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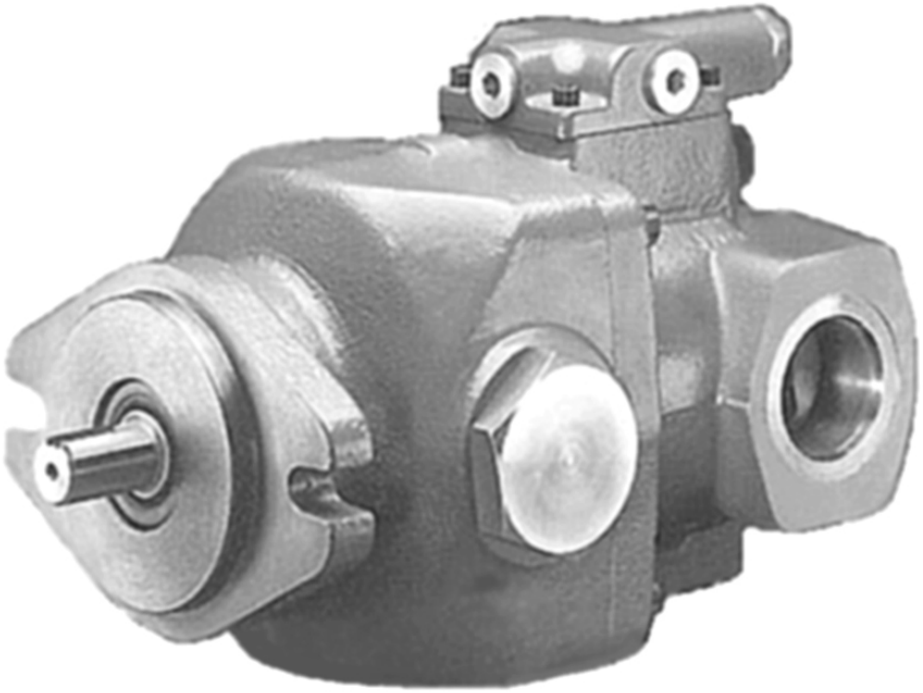
PUMPS - MOTORS - CONTROLS

Technical Information for PVC34/43 Series Pumps



Hydraulic pumps & motors with a hart of gold ™

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TECHNICAL INFORMATION FOR PVC PUMPS

PVC pumps were designed for long and dependable service in both industrial and mobile applications. When incorporated into a well-planned and properly maintained hydraulic environment, one could keep the pump trouble free and, thereby, minimize the downtime of the system.

Hydraulic Fluids

PVC pumps are designed for use with all standard petroleum-based hydraulic fluids. Special construction is available for use with water-based fluids or phosphate esters. Although, in general, 60/40 mixtures of water glycol fluids can be regarded as oils, one is encouraged to consult factory for details.
Consult fluid-formulation manufacturer for detailed physicochemical properties of the fluid in question.

Filtration

For proper operation, adequate filtration is required in the circuit. A return line filter is preferred on the high pressure conduit as well as on the case drain return. In each case, filter flow capacity and pressure drop should be matched to pump performance ratings. Bypass filtration and suction filters and/or strainers are not recommended and, if possible, should be avoided. Finally, fluid cleanness should conform to ISO code 4406 as shown below (Data Courtesy of HYDAC USA):

	Low/Medium Pressure Under 2000 psi		High Pressure 2000 to 2999 psi		Very High Pressure 3000 psi and over	
	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings
Pumps						
Fixed Gear or Fixed Vane	20/18/15	20	19/17/14	10	18/16/13	5
Fixed Piston	19/17/14	10	18/16/13	5	17/15/12	3
Variable Vane	18/16/13	5	17/15/12	3	not applicable	not applicable
Variable Piston	18/16/13	5	17/15/12	3	16/14/11	3[2]
Valves						
Check Valve	20/18/15	20	20/18/15	20	19/17/14	10
Directional (solenoid)	20/18/15	20	19/17/14	10	18/16/13	5
Standard Flow Control	20/18/15	20	19/17/14	10	18/16/13	5
Cartridge Valve	19/17/14	10	18/16/13	5	17/15/12	3
Proportional Valve	17/15/12	3	17/15/12	3	16/14/11	3[2]
Servo Valve	16/14/11	3[2]	16/14/11	3[2]	15/13/10	3[2]
Actuators						
Cylinders, Vane Motors, Gear Motors	20/18/15	20	19/17/14	10	18/16/13	5
Piston Motors, Swash Plate Motors	19/17/14	10	18/16/13	5	17/15/12	3
Hydrostatic Drives	16/15/12	3	16/14/11	3[2]	15/13/10	3[2]
Test Stands	15/13/10	3[2]	15/13/10	3[2]	15/13/10	3[2]
Bearings						
Journal Bearings	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Industrial Gearboxes	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Ball Bearings	15/13/10	3[2]	not applicable	not applicable	not applicable	not applicable
Roller Bearings	16/14/11	3[2]	not applicable	not applicable	not applicable	not applicable

1. Severe conditions may include high flow surges, pressure spikes, frequent cold starts, extremely heavy duty use, or the presence of water
2. Two or more system filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Level.

Operating Viscosities

For petroleum-based fluids, the optimal viscosity level is 150 SUS or 32 cSt. Continuous, heavy duty operations are best accomplished by using fluids with viscosity levels ranging from 63 to 2500 SUS, i.e., from 14 to 540 cSt. "Thicker" fluids may result in pump starvation/cavitation when operated in "cold" startups or low temperature environments. By contrast "thinner" fluids may result in pump accelerated wear and, possibly, unstable performance. Consult factory for details.

Inlet Conditions and Piping

The temperature of the hydraulic fluid at the inlet to the pump should not exceed 140ºF. Likewise, the temperature of the fluid in the reservoir should be maintained at or below 140º F. If necessary, a cooling system should be utilized on the high-pressure return line. For operation at elevated temperatures consult factory.

Strainers, screens and/or cooling grids, if installed in the tank, should be kept at least 1 ft away from the connection site to pump suction line. The suction pipe, hose or tubing should be sized properly to limit fluid bulk velocity to ≤ 5 ft/sec in industrial installations, and ≤ 8 ft/sec in mobile setups. Where feasible, a flooded inlet arrangement should be preferred. If impractical, the inlet conduit should be maintained as short as possible, and straight. Street elbows, restrictive valves, and other 'necked down' parts should be avoided. All in all, pump inlet resistance should be limited to ≤ 6" Hg (3 psi).

The suction line should be bolted to pump flanged-port with four ½-13 UNC-2B bolts, unless the model ordered has a straight thread. Suction hose, if used, must be wire reinforced to prevent its collapse. All connections must be airtight.

Case Drain

Two case-drain ports are provided on all pump models. To facilitate purging of air from the pump, case-drain piping should be connected to the top-most port. The case-drain line must be properly sized to limit port backpressure to < 15 psi. Although a ½" OD line is adequate for runs of up to 15 feet, it is suggested that the bulk velocity of fluid within the case-drain conduit be limited to 10 ft/sec in both, industrial and mobile installations. Use of clear, reinforced plastic tubing is optional to permit visual inspection of fluid flow during operation.

Case-drain line must be routed directly to the reservoir and it should extend below the fluid level, at an opposite end to suction inlet. This is especially pertinent in systems with negative suction pressure, when the reservoir is below pump level. Should the case-drain line be inattentively ending above fluid level, it may provide an air passage to pump case and allow priming fluid to gravity drain into the tank through the suction conduit. This, in turn, may result in loss of prime within the pump for the next startup. Pump case must be filled prior to startup.

CAUTION: Do not connect any valve drains or external returns to pump case-drain line as it may elevate the backpressure in the conduit beyond the permitted level and, inadvertedly, lead to seal-lip compromise.

Discharge Conditions and System Relief Valve

The temperature of the hydraulic fluid at the pump discharge port should not exceed 170º F. For higher levels consult factory.

Discharge pipe or hose should be sized properly to limit the build-up of too high a backpressure in the system circuit. It is suggested that the bulk velocity of fluid within the output conduit be 15 ft/sec in industrial installations and ≤ 25 ft/sec in mobile setups. It is also recommended that an appropriately rated check valve, or (preferably) sequence valve be placed 3-6 ft downstream of the discharge port to maintain the required minimal backpressure within pump architecture. When rating a check or sequence valve, the following guide should be consulted:

PVC PUMP MODEL	REQUIRED OVERALL BACKPRESSURE
34 or 43	**250 psi**

A relief valve is required in all applications to protect personnel and system elements from potentially damaging pressure overloads. It should be installed between pump outlet and check/sequence valve position. The relief valve should be sized for maximum flow in the system, and adjusted to about 10-12% above the setting of pump pressure compensator, or torque limiter, or the combination thereof. A fast acting, directly operated module is recommended.

Operating Pressures

Continuous and peak pressure ratings of PVC series pumps are detailed on the specification sheet. These pressure levels should not be exceeded without consulting factory first. To accord with the specified ratings in a given application, the sizing of intermittent pressure loads can be evaluated using the duty cycle loading formula:

$$P_{RMS}=[(P_1^2 \cdot t_1 + P_2^2 \cdot t_2 + \ldots + P_n^2 \cdot t_n)/(t_1 + t_2 + \ldots + t_n)]^{1/2}$$

where P_j represents the temporary pressure level during loading period t_j, $(j=1,2\ldots n)$, and $t_1 + t_2 + \ldots + t_n = T$, duration of one complete loading cycle.

Controls

All control units of the PVC-series pumps have a stackable modular design. These modules are fully interchangeable among the two displacement models.

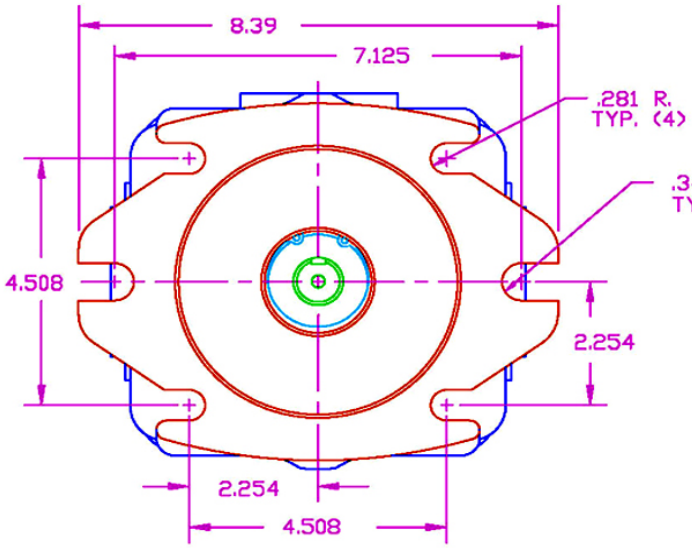
Pump Mounting Guides

PVC pumps are equipped with standard SAE mounts and drive shafts. When mounting and bolting a pump onto a prime mover, the following guide should be consulted:

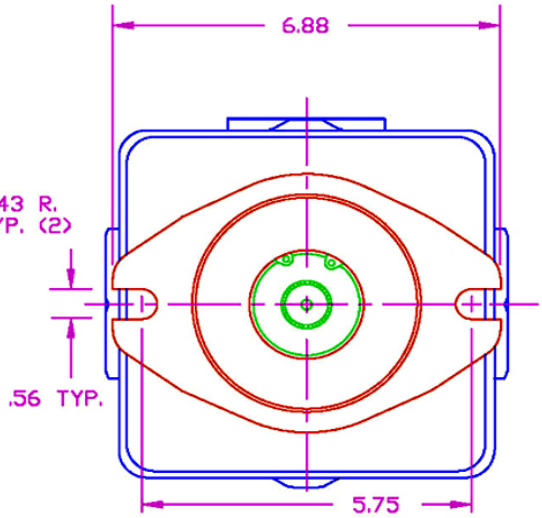
MOUNT CLASSIFICATION	NFPA HORSEPOWER RATING	BOLT SIZE
SAE 'B' 2 bolts mount	25 HP	1/2" ϕ
SAE 'C' 2 bolts mount	50 HP	5/8" ϕ
SAE 'C' 4 bolts mount	50 HP	1/2" ϕ

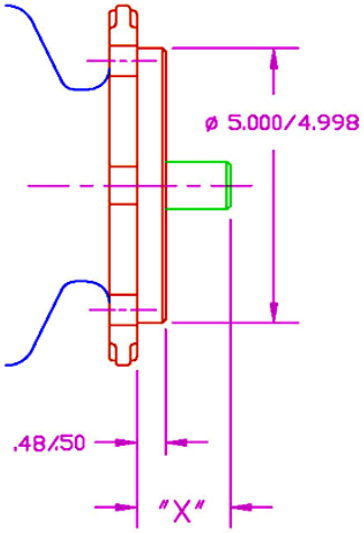
Pump shaft should be connected to prime mover shaft with a jaw type flexible coupling. Shaft alignment must be within 0.003" (0.8 mm) TIR (total indicated run-out). Upon engagement, the input and/or through shaft torque should accord with the values recommended on the specification sheet of each pump model.

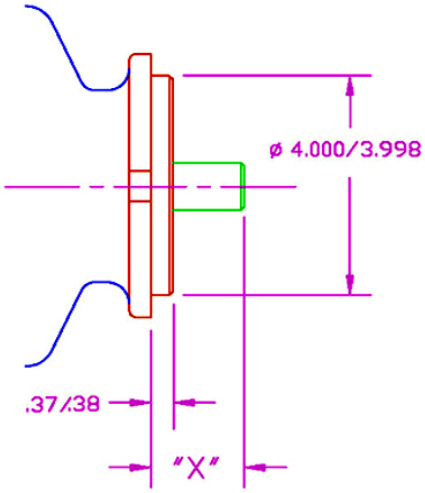
SAE C MOUNT



SAE B MOUNT







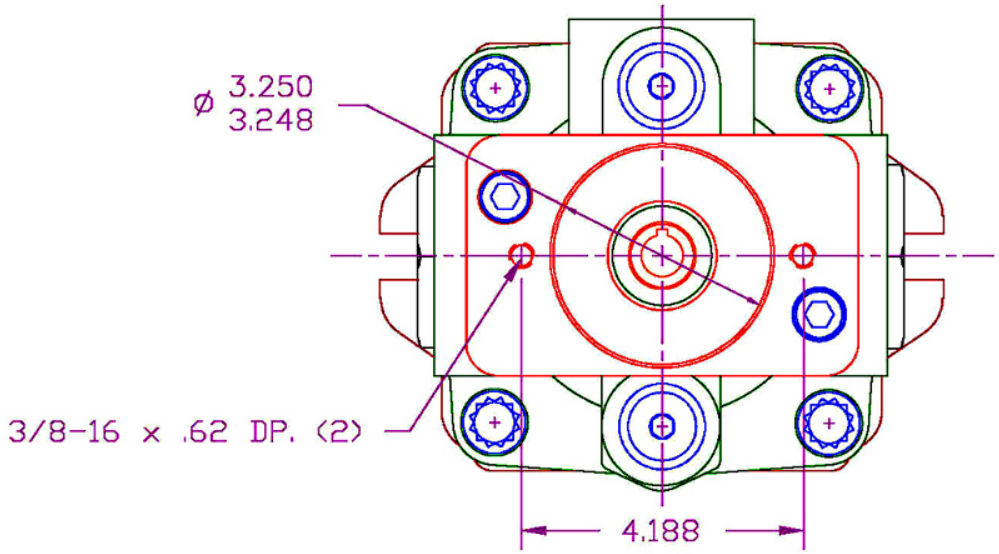
SAE SHAFT	DESCRIPTION	"X"
B SPLINE	13T, 16/32 DP	1.62
B KEYED	.875ø, 1/4 SQ. KEY	1.62
B-B SPLINE	15T, 16/32 DP	1.81
B-B KEYED	1.000ø, 1/4 SQ. KEY	1.81
C SPLINE	14T, 12/24 DP	2.19
C KEYED	1.250ø, 5/16 SQ. KEY	2.19

Seals

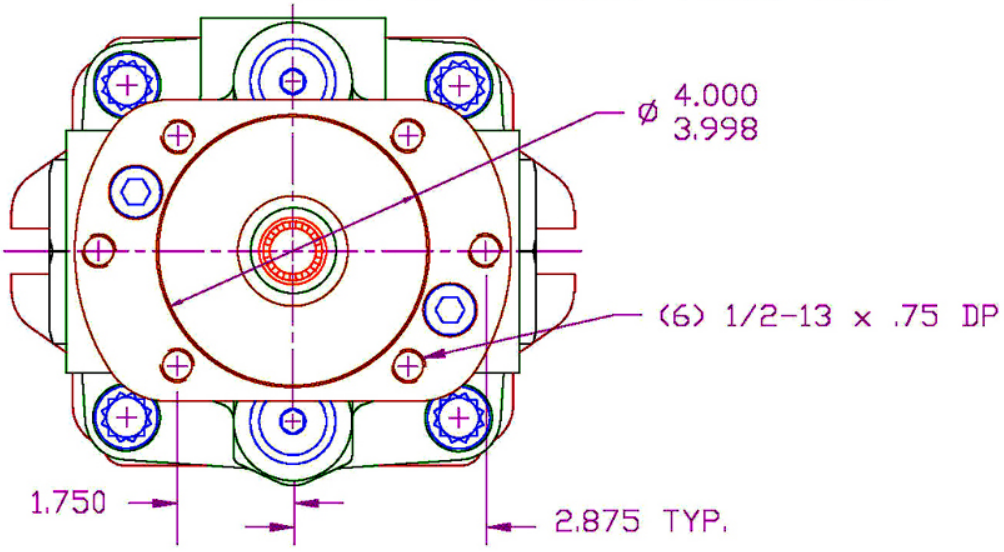
All PVC-series pumps are outfitted with Viton® shaft seals. If necessary, and/or when specifically requested, HCI Engineering/Service Departments can offer a different seal option, e.g., EPR, Buna N or more complex elastomers.

Tandem pumps

Side ported PVC pumps with trough drive option can be converted to tandem pumps by adding an adapter flange and shaft coupling to the rear pad in accordance with the changing needs and/or demands.



SAE A 2 BOLT ADAPTER



SAE B 2 AND 4 BOLT ADAPTER

Pump Priming and Startup

When starting a pump for the first time or after pump and system overhaul, the following guide should be referred to:

1) **Make sure the reservoir and all system equipment meet NFPA guidelines.**
2) **Make sure the system has been thoroughly flushed of all contaminants, cleansers and/or preservatives.**
3) **Fill pump case with hydraulic fluid.**
4) **Check direction of rotation on pump label and verify it against the direction of rotation of the prime mover. Damage may result to the unit if the directions of rotation do not match.**
5) **Make sure pump shaft turns easily.**
6) **Start prime mover. Idle system and allow all air to be purged from the circuit. Do not operate the pump at elevated pressure until the fluid circulated is free of foam and air bubbles.**
7) **Gradually apply load to the system permitting hydraulic fluid flow to challenge tightness of circuit connections.**
8) **Allow the system to reach normal operating temperature and verify proper operation of circuit cooler.**
9) **Gradually close the control valve in pump discharge line and observe on a nearby gauge pump-control pressure setting.**
10) **Adjust pump-control pressure and match it to relief valve preset level (200-250 psi above pump desired setting). Verify relief valve intactness.**
11) **Reset pump-control pressure to the desired setting.**
12) **Bring system to normal operating mode.**

CAUTION: Do not touch control adjustments during pump/system startup unless absolutely necessary, or if so advised by HCI engineer.