

USER MANUAL

VP 20 PLASTIC/ METAL PUMPS

VP 20 METALLIC PUMP USER'S MANUAL

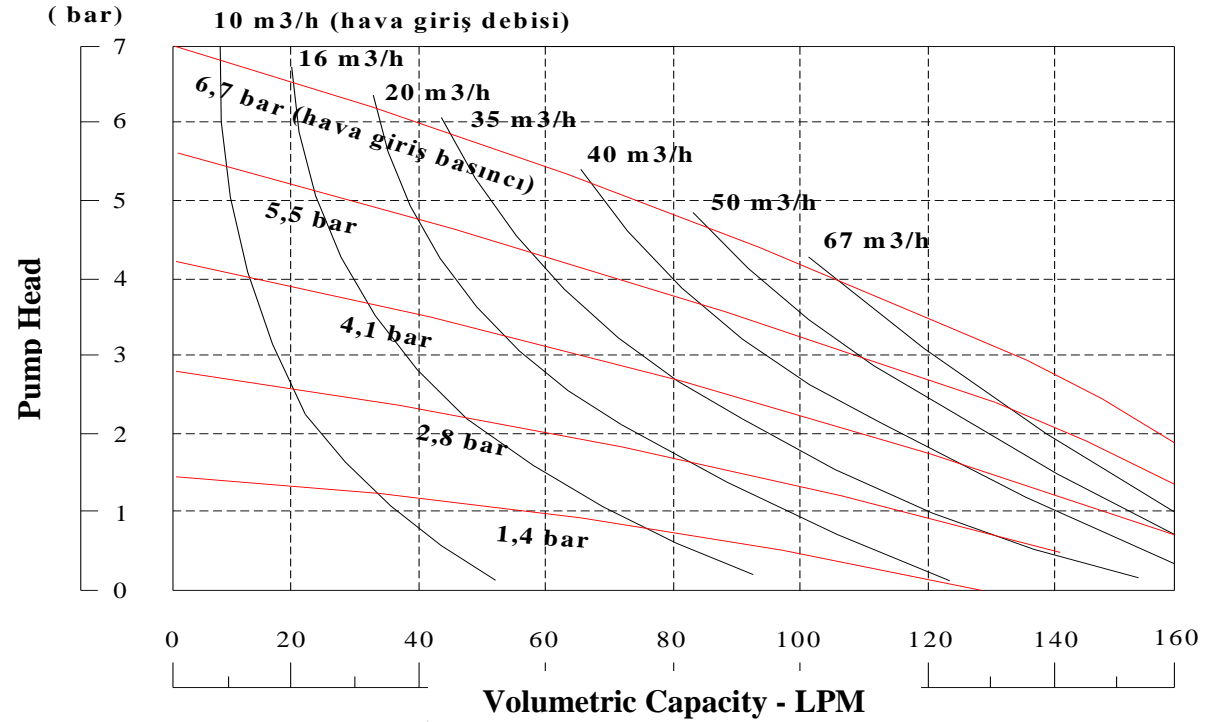
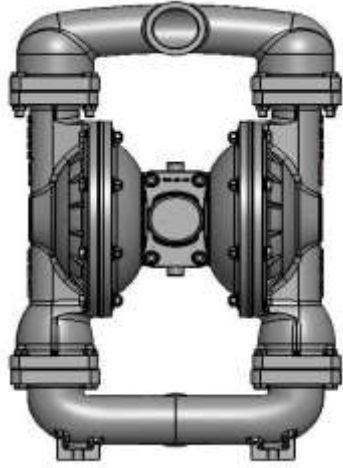
COMPRESSED AIR DOUBLE DIAPHRAGM TRANSFER PUMPS

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PERFORMANCE CURVES

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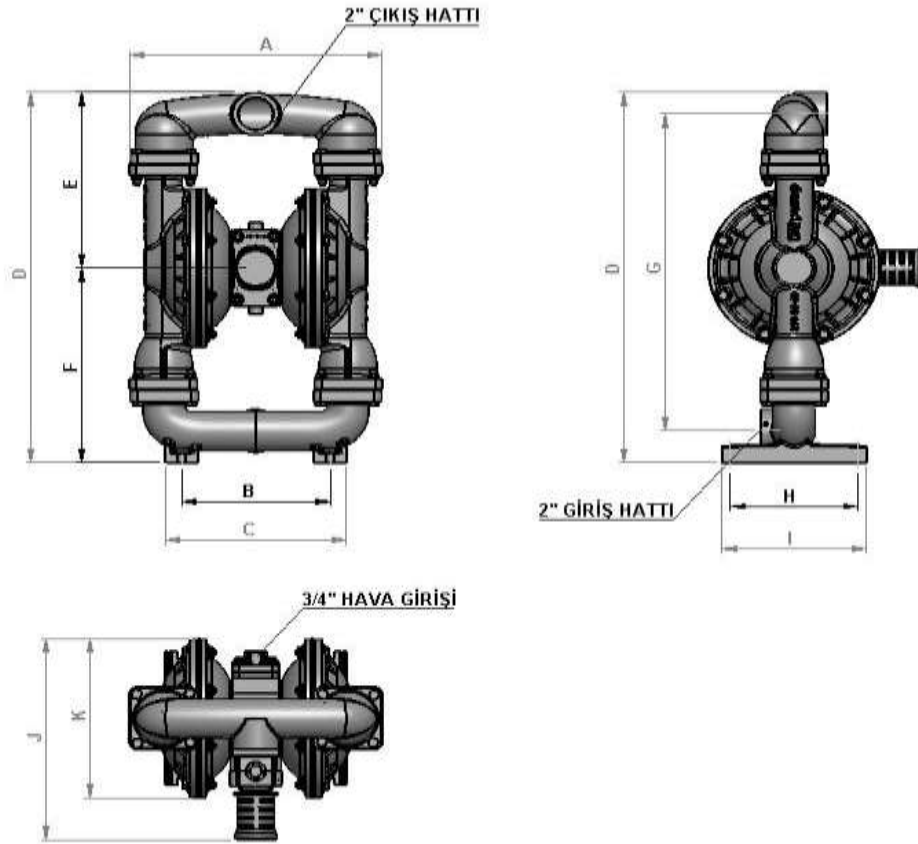


VP 20 (2") METALLIC PUMP

Suction / Discharge 2"	Max. Capacity 560 lpm	Max. Solid particle permeability (6 mm)	Max. Operation pressure 7 bar	Weight 30 kg (Aluminum)
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The operation pressure is 0 to 7 bars.
Operation temperature is between (-18 °C and 100 °C.)

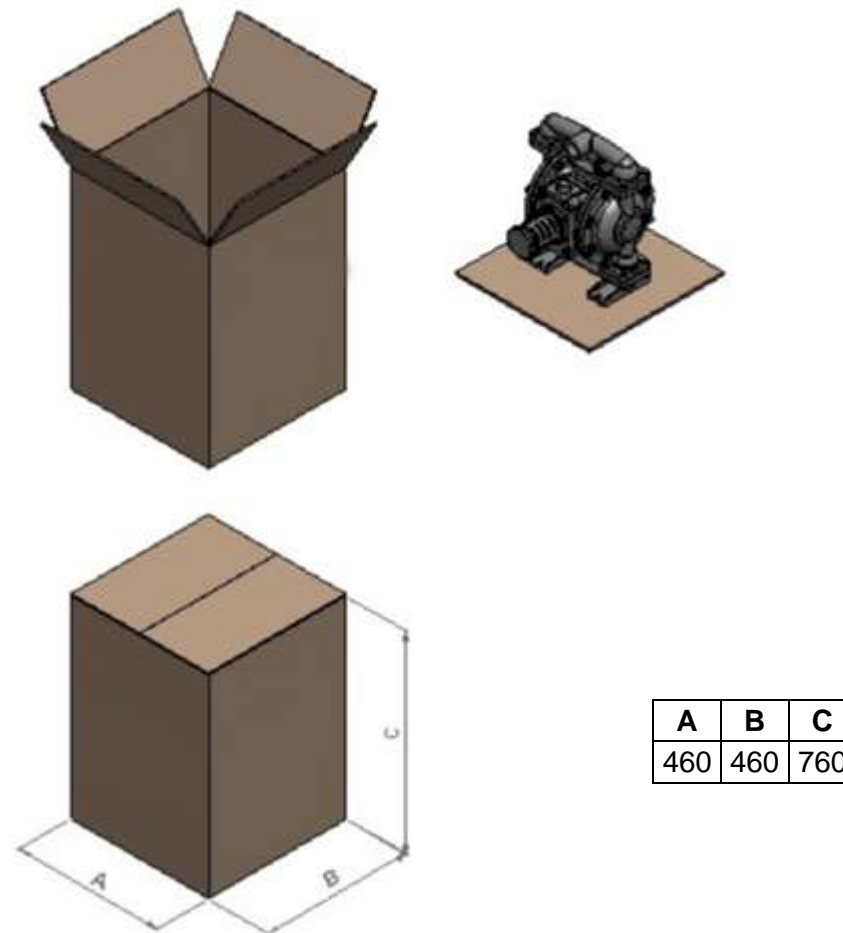
METRIC DIMENSIONS [mm]
Dimensional tolerances ± 3 mm
MODEL HP 20 METALLIC PUMP



A	B	C	D	E	F	G	H	I	J	K
435	256	312	690	327,5	362,5	591	220	250	374	296

PACKING DIMENSIONS [mm]

MODEL HP 20 METALLIC PUMP



DIAPHRAGM MATERIALS AND OPERATION TEMPERATURES

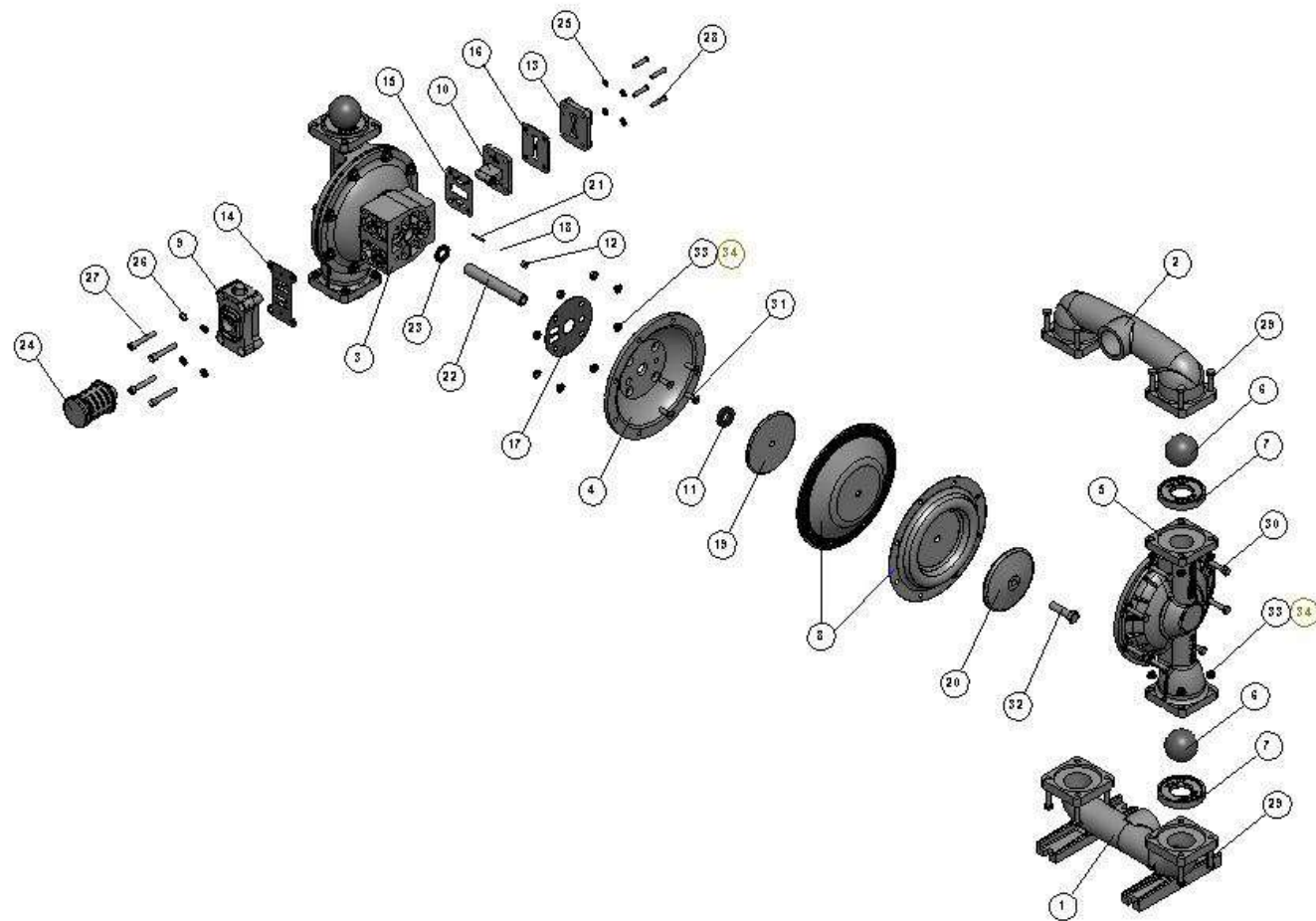
MODEL HP 20 METALLIC PUMP

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Material	Maximum	Minimum
<p>Neoprene It is resistant to the vegetable oils. Its abrasion resistance is very good. The fluids like acids, esters, ketones can cause damages to the material of construction and therefore they are not recommended.</p>	90 °C	-22 °C
<p>Buna-N It is generally used for oils. It is very durable to the transfer of water and hydraulic oil.</p>	87 °C	-22 °C
<p>EPDM It is durable to chemicals. It is not durable to oil and solvents. It has moderate resistance to the alcohols and ketones.</p>	138 °C	-40 °C
<p>Teflon It is generally used for heavy chemicals and acids. It features good resistance. It is suitable for heat transfer at elevated temperatures.</p>	100 °C	-35 °C
<p>Viton It has very good resistance to acids, oils and solvents.</p>	175 °C	-40 °C
<p>Santopren It is resistant to weak and medium acids. It features good abrasion resistance.</p>	135 °C	-40 °C
<p>Polypropylene It is resistant to chemicals. It is usually preferred for food, chemicals and cosmetic products.</p>	82 °C	0 °C

COMPOSITE PARTS DRAWING OF HP 05 (3/4") METALLIC PUMP

MODEL HP 20 METALLIC PUMP



COMPOSITE PARTS LIST

HP 20 METALLIC PUMP

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1	S012030	Suction Line	1	12	H064034	Pin Bushing	2
	S012031	Suction Line	1	13	H072033	Cover, Air Inlet Assembly	1
	S012032	Suction Line	1	14	H084047	Gasket, Air Valve	1
2	S022030	Discharge Line	1	15	H094047	Gasket, Pilot Valve, Front	1
	S022031	Discharge Line	1	16	H104047	Gasket, Pilot Valve, Rear	1
	S022032	Discharge Line	1	17	H115047	Gasket, Inner Chamber	2
3	H016030	Main Body	1	18	H124047	O-ring, Pin	2
	H016033	Main Body	1	19	H137030	Inner Diaphragm Holder	2
4	H022030	Inner Chamber	2	20	S073030	Outer Diaphragm Holder	2
	H022033	Inner Chamber	2		S073031	Outer Diaphragm Holder	2
5	S032030	Outer Chamber	2		S072032	Outer Diaphragm Holder	2
	S032031	Outer Chamber	2	21	H145090	Actuator Pin	2
	S032032	Outer Chamber	2	22	H152090	Diaphragm Rod	1
6	S042045	Check Ball	4	23	H165047	Oil Seal	2
	S042046	Check Ball	4	24	H174036	Muffler	1
	S042047	Check Ball	4	25	PM8-P	Washer, M8	4
	S042048	Check Ball	4		PM8	Washer, M8	4
	S042050	Check Ball	4	26	PM10-P	Washer, M10	4
	S042051	Check Ball	4		PM10	Washer, M10	4
7	S052036	Check Ball Seat	4	27	CM10X60-PI	Capscrew M 10 X60 imbus	4
	S052045	Check Ball Seat	4		CM10X60-I	Capscrew M 10 X 60 imbus	4
	S052046	Check Ball Seat	4	28	CM8X45-P	Capscrew M 8 X 45	4
	S052047	Check Ball Seat	4		CM8X45	Capscrew M 8 X 45	4
	S052048	Check Ball Seat	4	29	CM10X60-P	Capscrew M 10 X 60	16
	S052050	Check Ball Seat	4		CM10X60	Capscrew M 10 X 60	16
	S052051	Check Ball Seat	4	30	CM10X55-P	Capscrew M 10 X 50	16
8	S062045	Diaphragm	2		CM10X55	Capscrew M 10 X 50	16
	S062046	Diaphragm	2	31	CM10X30-PIHB	Capscrew M 10 X 30 imbus	8
	S062047	Diaphragm	2		CM10X30-IHB	Capscrew M 10 X 30 imbus	8
	S062048	Diaphragm	2	32	CM16X60-P	Capscrew M 16 X 60	2
	S062050	Diaphragm	2		CM16X60	Capscrew M 16 X 60	2
	S062051	Diaphragm	2	33	SM10-P	Ring Nut, M10	32
9	H034033	Air Valve Repair Kit	1		SM10	Ring Nut, M10	32
10	H044033	Pilot Valve Repair Kit	1	34	RM10-P	Nut, Hex M10	32
11	H055047	Bumper	2				
	RM10	Nut, Hex M10	32				

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35	SM10-PF	Ring Nut, Flanged	16
	SM10-F	Ring Nut, Flanged	16

MATERIAL CODES

30	ALUMINUM	45	NEOPRENE
31	CAST IRON	46	SANTOPRENE
32	STAINLESS STEEL	47	BUNA-N
33	POLYPROPYLENE	48	EPDM
34	DELIN	50	TEFLON
35	PVDF	51	VITON
36	POLYETHYLENE	70	DIA SPECIAL MATERIAL
38	BRONZE	90	STEEL

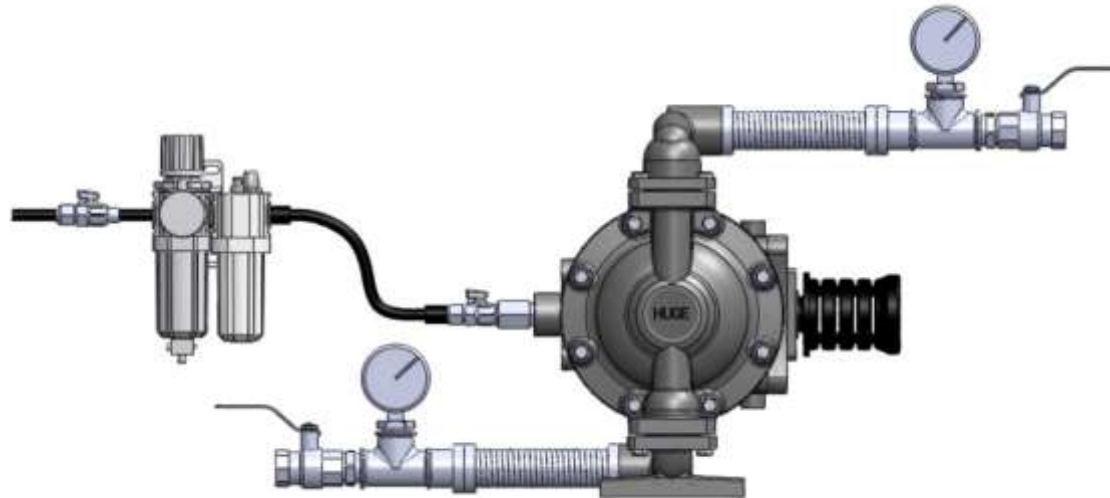
PRINCIPLE OF PUMP OPERATION

The diaphragm pump is consisted of two diaphragm chambers and two diaphragms. The diaphragms are connected to each other with a diaphragm rod and move in a reciprocating action. As one diaphragm performs the discharge stroke, the other diaphragm which is connected with the rod is pulled to perform the suction. At the end of the stroke, an air distribution valve automatically shifts, reversing the entire sequence, filling and pumping from alternate chambers. Mutual movements that repeated continuously ensure suction and discharge movements onto the fluids in each chamber. Continuously repeated

reciprocal motions pump the liquid during entering to and exiting from the chambers. The flow of the fluid from one chamber to another is regulated by the suction and discharge valves.

The ball and butterfly valves automatically controls the fluid suction and discharge of the fluid. The butterfly valves allow passage of the solid particles with a size up to diameter of the pipe. The ball valves regulate passage of the small-size particles.

INSTALLATION & START-UP



The interconnections of the diaphragm pump are straightforward. The fluid is taken from the bottom manifold and discharged at the upper manifold. Diaphragm pumps are characterized by turbulence flow. To prevent turbulence flow, the flexible hoses are installed upstream the suction and the discharge port.

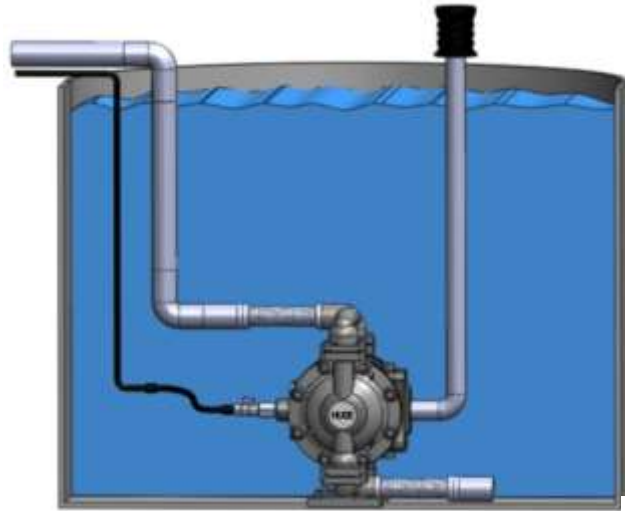
In order to observe the pressures at the suction and discharge parts of the pump and adjust the flow rate, the manometers and valves are attached at the suction and discharge ports. When one or both valves are closed down, the pump will be stopped. When they are opened, the operation will be resumed.

For the pump operation, the pressurized air is required. The pump is operated at the full capacity, if the suction and discharge hoses are the same size. A conditioner should be installed at the suction port. The conditioner will allow the pressure adjustment and lubricating the air direction valve. The valve installed downstream the air inlet line the air flow is regulated by the valve operation.

Special precautions should be observed in the operation of diaphragm pump. These precautions will provide the maximum efficiency to the pump.

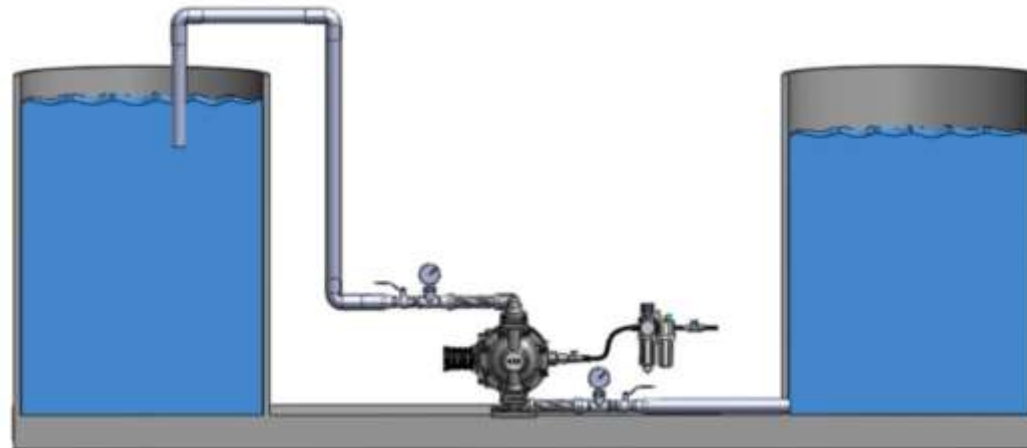
- The pump should be located as close to the product being pumped as possible.
- The suction line length and number of fittings should be kept in a minimum.
- The size of the suction pipe should not less than the size of the suction port of the pump.
- For installations of rigid piping, short sections of flexible hose should be installed between the pump and the piping.
- The flexible hose reduces vibration and strain to the pumping system.
- The buffer tank should be provided at the discharge port of the pump if discharge pipe assembly is long. The buffer tank will reduce transfer of the vibration in the pipe assembly onto the pump.

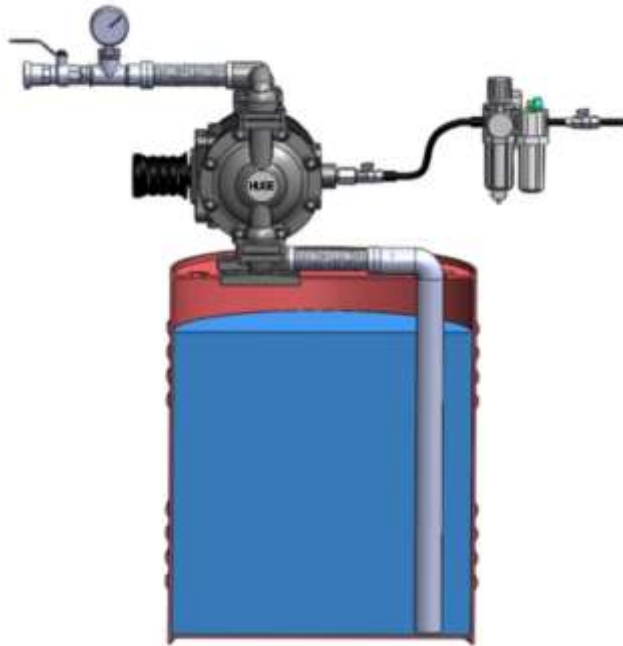
AREAS OF APPLICATION



Diaphragm pumps can also be used as submerged pump. It is necessary to maintain the exhaust port of the pump above the liquid surface with pipe or hose.

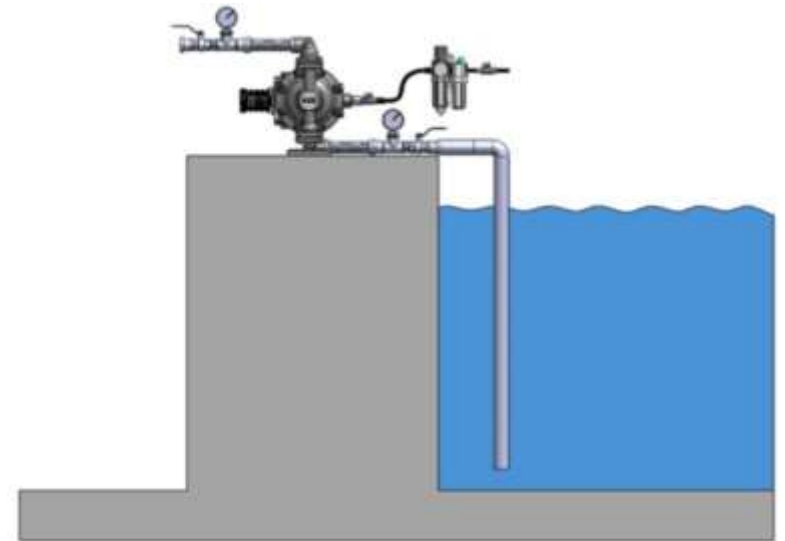
Diaphragm pumps can be used to transfer the fluid in the tank readily by connecting them to the bottom of the tank.





Diaphragm pumps can also be used as barrel pumps. They have effective suction ability and are able to transfer all the fluid in the barrel.

The diaphragm pumps are able to transfer fluids at 6 meters of depth. Cavitation might obstruct the operation. To prevent this, the air in the hose between the pump and fluid should be discharged.



AIR CONNECTION

The air pressure should not be in excess 7 bars. The pump should be provided with the air supply at such pressure and flow to achieve desired performance. When the air supply line is solid piping, use a short length of flexible hose not less than ½" in diameter between the pump and the piping to reduce strain to the piping. The weight of the air supply line, regulators and filters must be supported by some means other than the air inlet cap. Otherwise, unsupportive weight may result in damage to the pump. A pressure regulating valve should be installed to insure air supply pressure does not exceed recommended limits.



WARNING If the size of air connection is smaller than the pump supply port, the pump will not be able to provide the air required so, it will not perform properly.

AIR VALVE LUBRICATION

The air distribution valve and the pilot valve are designed to operate without lubrication. This is the preferred mode of operation. In regard

to anticipated practice or inferior air quality, it is likely include lubrication oil into the compressed air. The pump air system will operate with properly lubricated compressed air supply. Proper lubrication requires the use of an airline lubricator system to deliver one drop of SAE 10 oil for every 10 liters/sec. of air consumed by the pump at the operation point. For better determination of the mixing ratios, see the performance curves provided for the pump.

AIR LINE MOISTURE

Water in the compressed air supply might give rise to problem like freezing of the water or icing in the discharge line that cause the pump to cycle erratically or stop operating. These problems might be removed by using a point-of-use air dryer to supplement the user's air drying equipment. The air drying equipment will remove the water and alleviate problems like, freezing or icing.

AIR INLET AND PRIMING

Before operating the pump, turn the air supply valve at about 1/2 or 3/4 of a turn. After the pump primes, the air valve can be opened to increase air flow as desired. If opening of the valve increases the reciprocating frequency without increase in air flow, then it means that the pump operates under cavitation. In such cases, the valve should be closed slightly to obtain the most efficient air flow to pump flow ratio.

FREQUENCY OF USE

The pump should be flushed after each application to prevent its damage if the pump is used for the transfer of the fluid that contains suspended particles that settle and harden in the course of time when it is kept stand still.(Otherwise, product remaining in the pump between uses could dry out or settle out. This could cause problems with the diaphragms and check valves at restart.) The pump should be completely drained after every use in particular under freezing temperatures.

PUMP PROBLEMS AND SOLUTIONS

PROBLEM: The pump fails to operate even the air is supplied. The supplied air is directly exit through the exhaust filter.

SOLUTION: Check the air valve of the pump. The piston of the liner-piston assembly of the air valve may be jammed. Disassembly the air valve then remove, clean and lubricate the piston of the liner-piston assembly. Wipe off and lubricate the liner. Install the piston in the liner and break in a while. Install the air valve back and start the pump.

PROBLEM: The pump operates but no flow is transferred.

SOLUTION: Check the valves of the pump. The valve plunger may be jammed by the foreign matters. In such case, no transfer of the fluid is possible.

PROBLEM: The pump is in operation, but the capacity of the fluid is insufficient.

SOLUTION: There might be several reasons:

- * The pump suction and discharge port sizes are not proper. In such case, the air flow for the pump operation will be insufficient.
- * The air flow is less than the required volumetric rate. It is likely that the compressor falls short in supplying required air.
- * The cross sectional area of the pump at the suction and discharge ports might be contracted. Any contraction of the pump's suction and discharge ports might cause a drop in the real pump's capacity.

PROBLEM: The pump transfers the fluid, but the flow is fluctuating.

SOLUTION: Check the pilot valve and air valve of the pump.

O-rings of the piston of the pilot valve may be worn out. If this is so, replace the pilot valve.

- * The piston in the air valve might be worn out. Disassemble the piston and liner assembly of the air valve and lubricate before reassembling. If the problem still persists, then replace the assembly completely.

PROBLEM: There is excessive vibration in the pump during the fluid transfer.

SOLUTION: There might be several reasons and solutions for that.

- * High exit pressure of the pump and lack of rubber mountings on the pump's pedestals.
- * Long discharge pipe and lack of compensators on the pipe installed at specific intervals to prevent vibration.
- * Use of flexible adaptors at the suction and discharge ports of the pump

IMPORTANT

Read these safety warnings and instructions in this manual completely, before installation and start-up of the pump. It is the user's responsibility to retain this manual. Any operation performed that is not in accordance with the information provided under the manual may render the pump's warranty invalid.

WARNINGS



WARNING: Check all the connections with gaskets for any looseness before operating the pump. Any loose connection must be tightened to prevent any leakage.



WARNING: Check all capscrews and ring nuts for tightness before operating the pump for the first time.



WARNING: Operate the pump with a conditioner installed at in front of the pump.



WARNING: Lubricate the pump continuously with the conditioner. In order to prevent effluent water from the air line, in addition to usage of the conditioner, discharge the water accumulated in the compressor tank.



WARNING: Be sure not to tighten excessively to the capscrews during the assembly and disassembly; otherwise the pump's main body may be damaged.



WARNING: The silencer must be used while operating the pump.



WARNING: Please be careful at the pump transfer.



WARNING: The fittings should be installed to eliminate any possible leakage of the transferred liquid.



WARNING: The pump should be installed onto the rubber mountings.



WARNING: In order to prevent the knock at the discharge, the pump should be complete with the flexible hose adaptor at the discharge port where the pipe assembly is long.



WARNING: Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers or other miscellaneous equipment must be grounded.



WARNING: Be sure using the gloves and goggles in the pump repair and maintenance works.



WARNING: The air supply should be switched off before any repair or maintenance of the pump. Then pump pressure should be released and air connection be removed. Be careful compressed air line.



WARNING: When used for toxic or aggressive fluids, the pump should always be flushed with water before the repairment.



WARNING: If the diaphragm is split then, the transferred fluid may pass to the air side of the pump and diffuse to the atmosphere. If pumping a product which is hazardous or toxic, the air exhaust must be piped to an appropriate area for safe disposition.

NOTE: Contact to our company in case of any failure of the pump provided under the warranty. 2-year warranty will be terminated if the pump is dismantled without notifying to our company.



PUMPING HAZARDOUS LIQUIDS

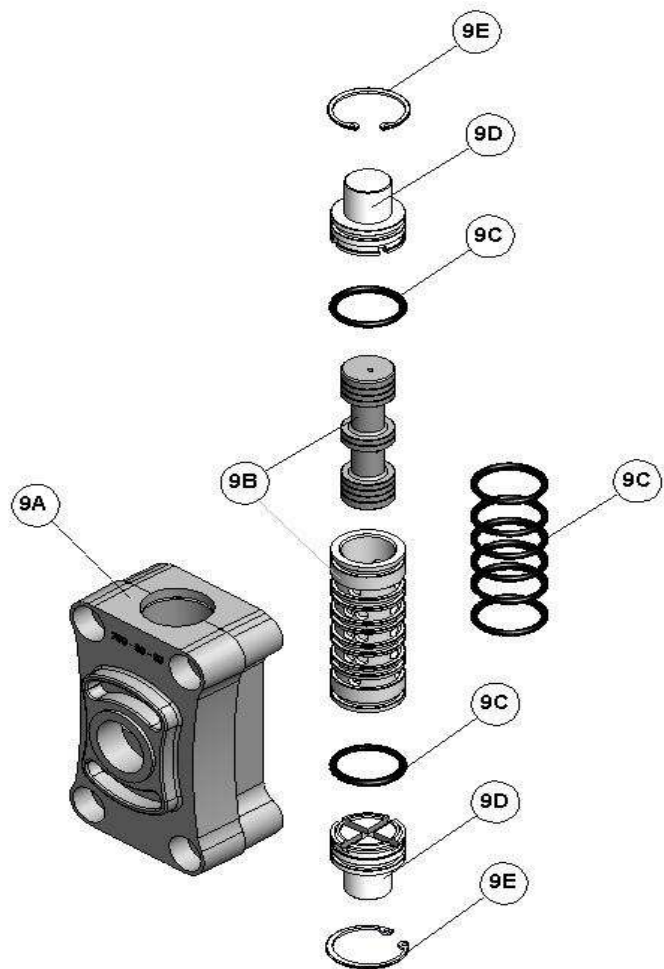
When a diaphragm fails, the pumped liquid or fumes enter the air end of the pump. Fumes may dissipate in the ambient air. When pumping hazardous or toxic materials, the exhaust air must be piped to an appropriate area for safe disposal.

If the material of construction of the pump is compatible to the liquid being pumped, the pump can be submerged into the fluid. In such

case, the air exhaust must be piped above the liquid level. The size of the pipe for air discharge should be at least 1" diameter. Reducing the pipe size will reduce air flow and pump performance. If the liquid to be transferred is at higher level than the pump (flooded suction condition), the discharge port should be kept at a higher level than the liquid surface to prevent siphoning spills.

AIR VALVE ASSEMBLY (H034033)

9 PART LIST OF AIR VALVE REPAIR KIT



Item No.	Part No.	Name of Part	Qty
9A	H554033B	Air Valve Body	1
9B	H564070	Sleeve and Spool Set	1
9C	H574047	O-ring	8
9D	H584033	Cap	2
9E	H504090	Snap ring	2

AIR VALVE MAINTENANCE

To begin with the servicing of the air valve first shut off the compressed air, bleed pressure from the pump, and disconnect the air supply line from the pump.

* **First: inspect the exploded view of the air valve.**

Remove four hex capscrews by using wrench or socket. Remove the air valve assembly from the pump. Remove the gasket and check to see any cracking or damage. Replace the gasket if it is necessary,

* **Second: Disassembly of the air valve.**

Remove the snap rings of two plugs beneath the air valve with pliers in order to have access to the internal parts of the air valve. Then remove two caps. Check O-rings to see any abrasion or cuts. Replace O-rings as needed. Take the spool out of the sleeve. Be sure not to scratch or damage the surface of the spool's mating surface. Wipe the spool with soft piece of cloth and check to see any scratch or damage. Check inner surface of the sleeve to see any dirt, scratches or other contaminants. Remove the sleeve and replace with a new sleeve and spool assembly, as necessary.

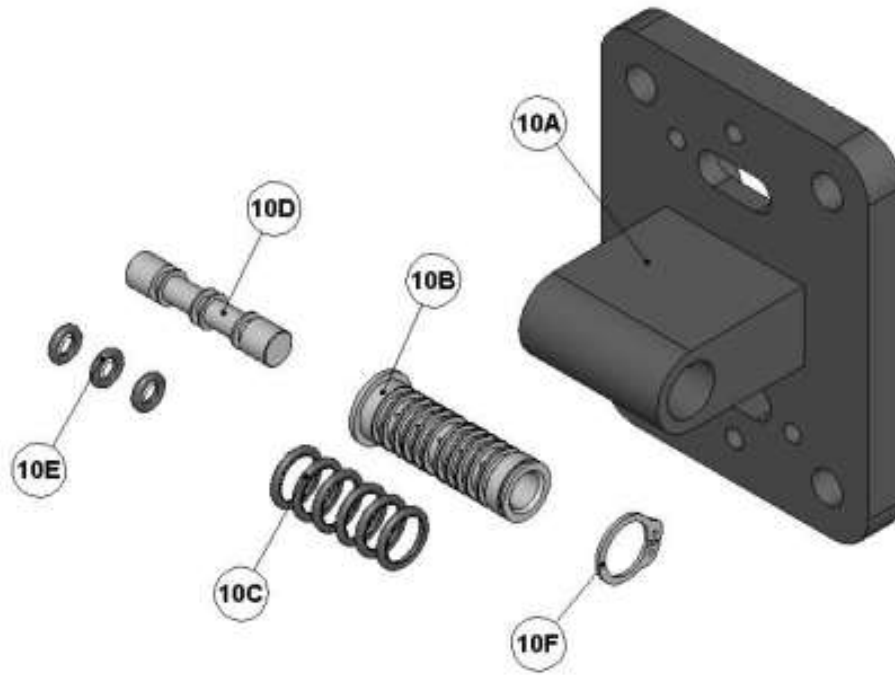
* **Third: reassembly of the air valve.**

To do this, install one bumper together with its O-ring on the one side of the air valve assembly. Check O-rings of the existing or new or sleeve and spool set replaced as necessary. Carefully take the spool out from the sleeve. Install six O-rings into the six grooves on the sleeve.

Then install the liner onto the main housing of the air valve. Be sure to apply a light coating of grease to the O-rings before installing the sleeve into the valve body; align the slots in the sleeve with the slots in the valve body. Insert the spool into the sleeve. Be careful not to scratch or damage the spool during installation. Install other bumper together with its O-ring. Install the snap ring. The repair of the valve is completed. During installing the complete with and gasket onto the pump, be sure to have the holes of the valve in line with the holes on the pump. Connect the compressed air line onto the pump. The pump is now ready to operation.

PILOT VALVE ASSEMBLY (H044033)

10 PART LIST OF PILOT VALVE REPAIR KIT



Item No.	Part No.	Name of Part	Qty
10A	H454033B	Pilot Valve Body	1
10B	H464090	Sleeve	1
10C	H474047	O-ring, sleeve	6
10D	H484090	Spool	1
10E	H494047	O-ring, spool	3
10F	S124090	Snap ring	1

PILOT VALVE MAINTENANCE

To begin with the servicing of the air valve first shut off the compressed air, bleed pressure from the pump, and disconnect the air supply line from the pump.

***First: See pump assembly drawings.**

Remove four capscrews by using M8 spanner or socket wrench. Remove air inlet cover and air inlet port gasket. The pilot valve assembly may now be taken out for inspection and service.

***Second: Removal of the pilot valve.**

Remove the spool of the valve. Wipe it to remove any dirt. Check the spool and O-ring to see any dirt, cut or abrasion. Replace O-ring and spool as necessary. Remove the snap ring from the end of the sleeve and remove the sleeve from the valve body. Wipe it to remove any dirt. Check the sleeve and O-ring to see any dirt, cut or abrasion. Replace O-ring and liner, if needed.

***Third: Installing the pilot valve**

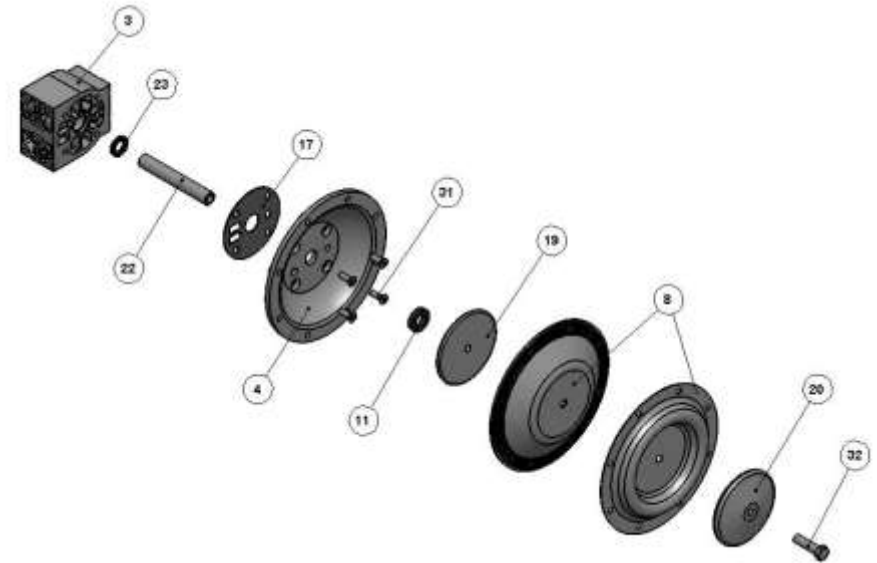
Generously lubricate outside diameter of the sleeve and o-rings. Then carefully insert sleeve into valve body. During the installation of the sleeve, take **CAUTION** not to damage O-rings. Install the snap ring to sleeve. Lubricate the other surface of the piston and O-ring. Then carefully install the spool into the sleeve. During the installation of the piston, take **CAUTION** not to damage O-rings.

***Fourth: Re-install the valve assembly into intermediate portion.**

During installing the pilot valve assembly onto the intermediate portion, be sure pilot valve ends located to the center of the piston pins. Re-install the gasket, air inlet cap and capscrews. Connect the air supply to the pump. The pump is now ready for operation.

DIAPHRAGM MAINTENANCE

Item No.	Part No.	Name of Part	Qty
3	H015033	Main Body	1
23	H165047	Oil Seal	2
22	H152090	Diaphragm Rod	1
17	H137047	Gasket, Inner Chamber	2
4	H022033	Inner Chamber	2
31	CM10X30-IHB	Capscrew M 10 X 30 imbus	2
11	H056047	Bumper	2
19	H132030	Inner Diaphragm Holder	1
8	S062045	Diaphragm	2
20	S072030	Outer Diaphragm Holder	2
32	CM16X60	Capscrew M 16 X 50	2



Double diaphragms are used for the pump with Teflon diaphragm. The rubber diaphragm which installed at the front of the Teflon diaphragm provides, supports and extends the service life.

For maintenance of diaphragms, first remove the suction line of the pump and then block the pump discharge line. Cut off the compressed air supply, bleed the pressure from the pump and disconnect the air supply line from the pump. Drain any remaining liquid from the pump. Inspect the pump assembly drawings and maintenance diagrams. Remove the manifolds. Remove the pump ball and ball seats. Then remove the outer covers of the pump.

***First: Removal of diaphragm assemblies**

Use M16 wrench or socket to unscrew the outer diaphragm holder by turning counterclockwise direction and remove the diaphragm assembly from the diaphragm rod. Then take one diaphragm together with outer and inner diaphragm holders and the other diaphragm with its diaphragm rod out. In order to disassemble first diaphragm with its holder, hold the diaphragm assembly with a vice by clamping the inner holder and remove the outer holder by turning it counterclockwise with M16 spanner.

Hold the diaphragm rod of other diaphragm assembly with a vice and dismantle diaphragm with a spanner. Perform dismantling the other diaphragm in the same manner. Check the diaphragm for cuts, bursting, abrasion and chemical corrosion. Replace the diaphragms as necessary.

***Second: Installing diaphragms**

Insert M16 capscrews onto the outer diaphragm holder and push the diaphragm into the center hole. Install the capscrews onto inner diaphragm holder and screw it onto the rod by turning clockwise. Hold loose assembly with a vice. Screw M16 wrench with a spanner.

***Third: Installing diaphragm assembly onto pump**

Make sure the bumper is installed over the diaphragm rod. Screw the rod of the diaphragm assembly by turning clockwise into threaded hole until it is in the same direction with the end of the inner diaphragm plate. Insert rod into pump. Bring the capscrew holes on the diaphragm in line with inner chamber capscrew holes. Install outer chamber onto the pump by capscrews and ring nuts.

On the opposite side of the pump, pull the diaphragm rod out as far as possible. Make sure the second bumper is installed over the diaphragm rod. Screw the exposed part of the diaphragm assembly shaft in clockwise direction onto the diaphragm rod as much as possible and leave the gap sufficient enough to adjust the capscrew holes on the diaphragm in line with inner casing capscrew holes.

Install the part of outer casing onto the pump with capscrews, nuts and washers. Install the manifolds onto the pump with capscrews, nuts and washers. Perform the necessary connections onto the pump. Now the pump is ready for the operation.

THRUST PIN MAINTENANCE

Item No.	Part No.	Name of Part	Qty
3	H015030	Main Body	1
21	H145090	Actuator Pin	2
18	H124047	O-ring, Pin	2
12	H064036	Pin Bushing	2

In order to prevent damages at the high pressure operation replace the actuator pin with new one. If this situation continues use bigger size of actuator pin.

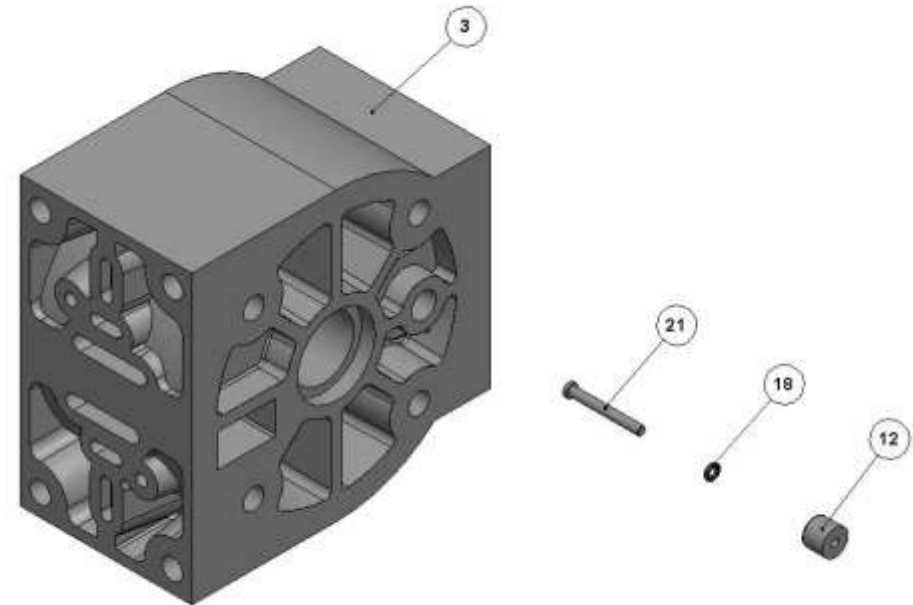
To begin with the maintenance of the actuator pin, first the compressed air supply, bleed the pressure from the pump, and disconnect the air supply line from the pump.

***First: Inspect pump installation drawings**

Remove four capscrews by using M8 spanner or socket wrench. Remove the air inlet cap and air inlet gasket. The pilot valve assembly can now be removed.

***Second: Inspect actuator pins**

See the assembly drawings. Access to the actuator pins can be reached through the opening of the pilot valve assembly. Remove the plungers from the bushings in each end of the cavity. Inspect the



installed o-ring for cuts and/or wear. Replace the o-rings, if it's necessary. Lubricate O-rings slightly and install the pins into the bushing. Push the plungers in as far as they will go.

***Third: Install the valve assembly into intermediate gap**

During installing the pilot valve assembly onto the intermediate portion, be sure pilot valve ends located to the center of the actuator pins. Install the gasket, air inlet cover and capscrews. Connect the air supply onto the pump. The pump is now ready for operation.

CHECK VALVE (BALL & SEAT) MAINTENANCE

Shut off the suction line and discharge line of the pump before starting the maintenance work. Then shut the compressed air supply, discharge the pressure in the pipe and remove the compressed air connection. Discharge the fluid in the pump. Now the pump can be disassembled for the maintenance.

Remove the manifold to have access to the check valves.

Inspect the check balls for any abrasion, cuts or corrosion marks. Perform the same checks on the check valve seats to see any cuts, abrasion and any foreign materials embedded onto the surface of both the external and internal chambers. The spherical surface of the check balls must seat flush to the surface of the check valve seats for the pump to operate to peak efficiency.



WARNING: The air supply should be switched off before any repair or maintenance of the pump. Then pump pressure should be released and air connection be removed. Be careful compressed air line.

Item No.	Part No.	Name of Part	Qty
2	S022030	Discharge Line	1
6	S042045	Check Ball Seat	4
1	S052045	Suction Line	1
7	S032030	Check Ball Seat	4
5	S012030	Outer Chamber	2

The damaged or worn out parts should be replaced as necessary. Re-assemble the parts of the check valves. The seat should fit into the counter bore of the outer chamber. Assemble the pump and make necessary connections. The pump is ready for operation.

