PENGUIN

Operating Instructions & Spare Parts Manual

Series PSS
VERTICAL PUMP

Models:
P-1/3S
P-1/2S
P-3/4S
P-1S
P-1 1/2S
P-2S
P-3S
P-5S
P-7 1/2S
P-10S
P-15S

Materials:
S - 316SS

P1/3 thru P2

P3 thru P15

Introduction

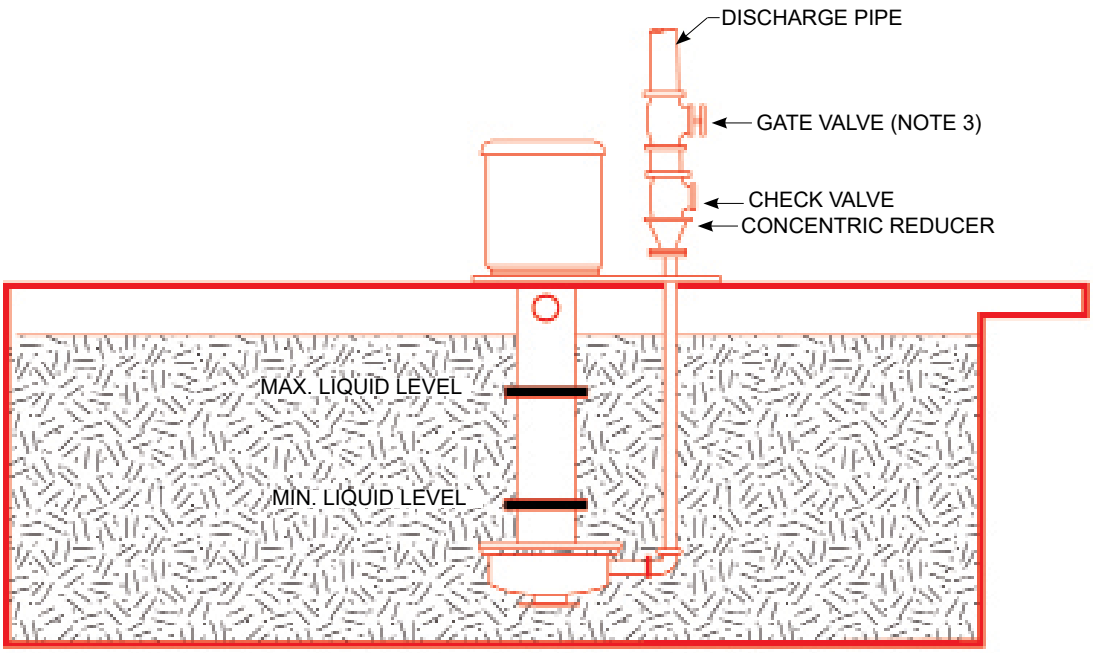
Penguin Series PSS vertical 316L stainless steel pumps have a liquid temperature range of -30 degrees F to 211 degrees F. Temperatures greater than 211 degrees F but less than 250 degrees F are acceptable for non-caustic, non-hydrocarbon service.

Glass-filled Teflon (GFT) bushings and bearings are reinforced tetrafluoroethylene (TFE) products with the following major advantages over unfilled, or virgin Teflon:

- Increased ware and good abrasion resistance
- Lower deformation under load
- Less thermal expansion
- Good lubricity
- Brief dry-run capability

Maintenance Instructions

Recommended installation for optimal performance and endurance.



Pump Installation

Install the pump vertically in-tank with the pump immersed in the liquid approximately half way and the motor facing upward on the tank lip or structural beam on top of the tank. Firmly bolt the pump using the plastic horizontal pump bracket or the vertical motor foot. Refer to the following installation diagrams:

Liquid Level

- The minimum liquid level is where the impeller is fully immersed in liquid so that the pump can self-prime itself, which is the point where the pump outlet nozzle is fully immersed in the liquid.
- The maximum liquid level is approximately half way up the pump column, or ½ H. If liquid comes out the weep hole located about 1-2 inches below the pump bracket, then the liquid level is too high and must be lowered. Operating the pump with the liquid level too high can seriously flood and damage the motor. The pump can not prime itself when the liquid level is too low.

Suction Lift/Suction Piping

- A suction pipe extension should be increased at least one pipe size larger than the pump suction opening
- A suction pipe extension should be short and direct with as few elbows as possible. Elbows create turbulence.
- Submerge the suction line at least three feet below the minimum level of the liquid being pumped.
- The static lift, including all friction losses, must not exceed the NPSH requirements of the pump.
- If necessary, install a strainer at the open end of the suction line to prevent foreign matter from entering the pump. The net area of the strainer should be 2 to 3 times larger than the suction pipe ID.
- To maintain prime for pumps operating under suction lift, a foot valve must be installed at the opening of the suction line. To facilitate priming the pump, install a T-connection with a small valve between pump case and check valve.
- A foot valve is not required when using a liquid level control device that turns the pump on when the suction line is flooded.
- All suction piping foot valve assemblies must be supported independent of the pump.
- Make sure all suction pipe fittings are sealed and tightened properly to avoid air leaks, which can cause the pump to lose prime.
- The bottom of a suction extension should always be at least two pipe diameters above the bottom of the tank.

Discharge Piping

- It is essential that no strain be placed on either the discharge piping or the pump column.
- It is necessary that alignment of the discharge piping should be done with great care, for any strain on the discharge piping may force the support pipe and shafting out of alignment and result in overloading the pump motor.
- Install a concentric reducer at the pump discharge opening and make all discharge piping one pipe size larger than the diameter of the discharge opening.

Maintenance Instructions

- Keep friction head to a minimum by making the discharge line short and direct with as few fittings as possible.
- The outlet piping should be supported as close to the pump as possible, using pipe hangers or pipe supports.
- Install a gate valve and check valve in the discharge line to prevent back flow which may damage the pump on shut down and to regulate the pump flow rate.
- If quick-closing valves are installed in the discharge piping system, protection must be provided to ensure that no surge or water hammer is transmitted to the pump.

Priming The Pump

- The casing and suction piping must be completely filled with liquid being pumped before starting.
- Under flooded conditions, open all the valves in the suction and discharge lines. Wait a few minutes for all the entrapped air to get out. Throttle the discharge valve ¾ closed. Leave suction valve wide open (if there is one). A closed suction or discharge valve could cause damage to the impeller and shaft. Start the pump and open the discharge valve to the desired flow.
- If the liquid source is above the pump, prime the pump by removing the vent at the top of the casing plug, thus allowing the liquid to replace the air trapped in the casing.
- To maintain prime when the liquid source is below the pump (non-flooded conditions), a foot valve must be installed in a vertical position at the open end of the suction line and a T-connection installed in the discharge line. Prime the pump by injecting liquid into the casing through the vent plug tap or fill the pump slowly from the T-connection and valve.

Recommendations

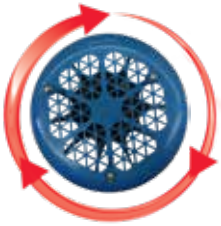
General

- Always make sure there is enough fluid in the reservoir and that the level is high enough, considering the capacity of the pump unit. A general guideline is that the tank volume should be three times the pumping flow rate and the minimum submergence is two feet.
- Inadequate liquid will cause a vortex in the reservoir. A vortex occurs when air mixes from the surface into the fluid, which can disturb the flow and can also prevent the pump from priming.
- Suction pipe velocities should be as low as possible, and in general, should not exceed 7-8 ft/sec.

Electrical Motor Connections

General

- Select a motor starter and overcurrent protection device suitable for the motor and its application. Consult motor starter application data as well as the National Electric Code, and any applicable local codes.
- This equipment must be grounded in accordance with local and national codes.
- The motor must not be energized unless the pump has been inspected and found to be in a condition for safe operation.
- Ensure that the pump rotates freely.
- All safety guards and covers must be installed before energizing the motor.
- It is recommended that the motor current be checked after it has been operating for a short time and compared against the nameplate current rating.
- Motors employed are dual voltage, 115/230/1/60, or 230/460/3/60. Many optional motor electrical characteristics are available.
- In general, motors can operate safely at motor nameplate voltage +/- 10%. If 208 volt is required, a motor should be used that lists 208 volt on the nameplate. A 230 volt motor can operate safely down to 207 volt only, and any 208 voltage fluctuations greater than 1 or 2 volts could short out the motor.



Motor Rotation

- Motor rotation should be checked at initial start-up and any time maintenance of the pump, or plant's electrical supply has been compromised. There is a rotation sticker attached to the motor and/or pump mounting plate that indicates the correct direction of rotation.
- Direction of rotation should be verified before powering up the pump by use of a "Phase Sequence Indicator" (three phase power) or briefly "bump" the motor by turning on and off for 1 or 2 seconds to determine the direction of rotation. Operating the motor in the wrong rotation (reverse or backwards) is a common mistake, should never happen, and can cause serious damage to the pump.
- It is good practice to check the motor rotation on all motors, both 3-phase as well as single phase.

Motor Bearing Lubrication/Change-out

- No motor bearing lubrication is required on motors that are furnished without plugs or grease fittings. These units are provided with permanently lubricated sealed bearings. Motors provided with grease fittings should be lubricated according to the motor manufacturer's lubrication frequency schedule. Contact your respectful motor manufacturer for details.
- Motor bearings should be changed either at regular maintenance intervals or when the first signs of wear appear, which is generally a loud, high-pitched squeal sound.
- Replacement bearings should be equivalent to or greater in quality than the motor's original bearings from the motor manufacturer. We strongly recommend Nachi replacement bearings because they maintain a higher degree of tolerance when compared to other bearing manufacturers and they last longer based on field experience.

Disassembly

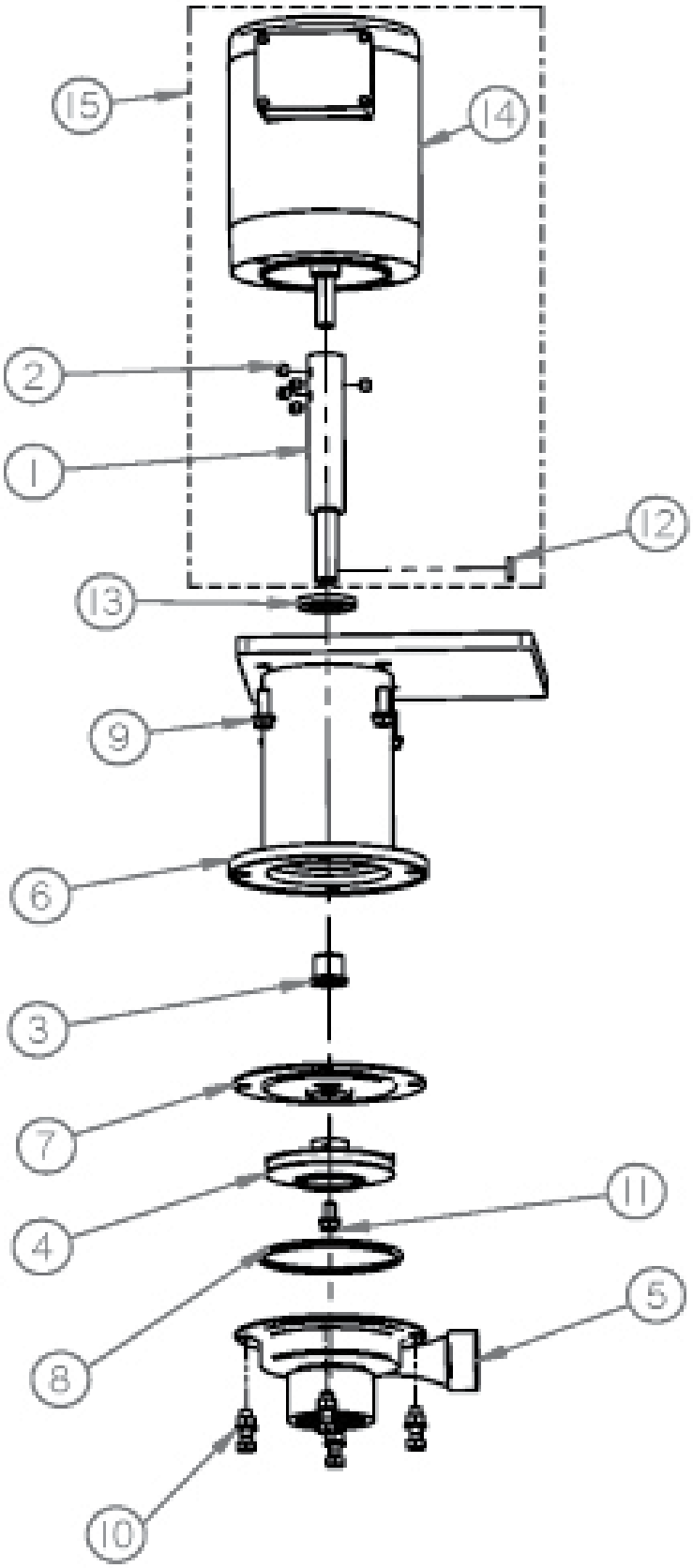
1. Remove any protective guards.
2. Remove bolts from any discharge pipe at mounting plate used and unthread discharge pipe from housing discharge elbow.
3. Remove strainer/tailpipe from housing suction if used.
4. Remove housing gasket from adaptor column carefully.
5. Restrain impeller and remove impeller bolt and lock-washer. Remove impeller---it is a slip-fit on the shaft extension; however, corrosion and dirt build-up may necessitate the use of a puller.
6. Remove the bolts securing the adaptor column to the extender casting (or motor C-face if the pump does not use an extender casting). Gently lift the adaptor column off the pump, use caution to avoid scratching shaft or chipping seal seat.
7. If used, slide the rubber checkseal off the shaft extension.
8. If installed, remove throttle bushing and seal seat by gently pushing them out of their cavities. Be careful not to scratch the cavities with any tools used in removal.
9. Remove the bolts securing the extender casting to the motor C-face and remove the extender.
10. Use a small amount of heat from a propane torch to soften the Loctite on the shaft extension set screws, and then loosen and remove the screws.
11. Pull the shaft extension off the motor shaft.

Assembly

1. Ensure all parts are clean and deburred before beginning assembly as trapped dirt can cause misalignment of assembled parts. All parts should also be dry as trapped water or chemicals can lead to premature failure. Any exposed ferrous parts should be coated with paint or other corrosion preventative treatment.
2. Install the shaft extension on the motor shaft and secure it with the set screws. Use Loctite on the set screws to insure they won't loosen in service. The shaft must be indicated in at the throttle bushing contact surface with a dial indicator, alternate the tightening of the set screws to keep the run-out at the bushing contact area tom less than 0.003" T.I.R.. All set screws must be tight. This process can take hours to do if it is unfamiliar to you. If this becomes too tedious, we offer the motor with the shaft installed to specifications.
3. Install the extender casting (if used) onto the motor C-face and secure the bolts.
4. If used, press the seal seat and throttle bushing into the cavities in the adaptor column.
5. If used, slide the rubber checkseal onto the shaft extension. Lubricate it generously with a grease that is compatible with the elastomer.
6. Install the adaptor column on the shaft extension and extender casting (or motor C-face, if extender casting is not used in this model), being careful not to contact the shaft with the seal seat as this could gouge the shaft and chip the seat.
7. Next install the mounting plate and securely tighten the fasteners.
8. Install the impeller and impeller key, and secure it with the impeller bolt.
9. Place the housing gasket on the adaptor column carefully centering it. A small amount of grease may be used to hold it in place.
10. Install the housing on the adaptor column and securely tighten the fasteners.

Exploded View and Spare Parts List

Installation & Maintenance



Spare Parts

SERIES PS VERTICAL 316SS PUMP SPARE PARTS									
ITM	QTY	DESCRIPTION	MAT'L	P-1/3S- 3/4 X 1/2	P-1/2S- 1 X 3/4	P-3/4S- 1 X 3/4	P-1S- 1-1/2 X 1	P11/2S- 1-1/2 X 1	P-2S- 1-1/2 X 1
1	1	SHAFT EXTENSION	316	PS-130-01	PS-130-01	PS-340-01	PS-130-01	PS-130-01	PS-130-01
2	1 SET	SHAFT EXTENSION SET SCREW SET (7)	316	PS-130-02	PS-120-02	PS-340-02	PS-130-02	PS-120-02	PS-130-02
3	1	THROTTLE BUSHING, GFT	GFT	PS-130-03T	PS-130-03T	PS-130--03T	PS-130--03T	PS-130--03T	PS-130 -03T
4	1	IMPELLER	316	PS-130-04	PS-120-04	PS-340--04	PS-340-04	PS-112-04	PS-200-04
5	1	HOUSING	316	PS-130-05	PS-120-05	PS-340--05	PS-100-05	PS-100-05	PS-012-05
6	1	ADAPTOR COLUMN/BRACKET	316	PS-130-06	PS-130-06	PS-340--06	PS-130-06	PS-130-06	PS-130-06
7	1	ADAPTOR PLATE	316	PS-130-07	PS-130-07	PS-340--07	PS-130-07	PS-130-07	PS-130-07
8E	1	HOUSING GASKET	EPR	PS-130-08E	PS-130-08E	PS-130-08E	PS-130-08E	PS-130-08E	PS-130-08E
8V	1	HOUSING GASKET	VTN	PS-130-08V	PS-130-08V	PS-130-08V	PS-130-08V	PS-130-08V	PS-130-08V
9	1 SET	ADAPTOR COLUMN/BRACKET HEX HD CAP SCREW & LOCK WASHER SET	316	HS-130-S09	HS-130-S09	HS-130-S09	HS-130-S09	HS-130-S09	HS-130-S09
10	1 SET	HOUSING HEX HD CAP SCREW, LOCK WASHER, HEX NUT SET	316	HS-130-S10	HS-130-S10	HS-340-S10	HS-130-S10	HS-130-S10	HS-130-S10
11	1 SET	IMPELLER BOLT & LOCK WASHER SET	316	HS-130-S11	HS-130-S11	HS-130-S11	HS-130-S11	HS-130-S11	HS-130-S11
12	1	KEY	316	PS-130-12	PS-130-12	PS-130--12	PS-130-12	PS-130-12	PS-130-12
13	1	VITON LIP SEAL	VTN	PS-130-13V	PS-130-13V	PS-130-13V	PS-130-13V	PS-130-13V	PS-130-13V
14	1	Motor, Ref on drawing only							
15-1	1 SET	Motor, TEFC, Rigid Mount, 3450 RPM, C Face, 1 PH, 60 HZ & Shaft Assy.		PS-130-0103	PS-120-0103	PS-340-0103	PS-100-0103	PS-112-0103	NA
15-2	1 SET	Motor, TEFC, Rigid Mount, 3450/2850 RPM, C Face, 1-PH, 60/50 HZ & Shaft Assy.		PS-130-2103	PS-120-2103	PS-340-2103	PS-100-2103	PS-112-2103	NA
15-3	1 SET	Motor, TEFC, Rigid Mount, 3450/2850 RPM, C Face, 3-PH, 60/50 HZ & Shaft Assy.		PS-130-3103	PS-120-3103	PS-340-3103	PS-100-3103	PS-112-3103	PS-200-3103

SERIES PS VERTICAL 316SS PUMP SPARE PARTS								
ITM	QTY	DESCRIPTION	MAT'L	P-3S- 3 X 1-1/2	P-5S- 3 X 1-1/2	P-7-1/2S- 3 X 2	P-10S- 3 X 2	P-15S- 3 X 2
1	1	SHAFT EXTENSION	316	PS-300-01	PS-300-01	PS-712-01	PS-712-01	PS-015-01
2	1 SET	SHAFT EXTENSION SET SCREW SET	316	PS-300-02	PS-300-02	PS-300-02	PS-300-02	PS-015-02
3	1	THROTTLE BUSHING	GFT	PS-300-03T	PS-300-03T	PS-712--03T	PS-300--03T	PS-300--03T
4	1	IMPELLER	316	PS-300-04	PS-500-04	PS-712-04	PS-010-04	PS-015-04
5	1	HOUSING	316	PS-300-05	PS-300-05	PS-712-05	PS-010-05	PS-010-05
6	1	ADAPTOR COLUMN/BRACKET ASSY.	316	PS-300-06	PS-300-06	PS-300-06	PS-300-06	PS-300-06
7	1	ADAPTOR PLATE	316	Incl. with #6	Incl. with #6	Incl. with #6	Incl. with #6	Incl. with #6
8E	1	HOUSING GASKET	EPR	PS-300-08E	PS-300-08E	PS-300-08E	PS-300-08E	PS-300-08E
8V	1	HOUSING GASKET	VTN	PS-300-08V	PS-300-08V	PS-300-08V	PS-300-08V	PS-300-08V
9	1 SET	ADAPTOR COLUMN /BRACKET HEX HD CAP SCREW & LOCK WASHER SET	316	HS-300-S09	HS-300-S09	HS-300-S09	HS-300-S09	HS-300-S09
10	1 SET	HOUSING HEX HD CAP SCREW, LOCK WASHER, HEX NUT SET	316	HS-300-S10	HS-300-S10	HS-300-S10	HS-300-S10	HS-300-S10
11	1 SET	IMPELLER BOLT & LOCK WASHER SET	316	HS-300-S11	HS-300-S11	HS-300-S11	HS-300-S11	HS-300-S11
12	1	KEY	316	PS-300-12	PS-300-12	PS-712-12	PS-712-12	PS-015-12
14	1	Motor, Ref on drawing only						
15-3	1 SET	Pump Motor Shaft Assy. Includes Set Screw		PS-300-3103	PS-500-3103	PS-712-3103	PS-010-3103	PS-015-3103

Contact factory for options such as optional bracket sizes, solid piped pump outlet up through bracket, longer pump column lengths, and more.

*: We recommend purchasing the motor and coupled shaft extension together as one unit due to this process being difficult and labor intensive.