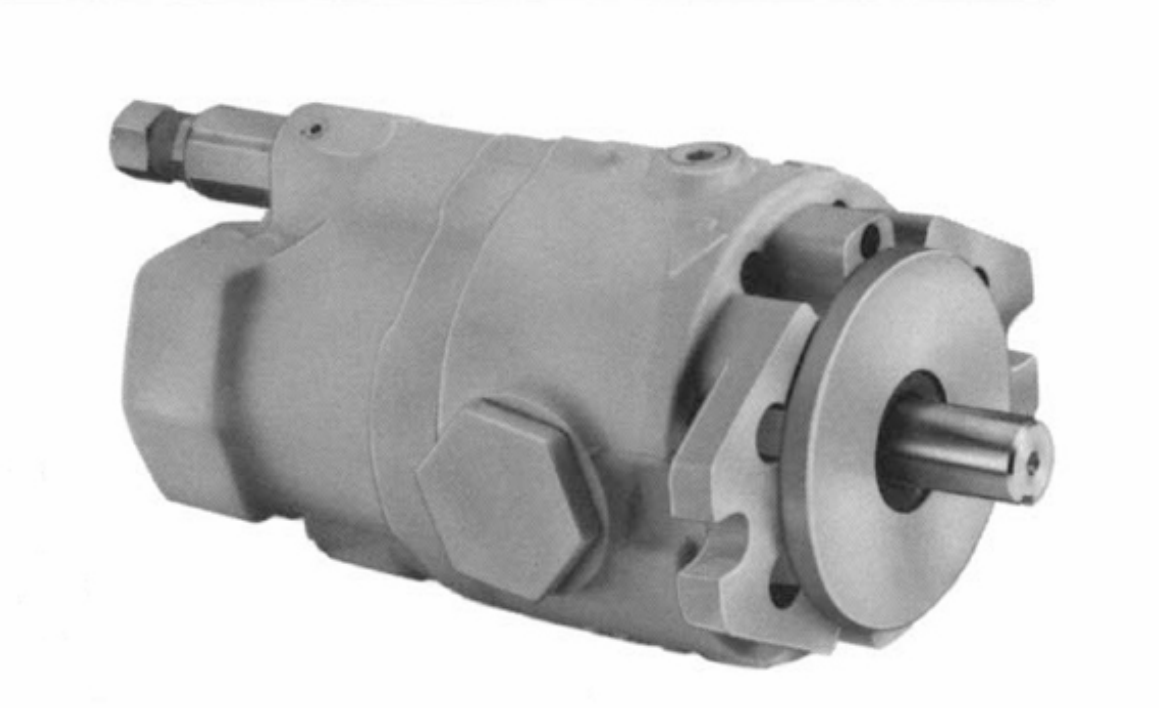
HARTMANN

PUMPS - MOTORS - CONTROLS

Technical Information for PV300/400 Series Pumps



Hydraulic pumps & motors with a hart of gold ™

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OPERATION AND MAINTENANCE INSTRUCTIONS

INTRODUCTION

This is your Owner's Service Manual for the Hartmann 300/400 series variable displacement, axial-piston, hydraulic pumps and motors. Included are brief instructions for mounting, operating, maintaining.

Before designing your circuit we recommend you read carefully Hartmann's Engineering Catalog. This designer's guide thoroughly explains all the technical data needed to properly apply your pump or motor. The designer's guide is full of information to help you insure smooth, efficient, and long-life operation.

A well planned and carefully maintained cleanliness program will help keep your pump—and other hydraulic components—trouble-free. Even small amounts of gum or sludge formed from oil oxidation, or contaminants like rust or dust, can cause trouble. This is one of the reasons for the emphasis on system cleanliness you will note as you read your manual.

We suggest you keep this manual in a convenient place for handy reference.

NOTE

Complete dimensions and mounting brackets are in the Hartmann Engineering Catalog.

PUMP MOUNTING

MOUNTING FLANGE. Bolt the pump with ½-13 UNC-2B bolts to either the Hartmann foot mounting bracket, the Hartmann flange mounting, or other mounting flange. Install the pump on your equipment.

INLET PIPING. The inlet (suction) line from the tank to the pump must be 1½ inches inside diameter. Using smaller lines will "starve" the pump of oil. Atmospheric pressure cannot provide oil velocities capable of feeding the pump with smaller pipe diameters. Pump malfunction, erratic operation, or damage may result. Here are some further installation guides:

1. Do not use street elbows, restrictive valves, low volume filters, or other "necked down" parts in the inlet line.
2. Keep inlet line as short and straight as possible. Air leaks in inlet line will result in pump damage.
3. Use a flooded inlet (tank above pump) when possible. Avoid oil levels that are over two feet below the pump inlet port.

DESCRIPTION

RATINGS

Speed:	1800 RPM
Pressure:	300 Series—4000 psi 400 Series—3000 psi
Temperature:	140°F. Inlet Fluid Max.
Fluid:	Mobil DTE 26 or Equal
Inlet:	All Pressure Compensated—50 psi Super Charged to 4″ Hg Vacuum All Others— 50 psi Super Charged to 6″ Hg Vacuum
Filtration:	200 Mesh (75 Micron) inlet strainer and 10 Micron return filters

MAXIMUM CAPABILITIES

Speed:	2400 RPM—300 Series 2200 RPM—400 Series
Pressure:	Up to 5000 psi depending on model
Temp:	180° F. Inlet Fluid depending on fluid and model
Inlet Vacuum:	Up to 6″ Hg depending on model

These MAXIMUM CAPABILITIES do not occur simultaneously. The Hartmann Engineering Department must be consulted before applying Hartmann pumps in the MAXIMUM CAPABILITY area. Please include all operating parameters so that we may be able to make a good judgment on the advisability of proceeding with a particular application that demands an operation in the MAXIMUM CAPABILITY area.

4. Use smooth bore, wire reinforced suction hose. Hose for the inlet may collapse if improperly selected.

PIPING CONNECTIONS. Bolt the lines to the pump port SAE flange with eight ½-13 UNC-2B bolts unless you've ordered a pump with special JIC straight threads. Make sure connections are leak tight.

CAVITY VENTING. The cavity return line from the pump must be ½-inch pipe or equal and must extend below the oil level in the reservoir. **CAUTION:** Do not connect any other drain or return lines to the pump cavity return line. Pressure on the pump cavity must not exceed 5 psi.

OPTIONAL PRESSURE TAPS. Two pressure taps are provided on your pump. These can be used for installing a pressure gauge to read either inlet or outlet pressures and temperature. The discharge side tap can also be used for purging the pump of air.

INSTALLATION CHECK LIST

CAUTION: Relief valves are necessary in all systems and should be set at 10% over the compensator setting. In systems using accumulators, a check valve must be installed between pump and accumulator.

1. Tank and equipment must meet proper guidelines. Make sure the system has been thoroughly flushed of all contamination. **CAUTION: Do not use the 300 or 400 series pump to do the flushing.**
2. 75-micron (nominal) high volume filter installed in inlet line.
3. 10-micron (nominal) filter installed in system return line, and case drain lines.
4. Inlet line, 1½" dia., should be smooth bore tubing, or wire inserted suction hose.
5. Outlet line bolted to pump outlet port. Connection leak tight.
6. Pump cavity filled with oil (oil viscosity 100 to 300 SSU at 100° F).
7. Cavity vent line connected to cavity return port and submerged in oil in tank; ½ inch pipe or equal. Make sure this is a separate, non-restricting line.
8. Pump bolted securely in place.
9. Pump shaft rotation correct. Damage may result if reversed. Rotation is viewed from shaft end of pump.

OPERATION

BEFORE STARTING

- If pump cavity has not been filled with oil, fill it with oil.

CAUTION

Pump cavity must be full before starting pump. Cavity vent line must be submerged below oil level in reservoir.

- Check to see that all connections are tight.
- Make sure all valves are open to permit free circulation of oil from tank through the pump and back to the tank.
- Make sure pump shaft turns easily.
- Make sure machine controls are neutral and oil being pumped is free to return to tank.
- Pump discharge must be open to atmospheric pressure to prime pump.

INITIAL STARTING

CAUTION

The initial operation is the most critical time for pump damage. During this start-up time all air must be removed from system components and the oil. Do not operate the pump at high pressure until the oil being circulated is free from foam and air bubbles. You can check this by watching the oil flow in the tank. If you attempt to operate at pressure with air in the system, the air may be compressed in the pump on the pumping cycle and decompressed on the intake cycle without leaving the pump. This condition generates heat, results in poor operation and causes galling and seizing of internal pump parts.

- Make sure oil is circulating freely to and from pump.
- Check all connections-especially suction line joints for leaks.
- Make sure shaft is rotating in correct direction.
- Check control adjustments. Adjust if necessary, as follows:

INITIAL ADJUSTMENT

Models MF300, MF400

FIXED DISPLACEMENT MOTORS

Fixed displacement motors cannot be regulated. The displacement (flow rate) is determined by the angle of the reaction plate support and the drive speed. They are normally set for maximum displacement, but can be supplied on special order set for reduced displacement.

The output torque of a fluid motor is a function of the pressure and displacement. Generally they should be used where the torque requirements are fairly constant throughout the speed range of a particular application. Under all operating conditions the oil pressure at either port must not fall below atmospheric pressure.

Drive shaft rotation is bidirectional (oil flow can be reversed). A pressure relief valve must be incorporated into the circuit.

Models PF300, PF400

FIXED DISPLACEMENT PUMPS

Fixed displacement pumps cannot be regulated. Unlike the motors, the pump drive shaft rotation is unidirectional (oil flows in one direction only). A pressure relief valve must be incorporated into the circuit.

Models PV310, PV410

HANDWHEEL CONTROL

The external handwheel control manually regulates the flow from zero to maximum delivery by means of a threaded extension that is used to position the angle of the reaction plate. Changing this angle controls the length of the piston stroke, thereby increasing or decreasing displacement of the pump. Rotating the handwheel one turn results in approximately 1° change in the angle of the reaction plate. One turn of the handwheel changes the flow approximately 1.5 gpm at 1800 rpm (5.7 L/min at 1800 rpm) on the PV310 series pump and 2.0 gpm at 1800 rpm (7.6 L/min at 1800 rpm) on the PV410 series pump. A pressure relief valve must be incorporated in the circuit.

Models PV320 and PV420

STANDARD PRESSURE COMPENSATOR CONTROL

Compensator pressure is adjustable from 500 psi to the maximum design pressure of the unit. When the control has been set at the desired pressure, the pump will automatically deliver maximum flow until the preselected pressure has been reached. It will then automatically reduce the pumped volume to the amount necessary to maintain this pressure setting. The response of the compensator system is typically 130 milliseconds, no flow to full delivery. Relief valves are desirable in all systems and should be set at 10% over compensating pressure.

When using accumulators in a hydraulic system, a check valve must be installed between pump and accumulator to prevent instability.

NOTE

Your pump has been set at the factory for 24 gpm (PV320) and 32 gpm (PV420) at 1750 rpm (maximum flow condition) and to compensate at 1500 psi pressure (pressure adjustment).

Turn the volume limit adjustment clockwise with an allen wrench to decrease maximum delivery; counter-clockwise to increase maxiumum delivery. Turn the pressure adjustments clockwise to increase system pressure; counter-clockwise to decrease system pressure.

NOTE

The adjustment nut is marked for proper identification; P, pressure compensation adjustment, and V, volume limit adjustment.

CAUTION

DO NOT back out volume limit screws too far. The cam reaction plate may then ride against the pump case causing extensive damage. Adjustments should be made only with complete instrumentation to monitor the extent of the adjustments.

Models PV324, PV424

REMOTE PRESSURE COMPENSATOR CONTROL

The remote pressure compensator control is designed for those applications where frequent adjustment of the compensating pressure and/or multiple pressure control circuits is desired. It adjusts pump delivery automatically to meet system flow requirements while maintaining the pre-selected pressure.

The remote compensator can be used in a two pressure (hi-low) circuit by adding a two-way valve between the pilot line to the remote relief valve and reservoir. When the two way valve is open, system compensating pressure is determined by the spring setting in the compensator valve. When the two-way valve is closed, system pressure increases to the sum of the spring setting and the setting of the remote relief valve. Additional two-way valves and relief valves connected in a series between the pilot line and the reservoir can be included to obtain intermediate pressure settings. Distances between pump and control of 50 feet or less can be used without affecting pump response time. For systems that require distances from pump to control in excess of 50 feet, contact the factory.

Models PV330, PV340; PV430 and PV440

REMOTE HYDRAULIC OR MECHANICAL CONTROL

Remove each nut with a ¾-inch wrench while holding jam nut with a ⅞-inch wrench. Loosen jam nut. Turn the volume limit adjustment clockwise with an allen wrench to decrease maximum delivery; counter-clockwise to increase maximum delivery.

DURING OPERATION

To be sure your drive unit does not exceed maximum recommended speed even under governor surge conditions, check rpm with a tachometer. Excessive speed will damage the pump. For maximum life keep maximum intake temperature below 140°F.

If problems occur during pump operation, refer to trouble-shooting chart for corrective action.

Models PV325, PV425

LOAD-SENSING CONTROL (FLOW COMPENSATOR)

The constant volume control responds to a pressure drop across an orifice and can be used effectively in two different control modes.

In one system let's assume, the requirement is to provide a constant flow of 10.5 gpm regardless of pump input speed within the limits of the pump. This system will use a fixed orifice sized at 10.5 gpm at 150 psi pressure drop. The PV325 pump will deliver 8 gpm at 600 rpm; and the PV425 pump, 10.5 gpm at 600 rpm. At maximum pump speed the reaction plate will be a relatively small angle to deliver this fixed flow. As pump speeds decrease, the pressure drop across the orifice falls resulting in the pump control repositioning the reaction plate at a larger displacement to maintain constant flow into the circuit.

Note: As speed decreases torque increases if discharge flow and pressure remain constant.

The other system involves a remote variable flow requirement. This system operates on the same principles as outlined above except a variable orifice is used. As the orifice is varied the reaction plate will assume an angle to satisfy the 200 psi pressure drop requirement across the variable orifice.

With a given orifice, and from no load to full load, the pump will provide a constant flow within ± 10%. **A relief valve is required in all systems.**

MAINTENANCE

The most important maintenance to assure trouble-free pump operation—in fact trouble-free hydraulic systems—is to maintain the system in a clean condition. Obviously sludge, water, dirt, or contamination of any kind can cause trouble. Many of the problems noted in the field could have been prevented by maintaining system cleanliness.

Periodically check the oil to determine when the oil should be replaced. Frequency of replacement will depend on the operating conditions. If oil is drained at the proper time, any subsequent cleaning of the system will be easier.

After draining, clean filters and strainers, remove sediment from oil tank. If necessary — when the system is heavily sludged — flush and clean the entire system, but **do not use your Hartmann pump as a flushing pump.**

Establish and maintain a schedule for changing filters and oil.

TROUBLE SHOOTING

Problem	Probable Cause	Remedy
A. Pump doesn't deliver oil.	1. Pump may be air bound.	1. Bleed air from system.
	2. Low oil level in reservoir.	2. Add oil. Check to see suction line is submerged.
	3. Suction filter plugged or too small.	3. Clean filter or replace.
	4. Air leak in suction line.	4. Repair leaks.
	5. Oil viscosity too heavy.	5. Use lighter viscosity oil.
	6. Wrong shaft rotation.	6. Correct immediately or pump will be damaged.
	7. Dirt in pump.	7. Clean system.
	8. Attempting to prime against back pressure.	8. Prime pump correctly.
B. No pressure in system.	1. Pump not delivering oil.	1. Follow remedies in A.
	2. Relief valve not functioning correctly.	2. Repair or replace valves.
	3. Free re-circulation of oil to tank being allowed through system.	3. Directional valve or other return line may be in open position unintentionally.
	4. Internal leakage in control valves or cylinders.	4. Block off various parts of circuit. Find trouble, repair.
C. Pump making noise.	1. Clogged inlet line or filter.	1. Clean inlet. Be sure suction line is open.
	2. Air leaks - at pump intake.	2. Pack grease on joints while listening for change in sound of operation. Tighten joints.
	3. Air drawn in inlet pipe.	3. Make sure suction line is below oil level. Add oil.
	4. Reservoir air vent plugged.	4. Atmospheric pressure must be free to force oil into pump. Clean or replace air breather.
	5. Pump running too fast.	5. Check drive speed. Do not exceed max. recommendations.
	6. Filter too small.	6. Use large capacity filter.
	7. Rag, paper, etc., pulled into inlet line.	7. Remove.
	8. Coupling misalignment.	8. Realign.
	9. Pump damage.	9. Return pump to factory for repair.
D. Oil leakage around pump.	1. Seals damaged at shaft or between housings.	1. Replace seals.
	2. Case drain not piped or piped improperly.	2. Pipe properly according to pump mounting instructions, pages 1 and 2, this manual.