CONTINENTAL HYDRAULICS
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Service Booklet
PVA-SERIES PUMPS
Installation, Start-up & Operating Instructions, Parts Pages & Repair Procedures

INSTALLATION

PUMP MOUNTING AND DRIVE CONNECTION

The pump may be mounted in any position but horizontal mounting with the case drain port in a vertical position is recommended to maintain case fluid level. It is essential that the pump case be completely filled with operating fluid before start up and must remain full thereafter. Failure to comply with this requirement may cause pump seizure, noise, or damage to internal parts.

For any system and combination of piping, the vacuum at the pump inlet must not exceed 5 inches hg. Nor may the pump be mounted more than 3 feet above the fluid level.

An automatic air bleed valve, model AB1 is recommended for use in pump models PVA15, PVA23, and PVA30. The bleed valve should be teed into the pump outlet line and piped back to the reservoir below the oil level.

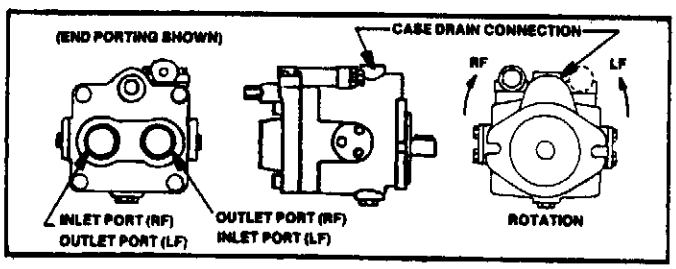
Align the pump and motor shafts to an alignment of .003 TIR inches. Pump and motor shaft ends must have a minimum end clearance of 1/4 to 1/2 inches, or as specified by coupling manufacturer.

Direct inline drive through a jaw type - flexible web coupling is recommended for all Continental pumps.

Pump and motor shafts must not be rigidly connected. Tire-type flexing elements or chain type couplings are not recommended.

Avoid indirect drives such as belts, chains, and gears that create side loads on the drive shaft.

FIGURE 1.



PIPING AND RESERVOIR

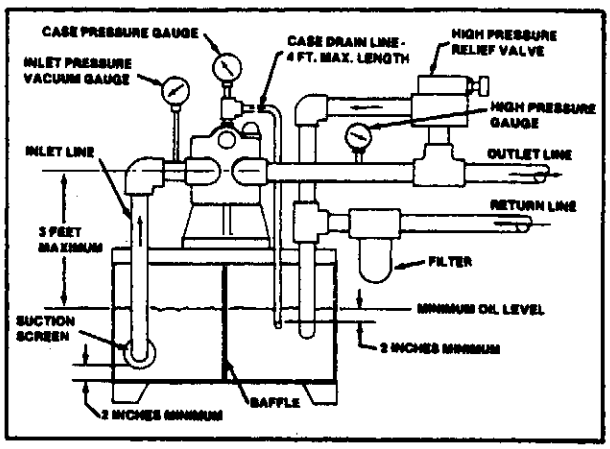
All piping should be full sized as shown in table 1. Use a minimum number of elbows, fittings, and bends.

TABLE 1.

	PVA6 and PVA10	PVA15	PVA23 and PVA30
Inlet and Outlet	1" SAE st. thread tube (1-5/16-12 thread) End ports	1-1/4" SAE st. thread tube (1-5/8-12 thread) End ports	1-1/2" SAE 4-bolt flange 3000 psi (Side ports)
Case Drain	3/8 SAE st. thread tube (9/16-18 thread)	1/2 SAE st. thread tube (3/4-16 thread)	5/8 SAE st. thread tube (7/8-14 thread)

Use pickled pipe or seamless tube free from dirt and scale. Do not use galvanized or other pipe that generates contamination. Avoid using pipe threads wherever possible. Inspect and clean the reservoir, pipe, fittings, and components threaded connections before installing pump.

FIGURE 2.



INLET LINE

All threaded joints in the inlet line must be vacuum tight.

It is recommended that a 150 mesh screen be installed in the inlet line for the PVA 23 and 30. Use 200 mesh screen for the PVA 6, PVA 10, and PVA 15. Screens must be below the minimum oil level but not less than 2 inches above the reservoir bottom.

WARNING

Operation of the pump at less than 160 psi outlet pressure will reduce the life of the pump. If a pump is to be " UNLOADED" vs. "DEADHEADED" during operation, 160 psi mimimum backpressure MUST be provided.

NOTE

The inlet piping system must be designed and constructed in a manner to limit vacuum measured at pump inlet to 5 inches hg maximum.

CASE DRAIN LINE

The case drain line should be full sized as shown in table 1 and not longer than 4 feet. This line should return directly to the tank below the minimum fluid level and not directed at the tank bottom. The tank connections should be as far from the pump suction screen as possible. Case drain coolers, filters, or other connections to the case drain line are not recommended. When the pump is rotated 90 degrees and the case drain port is horizontal, loop the case drain line to the highest point on the pump housing and then directly to the tank.

NOTE

The case drain pressure measured at the pump drain port must not exceed 10 psig.

PRESSURE LINE

Install a pressure relief valve as close to the pump outlet as possible. This valve should be set 300 psi higher than the maximum system working pressure. The relief valve is used to prevent surge pressures which could be damaging to the system.

RETURN LINES

For all return lines a 10 micron filter is preferred, 25 micron is acceptable for mobile pumps. All return lines should discharge at least 2 inches below minimum oil level, not directed at the tank bottom, separated from the suction screen by baffles, and as far away as possible.

START UP PROCEDURE

The following instructions apply for initial start up of the hydraulic pump. **After an extended shutdown period, start over with item 4.**

1. Check the nameplate and model number for rated RPM and pressure. Direction of rotation is indicated by an arrow on the pump body.
2. Fill the reservoir with the specified hydraulic fluid which should pass through a 25 micron (nominal) filter prior to entering the reservoir.
3. Install a vacuum gauge at the pump inlet, a suitable high pressure gauge at pump outlet, and a low pressure gauge at case drain port. (temporarily).
4. **Fill pump housing with fluid at the case drain port.**
5. Rotate the pump and motor by hand to ensure free rotation. (A high amount of drag will be present.)
6. Set the machine controls to open the circuit and allow free flow from the pump back to tank or connect the pump outlet line directly to the tank temporarily until the start up check out is complete.

   Jog the motor on and off for two or three seconds in each mode until the pump is primed. Check the direction of rotation during the first jog period. Never start a new pump installation against a blocked outlet line. An airbleed valve, AB1 is recommended on PVA15, PVA23 and PVA30 pumps.
7. After the pump has been primed, provide a method of loading the pump to 200-300 psi and run at the rated speed to purge the air from the system. It may be necessary to crack a pressure line to bleed air from the circuit or install an air bleed valve for this purpose.
8. Check the inlet vacuum gauge and if the inlet pressure is greater than 5 inches hg. vacuum, shut down the system and make the necessary adjustments to the inlet piping to reduce the pressure drop.
9. Do not adjust the controls until the air has been purged from the system. Normal start-up will be accompanied by pump noises as air passes through the pump. When the pump quiets down the air has been purged.

CONTROLS ADJUSTMENT

WARNING

Setting maximum system pressure requires dead-heading the pump. Take necessary safety precautions to disable or block all machine functions which would create unsafe or hazardous situations. Refer to the machine or system specifications for specific control settings and any procedures or instruction concerning control adjustment.

DISPLACEMENT ADJUSTMENT

This pump is set at the factory for maximum displacement. If pump displacement restriction is required to stay within horsepower or flow requirements, set maximum pump displacement as follows:

The displacement adjusting screw and locknut are shown in Figure 3. Using the appropriate metric wrenches, loosen the locknut and turn the adjusting screw clockwise to reduce displacement and counter-clockwise to increase displacement. Table 2 indicates the adjustment ranges for the different pumps. Stops are built into the pump to limit the maximum position of the adjusting screw.

FIGURE 3.

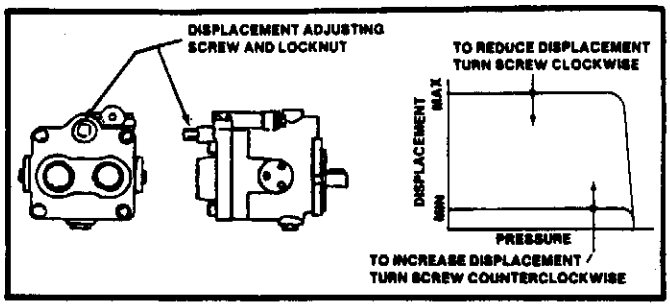


TABLE 2.

Pump size	Change in displacement per revolution of screw cubic inches/revolution	Nominal Flow change @ 1750 RPM (GPM)	Nominal Flow @ 1750 RPM MIN.	MAX.
PVA-6	.09	0.7	1.0	6.9
PVA-10	.12	0.9	2.8	10.7
PVA-15	.15	1.1	9.1	17.4
PVA-23	.25	1.9	0	23.9
PVA-30	.31	2.3	3.0	32.3

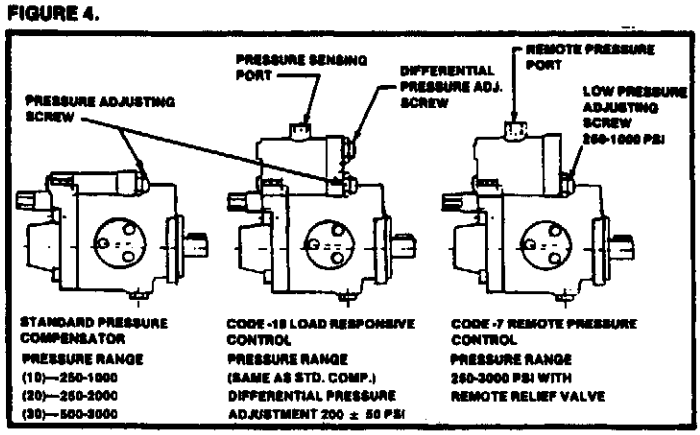
After adjustment, hold screw in place and torque locknut to 12-16 lb-ft.

PRESSURE ADJUSTMENT

The pressure compensator control automatically adjusts pump displacement to maintain volume requirements of the system at a pre-selected, adjustable operating pressure.

Your pump conforms to one of the configurations, shown in Fig. 4. Adjustment screws are identified and pressure adjustment ranges are stated.

FIGURE 4.

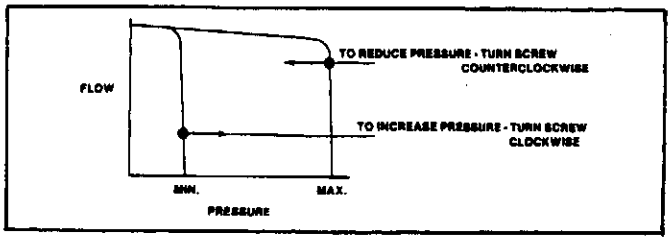


PRELIMINARY STEPS

1. The system relief valve must be set 300 psi higher than the desired dead-head pressure requirement to prevent control conflict between the compensator and relief valve. The system relief valve is to be set before setting the pump pressure.
2. The Load-Responsive function, if present, must be disabled prior to adjusting the pressure compensator using one of the following procedures:
   a. Connect system pressure to the pressure sensing port.
   b. Loosen the locknut on the differential pressure adjustir screw and screw clockwise until solid (5 to 10 lb-ft). Tighten locknut.
3. Start and Run pump until oil reaches at least 100 degrees F.

PRESSURE COMPENSATOR ADJUSTMENT

FIGURE 5.



1. Operate the pump against a closed or blocked circuit which will allow the compensator to regulate pump pressure at dead-head condition. The pumps are set at the factory for a low dead-head pressure. The outlet pressure gauge will indicate the compensator pressure setting.

2. Loosen the pressure adjusting screw locknut and turn the pressure adjusting screw clockwise to increase pressure, counter-clockwise to reduce pressure.

PUMP SIZE	CHANGE IN PRESSURE PER TURN OF ADJUSTING SCREW		
	PRESSURE CODE		
	10	20	30
PVA6	275	475	725
PVA10	275	475	725
PVA15	275	475	725
PVA23	225	400	650
PVA30	225	400	650

3. If the pressure setting does not increase in response to turning the adjusting screw clockwise, the system relief valve may be improperly set or flow to the system is occuring.

4. Slowly raise the pump pressure to system requirements. With the pump running at rated speed and dead-head, check the case drain pressure gauge. If the case drain pressure gauge reads higher than 10 psig, shut-down the system and find way to reduce case drain pressure to 10 psig, maximum.

5. It may be necessary to cycle the pump on and off; that is dead-head to open circuit and back to dead-head to purge air from the compensator control circuit.

6. When the desired dead-head pressure setting is reached, hold the adjusting screw in place and torque the locknut to 16-20 lb-ft. Cycle the pump 2 or 3 times to ensure pressure setting is maintained.

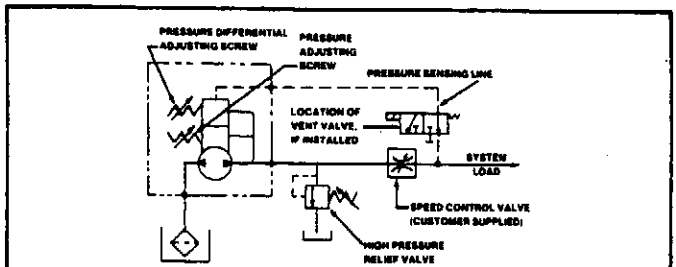
LOAD RESPONSIVE CONTROL CODE 19

The load responsive control automatically adjusts pump displacement to provide selectable constant outlet flow regardless of pump drive speed or system load.

Blocking pump outlet flow, as in a closed center valve position, and venting the pressure sensing port to tank, will cause the pump to dead-head at minimum pressure.

1. Connect the pump to a load circuit as shown in Figure 6.

FIGURE 6.



The pump has a 7/16-20 SAE straight threaded connection for 1/4" tube on the control for the pressure sensing line connection.

2. Open the speed control valve and operate the pump until all air is purged from the circuit and the fluid reaches at least 100 degrees F.

3. Set the pressure compensator adjusting screw to maximum system requirements as described in Pressure Adjustment Procedure.

4. Open and close the speed control valve several times for 2-3 seconds in each mode. The pump must cycle from dead-head to flow in response to valve position. The pressure gauge should indicate a dead-head pressure at approximately 250 psi with the speed control valve closed and pressure sensing line vented.

5. The Load Responsive Control is set at the factory to regulate constant flow with a 200 psi differential pressure across the speed control valve. The pressure differential adjusting screw will allow you to adjust this differential pressure approximately ± 50 psi. Higher differential pressures will cause a faster response time but will add to the heat load of the system. Lower differential pressures will reduce the heat load of the system but will cause slower response time.

6. To change the differential pressure, loosen the locknut and turn the screw clockwise to increase the differential pressure across the speed control valve.

7. Turning the screw counter-clockwise will reduce the differential pressure across the speed control valve.

8. Tighten the pressure differential adjusting screw locknut to 16-20 lb-ft once the desired setting is achieved.

REMOTE PRESSURE CONTROL CODE 7

This control allows the pump compensating pressure to be adjusted from a remote location using a pressure relief valve. The pump control has an internal orifice which meters 1/2 to 1 gpm of fluid into the compensator spring chamber. Directing this fluid from the remote pressure port to a remote pressure relief valve will allow you to set dead-head pressure for single or dual pressure circuits. The pump has a 7/16-20 SAE straight thread connection for 1/4 inch tube at the remote pressure port.

NOTE: The control port must never be blocked.

1. The low pressure adjusting screw is used to set minimum dead-head pressure. Clockwise rotation of the adjusting screw will increase the pressure setting.

2. By adding regulated pressure at the remote pressure ports, dead-head pressure (set with the low pressure adjusting screw) will increase on a direct basis. Example: with the low pressure set at 1000 psi and regulated pressure at the remote pressure port of 1500 psi, the dead-head pressure will be 2500 psi. Combined pressure settings must not exceed 3000 psi.

3. Follow the same safety procedure for setting dead-head pressure with this control as are used with the standard compensator.

NOTE

The remote pressure relief valve must be a direct acting differential piston relief valve. Pilot operated relief valves may cause instability.

Continental Hydraulics can provide the necessary accessory components needed for remote, single or multiple, pressure settings.

Contact your Continental Hydraulic distributor for assistance in selecting control valves and for applications with the pressure control relief valve further than 4 feet from the pump.

REMOTE ELECTRONIC PRESSURE CONTROL CODE 7*

This control allows the pump compensating pressure to be adjusted from a remote location by using a varying electronic signal. An increasing electrical current (in milli-amps.) will proportionally increase the maximum output pressure from the pump. Combined minimum deadhead setting and added pressure must **NOT** exceed maximum catalog pressure rating of the pump.

The electrical signal required may vary dependant upon the pump model selected. See Chart A for Typical Performance Specifications.

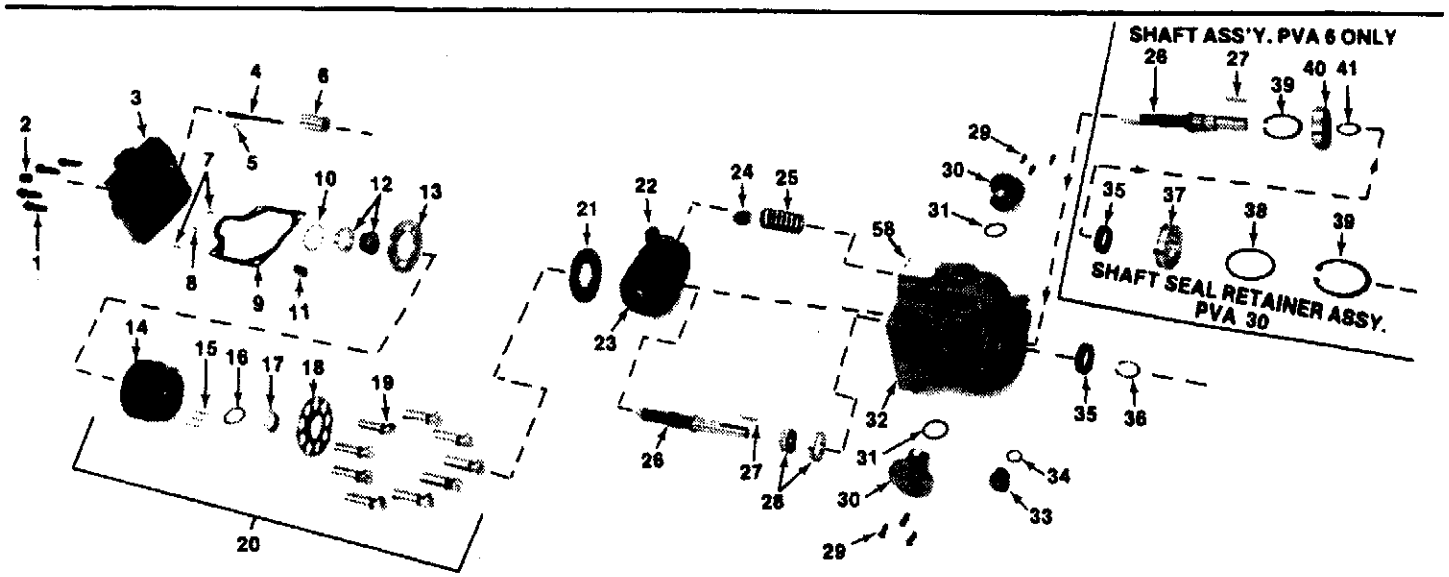
Note: The control port (tube connection) must never be blocked. The external drain for the control section must be piped separately back to tank & must not exceed 5 PSIG.

Contact your local Continental Hydraulics distributor for assistance in component sizing & selection for both the hydraulic & electronic applications.

CHART A. TYPICAL PERFORMANCE SPECIFICATIONS

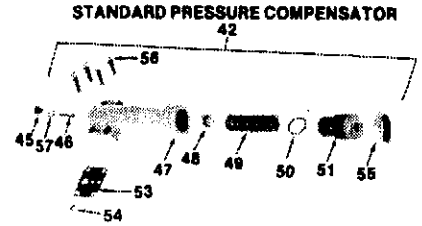
	7A	7C
Coil Resistance at 68°F (ohms)	70	16
Minimum Pressure Setting	See Note 1	
Remote Control Adjustable Range (PSIG)	See Note 2	
Current Adjustment Range	5-180 ma	20-540 ma
Voltage Rated/Max.	12 V dc / 15 V dc	
Dither CPS	100-400 Hz	

Notes:
1. Minimum pressure is controlled by the compensator spring and is adjustable from 250-1000 psi.
2. Remote control is additive to the minimum pressure setting: 7A is adjustable from 250-1750 PSIG, 7C is adjustable from 250-3000 PSIG. Electric control pressure + spring adjustment pressure = pump output pressure.
3. Dither of unfiltered voltage is required to obtain the above specifications. The Peak-to-Peak amplitude must not exceed 50% of DC control voltage.

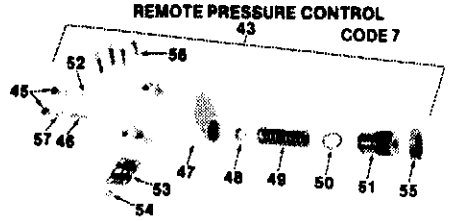


CONTROL VALVE PARTS BREAKDOWN

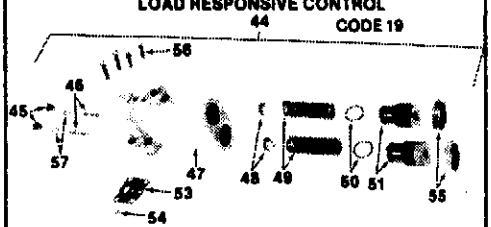
STANDARD PRESSURE COMPENSATOR



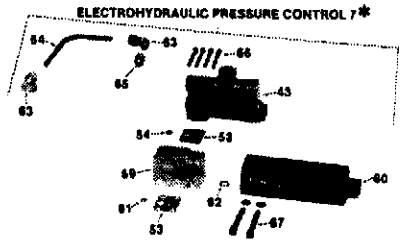
REMOTE PRESSURE CONTROL CODE 7



LOAD RESPONSIVE CONTROL CODE 19



ELECTROHYDRAULIC PRESSURE CONTROL 7*



SEAL KITS					
Includes Items: 5,9,31,34,35,38,50,53,54 and 57					
MODEL NO.		KIT NO.	MODEL NO.		KIT NO.
PVA6	Buna-N	253306	PVA6	Viton	253311
PVA10	Buna-N	253307	PVA10	Viton	253312
PVA15	Buna-N	252683	PVA15	Viton	253313
PVA23	Buna-N	253309	PVA23	Viton	253314
PVA30	Buna-N	253310	PVA30	Viton	253315

ITEM NO.	CODE	PART NO.	DESCRIPTION	NO. REQ.
1			Socket Head Bolt	4
2			Locknut (Flow Adj.Screw)	1
3		253324	PVA6-RH Cover-End Porting	1
3		253330	PVA6-RH Cover-Side Porting	1
3		253327	PVA6-LH Cover-End Porting	1
3		253335	PVA6-LH Cover-Side Porting	1
3		253325	PVA10-RH Cover-End Porting	1
3		253331	PVA10-RH Cover-Side Porting	1
3		253328	PVA10-LH Cover-End Porting	1
3		253336	PVA10-LH Cover-Side Porting	1
3	21	C.F.	PVA10-RH Cover	1
3	21	C.F.	PVA10-LH Cover	1
3		253326	PVA15-RH Cover-End Porting	1
3		253332	PVA15-RH Cover-Side Porting	1
3		253329	PVA15-LH Cover-End Porting	1
3		253337	PVA15-LH Cover-Side Porting	1
3	21	C.F.	PVA15-RH Cover	1
3	21	C.F.	PVA15-LH Cover	1
3		253333	PVA23-RH Cover-Side Porting	1
3		253338	PVA23-LH Cover-Side Porting	1
3	21	C.F.	PVA23-RH Cover	1
3	21	C.F.	PVA23-LH Cover	1
3		253334	PVA30-RH Cover-Side Porting	1
3		253339	PVA30-LH Cover-Side Porting	1
3	21	C.F.	PVA30-RH Cover	1
3	21	C.F.	PVA30-LH Cover	1
3	22	C.F.	PVA30-RH Cover	1
3	22	C.F.	PVA30-LH Cover	1
4			Flow Adj. Screw	1
5			O-Ring	1
6			Control Cylinder	1
7			Locating Pin (Cover)	2
8			Locating Pin (Valve Plate)	1
9			Gasket	1
10			Shim	A.R.
11		253372	PVA6 Rear Bearing	1
12		253373	PVA10 Rear Bearing	1
12		253374	PVA15 Rear Bearing	1
12		253377	PVA23 Rear Bearing	1
12	*	253378	PVA30 Rear Bearing	1
13	*	253345	PVA6 Valve Plate R.H. Brass	1
13	*	253346	PVA10 Valve Plate R.H. Brass	1
13	*	253347	PVA15 Valve Plate R.H. Brass	1
13	*	253351	PVA23 Valve Plate R.H. Steel	1
13	*	253352	PVA30 Valve Plate R.H. Steel	1
13	*	253348	PVA6 Valve Plate L.H. Brass	1
13	*	253349	PVA10 Valve Plate L.H. Brass	1
13	*	253350	PVA15 Valve Plate L.H. Brass	1
13	*	253353	PVA23 Valve Plate L.H. Steel	1
13	*	253354	PVA30 Valve Plate L.H. Steel	1
13	M	C.F.	Valve Plate	1
14			Cylinder Block	1
15			Pin	3
16	*		Washer	1
17			Retaining Guide	1
18			Retaining Ring	9
19			Piston	9
20	*	253340	PVA6 Cylinder Block Kit-Steel	1
20	*	253341	PVA10 Cylinder Block Kit-Steel	1
20	*	253342	PVA15 Cylinder Block Kit-Steel	1
20	*	253343	PVA23 Cylinder Block Kit-Brass	1
20	*	253344	PVA30 Cylinder Block Kit-Brass	1
20	M	C.F.	Cylinder Block Kit	1
21		253365	PVA6 Thrust Plate	1
21		253366	PVA10 Thrust Plate	1
21		253367	PVA15 Thrust Plate	1
21		253368	PVA23 Thrust Plate	1
21		253369	PVA30 Thrust Plate	1
22			Swashplate	1
23			Journal Bearing (Not Shown in Swashplate)	2
24			Spring Retainer	1
25			Spring	1
26		253355	PVA6 Keyed Shaft	1
26		253356	PVA10 Keyed Shaft	1
26		253357	PVA15 Keyed Shaft	1
26		253358	PVA23 Keyed Shaft	1
26		253359	PVA30 Keyed Shaft	1
26		253363	PVA6 Splined Shaft	1
26		253364	PVA10 Splined Shaft	1
26		253858	PVA15 Splined Shaft	1
26		254266	PVA23 Splined Shaft	1
26		254267	PVA30 Splined Shaft	1
27		253360	PVA6 Shaft Key	1
27		253361	PVA10 & PVA15 Shaft Key	1
27		253362	PVA23 & PVA30 Shaft Key	1
28		253371	PVA10 & PVA15 Front Bearing	1
28		253375	PVA23 Front Bearing	1
28		253376	PVA30 Front Bearing	1
29			Socket Head Bolt	3
30		253320	PVA6 Trunnion Bearing Kit (Includes Item #23)	2
30		253321	PVA10 & PVA15 Bearing Kit (Includes Item #23)	2
30		253322	PVA23 Trunnion Bearing Kit (Includes Item #23)	2
30		253323	PVA30 Trunnion Bearing Kit (Includes Item #23)	2
31			O-Ring	2
32			Pump Body	1
33			Plug	1
34			O-Ring	1
35		253316	PVA6,PVA10,PVA15 Shaft Seal BunaN	1
35		253317	PVA23,PVA30 Shaft Seal BunaN	1
35		253318	PVA6,PVA10,PVA15 Shaft Seal Viton	1
35		253319	PVA23, PVA30 Shaft Seal Viton	1
36			Snap Ring	1

ITEM NO.	CODE	PART NO.	DESCRIPTION	NO. REQ.
37	30		Seal Retainer	1
38	30		O-Ring	1
39	30		Snap Ring	1
40	6 Only	253370	PVA6 Front Bearing	1
41	6 Only		Snap Ring	1
42	STD	253382	PVA6,PVA10,PVA15 Control Valve 1000 psi	1
42	STD	254274	PVA6,PVA10,PVA15 Control Valve 2000 psi	1
42	STD	253300	PVA6,PVA10,PVA15 Control Valve 3000 psi	1
42	STD	254275	PVA23, PVA30 Control Valve 1000 psi	1
42	STD	254276	PVA23, PVA30 Control Valve 2000 psi	1
42	STD	253301	PVA23, PVA30 Control Valve 3000 psi	1
43	7	253302	PVA6,PVA10,PVA15 Control Valve 1000 psi	1
43	7	C.F.	PVA6,PVA10,PVA15 Control Valve 2000 psi	1
43	7	C.F.	PVA6,PVA10,PVA15 Control Valve 3000 psi	1
43	7	253303	PVA23, PVA30 Control Valve 1000 psi	1
43	7	C.F.	PVA23, PVA30 Control Valve 2000 psi	1
43	7	C.F.	PVA23, PVA30 Control Valve 3000 psi	1
44	19	254277	PVA6,PVA10,PVA15 Control Valve 1000 psi	1
44	19	254278	PVA6,PVA10,PVA15 Control Valve 2000 psi	1
44	19	253304	PVA6,PVA10,PVA15 Control Valve 3000 psi	1
44	19	254279	PVA23, PVA30 Control Valve 1000 psi	1
44	19	254280	PVA23,PVA30 Control Valve 2000 psi	1
44	19	253305	PVA23, PVA30 Control Valve 3000 psi	1
45			Screw	A.R.
46		254268	PVA6,10 & 15 Comp. Spool-Std Comp	1
46		254270	PVA6,10 & 15 Comp. Spool-Code 7 Comp.	1
46		254272	PVA6,10 & 15 Pressure Comp. Spool-Code 19 Comp.	1
46		254268	PVA6,10 & 15 Press. . ', PSI Comp. Spool-Code 19 Comp.	1
46		254269	PVA23&30 Comp. Spool- Std Comp	1
46		254271	PVA23&30 Comp. Spool-Code 7 Comp.	1
46		254273	PVA23&30 Press. Comp. Spool-Code 19 Comp.	1
46		254289	PVA23&30 Press. . ', PSI Comp. Spool-Code 19 Comp.	1
47			Compensator Body	A.R.
48			Spring Retainer	A.R.
49		253589	Comp. Spring 1000 PSI PVA6, 10 & 15	1
49		254262	Comp. Spring 2000 PSI PVA6, 10 & 15	1
49		254263	Comp. Spring 3000 PSI PVA6, 10 & 15	1
49		253590	Comp. Spring 1000 PSI PVA23 & 30	1
49		254264	Comp. Spring 2000 PSI PVA23 & 30	1
49		254265	Comp. Spring 3000 PSI PVA23 & 30	1
50			O-Ring	A.R.
51			Pressure Adj. Screw	A.R.
52			Orifice	A.R.
53		253211	PVA6,PVA10,PVA15 Gasket	1
53		253213	PVA23, PVA30 Gasket	1
54		253212	O-Ring	1
55			Locknut	1
56			Socket Head Bolt	4
57			O-Ring	A.R.
58		350181	PVA6 Escutcheon	1
58		350193	PVA10 Escutcheon	1
58		350180	PVA15 Escutcheon	1
58		350194	PVA23 Escutcheon	1
58		350182	PVA30 Escutcheon	1
59	7*	450182	PVA6,10,15 Adapter Manifold	1
59	7*	450189	PVA23 & 30 Adapter Manifold	1
60	7A	253271	Axial Force Motor (750 PSI)	1
60	7C	253280	Axial Force Motor (3000 PSI)	1
61		122405	O-Ring	1
62		108295	O-Ring	1
63		309053	90° Male Elbow	2
64		253761	Tube Ass'y.	1
65		253749	Straight Thd. Adaptor	1
66		199758	Mounting Bolts PVA6,10 & 15	4
66		199756	Mounting Bolts PVA23 & 30	4
67		198247	Mounting Bolts	2

*** See Note #9 Under Major Repair - Cylinder Block Kit**

C.F. - Consult Factory

Code 7* Control Valve Kits

(Kits include: All parts required to convert to the Remote Electronic Control Option.)

Kit No.	Code	Description
254941	7A	PVA6,10 & 15 Conversion Kit with Item 43
254942	7A	PVA6,10 & 15 Conversion Kit without Item 43
254943	7A	PVA23 & 30 Conversion Kit with Item 43
254944	7A	PVA23 & 30 Conversion Kit without Item 43
254756	7C	PVA6,10 & 15 Conversion Kit with Item 43
254757	7C	PVA6,10 & 15 Conversion Kit without Item 43
254758	7C	PVA23 & 30 Conversion Kit with Item 43
254759	7C	PVA23 & 30 Conversion Kit without Item 43

PVA PISTON PUMP REPAIR PROCEDURE

NOTE: A pump that has been disassembled for changing components or for any other reason may void warranty.

MINOR REPAIR — SHAFT SEAL REMOVAL:

Two types of shaft seals are used on the PVA series pumps. The PVA6 and PVA30 models utilize a seal retainer and o-ring. The PVA10, PVA15, and PVA23 models use a replacement seal and retaining snap ring only.

Using snap ring pliers, remove the snap ring from the shaft end of the pump.

CAUTION: The snap ring holds the shaft in the housing on the PVA6 model. Do not pull on the shaft after the snap ring has been removed. In the event the shaft is pulled from the housing, do not attempt to slide it back into the pump, but remove the end cap and cylinder block kit as outlined in the major repair section.

PVA6 and PVA30:

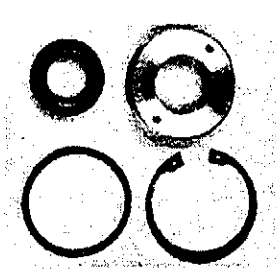
Install two screws into the seal retainer (use two of the screws from the compensator control). Pull or pry the seal retainer from the body. It will be held in place by the outer o-ring.

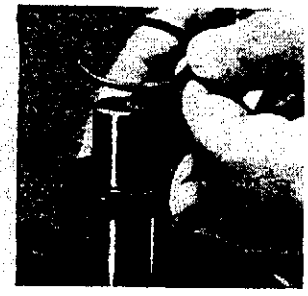
Remove the shaft seal (discard the shaft seal when removed) and outer o-ring.

PVA10, PVA15, and PVA30:

Using a punch, or some type of sharp instrument, puncture the shaft seal and gently pry it out.

NOTE: The PVA23 may have the same style shaft seal as the PVA6 and PVA30 on the earlier models.





MINOR REPAIR — SHAFT SEAL INSTALLATION:

PVA6 and PVA30:

Use a seal driver and press the new shaft seal into the retainer. Make sure it is bottomed out on the seal retainer. **(DO NOT USE EXCESSIVE FORCE).** Install a new outer o-ring on the retainer. Lubricate the outer o-ring and shaft seal and slide the assembly over the shaft and into the pump body until the snap ring groove is uncovered. Install the snap ring (beveled end out) into the groove.

PVA10, PVA15, and PVA23:

Lubricate the new shaft seal (I.D. and O.D.) and carefully slide it over the shaft. Press the seal into place and securely install the snap ring into the groove.

MINOR REPAIR — CONTROL VALVE:

Using an internal hex wrench, remove the (4) screws. Remove the control and gasket from the pump. Remove the o-ring from the control mounting surface. If the control is not performing properly, disassembly of the control valve may be required (See exploded view for orientation. **NOTE:** spool orientation before removal. **REASSEMBLE:** replacing all o-rings and gaskets. Place the control on the pump (make sure the gasket is on the valve properly) and re-install the (4) screws. Tighten to 61—60 In. lbs. torque.

NOTE: PVA6, PVA10, and PVA15 controls (pressure compensator, remote pressure compensator and load sensor) are interchangeable, likewise, the PVA23 and PVA30 controls are interchangeable.

MAJOR REPAIR — DISASSEMBLY:

GENERAL:

1. Remove the protective locknut from the maximum flow adjustment screw.

2. Remove the (4) bolts which hold the cover on to the pump. There is an internal loading on the cover. The cover should begin to separate from the body. Remove the cover from the body.

   NOTE: The valve plate and control cylinder are loose. Be certain they do not fall and become damaged.

3. Remove the valve plate and control cylinder. Do not attempt to remove the tube to which the control cylinder is fitted. The tube is pressed into the cover and is not replaceable.

4. Remove the maximum flow adjustment by turning it clockwise through the cover. Remove the o-ring from the adjustment screw.

BEARING REMOVAL — COVER:

1a. PVA6 rear needle bearing puller to remove.

1b. PVA10, PVA15, PVA23 and PVA30 — Remove the bearing race from the cover. **NOTE:** There may be shim under the race, they are for setting the shaft end in play. **DO NOT LOOSEN.** Using a clamp type bearing puller, remove the tapered roller bearing from the shaft. **CAUTION:** Do not damage the cylinder block. A brass shim spacer may be required to protect the cylinder block from damage.

2. Remove the gasket from the pump body.

3. Set the pump horizontal, slide the cylinder block kit off the shaft as a unit. If the cylinder kit does not remain together, it may be reassembled later.

4. Remove the thrust plate from its counterbore, in the swashplate. Avoid damaging all critical surfaces.

5. PVA6 — Remove the rotorshaft through the fromt of the pump.

TRUNNION REMOVAL:

1. Journal bearing style - First, mark right and left trunnions.
2. Remove the (3) screws from the trunnion.
3. Remove each trunnion by using a soft, blunt punch to drive it out of the pump body from the inside.
4. If other than trunnion shown are used, replace with listed trunnions and journal bearings (located in the swashplate) if needed.
5. Remove the o-ring from the trunnion and replace it.
6. After both trunnion assemblies have been removed, lift the swashplate out of the pump body.
7. Remove the spring and spring retainer from the pump body.

BEARING REMOVAL — SHAFT:

1. PVA — Remove the snap ring from the shaft and press the bearing off using an arbor type press.
2. PVA10, PVA15, PVA23, and PVA30 shaft bearing removal — remove the shaft from the body by removing it out the cover side.
3. Remove the bearing race from the body.
4. Press the bearing off the shaft with an arbor type press.
5. Thoroughly clean and inspect all parts. Replace all damaged parts.

MAJOR REPAIR — ASSEMBLY:

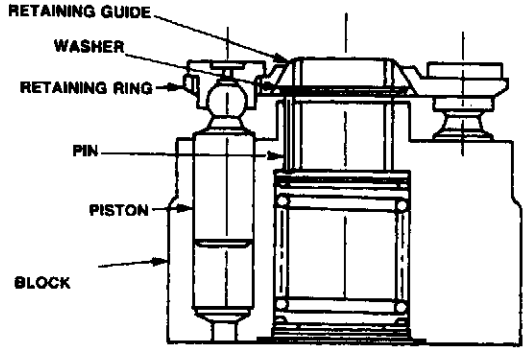
1. Shaft; bearing assembly — (PVA6 will be assembled later) PVA10, PVA15, PVA23 and PVA30 — Press the new bearing race into the body. **NOTE:** If shims were used, install them first.
2. Press the bearing on to the shaft until it rests on the shoulder shaft.
3. Insert the shaft and bearing into the body.
4. Replace the o-ring on the maximum flow adjustment screw and replace the assembly back into the cover.
5. Install the control cylinder and valve plate on the cover.
6. Install the cover gasket and maximum flow screw locknut.
7. Install the spring and spring retainer.
8. Insert the swashplate and make sure the spring retainer ball is inserted into the hole in the swashplate.
9. Install the trunnion (make sure they are on the correct side) and torque the mounting screws to: PVA6, PVA10 and PVA15 to 7—8 ft. lbs., PVA23 to 16—21 ft. lbs. and PVA30 to 27— 37 ft. lbs.

SHAFT/BEARING ASSEMBLY:

1. PVA6 — Install the snap ring on the shaft ahead of the bearing, press the bearing on with an arbor type press.
2. Install the PVA6 shaft seal and retaining assembly on to the shaft as outlined in the minor repair section.
3. Install thrust plate on to the swashplate making sure the thrust plate lies flat against the swashplate.

CYLINDER BLOCK:

1. Prior to the assembly of the cylinder block, inspect the pistons, retaining ring, retaining guide, washer and pins for damage and Excessive wear. Replace all parts that are defective. If any pistons are defective, it is necessary to replace the complete cylinder block kit.
2. Install bearing pins in neck end of cylinder block.
3. Place the washer on the locating pins.
4. Install the retaining ring guide on the washer.
5. Place the retaining ring over the retaining ring guide. The guide should protrude through the center of the retaining ring (make certain the washer remains centered under the guide).
6. Install all pistons through the retaining ring and into the block.
7. Place the pump in a horizontal position and slide the cylinder block assembly on to the shaft and against the thrust plate **CAUTION:** Care must be taken that the washer and retaining guide do not come off the locating pins.
8. Stand the unit vertically with the shaft seal down to insure all parts remain in position. Then rotate the cylinder block two or three times to insure the piston slippers are in contact with the thrust plate. When properly installed, a spring load can be felt when pushing against the cylinder block.



9. When replacing the cylinder block kit or the valve plate, compare the MATERIAL of the item to be replaced against the material of the item offered in the parts list. **NOTE:** If the cylinder block kit is offered in brass the valve plate MUST be steel, if the cylinder block kit is offered in iron the valve plate must be brass (bi-metal). Both the cylinder block kit and valve plate will require replacement if the parts needed is the same material as its mating surface.

BEARING INSTALLATION:

1. PVA6 — Cover needle bearing can be pressed into the cover. The bearing should protrude above the cover surface .088 — .098 in. The writing on the end of the bearing should be visable after the bearing is installed.

2. Press the PVA10, PVA15, PVA23, and PVA30 tapered bearing on the pump shaft with an arbor type press until the bearing rests on the shoulder of the shaft. Also install the bearing race and shims into the cover.
3. Install the cover, while holding the valve plate so it does not drop, on to the cylinder block and pump body.

BEARING INSTALLATION (CONTINUED)

4. Install the (4) socket bolts and tighten alternately until against the pump body. Torque the bolts on the PVA6, PVA23, and PVA30 to 35—45 ft. lbs. and the PVA10 to 62—80 ft. lbs.

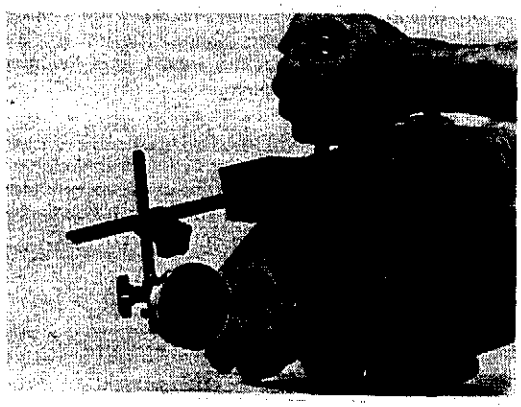
The shaft seal and seal retainer may be installed into the pump body at this time as outlined in the minor repair section.

Install the control valve assembly as outlined in the minor repair section.

NOTES:

If any of the following components have been replaced, check the shaft end play after the pump is assembled: Drive shaft, bearings, housing cover.

The shaft end play should be between .003 and .015 in. (only required on the PVA10, PVA15, PVA23 and PVA30).



TYPICAL PERFORMANCE SPECIFICATIONS

				PVA				
				6	10	15	23	30
VOLUMETRIC DISPLACEMENT			cu. in./rev.	0.91	1.41	2.30	3.16	4.36
			ml/rev.	15	23	38	52	70
PUMP DELIVERY AT 1750 RPM	● 91.5 psi 6.3 bar		gpm	6.9	10.7	17.4	23.9	32.3
			lpm	26.1	40.6	65.9	90.5	122.3
	● rated pressure		gpm	6.5	10.2	17.0	23.5	31.5
			lpm	24.6	38.6	64.3	88.9	119.2
OPERATING PRESSURES	Max.		psi	3000	3000	3000	3000	3000
			bar	207	207	207	207	207
	Rated		psi	3000	3000	3000	3000	3000
			bar	207	207	207	207	207
	Min.		psi	500	500	500	500	500
			bar	34.6	34.6	34.5	34.6	34.6
OPERATING SPEEDS			Min. rpm	500	500	500	600	600
	CODE B		Rated rpm	1750	1750	1750	1750	1750
	* CODE M		Max. rpm	3600	3300	3000	2400	2200
POWER INPUT @ RATED FLOW AND PRESSURE			hp	15	22	38	49	66
			kw	11	16.5	27	36.5	49
SUCTION	PRESSURE	Max.	psi	100	100	100	100	100
			bar	6.9	6.9	6.9	6.9	6.9
		Min. ** S.G. < 1	in. hg.	5	5	5	5	5
			mm. hg.	125	125	125	125	125
		Min. ** S.G. > 1	in.hg.	3	3	3	3	3
			mm. hg.	75	75	75	75	75
	FLUID VELOCITY	Max.	ft./sec.	5	5	5	5	5
			m./sec.	1.5	1.5	1.5	1.5	1.5
CASE DRAIN	NOMINAL FLOW AT DEADHEAD PRESSURE	1000 psi 69 bar	gpm	0.18	0.15	0.20	0.25	0.3
			lpm	0.57	0.57	0.75	0.9	1.1
		2000 psi 140 bar	gpm	0.25	0.25	0.30	0.4	0.5
			lpm	0.85	0.95	1.10	1.5	1.9
		3000 psi 207 bar	gpm	0.40	0.40	0.50	0.6	0.9
			lpm	1.5	1.5	1.9	2.3	3.4
	MAXIMUM BACK PRESSURE		psi	10	10	10	10	10
			bar	.7	.7	.7	.7	.7
MAX. VOLUME ADJ. /360° TURN			cu.in./rev.	0.091	0.133	0.180	0.260	0.310
			ml/rev.	1.52	2.06	2.51	4.18	5.18
PRESSURE ADJ. /360° TURN			Code 10	275 (19)			225 (16)	
STD. COMPENSATOR psi(bar)			Code 20	475 (33)			400 (28)	
			Code 30	725 (51)			650 (45)	
MOUNTING		SAE	Type	"A"	"B"	"B"	"C"	"C"
WEIGHT			lbs.	25	40	48	110	130
			kg	11.3	18	21.8	50	55

* MAX. VOLUME &/OR SUCTION CONSIDERATIONS MAY BE REQUIRED.
** Specific Gravity

COMMON CAUSES OF WEAR AND PART DAMAGE

AFFECTED PART	PROBLEM	PROBABLE CAUSE
Shaft	Broken	A. Pump is used at higher than maximum working pressure. B. Seizure is due to lack of lubrication.
	Wear	Needle bearing wear on PVA6 Excessive shaft end play on PVA10, 15, 23 &30 models
Cylinder Block Valve Plate	Seizure	A. Oil contamination
	Wear	A. Excessive oil temperature B. Cavitation C. Improper case drain filling D. Excessive speed E. Excessive pressure
Slipper Pads	Wear	A. Oil contamination B. Excessive speed C. Excessive pressure
Bearings	Damage	A. Improper shaft alignment B. Abnormal pressure C. Insufficient end play on PVA10, 15, 23 & 30 models.
Oil Seals	Damage	A. Excessive case leakage B. Excessive case pressure C. Improper shaft alignment
Control Cylinder Cylinder rod	Wear	A. Oil contamination

MAXIMUM FLOW vs. SPEED

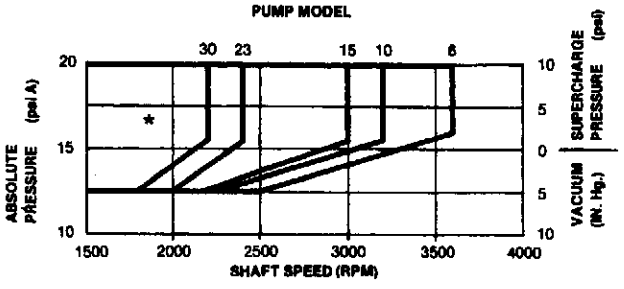
REF.	PUMP MODEL	6	10	15	23	30
A	MAX. FLOW (gpm)	10	14	22	27	33
B	MAX. SPEED (RPM)	3600	3200	3000	2400	2200
C	MAX. SPEED (RPM) FOR FULL DISPLACEMENT*	2500	2250	2200	2000	1800

*ANY HIGHER DRIVE SPEED GREATER THAN THAT FOR FULL PUMP DISPLACEMENT (C) UP TO THE MAX. SPEED (B) REQUIRES LIMITING OF THE MAX. FLOW (A). THIS IS DONE BY ADJUSTING THE MAX. DISPLACEMENT ADJUSTMENT SCREW ON THE PUMP.

High drive RPM's may require supercharging the pump and/or limiting the maximum pump flow due to suction limitations.

USE THE CHARTS BELOW TO DETERMINE SPECIFIC REQUIREMENTS.

INLET PRESSURE vs. SPEED



NOTE: CODE B PUMPS ARE LIMITED TO 1800 RPM MAXIMUM DRIVE SPEED.

- *RECOMMENDED OPERATING RANGE FOR MAXIMUM PUMP LIFE.
- EXAMPLE: PVA6 RUN AT 3600 RPM SHOULD BE SUPERCHARGED TO ABOUT 2 psi.
- CURVES BASED ON OIL TEMPERATURE OF 120°F. (100 SSU) or 100°F. (150 SSU).
- 10 psi MAX. CASE PRESSURE, 5 IN. Hg. MIN. SUCTION VACUUM.

NOISE LEVELS (dba)*

CODE B (< 1800 RPM)

PRESSURE - psi (bar)		0	500 (34.5)	1000 (69)	1500 (103.5)	2000 (138)	2500 (172.5)	3000 (207)
PVA6	FULL FLOW	56	61	64	66	68	70	72
	DEAD HEAD	—	58	60	62.5	65	67	69
PVA10	FULL FLOW	62	64	66	68	69	70	71
	DEAD HEAD	—	58	61	64	66	67	68
PVA15	FULL FLOW	64	65.5	67	69	71	73	75
	DEAD HEAD	—	60	62	64	66	68	70.5
PVA23	FULL FLOW	67	68	69	70.5	72	73.5	75
	DEAD HEAD	—	63	65	66.5	68	69.5	71
PVA30	FULL FLOW	68	71	72.5	73.5	74	75	76
	DEAD HEAD	—	65.5	68	70	72	73	74

*MEASURED 3.3 FT. (1 M) FROM PUMP-1750 RPM

CODE M (> 1800 RPM)

PRESSURE - psi (bar)		0	500 (34.5)	1000 (69)	1500 (103.5)	2000 (138)	2500 (172.5)	3000 (207)
PVA6	FULL FLOW	56	61	64	66	68	70	72
	DEAD HEAD	—	58	60	62.5	65	67	69
PVA10	FULL FLOW	69	71	73	74	76	78	79
	DEAD HEAD	—	66	69	70	72	73	75
PVA15	FULL FLOW	73.5	73.5	74.5	76	77	77.5	80
	DEAD HEAD	—	71	73	73.5	75	77	79
PVA23	FULL FLOW	74	75	76	77	78	80	82
	DEAD HEAD	—	70	71	73	75	76	78
PVA30	FULL FLOW	76	77	77.5	78	79	80.5	82
	DEAD HEAD	—	71	72	73	76	78	80