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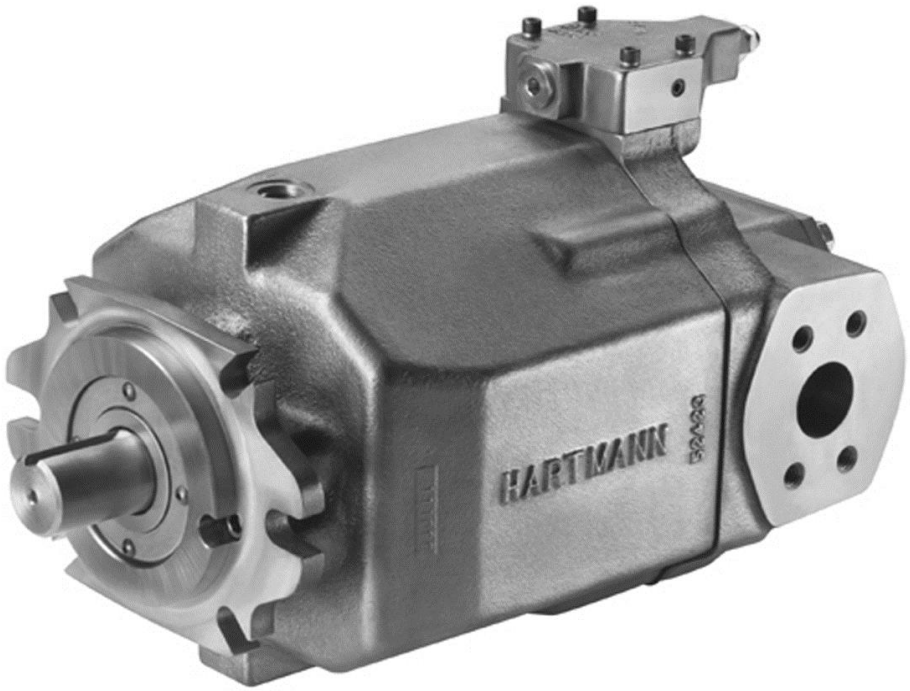
PUMPS - MOTORS - CONTROLS

Technical Information for PVX Series Pumps



Hydraulic pumps & motors with a hart of gold ™

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PVX pumps are designed for long and dependable service in both industrial and mobile applications. When incorporated into a well-planned and properly maintained hydraulic environment, pump(s) could be kept trouble free, thereby minimizing downtime of the system(s).

Hydraulic Fluids

PVX pumps are designed for use with standard petroleum-based hydraulic fluids. Special construction is available for use with water-based fluids or phosphate esters. Although, generally, 60/40 mixtures of water/glycol fluids may be regarded as equivalents to oils, one is encouraged to consult factory for specific 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:

PRESSURE (PSI)	ISO TARGET LEVELS	MICRON RATINGS
UNDER 2000	18/16/13	5
2000-2999	17/15/12	3
3000 & OVER	16/14/11	3

Operating

Elastomers, Viscosities and Operating Temperatures

PVX-series pumps are outfitted with Viton® made shaft seal and O-rings. Other elastomers may be offered if fluid type or operating conditions warrant. To obtain most favorable service life from both the fluid and the pump, the accepted temperature range should span -4°F (-20°C) at the lowest end and 175°F (80°C) at s the upper end. In that context, the optimal viscosity level should be 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. For extended limits or for non-petroleum-based fluid use, consult factory for details.

Inlet Conditions and Piping

The temperature of the fluid at the inlet to the pump should not exceed 140º F. Likewise, the temperature in the reservoir should be kept at or below 140º F. If needed, a cooling system should be utilized on the case drain and high-pressure return lines. For more elevated temperatures consult factory.

Strainers, screens and/or cooling grids, if installed in the tank, should be kept at least 1 foot 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). Suction hose, if used, must be wire reinforced to prevent its collapse.

The suction line should be bolted to pump flanged-port with four bolts, unless the model ordered has a straight thread. If the pump has a SAE, code 61, 4-bolt flanged port the following bolt assignment shall apply:

PVX PUMP MODEL		INLET PORT SIZE	BOLT SIZE & TYPE
110, 112, 114, 116, 118, 120 or 122 (Frame 0)		**SAE Straight Thread**	**NA**
116, 232, 348 or 360	**(Frame 1)**	**1.00" Ø**	**3/8-16 UNC-2B**
116, 232, 348 or 360	**(Frame 1)**	**1.25" Ø**	**7/16-14 UNC-2B**
116, 232, 348 or 360	**(Frame 1)**	**1.50" Ø**	**1/2-13 UNC-2B**
464 or 580	**(Frame 2)**	**2.00" Ø**	**1/2-13 UNC-2B**
696, 7112	**(Frame 3)**	**2.50" Ø**	**1/2-13 UNC-2B**
8128, 9144 or 10160	**(Frame 3)**	**2.50" Ø**	**1/2-13 UNC-2B**
11176 or 12190	**(Frame 3)**	**2.50" Ø**	**1/2-13 UNC-2B**
8128, 9144 or 10160	**(Frame 4)**	**3.00" Ø**	**5/8-11 UNC-2B**
11176 or 12190	**(Frame 4)**	**3.00" Ø**	**5/8-11 UNC-2B**

All connections must be airtight. For METRIC, code 61, 4-bolt flanged ports, consult factory.

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 valve drains or external returns to pump case-drain line as it may elevate the backpressure in the conduit beyond 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 a too high backpressure in 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, and (if feasible) a sequence valve be placed 3-6 ft downstream of the discharge port to prevent system back flow (reverse flow/pressure) effect and maintain the required minimal backpressure within pump architecture. PVX pumps require nominal backpressure at discharge port at all times, including during idle. When rating a check valve and/or sequence valve, the following guide should be consulted:

PVX PUMP FRAME SIZE	REQUIRED OVERALL BACKPRESSURE
0	**150 psi**
1	**250 psi**
2	**350 psi**
3	**400-450 psi**
4	**400-450 psi**

A relief valve is required in all applications to protect personnel and system elements from potentially damaging pressure overloads and spikes. A fast acting, directly operated unit is strongly recommended. The unit should be installed between pump outlet and check or sequence valve position. The relief valve should be sized to 10% above the maximum flow in the system, and adjusted to about 10-12% above the setting of pump pressure compensator, torque limiter, or the combination thereof. Yet, if the pump is governed by a remote compensator, a system relief valve is optional provided the adjusting relief control on the piloted line has a relief valve guard, preset at 250 psi above the operational envelope.

Pump Mounting Guide

Unless special orders are considered, all conventional PVX pumps are equipped with standard SAE coded mounts and drive shafts. When mounting and bolting a pump onto prime mover, the following guide should be consulted:

MOUNT CLASSIFICATION	NFPA POWER RATING	BOLT SIZE
SAE 'A' 2 bolts mount	**10 HP**	**3/8" Ø**
SAE 'B' 2 bolts mount	**25 HP**	**1/2" Ø**
SAE 'B' 4 bolts mount	**25 HP**	**1/2" Ø**
SAE 'C' 2 bolts mount	**50 HP**	**5/8" Ø**
SAE 'C' 4 bolts mount	**50 HP**	**1/2" Ø**
SAE 'D' 4 bolts mount	**100 HP**	**3/4" Ø**

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/through shaft torque should accord with the values recommended on the specification sheet of each pump model.

Operating Pressures

Continuous and peak pressure ratings of PVX series pumps are detailed on the respective specification sheets. 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:

$$P_{RMS}=[(P_1^2 \cdot t_1 + P_2^2 \cdot t_2 + \ldots + P_n^2 \cdot t_n)/(t_1 + t_2 + \ldots + t_n)]^{½}$$

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

Controls

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

Tandem pumps

Side ported PVX pumps with trough-drive option can be converted to tandem pumps by adding an adapter flange and shaft coupling to the rear pad. In addition, adapter flanges and/or shaft couplings can be ordered to readily resize the mounting pilot, bolting patterns and shaft input in accordance with the changing needs and/or demands.
Consult factory for details.

Pump Priming and Startup

When starting a pump for the first time or if the pump is about to be started after its or system overhaul, the following guides should be consulted:

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 tamper with pump null and volume control adjustments during pump/system startup, unless absolutely necessary, or if so advised by a HCI engineer.