

PowerTilt NG Series Service and Repair Manual

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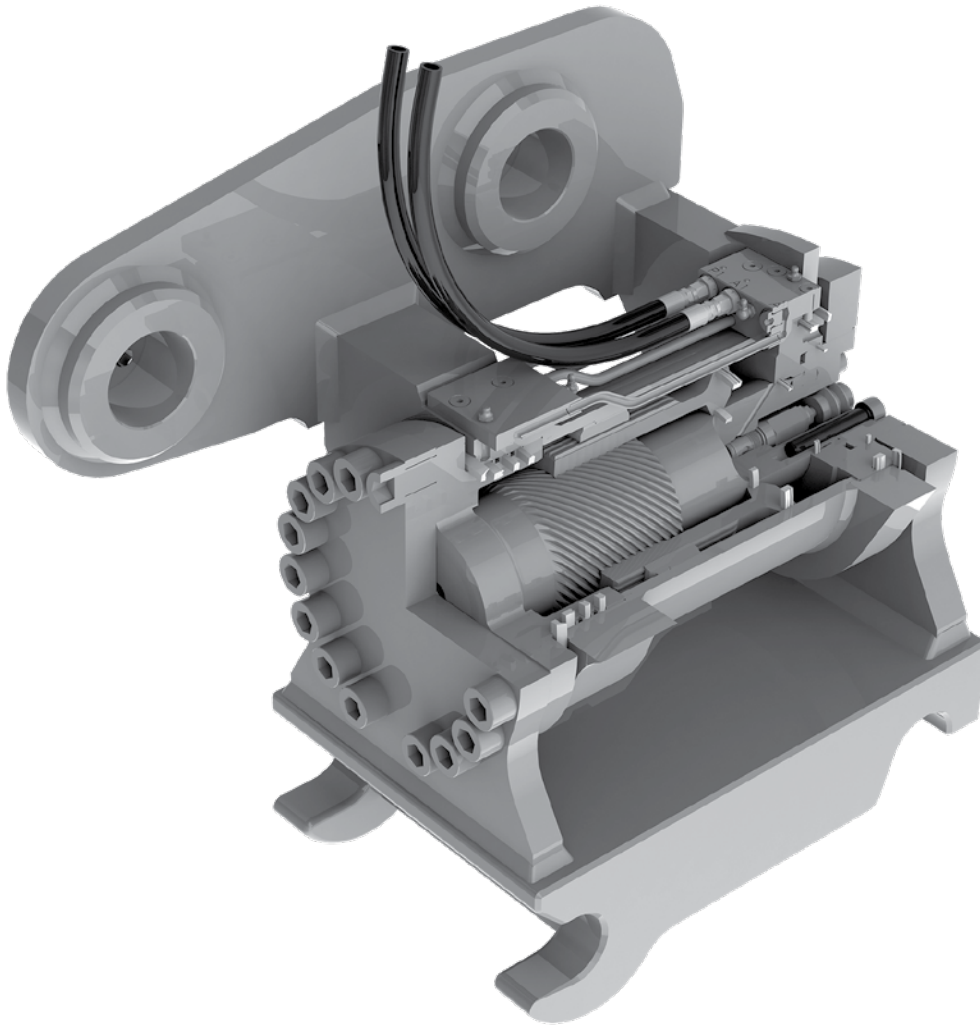
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Product Overview



Product Introduction

The Helac PTNG series is Helac's next generation of tilting innovation. More compact and powerful, the PowerTilt uses the same helical sliding spline technology that's been field proven for over 20 years.

Ideal for a broad range of tasks, the PTNG series will boost the versatility and productivity of your machine in countless ways when grading and excavating, ditch cleaning, metering fill material or landscaping.

To ensure it's high quality performance and safe operation, the PowerTilt will need to be properly maintained. Please read the information in this manual carefully and follow all safety measures and maintenance schedules.

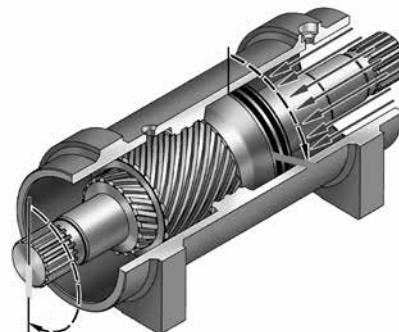
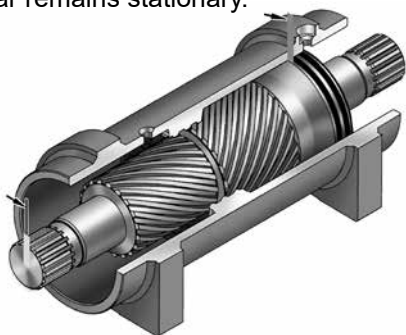
Operation Technology

PowerTilt uses Helac Corporation's innovative, sliding-spline operating technology to convert linear piston motion into powerful shaft rotation. Each actuator is composed of a housing and two moving parts — the central shaft and piston.

Helical spline teeth on the shaft engage matching teeth on the piston's inside diameter. A second set of splines on the piston's outside diameter mesh with the gear in the housing.

Starting position

The piston is completely bottomed out. Bars indicate starting positions of piston and shaft. Arrows indicate directions they will rotate. The housing with integral ring gear remains stationary.



Ending position

When hydraulic pressure is applied to the piston, it moves axially, while the helical gearing causes the piston and shaft to rotate simultaneously. Applying pressure to the opposite port will return the piston and shaft to their original starting positions.

General Safety Guidelines

Cautionary Notices


Before beginning installation, operating of machine, or repair of the PowerTilt, there are several cautionary notices that should be considered. If you are not comfortable with repair or maintenance of this product, contact Helac or PowerTilt AG for assistance.




WARNING
To avoid personal injury and machinery damage:
 Read the Service and Repair Manual for proper installation, maintenance and repair procedures.




WARNING
Pinch point hazard:
 Moving parts can cause serious injury. Keep hands clear during operation.




WARNING
To avoid personal injury and machinery damage:
 Make sure PowerTilt and/or attachment does not come in contact with boom, boom cylinder and/or operator area, particularly in fully curled position.



WARNING
To avoid personal injury and machinery damage:
 Make sure no personnel are standing within the arc described by the movement of the attachment. PowerTilt increases the swing radius of buckets and tools.



CAUTION
To avoid personal injury and machinery damage:
 Do not use PowerTilt or quick coupler for lifting or craning materials. PowerTilt should only be used to perform tasks for which it was designed.



NOTICE
To avoid damage to seals or other internal components:
 Do not weld directly onto PowerTilt when it is fully assembled. Modifications may void product warranty.

Other Safety Guidelines and Precautions

1. PowerTilt should only be used to perform tasks for which it was designed. Abusing the product and/or using it for purposes for which it was not intended can expose the operator and others to hazards as well as result in damage to the PowerTilt, carrier and/or other attachments.
2. Modification to the PowerTilt is done at the owner's risk and may void the warranty.
3. PowerTilt is designed for a maximum bucket width as noted below. Applying the full force of the excavator or backhoe to the corner of a wide bucket (e.g. corner digging with a wide bucket) may cause premature wear and/or reduced equipment life. It is also recommended that the bucket widths are not exceeded.

Maximum Recommended Bucket Width for Use with PowerTilt

PowerTilt Model	Maximum Bucket Width
PT-030	43 IN (1100 MM)
PT-050	47 IN (1200 MM)
PT-070	55 IN (1400 MM)
PT-100	67 IN (1700 MM)
PT-180	71 IN (1800 MM)
PT-240	75 IN (1900 MM)
PT-300	83 IN (2100 MM)

4. A decrease in breakout force may be experienced due to the increased tip radius.
5. It is the owner's responsibility to be sure all safety equipment is in place and operating properly at all times. If safety decals fade, are damaged or become unreadable from a distance of 3 meters, they should be replaced immediately.

General Safety Guidelines

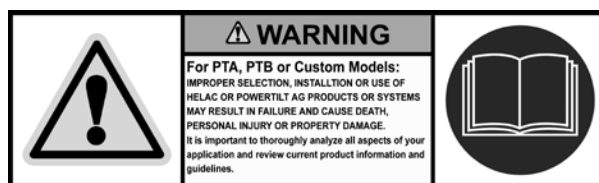
Be sure to post the provided warning decal to the cab of the carrier machine.



- PowerTilt should only be used in conjunction with attachments that do not adversely affect the stability of the machine.

Important Notice

Helac Corporation and PowerTilt AG do not assume any responsibility beyond the design and performance of its construction equipment attachment products. The customer is solely responsible for engineering of mating structures, fasteners, and other associated components related to the installation of the product and its ultimate application.

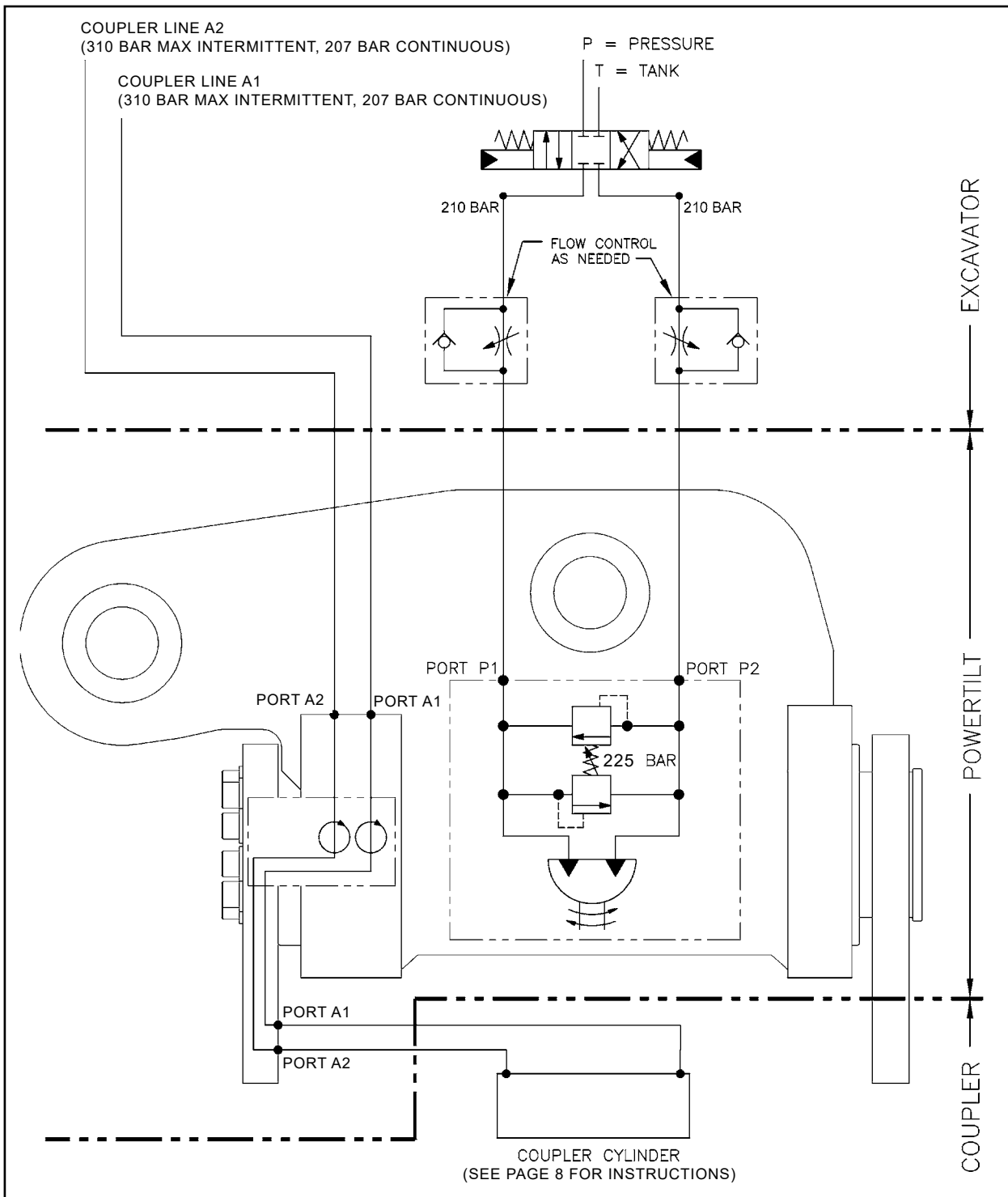


General Safety Guidelines

A unique serial number is located on each PowerTilt. This serial number is stamped on the housing and is also located on an Identification (ID) Tag.

POWER TILT		HELAC CORPORATION 225 BATTERSBY AVENUE ENJUMCLAW, WA 98022 USA	POWER TILT AG INDUSTRIESTRASSE 3 B CH-9434 AJ	CE
by HELAC				
Bez. Desc.	<input type="text"/>			
Typ Type	<input type="text"/>			
Ident-Nr. Serial No.	<input type="text"/>	<input type="text"/>		
Gewicht Weight [kg]	<input type="text"/>	Lastmoment Load torque	max [Nm]	<input type="text"/>
Pmax [bar]	<input type="text"/>	Tragfähigkeit Lasth. Lifting capacity lifting hook	[t]	<input type="text"/> Bj. YOM <input type="text"/>
Helac PN #L1024				

Hydraulic Requirements and Plumbing



The installer of the PowerTilt is responsible for selecting the control circuits that are compatible with the excavator and meet the PowerTilt requirements. If the PowerTilt is fitted with a hydraulic coupler, the installer is also responsible for providing and installing a circuit per coupler manufacturer specifications and Helac's instructions on page 8.

NOTICE When installing a new tool circuit or hydraulic lines, flush all the tool circuit lines with hydraulic oil prior to connecting the PowerTilt to flush contaminants.

Hydraulic Requirements and Plumbing

Tool Circuit Requirements		030	050	070	100	180	240	300
Displacement	in ³	38.0	57.1	77.0	126.0	158.5	212.0	288.6
	cm ³	623	936	1262	2065	2598	3474	4730
Suggested Oil Flow*	GPM	1.7-5	2.5-7.5	3.3-10	5-15	7-21	9-28	13-38
	l/min	6-19	9-28	13-38	19-58	26-78	35-105	47-142
Port Connections	BSPP	1/8	1/8	1/4	1/4	1/4	1/4	1/4
Hydraulic Pressures								
Cross Port Relief Valve Pressure**		3050-3450 psi (210-238 bar)						
Circuit Pressure		3000 psi (207 bar)						
Maximum Circuit Back Pressure		580 psi (40 bar)						

* Suggested oil flows will yield a speed of 6 seconds at low end and 2 seconds at high end, stop to stop.

** PowerTilts are equipped with factory-installed integral cross port relief valves.

Hydraulic Requirements and Plumbing

Important Notice

When the auxiliary ports, A1 and A2, are used for activating a hydraulic coupler or any device where safety is an issue, the port orientation must be correct. If the auxiliary ports are reversed, a rotary union seal failure could activate release of the coupled device.

Pressure-clamp/pressure-release devices:

Aux 1 must always be used to provide hydraulic pressure to clamp or secure an attached device.

Aux 2 must always be used to provide hydraulic pressure to unclamp or release an attached device.

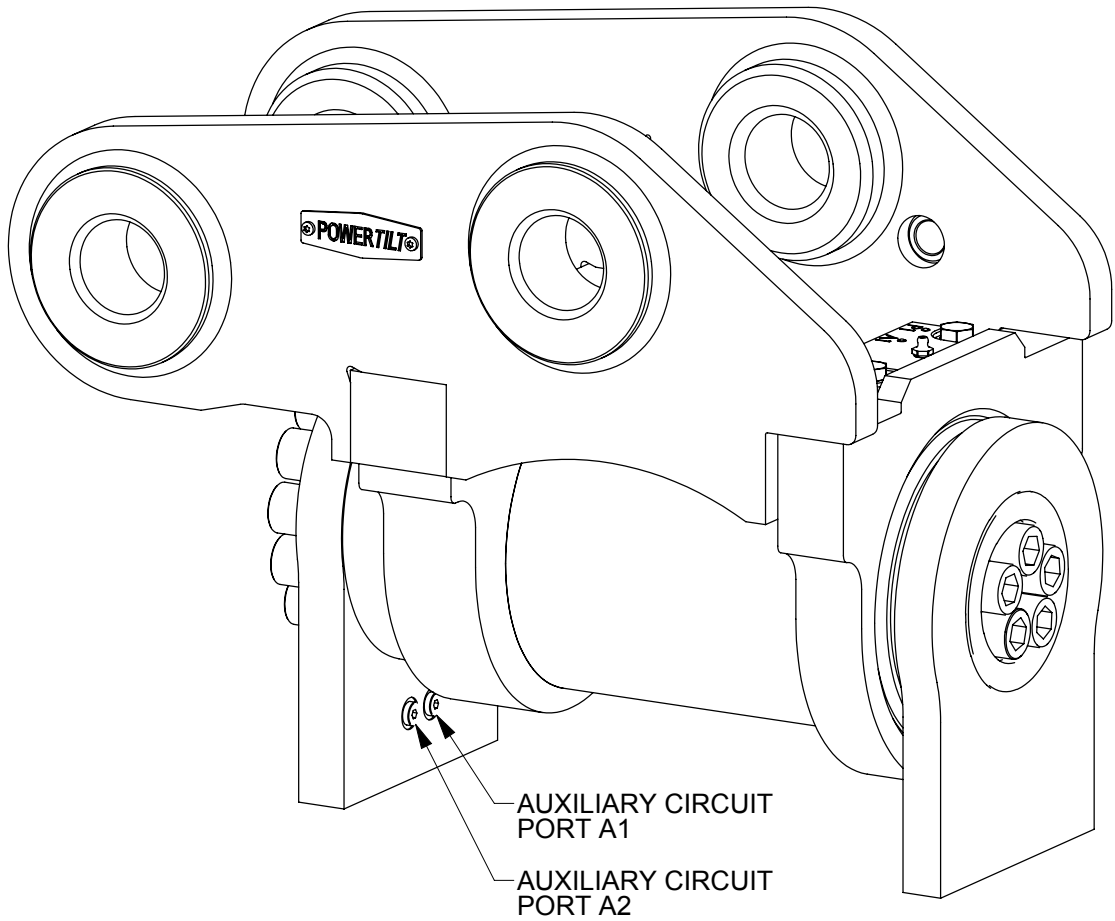
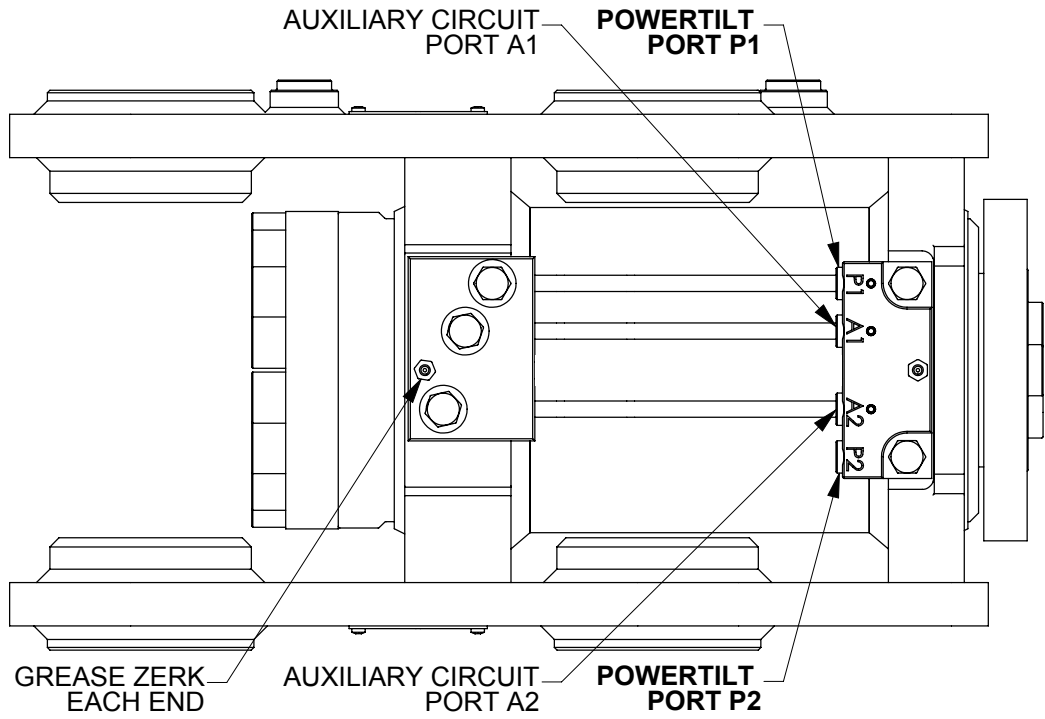
Spring-clamp/pressure-release devices:

Aux 2 must always be used to release spring-clamped, pressure-release devices.

NOTICE Failure of both rotary union seals could cause the release of a clamped device. Pressure at Aux 1 should render Aux 2 inoperable.

The Aux 1 circuit is inboard of the Aux 2 circuit. Therefore, failure of the inboard rotary union seal could cause the Aux 1 circuit to be pressurized by the main PowerTilt circuit, P1. In that case, the attached device would remain attached. Failure of both rotary union seals could cause both Aux 1 and Aux 2 to be simultaneously pressurized by P1. Attached devices should be configured to remain attached with Aux 1 and Aux 2 both pressurized at the same time.

Port Locations



Coupler Welding and Rotary Union Lubrication

The auxiliary ports A1 and A2 on the PowerTilt housing connect to a rotary union in the torque output end of the PowerTilt. The rotary union is also a bearing and must have lubrication. The rotary union must be filled with oil prior to using the PowerTilt. Failure to do so will void the warranty and may cause catastrophic damage to the PowerTilt.

Welding Instructions

- If the torque foot has port plugs, remove the O-rings from the torque foot port plugs in ports A1 and A2 and re-install the plugs. Otherwise the O-rings will be damaged or destroyed during the welding process. The plugs will keep debris from entering the ports.
- The torque foot may now be welded.
- If the coupler ports will be connected to a two-line hydraulic coupler, it is not necessary to add oil to the rotary union. The bearings will be lubricated by the coupler hydraulic circuit oil. The air needs to be bled to prevent cavitation.
- If the coupler ports will be connected to a one-line hydraulic coupler or will be left unused follow the steps under "Filling the Rotary Union with Oil." This process will be required if a quick coupler is not included from the Helac or PowerTilt AG factory.

Torque Bolts

- The torque of the torque foot and hub bolts must be checked before placing the PowerTilt in service. Bolt sizes and torque values are on pages 36-37.

Filling the Rotary Union with Oil

- If there is only one line to the coupler, that line should be connected to A2 and air bled. A1 should then be filled with oil.
- If no line is connected to A2, continue with this procedure.
- Remove actuator port plugs A1 and A2 and torque foot port plugs A1 and A2.
- If the torque foot has no auxiliary ports, it is for a mechanical coupler. In that case, remove the 1/16" NPT plug located in the shaft face.
- If a coupler is not connected, it is desirable to have the A1 and A2 circuits 80%-90% full of oil with some air to allow for expansion during use.
- Replace the port plugs.

Flushing and Air Purging Procedure

Purpose and Interval

Since the PowerTilt uses a low fluid volume, working fluid normally does not return to the hydraulic supply tank. The flushing procedure should be performed at approximately 100 hours of operation and at approximately 1000 hour intervals thereafter to remove accumulated wear products and to refresh the working fluid. The air purging procedure should be performed if there is any indication that air has entered the actuator.

NOTICE

Remove the bucket or working tool from the coupler prior to servicing the rotary actuator

NOTICE

Shut down the excavator prior to loosening or removing hydraulic lines.

NOTICE

This procedure requires the removal of hoses which will contain hydraulic fluid. A means should be provided for containing spilling hydraulic fluid. See the chart below to determine the approximate amount of fluid which will be ejected per flushing rotation.

Flushing Procedure

NOTICE

It is important to follow the steps of this procedure exactly to minimize the entry of air into the hydraulic system.

1. Note the location of PowerTilt ports P1 and P2 and the corresponding connections to the excavator auxiliary hydraulic system hoses or pipes on the stick boom.
2. Curl the PowerTilt (extend the stick cylinder) and position the stick boom and main boom until the PowerTilt is in the approximate position shown in Figure 1 below (fully inverted, PowerTilt ports facing down) and at a convenient distance from the ground.
3. Cycle the PowerTilt fully in both directions about 10 times. This will tend to move accumulated particles near the port locations.
4. Viewed from the cab of the excavator, rotate the PowerTilt fully clockwise against the stop and leave it there.
5. Carefully note the switch position for clockwise rotation.

Auxiliary Line Flushing

6. Locate the hose which joins PowerTilt port P1 to the excavator hydraulic system. Prepare for leakage, and slightly loosen the connection at the excavator hose or pipe system junction, Figure 1, to relieve residual pressure. Then carefully disconnect the hose.
7. Place the free end of that hose into the container for contaminated hydraulic fluid.
8. Locate the hose which joins PowerTilt port P2 to the excavator hydraulic system. Prepare for leakage, and slightly loosen the connection at the PowerTilt P2 junction to relieve residual pressure. Then disconnect the hose.
9. Connect the free end of the hose to the open excavator port junction creating a jumper between the two excavator ports.
10. Cycle the PowerTilt hydraulic system with the jumper hose for at least 10 seconds in one direction to completely flush the auxiliary system.
11. This completes the auxiliary line flushing.

Flushing and Air Purging Procedure

PowerTilt Flushing Continued

PowerTilt Flushing

12. Prepare for leakage, and slightly loosen the jumper hose connection at the excavator hose or pipe system P1 junction to relieve residual pressure. Then carefully disconnect the hose.
13. For safety, install a plug in the open excavator pipe or hose P1 port.
14. Connect the free end of the hose from the excavator P2 port to the PowerTilt P2 port.
15. The free end of the P1 hose should be in the container.
16. Note the correct switch position for CCW rotation and moderately rotate the PowerTilt fully counterclockwise against the stop and leave it there. The fluid in the PowerTilt will be ejected into the collection container.
17. The P1 port hose will still contain contaminated hydraulic fluid.
18. Swap the P1 and P2 port hoses at the actuator.
19. Now using the CCW rotation switch position rotate the PowerTilt fully CW against the stop and leave it there. This will clear the original P1 port hose.
20. Again, swap the P1 and P2 port hoses back to their original positions.
21. Though not normally required, this process may be repeated several times to assure that the PowerTilt is fully flushed with clean hydraulic fluid.
22. Reconnect the free end of the P2 port hose to the excavator hydraulic system P2 port connection.
23. Ensure that all hoses are routed correctly and all hose retainers are replaced.
24. Cycle the PowerTilt several times and check for leaks.
25. This completes the flushing process.

Approximate Fluid Capacities for Full Stroke

Model	Gallons	Liters
PT-030	0.15	0.6
PT-050	0.26	1.0
PT-070	0.34	1.3
PT-100	0.52	2.0
PT-180	0.68	2.6
PT-240	0.92	3.5
PT-300	1.24	4.7

Purging Air from the PowerTilt

1. Curl the PowerTilt out until the PowerTilt ports are facing upward.
2. Prepare for hydraulic oil leakage.
3. Slightly loosen ("crack") the PowerTilt P1 port fitting.
4. Rotate the PowerTilt clockwise by pressurizing the P2 port. This will allow trapped air to escape at the P1 port fitting.
5. Tighten the P1 port fitting and slightly loosen ("crack") the PowerTilt P2 port fitting.
6. Rotate the PowerTilt fully counterclockwise by pressurizing the P1 port. This will allow trapped air to escape at the P2 port fitting.
7. Repeat the procedure as necessary.
8. This completes the air purging procedure.

Flushing and Air Purging Procedure

Purging Air from the Coupler Ports

Follow this procedure if a hydraulic coupler is installed.

1. Position PowerTilt so that the A1 and A2 ports are facing up.
2. Retract the coupler cylinder by pressurizing A2 port.
3. Prepare for leakage.
4. Slightly loosen (crack) the A2 port fitting.
5. Extend coupler cylinder by pressurizing the A1 port. This will allow air to escape at the A2 port fitting.
6. Tighten the A2 port fitting and loosen (crack) the A1 port fitting.
7. Retract coupler cylinder by pressurizing the A2 port. This will allow air to escape at the A1 port fitting.
8. Tighten the A1 port fitting.
9. Repeat procedure as necessary.

Flushing and Air Purging Procedure

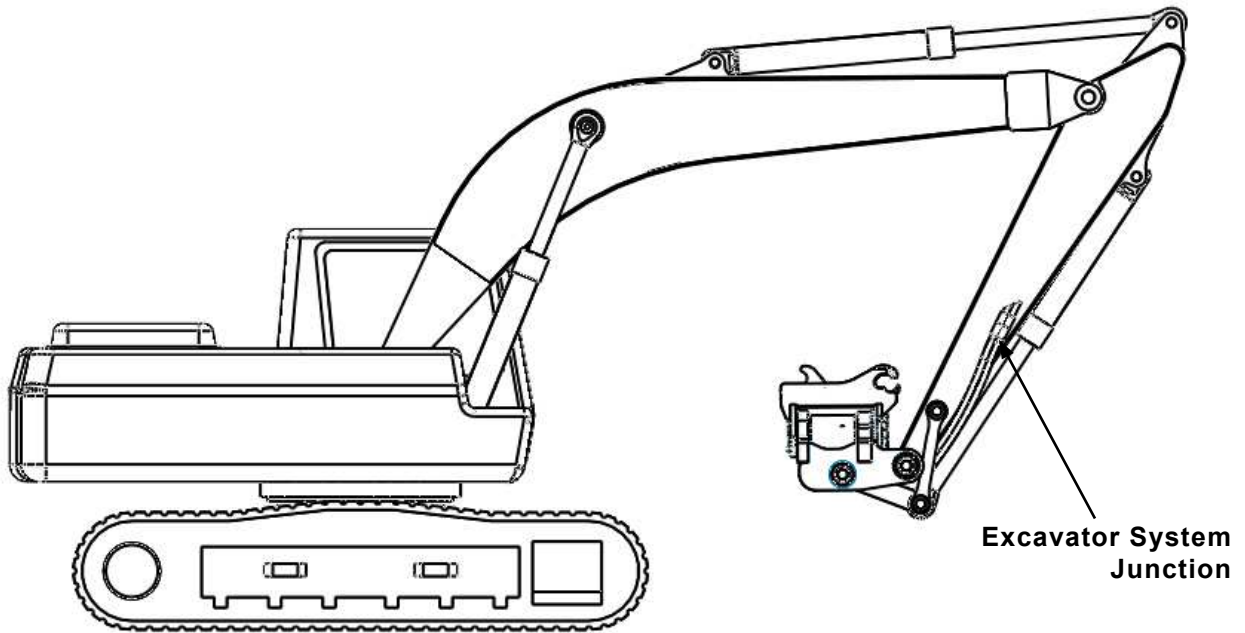


Figure 1: Boom Positions for Flushing Procedure – PowerTilt Inverted

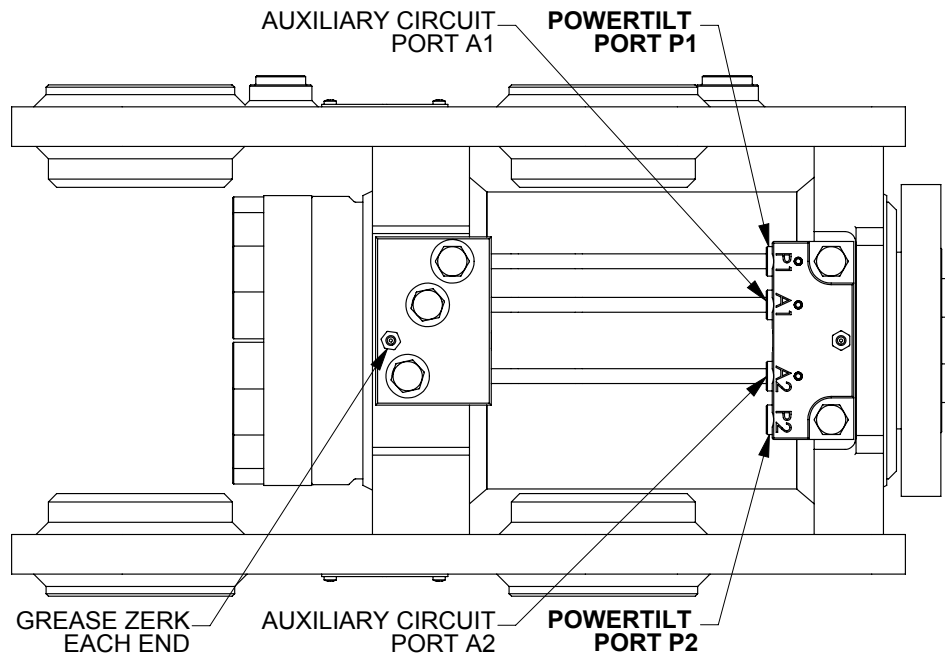


Figure 2: PowerTilt Port Locations

Flushing and Air Purging Procedure

PowerTilt Rotary Union Circuit Flushing

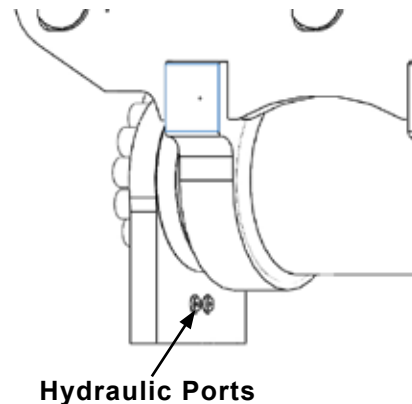
If the Powertilt unit has a hydraulic coupler operated through the integral rotary union, follow the flushing directions of the coupler manufacturer. Otherwise the rotary union, which acts partly as a bearing, should be flushed with fresh hydraulic oil. If the PowerTilt has an access hole at the bottom of the drive bolt circle, use the Flushing Procedure for Manual Torque Feet. If there is no access hole, use the Flushing Procedure for Hydraulic Torque Feet.

Flushing Procedure without Hydraulic Torque Feet:

1. Remove quick coupler.
2. Provide a means for injecting low pressure hydraulic oil into the A1 and A2 ports.
3. The Powertilt unit does not require inverting for this procedure.
4. Prepare for a small amount of fluid leakage from the shaft face ports.
5. Remove the A1 and A2 port plugs from the manifold.
6. Remove the 1/16 NPT plugs from the shaft face.
7. Inject oil into the A1 and A2 ports until fresh oil appears at the shaft face ports.
8. Replace the 1/16 NPT pipe plug.
9. Reinstall coupler.
10. This completes the flushing procedure.

Flushing Procedure for Hydraulic Torque Feet:

1. Provide a means for injecting low pressure hydraulic oil into the A1 and A2 port.
2. The Powertilt unit does not require inverting for this procedure.
3. Prepare for a small amount of fluid leakage from the torque foot ports.
4. Remove the A1 and A2 port plugs from the manifold and from the torque foot.
5. Inject oil into the A1 and A2 ports until fresh oil appears at the torque foot outlet ports.
6. Replace the port plugs and tighten according to the chart below.
7. This completes the flushing procedure.



Maintenance

Daily

1. Grease the two grease fittings with a high quality Lithium-based grease. Apply grease until clean grease passes the exclusion seal from around the shaft and end cap. Wipe off excess grease when done. Severe operating conditions such as abrasive dust or prolonged submersion in water may require more frequent grease applications.
2. Make sure that grease passes the exclusion seal when grease is applied to the grease fitting.
3. Inspect the PowerTilt for loose, worn or damaged components and replace or repair immediately.
4. Mounting pins should be greased upon installation and thereafter according to the equipment manufacturer's instructions.

Every 1,000 Hours

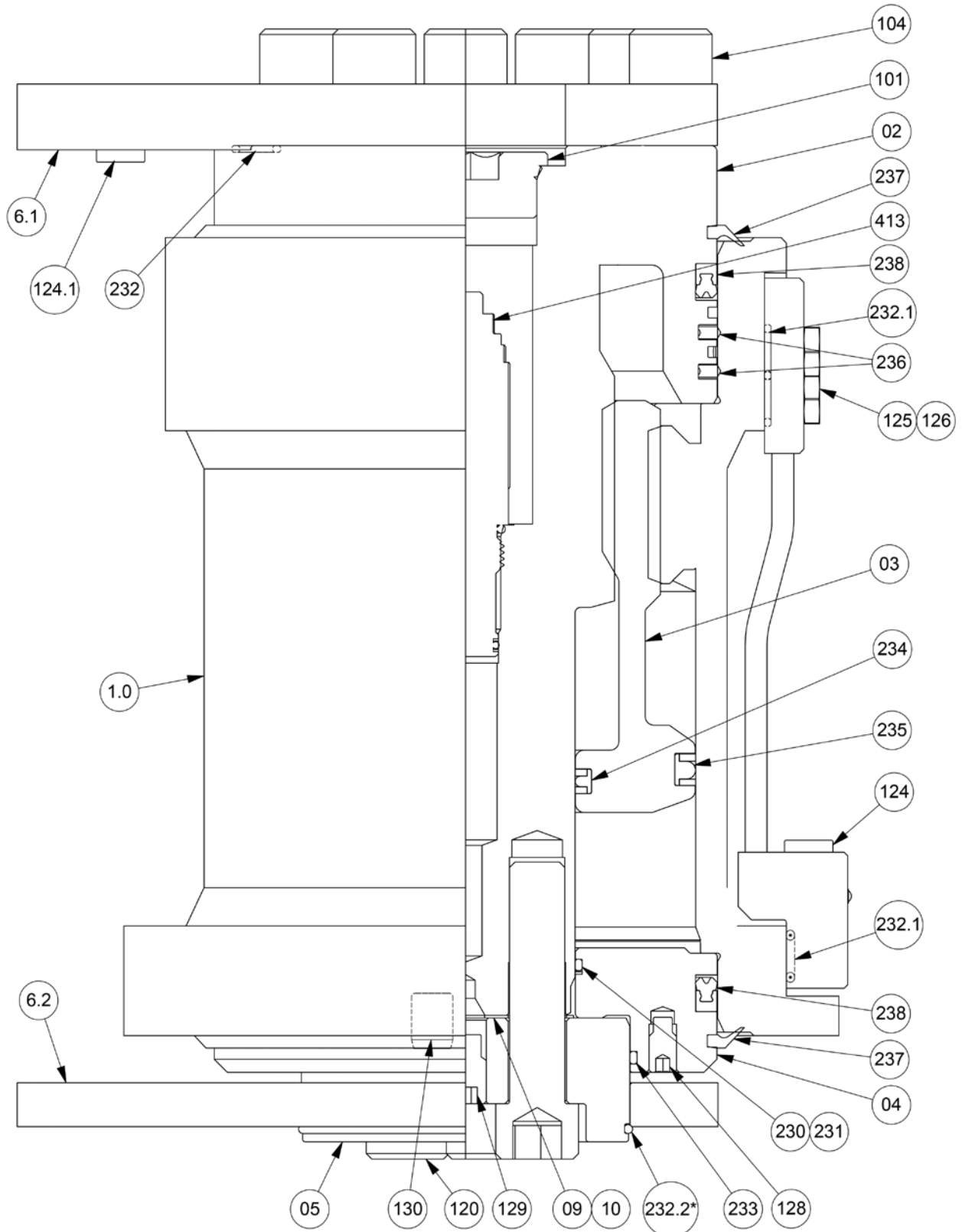
Follow flushing procedure. See pages 11-14.

Troubleshooting Guide

Problem	Possible Cause	Solution
PowerTilt does not hold position	<p>Cross port relief is opening due to excess down pressure from excavator</p> <p>Faulty cross port relief valve.</p> <p>Control valve leaking oil.</p> <p>Seals leaking oil.</p>	<p>This is normal. The integral cross port relief valve is designed to protect the PowerTilt from excessive internal pressures that can damage the unit.</p> <p>Remove the integral cross port relief valve and visually inspect for damage or debris. Check pressure setting of the cross port relief valve which can be found in the Tool Circuit Requirements Chart shown on Page 8.</p> <p>Test, repair or replace as needed.</p> <p>Test and replace seals as needed.</p>
PowerTilt swings in only one direction.	<p>Single directional control valve is being used.</p> <p>Cross port relief valve damaged.</p>	<p>Replace with bi-directional control valve.</p> <p>Inspect, test and replace as needed.</p>
PowerTilt has spongy feel side to side.	<p>Air in PowerTilt or hydraulic circuit.</p> <p>Diameter of tubing/hoses larger or longer than recommended.</p>	<p>Bleed air from circuit and check for cause.</p> <p>Install new tubing/hoses with recommended diameters which can be found in the Tool Circuit Requirements Chart shown on Page 8.</p> <p>Install pilot operated check valve in lines as close as possible to PowerTilt.</p>
Side to side bucket movement.	<p>Some movement is normal due to clearance required between internal spline teeth.</p>	<p>Normal movement is 1° to 1-1/2°. Consult factory.</p>
PowerTilt squeals at maximum tilt or when stalled.	<p>Relief valve is opening from machine pressure.</p>	<p>Check relief pressure, and if within range, reduce the pressure from the machine to below relief pressure setting.</p>

PT-030/050 Assembly Drawing

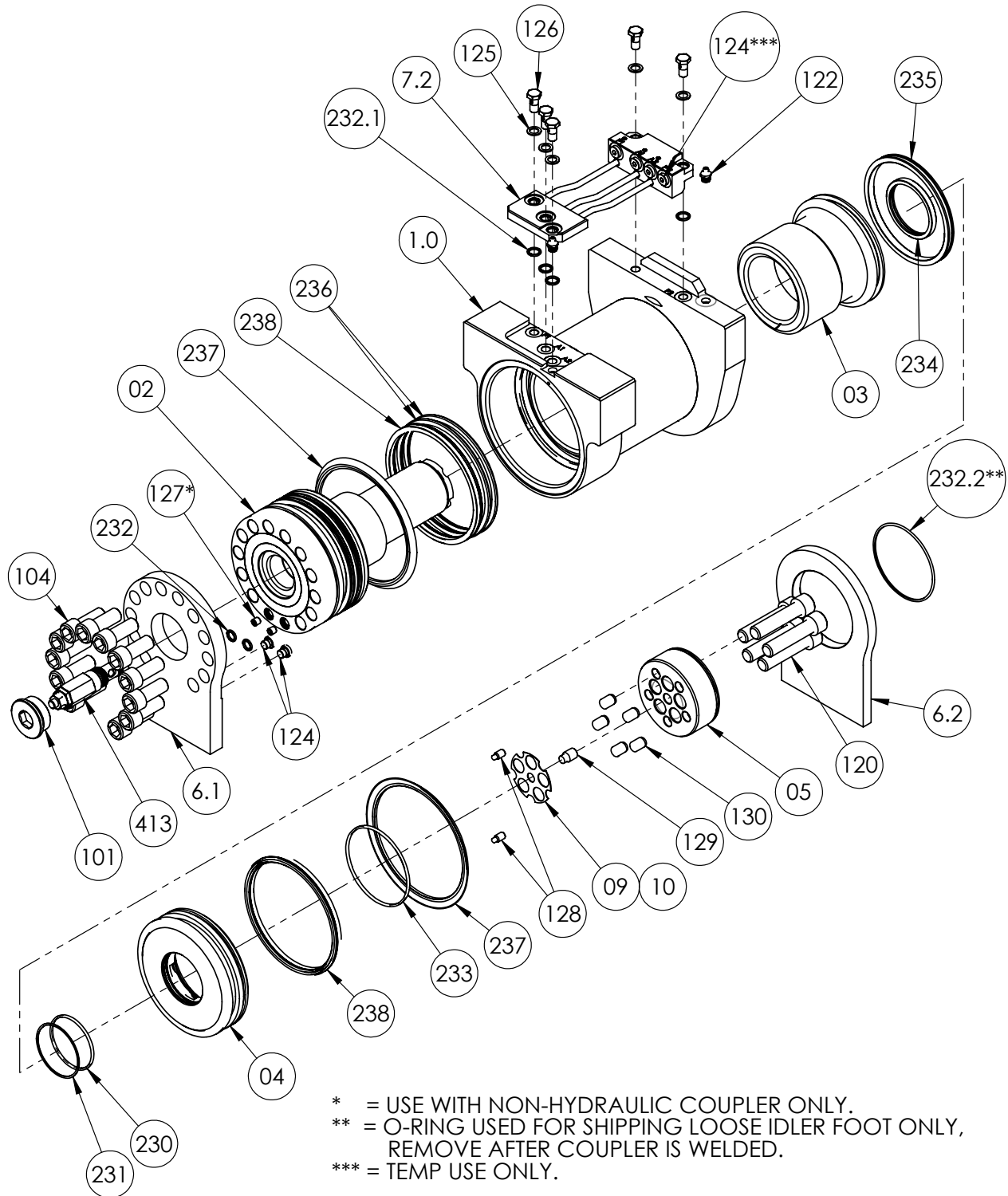
*PT-050 Shown



* O-RING USED FOR SHIPPING LOOSE IDLER FOOT ONLY, REMOVE AFTER COUPLER IS WELDED.

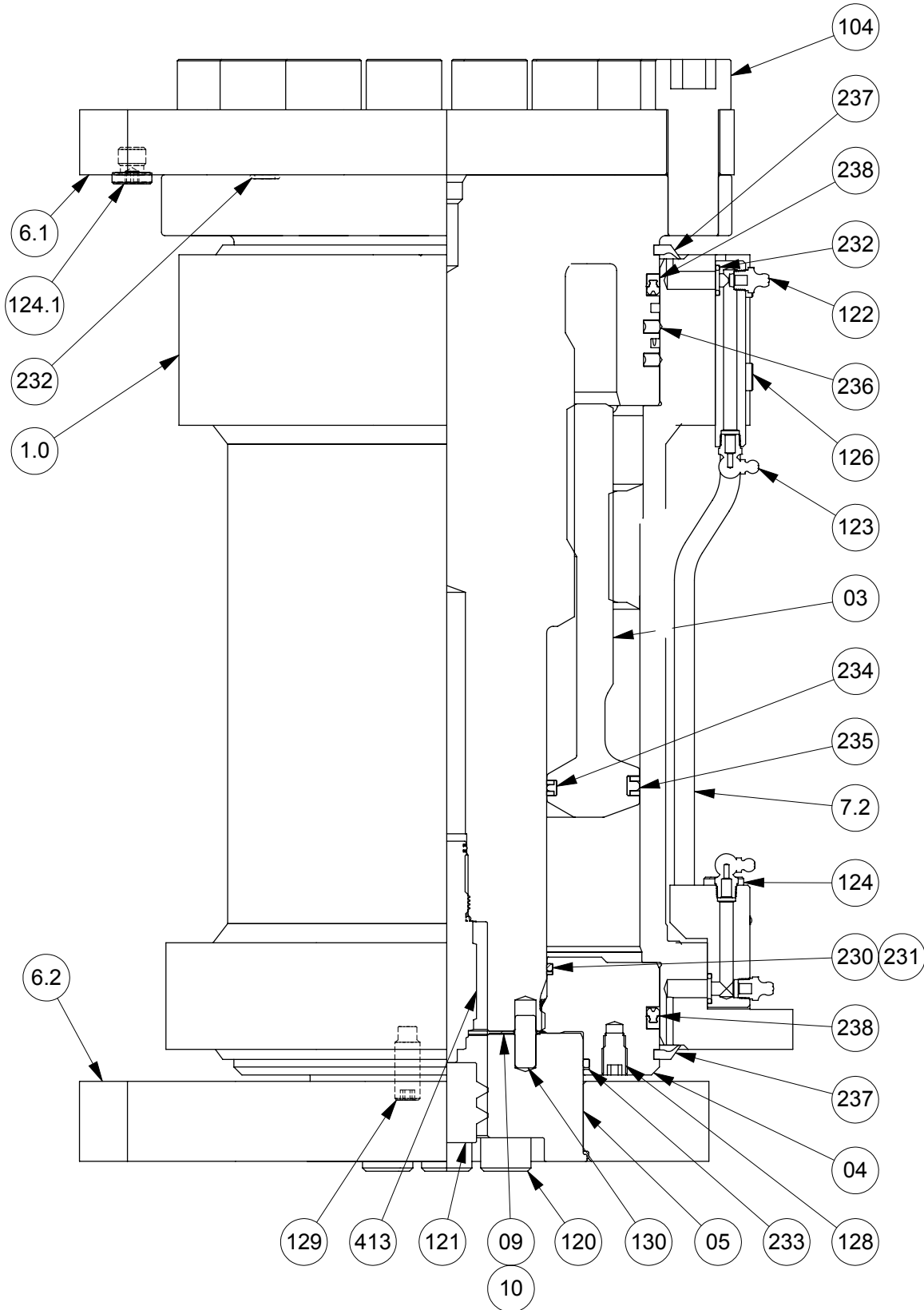
PT-030/050 Exploded View

*PT-050 Shown. See parts list for quantities of an item.



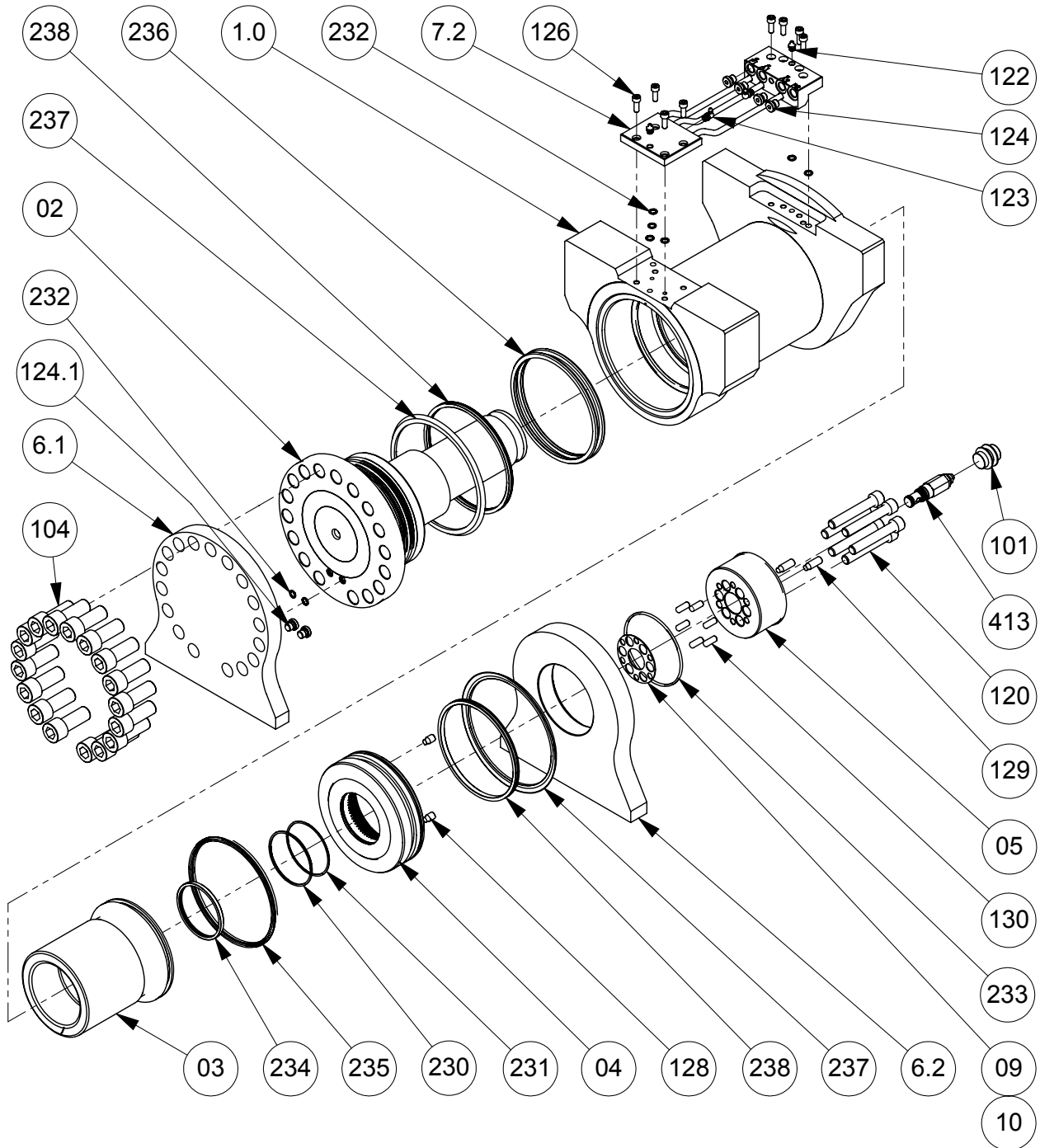
PT-180 Assembly Drawing

With cross-port relief from hub end



PT-180 Exploded View

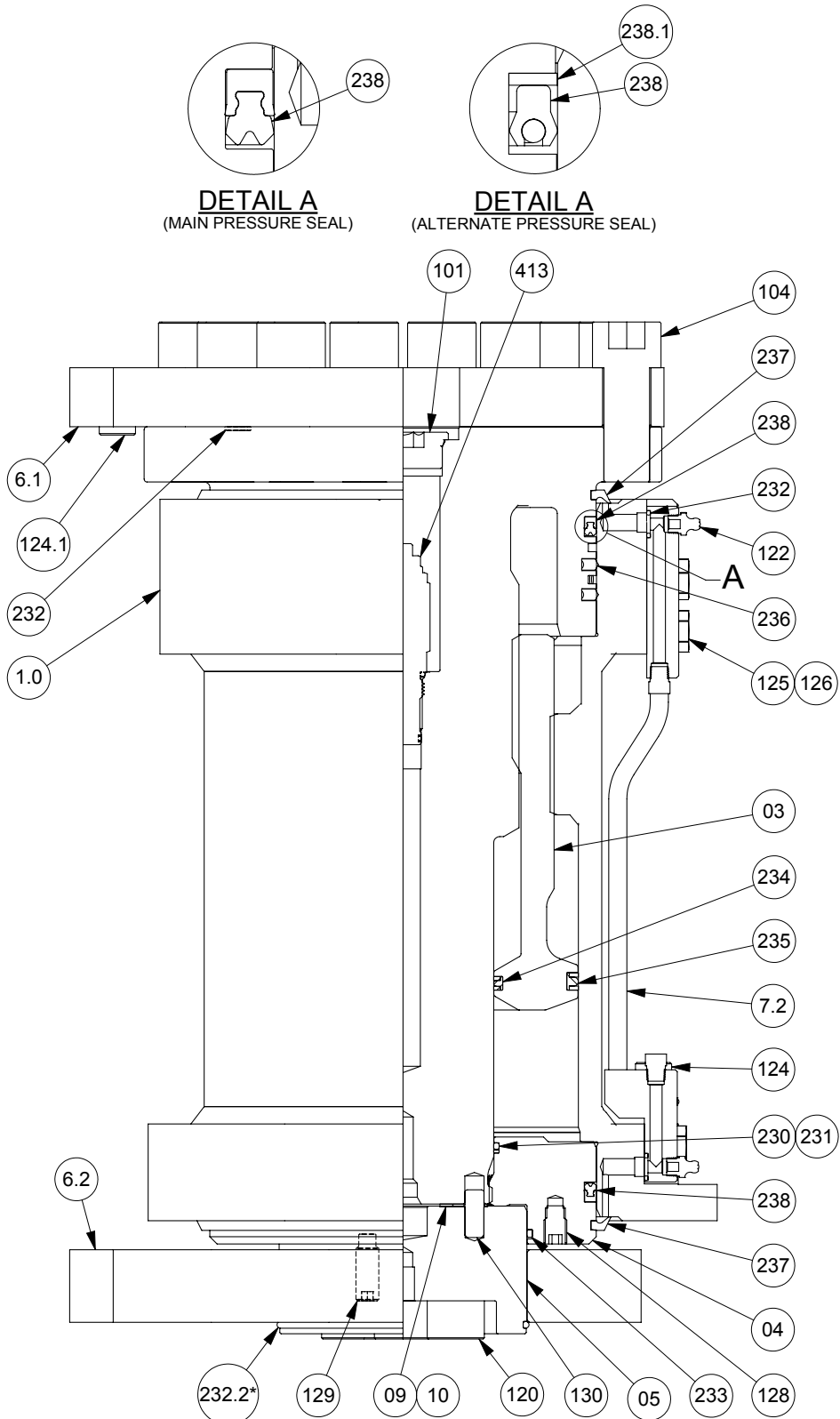
With cross-port relief from hub end



PT-070/100/180/240/300 Assembly Drawing

With cross-port relief from shaft flange end

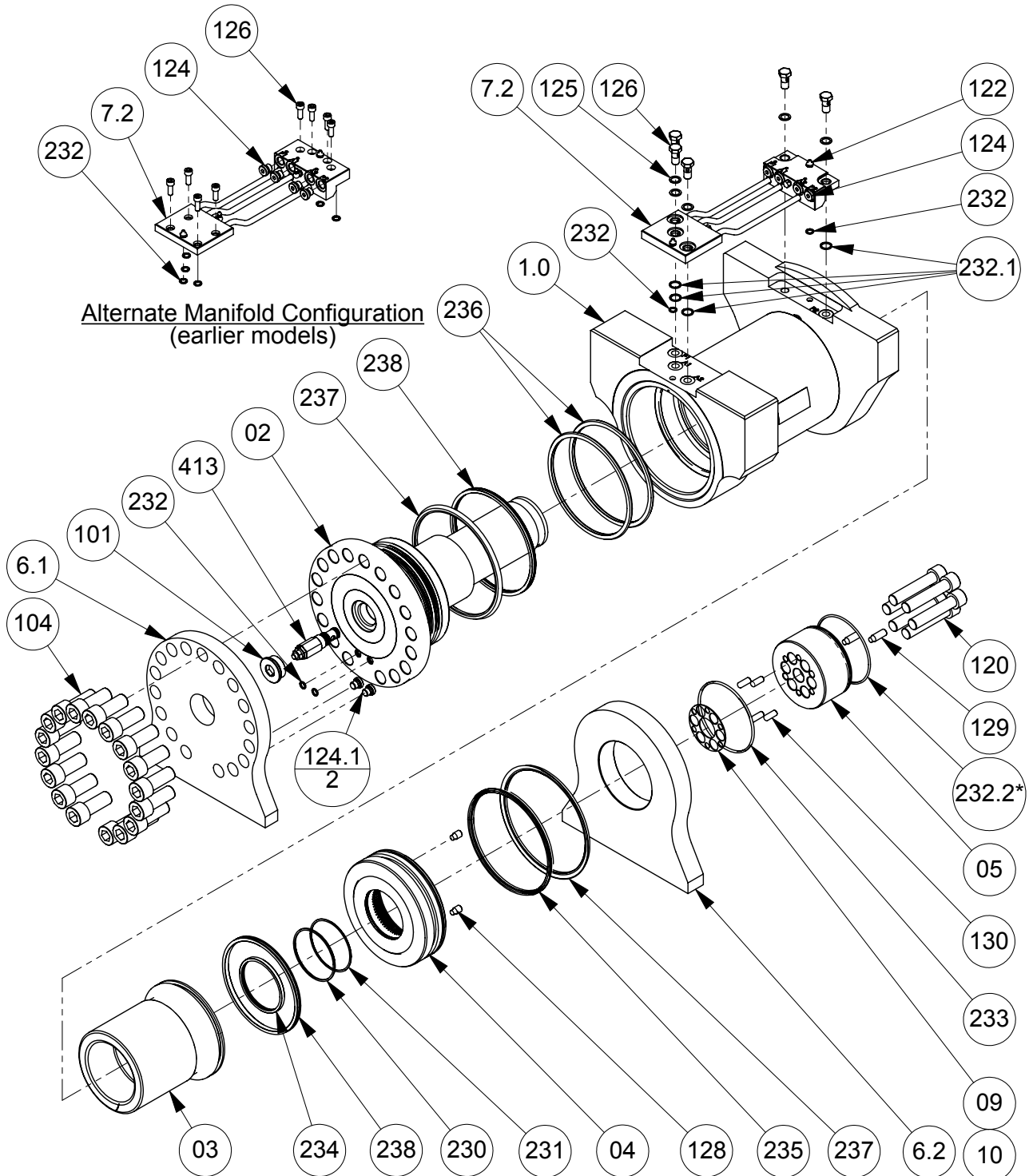
*PT-180 Shown. See parts list for quantities of an item.



* O-RING USED FOR SHIPPING LOOSE IDLER FOOT ONLY, REMOVE AFTER COUPLER IS WELDED.

PT-070/100/180/240/300 Exploded View

*PT-180 Shown. See parts list for quantities of an item.



* O-RING USED FOR SHIPPING LOOSE IDLER FOOT ONLY, REMOVE AFTER COUPLER IS WELDED.

Parts List

PARTS

Item	Description	Quantity
01	Housing	1
02	Shaft	1
03	Piston	1
04	End Cap	1
05	Hub	1
6.1	Torque Foot	1
6.2	Idler Foot	1
09/10	Shim Pack	1
7.2	Manifold Assembly	1
413	Relief Valve	1

HARDWARE

Item	Description	Quantity
101	Plug	1
104	Screw	See table page 37
120	Screw	6
120	Screw, PT-030	4
120	Screw, PT-050, 070	5
122	Grease Fitting	2
124	Plug (BSPP 1/4)	4
124.1	Plug	2
	PT-030 – PT-100 BSPP 1/8	
	PT-180 – PT-300 BSPP 1/4	
125	Crush Washer	5
126	Screw	8
126	Banjo bolt	5
128	Screw, Set	See table page 37
129	Screw, Set	See table page 37
130	Hub Pin	See table page 37

SEALS

Sold as "kit" only

Item	Description	Quantity
230	Seal; O-Ring	1
231	Seal; O-Ring Backup	1
232	Seal; O-Ring	See table page 37
232.1	Seal; O-Ring	See table page 37
233	Seal; O-Ring	1
234	Seal; T-Seal	1
235	Seal; T-Seal	1
236	Seal; Rotary Union	2
237	Seal; Exclusion	2
238	Seal	2

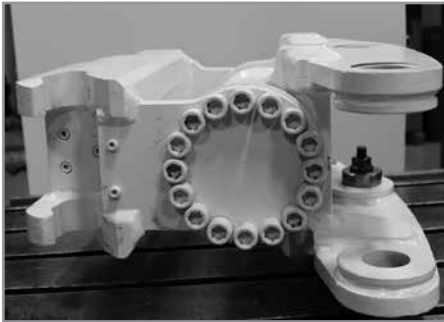
Product Inspection

Make sure the PowerTilt is thoroughly cleaned prior to disassembly. Continue to clean all machined parts in a wash tank and dry with compressed air. Inspect the PowerTilt for corrosion prior to disassembly.

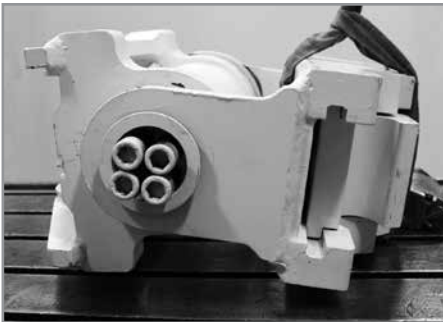
Severe corrosion can make it difficult to remove the hub, set screws or the end cap. If corrosion is evident, soak the screws with penetrating oil for several hours before disassembly.

Removal of Coupler

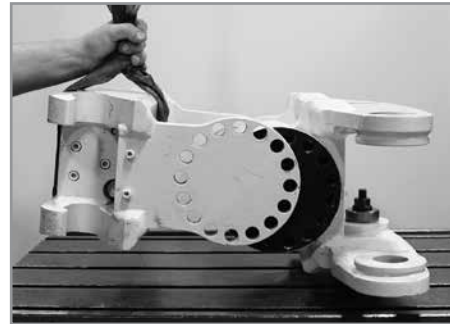
1. Clamp PowerTilt to a secure table.



2. Remove bolts from hub. Use a jacking screw(s) to remove the hub.



3. Remove the flange bolts and remove the coupler from the PowerTilt.



	CAUTION
	<p>To avoid injury or damage to product:</p> <p>Secure the standard pin-on coupler before removing the lock ring screws.</p>

NOTICE
<p>To avoid damage to gear teeth and housing bore:</p> <p>Carefully support the weight of the piston as it clears the housing.</p>

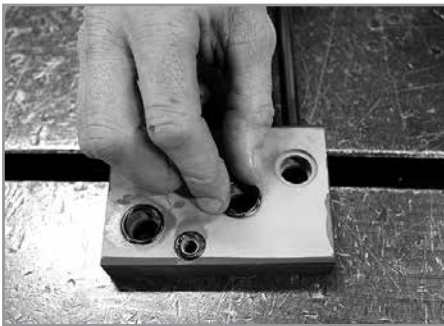
NOTICE
<p>To avoid damage to machined parts:</p> <p>Carefully remove seals using removal tools with rounded edges.</p>

Disassembly of PowerTilt

1. Remove manifold from PowerTilt.



2. Remove o-ring seals from manifold



3. Remove hub screws from end cap if not already done.



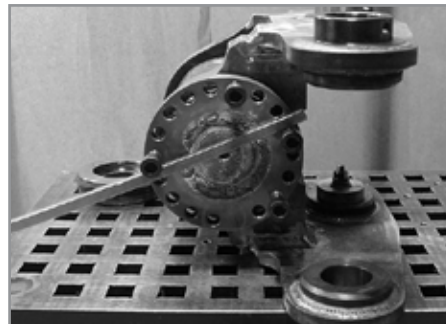
4. Remove hub from end cap if not already done.



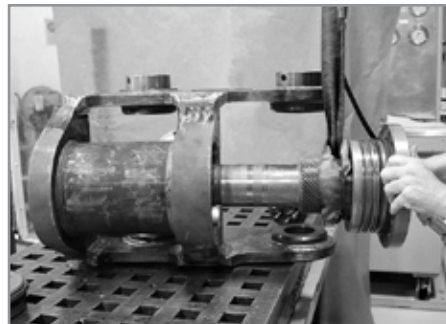
5. Remove end cap from housing.



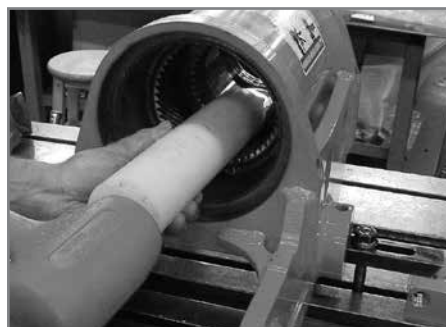
6. Insert two flange bolts and using a bar, rotate the shaft counter clockwise until it clears the seals.



7. Carefully remove the shaft.



8. Use a hammer or other soft face tool to remove piston sleeve.



Disassembly of PowerTilt

9. Remove piston sleeve from housing.



10. Remove piston seal from piston sleeve.



11. Remove backup ring seal from piston sleeve.



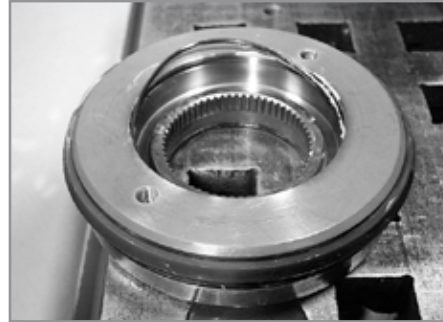
12. Remove rod seal from piston sleeve.



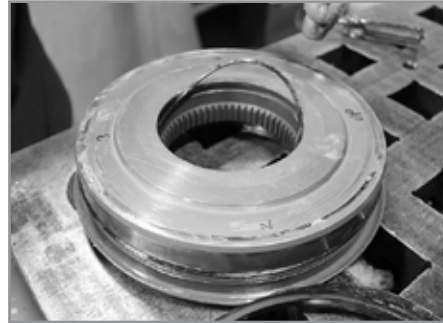
13. Remove backup ring seal from piston sleeve.



14. Remove o-ring seal from end cap.



15. Remove backup ring seal from end cap.



16. Remove exclusion seal from end cap.

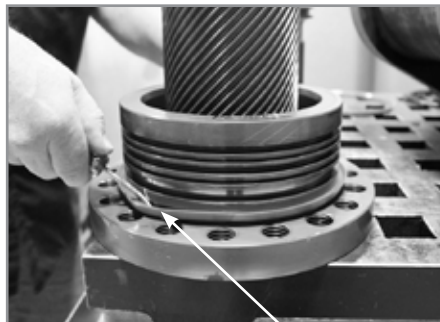


Disassembly of PowerTilt

17. Remove pressure seal from end cap.



21. Remove exclusion seal from shaft.



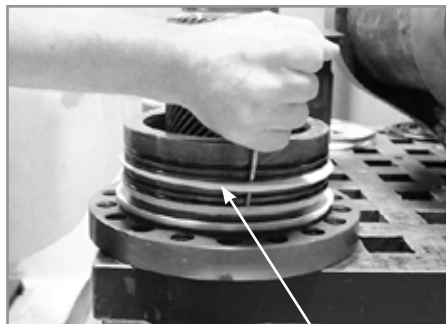
exclusion seal

18. Remove first rotary seal from shaft.



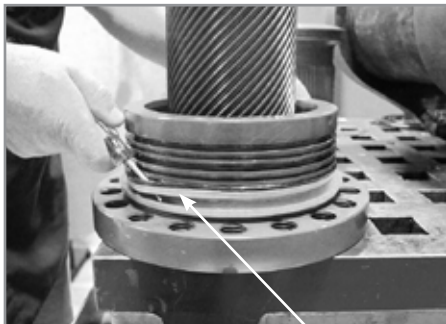
rotary seal

19. Remove second rotary seal from shaft.



rotary seal

20. Remove pressure seal from shaft.



pressure seal

Shims Replacement

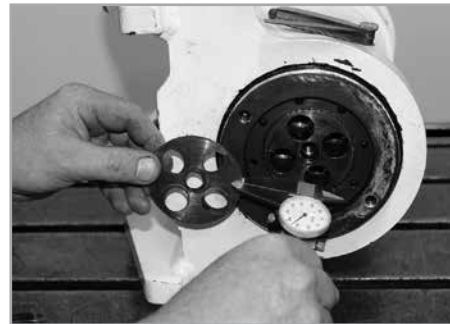
NOTICE

This procedure is required only if the housing, end cap or shaft have been replaced.

1. Assemble the shaft and end cap only into the housing without any seals. It is difficult to get an accurate measurement with the seals installed. To get an accurate measurement with the piston and seals installed, use a bar clamp or other device to pull the shaft and end cap tightly against the housing thrust bearings.
2. Use a depth micrometer or feeler gauge to carefully determine the step between the shaft end and the end cap counterbore.

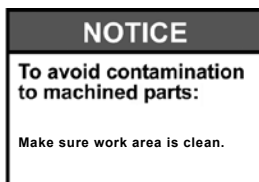
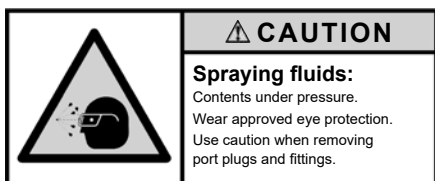


3. Record the measurement. The replacement shims consist of .020" shims and .004" shims. In final assembly, use sufficient shims to produce a stack equal to the recorded measurement plus .003" (.08 mm) to .012" (.30 mm). This will determine the running clearance between the thrust bearings. Too much clearance will result in a loose actuator. Too little may result in bearing damage or an inoperable PowerTilt.



4. Disassemble the PowerTilt and proceed to assembly.
5. After assembly, verify that the shimming is correct by checking the end play during testing. See page 39.

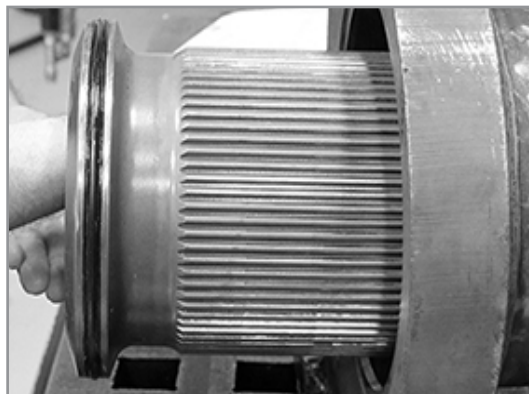
Dry Assembly



For personnel not familiar with the assembly of the PowerTilt it is recommended to assemble the unit without seals to verify timing and rotation limits.

Caution: Support all components carefully to avoid damage to any edges or sealing surfaces.

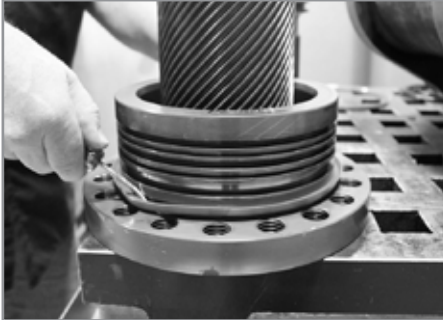
Align existing timing marks on Piston with those on the Ring Gear in the housing. Push Piston in until it bottoms out on the Ring Gear. Align existing timing marks on Shaft to those on the mating gear of Piston. Rotate Shaft into gearing until it bottoms out on housing thrust face. Install End cap, hub and screws. Snug screws down and check for complete rotation of shaft. Depending on unit, rotation will be 180-186 degrees or 120-126 degrees. If timed correctly the two small O-ring counterbores should rotate either 90° or 60° each way from the 6:00 position. Once correct timing and assembly steps are verified disassemble unit and complete assembly per steps listed.



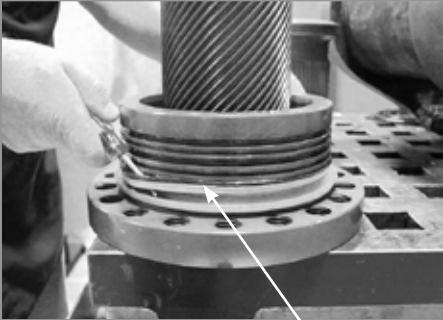
Assembly of PowerTilt

NOTICE Wash and clean parts thoroughly.

1. Oil and install exclusion seal onto shaft.

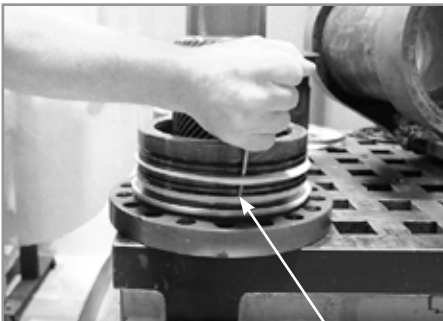


2. Oil and install pressure seal onto shaft.



pressure seal

3. Oil and install second rotary seal onto shaft.



rotary seal

4. Oil and install first rotary seal onto shaft.



rotary seal

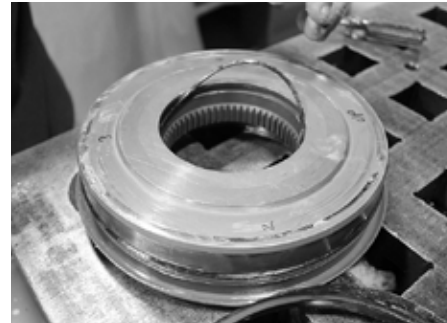
5. Oil and install pressure seal onto end cap.



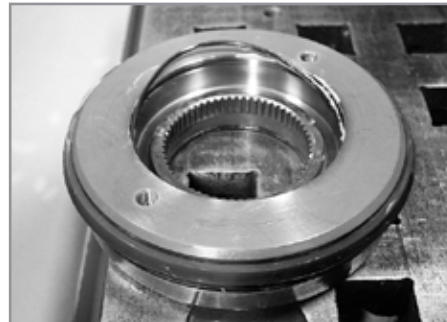
6. Oil and install exclusion seal onto end cap.



7. Oil and install backup ring seal onto end cap.

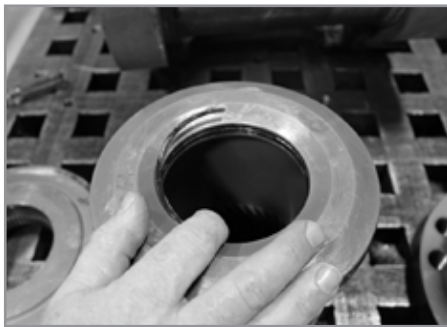


8. Oil and install o-ring seal onto end cap.



Assembly of PowerTilt

9. Oil and install backup ring seal onto piston sleeve.



10. Oil and install rod seal onto piston sleeve.



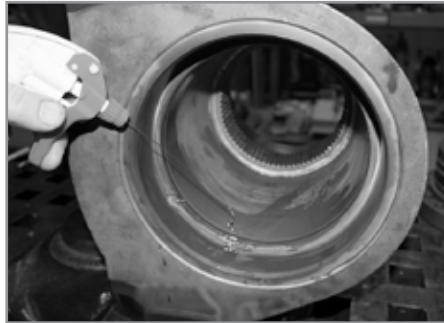
11. Oil and install backup ring seal onto piston sleeve.



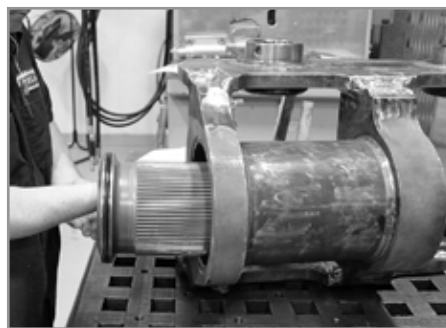
12. Oil and install piston seal onto piston sleeve.



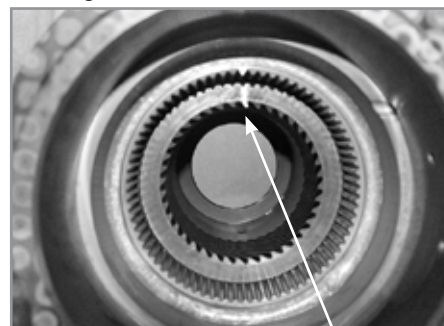
13. Oil housing and piston sleeve.



14. Install piston sleeve into housing.



15. Align timing marks with the piston sleeve and housing.



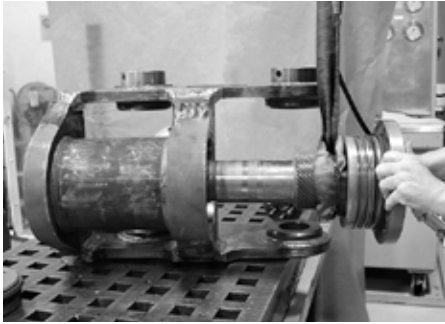
timing marks

16. Use a soft hammer to install piston sleeve.



Assembly of PowerTilt

17. Pack exclusive seal with grease. Oil and install the shaft into piston sleeve.

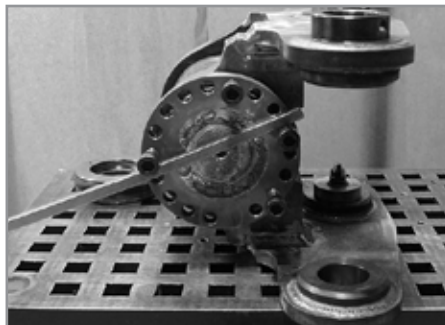


18. Align timing marks with piston sleeve and shaft.

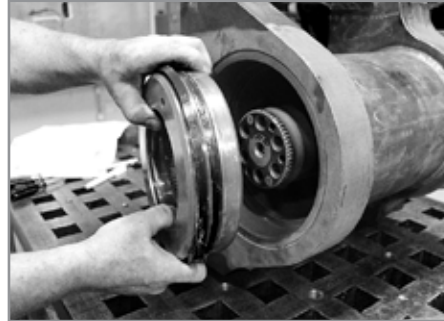


timing marks

19. Use a bar to turn the shaft clockwise into the piston sleeve.



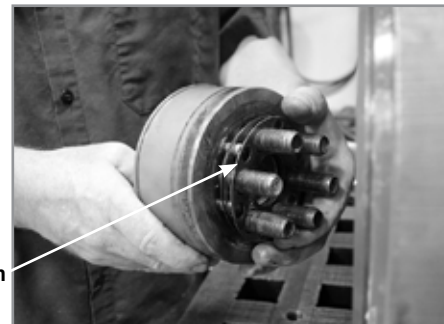
20. Pack exclusive seal with grease. Oil and install end cap into housing. Use soft hammer to push the end cap into the housing.



21.



After tightening and removing bolts, measure the distance from the end cap surface to the shaft face and record measurement for later use. Now separate shims to approximately .003" (.08 mm) and .012" (.30 mm) thicker than the gap value recorded in previous step and install under hub to ensure proper end play.

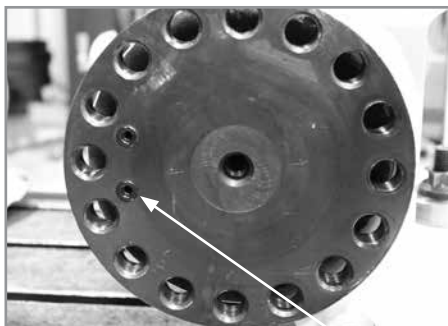
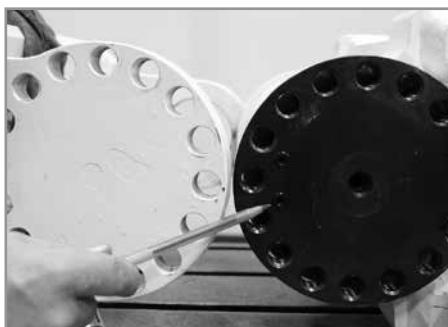


shim

Assembly of PowerTilt

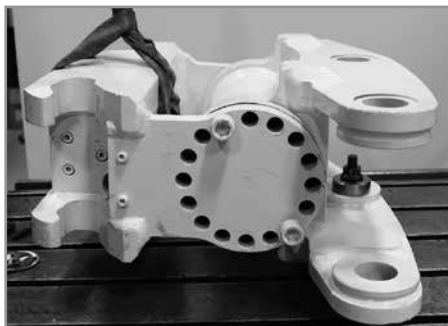
Coat bolt threads with Loctite Nickel Anti-Seize #77164 or equivalent and install bolts.

22. Ensure that the coupler port o-rings are in place.



Port O-rings

23. Install the coupler and secure it with two loose flange bolts.



24. Install the hub with the shims.



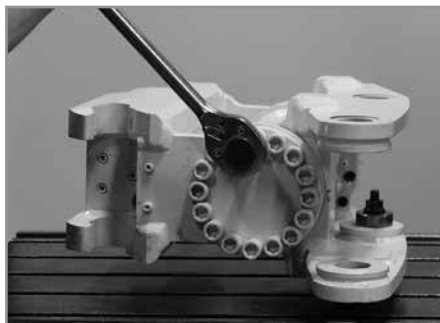
25. Coat bolt threads with Loctite Nickel Anti-Seize #77164 or equivalent. Insert hub bolts and tighten per table on page 36.



NOTICE

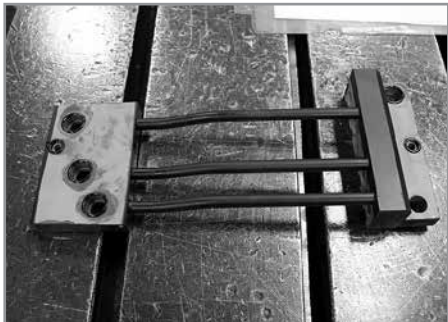
If the shaft, housing or end cap have been replaced the correct quantity of shims will have to be determined. See the instructions under Shims Replacement on page 29.

26. Coat bolt threads with Loctite Nickel Anti-Seize #77164 or equivalent. Insert bolts and tighten per table on page 36. At this time PowerTilt can be tested and inspected for leaks.



Assembly of PowerTilt

27. Install o-ring seals into manifold if using manifold.



28. Install manifold onto PowerTilt. Torque to value in table on page 36.



PowerTilt Timing

Check timing by assuring that the PowerTilt can be rotated 90°/60° depending on unit rotation, each way from the 6:00 position. This check can be performed during dry assembly by rotating the PowerTilt with a suitable bar inserted between bolts inserted into the drive face. The check can be performed by operating the PowerTilt hydraulically after assembly.

If the timing is not correct, the unit must be disassembled and timed correctly.

Installation or replacement of relief valve cartridge

Oil seals and threads. Torque to 44 ft-lbs (60 Nm).



Fastener Torque Specifications

Torque Values for Port Plugs

Plug Size	Torque Value - Hollow Hex Head Plugs Nm
BSPP G1/8	14 +/- 1
BSPP G1/4	31 +/- 1
BSPP G3/8	65 +/- 4

Torque Values for Banjo Bolts

Size	Torque Nm
BSPP G1/8	20 +/- 1
BSPP G1/4	50 +/- 3

Torque Values for Metric Fasteners

COARSE THREAD

Fastener Size	Socket Head Bolt (grd 12.9) Nm
M10 x 1.50	70 +/- 3
M12 x 1.75	125 +/- 5
M16 x 2.00	310 +/- 7
M20 x 2.50	615 +/- 20
M24 x 3.00	1100 +/- 27
M30 x 3.50	2150 +/- 41

FINE THREAD

Fastener Size	Socket Head Bolt (grd 12.9) Nm
M10 x 1.50	70 +/- 3
M16 x 1.50	340 +/- 7
M20 x 1.50	660 +/- 20
M24 x 2.00	1140 +/- 27
M30 x 2.00	2270 +/- 41

* All fasteners must be grade 12.9


PowerTilt Specifications

PowerTilt Specifications

	PT-030	PT-050	PT-070	PT-100	PT-180	PT-240	PT-300
Maximum Machine Weight							
kg	3 000	5 000	7 000	10 000	18 000	24 000	32 000
lbs	6 600	11 000	15 500	22 000	40 000	53 000	70 000
Output Torque							
Nm @ 207 bar	1 630	2 600	4 375	6 650	13 300	17 875	24 900
in-lbs @ 3000 PSI	14 400	22 900	38 700	58 800	117 600	158 200	220 400
Holding Torque							
Nm @ 225 bar	6 425	9 350	14 850	20 450	40 725	53 100	70 330
in-lbs @ 3250 PSI	56 900	82 800	131 400	180 900	360 400	470 000	622 400
Design Straddle Moment Load							
Nm @ 225 bar	9 490	17 650	30 400	51 100	137 200	197 800	267 650
in-lbs @ 3250 PSI	84 000	156 100	269 000	452 200	1 214 360	1 750 500	2 368 700
Torque Foot Bolt Size & Quantity							
Item 104	M12 x 1.75 16 each	M16 x 2.0 12 each	M20 x 2.50 12 each	M20 x 2.50 14 each	M24 x 3.00 17 each	M30 x 3.50 16 each	M30 x 3.50 18 each
Hub Bolt Size & Quantity							
Item 120	M16 x 1.5 4 each	M16 x 1.5 5 each	M20 x 1.5 5 each	M20 x 1.5 5 each	M20 x 1.5 6 each	M24 x 2.00 6 each	M30 x 2.00 5 each
Item 128 Quantity	2	2	2	2	2	2	2
Item 129 Quantity	1	1	1	1	2	2	2
Item 130 Quantity	4	5	5	5	4	4	5
Item 232 Quantity	2	2	4	8 or 4 with banjo manifold	8 or 4 with banjo manifold	4	4
Item 232.1 Quantity	4	4	4	4 with banjo manifold	4 with banjo manifold	4	4

Testing and Greasing

	⚠ WARNING
	Pinch point hazard: Moving parts can cause serious injury. Keep hands clear during operation.

	⚠ CAUTION
	Spraying fluids: Contents under pressure. Wear approved eye protection. Use caution when removing port plugs and fittings.

	⚠ CAUTION
	To avoid injury or damage to product: Secure product to work bench.

NOTICE
To avoid contamination to machined parts: Make sure work area is clean.

Testing the Carrier's Hydraulic System

If symptoms of poor performance develop, refer to the Troubleshooting Guide on Page 15 for general instructions. If you need help with more specific application issues, contact Helac or PowerTilt AG.

It is the responsibility of your service technician to verify that the carrier and hydraulic circuit are operating correctly. Because the PowerTilt receives its power from the carrier, a thorough check of the carrier hydraulic system is mandatory before performing any PowerTilt service or adjustments.

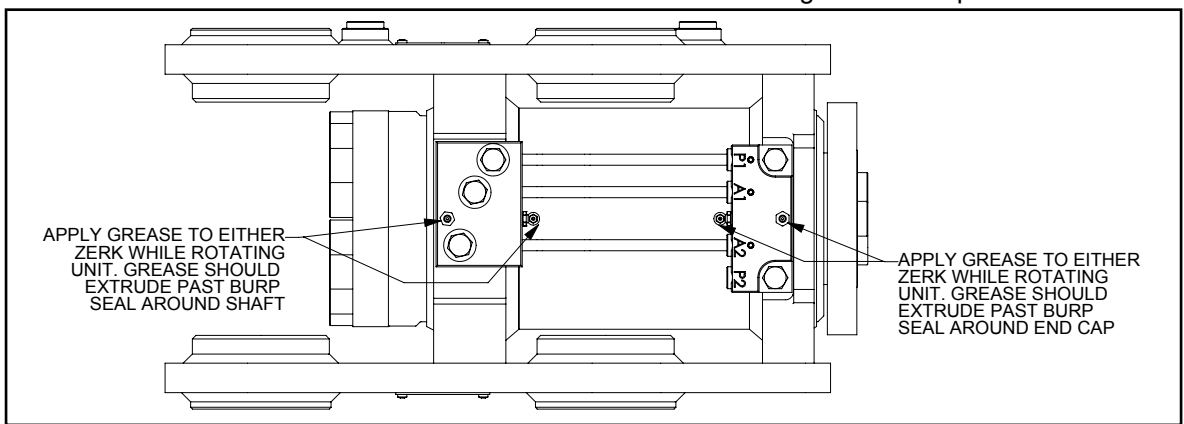
Filling Rotary Union with Oil.

See page 10 for instructions.

Testing and Greasing

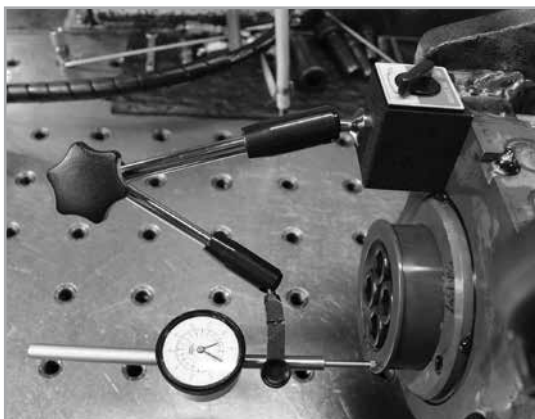
Attach the PowerTilt to either a hydraulic test bench, excavator or portable pump for greasing and testing. Make sure the PowerTilt is secured to prevent unwanted movement. Install the grease fittings.

1. After the PowerTilt is assembled but before it is put back into service, the exclusion seals and grease cavity must be packed with Lithium grease.
2. Locate the grease fittings or ports on the top of the PowerTilt and using a grease gun, pack the exclusion seal areas with grease until it exhausts from around the shaft and end cap. Clean excess grease as required.



Testing and Greasing

- Cycle the PowerTilt slowly and re-grease as necessary. During testing, it is recommended the PowerTilt be cycled 20 to 30 times to check for leaks and the proper degrees of rotation.
- Measure end play with a dial indicator. Rotate PowerTilt all the way one direction and zero out the dial indicator while the PowerTilt is still pressurized. Rotate the PowerTilt all the way the other direction. Take the reading from the dial indicator while still pressurized. The measurement should be between .003" (.08 mm) and .012" (.30 mm). If the measurement is not within specification, shims will need to be added or removed to bring the measurement within specification.



Testing for Leakage

- Connect a 3000 psi (210 bar) test gauge into the hydraulic line to Port P1. Slowly pressurize until the shaft reaches the end of rotation and bottoms out externally, e.g. the shaft bracket or torque foot contacts the housing or mounting bracket.

NOTICE

If the shaft is not completely bottomed out, hydraulic fluid will exhaust from Port P2 at a high velocity during step 2.

- Remove the hydraulic line to Port P2. Pressurize Port P1 to 2500 psi (175 bar). Check for leakage at Port P2 and from around the main shaft and end cap seals. Leaks indicate improperly installed or damage parts.

- Reconnect the hydraulic line to Port P2 and pressurize as in Step 1 above.
- Check for leaks at Port P1 and around the main shaft and end cap seals as in Step 2 above.
- Plug port A1 at the shaft ports or torque foot ports.
- Remove the A2 and P1 hydraulic hose.
- Apply pressure to A1 port.
- There should be no flow from A2 or P1.
- Remove the A1 hydraulic hose.
- Apply pressure to A2.
- There should be no flow from A1 or externally past main shaft seal.

Testing the Cross Port Relief Valve

The integral cross port relief valve vents hydraulic oil around the internal piston assembly of the PowerTilt at approximately 3250 psi (225 bar).

To test the valve:

- Connect a 3625 psi (250 bar) test gauge into the line to Port P1. Pressurize until the shaft reaches the end of rotation and bottoms out externally, e.g. the shaft bracket or torque foot contacts the housing or mounting bracket.
- Relieve pressure to P2 and disconnect the hydraulic hose and cap off the hose end.
- Install a temporary hydraulic hose to P2 with the end of the hose vented to an appropriate container.

NOTICE

The cross port relief valve is set at the factory and cannot be adjusted.

- Slowly pressurize Port P1 noting the pressure at which oil flows from P2. The relief should vent at approximately 3250 psi (225 bar).
- Test at Port P2 using the same procedure.
- If test pressure does not meet specification, the valve must be replaced. If piston seal leakage is suspected, relief port test plugs are available from the factory.

Warranty Information

Helac Corporation warrants its products to be free from defects in material and factory workmanship for a period of two (2) years or 2,000 service hours, whichever occurs first, for applications defined as medium duty, on the machine for which the Helac Attachment (PowerTilt® or PowerGrip®) was originally designed and with cross port or work port relief valves installed according to Helac Corporation's recommendations. The warranty period shall begin when the Helac Attachment is first placed into service as documented on the Warranty Registration Card. Parts and labor will be covered for the first 12 months or 1000 service hours after the start of the warranty period. Parts only will be covered for the remainder of the warranty period.

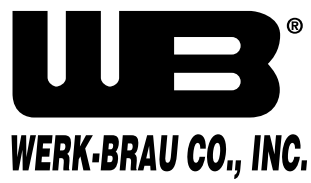
This warranty shall be voided as to any products which have been repaired, worked upon, or altered by persons not authorized by Helac Corporation, or which have been subject to misuse, misapplication, negligence, accident, overload, field alteration, severe use or service applications beyond what the Helac Attachment was designed to perform. In no event shall Helac Corporation be liable for any incidental or consequential damages or claims including, but not limited to, the application in which the product was placed, field travel, freight charges, oil samples, downtime, etc. Warranty related repair and/or replacement issues will be satisfied according to how the product was originally purchased:

Helac Corporation reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligations to make changes or alterations to products previously sold. Helac Corporation reserves the right to alter this warranty and/or its terms at any time. This warranty is in lieu of all other and/or prior warranties, expressed or implied, and no other company or person is authorized to represent or assume for Helac Corporation any liability in connection with the sale of Helac Corporation products other than set forth herein.

Notes

Notes

Notes



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