Parkway
Process Solutions

A leading provider of innovative water treatment
PRODUCTS | SERVICES | SOLUTIONS | TECHNOLOGY

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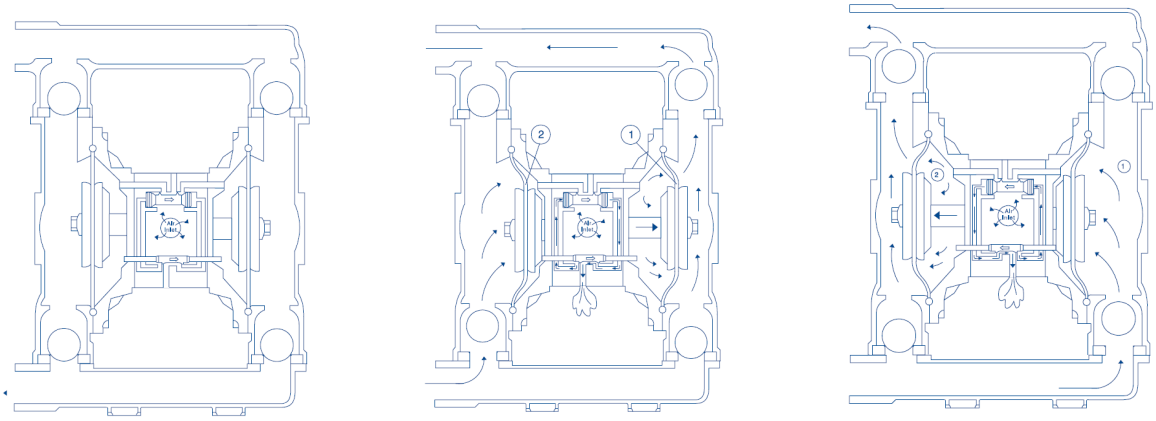
PPS Range of Air Operated (AODD)

DIAPHRAGM PUMPS

OPERATING MANUAL

V3.02

Air Operated Diaphragm Pumps
General Working Principle

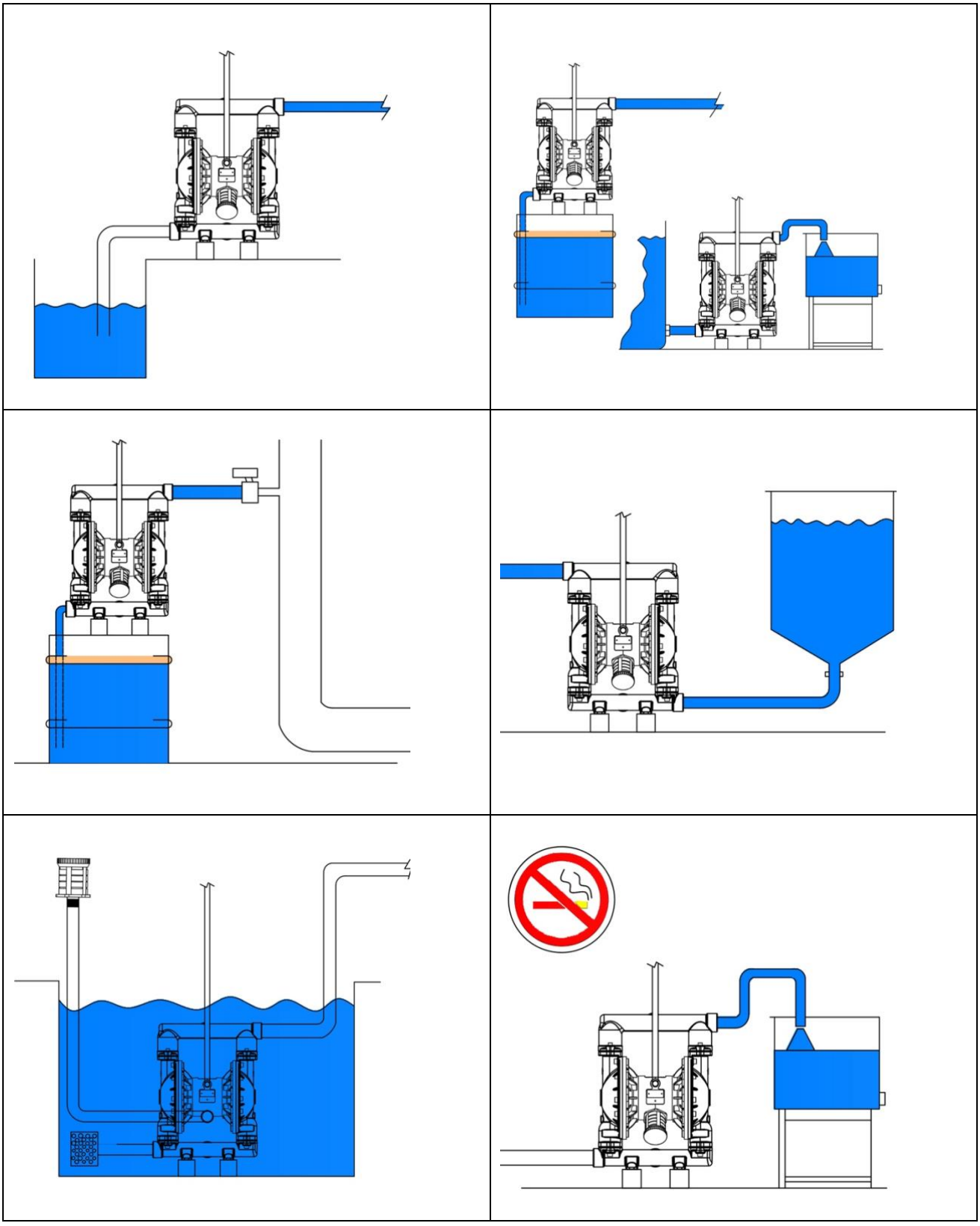


After connecting the compressed air, air valve control the compressed air impels diaphragm 1 moves toward right, meanwhile, the diaphragm 1 also extrude medium and cause it out of chamber. Diaphragm not only convey medium, also isolate compressed air and medium in the pump chamber. When one diaphragm is pushed away from the center body, another diaphragm will move toward center body for these two diaphragms are connected by one shaft. When diaphragm 2 moves toward the center body. The following high pressure compressed air will be discharged out through the muffler; meanwhile, the pump inlet side will create a vacuum, then atmospheric pressure will push the medium into suction pipeline. The pump entry valve ball will be raised and away the valve seat. The medium will enter into pump chamber.

When the diaphragm 1 under high pressure. It will slowly move to maximum position of the str oke. Meanwhile, the compressed air will slowly enter into diaphragm 2 following space and impel s the diaphragm 2 away the center body. The diaphragm 1 also will move toward center body for these two diaphragms are connected by one shaft. The diaphragm 2 will extrude the medium an d function on entry valve ball and seal up the suction pipeline through the water power. The wate r power also will function on exit valve ball and open the discharge pipeline. Meanwhile, exit valv e ball of pump another side will shut down for pressure function, entry valve ball will open, and th en the medium will enter into the pump chamber.

When one stroke finishes. The compressed air will enter into diaphragm 1 following space again through reversing valve. Simultaneously the diaphragm 2 following compressed air will discharge out through muffler.

Various Operating Modes for PPS Diaphragm Pumps



Main Applications

1. **Chemical industry：** Acids**,** alkalis, solvents, suspended solids, decentralize system.
2. **Petrochemical industry:** crude oil, heavy oil, grease, mud, sludge, etc.
3. **Coatings industry:** resins, solvents, coloring agent, paint, etc.
4. **Cosmetic industry:** detergent, shampoo, lotion, emulsion, camphor ice, surface active agents.
5. **Ceramics:** mud slurry pottery, lime milk, clay slurry.
6. **Mining industry:** coal slurry, magma, mud, mortar and explosives, lubricant, etc.
7. **Water treatment:** lime milk, soft sediments, sewage, chemicals, waste water.
8. **The food industry:** liquid semi-solid, chocolate, salt water, vinegar, syrup, vegetable oil, honey, animal blood.
9. **Beverage industry:** yeast, sugar syrup, concentrations, gas-liquid mixture, wine, fruit juice, corn pulp, etc.
10. **Pharmaceutical industry:** solvents, acids, alkalis, plant extract liquid, cream, plasma and other liquid drugs.
11. **Paper industry:** adhesives, reins, paints, inks, paints, hydrogen peroxide, etc.
12. **Electronics industry:** solvents, electroplating fluid, cleaning.
13. **Textile solution:** chemical dyes, resins, rubber, etc.
14. **Construction industry:** grout, ceramic tile adhesives, rock slurry, ceiling finish, etc.
15. **Automotive industry:** polishing emulsion, oil, coolant, automotive priming, oil emulsion paint, varish, varnish additives, degreasing fluid, fluid, paint, etc.
16. **Furniture industry:** adhesives, varnishes, decentralized system, solvents, color agent, sapwood glue, epoxy resins, starch binder.
17. **Metallurgy, casting and dyeing industry:** metal slurry, hydroxides and carbide slurry, dust cleaning slurry.




Air Operated Diaphragm Pump Selection

Selection of the right diaphragm for an air-operated double-diaphragm (AODD) pump is a critical consideration for safety, efficiency and trouble-free operations. A number of factors must be taken into account when choosing the proper diaphragm that will be suitable for a specific application. Previous experience is always a very helpful guide, but new applications will often require research and outside advice to determine the appropriate diaphragm that will meet specific application requirements and parameters.

In selecting a diaphragm, there are ten primary factors to consider:

Pump Capacity

To select the right PPS pump for your application, the following factors should be considered to achieve economy of operation, long pump life, and minimal maintenance costs:

• The nature of the medium to be pumped, its viscosity, and the solids content (proportion to total content)

• Pumping capacity in relation to the desired output (per unit of time)

• Suction and pressure conditions

Considering these parameters, an optimal pump size is selected when the intersection of the intended installation “pressure vs. flow rate” is near the middle section of the curves.

Capacities with Specified Suction Lift

All PPS air-operated double diaphragm pumps are self-priming. There is a difference between “dry” (without medium) and “wet” (with medium) priming. When calculating the pumping capacity, the specific gravity of the product and the respective suction lift must be taken into consideration. Furthermore, losses attributed to piping or hoses on the suction side and the specific properties of housing and diaphragm materials must also be factored in.

Capacities with Viscous Fluids

All capacity curves shown in the diagram are related to water (1 mPa•s). In order to determine the appropriate pump capacity for viscous media, the realized capacity reductions shown in the diagram must be considered in relation to the known viscosity. In addition, factors such as product flow properties, length and cross-section of piping or hoses on suction and discharge sides, and valve and pump sizes with their specific characteristics must be taken into account.

Chemical resistance

Material compatibility with the fluid being pumped. The spectrum of fluids pumped can range from water to aggressive acids and caustics. Each diaphragm material has been tested to measure its compatibility against many chemicals. The operator should evaluate the pumped fluid against published chemical compatibility guides.

Temperature ranges

Capability to remain flexible in low temperatures and not deteriorate in high temperatures. Temperature is a very critical factor, and the working range available in diaphragm materials varies greatly. The type of fluid can also affect the working temperature range of the material.

Abrasion resistance

Ability to withstand wear and friction from contact with solids and particles in the fluid being pumped. Diaphragms are available to handle fluids ranging from clear to heavy slurries to dry bulk pumping.

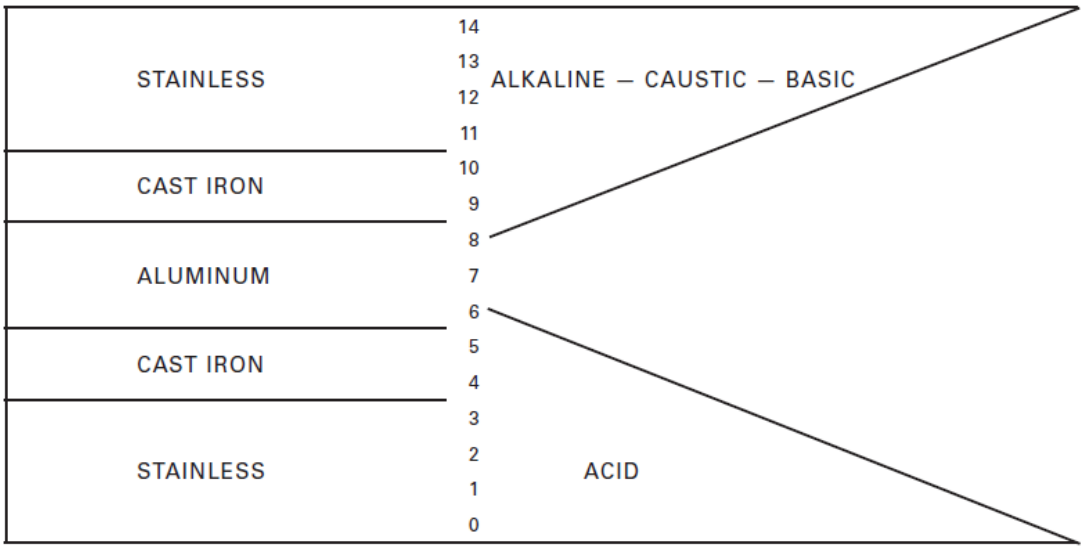
Inlet condition (flooded suction and suction lift)

Capacity to pump fluid from one location to another. For different pumping configurations and conditions, certain diaphragm materials are more efficient and longer lasting than others. Outside advice from an expert such as a PPS distributor can assist in determining the optimum material for specific applications.

PH value

PH is a measure of hydrogen-ion concentration.

PH of 7 is neutral; below 7 is acid; above 7 is alkaline.



Materials

To meet your most severe process conditions, yet still having a trouble-free operation, PPS pumps have thirteen (13) different material options for the valve seat, diaphragm & balls. The combination of these high quality materials together with the choice of different pump materials give the optimum pump selection.

Material Profile: ⚠ CAUTION *Operating temperature limitations are as follows:*	Operating Temperatures Max.	 Min.
Acetal : Wide range of solvent resistant and withstands extreme fatigue. Good level of abrasion resistance. Electrically conductive (ATEX).	180℉ 82℃	- 20℉ - 29℃
Polypropylene: Wide chemical compatibility. General Purpose. Limited temparature resistant.	175℉ 79℃	32℉ 0℃
PVDF (Kynar): PVDF is the best choice for even the most chemically aggressive media.	225℉ 107℃	40℉ 4℃
Aluminium: General purpose. Good for solvent based coatings and inks. Resistant to mild chemicals.	150℉ 65.5℃	40℉ 4.4℃
Stainless Steel: Resistant to most acids, bases and solvents. Can handle halogenated hydrocarbons. Good resistance to abrasive	392℉ 200℃	40℉ 4℃
Teflon (PTFE): Most compatible material for chemical applications, extremely resistant to corrosion and high temperatures, very low friction coefficient, non-adhesive.	220℉ 104℃	40℉ 4℃
Santoprene: Good resistance to abrasive and chemical fluids. Santoprene is compatible with some solvents (e.g. Acetone, MEK), caustic solutions, dilute acids and alcohols.	220℉ 104℃	- 20℉ - 29℃
Hytrel(TPE): Good performance properties at lower temperatures and good resistance to abrasive fluids. Thermoplastic polyester is often a substitute for Buna-N.	220℉ 104℃	- 20℉ - 29℃
Viton(FKM): High heat resistance. Good resistance to agressive chemicals including acids and some solvents. (e.g. xylene and mineral spirits). Good resistance to steam as well as animal, vegetable and petroleum oils. Resists unleaded fuels.	350℉ 177℃	- 40℉ - 40℃
Geolast: Abrasion resistance. Approximately same chemical compatibility as Buna-N.	180℉ 82℃	- 40℉ - 40℃
EPDM: Good water and chemical resistance. Not for use with oils, greases and most solvents.	280℉ 138℃	- 60℉ - 51℃
BUNA N(Nitrile): Good for petroleum-based fluids, water, oils, hydrocarbons and mild chemicals (e.g. mineral spirits)	180℉ 82℃	10℉ - 12℃
Neoprene: Good chemical resistance, good performance with oils and many chemicals, good temperature resistance, outstanding physical toughness, outstanding resistance to damage caused by flexing and twisting. Resistance to abrasion is approximately 30% higher than Buna.	200℉ 93℃	0℉ - 18℃

Temperature limits are based upon mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperatures. Consult engineering guides for chemical compatibility and temperature limits. It must be emphasized that none of these figures are absolute and are only general guidelines.

Note: These are indicative temperatures. Chemicals and solvents can have an effect on temperature limits.

Performance Introduction

PPS air operated diaphragm pump can not only pump fluid liquids and powders, but also some other mediums which usually hard to flow. It takes advantages over some transportation machines. Such as self-priming pump, submerged pump, shielding pump, slurry pump, impurity pump.

1. Need no pilot water, suction lift up to 7m, pump head up to 80m, outlet pressure≥0.8Mpa.

2. Spacious flowing way with good through-pass performance, the largest size of particles allowed can be up to 9.4mm. While pumping slurry and impurity, the abrasion is lower.

3.The pump head and capacity can be adjusted via the pressure of air source (between 0.1～0.84Mpa).

4.Temperature ranged by working environment:5～65℃

5、The pump has no rotating parts and shaft seals. The diaphragms separate the pumped medium from moving part and working medium absolutely, so that the pumped medium does not leak to outside. So there are no risks of environment pollution and personal injury while pumping poisonous, volatile or corrosive media.

6、It can work without electricity and be safe and reliable in inflammable and explosive conditions.

7、Can immerge into the medium.

8、Easy to use and works reliably. When turn on/off the pump, just open and close the air valve. Even in cases of unexpected, long-term operation without medium or shut down, it will not be damaged. Once overloaded, it has self-protecting function and will shutdown automatically. As long as the load goes back to normal, it starts up automatically again.

9、Simple structure, less vulnerable parts. The pump owns a simple structure design and become easier to install and maintain. The pumped medium does not contact with moving parts such as air-distributing valve and link rod, so the performance will not go worse with the abrasion of rotors, pistons, gears and vanes as other types of pumps.

10、Can pump the viscous liquids (viscosity below 10000cm).

11、No need of lubrication. There are no effects to the pump in dry operation mode. This is a key feature of the pump.

Symbols

Warning Symbol

⚠ WARNING

This symbol alerts you to the possibility of serious injury or death if you do not follow the instructions.

Caution Symbol

⚠ CAUTION

This symbol alters you to the possibility of damage to equipment if you do not follow the instructions.

⚠ WARNING

INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

Any misuse of the equipment can cause them to rupture and failure, and result in serious injury.

- This equipment is for professional use only.
- Read and understand all instruction manuals, warning labels, and tags before you operate the equipment.
- This equipment can be used for specified purpose. Please contact with the distributor of HY Company if you are not sure about it.
- Never alter or modify any part of this equipment. Use only genuine HY parts and accessories.
- Check the equipment daily and repair or replace worm or damaged parts immediately.
- Do not exceed the maximum working pressure of 0.8Mpa when the maximum incoming air pressure is 0.8Mpa.
- Be sure that all fluids and solvents used are chemically compatible with the wetted parts. Always read the content about technical data in equipment instructions, and acquaint yourself with the warning of the manufacturer about relevant fluid or solvent.
- Never use 1.1.1-trichloroethane, methylenechloride, other halogenated hydrocarbon solvents or fluids containing such solvents in aluminum pressure equipments. Such use could result in a serious chemical reaction, with the possibility of explosion.
- Never use a hose to pull the equipment.
- The hose should be secured away from traffic areas, sharp edges and hot surface.
- Never move or lift a pump under pressure.
- Observe all relevant national regulations about fire, electrical and safety.

⚠ WARNING

TOXIC FLUIDS HAZARDS

Improper handling of hazardous fluids or inhaling toxic vapors can cause extremely serious injury or death from to splashing in the eyes, ingestion, or bodily contamination.

- Know what fluid you are pumping and its specific hazards.
- Store hazardous fluid in an appropriate, approved container. Dispose of it according to national guidelines.
- Always wear appropriate clothing and equipment, such as eye protection and breathing apparatus recommended by manufacturer of fluids and solvents.
- Pipe and dispose of the exhaust air safely, away from people, animals, and food handling areas. If the diaphragm fails, the fluid is exhausted along with the air. See Air Exhaust Ventilation on page 11.

FIRE AND EXPLOSION HAZARDS

If the equipment is not properly grounded and ventilated, sparking may occur and cause a fire or explosion and serious injury.

- Ground all equipment. Refer to Grounding on page 9.
- If you experience any static sparking or even a slight shock while using this equipment, stop pumping immediately. Do not use the system again until the problem has been identified and corrected.
- Provide ventilation of the fresh air. Avoid accumulating flammable gases in solvents and fluids to be pumped.
- Pipe and dispose of the exhaust air safely, away from all sources of ignition. If the diaphragm fails, the fluid is exhausted along with the air. See Air Exhaust Ventilation on page 11.
- Keep the working place clean and without any waste, including solvents, clouts and gasoline.
- Disconnect all equipments in working place from electrical connection.
- Extinguish all flames and indicating lamps in working place.
- Do not smoke in the work area.
- Do not switch on an off any lamp switches during operation or if there exists flammable gases.
- Never use gasoline engine in working place.

Installation

General Information

The typical installation information shown in Fig.2 is only used to guide you to select and install system components. If you want to plan a system to suit your need, please contact Haoyang distributor. Hold the outlet manifold to lift the pump safely.

Tighten Fasteners Before Setup

Before using the pump for the first time, check and re-torque all external fasteners.

After unpacking the diaphragm pump, please check and re-torque all fasteners on the surface.

Adjust the torque of screws of left and right fluid covers first, and then the top/bottom Liquid Chambers.

In this way, pump is guaranteed not affected by the fastened Liquid Chambers.

Mounting

1. Be sure the mounting surface can support the weight of the pump, hoses, and accessories,as well as the stress caused during operation.
2. For all mountings, be sure the pump is bolted directly to the mounting surface.
3. For ease of operation and service, mount the pump so air valve, air inlet, fluid inlet and fluid outlet ports are easily accessible
4. Rubber Foot Mounting kit is available to reduce noise and vibration during operation.

Grounding

⚠ WARNING

FIRE AND EXPLOSIVE HAZARD

The equipment must be grounded to reduce the risk of static sparking. Static sparking can cause fumes to ignite or explode. Grounding provides an escape wire for the electriccurrent.

Air and fluid hoses: Use only grounded hoses with a maximum of 500 ft (150 m) combined hose length to ensure grounding continuity.

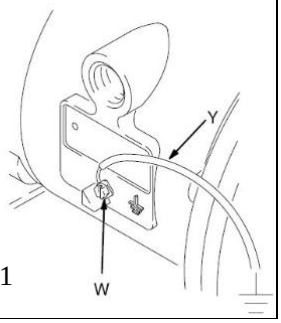


Fig 1

⚠ WARNING

Polypropylene and PVDF

Only aluminum,conductive polypropylene, hastelloy, and stainless steel pumps have a ground screw.Standard polypropylene and PVDF pumps are **not** conductive. **Never** use a non-conductive polypropylene or PVDF pump with non-conductive flammable fluids. Follow your local fire codes. When pumping conductive flammable fluids, **always** ground the entire fluid system as described.

Installation

Fluid Inlet and Outlet Ports

NOTE: Remove and reverse the manifold(s) to change the orientation of inlet or outlet port(s).

If the fluid inlet and outlet manifolds each have multiple threaded ports. Close off the unused ports, using the supplied plugs.

Ground all of this Equipment:

Diaphragm Pump: Connect a ground wire and clamp as shown in Fig.1. Loosen the grounding lug locknut(W). Insert one end of a 1.5mm2 minimum ground wire(Y) into the slot in the locknut, and tighten the locknut securely. Connect the clamp end of the ground wire to a true earth ground.

Air compressor: Follow the manufacture's recommendations.

Air and fluid hoses: Use only conductive hoses.

All solvent pails used when flushing: Follow the local code. Use only metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts grounding continuity. **Fluid supply container:** Follow the local code.

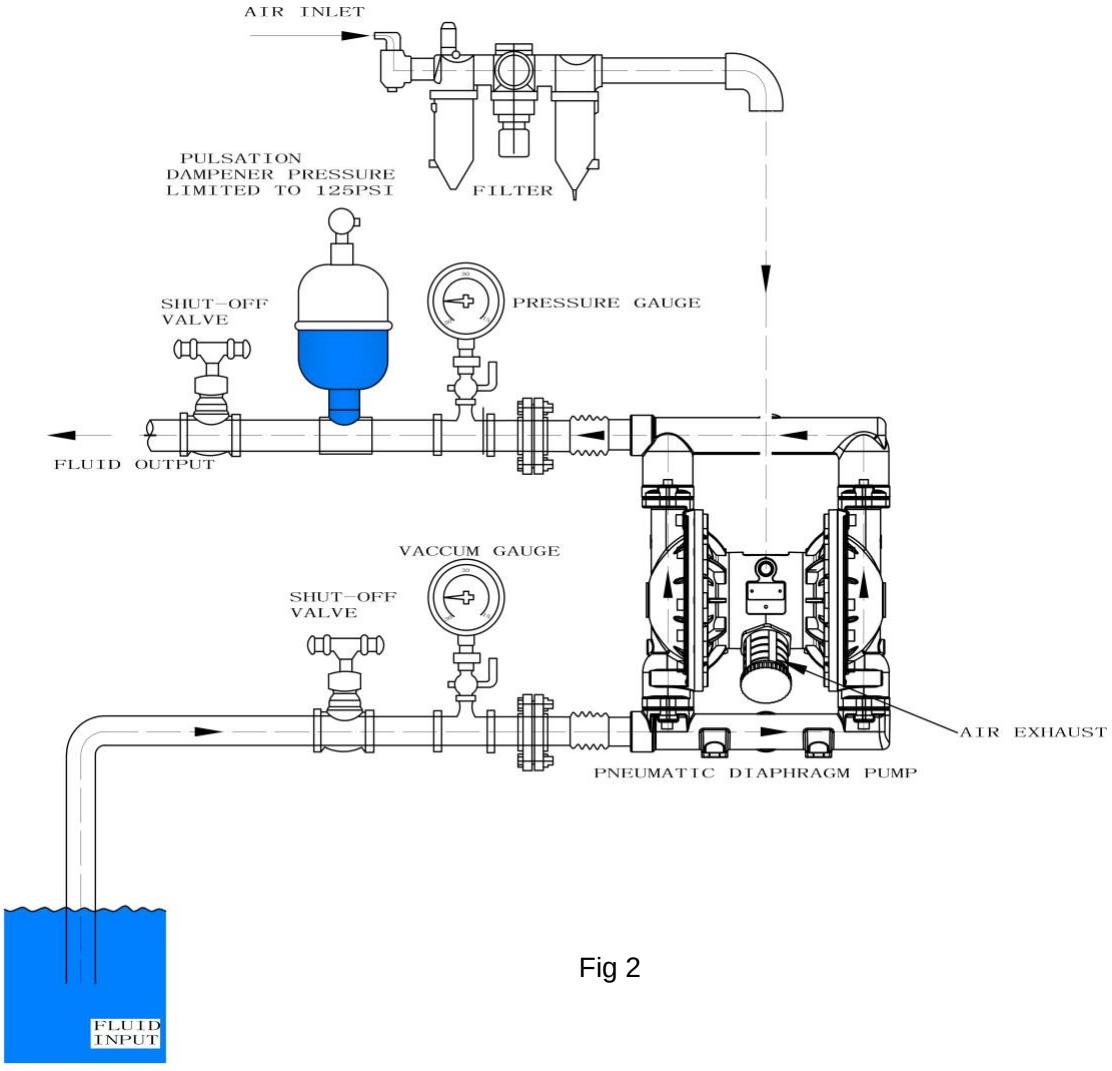


Fig 2

Operation

Pressure Relief Procedure

⚠ WARNING

PRESSURE EQUIPMENT HAZARES

Before manual pressure relief, the equipment is in pressure state. In order to reduce the risk of extremely serious injury from pressure fluids, spray gun or splashing fluid , during the following operation, specified procedures should be observed:

- Request to relief pressure.
- Stop pumping.
- Check, clean and repair any system equipment.
- Install and clean the fluid spray gun.

① Install valve between fluid inlet and outlet ports.

1. Shut off the air to the pump.
2. Open the dispensing valves if exist.
3. Open any available outbound fluid valves to relieve fluid pressure from the pump, and prepare the container for discharged fluid.

KEY

R 1″fluid inlet port

S 1″ fluid outlet port

V Pressure relief valve

Part No.110134 (aluminum)

Part No.112119 (stainless steel)

Connect fluid outlet line here.

② Connect fluid inlet line here

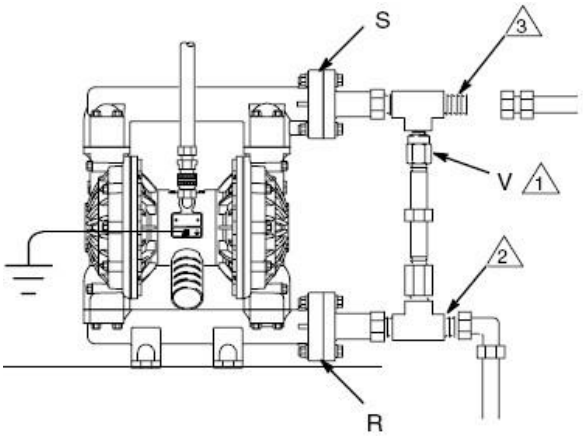
③ Connect fluid outlet line here

Staring and Adjusting Pump

⚠ WARNING

TOXIC FLUIDS HAZARDS

To reduce the risk of serious injury, splashing in the eyes or on the skin, and toxic fluid spills, never move or lift a pump under pressure. If the pump is dropped, the fluid section could rupture. Always follow the Pressure Relief Procedure above before you move or lift the pump.



Be sure the pump is properly grounded. Refer to the instructions in Grounding section on page 9.

1. Check all fittings and make sure they are tight. Be sure to use compatible liquid thread sealant on all male threads.
   Make sure the fittings at inlet and outlet are reliably secured.
2. Place the suction tube (if used) in the fluid to be pumped.
   NOTE: If the inlet pressure to the pump is more than 25 percent of the outlet working pressure, the ball check valves will not close fast enough, resulting in inefficient pump operation.
3. Place the end of the outlet hose (L) into an appropriate container.
4. Close the fluid drain valve. Refer to Fig.2.
5. With the air regulator closed, open all bleed-type master air valves.
6. If the outlet hose has a dispensing device, hold it open while continuing with step 8.
7. Slowly open the air regulator until the pump starts to cycle. Allow the pump to cycle slowly until all air is pushed out of the lines and the pump is primed.

8. If you are flushing, run the pump long enough to thoroughly clean the pump and hoses, close the air regulator, and remove the suction hose from the solvent and place it in the fluid to be pumped.

PPS Diaphragm Pump Standard Warranty

The sale of any diaphragm pumps and related materials (collectively the **"Pumping Equipment"**) including spares from Parkway Process Solutions Pty Limited (**"PPS"**) is bound by PPS's Terms of Trade. By purchasing and/or operating the Pumping Equipment, the buyer agrees to be bound by PPS's Terms of Trade available for review at: https://pwnps.com/pages/Terms-of-Trade

PPS warrants all equipment referenced in this document which is manufactured by PPS and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by PPS, PPS will, for a period of one years from the date of sale, repair or replace any part of the equipment determined by PPS to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with PPS's written recommendations. This warranty does not cover, and PPS shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-PPS component parts. Nor shall PPS be liable for malfunction, damage or wear caused by the incompatibility of PPS equipment with structures, accessories, equipment or materials not supplied by PPS, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by PPS. This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized PPS distributor for verification of the claimed defect. If the claimed defect is verified, PPS will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

PPS's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within one years of the date of sale.

PPS MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY PPS.

These items sold, but not manufactured by PPS (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. PPS will provide purchaser with reasonable assistance in making any claim for breach of these warranties. In no event will PPS be liable for indirect, incidental, special or consequential damages resulting from PPS supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of PPS, or otherwise.

Additional Information

For the latest information about PPS range of diaphragm pumps, visit:
https://pwnps.com/collections/pump-range-diaphragm-pumps

NOTES SERVICE RECORD: