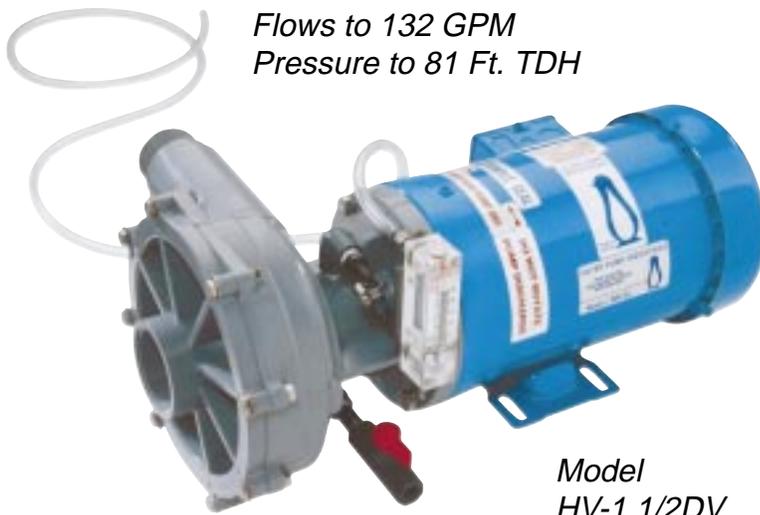


# Series HV

## CPVC Horizontal Centrifugal Pump



Flows to 132 GPM  
Pressure to 81 Ft. TDH

Model  
HV-1 1/2DV

### Features:

- True Volute Design
- High Efficiency
- Energy Saving
- Higher Flow vs. Pressure
- No Metal Contact

### Recommended Applications:

- Plating, Anodizing and Electropolishing
- Fume Scrubbing, Pollution Control and Evaporators
- Recirculation, Mixing, Agitating, Spray/Rinse and Filtering
- Water and Waste Treatment
- Photographic Processing and Developers
- PCB Manufacturing
- Chemical Processing

Penguin series HV horizontal end suction centrifugal pumps are designed to the latest hydraulic technology. A true volute design provides an energy saving pump because less horsepower (HP) is required. The HV series pump has a higher flow versus pressure, yet very smooth and quite operational. The volute design helps to reduce vibrations and shock losses, premature shaft fatigue and bearing failures, and radial thrust loads while prolonging mechanical seal life. The rear impeller vanes are designed to help assure proper lubrication of the mechanical seal cavity while balancing axial forces hydraulically.

Penguin series HV pumps are easy to assemble and disassemble. The pump bracket and half the volute are one piece. Constructed of CPVC, there is no metal contact with the solution being pumped. If the HV series pump should accidentally run dry excessively, usually the seal insert can be replaced in lieu of replacing the entire pump housing/motor bracket assembly, thus saving costly repair/replacement dollars.

### Motor and Shaft

Totally enclosed fan cooled (TEFC) motors with extended one-piece rotor/shafts are standard on most models. All standard metallic shafts are sleeved in CPVC plastic for no metal contact while optional 316SS shafts without plastic sleeves are readily available from stock upon request. Single phase motors are wired 115V and supplied with a cord and three-prong plug. Three phase motors are shipped unwired.

### Elastomers

Ethylene propylene (EPR) is the standard elastomer for o-rings and seal components. Optional viton is readily available.

### Seals

#### Single Mechanical (External)

Standard single mechanical seals are type 21, general pur-

pose, that rotate with the shaft against a stationary mating face. The liquid being pumped acts as a seal lubricant, therefore, it is imperative that the seal be assured of positive flow of liquid at all times. Standard materials of construction are carbon/high purity ceramic/EPR. Options include viton elastomers and siliconized carbide seal faces. **Pump inlet pressures are limited to 10 psi maximum for external seals.**

#### Double Mechanical (External)

Standard double mechanical seals employed are essentially two single mechanical seals placed back to back with a common spring between them and water flush assembly, which includes flow meter, flow valve, and hose. The required 3-5 gph (gallons per hour) water should be set to maintain an internal seal chamber pressure 2-4 psi higher than the minimum operating pressure of the pump. Standard seal materials of construction are carbon/high purity ceramic/EPR, front and rear. Options include viton elastomers and siliconized carbide seal faces. Double seals are generally recommended for elevated temperatures, electroless plating baths, crystalline solutions, highly corrosive applications, and for abrasive solutions with a high percentage of solids present. Double seals allow the pump to run dry for a limited time period without damage provided the water flush is on prior to pump start-up.

#### Single Diplo (Internal)

The Diplo seal has no metallic spring and can be used in highly corrosive applications or where contaminants may clog conventional designs. These internal seals can also handle higher suction pressures than external seals upward to 60 psi maximum, while also allowing the pump to run dry for a short time period without excessive damage. Standard seal materials of construction are carbon/high purity ceramic/viton elastomer.



# Series HV

## CPVC Horizontal Centrifugal Pump

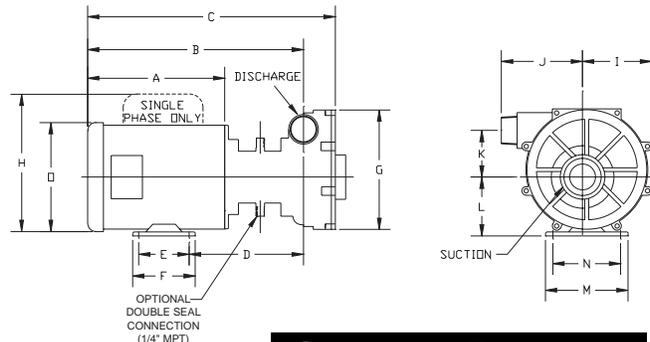
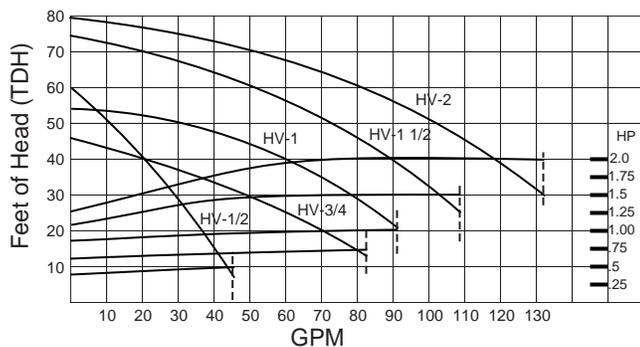
### Specifications

Pump					Motor					Dimensions				
Model	Max Flow (gpm)	Max Head (ft)	Suction	Discharge	HP	RPM	Volts	Hertz	Phase	Amps	Ht	Wth	Lth	Wt
HV-1/2	45	59	1 1/2" FPT	1" MPT	3/4	3450	115/230	60	1	10.0/5.0	11	11	26	38
					1/2		208-230/460	50-60	3	1.9-1.8/0.9				43
HV-3/4	82	46	2" FPT	1 1/2" MPT	3/4		115/230	60	1	10.0/5.0				44
					1		208-230/460	50-60	3	2.7-2.6/1.3				46
HV-1	91	54	2" FPT	1 1/2" MPT	1		115/230	60	1	12/6				46
					1 1/2		208-230/460	50-60	3	3.3-3.2/1.6				48
HV-1 1/2	109	74	2" FPT	1 1/2" MPT	1 1/2		115/230	60	1	15/7.5				48
					2		208-230/460	50-60	3	4.8-4.6/2.3				48
HV-2	132	80	2" FPT	1 1/2" MPT	2		115/230	60	1	17.8/8.9				48
					3		208-230/460	50-60	3	6.0-5.8/2.9				48

### Dimensions

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
HV-1/2	8 3/4	13 3/4	16 1/2					8 1/4		4 5/8					
HV-3/4	9 1/4	14 1/4	17					9	4 1/2	5 3/8	3 1/8	3 1/2	6 1/2	4 7/8	7
HV-1				7 5/8	3	4	8								
HV-1 1/2	9 3/4	14 3/4	17 1/2												
HV-2															

### Performance



### Specific Gravity Increased HP

Model	Motor HP	Specific Gravity
HV-1/2	1/2 HP	1.0
	3/4 HP	1.1-1.5
	1 HP	1.5-2.0
HV-3/4	3/4 HP	1.0
	1 HP	1.1-1.3
	1 1/2 HP	1.4-2.0
HV-1	1 HP	1.0
	1 1/2 HP	1.1-1.5
HV-1 1/2	2 HP	1.5-2.0
	3 HP	1.1-1.3
HV-2	2 HP	1.0
	3 HP	1.1-1.5

### Nomenclature

HV	1/2	S	E	3/4
Horizontal Diffuser Pump	Horsepower	No. of Stages	Seal Material	Optional increased horsepower
	1/2 = 1/2	S = single mechanical	E = ethylene/propylene carbon/ceramic	3/4 = 3/4
	3/4 = 3/4	N = single diplo	V = viton	1 = 1
	1 = 1	D = double	S = viton	1 1/2 = 1 1/2
	1 1/2 = 1 1/2		silicon carbide/ silicon carbide	2 = 2
	2 = 2			3 = 3



### **SERIES HV PUMPS**

<b>MODELS</b>	<b>SEALS</b>
HV-1/2	<b>S - Single</b>
HV-3/4	<b>D - Double</b>
HV-1	<b>N - Single Diplo</b>
HV-1 1/2	
HV-2	



### ***Introduction***

Penguin Pumps are designed to handle a large range of chemicals without difficulty. Completely constructed of CPVC where in contact with the solution being pumped, Series HV pumps have an upper working temperature of 180 degrees, and thus can handle most corrosive, slurries, and abrasive solutions. For high temperature and very corrosive abrasive solutions, a double mechanical seal and water flush are supplied. For higher suction pressure, a single diplo internal seal is supplied. All pumps have been tested for proper operation before leaving the factory. To obtain optimum service life, please follow all installation and operation instructions.

# Installation & Operation Instructions

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Install the pump as close as possible to the liquid reservoir from which the liquid is being pumped. As more energy is necessary to prime the liquid than to discharge the fluid, make the suction as short as possible.

## ELECTRICAL

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All Series HV pumps are available with either a single or three phase motor. The single phase motor is dual voltage, 115/230V, 60c, which is wired at the factory for proper rotation. The factory wires all dual voltage motors for the lower voltage (115V) unless otherwise requested. When changing from 115V wiring to 230V wiring, follow the motor manufacturer's wiring instructions, which are found in the motor junction box. With some motors the diagram is under the cover gasket. Be sure to wire the motor for counterclockwise rotation as viewed from the suction entrance of the pump. A power cord and plug are supplied for immediate plug-in operation. A plug is not supplied on motors wired for 230V. Many options are available on the HV Series motors including single phase-50c, explosion-proof, and 575V motors. If any of these options are required, please check the motors carefully or consult the factory. The three-phase are dual

voltage, 230/460V, 50/60c which are not wired at the factory. The direction of rotation must be determined by operating the pump. The system, including the pump, has to be completely filled with only fluid (no air). Entrapped air can also cause damage to the pump. Just bump start the motor while checking the rotation of the fan through the fan cover. Do not reverse pump unit for any duration of time. On all Penguin pumps, the rotation is clockwise facing the fan cover of the motor. Arrows are provided on the motor for proper rotation. In case of reverse rotation, interchange the two phases and check rotation again.

For double seal pump units, the water flush must be hooked up before bump starting. Forgetting the water flush will cause severe damage to the second seal and bracket. The flush should be between 3-5 gph.

## PLUMBING

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It is recommended to enlarge the suction line a minimum of one size larger than the suction entrance. Never reduce plumbing on the suction. Avoid 90 degree elbows and never use 180 degree elbows. Make sure that every suction coupling/connection is airtight. Always use a valve on the discharge of the pump. In case of a flooded suction, in which the liquid level is higher than the center of the suction entrance, provide a T-connection with a small valve after the discharge valve to assist in letting the air out during flooding. In case of

a non-flooded suction, in which the liquid level is lower than the center of the suction entrance, provide a foot valve on the end of the submerged suction line. All plumbing and accessories must be supported other than by the pump, in order to prevent possible distortion of the pump case. The use of some hoses in the discharge plumbing close to the discharge nozzle of the pump will absorb any movement of the solid plumbing if vibration exists.

## PRIMING

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Under flooded conditions, open all the valves in the suction and discharge lines. If a T-connection with valve is provided, wait until the fluid is escaping with no air bubbles. Close all the valves in the discharge line. Always leave the suction valves wide open. A closed suction valve will cause severe damage to the impeller and the seal. Under non-flooded conditions, fill up the pump and suction line very slowly from the discharge in order to let entrapped air out. Then close all valves in the discharge line. Give the pump a couple of seconds to build up pressure, then slowly open discharge valve until the desired flow is achieved. A priming chamber can be included as an option to help facilitate priming the pump, but all non-flooded directions must still be followed. If a priming chamber is included, unscrew the filler cap and fill the priming chamber. Replace the filler cap and tighten securely to compress the cap gasket to prevent air leakage through the cap. Make sure the piping on both inlet and

outlet is secure and then start up the pump. During the first few minutes there will be air trapped in the chamber and the piping. This air must purge itself before the full rated performance of the pump will be achieved. If the air does not purge itself, then check for air leakage at the various pipe and chamber connections. The longer the length of the inlet pipe, the longer it will take to purge the air. When the pump is shut off, if the system siphons the liquid out of the chamber, it must be refilled before starting up again. When a flapper valve is supplied on the inlet of the priming chamber, the liquid should remain in the chamber, and thus it is not usually necessary to refill before restarting the pump. Liquids that have water-like characteristics will function as described above. Liquids with higher specific gravities and viscous liquids may not give satisfactory results. The acceptability of the chamber for a specific liquid and specific piping situation must be determined. Consult factory if necessary.

## RECOMMENDATIONS

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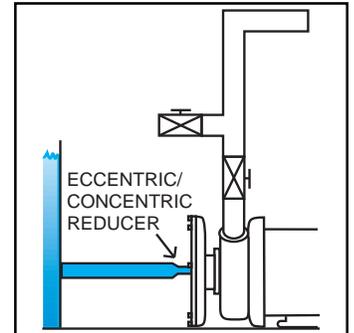
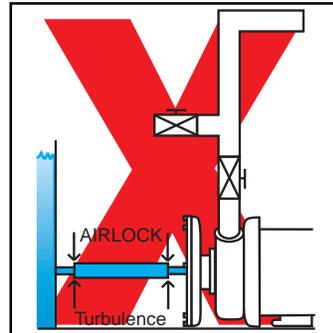
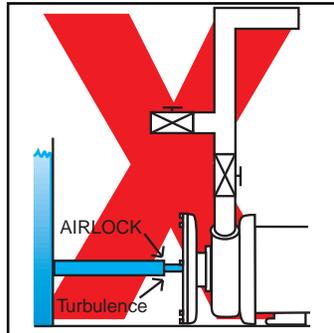
Always make sure there is enough liquid in the reservoir and the level is high enough considering the capacity of the pump unit. Inadequate liquid will cause vortex in the reservoir. A vortex occurs when air mixes from the surface into the fluid. This can disturb the flow and also prevents the pump from priming. Never run the pump for more than 5-10 minutes against a closed discharge valve. This will cause overheating of the fluid in the pump and will damage the CPVC parts. Temperature in this case will increase up to 220 degrees. If

the pump is being run against a closed discharge valve for a long duration of time, install a small bleed line back into the reservoir before the discharge valve of the pump. If the line is small, there is a minimum pressure loss. This prevents overheating by recirculating the fluid.

Note: The maximum suction pressure cannot exceed 10 psi without utilizing a diplo internal seal.

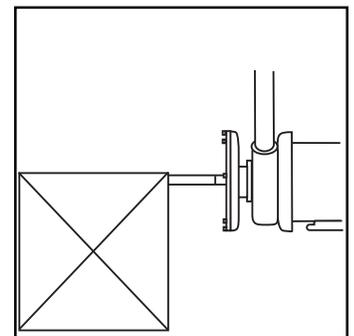
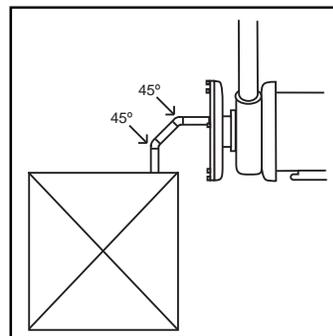
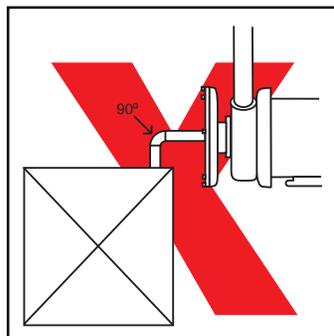
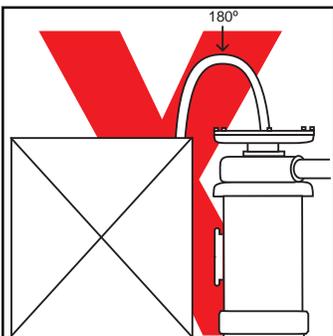
# Recommended Installation

## Suction Plumbing



**Recommended**

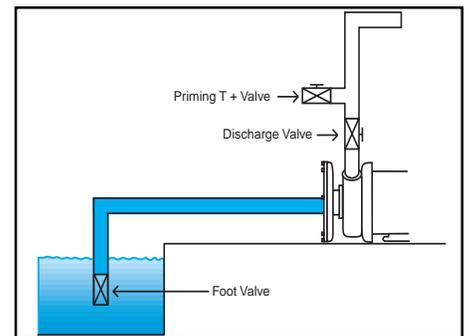
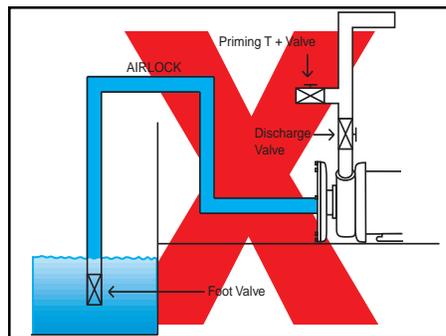
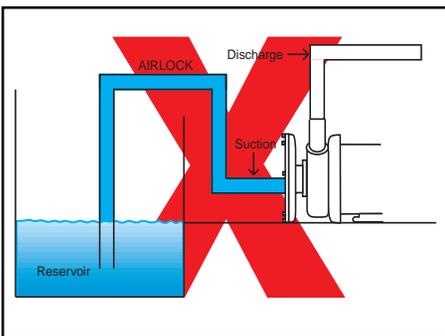
## Suction Top View



**Recommended**

**Recommended**

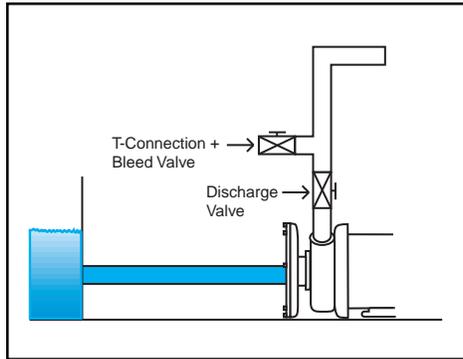
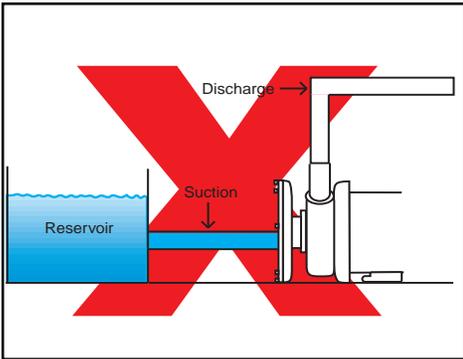
## Suction Lift



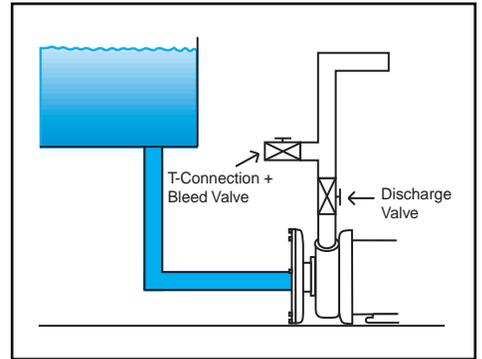
**Recommended**

# Recommended Installation

## Suction Head



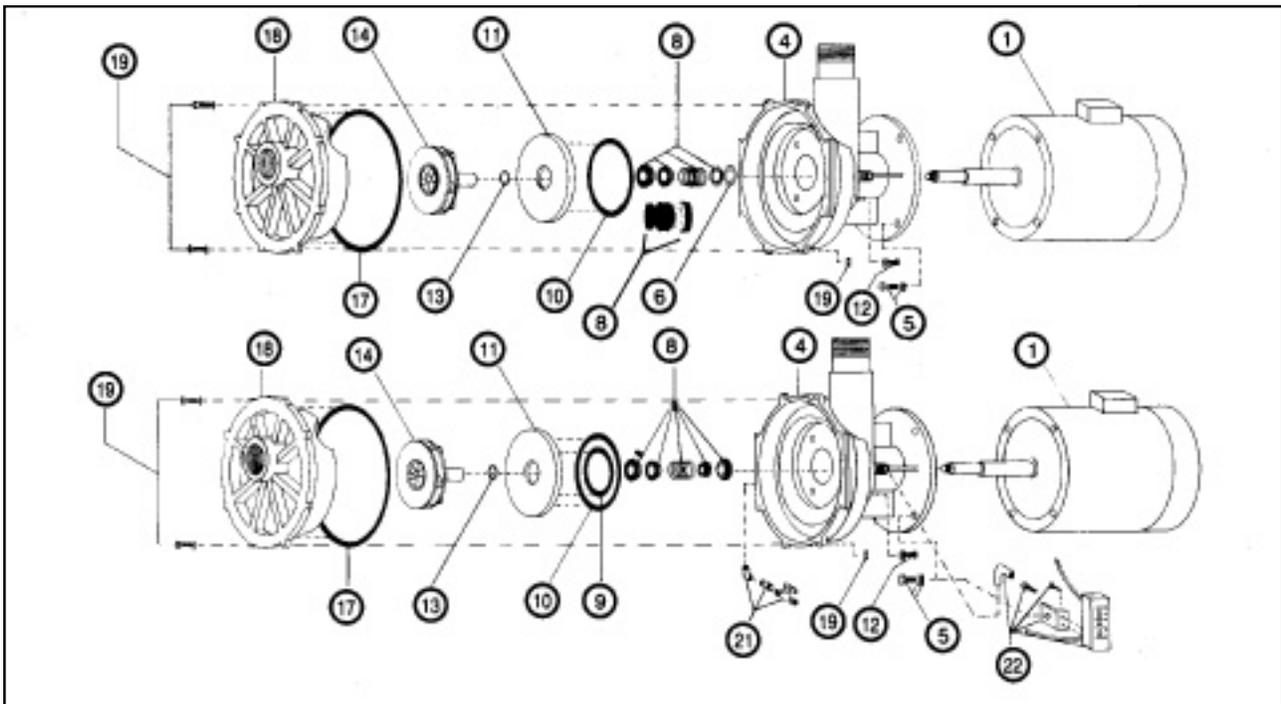
Recommended



Recommended

# Series HV Spare Parts List

## MODEL HV-1/2, HV-3/4, HV-1, HV-1 1/2, HV-2



# Series HV Spare Parts List

Item	Description	HV-1/2 Part No.	HV-3/4 Part No.	HV-1 Part No.	HV-1 1/2 Part No.	HV-2 Part No.
1	Motor/ Shaft Ass'y					
	Phase - Voltage - Cycle					
	1 115/230 50* or 60* single seal	HV-340-0102S	HV-340-0102S	HV-100-0102S	HV-112-0102S	
	1 115/230 50/60 single seal	HV-340-2102S	HV-340-2102S	HV-112-2102S	HV-112-2102S	
	3 230/460 50/60 single seal	HV-120-3102S	HV-340-3102S	HV-100-3102S	HV-112-3102S	HV-200-3102S
	1 115/230 50* or 60* double seal	HV-340-0102D	HV-340-0102D	HV-100-0102D	HV-112-0102D	
	1 115/230 50/60 double seal	HV-340-2102D	HV-340-2102D	HV-340-2102D	HV-112-2102D	
	3 230/460 50/60 double seal	HV-340-3102D	HV-340-3102D	HV-340-3102D	HV-112-3102D	HV-200-3102D
1BS	Bearing Set (specify motor mfg.)	P-120-01BS	P-120-01BS	P-120-01BS	P-120-01BS	P-120-01BS
1EF	External Fan (specify motor mfg.)	P-120-01EF	P-120-01EF	P-120-01EF	P-120-01EF	P-120-01EF
1FC	Fan Cover (specify motor mfg.)	P-120-01FC	P-120-01FC	P-120-01FC	P-120-01FC	P-120-01FC
4	Pump Housing/Bracket Ass'y	HV-120-03A	HV-340-03A	HV-340-03A	HV-340-03A	HV-340-08AS
5	Motor Bolt/Washer Ass'y - SS	HV-120-04 (4)	HV-120-04 (4)	HV-120-04 (4)	HV-120-04 (4)	HV-120-04 (4)
6S	Shaft Retainer Washer - SS (single seal only)	HV-120-05S	HV-120-05S	HV-120-05S	HV-120-05S	HV-120-05S
8S	Single Seal Ass'y, Mechanical					
8S01E	carbon/ceramic/EPR	HV-120-0601SE	HV-120-0601SE	HV-120-0601SE	HV-120-0601SE	HV-120-0601SE
8S01V	carbon/ceramic/viton	HV-120-0601SV	HV-120-0601SV	HV-120-0601SV	HV-120-0601SV	HV-120-0601SV
8S02V	silicon carbide/silicon carbide/viton	HV-120-0602SV	HV-120-0602SV	HV-120-0602SV	HV-120-0602SV	HV-120-0602SV
8N	Single Seal Ass'y, Diplo					
8N03E	carbon/ceramic/EPR	HV-120-0603NE	HV-120-0603NE	HV-120-0603NE	HV-120-0603NE	HV-120-0603NE
8N03V	carbon/ceramic/viton	HV-120-0603NV	HV-120-0603NV	HV-120-0603NV	HV-120-0603NV	HV-120-0603NV
8N04V	silicon carbide/ceramic/viton	HV-120-0604NV	HV-120-0604NV	HV-120-0604NV	HV-120-0604NV	HV-120-0604NV
8D	Double Seal Ass'y, Mechanical					
8D01E	carbon/ceramic/EPR front and carbon/ceramic/buna-n rear	HV-120-0601DE	HV-120-0601DE	HV-120-0601DE	HV-120-0601DE	HV-120-0601DE
8D01V	carbon/ceramic/viton front and carbon/ceramic/buna-n rear	HV-120-0601DV	HV-120-0601DV	HV-120-0601DV	HV-120-0601DV	HV-120-0601DV
8D02V	silicon carbide/silicon carbide/viton front carbon/ceramic/buna-n rear	HV-120-0602DV	HV-120-0602DV	HV-120-0602DV	HV-120-0602DV	HV-120-0602DV
9E	Seal Insert O-ring - EPR (small diam.)	HV-120-07E	HV-120-07E	HV-120-07E	HV-120-07E	HV-120-07E
9V	Seal Insert O-ring - Viton (small diam.)	HV-120-07V	HV-120-07V	HV-120-07V	HV-120-07V	HV-120-07V
10E	Seal Insert O-ring - EPR (large diam.)	HV-120-08E	HV-120-08E	HV-120-08E	HV-120-08E	HV-120-08E
10V	Seal Insert O-ring - Viton (large diam.)	HV-120-08V	HV-120-08V	HV-120-08V	HV-120-08V	HV-120-08V
11-01	Seal Insert (single and double mechanical)	HV-120-09-01	HV-120-09-01	HV-120-09-01	HV-120-09-01	HV-120-09-01
11-02	Seal Insert (diplo, single)	HV-120-09-02	HV-120-09-02	HV-120-09-02	HV-120-09-02	HV-120-09-02
12	Seal Insert Bolt/Washer/Nut Ass'y - SS	HV-120-10 (4)	HV-120-10 (4)	HV-120-10 (4)	HV-120-10 (4)	HV-120-10 (4)
13	Impeller Lock Washer - SS	HV-120-11	HV-120-11	HV-120-11	HV-120-11	HV-120-11
14A	Impeller with Sleeve	HV-120-12A	HV-340-12A	HV-100-12A	HV-112-12A	HV-200-12A
14A01	Impeller without Sleeve	HV-120-12A-1	HV-340-12A-1	HV-100-12A-1	HV-112-12A-1	HV-200-12A-1
17E	Housing Cover O-ring - EPR	HV-120-13E	HV-120-13E	HV-120-13E	HV-120-13E	HV-120-13E
17V	Housing Cover O-ring - Viton	HV-120-13V	HV-120-13V	HV-120-13V	HV-120-13V	HV-120-13V
18	Pump Housing Cover	HV-120-14	HV-340-14	HV-340-14	HV-340-14	HV-340-14
19	Housing Cover Bolt/Washer/Nut Ass'y - SS	HV-120-15 (8)	HV-120-15 (8)	HV-120-15 (8)	HV-120-15 (8)	HV-120-15 (8)
21D	Flow Valve/Hose Ass'y (double seal only)	HV-120-17	HV-120-17	HV-120-17	HV-120-17	HV-120-17
22D	Flow Meter/Bracket Ass'y (double seal only)	HV-120-18	HV-120-18	HV-120-18	HV-120-18	HV-120-18
23	Pump Head Ass'y					
SE	EPR - single	HV-120-19SE	HV-340-19SE	HV-100-19SE	HV-112-19SE	HV-200-19SE
SV	Viton - single	HV-120-19SV	HV-340-19SV	HV-100-19SV	HV-112-19SV	HV-200-19SV
DE	EPR - double	HV-120-19DE	HV-340-19DE	HV-100-19DE	HV-112-19DE	HV-200-19DE
DV	Viton - double	HV-120-19DV	HV-340-19DV	HV-100-19DV	HV-112-19DV	HV-200-19DV
NE	EPR - diplo	HV-120-19NE	HV-340-19NE	HV-100-19NE	HV-112-19NE	HV-200-19NE
NV	Viton - diplo	HV-120-19NV	HV-340-19NV	HV-100-19NV	HV-112-19NV	HV-200-19NV

( ) Indicates quantity required other than one (1)

\* Please specify at time of order

# Maintenance Instructions

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## MODEL HV-1/2, HV-3/4, HV-1, HV-1 1/2 HV-2

### ASSEMBLY

1. Place the motor vertically with the shaft facing upward.  
**Double Seal-** Take the ceramic section (white-colored) of the double seal assembly without the green dot on the elastomer and press this into the rear cavity of the pump housing/motor bracket (item #3A) until it bottoms out. Lubricate the second half of the shaft slightly for easy assembly.  
Place the pump housing/motor bracket (item#3A) on the C-face of the motor. Take the four (4) 3/8" bolts, washers, and lock washers, and place them in the holes of the bracket. Line up the pump case with the discharge nozzle pointing horizontally to the left. Tighten these bolts diagonally.  
**Single Seal-** Check to see that the shaft is as much in the center of the cavity in the bracket as possible.  
**Standard External Seal-** Place the SS shaft retainer washer over the shaft. Place the spring of the seal with its own retaining ring (L-shape) on top of the flat washer, remembering that the retaining ring of the seal has to sit on top of the flat washer.  
**Double Seal-** Check to see that the shaft is centered in the ceramic portion of the bracket. Take the carbon section (black-colored) of the double seal assembly without the green dot and press it over the shaft until it bottoms out on the ceramic section. Place the spring of the double seal on top of the carbon section.
2. With the O-ring grooves facing upward, take one (1) O-ring and press it into the largest diameter groove of the seal insert (item #9A).  
**Double Seal-** Press smaller second O-ring into the smaller matching groove in the seal insert.  
**Standard External Seal-** Take the ceramic seal section (white-colored) and press it into the cavity in the center of the seal insert until it bottoms out. Place the impeller on end with the sleeve facing upward. Lubricate this sleeve slightly for easy assembly (preferably vaseline). Place the seal insert with the O-ring grooves facing upward over the impeller sleeve until it bottoms out. Take the carbon seal section (black colored) and press it over the sleeve until it bottoms out on the ceramic piece. Make sure these two seal surface are pushed tightly together during assembly.  
**Diplo Internal Seal-** With the O-ring grooves facing downward, press the ceramic (white-colored) part into the matching cavity with the ceramic facing upward. Place the impeller with the sleeve facing upward. Take the carbon seal section (black-colored) and slide it over the sleeve with the carbon facing upward.
3. Place the SS impeller lock washer (item #11) with the same O.D. as the top half of the shaft over the thread on top of the shoulder of the shaft. The O.D. of the washer and shaft should be flush.
4. Lock the shaft of the motor through the fan cover using a screwdriver.  
**Standard External Seal-** Place the impeller and seal insert over the shaft with the sleeve of the impeller facing downward. Line up the seal insert with its external locator with the timing slot in the volute.  
**Diplo Internal Seal-** Press the seal insert into the volute with the ceramic facing upward, lining up the external locator with the timing slot in the volute. Place the impeller over the shaft with the sleeve of the impeller facing downward.
5. Screw the impeller (and seal insert for standard external seal) on the shaft by turning the impeller clockwise (seal insert is locked in the timing slot). Make sure the impeller is very tight on the shaft. (This should prevent the impeller from being unscrewed if the motor is accidentally reversed.) Place the four (4) (1/4" x 3/4") bolts and washers (not forgetting the lock washers) through the bolt holes located in the back of the volute on the centerline between the four (4) ribs of the bracket. Start tightening diagonally, until the seal insert bottoms out. Overtightening of these bolts might strip the threads inside of the seal insert.
6. Remove the locking device(s) from the back of the fan cover.
7. Place the O-ring (approximate O.D.-7") underneath the flange of the pump housing cover.
8. The bolt pattern in the housing cover is not symmetric, and thus can only line up one way. Looking through the suction entrance in the housing cover, line up this hole with the eyes of the impeller by turning the housing cover. If the eye of the impeller and suction entrance are aligned, the bolt pattern is also matching.
9. Place the eight (8) (1/4" x 1 1/4") bolts with the washer underneath the head of the bolt. Do not apply the washer directly against the nut. Tighten these bolts again diagonally.
10. **Double Seal-** Hook up the water flush assembly. The water flush inlet, including the 1/4" ball valve and elbow, has to be at the bottom of the bracket. The water flush outlet, including hose barbs, hose, and flow meter, has to be at the top of the bracket.