Lutz®
The Fluid Managers

GB

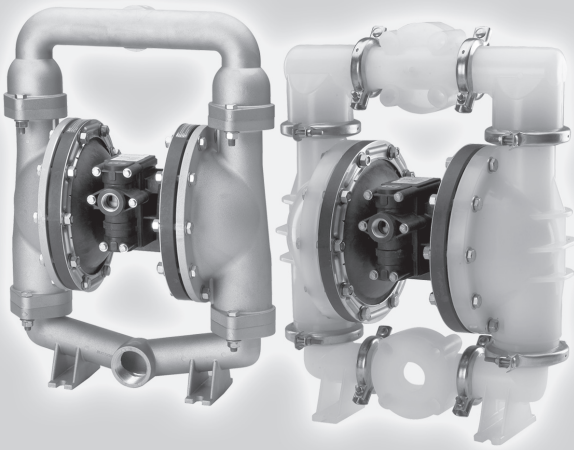
Operating Instructions

OIL-FREE, AIR OPERATED DOUBLE DIAPHRAGM PUMPS

in non-metallic and metallic version

Model

1/4"
3/8"
1/2"
1"
1 1/2"
2"
3"



Read this operating instructions before start up!

To be retained for future reference.

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Notice: In the operating instructions figures are mentioned in brackets. These refer to the item specifications in the spare parts list of the respective model. The single steps in the operating instructions refer to the non-metallic and metallic version. If the item number of the operating instructions is not included in the spare parts list, the instruction must not be considered for this pump version.

1. Safety

1.1 Danger associated with this machine

The air operated double diaphragm pumps are tested prior to delivery.

In case of maloperation or improper use there is danger for

- life and health of the user
- the pump and other material assets of the user
- the efficiency of the machine.

All persons who are dealing with the installation/assembly, starting, operation, servicing and maintenance of the machine have

- to be accordingly qualified
- to exactly follow these operating instructions

It is your safety!

1.2 Safety information and tips

In these operating instructions the following explanations are used:

Danger!
Refers to a direct danger.
Non-observance of the precaution will cause death or extremely serious injury.

Warning!
Defines a possibly dangerous situation.
Non-observance of the precaution can cause death or extremely serious injury.

Caution!
Defines a possibly harmful situation.
The product or something in its environment may be damaged if this instruction is not observed.

1.3 Proper use

The air operated double diaphragm pumps are suitable for pumping pure, turbid, flammable and non-flammable, aggressive and non-aggressive liquids. Following regulations however must be observed.

Please note the following chapters. No liability whatsoever can be assumed for failure of the pump or parts of the pump, for personal injury or other claims if the pump is used for other purposes.

For safety reasons, the pump must not be converted or modified in any way without authorization!

Model 1/4": Pump has wear parts in the air flow system. A continuous operation therefore is limited.

Danger!
Dangerous liquids can damage your health and the environment.

- When handling dangerous or toxic liquids you have to waer goggles and protective clothing.
- Before starting the pump check that the medium being pumped is compatible. 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.
- If a diaphragm ruptures, the pumped liquid can enter the air side of the pump and exit through the air exhaust (muffler). If a diaphragm rupture occurs immediately stop the pump, close suction- and discharge lines and have pump repaired.
- 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. After operation of pump it should be possible to close the suction line by means of e.g. a ball valve. Running out of the container can be effectively avoided in case a damage occurs at the piping system or at the pump.

Danger!
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.

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!
Excessive positive suction pressure can cause pump damage. The maximum positive suction pressure must not exceed 0.6 bar.

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. The pump must be installed free of tension.
Flexible connections will avoid damage to piping due to vibration.

Caution!
The characteristic feature of double diaphragm pumps is a pulsating volume flow.
For reduction use a pulsation dampener if necessary.

In addition please note for model 1/4":

Caution!
Following operating conditions can cause early damage of the pump by spring breakage:

- dirty, wet or contaminated air supply
- too small suction pipe diameter or too large particles in the pumped liquid
- blocked valve seats or viscosity of the liquid exceeding 10.000 mPas
- high flow rate at a back pressure of more than Δp = 1.4 bar
- safe operating pressure exceeded

Caution!
Following conditions cut down the continuous operation of the pump:

- high stroke frequency
- Flow rate at maximum value
- resistance at suction side (large suction head, filter or valve)
- viscous liquid
- high operating pressure
- During continuous operation (t > 2h/day) operating pressure and flow rate must not exceed more than the half of the maximum admissible operating pressure respectively the maximum possible flow rate.
- high suction prepressure

These operating conditions and long running times can wear movable parts after 3-6 months.

1.3.1 Specifications

Model	**1/4“**	**1/2“** Bolted Version	**1“** Bolted Version	**1 1/2“** Bolted Version	**2“** Bolted Version	**3“** Bolted Version
Capacity	Adjustable 0-16 l/min	Adjustable 0-65 l/min	Adjustable 0-156 l/min	Adjustable 0-492 l/min	Adjustable 0-681 l/min	Adjustable 0-965 l/min
Maximum temperature						
PVDF models	+93°C	+93°C	+93°C	+93°C	+93°C	–
PP models	+66°C	+66°C	+66°C	+66°C	+66°C	–
Metallic models	–	+93°C	+93°C	+93°C	+93°C	+93°C
Maximum air pressure						
PVDF models		8.0 bar	8.0 bar	8.2 bar	8.2 bar	–
Other models	6.8 bar	8.0 bar	8.0 bar	8.2 bar	8.2 bar	8.5 bar
Minimum air pressure		1.2 bar	1.2 bar	1.3 bar	1.3 bar	1.3 bar
Dry lift capacity at:	6.8 bar	8.0 bar	8.0 bar	8.2 bar	8.2 bar	6.8 bar
Models with Teflon balls	5.0 m	3.0 m	3.0 m	3.0 m	3.0 m	3.0 m
Other models	5.0 m	4.5 m	4.5 m	4.5 m	4.5 m	4.5 m
Weight						
PVDF models	3.2 kg	5.4 kg	13.7 kg	29.5 kg	31 kg	–
Other non-metallic models	2.3 kg	4.1 kg	9.1 kg	21 kg	22 kg	–
Stainless steel	–	8.6 kg	20.4 kg	60 kg	60 kg	–
Aluminium	–	4.5 kg	10.5 kg	27 kg	28 kg	59 kg
Maximum solids						
Max-Pass valves	–	–	–	–	–	–
Others	1.6 mm	3.1 mm	6.4 mm	6.4 mm	6.4 mm	11.1 mm
Air supply						
Inlet	1/4" NPT female	1/4" NPT female	1/4" NPT female	3/4" NPT female	3/4" NPT female	3/4" NPT female
Outlet	1/4" NPT female	3/8" NPT female	3/8" NPT female	3/4" NPT female	3/4" NPT female	3/4" NPT female
Fluid inlet/ discharge						
Non-metallic models	1/4" BSP female	1/2" BSP female	1“ DIN/ANSI-Flange	1 1/2“ DIN/ANSI-Flange	2“ DIN/ANSI-Flange	3" BSP female
Metallic models	dto.	dto.	1" BSP female	dto.	2" BSP female	dto.

Model	**3/8“** Band clamp Version	**1/2“** Band clamp Version	**1“** Band clamp Version	**1 1/2“** Band clamp Version	**2“** Band clamp Version
Capacity	Adjustable 0-34 l/min	Adjustable 0-53 l/min	Adjustable 0-152 l/min	Adjustable 0-360 l/min	Adjustable 0-569 l/min
Maximum temperature					
PVDF models	+93°C	+93°C	+93°C	+93°C	+93°C
PP models	+66°C	+66°C	+66°C	+66°C	+66°C
Metallic models	–	+93°C	+93°C	+93°C	+93°C
Maximum air pressure					
PVDF models	8.2 bar		4.8 bar	4.8 bar	4.8 bar
Other models	8.2 bar	6.8 bar	6.8 bar	6.8 bar	6.8 bar
Minimum air pressure	1.3 bar	1.3 bar	1.3 bar	1.3 bar	1.3 bar
Dry lift capacity at:	8.2 bar	6.8 bar	6.8 bar	6.8 bar	6.8 bar
Models with Teflon balls	3.0 m	3.0 m	3.0 m	3.0 m	3.0 m
Other models	5.2 m	4.5 m	4.5 m	4.5 m	4.5 m
Weight					
PVDF models	2.3 kg	4.9 kg	9.9 kg	30 kg	30 kg
Other Non-metallic models	1.7 kg	3.6 kg	8.6 kg	24 kg	24 kg
Stainless steel	–	7.2 kg	19.1 kg	51 kg	59 kg
Aluminium	–	3.8 kg	8.6 kg	28 kg	28 kg
Maximum solids					
Max-Pass valves	6.4 mm	–	–	–	–
Others	3.2 mm	3.1 mm	6.4 mm	6.4 mm	6.4 mm
Air supply					
Inlet	1/4" NPT female	1/4" NPT female	1/4" NPT female	3/4" NPT female	3/4" NPT female
Outlet	3/8" NPT female	3/8" NPT female	3/8" NPT female	3/4" NPT female	3/4" NPT female
Fluid inlet/discharge					
Non-metallic models	3/8" BSP female	1/2" BSP female 3/4" BSP male	1" BSP female	1 1/2“ DIN/ANSI-Flange	2“ DIN/ANSI-Flange
Metallic models	–	dto.	dto.	dto.	dto.

1.3.2 Operation in hazardous location or pumping flammable liquids

Pump may only be used at atmospheric conditions of 0.8 bar up to 1.1 bar, normal air moisture conditions and within a temperature range of –20°C up to +40°C. Pump must not be used within atmospheres containing inflammable dust.

Danger!
Pumping of flammable liquids 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 liquids or when used in a location where surrounding atmosphere is conductive to spontaneous combustion.
The rating plate of the pump must show a respective Ex-identification according to the application.
Use grounding plugs and always connect to a good ground source. Actual valid regulations concerning the grounding have to be observed.

- 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. Resistance of grounding must not exceed 10^6 ohm.
- Note local building codes and regulations for explosion protection.
- Use conductive hoses.
- Use proper ventilation.
- Keep flammables away from heat, open flames and sparks.
- Keep containers closed when not in use.
- Use only new genuine spare parts for repairs.
- **Pumps which are modified by the customer may vary from the EC-Declaration of Conformity. Observe rating plate!**

1.3.2.1 Traceability

Products manufactured by Lutz-Pumpen for potentially explosives atmospheres are identified by an individual batch number which allows them to be traced. This number provides the year of construction and the design of the equipment.

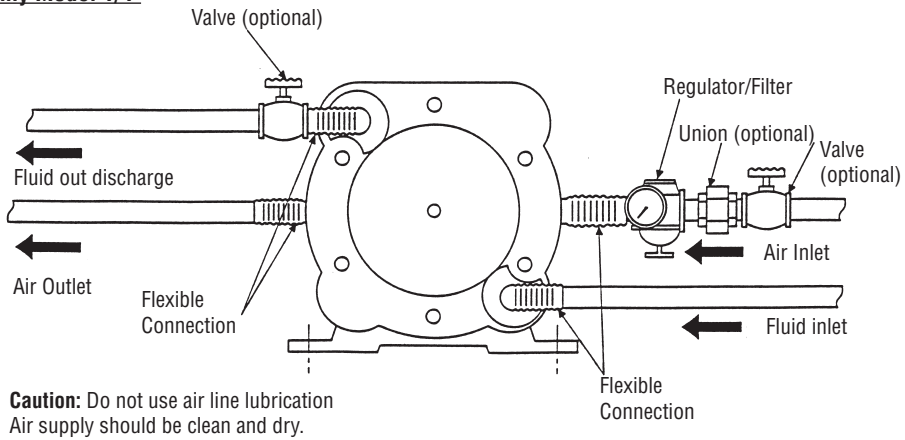
This product is an appliance for potentially explosive atmospheres. In this regard and in compliance with the EC ATEX 94/9 Directive, provisions must be made to ensure ascending and descending traceability.
Our ATEX notified quality system ensures this traceability up to the initial point of delivery.
Except as otherwise agreed in writing, anyone that guarantees to redeliver said equipment undertakes to put in place a system that allows for equipment that is not conform to be recalled if necessary.

1.3.2.2 Year of construction

The year of construction of the appliance can be seen on the field for the serial number. Here are attached to the serial number the both last digits of the year of construction, e.g. (-10 for the year 2010).

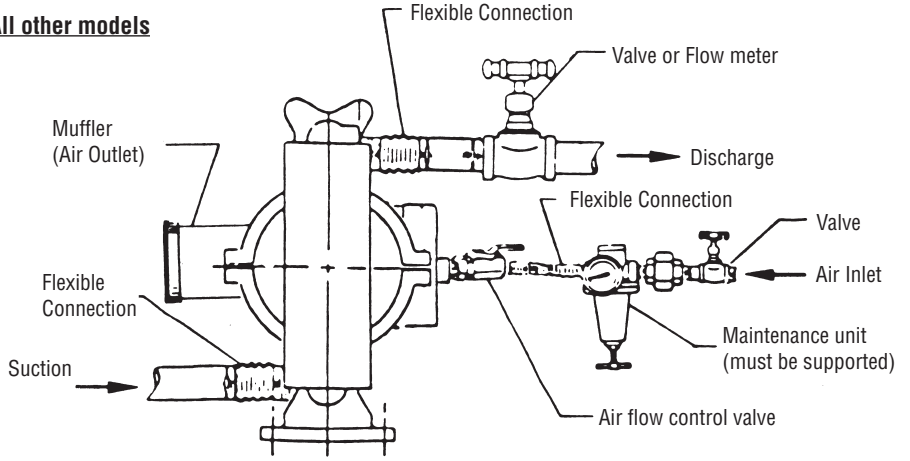
2. Installation

Only Model 1/4"



Caution: Do not use air line lubrication
Air supply should be clean and dry.

All other models



Notice: Suction and discharge ports may be repositioned to suit the application.

Notice: Re-torque fasteners prior to use. See respective chapter in this maintenance manual.

Danger!
Danger of fire and explosion due to inflammable compressed gases within the air supply system!
Combustion hazard. Blast wave: Flying parts can kill you.
Do not operate the pump with compressed flammable gases.

1. A lube-free, clean, dry, compressed air source 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.
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 the 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 14 Nm of torque on plastic pipe threads.
9. For installation with connection flanges tighten fasteners to 25 Nm of torque.
10. If changing to a different application reconfirm compatibility of fluid.

2.1 Submerged Applications

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

2.2 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. The use of dual manifolds may increase flow rate (only possible with 1/2"- models).
3. Start the pump slowly using a valve on the air line.

2.3 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 (note explosion protection!).
3. UV rays will damage polypropylene pumps. Either shroud the pumps from UV rays or use pumps with UV stabilized materials.

3. Maintenance

3.1 General Maintenance

1. Check periodically for product or air leakage. Tighten any joint where leakage is occuring.
2. When pumping hazardous or toxic liquids, diaphragms should be replaced at regularly scheduled intervals based upon pump usage.
3. When pumping highly abrasive fluids reduce discharge flow rate to prolong life of diaphragm, valve balls, valve seats etc. or optionally use a larger pump which can be operated at a lower stroke frequency.
4. If you are pumping a fluid that will settle or compact the pump must be flushed before shut down.
5. In freezing temperatures, the pump must be completely drained when idle.

3.2 Maintenance Model 1/4"

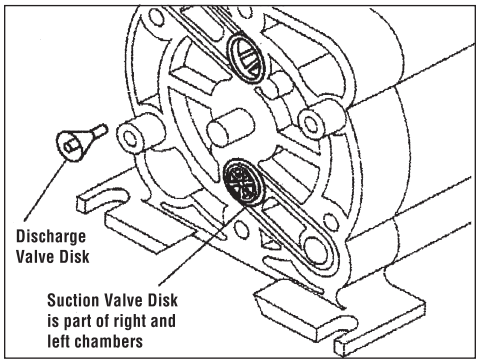
3.2.1 Maintenance of Check Valve, Gasket and O-Ring

1. Flush the pump to be certain all corrosive or hazardous materials are removed. Remove suction, discharge and air supply lines.
2. Remove the nuts (28) and slide the six cap screws (27) that hold the pump together out of the pump. Remove the eight screws (5) and two screws (5A) from the left and right manifold plates (1,19) and inspect the gaskets (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 (18) which contain the valves must be replaced.
   The upper discharge valve disks (3) are not sealed into the chambers and may be inspected for wear.

Caution!
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 (17) remove right chamber (18).
4. Both diaphragms (9) can be inspected after removing the right and left chamber (6.18). 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 (3) into place. Press gaskets (2) into groove in chambers (6, 18).

6. Align left and right manifolds (1,19) on the bosses of the chambers (6,18). Secure to each chamber with the eight screws (5) and two screws (5A). Slide left chamber tubes (6) through intermediate (15). Position o-ring retainers (4) and o-rings (17) on the end of the tubes. Lubricate o-rings and right chamber holes (18). Slide a flat washer (26) onto each of the six cap screws (27) and insert through the entire assembly. Secure with a flat washer (26) and a tension washer (29) under each nut. Tighten to 7 Nm. Apply torque evenly.



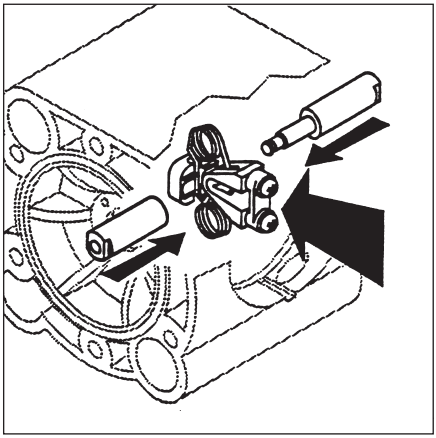
3.2.2 Maintenance of Diaphragms

7. Remove outer diaphragm plates (7) by holding one diaphragm plate and twisting off the other plate.
8. The diaphragm o-ring (8) is used only with Teflon diaphragms. Replace diaphragms if ruptured or worn. Inspect inner diaphragm plates (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 4.5 Nm. Reassemble pump according to steps 5 and 6.

3.2.3 Maintenance of Air Valve and Diaphram Rod

10. To remove the diaphragm rod twist the two rod halves (11,16) apart by using a 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 (14) remove the two self tapping screws (12) from the retaining plates (13). Gently remove lip seals and inspect for damage. To reassemble lubricate diaphragm rod lip seals (14) and insert into bore with the u-cup portion facing inward.

12. To remove spring clip assembly (23) firmly pull air valve plug (25) from pump.
13. Inspect spring clip assembly (23) and shuttle (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 seal retainer (13) with flat surface toward lip seals (14). Do not over tighten self-tapping screws (12).
15. To reinsert diaphragm rod halves, drop shuttle (22) into intermediate over ports. Groove in 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 (16) through spring clip assembly and position under spring ends.



Apply pressure with finger while inserting and assembling the diaphragm rods.

16. While continuing to apply pressure to spring clip assembly, screw short half of diaphragm rod (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 (7) are tightened.
18. Make sure valve plug o-ring (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.
19. Follow procedure for final assembly of pump in step 6.

3.3 Maintenance Model 3/8"

3.3.1 Maintenance of Max-Pass- or Check Valve

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 (3) and washers (4) from the bolts (23) in manifolds. Remove the manifolds (20), (11). Two of the four max-pass valves and back-ups (13, 14) are located inside of the bottom of the outer chambers (16). Gently remove and inspect for excessive wear, pitting or other signs of degradation. Inspect manifold o-ring (12) as well and replace if necessary. The other two max-pass valves are located inside of the bottom of the discharge manifold (20). Repeat the procedure for inspection of discharge valves, back-ups and o-rings.
   (Some pumps such as those built with PTFE have ball valves in place of the max-pass valves. Repeat the procedure – inspect valve seat (28), balls (29), ball cage (27) and o-ring (12)).
3. When re-assembling the max-pass pump, the sleeve (15) should be assembled into the valve cavity first, followed by the max-pass valve (13), the valve back-up (14) and finally the o-ring (12).
   For pumps with ball valves, the cage (27) should be assembled into the valve cavity first, followed by the ball (29), valve seat (28) and finally the o-ring (12).
   Lightly tighten all external fasteners when assembling, torquing them to their requirements after pump is completely assembled.

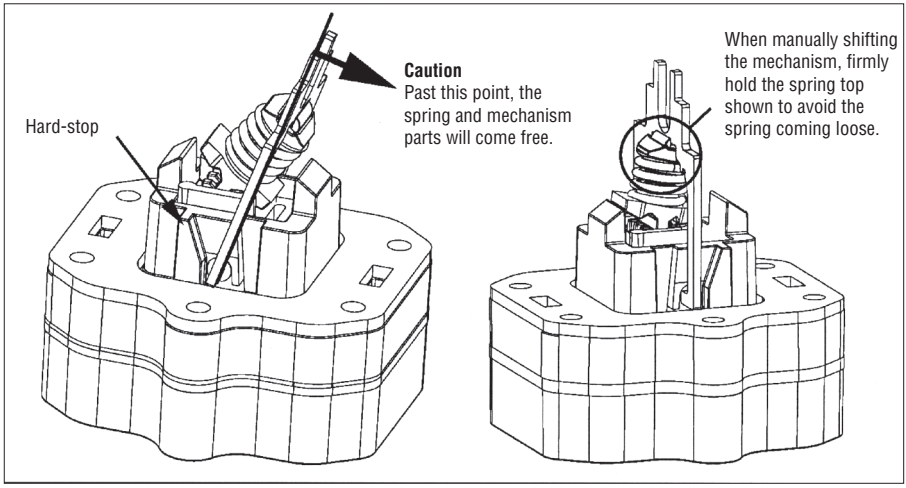
Caution!
When using pumps built with PTFE o-rings always replace with new PTFE o-rings, since the original o-rings may not reseal the pump.

3.3.2 Maintenance of Diaphragms

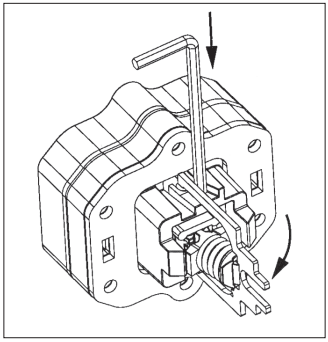
4. To inspect diaphragms, remove the nuts (7) from the carriage bolts (8) on the band clamps (6) surrounding the outer pump chambers (16). If replacement is necessary due to abrasion or rupture unscrew the outer diaphragm plates (17). Only models that have PTFE elastomers will have both a PTFE overlay (18) that faces the outer pump chamber and an o-ring (25) on the air side of pump. Note: Pumps that do not contain PTFE will not have o-ring (25), they are built with diaphragms (19) only.
5. To inspect the diaphragm rod`s lip seals (26) remove diaphragm rod (5). Before remove the air valve assembly (2) by unscrewing the screws (9). Replace if necessary. Be sure to reinsert the lip seals with open cup facing the inside of the pump. Make sure that the rod guide is facing the air valve assembly and slide the diaphragm rod back into the intermediate.
6. Take one diaphragm and with the curved side of the inner diaphragm plate facing the diaphragm, assemble onto the outer diaphragm plate stud (17). Screw the assembly into the end of the diaphragm rod. Repeat for the other side. Tighten the outer diaphragm plates to 4.5 Nm of torque.
7. Position outer diaphragm chambers onto the intermediate, making sure that the witness line of the intermediate matches with the parting line of the chamber.
8. 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 anti-seize compound to the thread. Tighten all external fasteners to final torque requirement after pump is completely assembled.
9. 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.

3.3.3 Air Valve Assembly Inspection

Caution!
Only one side of the mechanism has a hard-stop. Shifting the mechanism past its operating position can cause the spring to pop free and many small components to come loose. Use caution when shifting the mechanism manually.



10. If there has been a diaphragm rupture and fluid has entered the air side of the pump, the complete air system should be inspected. Remove the air valve assembly (2) by unscrewing the screws (9).
11. Clean or replace the air valve assembly if there is excessive wear, dirt build-up or chemical attack. Inspect for proper shifting of the spring mechanism by manually pushing the metal spring retainer from one side to the other.
12. To reassemble the air valve, first shift the spring mechanism to the side with the hard-stop. Next, prop the spring retainer into a more neutral position by inserting a 3 mm hex key as shown between the hard-stop and the spring retainer.
13. With the rod guide (1) positioned such that the opened end is facing the air valve assembly opening, slide the air valve assembly in place so that the forks slide into the rod guide. Once the fork of the spring retainer is in the rod guide, pull the hex key free and push the air valve assembly fully into place. Finally, reinsert and tighten the air valve assembly screws to the torque listed below.



3.3.4 Fastener Torque Requirements

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

Air valve assembly screws	1.35 Nm
Band clamps	18.8 Nm
Manifold bolts	1.13 Nm
Outer diaphragm plates	4.5 Nm

3.4 Maintenance Model 1/2", Band Clamp Version

3.4.1 Maintenance of Check Valve and O-Ring

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 (8) 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 and manifold o-rings (38). Replace if necessary. Discharge check valves are located inside of the bottom of the discharge elbows (32).
3. To inspect the manifold o-rings (22) 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. Align the single parts of the complete pump and tighten the screws in turn with the admissible torque requirement. The check ball should fit into the curved portion of the valve seat and be facing upward when reinserted into the valve seat location.

⚠ **Caution!**
When using pumps built with PTFE o-rings always replace with new PTFE o-rings, since the original o-rings may not reseal the pump.

3.4.2 Maintenance of Diaphragm and Pilot Sleeve Assembly

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 PTFE elastomers will have a PTFE overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. When changing diaphragms it is recommended to replace always both. Pumps without PTFE will contain only the back-up diaphragms (31).
5. If a diaphragm has been ruptured and corrosive or viscous fluid has entered the air side of the 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) and push the entire unit out through the bore in the intermediate (34). Diaphragm rod assembly must be unscrewed to remove pilot sleeve.

⚠ **Caution!**
To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives.

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 (14), o-rings (42) and lip seals (40) within bore of intermediate. Make sure that the open side of the lip seals (40) 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 (13.15) with pilot sleeve (45) inside the assembly in the bore. Reattach retaining plates (41). 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 (33) facing the diaphragm assemble onto outer diaphragm plate stud (29) 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 8 Nm of torque.
8. Assemble the outer chamber (28) and band clamps (16) first on the side where the diaphragm is fitted on the intermediate. Lightly tighten fasteners at band clamp. Push opposite diaphragm towards intermediate and fix second outer chamber. When positioning outer diaphragm chambers onto intermediate make sure that witness lines are matching.

Caution!
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 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.

3.4.3 External fastener torque requirements

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

Band clamps	18 Nm
Manifold bolts and outer chamber cap screws	2.3 Nm
Air valve cap screws	7 Nm

3.4.4 Maintenance of Air Valve

11. To evaluate air valve components, remove the four cap screws (11), washers, (25, 10) and nuts (19) 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. 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.

Caution!
Make sure that the open sides of the two lip seals (43) face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.

12. Reinsert air valve spool (2) inside of air valve body (7). Place shuttle (6) on middle rib of air valve spool (2) through the square slot in back of air valve (7). If using original valve plate (5) lubricate side of plate that was facing the shuttle (6) (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 the valve plug (1) into air valve body, chamfered end first.
13. Check the gaskets (3,4) are not cracked. If damaged replace.
14 After gaskets (3,4) are pressed back into position align air valve onto intermedaite and reinsert the four cap screws (11) with lock washer (25) and flat washers (10). Apply 7 Nm of torque to fasteners.

Caution:
1/2" double diaphragm pumps (non-metallic models only) are supplied in addition with a dual manifold capability. This makes it possible to pump two different fluids at the same time but seperately. Manifold dual suction port and single discharge port enable the pump to mix two different fluids.

3.5 Maintenance Model 1/2", Bolted Version

3.5.1 Maintenance of Check Valve and O-Ring

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 nuts (18) from bolts (16) in both the discharge and suctions manifolds. 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 and manifold o-rings (19,38). Replace if necessary. Discharge check valves are located inside of the bottom of the discharge elbows (32).
3. When re-assembling, the check ball should fit within the ball cavity of the chamber and discharge manifold. Press fit the valve seats into position with the curved portion facing the ball. Lightly tighten fasteners. Tighten all external fasteners to final torque requirement after pump is completely assembled.

Caution!
When using pumps built with PTFE o-rings always replace with new PTFE o-rings, since the original o-rings may not reseal the pump.

3.5.2 Maintenance of Diaphragm and Pilot Sleeve Assembly

4. To inspect diaphragms remove nuts (18) from bolts (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 PTFE elastomers will have a PTFE overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. Pumps without PTFE will contain only the back-up diaphragms (31).
5. If a diaphragm has been ruptured and corrosive or viscous fluid has entered the air side of the 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) and push the entire unit out through the bore in the intermediate (34). Diaphragm rod assembly must be unscrewed to remove pilot sleeve.

Caution!
To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives.

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 (47), o-rings (42) and lip seals (40) within bore of intermediate. Make sure that the open side of the lip seals (40) 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 (13.15) with pilot sleeve (45) inside the assembly in the bore. Reattach retaining plates (41). Do not over tighten 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 (33) facing the diaphragm assemble onto outer diaphragm plate stud (29) 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 8 Nm of torque. After tightening, reverse the inverted diaphragm back to its original state, allowing the outer bead to seat in the groove of the intermediate.

Caution!
Inverting the first diaphragm aids reassembly.

8. When positioning outer diaphragm chambers onto intermediate make sure that witness lines are matching.

Caution!
If air valve has been removed, proper orientation of air system with fluid chambers must be observed. The bottom of the intermediate has the smaller hook shaped air passage slot on the air valve mounting face and the outer chamber check ball cavity should be pointing downward.

9. Tighten all external fasteners to final torque requirement after pump is completely assembled.
10. Position the manifolds making sure of the proper orientation in relation to the air valve for your application. Also make sure that the manifold o-rings do not shift from their grooves during reassembly. Tighten all external fasteners to final torque requirement after pump is completely assembled.

3.5.3 External fastener torque requirements

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

Air valve cap screws	4.5 Nm
Manifold bolts	10.0-11.3 Nm
Outer chamber cap screws	8.5-9.5 Nm

3.5.4 Maintenance of Air Valve

11. To evaluate air valve components, remove the four cap screws (11), washers, (25, 10) and nuts (17) from the air valve body (7). The shuttle 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. Remove the plug (1) at the bottom of the air valve. 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.

Caution!
Make sure that the open sides of the two lip seals (43) face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.

12. Reinsert air valve spool (2) inside of air valve body (7). Place shuttle (6) on middle rib of air valve spool (2) through the square slot in back of air valve (7). Lubricate side of plate (5) that faces the shuttle (6) and reposition valve plate over shuttle. Press the valve plug (1) into air valve body, chamfered end first.
13. Check that gasket (4) is not cracked. If damaged replace.
14. After gasket (4) is pressed back into position align air valve onto intermediate and reinsert the four cap screws (11) with lock washer (25) and flat washers (10). Apply 4.5 Nm of torque to fasteners.

3.6 Maintenance Model 1", Band Clamp Version

3.6.1 Maintenance of Check Valve and O-Ring

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 and manifold o-rings (22). Replace if necessary. Discharge check valves are located inside of the bottom of the discharge elbows (21 metallic), (32 non-metallic).
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. Align the single parts of the complete pump and tighten the screws in turn with the admissible torque requirement. The check ball should fit into the curved portion of the valve seat and be facing upward when reinserted into the valve seat location.

Caution!
When using pumps built with PTFE o-rings always replace with new PTFE o-rings, since the original o-rings may 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.

3.6.2 Maintenance of Diaphragm and Pilot Sleeve Assembly

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 PTFE elastomers will have a PTFE overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. When changing diaphragms it is recommended to replace always both. Pumps without PTFE will contain only the back-up diaphragms (31).
5. If a diaphragm has been ruptured and corrosive or viscous fluid has entered the air side of the 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.

Caution!
To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives.

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 (14), o-rings (42) and lip seals (48) within bore of intermediate. Make sure that the open side of the lip seals (48) 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 (13.15) with pilot sleeve (45) inside the assembly in the bore. Reattach retaining plates (49). Do not overtighten self-tapping screws (38).
7. Assemble diaphragm (31) (and optional Teflon overlay (30)) and inner diaphragmm plate (33) onto outer diaphragm plate stud (29). 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 18 Nm of torque.
8. Assemble the outer chamber (28) and band clamps (16) first on the side where the diaphragm is fitted on the intermediate. Lightly tighten fasteners at band clamp. Push opposite diaphragm towards intermediate and fix second outer chamber. When positioning outer diaphragm chambers onto intermediate make sure that witness lines are matching.

Caution!
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 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. Concave side of tension washers used in non-metalllic pumps only should face each other.

3.6.3 External fastener torque requirements

Caution!
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)		18 Nm
Band clamps (manifolds)		9 Nm
Outer chamber cap screws:	Non-metallic pumps	5 Nm
	Metallic pumps	22 Nm

3.6.4 Maintenance of Air Valve

11. To evaluate air valve components, remove the four cap screws (11), washers, (8, 10) and nuts (40) 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. 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.

Caution!
Make sure that the open sides of the two lip seals (43) face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.

12. Reinsert air valve spool (2) inside of air valve body (7). Place shuttle (6) on middle rib of air valve spool (2) through the square slot in back of air valve (7). If using original valve plate (5) lubricate side of plate that was facing the shuttle (6) (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 the valve plug (1) into air valve body, chamfered end first.
13. Check the gaskets (3,4) are not cracked. If damaged replace.
14. After gaskets (3,4) are pressed back into position align air valve onto intermedaite and reinsert the four cap screws (11) with lock washer (10) and flat washers (8). Apply 7 Nm of torque to fasteners.

3.6.5. Dual manifold capability (non-metallic pumps only)

1. Release the four screws (35) and the band clamps (20).
2. Remove existing manifolds (21) (depending on function).

Caution:
There is a female 1" NPT thread inside the elbows.

3. Rotate elbows 180° outwards and realign and secure pumping chamber cap screws (35).
4. Pump is now ready for dual side suction and discharge through the elbows.

3.7 Maintenance Model 1", Bolted Version

3.7.1 Maintenance of Check Valve and O-Ring

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 nuts (18) and washers (12) from bolts (16) in both the discharge and suctions manifolds. 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 and manifold o-rings (19,38). 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 and o-rings.
3. When re-assembling, the check ball should fit within the ball cavity of the chamber and discharge manifold. Press fit the valve seats into position with the curved portion facing the ball. Lightly tighten fasteners. Tighten all external fasteners to final torque requirement after pump is completely assembled.

Caution!
When using pumps built with PTFE o-rings always replace with new PTFE o-rings, since the original o-rings may not reseal the pump.

3.7.2 Maintenance of Diaphragm and Pilot Sleeve Assembly

4. To inspect diaphragms remove nuts (18) and washers (12, 9) from bolts (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 PTFE elastomers will have a PTFE overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. Pumps without PTFE will contain only the back-up diaphragms (31).
5. If a diaphragm has been ruptured and corrosive or viscous fluid has entered the air side of the 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) and push the entire unit out through the bore in the intermediate (34). Diaphragm rod assembly must be unscrewed to remove pilot sleeve.

Caution!
To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives.

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 (47), o-rings (42) and lip seals (40) within bore of intermediate. Make sure that the open side of the lip seals (40) 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 (13.15) with pilot sleeve (45) inside the assembly in the bore. Reattach retaining plates (41). Do not over tighten self-tapping screws (24).
7. Take one diaphragm (31) with the curved side of the inner diaphragm plate (33) facing the diaphragm assemble onto outer diaphragm plate stud (29) and then screw assembly into diaphragm rod. Push diaphragm rod to opposite side of intermediate and add the opposite diaphragm assembly. Apply 18.5 Nm of torque to outer diaphragm plates.
8. When positioning outer diaphragm chambers onto intermediate make sure that witness lines are matching.

Caution!
If air valve has been removed, proper orientation of air system with fluid chambers must be observed. The bottom of the intermediate has the smaller hook shaped air passage slot on the air valve mounting face and the outer chamber check ball cavity should be pointing downward.

9. Replace all external fasteners and tighten to final torque requirement after pump is completely assembled.
10. Position the manifolds making sure of the proper orientation in relation to the air valve for your application. Also make sure that the manifold o-rings do not shift from their grooves during reassembly. Tighten all external fasteners to final torque requirement after pump is completely assembled.

3.7.3 External fastener torque requirements

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

Air valve cap screws	4.5 Nm
Manifold bolts	11.3-12.5 Nm
Outer chamber cap screws	8.5-9.5 Nm

Caution!
Always torque the chamber bolts prior to the manifold bolts.

3.7.4 Maintenance of Air Valve

11. To evaluate air valve components, remove the four cap screws (11), washers, (25, 10) and nuts (17) from the air valve body (7). The shuttle 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. Remove the plug (1) at the bottom of the air valve. 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.

Caution!
Make sure that the open sides of the two lip seals (43) face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.

12. Reinsert air valve spool (2) inside of air valve body (7). Place shuttle (6) on middle rib of air valve spool (2) through the square slot in back of air valve (7). Lubricate side of plate (5) that faces the shuttle (6) and reposition valve plate over shuttle. Press the valve plug (1) into air valve body, chamfered end first.
13. Check that gasket (4) is not cracked. If damaged replace.
14. After gasket (4) is pressed back into position align air valve onto intermediate and reinsert the four cap screws (11) with lock washer (25) and flat washers (10). Apply 4.5 Nm of torque to fasteners.

3.8 Maintenance Model 1 1/2" and 2", Band Clamp Version

3.8.1 Maintenance of Check Valve and O-Ring

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.

2a. Non-metallic pumps: Remove the elbow to outer pumping chamber (28) 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 and manifold o-rings (24). Replace if necessary. Discharge check valves are located inside of the bottom of the discharge elbows (32).

2b. Metallic pumps: To inspect the check valves, remove the nuts (17) from elbow manifold sections (21,23) and screws (19). Repeat procedure as described under point 2a. There are no manifold o-rings in the metallic pumps.

3. To inspect the manifold o-rings (22) remove the manifold band clamps (20) from each manifold assembly. Inspect and replace o-rings (22) if necessary. Then reassemble, lightly tighten fasteners. Align the single parts of the complete pump and tighten the screws in turn with the admissible torque requirement. The check ball should fit into the curved portion of the valve seat and be facing upward when reinserted into the valve seat location.

Caution!
When using pumps built with PTFE o-rings always replace with new PTFE o-rings, since the original o-rings may not reseal the pump.

3.8.2 Maintenance of Diaphragm and Pilot Sleeve Assembly

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 PTFE elastomers will have a PTFE overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. When changing diaphragms it is recommended to replace always both. Pumps without PTFE will contain only the back-up diaphragms (31).

5. If a diaphragm has been ruptured and corrosive or viscous fluid has entered the air side of the pump, the complete air system should be inspected. After removing diaphragms and 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 (49) (you may only need to remove one retaining plate) and pushing the entire unit out through the bore in the intermediate (41). The diaphragm rod assembly must be unscrewed to remove the pilot sleeve (13).

Caution!
To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives.

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 (45), o-rings (42) and lip seals (14) within bore of intermediate. Make sure that the open side of the lip seals (14) 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 (15). Next carefully insert the diaphragm rod assembly (34,49) with pilot sleeve (13) inside the assembly in the bore. Reattach retaining plates (46). Do not overtighten self-tapping screws (38).
7. With the curved side of the inner diaphragm plate (33) facing the diaphragm, assemble onto outer diaphragm plate stud (29) and then screw assembly into diaphragm rod. Push diaphragm rod to opposite side of intermediate and add the opposite diaphragm assembly. Apply 42 Nm of torque to outer diaphragm plates (29). Assemble the outer chamber (28) and band clamps (16) 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.

Caution!
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 chack ball cavity should be pointing downward.

Caution!
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.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. Metallic pumps: Position manifold/elbow sections making sure that the valve seat o-rings do not shift from their grooves. Tighten fasteners on bolts loosely.

3.8.3 External fastener torque requirements

Caution!
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)	28 Nm
Band clamps (manifolds and elbow)	9 Nm
Metallic pumps (elbow and chamber bolts)	50 Nm

3.8.4 Maintenance of Air Valve

9. To evaluate air valve components, remove the four cap screws (11), washers, (8, 10) and nuts (40) 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. 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.

Caution!
Make sure that the open sides of the two lip seals (43) face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.

10. Reinsert air valve spool (2) inside of air valve body (7). Place shuttle (6) on middle rib of air valve spool (2) through the square slot in back of air valve (7). If using original valve plate (5) lubricate side of plate that was facing the shuttle (6) (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 the valve plug (1) into air valve body, chamfered end first.
11. Check the gaskets (3,4) are not cracked. If damaged replace.
12. After gaskets (3,4) are pressed back into position align air valve onto intermedaite and reinsert the four cap screws (11) with lock washer (10) and flat washers (8). Apply 7 Nm of torque to fasteners.

3.9 Maintenance Model 1 1/2“ and 2“, Bolted Version

3.9.1 Maintenance of Check Valve and O-Ring

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.

2a. **Non-metallic pumps:**Remove the elbow to outer pumping chamber (28) 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.

2b. **Metallic pumps:**To inspect the check valves, remove the cap screws (19) from manifold sections (21,23). Repeat procedure as described under point 2a. There are no manifold o-rings in the metallic pumps.

3. **Non-metallic pumps:** To inspect the manifold o-rings (22) remove the manifold band clamps (20) from each manifold assembly. Inspect and replace o-rings (22) if necessary. Then reassemble, lightly tighten fasteners. The check ball should fit into the curved portion of the valve seat and be facing upward when reinserted into the valve seat location. Tighten all external fasteners to final torque requirement after pump is completely assembled.

Caution!
When using pumps built with PTFE o-rings always replace with new PTFE o-rings, since the original o-rings may not reseal the pump.

3.9.2 Maintenance of Diaphragm and Pilot Sleeve Assembly

4. To inspect diaphragms remove cap screws (16) and reinforcement bracket (25) 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 PTFE elastomers will have a PTFE overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. Pumps without PTFE will contain only the back-up diaphragms (31).
5. If a diaphragm has been ruptured and corrosive or viscous fluid has entered the air side of the pump, the complete air system should be inspected. After removing diaphragms and 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.

Caution!
To aid in reassembly use a non-synthetic, petroleum based lubricating grease without EP additives.

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 (45, 48), o-rings (42) and lip seals (14) within bore of intermediate. Make sure that the open side of the lip seals (14) 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 (42). Next carefully insert the diaphragm rod assembly (34, 49) with pilot sleeve assembly (13, 14, 15, 42, 45, 48) inside the bore. Reattach retaining plates (46). Do not overtighten self-tapping screws (38).
7. With the curved side of the inner diaphragm plate (33) facing the diaphragm, assemble onto outer diaphragm plate stud (29) 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 42 Nm of torque. Assemble the outer chamber (28), reinforcement brackets (25) and bolts first on the side where the diapragm has been inverted. Next reach under the opposite diaphragm assembly and pull diaphragm rod to opposite side (a large flat screwdriver may be used as an aid in this process) and assemble remaining outer chamber, reinforcement brackets and cap screws. When positioning outer diaphragm chambers onto intermediate make sure that witness lines are matching.

Caution!
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.

Caution!
Non-metallic pumps: When positioning band clamps (35, 20) 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 and cap screws 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. **Metallic pumps:**Also make sure that the valve seat o-rings do not shift from their grooves during reassembly. Tighten fasteners on bolts loosely.

3.9.3 External fastener torque requirements

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

Chamber Bolts (Outer Chamber – all versions)	20.5 Nm
Band clamps (manifolds and elbow)	9 Nm
Metallic pumps (elbow and chamber bolts)	50 Nm
Air valve cap screws	4.5 Nm

3.9.4 Maintenance of Air Valve

9. To evaluate air valve components, remove the six cap screws (11), washers, (8, 10) and nuts (40) from the air valve body (7). The shuttle 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. 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.

Caution!
Make sure that the open sides of the two lip seals (43) face each other when reassembling air valve. Lube all components with suggested maintenance grease as an aid in reassembly.

10. Reinsert air valve spool (2) inside of air valve body (7). Place shuttle (6) on middle rib of air valve spool (2) through the square slot in back of air valve (7). If using original valve plate (5) lubricate side of plate that was facing the shuttle (6) (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 the valve plug (1) into air valve body, chamfered end first.
11. Check that gasket (4) is not cracked. If damaged replace.
12. After gasket (4) is pressed back into position align air valve onto intermediate and reinsert the six cap screws (11) with lock washer (10) and flat washers (8). Apply 4.5 Nm of torque to fasteners.

3.10 Maintenance Model 3", Bolted Version

3.10.1 Maintenance of Check Valve and O-Ring

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 suction and discharge manifolds fasteners (18). The check valve seats (26) and check balls (27) are located inside the bottom of the outer chamber (28) or inside the discharge manifold (22). Remove the seat and balls and inspect for excessive wear, pitting, or other signs of degradation. On models using nylon check valve seats (25) and o-rings (24), check the seats, balls, for excessive wear, pitting, or other signs of degradation.

Caution!
When using pumps built with PTFE o-rings always replace with new PTFE o-rings, since the original o-rings may not reseal the pump.

3.10.2 Maintenance of Diaphragm and Pilot Sleeve Assembly

3. To inspect the diaphragms, remove the eight fasteners (33) from the outer chamber. If replacement is necessary due to abrasion or rupture, remove the outer diaphragm plates (52) by turning counter-clockwise. Models that are built with PTFE elastomers will have a PTFE overlay (30) that faces the outer pumping chamber (28) and a back-up diaphragm (31) on the air side of pump. Pumps without PTFE will contain only the back-up diaphragms (31).
4. If diaphragm replacement is required, remove the inner diaphragm plate by removing fasteners (56, 55).
5. If a diaphragm has been ruptured and corrosive or viscous fluid has entered the air side of the pump, the complete air system should be inspected.
6. After removing the diaphragm-plate assemblies, bumpers (3), & flat washers (47) the pilot sleeve assembly (13, 14, 15, 42, 45 & 48) and diaphragm rod assembly (34, 49) may be removed after removing the retaining plate (46) fasteners (38) and pushing the entire unit out through the bore in the intermediate (41). The diaphragm rod assembly must be unscrewed to remove the pilot sleeve (13).

Caution!
To aid in reassembly apply a non-synthetic petroleum based lubricating grease without EP additives on all the o-rings and the intermediate bore.

7. 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 (45), o-rings (42) and lip seals (14) within bore of intermediate. Make sure that the open side of the lip seals (14) 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 (42). Next carefully insert the diaphragm rod assembly (34,49) with pilot sleeve (13) inside the assembly in the bore. Reattach retaining plates (46). Do not over tighten self-tapping screws (38).

Caution!
To aid in reassembly of the diaphragms apply a non-synthetic petroleum based lubricating grease without EP additives to the diaphragm`s outside diameter sealing bead.

8. Reassemble the diaphragms (31) by placing the “liquid side” on the outer diaphragm plate (52), place the inner diaphragm plate on the opposite side of the diaphragm, insert fasteners (56) with washers (55) and tighten fasteners to 17.0 Nm of torque.

Caution!
For models with Teflon overlays (30), position the overlay between the outer diaphragm plate (52) and the diaphragm (31) before attaching the inner diaphragm plate (51).

9. Screw stud (35) into the end of the diaphragm rod, place washer (47) onto stud (35) and bumper (3) onto diaphragm rod. Screw the diaphragm assembly to one end of the diaphragm rod and tighten to 10 ft-lbs (13.56 Nm). Position the outer chamber (28) and lightly tighten fasteners (16, 17, 18, 33).
   Insert a pry bar into the chamber`s suction opening until it touches the hex boss of the outer diaphragm plate (52). Move the diaphragm rod toward the open chamber. Wedge a block of wood between the pry bar and the side of the suction opening to hold the diaphragm rod in position.
   Invert the second diaphragm assembly, place washer (47) onto stud (35) and bumper (3) onto diaphragm rod. Screw the diaphragm assembly to the end of the diaphragm rod, and tighten to 10 ft-lbs (13.56 Nm) of torque. Roll the outside bead of the diaphragm toward the outer chamber. Position the outer chamber (28) and tighten fasteners (16, 17, 18, 33) to 20 ft-lbs (27.12 Nm) of torque. Return to the first outer chamber, align the suction opening flanges until they are level and on the same plane, tighten fasteners (16, 17, 18, 33) to 20 ft-lbs (27.12 Nm) of torque.
10. Place the check balls (27) and check valve seats (26) in the discharge manifold (22), position on the outer chamber (28) and reassemble using fasteners (16, 17, 18). Place the check balls (27) and check valve seats (26) in the outer chambers (28), position the suction manifold (23) and reasssemble using fasteners (16, 17, 18). Torque all manifold fasteners to 50 Nm.

10a. For models using Teflon elastomers, check valve seats (25), and o-rings (24), make sure that the o-rings (24) are facing the machined flanges of the suction manifold (23) and/or discharge manifold (22). Also make sure that the o-rings do not shift from their grooves during reassembly.

3.10.3 External Fastener Torque Requirements

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

Diapraghm Plates	17 Nm
Diaphragm/Rod	13.5 Nm
Chambers	27 Nm
Manifolds/Chamber	50 Nm
Air Valve Body	4.5 Nm

3.10.4 Maintenance of Air Valve

11. To evaluate the air valve components, remove the eight cap screws (11), washers (8, 10) from the air body (7). Inspect the gasket (4), valve plate (5) and shuttle (6) for scratches, surface irregularities, and excessive wear. Replace if necessary. Remove one of the end plugs (1) by inserting two of the cap screws (11) back into one end of the air valve body, point the other end of the air valve body safely away from people, and apply compressed air through one of the holes located on the gasket surface of the air valve body and the end plug will shoot out. Remove the two cap screws and push the air valve spool (2) toward the remaining end plug until both the end plug and air valve spool are removed being careful not to damage the machined bore in the air valve body.
    Gently reach in and pull the lip seal (43) and o-rings (44) out of inside bore of the air valve body. Check the air valve spool, lip seal and o-rings for cracks, splitting, scratches, and wear. Replace and/or clean items as necessary.
12. Lubricate lip seals (43) and o-rings (44). Reinstall the o-rings and lip seals making sure that the lips of the seals are facing each other.
    Lubricate and insert the air valve spool (2) with the chamfered end entering the air valve body`s inside bore through the end that has the spool image. Press the end plugs into position. Lubricate and reinstall the shuttle valve (6) and valve plate (5). Place the gasket (4) with the words “This side up” facing the valve plate. Reassemble to the intermediate using cap screws (11) and washers (8, 10). Flat washers should be touching the plastic air valve body. Tighten the screws to 4.5 Nm.

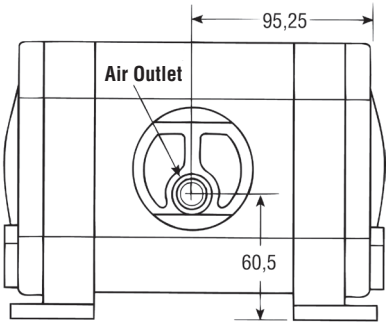
4. Repairs

Repairs should only be made by the manufacturer or authorized Lutz-dealers. Only use genuine Lutz spare parts.
Before sending back the appliance, following must be observed:

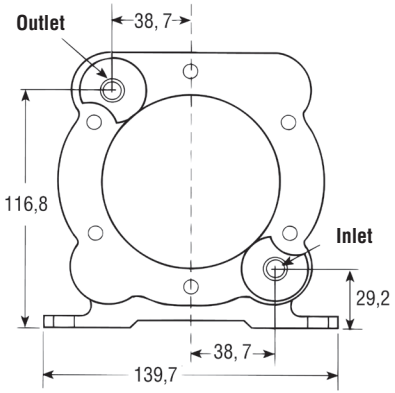
- Residuals in the appliance can cause danger to the environment and human health. The appliance must be completely emptied, rinsed and cleaned.
- Please advise which liquid has been pumped. A respective safety data sheet must be attached to the return consignment.

5. Dimensions

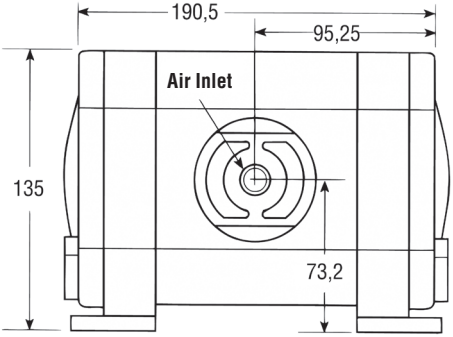
5.1 Model 1/4“



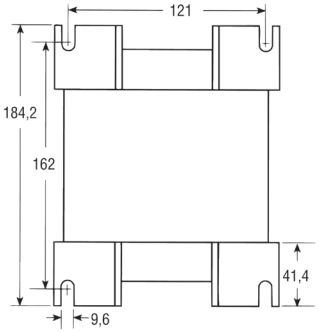
Rear View



Side View



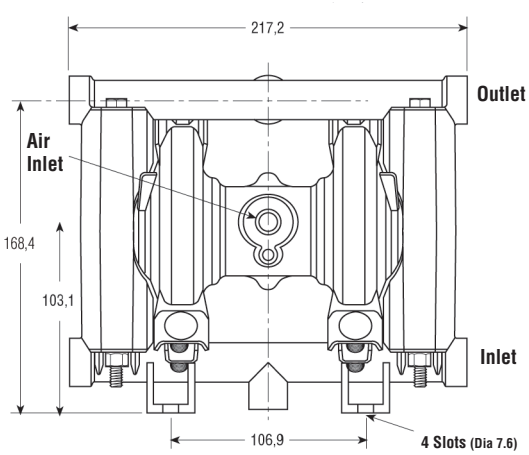
Front View



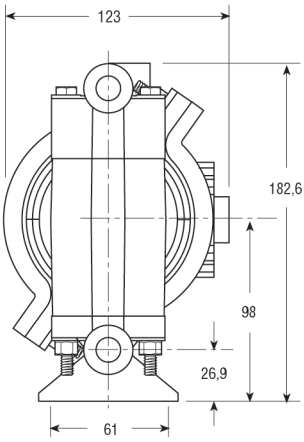
Mounting Positions

(Dimensions in mm)

5.2 Model 3/8“



Front View

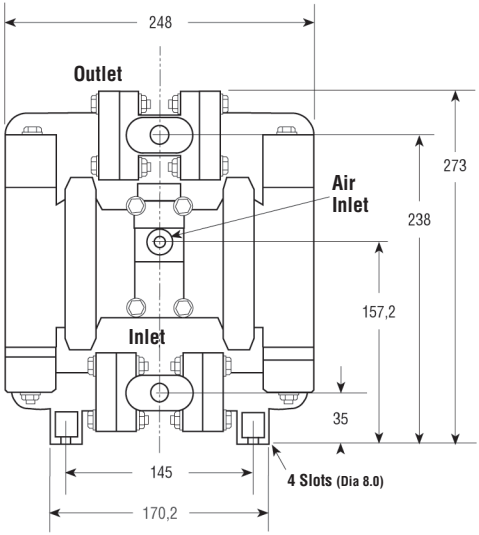


Side View

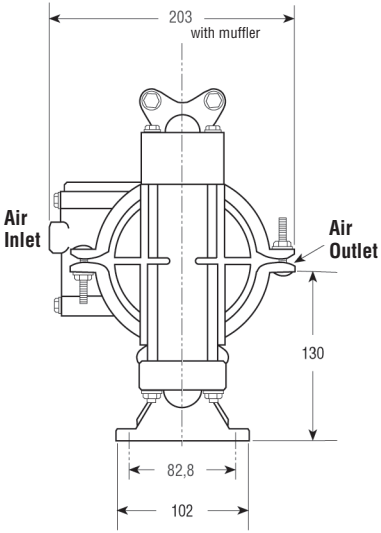
(Dimensions in mm)

5.3 Model 1/2", Band Clamp Version

Non-metallic pumps

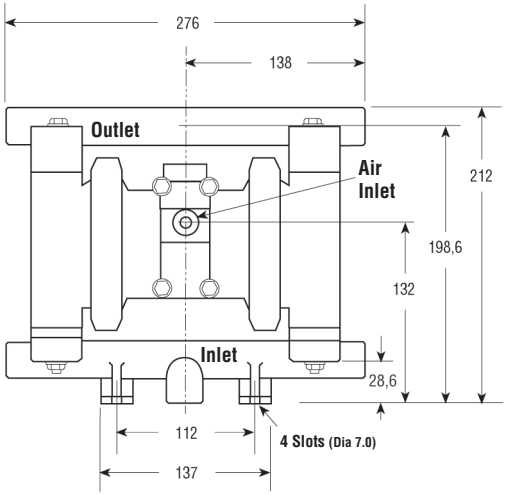


Front View

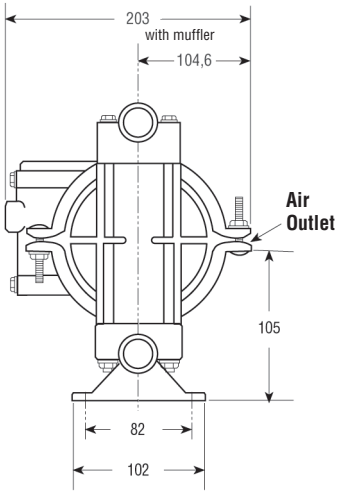


Side View

Metallic pumps



Front View

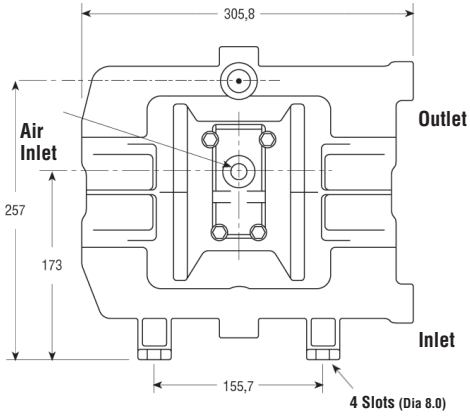


Side View

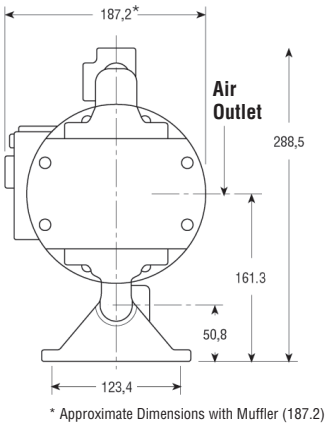
(Dimensions in mm)

5.4 Model 1/2", Bolted Version

Non-metallic pumps



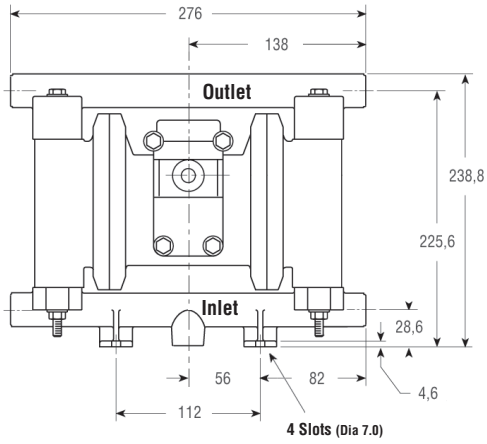
Front View



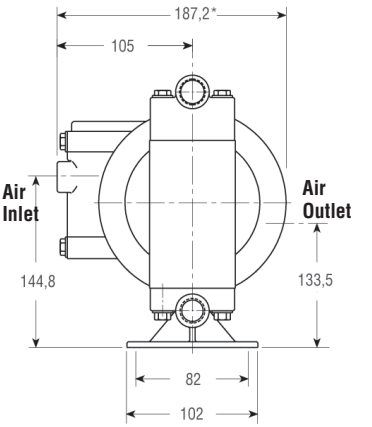
* Approximate Dimensions with Muffler (187.2)

Side View

Metallic pumps



Front View



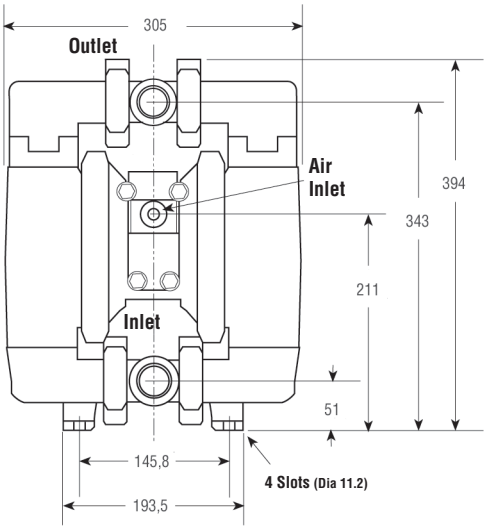
* Approximate Dimensions with Muffler (187.2)

Side View

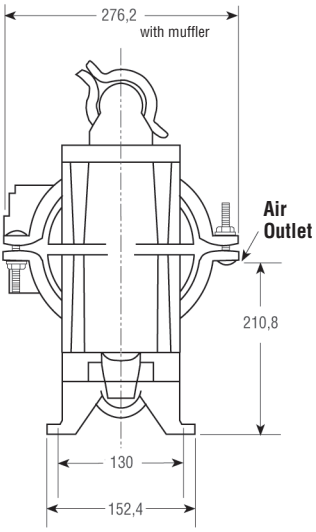
(Dimensions in mm)

5.5 Model 1", Band Clamp Version

Non –metallic pumps

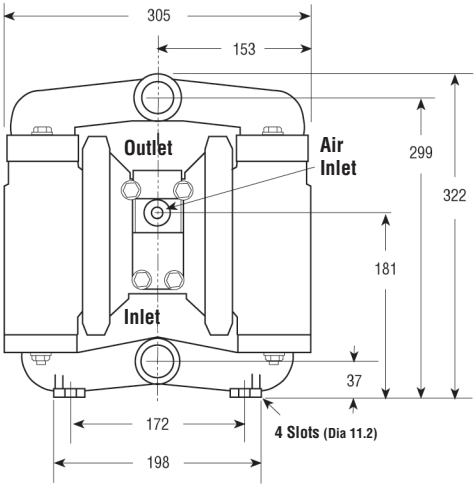


Front View

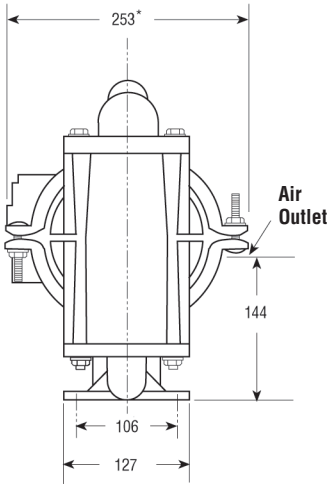


Side View

Metallic pumps



Front View



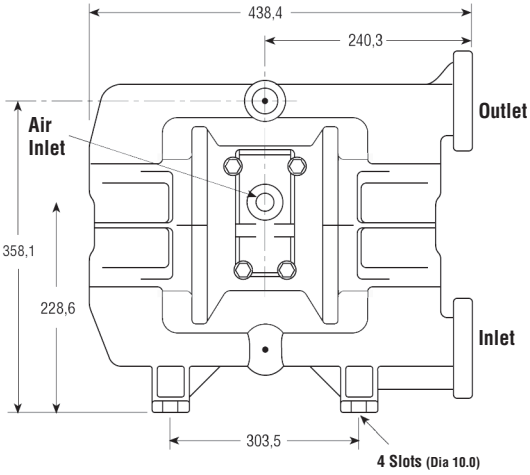
* Approximate Dimensions with Muffler (293.9)

Side View

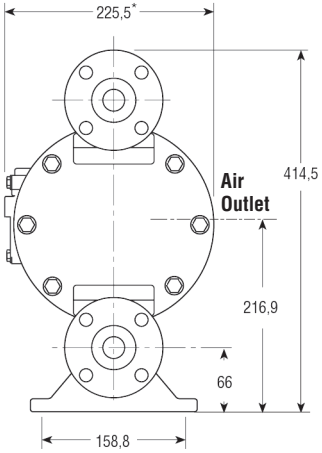
(Dimensions in mm)

5.6 Model 1", Bolted Version

Non –metallic pumps



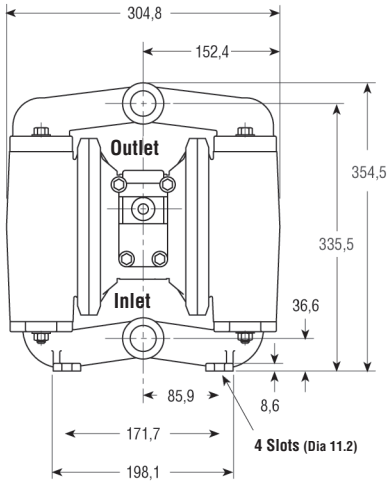
Front View



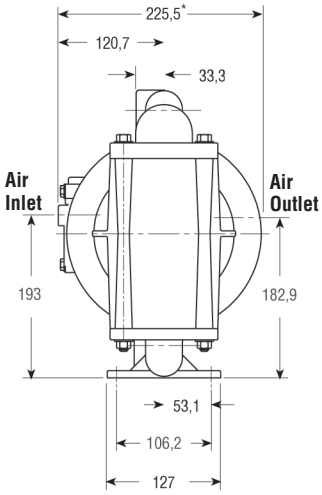
* Approximate Dimensions with Muffler (272.5)

Side View

Metallic pumps



Front View



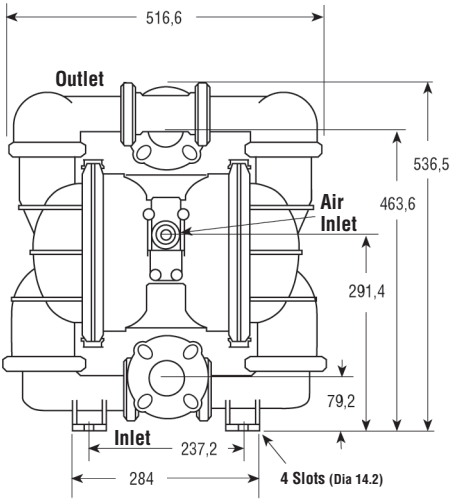
* Approximate Dimensions with Muffler (264)

Side View

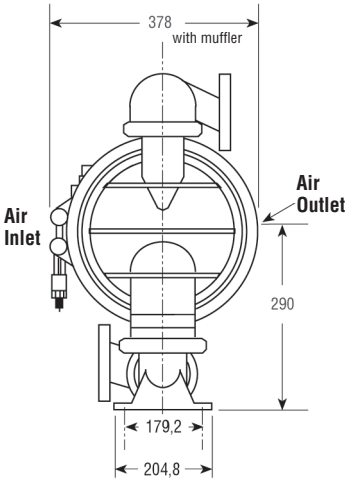
(Dimensions in mm)

5.7 Model 1 1/2", Band Clamp Version

Non –metallic pumps

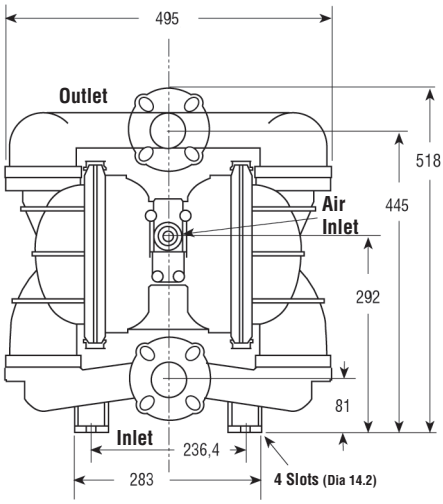


Front View

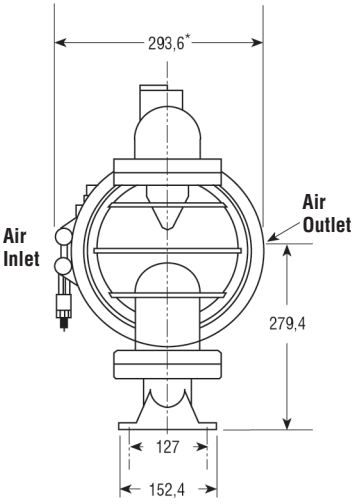


Side View

Metallic pumps



Front View



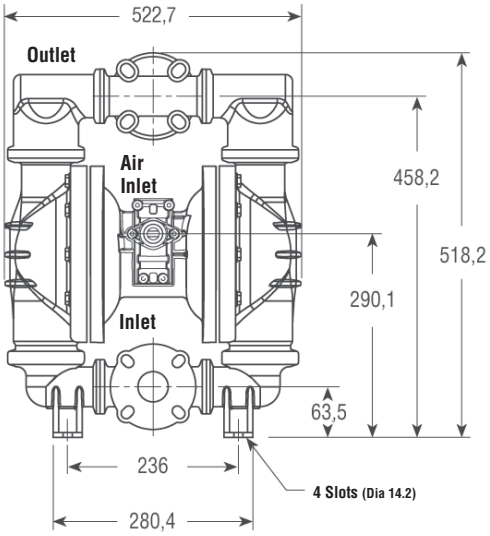
* Approximate Dimensions with Muffler (378)

Side View

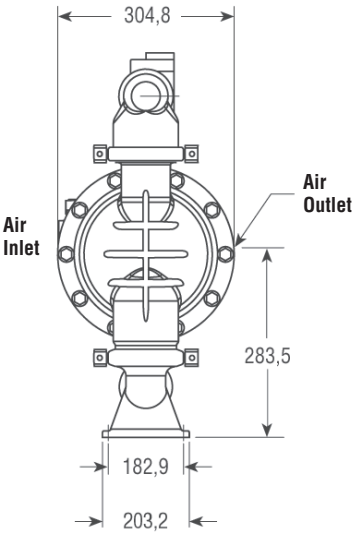
(Dimensions in mm)

5.8 Model 1 1/2", Bolted Version

Non –metallic pumps

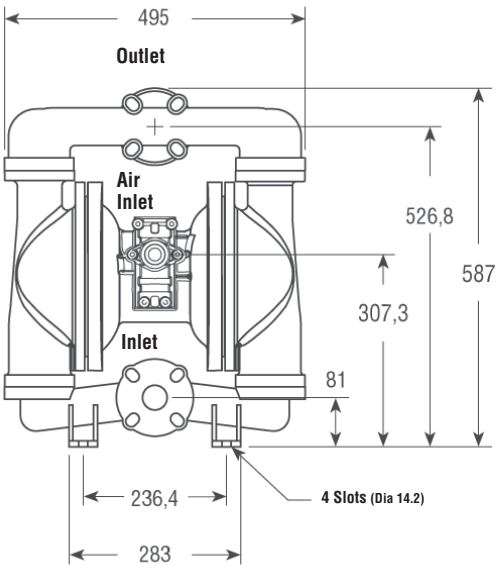


Front View

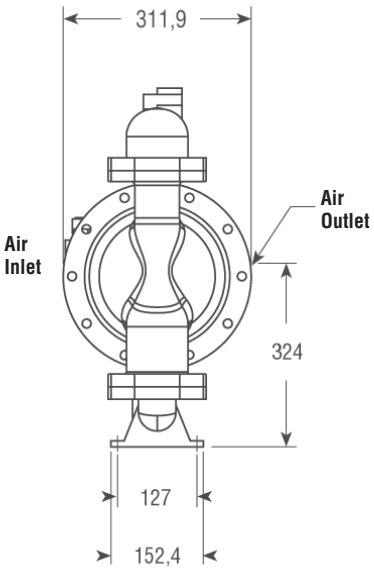


Side View

Metallic pumps



Front View

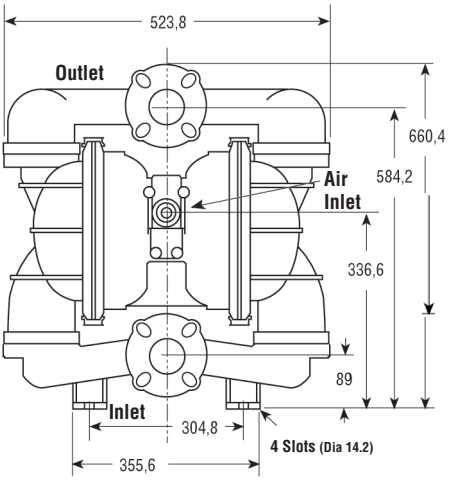


Side View

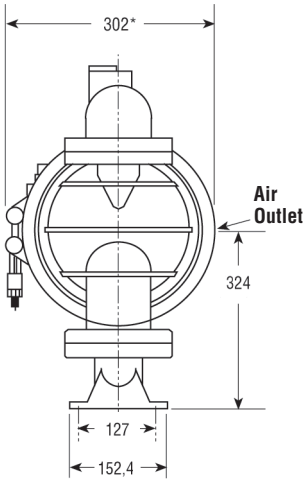
(Dimensions in mm)

5.9 Model 2", Band Clamp Version

Non –metallic pumps



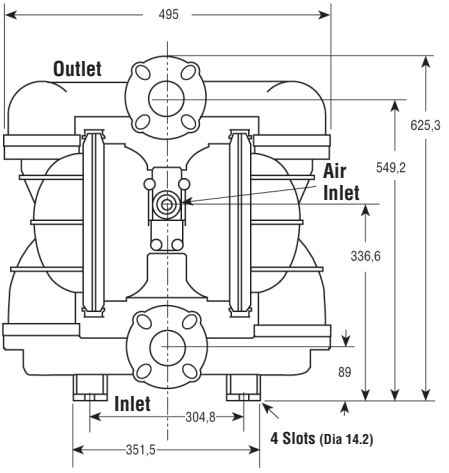
Front View



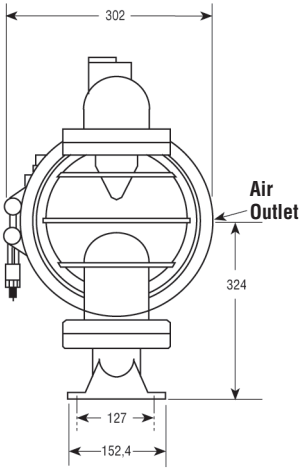
* Approximate Dimensions with Muffler (378)

Side View

Metallic pumps



Front View

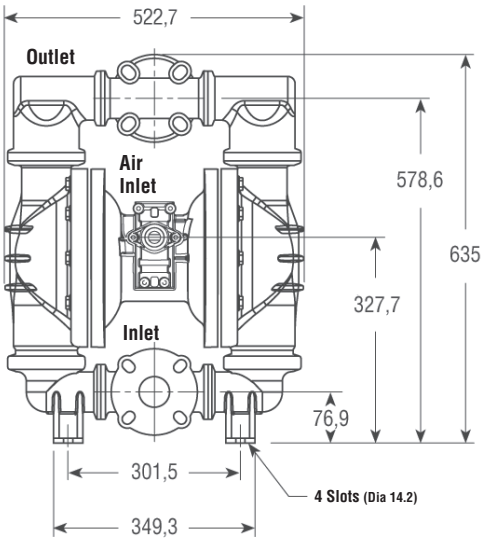


Side View

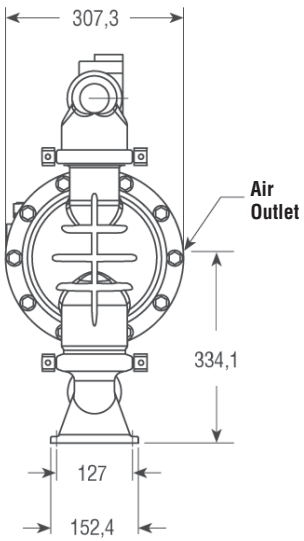
(Dimensions in mm)

5.10 Model 2", Bolted Version

Non –metallic pumps



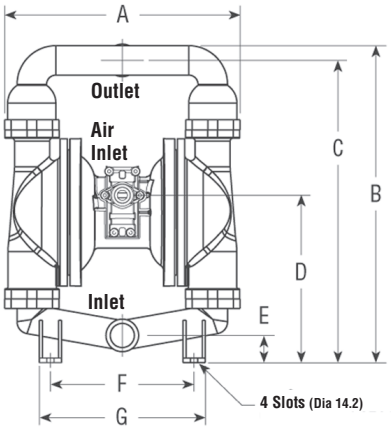
Front View



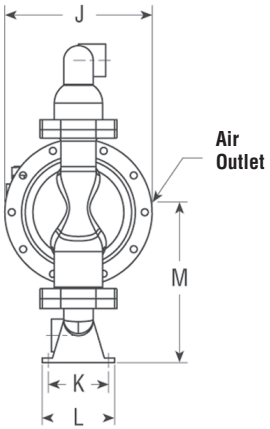
Side View

(Dimensions in mm)

Metallic pumps



Front View



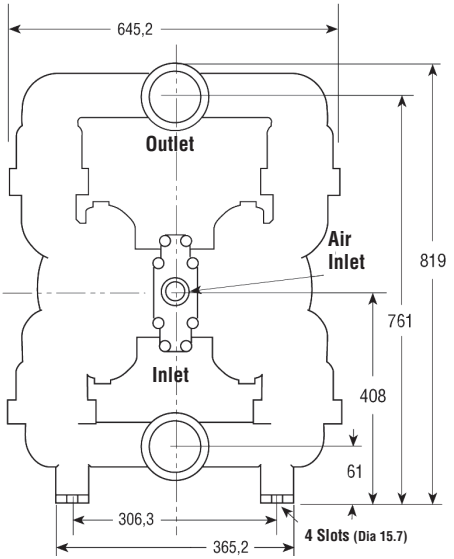
Side View

(Dimensions in mm)

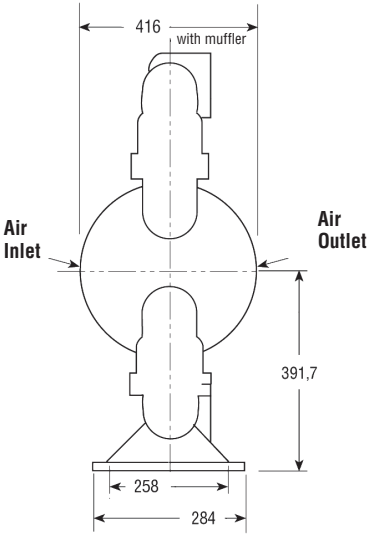
	A	B	C	D	E	F	G	J	K	L	M
Aluminium	495	665	619.8	338.3	40.4	259.1	304.8	309.9	127	152.4	337.1
Stainless steel	495	595.9	561.3	354.3	89	304	351.5	309.9	127	152.4	358.1

5.11 Model 3", Bolted Version

Metallic pumps



Front View

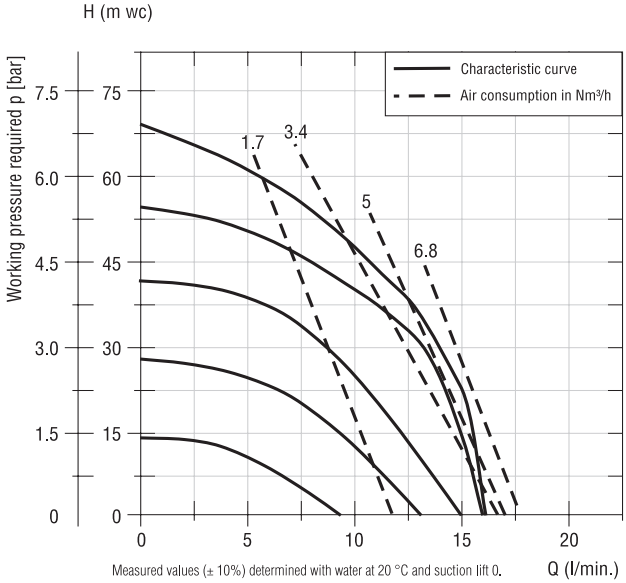


Side View

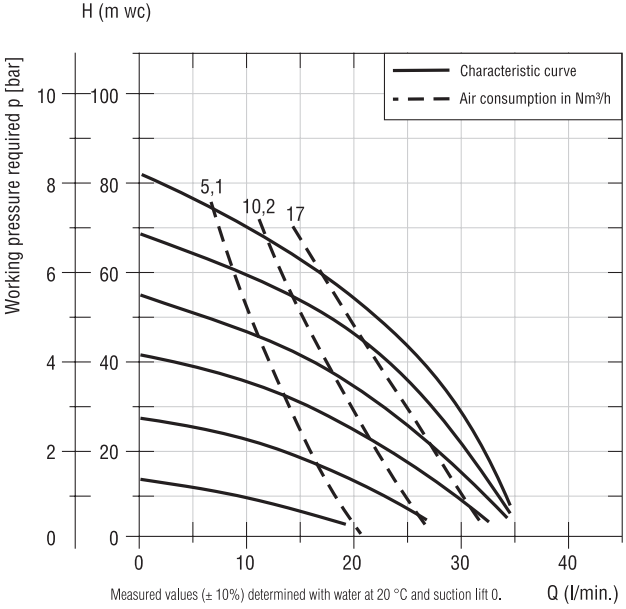
(Dimensions in mm)

6. Performance Curves

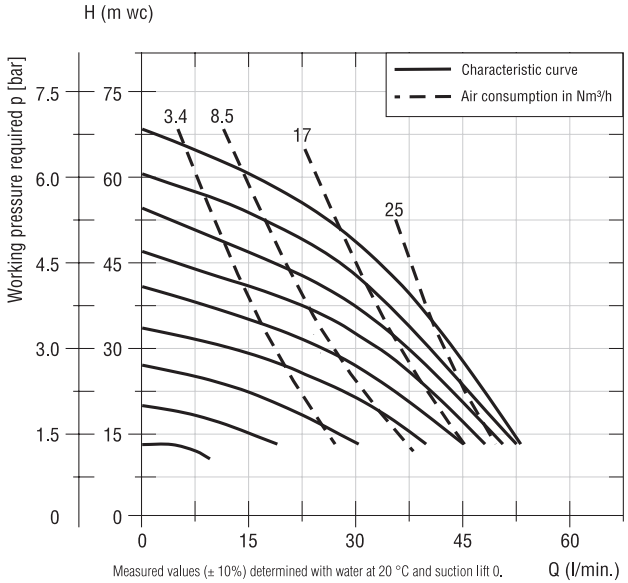
6.1 Model 1/4“



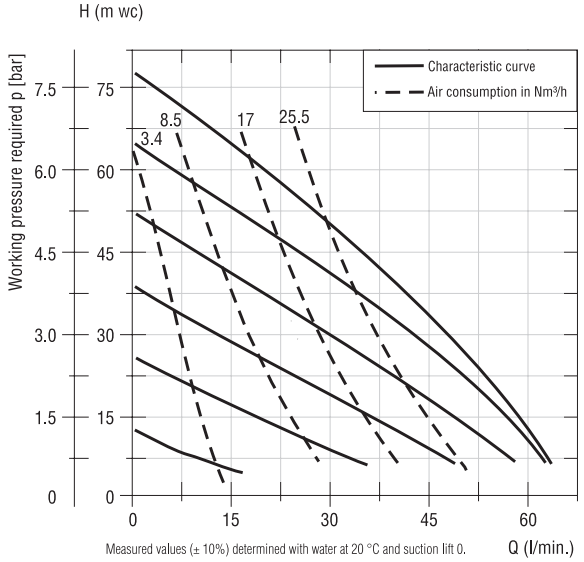
6.2 Model 3/8", Band Clamp Version



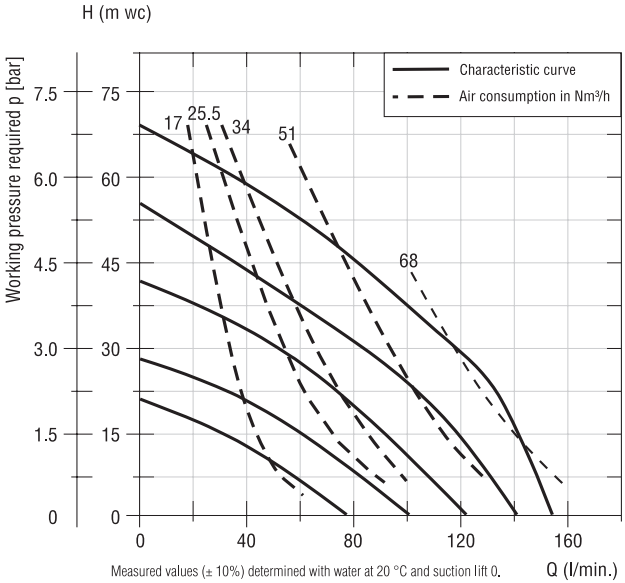
6.3 Model 1/2", Band Clamp Version



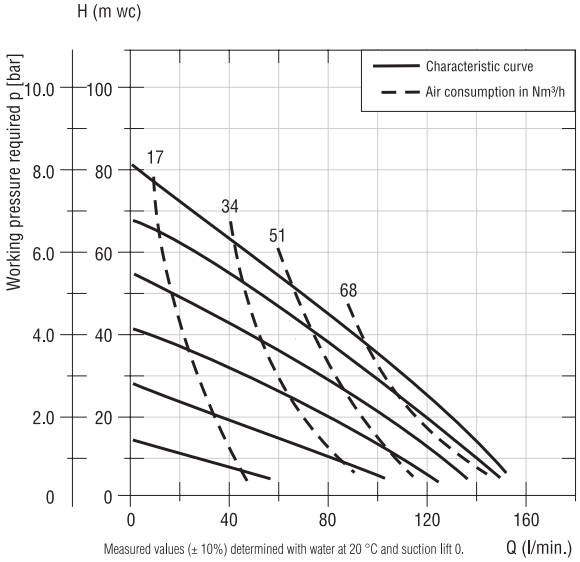
6.4 Model 1/2", Bolted Version



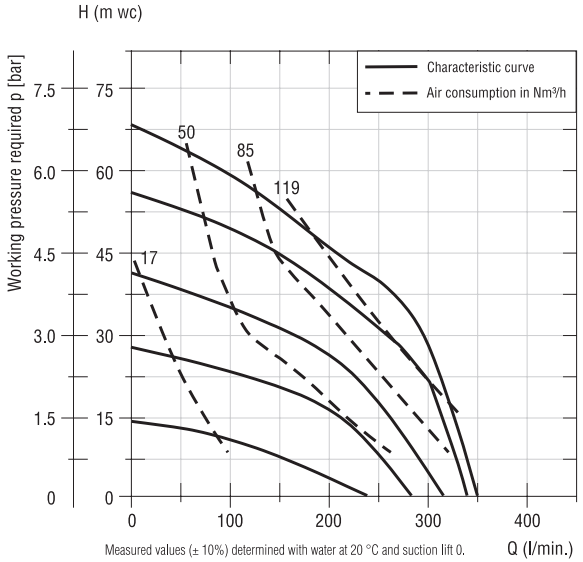
6.5 Model 1", Band Clamp Version



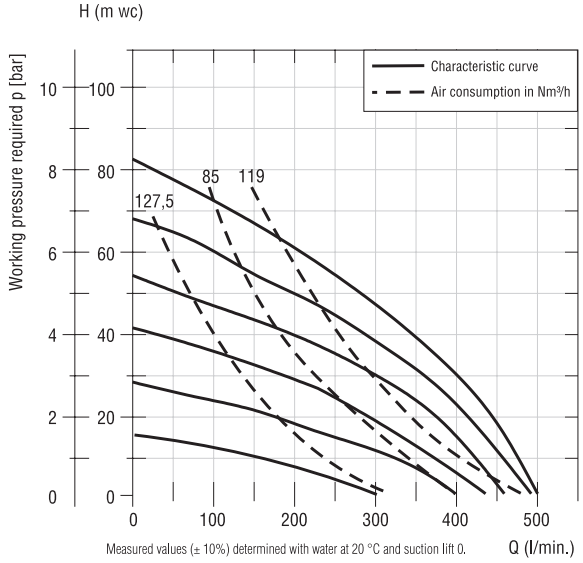
6.6 Model 1", Bolted Version



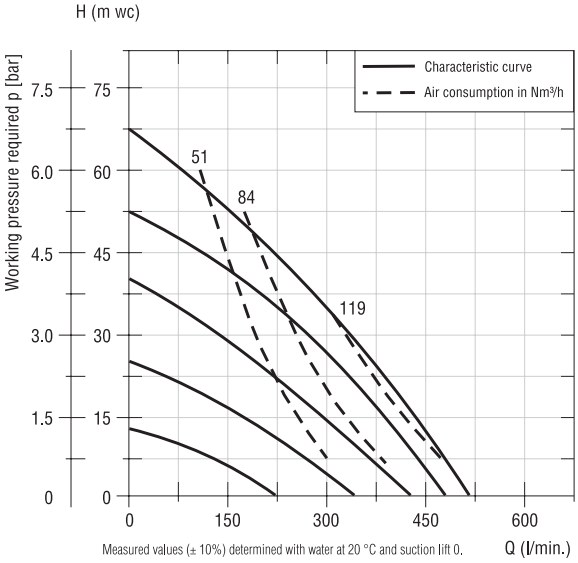
6.7 Model 1 1/2", Band Clamp Version



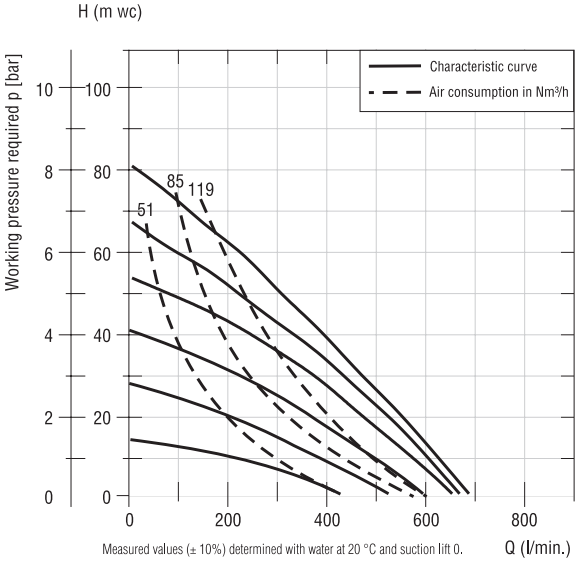
6.8 Model 1 1/2", Bolted Version



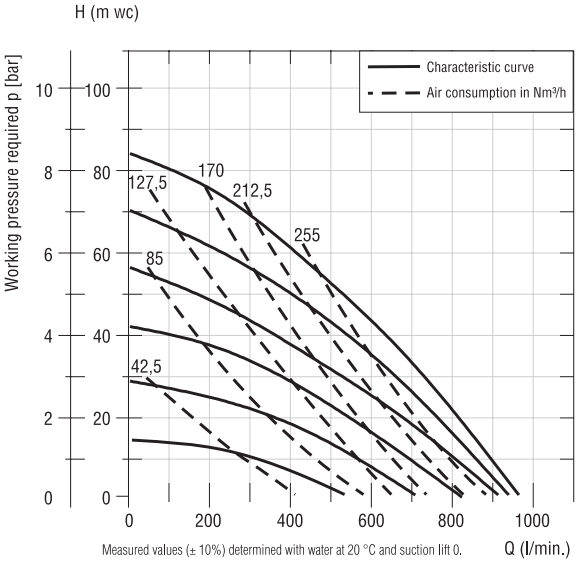
6.9 Model 2", Band Clamp Version



6.10 Model 2", Bolted Version



6.11 Model 3", Bolted Version



7. Trouble shooting

Air is applied to pump but pump is not starting
1. Clean filters and debris from all fluid lines.
2. Make sure all valves on fluid lines are open.
3. Inspect diaphragms for rupture.
4 Air pressure must not be below 1.4 bar.

Pump is pumping but not priming
1. Check all suction line connections for leakage.
2. Inspect check valves for wear or debris.
3. Suction lift specifications may be exceeded.
4. If fluid is viscous use larger suction lines.

Leakage
1. Retorque all fasteners to specified torque requirements.
2. Replace o-rings.
3. Inspect diaphragms for rupture.

Low Flow rate
1. Confirm air pressure and air capacity at the air valve as required.
2. Check for leaks in suction line or obstructions in lines.
3. If fluid is viscous use larger suction lines.

Air in discharge lines
1. Check for leaks in suction lines.
2. Inspect diaphragms for rupture.

Erratic cycling
1. Inspect check valve seats for debris.
2. Inspect fluid lines for debris.
3. Automatic valves must be properly functioning.
4. Viscosity of product may be changing.

Premature destruction of wetted components
1. If fluid is abrasive slow down pump or increase size of pump.
2. Filter fluid for sharp objects.
3. Make sure fluid is compatible with wetted materials.

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Declaration of Conformity

Herewith we declare that the below-mentioned machine in it's conception and design and in the execution marketed by us fully complies with the EC directives.

This declaration ceases to be valid if the machine is modified in any way without prior consultation with us.

Type of device: **Double diaphragm pump**

Model:		1/4“		3/8“		1/2“		1“		1 1/2“		2“		3“
Version:		PPB, PPE, PPT, NT, KNT	NT/C, NB/C, NE/C	PPB, PPE, PPT, PPV, KNE, KNT, KNV	NT/C, NB/C, NV/C	PPB, PPT, NT, KNT, PPE, PPV, NB, PPB, AT, PPT/TF, KNT/TF	Alu, SS, NT/C	PPB, PPT, NT, KNT, PPE, PPV, AT, NB, KNV, PPT/TF, KNT/TF	Alu, SS	PPB, PPT, KNE,KNT, PPE, Alu, SS	Alu with conductive diaphragm, SS with conductive	PPB, PPT, NT, KNT, NB, PPE, PPT/TF, KNT/TF, Alu, SS	Alu with conductive diaphragm, SS with conductive	Alu
Applicable EC Directives:	EC Directive on machines 2006/42/EC	●	●	●	●	●	●	●	●	●	●	●	●	●
	EC directives ATEX (94/9/EC)		●		●		●		●		●		●	
Registered number	Epsilon Compliance, Drury Lane, Drury, Buckley CH7 3DU, UK Epsilon 03ATEX1239 Certification: Ex II 2 G c T4		●		●		●		●		●		●	
Applicable harmonized standards	EN ISO 12100-1	●	●	●	●	●	●	●	●	●	●	●	●	●
	EN ISO 12100-2	●	●	●	●	●	●	●	●	●	●	●	●	●
	EN 1127		●		●		●		●		●		●	
	EN 13463-1		●		●		●		●		●		●	
	EN 13463-5		●		●		●		●		●		●	

Person authorised to compile the technical file:
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Wertheim, 29.12.2009

Jürgen Lutz, Managing Director

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