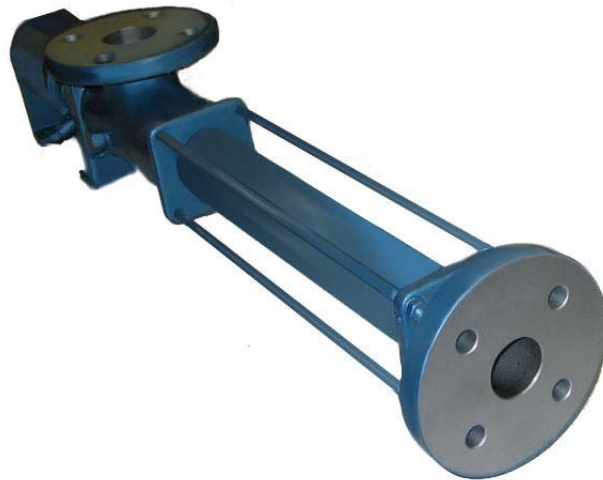




VIGOR PROGRESSIVE CAVITY PUMPS

Operation and Maintenance Manual



FOREWARD

This manual provides instructions for the Installation, Operation, and Maintenance of the Vigor Progressive Cavity Pumps. Any questions not answered specifically by this manual should be referred to Vigor's engineering department for further technical assistance.

This manual must be read and understood before installation and startup. This instruction manual covers several different Vigor pump sizes with similar design. The design, materials, and workmanship incorporated in the construction of Vigor pumps makes them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is enhanced and extended by correct application, proper installation, periodic inspection, condition monitoring and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and the correct methods of installing, operating, and maintaining these pumps. Vigor shall not be liable for physical injury, damage, or delays caused by a failure to observe the instructions for installation, operation, and maintenance contained in this manual.

Due to the wide range of applications covered by Vigor Progressive Cavity pumps, it is necessary to have a variety of construction arrangements and material combinations to meet specific requirements. Each Vigor pump is identified by a nameplate that includes a serial number and model code. The Vigor model system is as follows:

VH 1 - 6 CI 4 B - M

Series

VH	–	standard model
VL	–	heavy duty standard
VR	–	open throat design
VS	–	food industry standard
VU	–	vertical design
VP	–	high pressure standard

Number of Stages

1	–	30 to 90 psig
2	–	90 to 180 psig
3*	–	180 to 270 psig
4**	–	180 to 360 psig
*		available only for sizes 150, 190, 260, and 450
**		not available for sizes 450 and 630

Size

See Vigor Brochure

Casing Material

CI	–	Cast Iron
CS	–	Cast Steel
SS	–	Stainless Steel

Rotor Material

4	–	HCP / 420SS
3	–	321 SS

Stator Material

V	–	viton
B	–	buna
E	–	EPDM
R	–	food-grade rubber

Sealing Method

M	–	Mechanical seal
P	–	Packing

INSTALLATION

Foundation

Baseplates and foundations must be able to provide rigid support for the pumping unit. A pump should be located near the supply of liquid, and have adequate space for operation, maintenance, and inspection. Be sure that the baseplate is level and rests on a flat surface.

Piping Connections

The suction line should be as short as possible to avoid friction losses. Use of elbows close to the pump suction flange should be avoided for the same reason. A suction line one size larger than the pump inlet is recommended. Suction piping should never be of smaller diameter than the pump suction.

All piping must be supported independently of, and line up naturally with, the pump flanges.

Before connecting the pump, the system should be flushed of all debris that may have accumulated during fabrication to avoid any damage to the pumping elements and fittings.

Be sure to connect suction and discharge lines with flanges that are compatible with the pump, ie ANSI or DIN standard.

Alignment

Alignment procedures must be followed to prevent unintended contact of rotating parts. Follow coupling manufacturer's coupling installation and operation procedures.

Alignment should be performed prior to operation when the pump and the driver are at ambient temperature, and after operation when the pump and driver are at operating temperature.

Startup

NOTE: The pump must not run dry. Even a few revolutions without liquid will destroy the pump inserts. Before operating for the first time, the pump should be filled with the fluid to be pumped.

All piping should be designed so that the pump suction housing remains filled when the pump is not running. The discharge line should remain flooded at all times.

Before putting the pump into operation, the following items should be checked to ensure that each piece of equipment is installed correctly:

- Electrical connections.
- Gauges and other instruments.
- Pump rotation. Rotation is indicated on the pump nameplate.
- All valves should be open on both suction and discharge sides of pump.
- Seal flush systems if required should be operational. Double seals require flushing between faces.

CAUTION: This is a positive displacement pump. Do not operate against a closed valve.

Stuffing Box Adjustment

Prior to pump startup, loosen the packing gland. After pump is started, tighten the packing gland hex nuts by ½ rotation until hand tight.

At initial startup, the leakage from the stuffing box may be substantial. Packing will reduce, but not eliminate, leakage from the pump. Leakage rates of 1 to 10 drops per minute are considered to be normal for Teflon packing. Frequent adjustments of the packing gland may be necessary during the first few hours of operation in order to compress and seat the packing.

CAUTION: Do not tighten until zero leakage is obtained. Over tightening the packing gland may result in accelerated wear on the packing and damage to the shaft. In those situations where no packing leakage can be tolerated, consult your Vigor representative.

The stuffing box should not be hot to touch. If there is evidence of sudden temperature rise, ie. steaming, loosen the packing gland nuts.

Mechanical Seal Adjustment

Mechanical seals are lubricated by the fluid being pumped. If a separate flush system is used, the flush medium should be delivered to the seal prior to startup at a pressure of 10 psi greater than suction pressure. Seal flush pressure and sealant temperature should be checked daily.

Operation & Maintenance

If the pump is started for the first time and fails to deliver medium, stop the pump at once to avoid dry running.

If the pump is not used for a long time, it is recommended that the pump be drained of the pumped liquid.

It is recommended that ball bearings be greased every 3000-4000 hours of operation.

The Vigor PC pump has been designed for minimal maintenance, the extent of which is routine adjustment of the packing. The pump is one of the easiest to maintain because the main elements are very accessible and require few tools to disassemble.

DISASSEMBLY

Disconnecting Pump

1. Disconnect the power source.
2. Close suction and discharge valves to isolate the pump from the line. Relieve any pressure remaining in the suction and discharge piping.
3. If applicable, remove any seal flush and/or relieve valve lines from the pump.
4. Disconnect coupling and remove coupling hub and shaft key from drive shaft.
5. Disconnect pump from all suction and discharge piping.
6. Remove pump foot.

3. Rotate driveshaft manually to break stator/suction housing from suction housing/bearing housing studs.
4. Pull the suction housing away from the bearing housing until the stator is completely pulled off the rotor. Place a block of wood under the suction housing to prevent it from dropping.

Disconnecting Rotor

There are two Vigor Universal Joint assemblies in each Vigor PC pump. The first joint connects the rotor to the pump shaft, while the second joint connects the pump shaft to the drive shaft. See table 1 to determine which joint style is used on your size pump, and disassemble according to the corresponding instructions.

Removing Packing

1. Remove packing gland nuts and slide packing gland away from the stuffing box.
2. Use a packing puller tool to remove
3. packing rings.
4. Remove lantern ring if installed.

Removing Stator & Suction Housing

1. Remove discharge flange hex nuts and lock washers, then remove tension rods and discharge flange from pump.
2. Remove suction-to-bearing housing nuts and lock washers.

Table 1: Joint Styles for Vigor PC Pump

Size	Stages	Joint Style
6	1,2,4	A
10	1,2,4	A
16	1,2,4	A
23	1,2,4	A
37	1,2,4	B
60	1,2,4	B
102	1,2,4	B
150	1,2,3,4	B
190	1,2,3,4	B
265	1,2	B
265	4	A
450	1,2	A
630	1,2	A

Disassembly Instructions for Joint Style A (refer to Figure 1)

1. Loosen the snap ring (item 31), and remove the boot collars (item 14)
2. from the rubber protecting sleeve (item 24).
3. Carefully pry the rubber protecting sleeve from the grooves in the shaft and rotor head and slide it completely off of the joint onto the rotor.
4. Using a suitable punch, remove the set pins (item 219) from both the shaft and rotor. Place a wood block under the shafts when removing the set pins for support.
5. Using a suitable punch, remove the joint pins (item 17) from the yoke (item 213). Remove the yoke from the shaft and rotor heads.
6. Pull the rotor away from the joint. If necessary, remove the boot from the rotor.
7. Repeat steps 1-5 for removing the shaft and second joint.

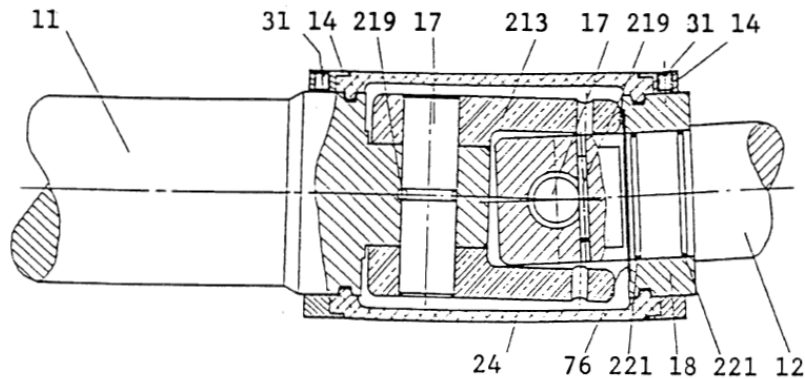


Figure 1: Vigor Universal Joint Style A

Disassembly Instructions for Joint Style B (refer to Figure 2)

1. Using a center punch, punch a hole in the sealing disc and pry it from it's lodging. Repeat on the opposite side.
2. Using a center punch, tap the tapered pin (item 272) from the sleeve (item 215). Be sure to remove the taper pin from its small end, not large end. From the opposite side, tap out the sleeve.
3. Pull the rotor away from the joint, and remove the O-ring (item 222) from the shaft.
4. Repeat steps 1-3 for removing the shaft and second joint.

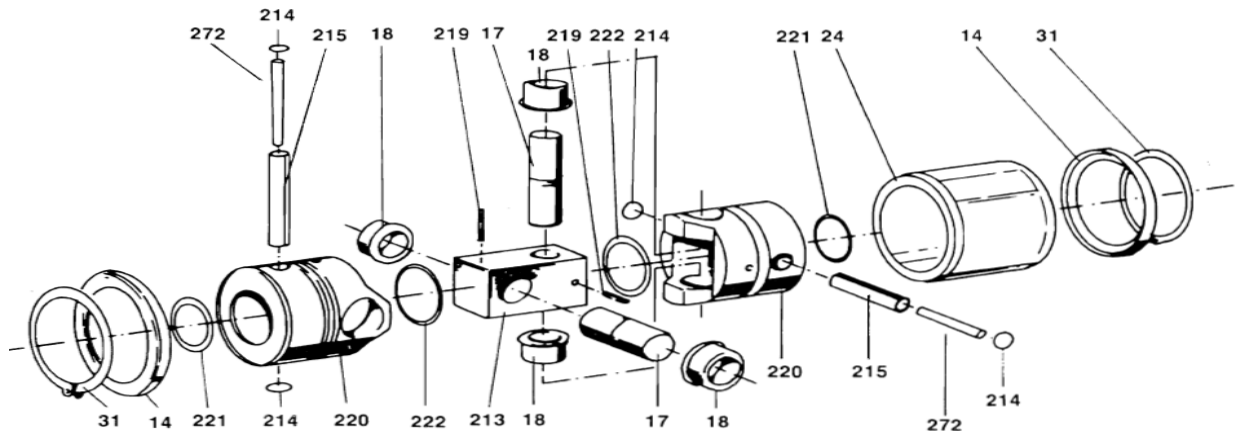


Figure 2: Vigor Universal Joint Style B

Removing Mechanical Seal (refer to Figure 3)

*These instructions are for standard M7 style Burgmann Mechanical Seals. If a different style seal is used, please refer to seal manufacture's instructions.

1. Remove seal ring seat bolts (item 110)
2. Remove stationary seal ring seat (item 91), seal ring seat O-ring (item 95-9) and stationary seal seat (item 95-8).
*during reassembly, take extreme care not to touch, scratch, or otherwise mar the stationary seal ring face sealing surface.
3. Loosen rotating seal body set screws (item 95-7). Slide rotating seal assembly (item 95-1 through 95-6) from drive shaft.
4. Slide seal spacer bushing (item 93) from drive shaft.

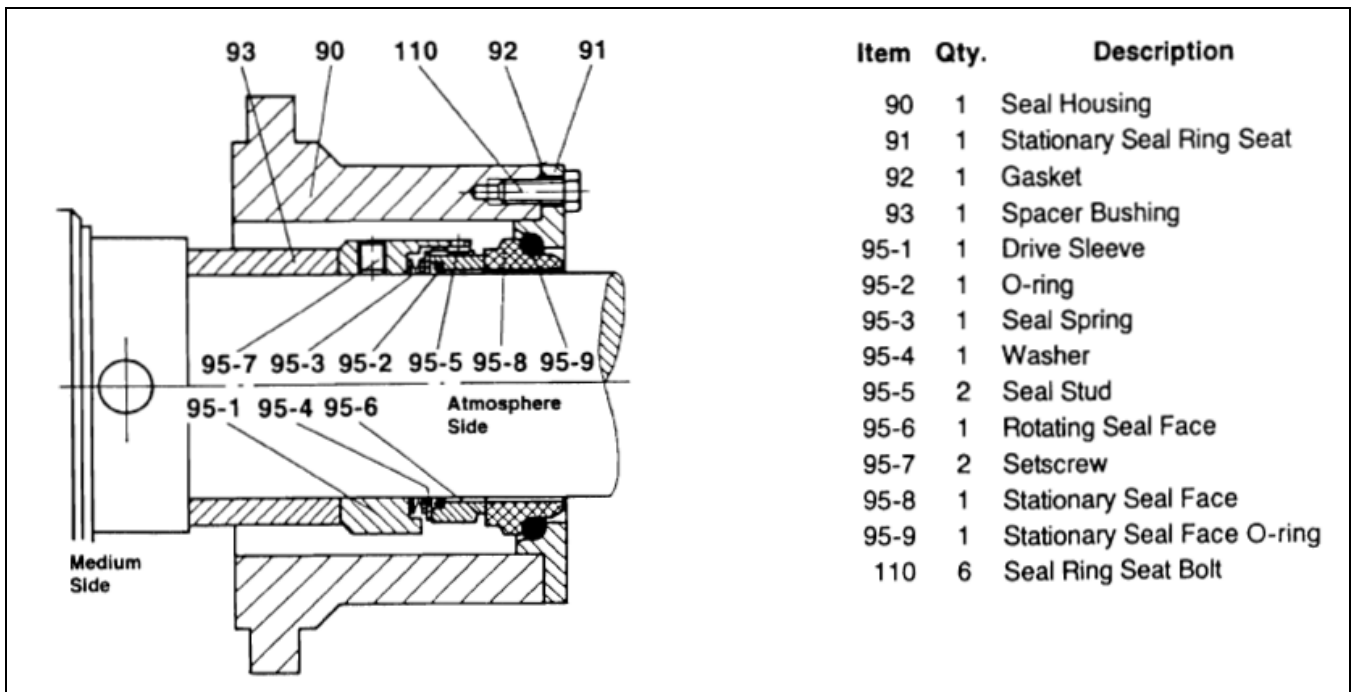


Figure 3: Standard Vigor Mechanical Seal Arrangement

PUMP ASSEMBLY

Installing Bearings and Drive Shaft

1. Inspect the shaft for wear or scoring and replace as necessary. If shaft is worn, bearings will not be properly sealed and can result in premature bearing failure.
2. Slide the snap ring (item 33) into the drive shaft and install in the groove furthest from the motor end. Apply a coat of grease to the drive shaft (item 12). Press the inner ball bearing (item 27) on the drive shaft from the motor end until it is pressed firmly against the snap ring.
3. Install the second snap ring (item 33) against the bearing, install the spacer ring (item 29) and bearing spacer (item 15).
4. Fill bearing spacer to approximately 1/3 full.
5. Install grease retaining ring (item 38).
6. Press outer ball bearing (item 28) on drive shaft until it is pressed firmly against the bearing spacer.
7. Using a rubber mallet, force drive shaft with installed bearings into bearing housing (item 2) towards suction end of pump.
8. Install snap rings (item 32) on both ends of bearing housing.
9. Install V-ring (item 68), and lip seal (item 36).
10. Screw studs (item 41) into the suction end of the bearing housing.

****If using a Mechanical Seal, please skip steps 11-12.***

11. In case of soft packing, slide packing gland (item 4) onto drive shaft. Install the stuffing box housing (item 3) onto studs.
12. Place bearing housing gasket (item 25) over studs such that it lays flat between the bearing housing suction housing.

Installing Mechanical Seal

1. Clean the drive shaft (item 12) with a soft rag. Inspect shaft for nicks, scratches, flat spots or other signs of wear or damage.
2. Please use extra care when handling the mechanical seal. Any dirt, grease, dust, or other contaminant will damage seal faces and adversely affect its ability to seal.
3. Slide the entire seal assembly (items 90 through 95-9) on the drive shaft.
4. Tighten the mechanical seal set screws (item 95-7), and lock the mechanical seal into position on the drive shaft.
5. Slide the seal housing (item 90) against the bearing housing (item 2). Position the seal housing on the suction-to-bearing housing studs (item 41).
6. Install seal ring seal bolts (item 110) and tighten.
7. Coat the seal faces with a lubricant compatible with seal faces and fluid being pumped.
*The pump should never be started or operated with dry seal faces
8. Place the bearing housing gasket (item 25) over the studs so that it lies flat between the bearing housing and the suction housing.

Installing Rotor, Stator, and Suction housing

Make sure that o-rings and sealing discs are always replaced by new parts. Check locking pins and joint pins for wear and replace if necessary.

1. Install O-rings (item 221) onto Vigor shaft and rotor.
2. Coat the rotor and inside of the stator with a lubricant compatible with the stator material and fluid being pumped.
3. Slide the bearing housing gasket (item 25) over the rotor/joint drive

train and onto the bearing housing studs.

4. Slide the suction housing (item 1) over the rotor/joint drive train and bring suction housing up against the bearing housing (item 2). Position the suction housing on suction-to-bearing housing studs (item 41). Do not allow rotor to slide against the inside of the suction housing, as this will scratch the surface of the rotor.
5. Install the suction-to-bearing housing lockwashers and nuts (items 43 & 44) and tighten.
6. Slide the stator gasket (item 253) over and against the suction housing where the stator seats. Place the second stator gasket into the discharge housing where the stator seats.
7. Insert the end of the rotor into the stator and push it in as far as possible by hand. Manually rotate the drive shaft clockwise, as viewed from the motor, and hold the stator with a strap wrench while screwing the stator onto the rotor until the suction end of the stator seats itself into the suction housing against the stator gasket.
8. Screw the tension rods (item 20) into the discharge side of the suction housing such that all four are parallel to the stator. Two rods are above stator, two are below.
9. Slide the pump foot into desired position along the stator. Tighten the pump foot clamp bolt.

Installing Packing

*If using Mechanical Seal, please skip this section

1. Inspect the shaft for wear and scoring. Worn or scored shafts must be replaced.
2. Pull the packing gland (item 4) back against the lip seal such that the stuffing box can be accessed easily.
3. Carefully wrap a packing ring around the drive shaft, meeting ends of the ring together. Rotate the ring so that where the ends meet is on top of the shaft. Push the ring into the stuffing box, being careful to keep the ends together. Install the second ring in the same fashion, except rotate the ring so that the ends meet at the bottom of the shaft.
4. If a lantern ring (item 57) is used, place the ring halved around the drive shaft so that the side with two holes faces toward the motor side of the stuffing box. This will enable easy removal at a later date. Push the lantern ring halves together and push the ring into the stuffing box.
5. Install two more packing rings, with the ends meeting at the sides of the shaft. Use the packing gland to help push the rings into the stuffing box.
6. Push the packing gland into the stuffing box. Install the T-bolts (item 44) and hex nut (item 45) and lightly tighten. Be sure not to overtighten.

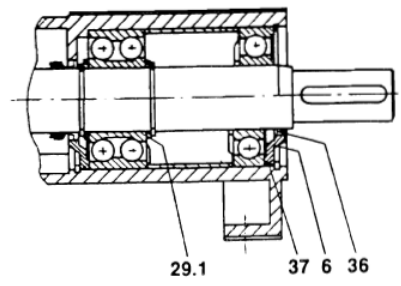
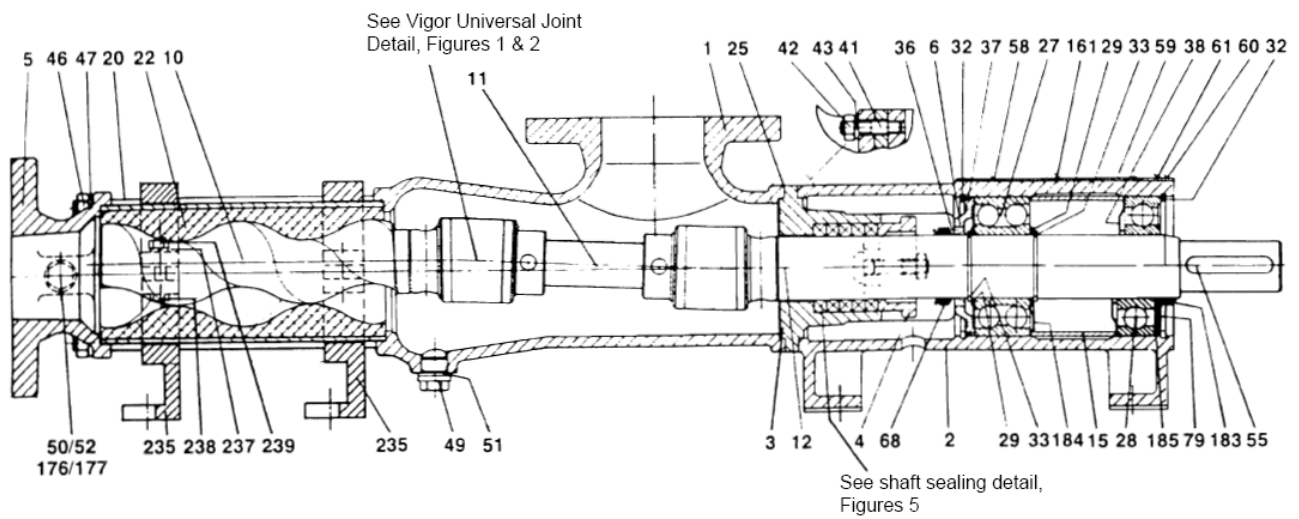


Figure 4: Vigor PC Pump Cross-Sectional Drawing

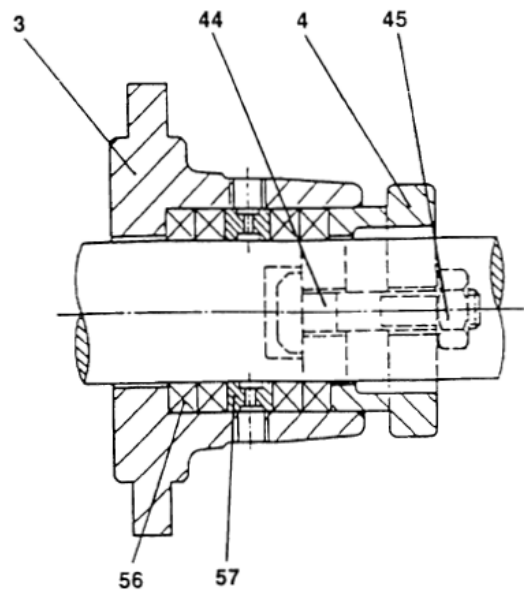


Figure 5: Vigor PC Pump Packing Arrangement

