



P.O. Box 2068 | Streetsboro, Ohio 44241 | 330.626.2801
support@permco.com

Gear Pumps

Common Hydraulic Gear Pump Installation Practices

1. The vehicle or equipment must be securely "locked out" before any work is performed on the hydraulic circuit.
2. If application is equipped with a Power Take Off (PTO), follow PTO/Truck Chassis Manufacturers Guidelines for PTO connection(s) to ECMs/TCMs to control operating parameters. Prior to PTO engagement, ensure the pump has unobstructed oil supply!

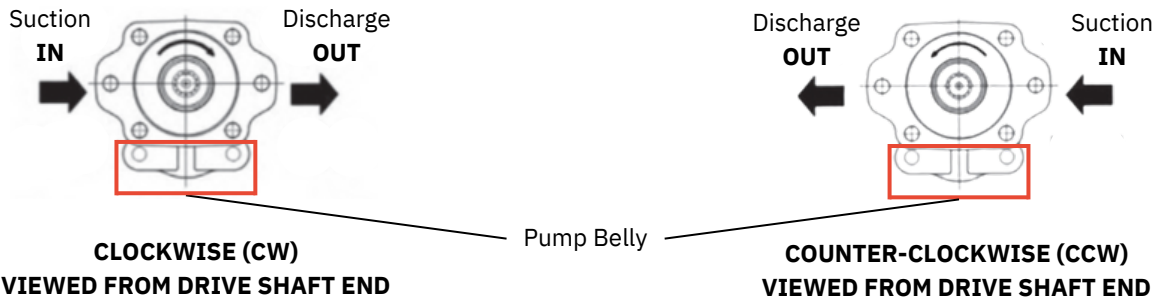
Determining Pump operating RPM (=GPM), Pump rotation, and Pressure requirements

- Verify the Gallons Per Minute (GPM) required for the application. Review the pump's flow cubic inch displacement (CID) and calculate the PTO % and operating Engine RPM to determine the output of hydraulic GPM flow. If replacing a pump on an existing system, review and compare pump sizes to ensure compatibility.

Example: $6.43 \text{ Pump CID} \times 1000 \text{ Engine RPM} \times 120\% \text{ PTO Ratio} = 7716 \text{ CID}$. $7716 / \text{by } 231 \text{ (cubic inches in a gallon)} = 33.40 \text{ GPM}$ (Theoretical Flow). Adjust Theoretical Flow by 12-15% for Actual Flow. $33.4 \times .85 = \text{approximately } 28.40 \text{ Actual Flow}$

Step 1		Step 2		Step 3	
Engine RPM	1000	Pump Displacement	6.43	Total CID =	7716
PTO %	$\times 120$	Pump RPM	$\times 1200$	CID to Gallons $\div 231$	= 33.40 GPM "Theoretical Flow"
Pump RPM	= 1200	Total CID	7716	Adjust for Actual Flow $\times .85$	= 28.40 GPM "Approx. Actual Flow"

- Confirm Pump operating rotation and ensure it's correct with the PTO or power source rotation. Note: Pump Shaft must be opposite rotation of PTO or power source when looking directly into the shaft(s). Review the plumbing diagrams below for correct suction and pressure port locations. This applies to both uni-directional and bi-rotational pumps.
- Determine rotation and port identification:
 - Looking at the shaft end, belly down, suction is on the left = Clockwise (CW)
 - Looking at the shaft end, belly down, suction is on the right = Counterclockwise (CCW)
 - Bi-rotation Pumps have equal size ports but must be plumbed correctly.
 - See drawing below for rear and side port functions.



- Hydraulic Pumps DO NOT create Pressure. Pressure is a result of "restriction of flow".
- Hydraulic Pumps do have a Pressure limit or maximum. It's important to understand the equipment's "working AND maximum pressure" requirements for proper function. Confirm pump maximum pressure rating is not exceeded. Relief Valve must be used for system component(s) protection. Relief Valve PSI setting to be 200 PSI below any system component pressure maximum limit.
- Pump mounting and support - Traditionally, pumps over 40 pounds or longer than 12" require rear pump support. Consult with the PTO or power source manufacturer for specifics.

MOUNTING INSTRUCTIONS – DIRECT MOUNT

- Direct mount Pump mounts directly to a PTO output flange or drive motor/equipment.
- Ensure the Pump Flange and mounting Flange of PTO are both clean and free of debris.
- Apply anti-seize grease to PTO shaft before mounting Dump Pump. Re-apply annually or sooner for severe duty applications.

MOUNTING INSTRUCTIONS – REMOTE MOUNT VERSION

- Remote mount Pumps can be mounted in a location that is accessible for a driveshaft to turn the pump.
- Consult driveline manufacturer for proper shaft sizing and "Working Angles".

NOTE: When replacing an existing pump, always filter or replace hydraulic fluid to remove contaminants.

Hydraulic System Components; Hoses, Reservoir, Fittings, Filtration and Oil

Hose Selection Recommendations

Hose PSI rating must be higher than system operating pressures.

ORB Fittings preferred for improved sealing and fitting orientation.

	SAE 100R4 Suction Line	SAE 100R2 Pressure Line	SAE100R1 Return Line
• up to 10 GPM	1"	1/2"	5/8"
• up to 20 GPM	1-1/4"	5/8"	1"
• Up to 25 GPM	1-1/2"	3/4"	1"
• up to 30 GPM	1-3/4"	1"	1-1/4"
• up to 40 GPM	2"	1"	1-1/4"

Reference Source: "The Fluid Conveyance Handbook" (Click Here)

Do not use Teflon Tape as a thread sealant. The use of Teflon Tape will void all warranties expressed or implied for this product. High Performance Thread Sealants are recommended; ex.: Loctite or Permatex. High Pressure hoses are not to be used for Suction Hoses. Suction Hose T-Bolt Clamps recommended to prevent aeration.

Hydraulic Oil

- Hydraulic fluid/oil provides energy transmission, lubrication and the ability to transfer heat in a hydraulic system.
- Hydraulic systems are designed to operate below 160 °F. Higher temperatures can cause premature component wear and damage.
- Various types are available. The selection process includes the weight of the oil, ambient working temperatures and anti-wear characteristics.
- ISO 32 or 46 is commonly used in Gear Pump hydraulic systems. Consult with the equipment manufacturer for more specific guidelines.
- Hydraulic Oil does have a defined life period depending on use, filtration, component wear and maintenance. Bulk Oil suppliers are a good source to have oil samples tested.

Hydraulic Fittings

- Fitting selection includes matching the pump and hydraulic components thread types; NPT or SAE/ORB.
- SAE/ORB has advantages for sealing and fitting orientation. NPT offers slightly higher flow.
- NPT fitting torque values not to exceed: 1" (130 ft. lbs.), 1-1/4" (160 ft. lbs.), and 1-1/2" (190 ft. lbs.). NPT Fittings are tapered thread and will cause damage (fractured ports) to pumps and other components if over torqued.
- System design should limit the number of fittings to reduce leak points and increased heat.
- 90 degree fittings cause increased heat from oil turbulence.
- Full Flow Ball Valves installed on suction lines must be Zip Tied open during pump operation.
- High Performance Thread Sealants are approved. Examples: Loctite 5452 or Permatex with PTFE

Filtration Basics

- Hydraulic Pumps and other system components require proper filtration. Common Roller Bearing Gear Pumps require a minimum of 25 Micron filtration. Sleeve Bushing Gear Pumps require at least a 10 Micron filtration.
- Ensure the flow rating of the filter exceeds the GPM of the system. Cylinder applications need to have filtration flow ratings that match the GPM during retraction.
- Install filtration on the system's return line to reservoir, as the larger size of the Return Hose slows the velocity or speed of the oil.
- The In line Filter Assembly is generally ONE WAY flow. Check the inlet and outlet flow direction.

Reservoir Basics

- The volume of system hydraulic oil is commonly 1.5 times the System GPM Flow requirements (*example: 20 GPM would need 30 gallons of hydraulic oil*). Hydraulic reservoir should have a storage capacity of at least 10 additional gallons.
- Internal baffle, with separated inlet and return ports
- Vented at top of the reservoir
- Reservoirs are not designed or intended to dissipate heat. Motor Circuits will create high amounts of heat. Hydraulic Systems with oil temperature above 180 °F will cause pump and component failures.
- Polyethylene Reservoirs are not recommended for continuous duty systems.