-rings (24). Replace if necessary. Discharge check valves are located inside of the bottom of the discharge elbows (32). Repeat procedure for inspection of discharge check valves.
- 2A. **METAL PUMPS:** To inspect the check valves, remove the carriage bolts (17) from elbow/manifold sections (21, 23). Repeat procedure above. There are no manifold o-rings in the metallic pumps.
3. To inspect the manifold o-rings remove the manifold band clamps from each manifold assembly. Inspect and replace o-rings if necessary. Then reassemble, lightly tighten fasteners. Tighten all external fasteners to final torque requirement after pump is completely assembled. The check ball should fit into the curved portion of the valve seat and be facing upward when reinserted into the valve seat location.
NOTE: When using pumps built with Teflon o-rings always replace with new Teflon o-rings, since the original o-rings will not reseal the pump.

DIAPHRAGM AND PILOT SLEEVE ASSEMBLY MAINTENANCE

4. To inspect diaphragms remove the band clamps (16) from the outer pumping chambers. If replacement is necessary due to abrasion or rupture unscrew the outer diaphragm plates (29). Models that are built with Teflon elastomers will have a Teflon overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. Pumps without Teflon will contain only the back-up diaphragms.
5. If there has been a diaphragm rupture and corrosive or viscous fluid has entered the air side of pump the complete air system should be inspected. After removing diaphragms, inner diaphragm plate (33), and flat washer (47) the pilot sleeve assembly (13, 14, 15, 42, 45, 48) and diaphragm rod assembly (34, 49) may be removed by removing the retaining plates (46) (you may only need to remove one retaining plate) and pushing the entire unit out through the bore in the intermediate (41). Diaphragm rod assembly must be unscrewed to remove pilot sleeve.
NOTE: To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives. Carleton-Stuart MagnaLube G is recommended.
6. Clean or replace any components that have excessive wear, dirt build-up, or chemical attack. Lube all components prior to reassembling. Reassemble pilot sleeve spacers, o-rings and lip seals (14) within bore of intermediate. Make sure that the open side of the lip seals is facing outward toward the diaphragms. Also make sure that the end pilot spacers (45) are at the end on either side of the pilot sleeve assembly and all inner spacers (48) are separated by o-rings. Next carefully insert the diaphragm rod assembly with pilot sleeve inside the assembly in the bore. Reattach retaining plates. Do not overtighten self-tapping screws (38).
7. With the curved side of the inner diaphragm plate facing the diaphragm, assemble onto outer diaphragm plate stud and then screw assembly into diaphragm rod. Push diaphragm rod to opposite side of intermediate and add the opposite diaphragm assembly. Tighten the outer diaphragm plates to 372 in-lbs (42,04 NM) of torque. Assemble the outer chamber and band clamps first on the side where the diaphragm has been inverted. Next reach under the opposite diaphragm assembly and pull diaphragm rod to opposite side (a large flat screw driver may be used as an aid in this process) and assemble remaining outer chamber and band clamp. When positioning outer diaphragm chambers onto intermediate make sure that witness lines are matching.

NOTE: When positioning band clamps use soapy water or a compatible lubricating spray on the inside of band clamps to aid assembly. Tap with a mallet on the outside of clamp to help position the clamp while tightening the fasteners. The band clamp fasteners are stainless steel. To prevent galling always apply an anti-seize compound to the thread. Tighten all external fasteners to final torque requirement after pump is completely assembled.

8. Position the reassembled manifolds making sure of the proper orientation in relation to the air valve for your application. Also make sure that the valve seat o-rings do not shift from their grooves during reassembly. Flat washers should be placed under the head of each cap screw and nut. Tighten all external fasteners to final torque requirement after pump is completely assembled.
- 8A. **METAL PUMPS:** Position manifold/elbow sections making sure that the valve seat o-rings do not shift from their grooves. Tighten fasteners on bolts loosely.

EXTERNAL FASTENER TORQUE REQUIREMENTS

NOTE: When reassembling loosely tighten all external fasteners adjusting and aligning and gradually, in an alternating fashion, tighten to torque requirements listed below.

BAND CLAMPS (Outer Chamber - all versions), 20.8 ft-lbs (28,25 NM)
BAND CLAMPS (Manifolds & Elbow), 80 in-lbs (9,04 NM)
METAL PUMPS (Elbow to Chamber Bolts), 37 ft-lbs (50,17 NM)

AIR VALVE MAINTENANCE

9. To evaluate air valve components, remove the four cap screws (11), washers, (8, 10) and nuts from the air valve body (7). The valve plate (5) and shuttle (6) may be inspected by removing them from their location in the slot in the back of the air valve. Inspect for scratches or surface irregularities. Replace if necessary. To remove the plug (1) at the bottom of the air valve, point the bottom of the air valve safely away from people, direct compressed air through one of the lower holes in the back of the air valve body and the plug will shoot out. Next push the air valve spool (2) out of the air valve body. Gently reach in and pull lip seals (43) out of inside bore of the air valve body. Check for cracks, splitting or scratches. Clean components if replacement is not necessary. Inspect plug o-ring (44) for any damage and replace if necessary and reinsert in o-ring groove.
NOTE: Make sure that the open side of the two lip seals face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.
10. Reinsert air valve spool inside of air valve body. Place shuttle on middle rib of air valve spool through the square slot in back of air valve. If using original valve plate lubricate side of plate that was facing the shuttle (or if new valve plate is used lubricate the lapped and polished side of plate) and place the lubricated side next to the shuttle in the slot. Press valve plug into air valve body, chamfered end first.
11. Check that gaskets (3, 4) are not cracked. If damaged replace.
12. After gaskets are pressed back into position align air valve onto intermediate and reinsert the four cap screws with lock washer and flat washers. Apply 60 in-lbs (6,78 NM) of torque to fasteners.

U.S. Patent Number 5232352

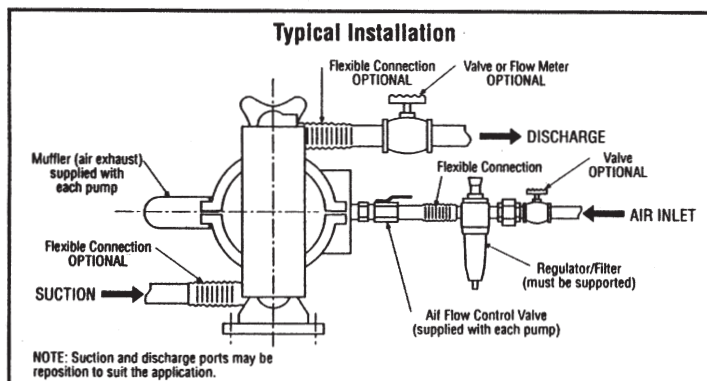
SPECIFICATIONS

CAPACITY:
Adjustable 0-95 GPM (569 LPM)
MAXIMUM TEMP:
PVDF models - 200°F (93°C)
Other Non-Metallic - 150°F (66°C)
Metallic - 200°F (93°C)
MAXIMUM AIR PRESSURE:
100 psi (6,8 bars)
MINIMUM AIR PRESSURE:
30 psi (2,7 bars)
DRY LIFT CAPACITY
@ 100 psi (6,8 bars):
Models with Teflon balls - 10 feet
(3 meters)
Other models - 15 feet (4,5 meters)

WEIGHT:
PVDF models - 59 pounds (27 kg)
Other Non-Metallic - 53 pounds (24 kg)
Stainless Steel - 113 pounds (51 kg)
Aluminum - 55 pounds (24 kg)
MAXIMUM SOLIDS:
1/4" (6,4 mm)
AIR SUPPLY:
Inlet - 3/4" NPT Female (BSP compatible)
Outlet - 3/4" NPT Female
FLUID INLET/DISCHARGE:
1-1/2" ANSI Flange (DIN compatible)

1½" MODELS

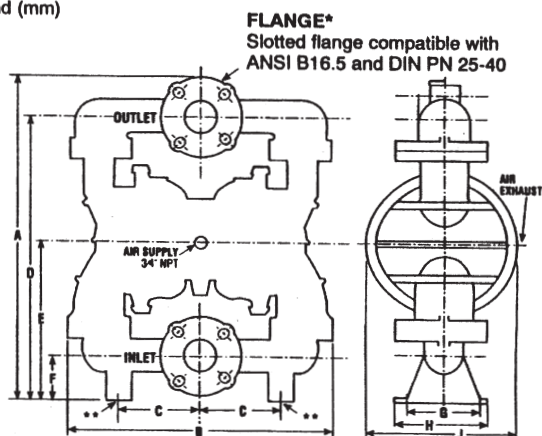
DO NOT USE AIR LINE LUBRICATION



DIMENSIONS

Dimensions in inches and (mm)

| | Metric |
|---|-------------|
| A | 20.5 (520) |
| B | 19.5 (495) |
| C | 4.66 (118) |
| D | 18.0 (457) |
| E | 10.62 (270) |
| F | 3.19 (81) |
| G | 5.0 (127) |
| H | 6.0 (152) |
| J | 10.9 (278) |



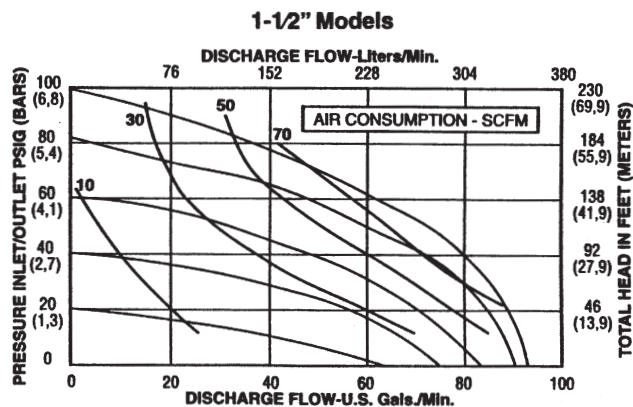
ANSI Flange: 5/8" Dia. on 3-7/8" B.C.

* Flange mounting requires four (4) bolts: 1/2" x 4"

** Slotted mounting holes four (4): .56 (14) wide x .75 (19) long

PERFORMANCE CURVE

(Based on water-flooded suction)



2" MODELS

MAINTENANCE MANUAL

CHECK VALVE AND O-RING MAINTENANCE

1. Flush and neutralize the pump to be certain all corrosives or hazardous materials are removed prior to any maintenance. This procedure should always be followed when returning pumps for factory service also.
2. Remove the elbow to outer pumping chamber band clamps (35). Suction check valve seats and check balls (26, 27) are located inside of the bottom of the outer chamber (28). Gently remove and inspect for excessive wear, pitting or other signs of degradation. Inspect valve seat o-rings (24). Replace if necessary. Discharge check valves are located inside of the bottom of the discharge elbows (32). Repeat procedure for inspection of discharge check valves.
- 2A. **METAL PUMPS:** To inspect the check valves, remove the carriage bolts (17) from elbow/manifold sections (21, 23). Repeat procedure above. There are no manifold o-rings in the metallic pumps.
3. To inspect the manifold o-rings remove the manifold band clamps from each manifold assembly. Inspect and replace o-rings if necessary. Then reassemble, lightly tighten fasteners. Tighten all external fasteners to final torque requirement after pump is completely assembled. The check ball should fit into the curved portion of the valve seat and be facing upward when reinserted into the valve seat location.

NOTE: When using pumps built with Teflon o-rings always replace with new Teflon o-rings, since the original o-rings will not reseal the pump.

DIAPHRAGM AND PILOT SLEEVE ASSEMBLY MAINTENANCE

4. To inspect diaphragms remove the band clamps (16) from the outer pumping chambers. If replacement is necessary due to abrasion or rupture unscrew the outer diaphragm plates (29). Models that are built with Teflon elastomers will have a Teflon overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. Pumps without Teflon will contain only the back-up diaphragms.
5. If there has been a diaphragm rupture and corrosive or viscous fluid has entered the air side of pump the complete air system should be inspected. After removing diaphragms, inner diaphragm plate (33), and flat washer (47) the pilot sleeve assembly (13, 14, 15, 42, 45, 48) and diaphragm rod assembly (34, 49) may be removed by removing the retaining plates (46) (you may only need to remove one retaining plate) and pushing the entire unit out through the bore in the intermediate (41). Diaphragm rod assembly must be unscrewed to remove pilot sleeve.
NOTE: To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives. Carleton-Stuart MagnaLube G is recommended.
6. Clean or replace any components that have excessive wear, dirt build-up, or chemical attack. Lube all components prior to reassembling. Reassemble pilot sleeve spacers, o-rings and lip seals (14) within bore of intermediate. Make sure that the open side of the lip seals is facing outward toward the diaphragms. Also make sure that the end pilot spacers (45) are at the end on either side of the pilot sleeve assembly and all inner spacers (48) are separated by o-rings. Next carefully insert the diaphragm rod assembly with pilot sleeve inside the assembly in the bore. Reattach retaining plates. Do not overtighten self-tapping screws (38).
7. With the curved side of the inner diaphragm plate facing the diaphragm, assemble onto outer diaphragm plate stud and then screw assembly into diaphragm rod. Push diaphragm rod to opposite side of intermediate and add the opposite diaphragm assembly. Tighten the outer diaphragm plates to 372 in-lbs (42,04 NM) of torque. Assemble the outer chamber and band clamps first on the side where the diaphragm has been inverted. Next reach under the opposite diaphragm assembly and pull diaphragm rod to opposite side (a large flat screw driver may be used as an aid in this process) and assemble remaining outer chamber and band clamp. When positioning outer diaphragm chambers onto intermediate make sure that witness lines are matching.
NOTE: If air valve has been removed, proper orientation of air system with fluid chambers must be observed. The top of the intermediate has a single vertical air passage slot on the air valve mounting face while the outer chamber check ball cavity should be pointing downward.

NOTE: When positioning band clamps use soapy water or a compatible lubricating spray on the inside of band clamps to aid assembly. Tap with a mallet on the outside of clamp to help position the clamp while tightening the fasteners. The band clamp fasteners are stainless steel. To prevent galling always apply an anti-seize compound to the thread. Tighten all external fasteners to final torque requirement after pump is completely assembled.

8. Position the reassembled manifolds making sure of the proper orientation in relation to the air valve for your application. Also make sure that the valve seat o-rings do not shift from their grooves during reassembly. Flat washers should be placed under the head of each cap screw and nut. Tighten all external fasteners to final torque requirement after pump is completely assembled.
- 8A. **METAL PUMPS:** Position manifold/elbow sections making sure that the valve seat o-rings do not shift from their grooves. Tighten fasteners on bolts loosely.

EXTERNAL FASTENER TORQUE REQUIREMENTS

NOTE: When reassembling loosely tighten all external fasteners adjusting and aligning and gradually, in an alternating fashion, tighten to torque requirements listed below.

BAND CLAMPS (Outer Chamber - all versions), 20.8 ft-lbs (28,25 NM)

BAND CLAMPS (Manifolds & Elbow), 80 in-lbs (9,04 NM)

METAL PUMPS (Elbow to Chamber Bolts), 37 ft-lbs (50,17 NM)

AIR VALVE MAINTENANCE

9. To evaluate air valve components, remove the four cap screws (11), washers, (8, 10) and nuts from the air valve body (7). The valve plate (5) and shuttle (6) may be inspected by removing them from their location in the slot in the back of the air valve. Inspect for scratches or surface irregularities. Replace if necessary. To remove the plug (1) at the bottom of the air valve, point the bottom of the air valve safely away from people, direct compressed air through one of the lower holes in the back of the air valve body and the plug will shoot out. Next push the air valve spool (2) out of the air valve body. Gently reach in and pull lip seals (43) out of inside bore of the air valve body. Check for cracks, splitting or scratches. Clean components if replacement is not necessary. Inspect plug o-ring (44) for any damage and replace if necessary and reinsert in o-ring groove.
NOTE: Make sure that the open side of the two lip seals face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.
10. Reinsert air valve spool inside of air valve body. Place shuttle on middle rib of air valve spool through the square slot in back of air valve. If using original valve plate lubricate side of plate that was facing the shuttle (or if new valve plate is used lubricate the lapped and polished side of plate) and place the lubricated side next to the shuttle in the slot. Press valve plug into air valve body, chamfered end first.
11. Check that gaskets (3, 4) are not cracked. If damaged replace.
12. After gaskets are pressed back into position align air valve onto intermediate and reinsert the four cap screws with lock washer and flat washers. Apply 60 in-lbs (6,78 NM) of torque to fasteners.

U.S. Patent Number 5232352

SPECIFICATIONS

CAPACITY:

Adjustable 0-150 GPM (569 LPM)

MAXIMUM TEMP:

PVDF models - 200°F (93°C)

Other Non-Metallic - 150°F (66°C)

Metallic - 200°F (93°C)

MAXIMUM AIR PRESSURE:

100 psi (6,8 bars)

MINIMUM AIR PRESSURE:

30 psi (2,7 bars)

DRY LIFT CAPACITY

@ 100 psi (6,8 bars):

Models with Teflon balls - 10 feet

(3 meters)

Other models - 15 feet (4,5 meters)

WEIGHT:

PVDF models - 59 pounds (27 kg)

Other Non-Metallic - 53 pounds (24 kg)

Stainless Steel - 131 pounds (59 kg)

Aluminum - 70 pounds (32 kg)

MAXIMUM SOLIDS:

1/4" (6,4 mm)

AIR SUPPLY:

Inlet - 3/4" NPT Female (BSP compatible)

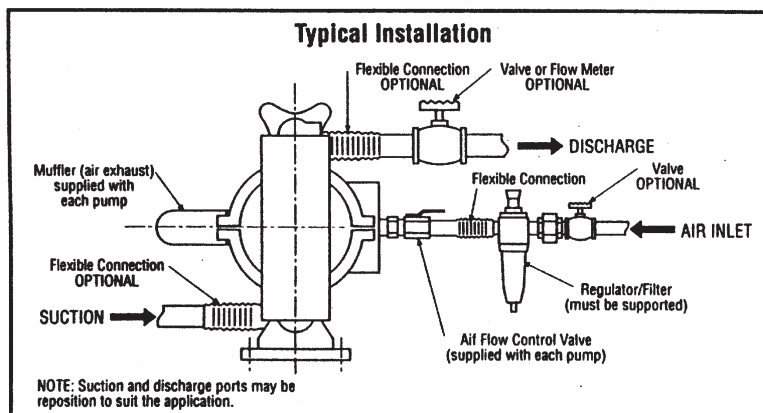
Outlet - 3/4" NPT Female

FLUID INLET/DISCHARGE:

2" ANSI Flange (DIN compatible)

2" MODELS

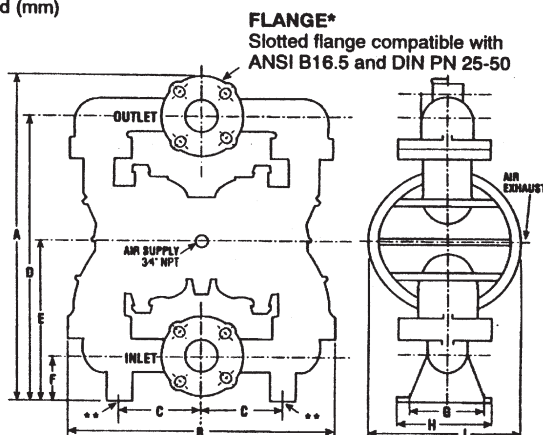
DO NOT USE AIR LINE LUBRICATION



DIMENSIONS

Dimensions in inches and (mm)

| | Non-metallic | Metallic |
|---|----------------|----------------|
| A | 25.75 (655) | 24.50 (622) |
| B | 20.5 (521) | 19.5 (495) |
| C | 6.0 (152) | 6.0 (152) |
| D | 22.88 (582) | 21.50 (546) |
| E | 12.25 (311) | 12.25 (311) |
| F | 3.5 (89) | 3.5 (89) |
| G | 5.0 (127) | 5.0 (127) |
| H | 6.0 (152) | 8.0 (203) |
| J | 10.9 (278) | 10.9 (278) |



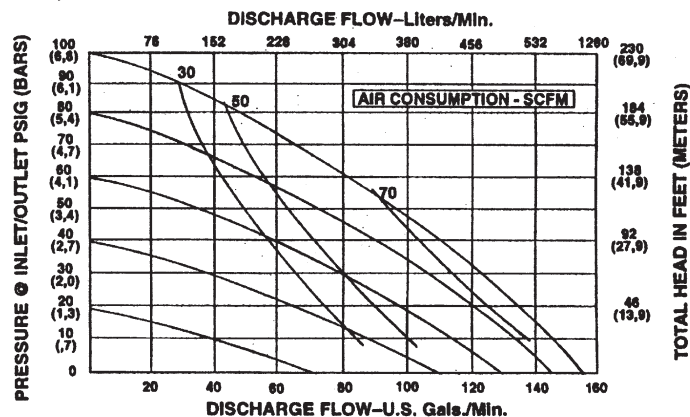
ANSI Flange: 11/16" Dia. on 4-3/4" B.C.

* Flange mounting requires four (4) bolts: 5/8" x 4-1/2"

** Slotted mounting holes four (4): .56 (14) wide x .75 (19) long

PERFORMANCE CURVE

(Based on water-flooded suction)



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