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*Electric-Powered*  
**400 Series  
Hydraulic Pump**





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## Description

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*The 400 series hydraulic pumps are designed to have a maximum of 690 bar (10,000 psi) at a flow rate of 6,554.8 cc/min (400 cu. in/min). A pump can be valved for use with either single- or double-acting cylinders. All pumps come fully assembled, less fluid, and ready for work.*

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## PE400-Series Electric / Hydraulic Pumps

### Electric Motor

The electric motor on the PE400 series is available in a 1.1 kW (10 hp,) 208/230/460 volt 60 Hz, 3-phase. It is also available in 220/380V, 50Hz and 575V, 60Hz. The weight can be up to 290kg (639 lbs).



**Figure 1. Electric Motor**

# Control Valves

Max. Capacity: 690 bar (10,000 psi)

	Valve Function	Use with Cylinder Type	Valve No.
PE4004	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p><b>Position "A"</b></p> <p>From Pump To Tank</p> </div> <div style="text-align: center;"> <p><b>Center Position</b></p> <p>From Pump To Tank</p> </div> <div style="text-align: center;"> <p><b>Position "B"</b></p> <p>From Pump To Tank</p> </div> </div>	Double-acting	9506 4-way advance hold return
	<b>Diagrams</b>		
PE4004S	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p><b>Solenoid "A" ON</b></p> <p>From Pump To Tank</p> </div> <div style="text-align: center;"> <p><b>Solenoid "A/B" OFF</b></p> <p>From Pump To Tank</p> </div> <div style="text-align: center;"> <p><b>Solenoid "B" ON</b></p> <p>From Pump To Tank</p> </div> </div>	Double-acting	9512 4-way solenoid advance hold return
	<b>Diagrams</b>		

**Table 1. Pump Configurations**

# Safety Symbols and Definitions

The safety signal word designates the degree or level of hazard seriousness.



**DANGER:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



**CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

**CAUTION:** Used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

**IMPORTANT:** Important is used when action or lack of action can cause equipment failure, either immediate or over a long period of time.

## Safety Precautions



### WARNING:



- The following procedures must be performed by qualified, trained personnel who are familiar with this equipment. Operators must read and understand all safety precautions and operating instructions included with the pump. If the operator cannot read these instructions, operating instructions and safety precautions must be read and discussed in the operator's native language.

- These products are designed for general use in normal environments. These products are not designed for lifting and moving people, agri-food machinery, certain types of mobile machinery, or in special work environments such as: explosive, flammable, or corrosive. Only the user can decide the suitability of this product in these conditions or extreme environments. Power Team will supply information necessary to help make these decisions. Consult your nearest Power Team facility.



- Safety glasses must be worn at all time by the operator and anyone within sight of the unit. Additional personal protection equipment may include: face shield, goggles, gloves, apron, hard hat, safety shoes, and hearing protection.



- The owner of this tool must ensure that safety-related decals are installed, maintained, and replaced if they become hard to read.



- Shut OFF the motor before opening any connections in the system.
- The guide cannot cover every hazard or situation so always do the job with SAFETY FIRST.

### Pump



### WARNING:

- Do not exceed the hydraulic pressure rating noted on the pump nameplate or tamper with the internal high pressure relief valve. Creating pressure beyond rated capacities can result in personal injury.
- Retract the system before adding fluid to prevent overfilling the pump reservoir. An overfill can cause personal injury due to excess reservoir pressure created when cylinders are retracted.
- The load must be under operator control at all times.

## Safety Precautions continued

- Do not connect pump to hydraulic system powered by another pump.

### Electric Motor



#### WARNING:



- Electrical work must be performed and tested by a qualified electrician per local directives and standards.
- Disconnect the pump from the power supply and relieve pressure before removing the motor case cover or performing maintenance or repair.
- Check the total amperage draw for the electrical circuit you will be using. *For example: Do not connect a pump that may draw 25 amps to a 20 amp fused electrical circuit.*
- Never use an ungrounded power supply with this unit.
- Changing the voltage is an involved and, if incorrectly performed, hazardous procedure. Consult the manufacturer for specific information before attempting rewiring.
- Wire pump motors for counterclockwise rotation when viewed from the shaft end of the motor.



- Do not attempt to increase the power line capacity by replacing a fuse with another fuse of higher value. Overheating the power line may result in fire.
- Exposing electric pumps to rain or water could result in an electrical hazard.
- Avoid conditions that can cause damage to the power cord, such as abrasion, crushing, sharp cutting edges, or corrosive environment. Damage to the power cord can cause an electrical hazard.

### Hoses



#### WARNING:



- Before operating the pump, tighten all hose connections using the correct tools. Do not overtighten. Connections should be only secure and leak-free. Overtightening can cause premature thread failure or high pressure fittings to split at pressures lower than their rated capacities.
- Should a hydraulic hose rupture, burst, or need to be disconnected, immediately shut off the pump and shift the control valve twice to release pressure. Never attempt to grasp a leaking hose under pressure with your hands. The force of escaping hydraulic fluid could cause serious injury.



- Do not subject the hose to potential hazard, such as fire, sharp surfaces, heavy impact, or extreme heat or cold. Do not allow the hose to kink, twist, curl, or bend so tightly that the fluid flow within the hose is blocked or reduced. Periodically inspect the hose for wear, because any of these conditions can damage the hose and possibly result in personal injury.
- Do not use the hose to move attached equipment. Stress can damage the hose and possibly cause personal injury.
- Hose material and coupler seals must be compatible with the hydraulic fluid used. Hoses also must not come in contact with corrosive material such as creosote-impregnated objects and some paints. Consult the manufacturer before painting a hose. Never paint the couplers. Hose deterioration due to corrosive materials may result in personal injury.

## Safety Precautions continued

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- Avoid straight line tubing connections in short runs. Straight line runs do not provide for expansion and contraction due to pressure and/or temperature changes.
- Eliminate stress in the tube lines. Long tubing runs should be supported by brackets or clips. Tubes through bulkheads must have bulkhead fittings. This makes easy removal possible and helps support the tubing.
- Carefully inspect all hoses and fittings prior to use. Before each use, check entire hose for cuts, leaks, abrasion or bulging of cover, or damage or movement of couplings. If any of these conditions exist, replace the hose immediately. NEVER attempt to repair the hose.

### Cylinder



#### **DANGER:**

- Do not exceed rated capacities of the cylinders. Excess pressure may result in personal injury.
- Avoid off-center loads that could damage the cylinder and/or cause loss of the load.
- Read and understand all safety and warning decals and instructions for devices attached.
- Inspect each cylinder and coupler before each shift or usage to prevent unsafe conditions from developing.
- Do not use cylinders if they are damaged, altered or in poor condition.
- Do not use cylinders with bent or damaged couplers or damaged port threads.
- Under certain conditions, the use of an extension with a hydraulic cylinder may not be advisable and could present a dangerous condition.
- Avoid pinch points or crush points that can be created by the load or parts of the cylinder.
- To help prevent material fatigue if the cylinder is to be used in a continuous application, the load should not exceed 85% of the rated capacity or stroke.
- Cylinder must be on a stable base which is able to support the load while pushing or lifting.
- To help prevent personal injury, use shims, friction material or constraints to prevent slippage of the base or load.
- Do not set poorly-balanced or off-center loads on a cylinder.
- The load can tip or the cylinder can “kick out” and cause personal injury.
- Do not use the locking collar on a threaded piston as a stop. The threads may shear resulting in loss of the load.
- If this component is used to lift or lower loads, be certain that the load is under operator control at all times and that others are clear of the load.
- Do not drop the load.
- As the load is lifted, use blocking and cribbing to guard against a falling load.
- To help prevent personal injury, do not allow personnel to go under or work on a load before it is properly cribbed or blocked. All personnel must be clear of the load before lowering.
- Never use extreme heat to disassemble a hydraulic cylinder. Metal fatigue and/or seal damage will result and can lead to unsafe operating conditions.





### IMPORTANT

- **Keep the cylinder clean at all times.**
- **While at a job site, when the cylinder is not in use, keep the piston rod fully retracted and upside down.**
- **Use an approved, high-grade pipe thread sealant to seal all hydraulic connections. Teflon tape can be used if only one layer of tape is used and it is applied carefully (two threads back) to prevent the tape from being pinched by the coupler and broken off inside the pipe end. Any loose pieces of tape could travel through the system and obstruct the flow of fluid or cause jamming of precision-fit parts.**
- **Always use protective covers on disconnected quick couplers.**
- **When mounting cylinders using the internal piston rod threads, collar threads, threaded tie rods or base mounting holes, the threads must be fully engaged. Always use SAE grade 8 or better fasteners when attaching components to cylinders and tighten securely.**
- **Limiting the stroke and pressure on all cylinders will prolong their life.**

# Initial Setup

1. Remove all packing materials from the assembled unit.
2. Inspect the unit upon arrival. The carrier, not the manufacturer, is responsible for any damage resulting from shipment.

## Filling the Pump Reservoir

Most pumps are shipped without hydraulic fluid in the reservoir. Hydraulic fluid may have been shipped in a separate container, but if hydraulic fluid is needed, use only approved Power Team hydraulic fluid rated at AW 46 47 cSt @ 38°C (237 SUS @ 100°F). If low temperature requirements are needed, use hydraulic fluid 5.1 cSt @ 100°C (451 cSt @ -40°C).

1. Clean the area around the filler cap to remove all debris. Any debris in the fluid can damage the polished surfaces and precision parts of this pump.
2. Retract all cylinders to the return position.
3. Remove the filler cap and insert a clean funnel with a filter. Fill with hydraulic fluid to the bottom of the filler screen approximately 57.2 mm (2.25 inches) below the cover plate. Replace the filler cap, leaving the breather-hole open.
4. Cycle the pump several times with the cylinders attached. Retract the cylinders and check the fluid level in the pump reservoir.

## Hydraulic Connections

1. Clean the areas around the fluid ports of the pump and cylinders.
2. Inspect all threads and fittings for signs of wear or damage, replace as needed.
3. Clean all hose ends, couplers or union ends.
4. Remove the thread protectors from the hydraulic fluid outlets.
5. Connect the hose assembly to the hydraulic fluid outlet, and couple the hose to the cylinder.



**CAUTION:** To prevent personal injury from leaking hydraulic fluid, seal all hydraulic connections with a high-quality, non-hardening, pipe thread sealant.



**IMPORTANT:** Sealant tape or non hardening sealer tape can be used to seal hydraulic connections if only one layer of tape is used. Apply tape carefully, two threads back, to prevent it from being pinched by the coupler and broken off inside the system. Loose pieces of sealant could travel through the system and obstruct the flow of fluid or cause jamming of precision-fit parts.

## Electric Motor Operation

**WARNING:** Any electrical work should be done by a qualified electrician. Disconnect power supply before removing electrical box cover. All voltages must be wired for counterclockwise rotation viewed from lead end of motor.

1. The electric motor is a three phase 60 cycle motor and can be wired for 230 or 460 volt. This pump may also be ordered with a 50 cycle 220 or 380 volt motor. If the unit is prewired at the factory, there will be a tag on the motor that will indicate what the motor voltage is. This unit is supplied without a power cord or plug.\* The motor leads are located on the magnetic starter inside the electrical box (refer to the electrical schematic decal on inside of box cover).
2. Carefully check your line voltage to ensure that it is compatible with the voltage required by the pump. Plug cord into proper electrical outlet or provide wiring as required. To rewire motor from one voltage to another, see diagram on motor nameplate and electrical schematic and heater elements

sections in parts list.

**WARNING: Changing the voltage on this unit is an involved, and if improperly performed, potentially hazardous procedure. Consult the manufacturer for specific information before attempting any rewiring.**

- When a valve is changed either from manual to solenoid or from solenoid to manual, reference should be made to the schematic decal inside the electrical box cover.

**NOTE: It is not advisable to start and stop the motor to control flow of the pump. Instead, flow should be controlled by valve only.**

- Reset switch: When overheating occurs, the thermal overload will kick out. To restart the motor, place valve in neutral and push the start switch once the unit is cooled.
- Power outage: The electrical design of this unit is such that when the unit is in operation and the power goes off and back on again, the unit's start switch must again be pushed before it will run. Place valve in neutral before restarting.

**NOTE: An appropriately rated power cord and plug should be selected for the current rating of the motor found on the specifications decal on the motor.**

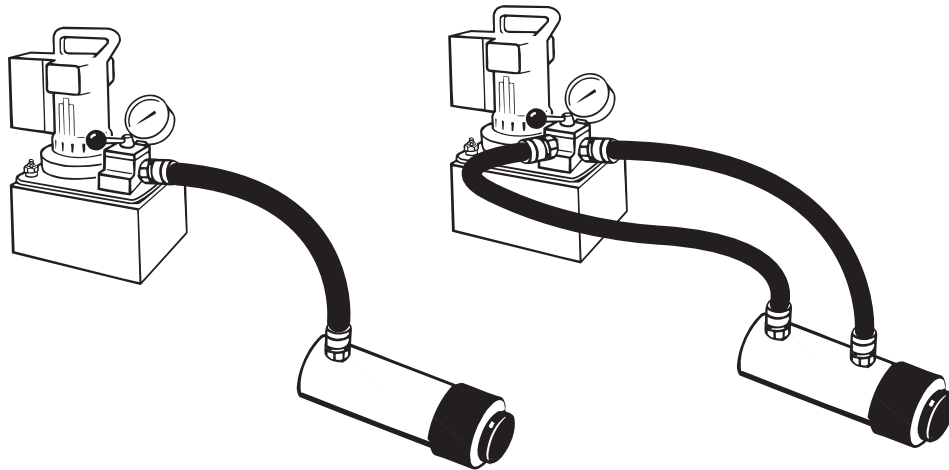
AMPS at Maximum Hyd. Pressure	Electrical Cord Size AWG (mm <sup>2</sup> ) 3.2 Volt Drop Length of Electrical Cord							
	mm <sup>2</sup>				AWG			
	0-8 m	8-15 m	15-30 m	30-46 m	0-25 ft	25-50 ft	50-100 ft	100-150 ft
6	0.75	1	1.5	2.5	18	16	14	12
10	0.75	1.5	2.5	4	18	14	12	10
14	1	2.5	4	6	16	12	10	8
18	1.5	2.5	6	6	14	12	8	8
22	1.5	4	6	10	14	10	8	6
26	2.5	4	6	10	12	10	8	6
30	2.5	4	10	16	12	10	6	4

**Table 2. Minimum Recommended Gauge Table**

### Bleeding Air from the System

After all connections are made, the hydraulic system must be bled of any trapped air. See Figure 2. With no load on the system and the pump vented and positioned higher than the hydraulic device, cycle the system several times. Check the reservoir fluid level and fill to proper level with Power Team hydraulic fluid as necessary. If there is a problem contact Power Team.

## Initial Setup continued



**Figure 2. System Bleeding**

**IMPORTANT:** Some spring return cylinders have a cavity in the rod which forms an air pocket. This type of cylinder should be bled when positioned upside down or lying on its side with the port facing upward.

### Hydraulic Pressure Gauge (optional)

#### Automatic Dump Valve

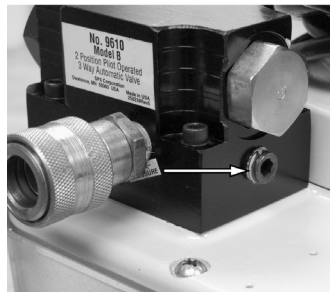
To monitor line pressure when using an automatic dump valve, a T-adaptor is used between the valve and the pressure switch to adapt a hydraulic pressure gauge.

#### Posi-Check Valve

If a Posi-Check valve is used, a hydraulic gauge shows zero pressure when the valve is switched to the neutral (hold) position. Cylinder pressure, however, is held without loss.

To install a hydraulic pressure gauge:

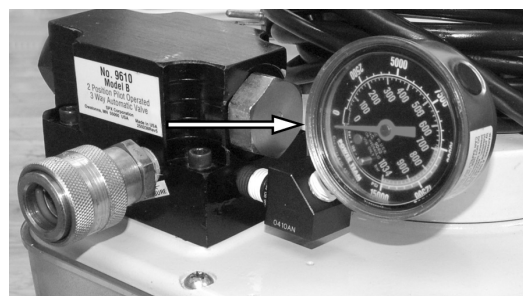
1. See Figure 3. Remove the pipe plug from the valve's gauge port.
2. See Figure 4. Install sealant tape or non hardening sealer to a 45 degree elbow (PN 9678). Install the elbow as shown.
3. Install sealant tape or non hardening sealer to the gauge.
4. See Figure 5. Install the pressure gauge.



**Figure 3. Gauge Port**



**Figure 4. Elbow Installation**



**Figure 5. Pressure Gauge Installation**

# Operating Instructions

The following instructions should be followed when operating the pump for the first time.

1. Make sure all valve and hose connections are tight, and then plug in the electric motor.
2. Set valve in the neutral or return position. Switch pump on and off several times. Depress the start switch and let pump idle for a few minutes.
3. Run cylinder out to its full travel several times to eliminate air from the system.
4. Pump is ready now to be put into regular operation.

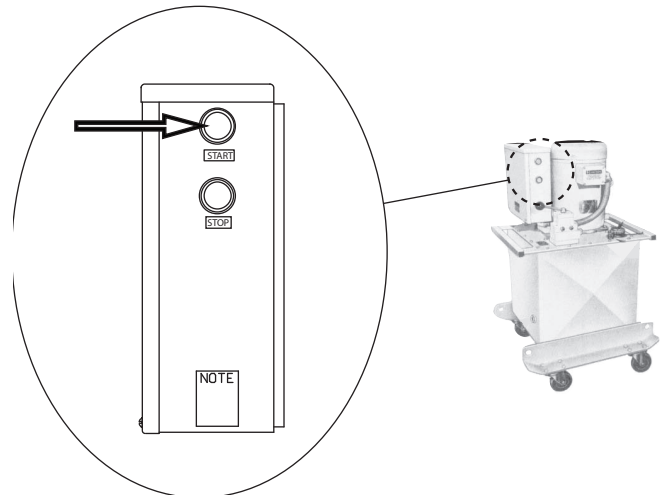
**NOTE: If a large double acting cylinder is being operated, after eliminating the air from the system, refill the pump reservoir to the bottom of the filler screen with the cylinder in the retracted position, since the forward part of the cylinder acts as a reservoir in this instance.**

## Bleeding Air from the System

1. Cycle the hydraulic system until operation is smooth and consistent.
2. Check the pump reservoir level. Add Power Team hydraulic fluid as needed.

## Electric Motor Control Operation

1. Connect the power cord to an appropriate power source.
2. See Figure 6. Push the START switch.



**Figure 6. Electric Motor Control Switches**

See Figure 7. This remote will start and run the pump motor to advance or retract of the cylinder. When released, it allows the pressure to be held.

1. Press the rocker switch toward the Advance side of the switch and hold to extend the cylinder.
2. Press the rocker switch toward the Retract side of the switch and hold to retract the cylinder.
3. Release the rocker switch and the pump will stop but the system will hold. Generally used on 4-Way-2-Position valves.



**Figure 7. Advance-Hold-Retract Remote**

# Operating Instructions continued

## Pressure Regulating Controls

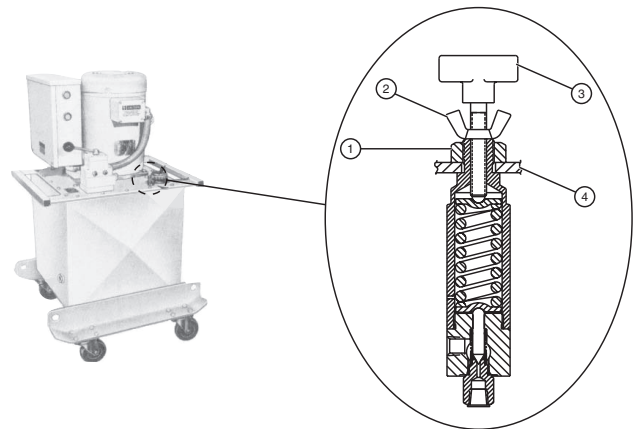
To ensure accuracy and low pressure differential (approx. 20 bar 300 psi) throughout the pressure range (69-690 bar (1,000-10,000 psi) depending on the pump model), the pressure switch should be used with the pressure regulating valve. The pressure switch must be set at a pressure lower than the pressure regulating valve to work correctly.

- The pressure regulating valve can be adjusted to bypass fluid at a given pressure setting while the pump continues to run.
- The pressure switch can be adjusted to stop the pump at a given pressure setting.

## Adjusting The Pressure Regulating Valve

**IMPORTANT: For easy adjustment of the pressure regulating valve, always adjust the pressure by INCREASING it to a desired pressure setting. The pressure range for this unit is from 1,000 psi to 10,000 psi. Loosen the locknut on the pressure regulating valve.**

1. See Figure 8. Loosen the locknut on the pressure regulating valve, and turn the adjusting screw a few turns counterclockwise (CCW) to decrease the pressure setting to a lower than desired pressure.
2. With the engine running, shift the valve into the operating position.
3. Slowly turn the adjusting screw in a clockwise (CW) direction to gradually increase the pressure setting. When the desired pressure setting is reached, lock the adjusting screw into position by tightening the locknut.



Item	Description
1	Lock Nut
2	Wing Nut
3	Tee Knob
4	Cover Plate

**Figure 8. Pressure Regulating Valve**

## Adjusting The Pressure Switch

This unit is a two stage, high pressure pump. The low pressure, high volume stage provides fast cylinder piston travel. The unloading valve pressure is preset at the factory at 1550-1650 psi. In the event this valve needs to be reset.

1. Loosen the locknut on the pressure switch, and turn the adjusting screw in a clockwise direction. This increases the pressure setting to a higher than desired pressure.
2. Adjust the pressure regulating valve to the desired pressure setting by using the procedure previously outlined.
3. With the pump running and bypassing fluid at the desired pressure, slowly turn the pressure switch adjusting screw in a counterclockwise direction, decreasing the pressure switch setting until the pump motor shuts off.
4. Lock the adjusting screw in position by tightening the locknut.
5. Release pressure. Run the pump to check the pressure setting and cut-out of the motor. It may be necessary to make a second adjustment.

*Note: When the pressure switch setting is reached, the motor shuts off. However, the “coast” of the motor continues to deliver fluid for a brief period. The pressure regulating valve bypasses this surplus fluid, preventing it from going into the system. As a result, the pressure differential can be held to approximately 20 bar (300 psi).*

# Performance Specifications

The information in the following charts can be used as a basis to determine if the system is performing as expected during operation.

Pump	RPM	Amp Draw at 690 bar (10,000 psi) (115V)	Amp Draw at 690 bar (10,000 psi) (230V)	dBa at Idle and 690 bar (10,000 psi)	Air Supply Req'd bar (psi)
PE400	1,725	-	34	73/80	N/A
* Requires 1.4 M <sup>3</sup> /min. (49 CFM) at 5.5 bar (80 psi) shop air pressure at pump.					

**Table 3. Drive Unit Requirements**

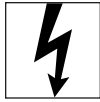
Pump	Max. Pressure Output bar (psi)	Fluid Delivery* (cu. in./min. @)					
		0 bar (0 psi)	7 bar (100 psi)	50 bar (700 psi)	70 bar (1,000 psi)	345 bar (5,000 psi)	690 bar (10,000 psi)
PE400	690 bar (10,000 psi)	-	-	-	-	450	420
* Typical delivery. Actual flow varies with field conditions.							

**Table 4. Fluid Pressure Chart**

# General Maintenance



## WARNING:



- **Disconnect the unit from the power supply before performing maintenance or repair procedures.**
- **Repairs and maintenance are to be performed in a dust-free area by a qualified technician.**

## System Evaluation

The components of your hydraulic system — cylinders, pumps, hoses, and couplings — all must be:

- Rated for the same maximum operating pressure.
- Correctly connected.
- Compatible with the hydraulic fluid used.

A system that does not meet these requirements can fail, possibly resulting in serious injury. If you are in doubt about the components of your hydraulic system, contact Power Team Technical Support.

## Inspection

Keep a dated and signed inspection record of the equipment. Before each use, the operator or other designated personnel should visually inspect for the following conditions:

- Cracked or damaged cylinder.
- Excessive wear, bending, damage, or insufficient thread engagement.
- Leaking hydraulic fluid.
- Scored or damaged piston rod.
- Incorrectly functioning or damaged heads and caps.
- Loose bolts or cap screws.
- Damaged or incorrectly assembled accessory equipment.
- Modified, welded, or altered equipment.
- Bent or damaged couplers or port threads.

## Periodic cleaning



**WARNING: Contamination of the hydraulic fluid could cause the valve to malfunction. Loss of the load or personal injury could result.**

Establish a routine to keep the hydraulic system as free from debris as possible.

- Seal unused couplers with dust covers.
- Keep hose connections free of debris. Equipment attached to a cylinder must be kept clean.
- Keep the breather-hole in the filler cap clean and unobstructed.
- Use only Power Team hydraulic fluid. Replace hydraulic fluid as recommended, or sooner if the fluid becomes contaminated. Never exceed 300 hours of use between fluid changes.

## Hydraulic Fluid Level

1. Check the fluid level in the reservoir after each 10 hours of use. The fluid level should be to the bottom of the filler screen approximately 57.2 mm (2.25 inches) below the cover plate when all cylinders are retracted.
2. Drain, flush, and refill the reservoir with an approved Power Team hydraulic fluid after every 300 hours of use. The frequency of fluid changes depends upon general working conditions, severity of



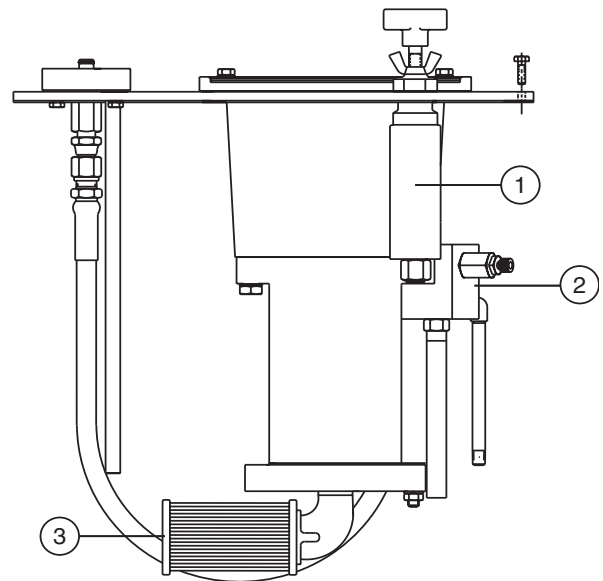
use, the overall cleanliness and care given to the pump. Fluid should be changed more frequently when the system is not operated regularly indoors.

### Draining And Flushing The Reservoir

1. Clean the pump exterior before the pump interior is removed from the reservoir.
2. See Figure 9. Remove the (20) cap screws fastening the motor and pump assembly to the reservoir.

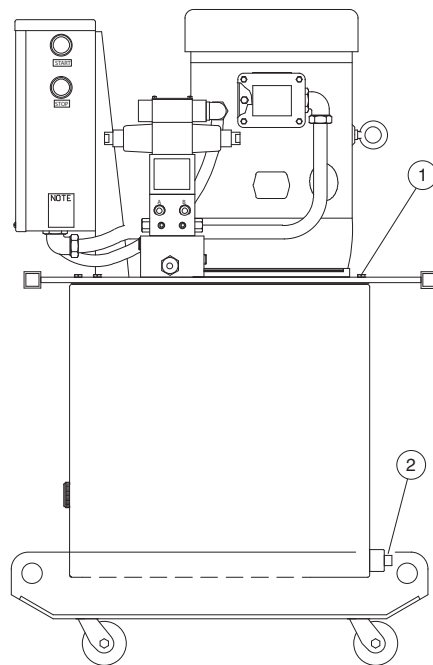
**Caution: Do not damage the pump filter or pressure regulating valves when lifting the pump and motor off the reservoir. See Figure 10.**

3. Clean the inside of the reservoir, and fill with Power Team hydraulic fluid. Rinse the filter clean.
4. Place the pump and motor assembly back onto the reservoir, and secure with two machine screws assembled on opposite corners of the housing.
5. Place the hydraulic flow control valve in the neutral position. If the pump is equipped with a valve that has only an advance or retract position, place the valve in the advance position.
6. Run the pump for several minutes.
7. Disconnect the motor and pump assembly, and drain and clean the inside of the reservoir.
8. Fill the reservoir with Power Team hydraulic fluid.
9. Place the pump and motor assembly (with new gasket) on the reservoir, and thread the cap screws. Tighten cap screws securely and evenly.
10. Run the pump for several minutes.
11. Disconnect the motor and pump assembly, and drain and clean the inside of the reservoir.
12. Fill the reservoir with Power Team hydraulic fluid.
13. Place the pump and motor assembly (with new gasket) on the reservoir, and thread the new screws. Tighten screws securely and evenly.



Item	Description
1	Pressure Regulating Valve
2	High Pressure Relief Valve
3	Filter

**Figure 9. Pump Assembly**



Item	Description
1	Cover Plate Cap Screws (20)
2	Drain Plug

**Figure 10. Pump and Motor Assembly**

# General Maintenance continued

## Adding Hydraulic Fluid To The Reservoir

1. Retract the cylinder(s) devices.
2. Disconnect the power supply.
3. Clean the entire area around the filler plug.
4. Remove the filler plug, and install a clean funnel with a filter.
5. Use only Power Team hydraulic fluid AW 46 47 cSt @ 38°C (237 SUS @ 100°F).

## Sound Reduction - Electrically Powered Motor

The electrically powered hydraulic pump operates in the 73–80 dBA range. If further sound reduction is desired, any of the following options will help reduce the sound level.

1. Contact Power Team Hydraulic Technology technical support for products more suitable to your application.

## Hose Connections



**CAUTION:** To prevent personal injury from leaking hydraulic fluid, seal all hydraulic connections with a high-quality, non-hardening, pipe thread sealant.



**IMPORTANT:** Sealant tape or non-hardening sealer tape can be used to seal hydraulic connections if only one layer of tape is used. Apply tape carefully, two threads back, to prevent it from being pinched by the coupler and broken off inside the system. Loose pieces of sealant could travel through the system and obstruct the flow of fluid or cause jamming of precision-fit parts.

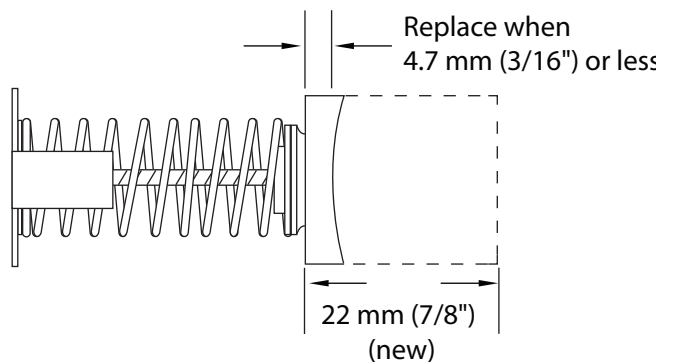
## Storage

Store the unit in a dry, well-protected area where it will not be exposed to corrosive vapors, dust, or other harmful elements. If a unit has been stored for an extended period of time, it must be thoroughly inspected before it is used.

## Checking Brushes on Electric Motors

To help prevent premature failure of the armature, check the brushes periodically:

1. Remove the metal brush cover plates.
2. Remove the brush holder caps and brush assemblies.
3. The brush assemblies must be replaced if they are 4.7mm (3/16") long or less. See Figure 11.
4. Install brush assemblies, brush holder caps, and metal brush cover plates.



**Figure 11. Brush Inspection**

# Troubleshooting Guide



**WARNING:** To prevent personal injury,

- Repair work or troubleshooting must be performed by qualified personnel who are familiar with this equipment.



- Disconnect the power supply before removing the electrical cover. Electrical work should be performed by a qualified electrician.



- Check for system leaks by using a hand pump to apply pressure to the suspect area. Watch for leaking fluid and follow it back to its source. Never use your hand or other body parts to check for a possible leak.

Notes:

- For a detailed parts list or to locate a Power Team Authorized Hydraulic Service Center, contact your nearest Power Team facility.
- Plug the outlet ports of the pump when checking for leakage to determine if the leakage is in the pump, in the cylinder, or in the tool.

Problem	Cause	Solution
<b>Electric motor does not run.</b> <b>WARNING:</b> <b>Disconnect power supply before removing cover. Any electrical work should be performed by a qualified electrician.</b>	1. Unit is not plugged in.	1. <i>Plug in unit.</i>
	2. No voltage supply.	2. <i>Check line voltage. Check reset switch on power panel.</i>
	3. Broken lead wire or defective power cord plug.	3. <i>Replace defective parts.</i>
	4. Defective switches.	4. <i>Replace switches.</i>
	5. Defective starter relay.	5. <i>Replace defective parts.</i>
	6. Circuit breaker tripped because total amperage draw too high for existing circuit.	6. <i>Add an additional circuit or use alternate circuit.</i>
	7. Overheated motor.	7. <i>Wait for motor to cool before restarting. Thermal protector will reset automatically, or push red reset switch on top of the motor (if so equipped).</i>
	8. Faulty thermal protector.	8. <i>Replace.</i>
	9. Defective motor.	9. <i>Replace or repair motor.</i>

## Troubleshooting Guide continued

Problem	Cause	Solution
<p><b>Pump is not delivering fluid or delivers only enough fluid to advance cylinder(s) partially or erratically.</b>  <b>WARNING: The force of escaping hydraulic fluid could cause serious injury. Keep hands, face, etc. clear of any hydraulic leaks.</b></p>	1. Fluid level too low.	<i>1. Fill reservoir to bottom of the filler screen with all cylinders retracted.</i>
	2. Loose fitting coupler to cylinder.	<i>2. Check quick-disconnect couplings to cylinders. Inspect couplers to insure that they are completely coupled. Occasionally couplers have to be replaced because the ball check does not stay open due to wear.</i>
	3. Air in the system.	<i>3. Bleed the system.</i>
	4. Air leak in suction line.	<i>4. Check and tighten the suction line.</i>
	5. Debris in pump or filter plugged.	<i>5. Pump filter should be cleaned and if necessary, pump should be dismantled and all parts inspected and cleaned.</i>
	6. Cold fluid or fluid is too heavy (Hydraulic fluid is of a higher viscosity than necessary).	<i>6. Change to lighter fluid.</i>
	7. Relief valve or low pressure unloading valve out of adjustment.	<i>7. Readjust as needed.</i>
	8. Reservoir capacity is too small for the size of the cylinder(s) used.	<i>8. Use smaller cylinder(s) or larger reservoir.</i>
	9. Defective directional valve.	<i>9. Inspect all parts carefully and replace if necessary.</i>
	10. Release poppet not seating in solenoid valve.	<i>10. Disassemble, inspect, and clean pump to remove any debris.</i>
	11. Sheared drive shaft key(s).	<i>11. Replace after checking pump cavity for broken pieces.</i>
	12. Motor rotating in wrong direction.	<i>12. Refer to electrical schematic on motor.</i>
	13. Vacuum in reservoir.	<i>13. Check for plugged vent in filler plug.</i>
	14. Low pressure pump worn.	<i>14. Repair or replace gerotor pump.</i>

## Troubleshooting Guide continued

Problem	Cause	Solution
<b>Pump builds pressure but cannot maintain pressure.</b>	1. Check to see if there are any external leaks. If no fluid leakage is visible, the problem is internal.	<i>1. Reseal leaking pipe fittings with pipe sealant.</i>
	2. To test for a leaking control valve, lift the pump from the reservoir but keep the filter in the fluid. Remove the drain line to see if the fluid is leaking from the valve. If the valve is not leaking, the internal check valve could be leaking. Refer to the note concerning checking for fluid leaks at the beginning of this Troubleshooting Guide.	<i>2. Clean, reseal or replace control valve parts. If the internal check valve is leaking, the check valve must be disassembled and the seat area repaired, poppet replaced, etc.</i>
<b>Pump will not build full pressure.</b>	1. Faulty pressure gauge.	<i>1. Calibrate gauge.</i>
	2. Check for external leakage.	<i>2. Seal any faulty pipe fitting with pipe sealant.</i>
	3. Check the relief valve setting.	<i>3. Lift the pump from the reservoir but keep the filter immersed in fluid. Note the pressure reading when the relief valve begins to open up. If functioning normally, it should start to leak off just prior to relief valve pressure.</i>
	4. Check for leaks in the solenoid valve.	<i>4. Clean and reseal or replace parts.</i>
	5. Inspect the pump for internal leakage. Check high pressure pump inlet or outlet ball checks.	<i>5. Same procedure as above but look for leaks around the entire inner mechanism. If there are no visible leaks the high pressure pump subassembly may be leaking. Remove all parts. Check the valve head assembly for any damage to the seat area. Clean and reseal if necessary. Inspect for damage and replace parts if necessary, then reassemble.</i>
	6. Sheared key(s).	<i>6. Replace after checking pump cavity for broken pieces.</i>

## Troubleshooting Guide continued

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<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
<b>Cylinder(s) will not retract.</b>	1. Check the system pressure; if the pressure is zero, the solenoid valve is releasing pressure and the problem may be in the cylinder, (mechanical linkage connected to cylinders), or quick-disconnect couplings.	<i>1. Check the cylinders for broken return springs and check couplers to insure that they are completely coupled. Occasionally couplers have to be replaced because one check does not stay open in the coupled position.</i>
	2. Defective valve.	<i>2. Check valve operation and inspect parts. Replace if necessary.</i>

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