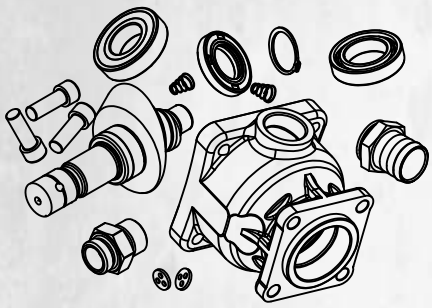
PUMP INSTRUCTION



PUMP INSTALLATION & OPERATOR'S MANUAL

ESSENTIALS

Hydraulic Fluids

We recommend using fluids based on mineral oil; in particular, when selecting the fluid, the compatibility with all the systems elements must be considered. A good quality anti-foaming petroleum based fluid with anti-emulsion and anti-wear additives is recommended. Do not use automatic transmission fluid (ATF), biodegradable oil, or fire resistant fluids due to the poor lubricating properties.

Fluids HL/HM/HV (according to ISO 6743-4). These fluids are the most common fluids in the hydraulic systems. They contain anticorrosion, anti-fretting and anti-oxidation components. Avoid using mixtures of different oils, which could result in decomposition and reduction of the oil's lubricating power.

For mineral oils the viscosity at the beginning should be;

- For gear pumps ≤ 1300 cSt
- For piston units ≤ 1000 cSt

During operation a minimal viscosity of 10 cSt is required. The optimal operation range is reached with the viscosity 40 - 15 cSt.

The viscosity of the hydraulic oil drops (the oil becomes thinner) when the temperature rises. An ideal choice is an oil with a high viscosity index (VI). A higher VI gives less viscosity variation when the temperature changes.

- At a viscosity higher than 1500 cSt (limit for cold start) the pump cannot suck in oil.
- At a viscosity lower than 10 cSt the lubrication capacity is insufficient. System efficiency will also be impaired.
- When there is a risk of the oil temperature in the oil tank exceeding 60 °C, an oil cooler must be used.
- Pumps can manage a start temperature as low as -40 °C (because the material in the seals is heated by friction immediately).

Oil viscosity reference: cold climate - 22cST, medium climate - 37cST, hot climate - 46cST. During cold weather, oil may thicken and not flow properly into the pump resulting in cavitation damage. Allow oil to warm up at slow speed.

Lines

The lines must have a major diameter, which is at least as large as the diameter of pump ports, and must be perfectly sealed. To reduce loss of power, the lines should be as short as possible, reducing the sources of hydraulic resistance (elbow, throttling, gate valves, etc.) to a minimum. A length of flexible tubing is recommended to reduce the transmission of vibrations. All return lines must end below the minimum oil level, to prevent foaming. Before connecting the lines, remove any plugs and make sure that the lines are perfectly clean.

- Choose a large-bore suction line of the shortest possible length to avoid cavitation
- Choose large-bore pressure and return lines so as to avoid pressure losses (heat generation)

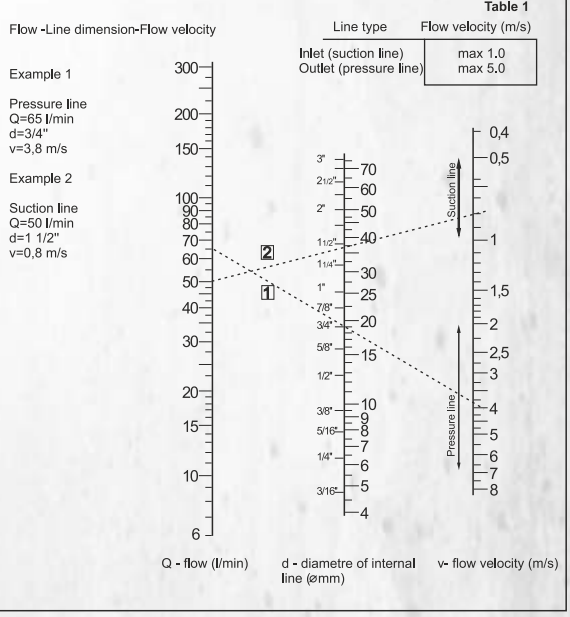
In order to obtain sufficient inlet (suction) pressure to the pump, low noise level and low heat generation, flow velocity shown in table 1 should not be exceeded.

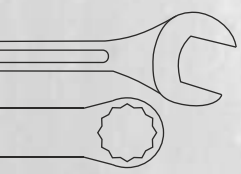
How to use nomogram: Determine the proper flow (Q) your system requires, then connect a straight edge from the selected flow rate to recommended velocity range. The required hose size will appear at the intersection of straight edge and the center column. If the straight edge passes through the scale between sizes listed, use the next larger hose. (See examples)

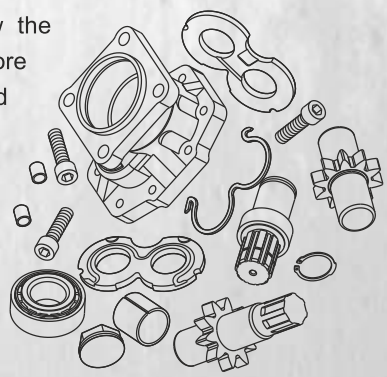
Nomogram

Table 1

Line type	Flow velocity (m/s)
Inlet (suction line)	max 1.0
Outlet (pressure line)	max 5.0







Oil tank

Oil volume

- At least equal to the oil flow (l/min.) with short working cycles e.g. tipper operations
- At least 1,5 times the oil flow with long working cycles e.g. a forestry crane
- At least twice the oil flow in continuous operation

The following will be required to prevent foaming:

- Return filter with canister
- Air filter
- Large ventilated area
- Long distance between suction and return connections

The upper side of the tank must be sealed so that water cannot run in. The tank should preferably be placed so that the oil level is higher than the pump.

Water in the hydraulic oil

- Corrosion on component surfaces
- Breakdown of the hydraulic oil
- The lubrication performance deteriorates and wear increases
- Ice formed at freezing temperatures may clog up the system

Oil filling - Oil changing

- New hydraulic oil in a drum has too high impurity. Filling should therefore be done with the help of a filter unit or through the oil tank's return filter
- Do not mix oil of a different quality, viscosity or brand. This will impair the technical properties of the oil
- In the event of a pump breakdown: Change the oil or pass it through the filter unit and replace the filter cartridge before putting the pump back into service. The oil should be changed about every 1000 running hours, though at least once a year. Change the filter cartridge as well

Filters

We recommend filtering the entire system flow. Investing in cleanliness is worthwhile:

- Halving of the amount of particles doubles component life
- Halving of the amount of particles reduces the degree of malfunction by half

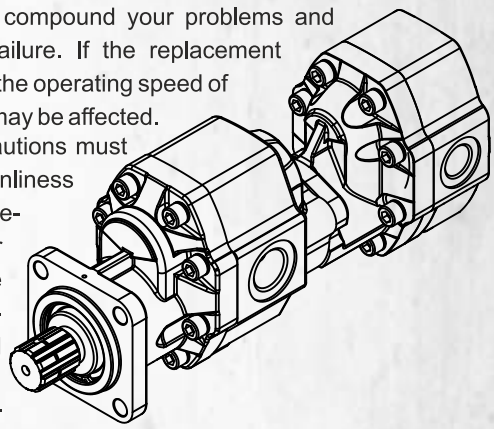
To conform to most market demands on operating reliability and life span the impurity level of the oil should correspond to class 18/16/13 as set out in ISO 4406. Consequently, the hydraulic system is equipped with a return filter and air filter with a degree of filtration equal to 10µm absolute. Furthermore, the hydraulic system should be equipped with a pressure filter if necessary. Changing the filter: First change after 50 hours of operation. Then whenever the filter pressure indicates too high a pressure at the normal operating temperature for hydraulic oil. A good rule is to change the air filter at the same time.

Storage

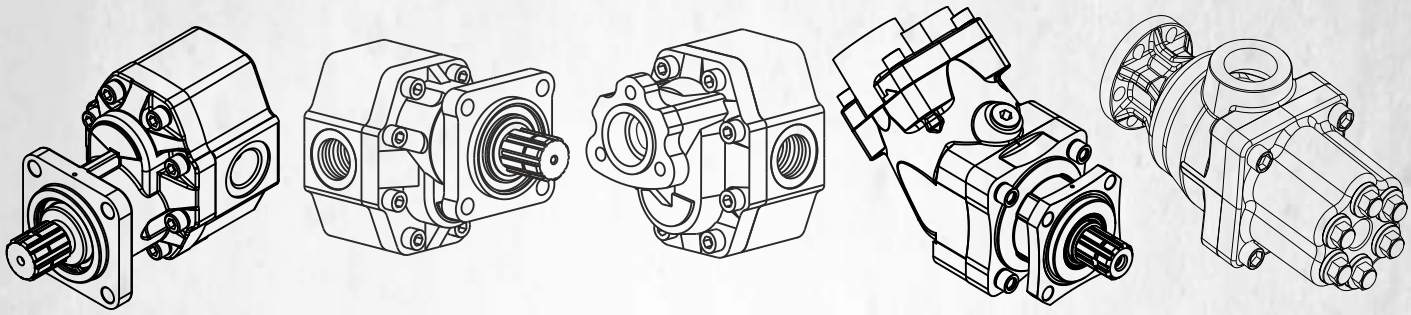
The storage must be in a dry environment. The ideal storage temperature is between 5°C (41°F) and 20°C (68°F).

Mounting, operation and maintenance of hydraulic pumps

Mounting



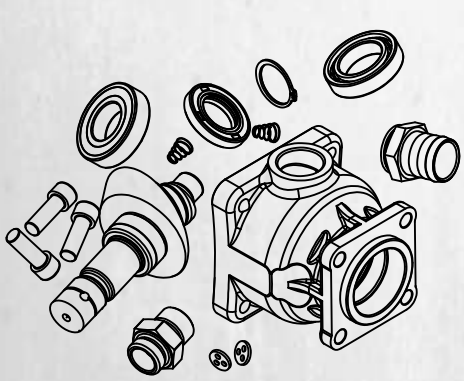
- Be sure that this installed pump is of the correct displacement (flow rate) and pressure rating to operate your equipment. Substituting a larger pump for the smaller original pump may only compound your problems and result in early failure. If the replacement pump is smaller, the operating speed of your equipment may be affected.
- Necessary precautions must be taken for cleanliness of the pump; especially the inner parts must be clean during installation and operation.
- Be sure to completely clean the hydraulic system. The oil should be drained and the reservoir should be completely wiped clean. The filter should be changed and the hydraulic lines cleaned.
- Fill the oil tank with clean new hydraulic oil of the correct viscosity for your operating environment
- Pump direction should be opposite with the direction of the PTO. The pump must not be run at reverse direction.
- The pump can be mounted in any position with the input shaft horizontal. Make sure the mounting bolts and connections are tight prior to startup. The reservoir oil level should be higher than the pump inlet. This will enhance inlet feed conditions and initial pump priming.
- When routing and plumbing the inlet side of the pump, avoid sharp bends of any type. Smooth sweeps will help prevent restrictions to the pump.
- Cycle system under no load conditions to purge any entrained air.
- Pump Inlet. Due to the nature of design and operation of a piston pump, care must be taken to prevent operation at high vacuum conditions. The piston pump is more susceptible to damage and premature wear than a typical gear pump due to design, tighter tolerances, and numerous contact surfaces. All inlet connections must be air tight to prevent the possibility of drawing air into the inlet oil and to prevent the draining of oil out of the inlet line when off.

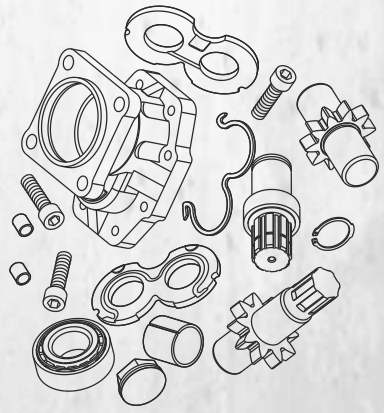


Startup, operation and maintenance

With the system installation complete and the tank filled with clean oil, the following is recommended:

- Equipment, which is working by electricity, must be checked for the convenience of feed voltage and current.
- Prior to startup, be sure that suction line and inner of the pump is filled with the oil. Avoid running of pump without oil during startup.
- During startup all suction lines should be open.
- Start vehicle and let engine idle with pump running at no load for approximately five minutes to purge air out and flush out contaminates. Look for leaks or any other problems.
- Do not run pump longer than 30 seconds if it does not prime itself.
- Cycle system to fill with oil and to purge air from the system. Monitor oil level and refill as needed. Look up for leaks or any other problems.
- Once system is filled and air purged, set relief valve(s) as needed.
- At the first action while the cycle is starting to fill, oil level in the tank should not drop under normal level. If there is an important decrease at the fluid level of the tank, additional oil must be added until normal level.
- Pressure adjustment is done while pump is running in normal revolution. Increase pressure slowly. After adjustment, be sure that someone else cannot re-adjust the pump.
- After short revolution, check the system for leaking of oil and temperature of oil.
- Routine controls (oil level and impurity, temperature, filters as well as lines etc.) should be done during operation of system. Check troubleshooting list for any case.
- Change the filter again after the first week of service and thereafter according to the indicator gauge on the filter.
- Pump maintenance is done based on user's experience in accordance with operation conditions.





PUMP TROUBLESHOOTING GUIDE

Condition	Likely cause	Correction
No oil flow from pump	No oil in oil tank	Fill oil tank with approved fluid.
	Closed shut-off valve	Open valve
	Air lock in pump inlet hose	Use compressed air to pressurize reservoir while running pump or fill inlet hose with oil from the pump end
	Pump is wrong rotation for application	Replace or re-configure pump to correct rotation
	Hoses are reversed	Change inlet and pressure hose locations
	PTO not engaged	See "PTO Troubleshooting"
	Pump worn or damaged	Repair or replace pump
Pump will not build/hold pressure	Relief valve improperly set	Adjust relief valve to manufacturers specification.
	Relief valve stuck open	Remove, clean, and re-set to specification
	Pump worn or damaged	Repair or replace pump
Pump is noisy	Aeration (air in system)	See "Oil foaming"
	Cavitation (Cavitation is caused by excessive vacuum at the pump inlet.Test with a vacuum gauge at theinlet port. Gauge should register under 5 Hg/in. at normal operating speed and temperature.)	Increase inlet hose size. Re-route inlet hose. Check for kinked or collapsed inlet hose. Check for clogged reservoir breather or strainer
Pump leaks; At shaft seal	Dirt under seal	Replace seal. Examine pump shaft for scoring
	Damaged seal or pump body.	Replace seal or body section.

PUMP TROUBLESHOOTING GUIDE

Condition	Likely cause	Correction
Pump leaks; At shaft seal	Improperly fitted seal	Replace seal
Pump leaks; At body section	Damaged o'ring or body	Replace o'ring or body section
	Improper torquing of bolts	Torque to specification
Pump leaks; At pump port (Do not use Teflon tape on pipe thread fittings!)	Loose fitting	Tighten fitting
	Damaged fitting	Replace fitting
	Damaged pump body	Replace body section
Pump is hot. (Oil temperature should not exceed 60° C {140° F})	Low oil level	Fill tank
	Tank is too small	Increase tank size
	Dirty oil	Replace oil and filter
	Relief valve stuck open	Remove, clean and reset
	Relief valve improperly set	Adjust relief valve to manufacturer's specification
	Pump too large for application	Review application.Replace with correct model.
	Undersized system component	Review application.Replace with correct model.
	Improper weight oil	Replace with correct oil
Oil foaming	Loose inlet fitting	Tighten fitting
	Damaged shaft seal	Replace seal
	Leak in inlet hose	Replace hose
	Improper tank baffle	Install baffle or diffuser

WERA
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