

# PowerTilt NG Series Service and Repair Manual



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## Assembly

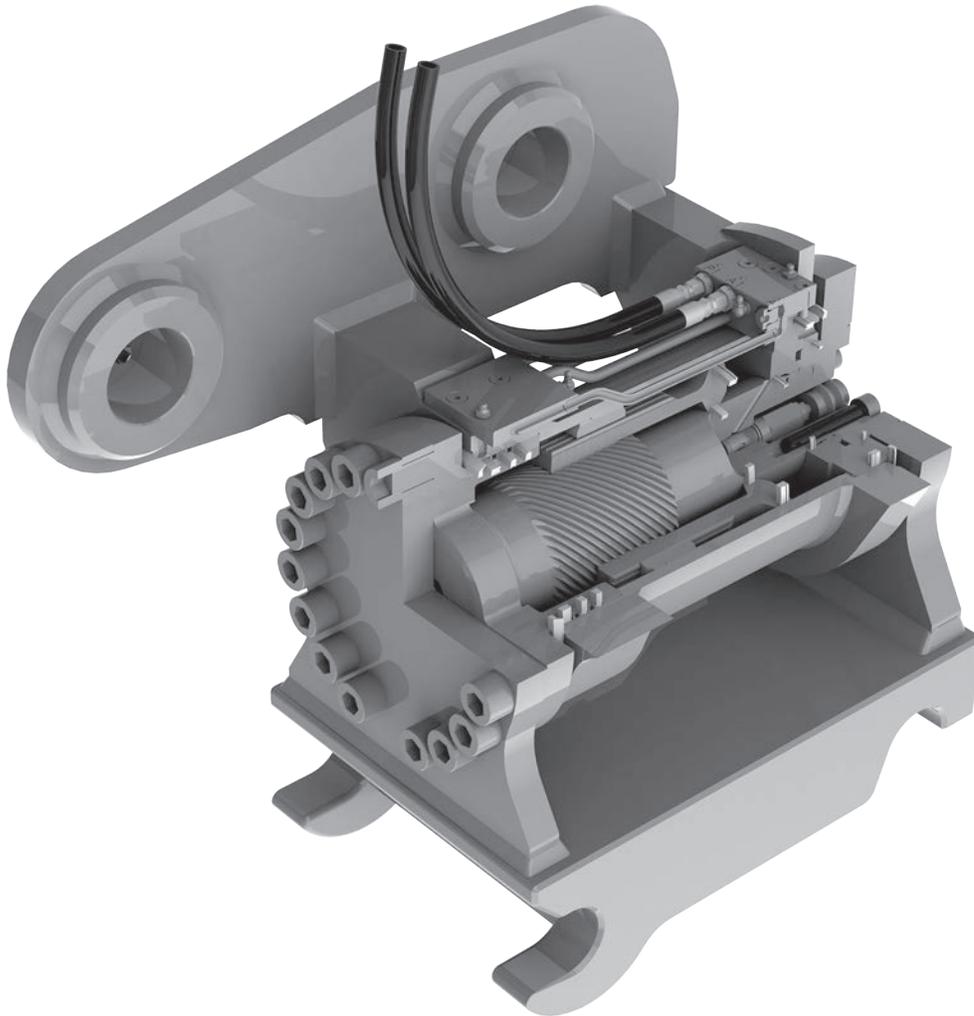
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## Product Overview



### Product Introduction

Parker's Helac brand 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.

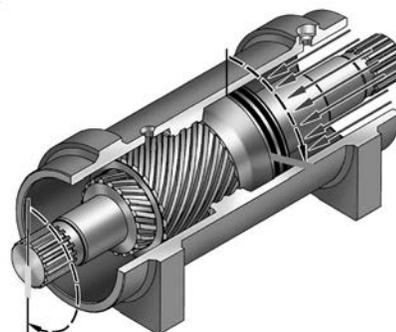
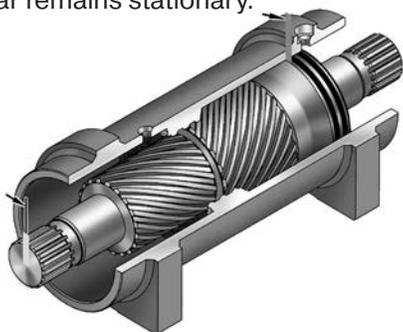
## Operation Technology

PowerTilt uses Parker's Helac brand 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 Parker 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

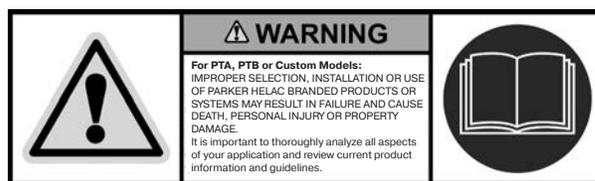
Be sure to post the provided warning decal to the cab of the carrier machine.



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

## Important Notice

Parker does 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.

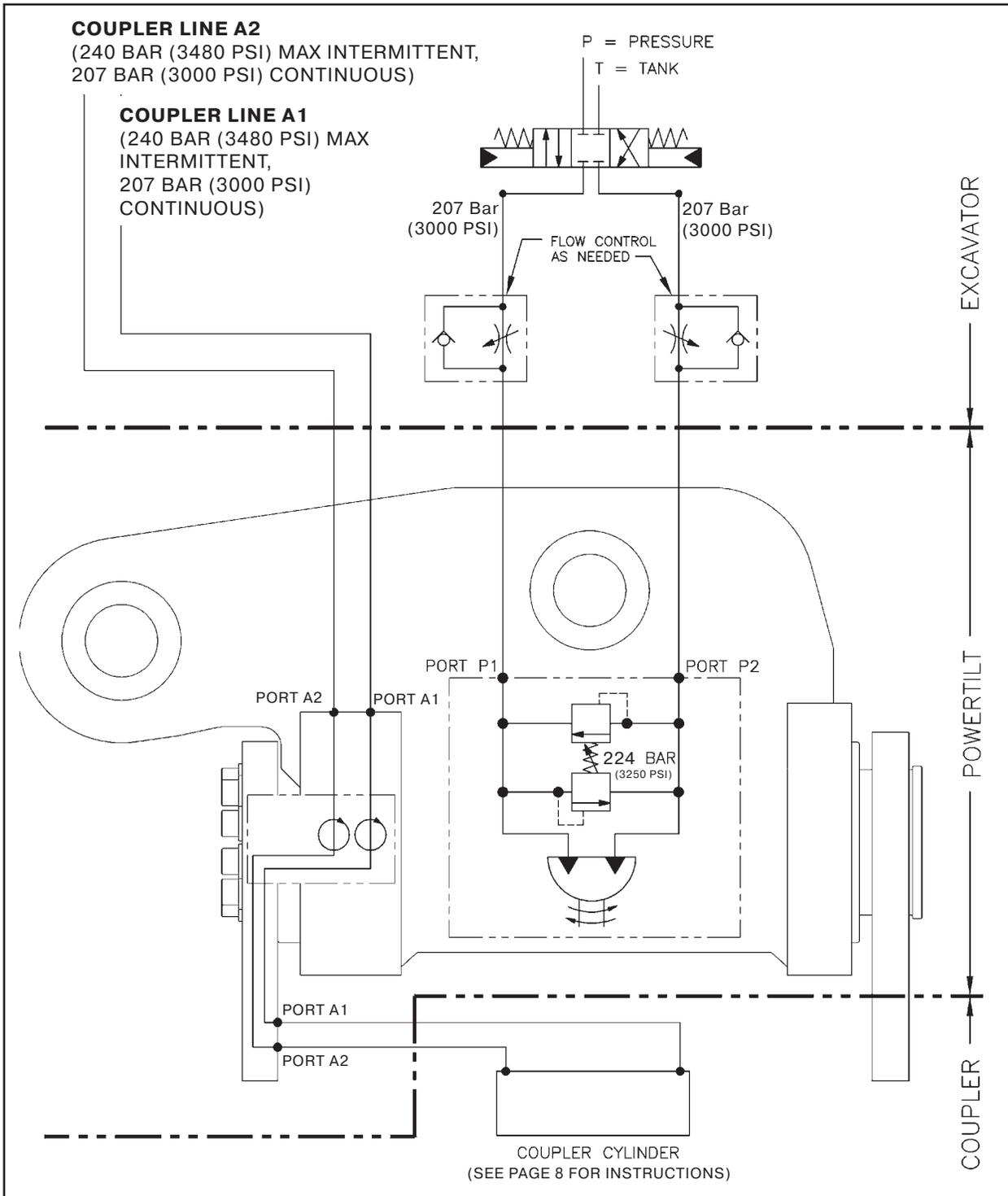


# General Safety Guidelines

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.

<b>Parker POWER/TILT</b>		PARKER HANNIFIN 225 BATTERSBY AVENUE ENUMCLAW, WA 98022 USA		CE
by <b>HELAC</b>				
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.[t] Lifting capacity lifting hook	<input type="text"/>	Bj. YOM <input type="text"/>
<small>Helac P/N #L1024</small>				

# 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. Note coupler pressures above. Higher pressures will cause failure

**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								
Model Sizes		030	050	070	100	180	240	300
Displacement	in <sup>3</sup>	38.0	57.1	77.0	126.0	158.5	212.0	288.6
	cm <sup>3</sup>	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
<b>Hydraulic Pressures</b>								
Cross Port Relief Valve Pressure**			3050-3450 psi (210-238 bar)					
PowerTilt Circuit Pressure			3000 psi (207 bar)					
Coupler Circuit Pressure			3000 psi (207 bar) Continuous, 3480 psi (240 bar) Max Intermittent					
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

Using higher coupler circuit pressures than recommended will cause failure of the rotary union seals. 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:

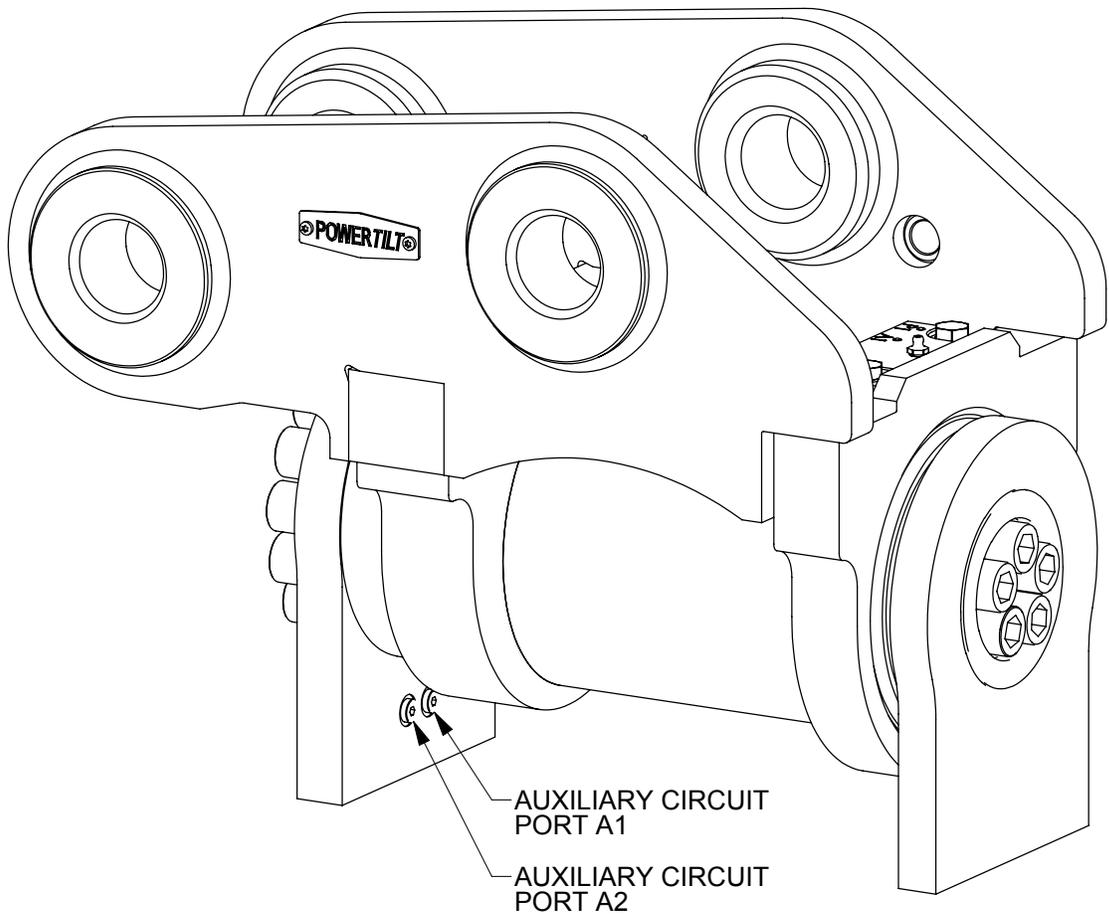
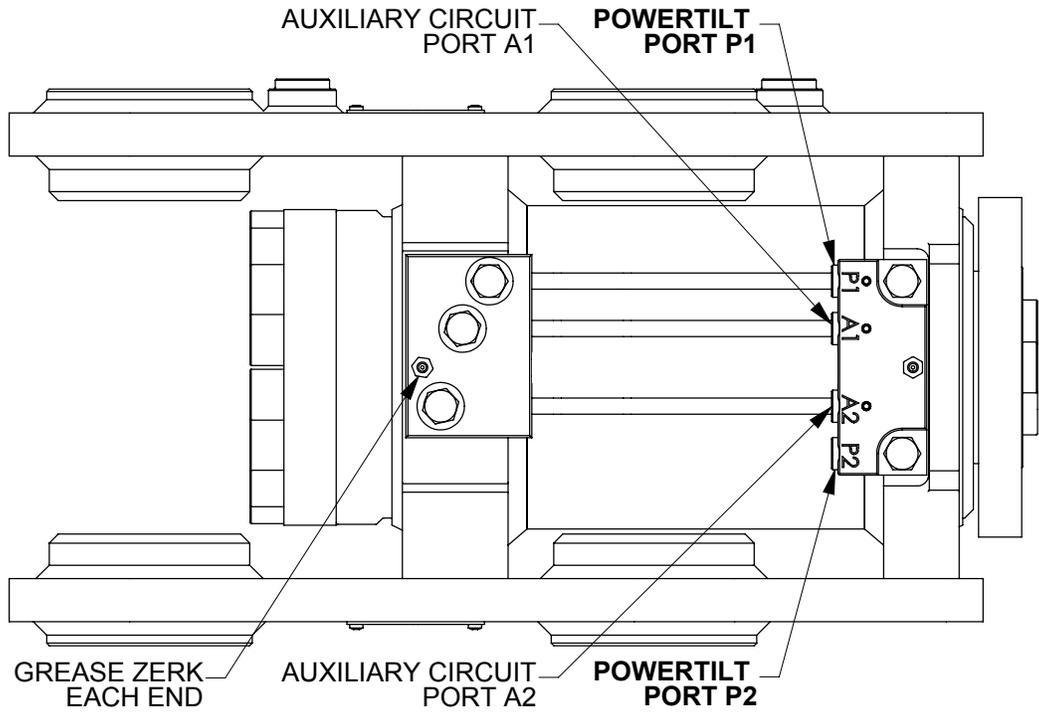
Aux 2 must always be used to release spring-clamped, pressure-release devices.

### 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 Parker 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

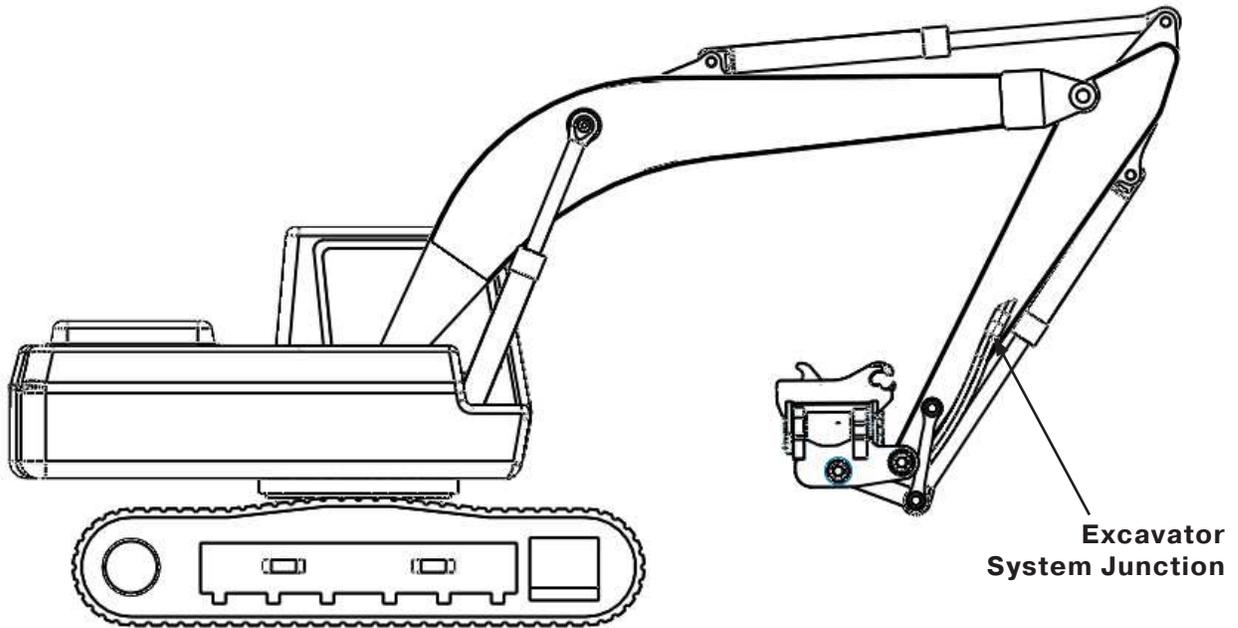


Figure 1: Boom Positions for Flushing Procedure – PowerTilt Inverted

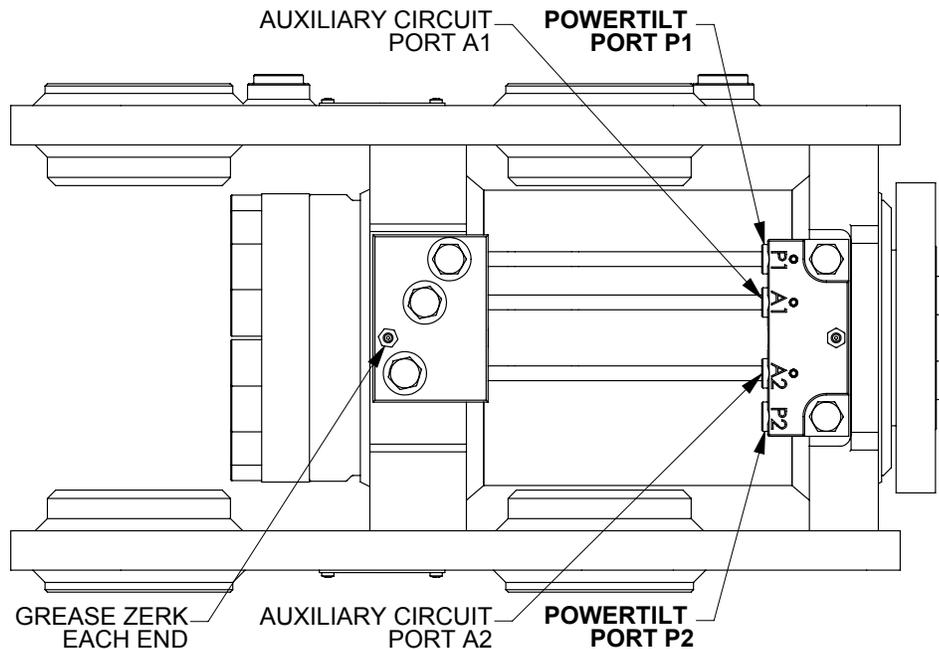


Figure 2: PowerTilt Port Locations

# Flushing and Air Purging Procedure

## PowerTilt Rotary Union Circuit Flushing

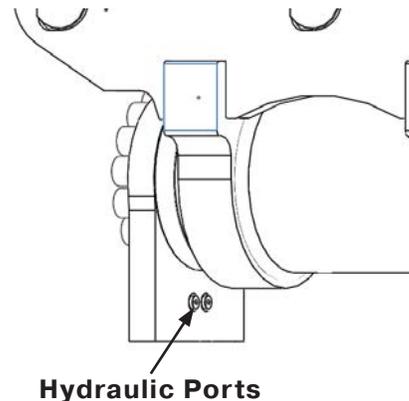
If the PowerTilt unit has a hydraulic coupler operated through the integral rotary union, follow the flushing directions of the coupler manufacturer. Otherwise the rotary union, which acts partly as a bearing, should be flushed with fresh hydraulic oil. If the PowerTilt has an access hole at the bottom 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

## Weekly

1. Inspect the PowerTilt for loose, worn or damaged components and replace or repair immediately, especially the exclusion seals.
2. Mounting pins should be greased upon installation and thereafter according to the equipment manufacturer's instructions.
3. Check torque foot and hub bolt torque. Re-torque to recommended torque if needed.
4. Every 400 hours grease the two grease fittings with a high quality Lithium-based grease. Apply grease slowly 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. \*

\* Automatic greasing systems are not recommended

### NOTICE

Do not use high pressure water to clean exclusion seal area. Dirt and water could be forced under the exclusion seal and cause accelerated wear.

## Every 1,000 Hours

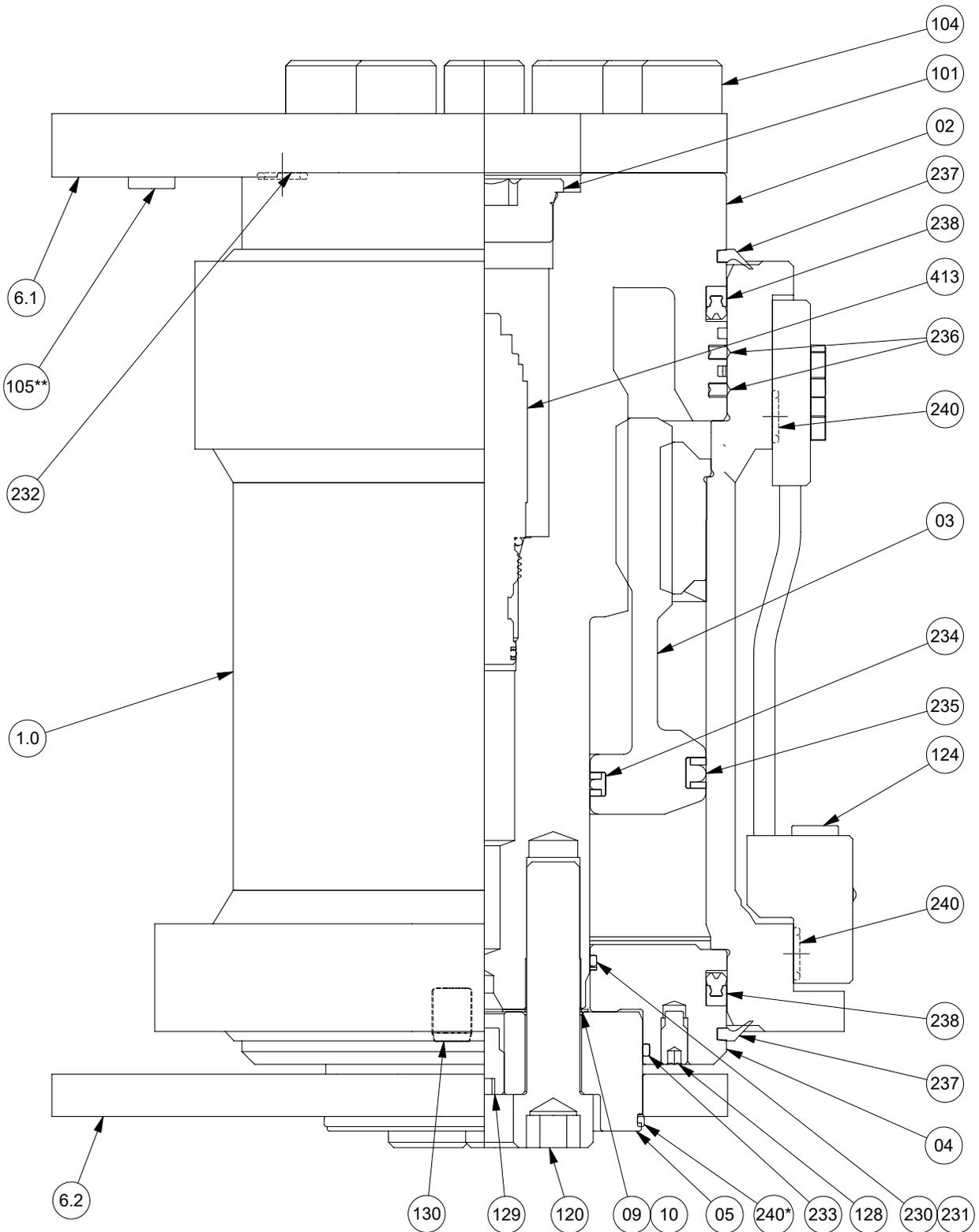
Follow flushing procedure. See pages 11-14.

# 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

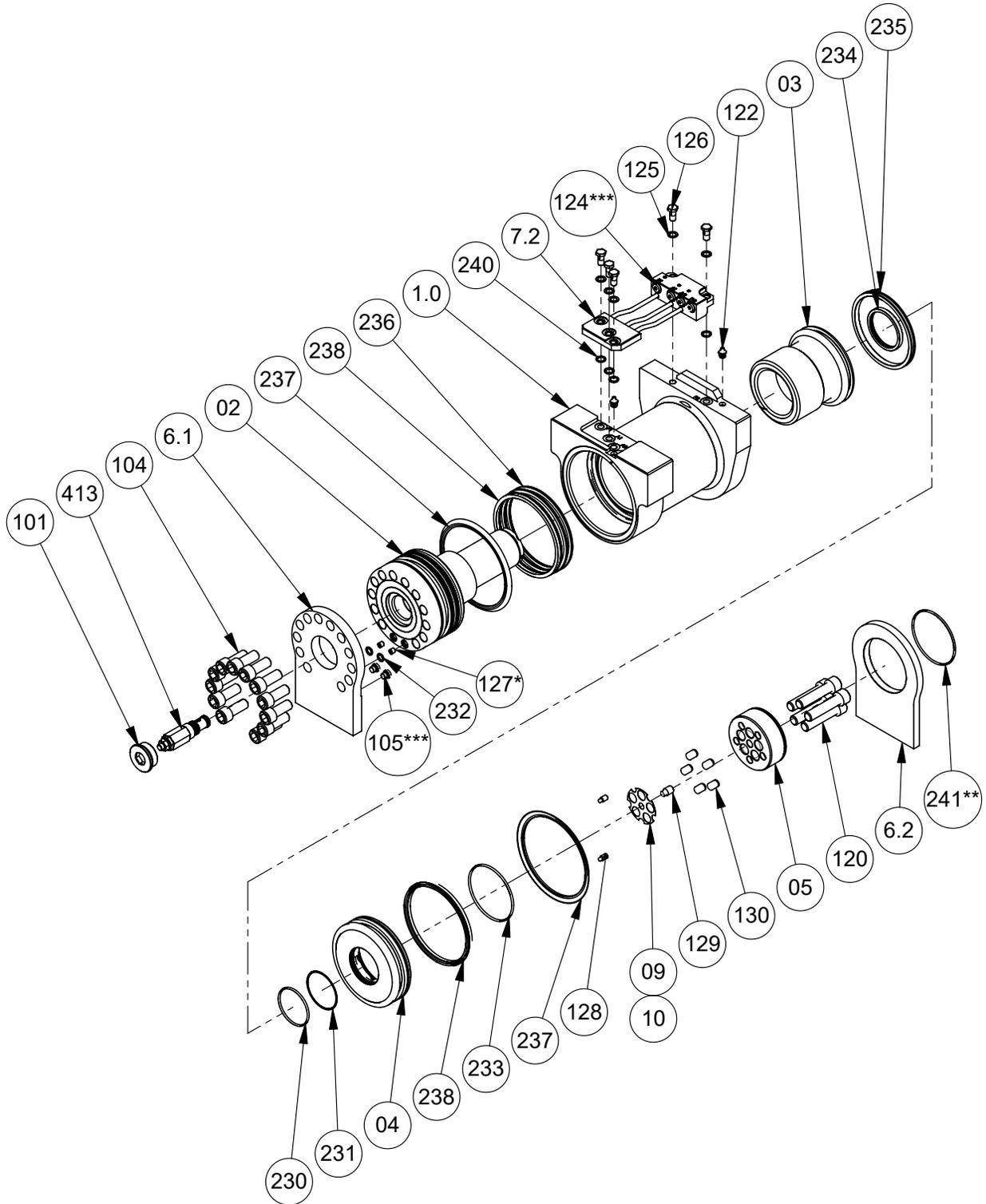
\*PT-050 Shown



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

# PT-030/050 Exploded View

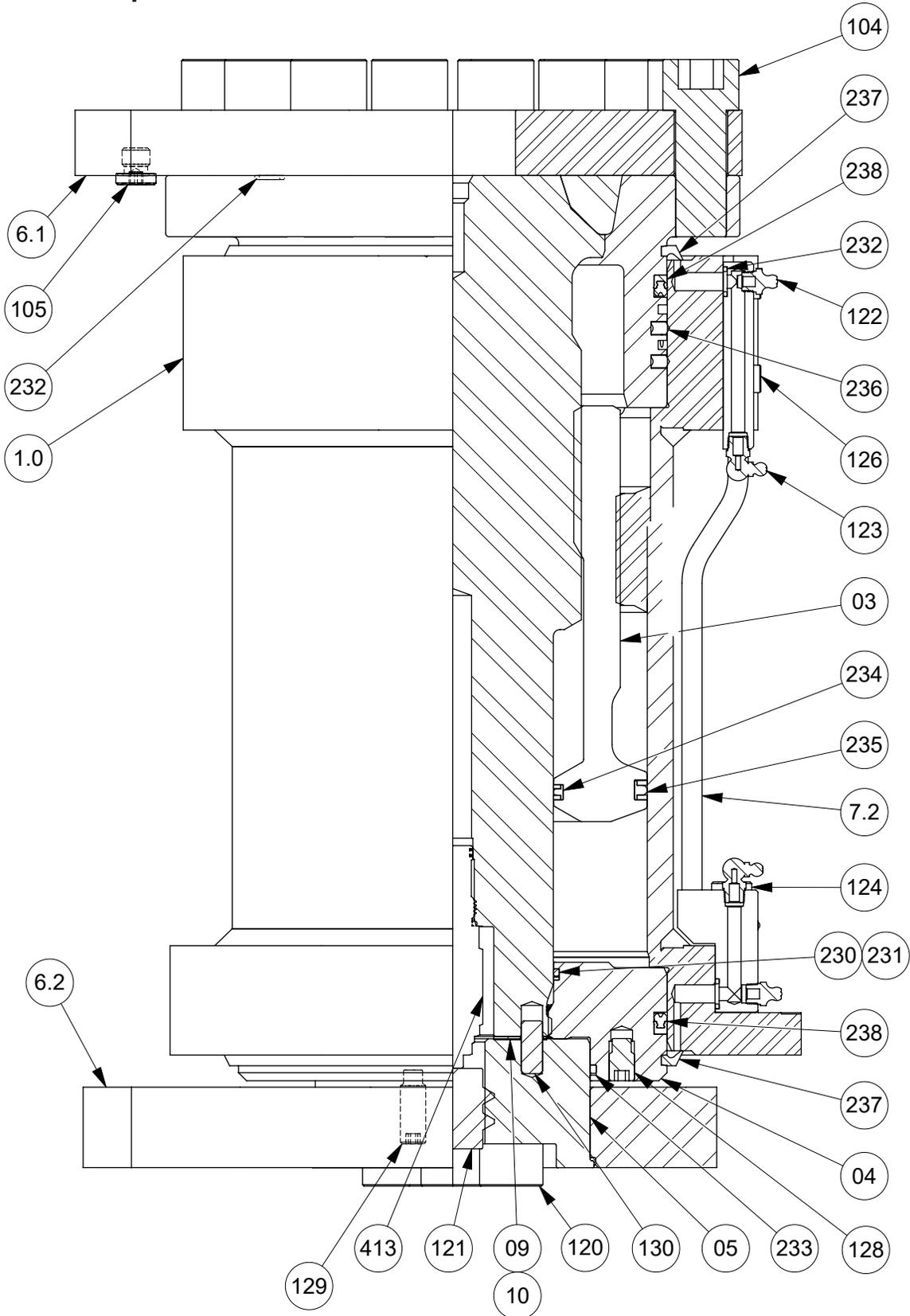
\*PT-050 Shown. See parts list for quantities of an item.



- \* = USE WITH NON-HYDRAULIC COUPLER ONLY.
- \*\* = O-RING USED FOR SHIPPING LOOSE IDLER FOOT ONLY, REMOVE AFTER COUPLER IS WELDED.
- \*\*\* = TEMP USE ONLY.

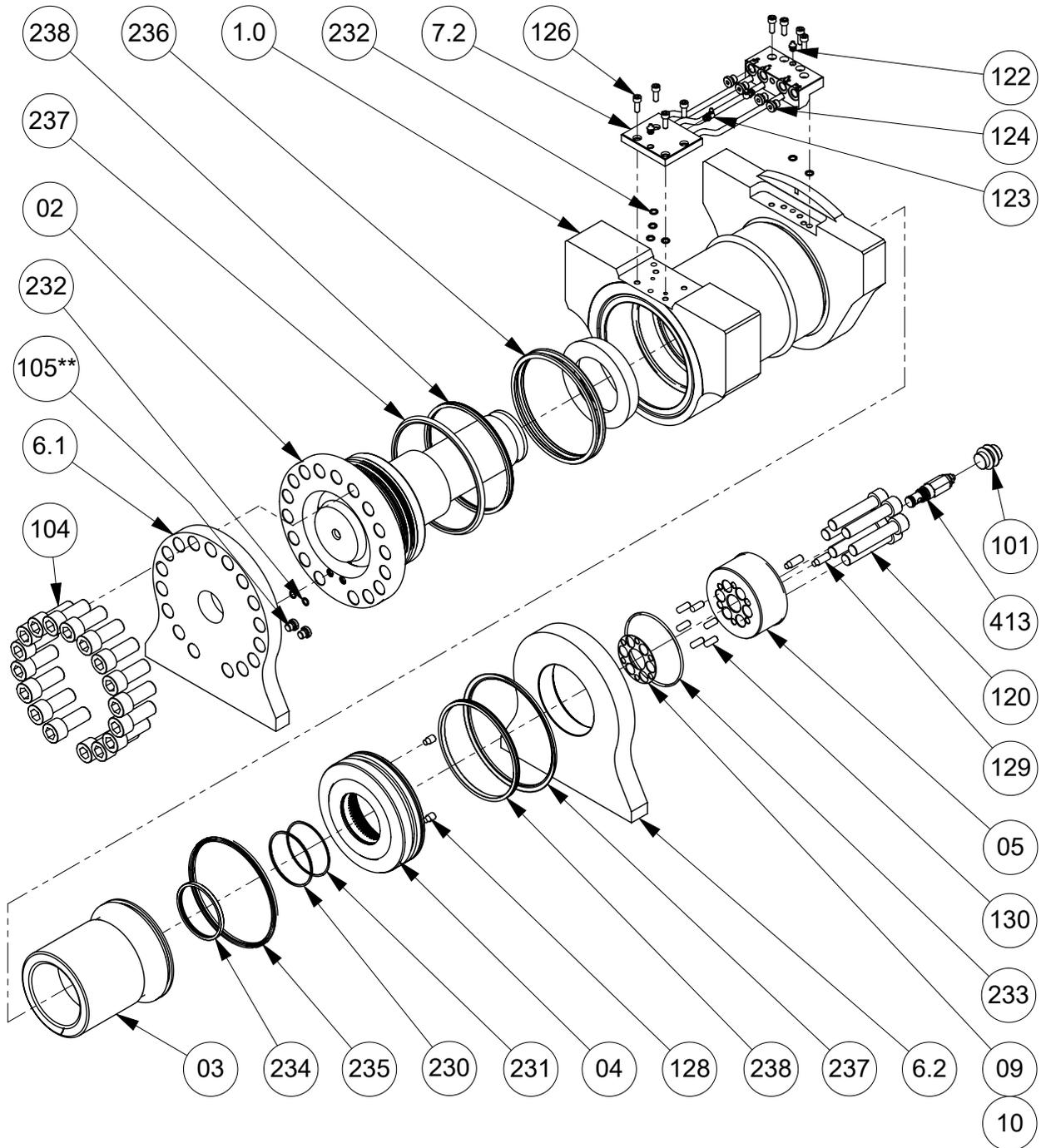
# PT-180 Assembly Drawing

With cross-port relief from hub end



# PT-180 Exploded View

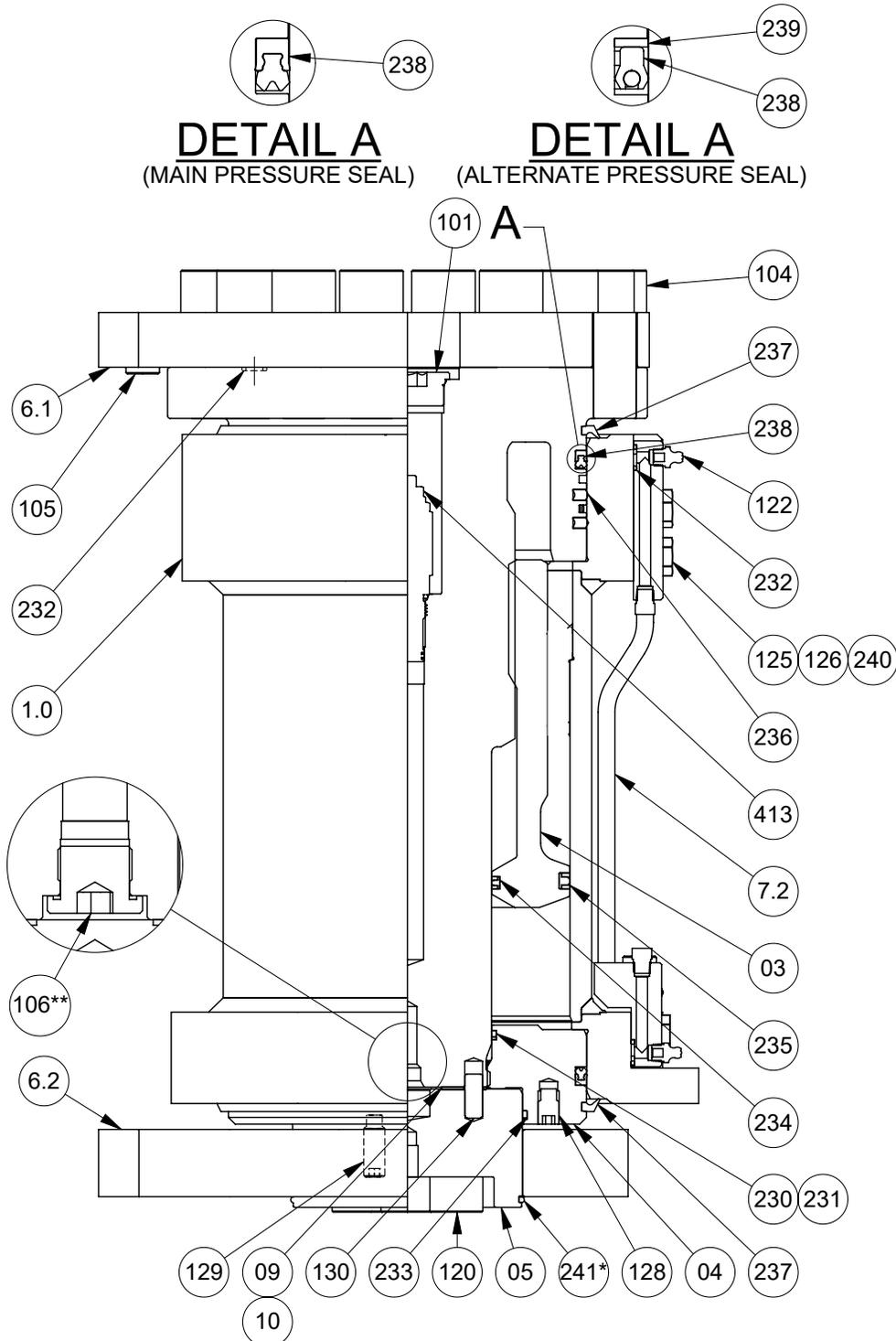
With cross-port relief from hub end



# 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.

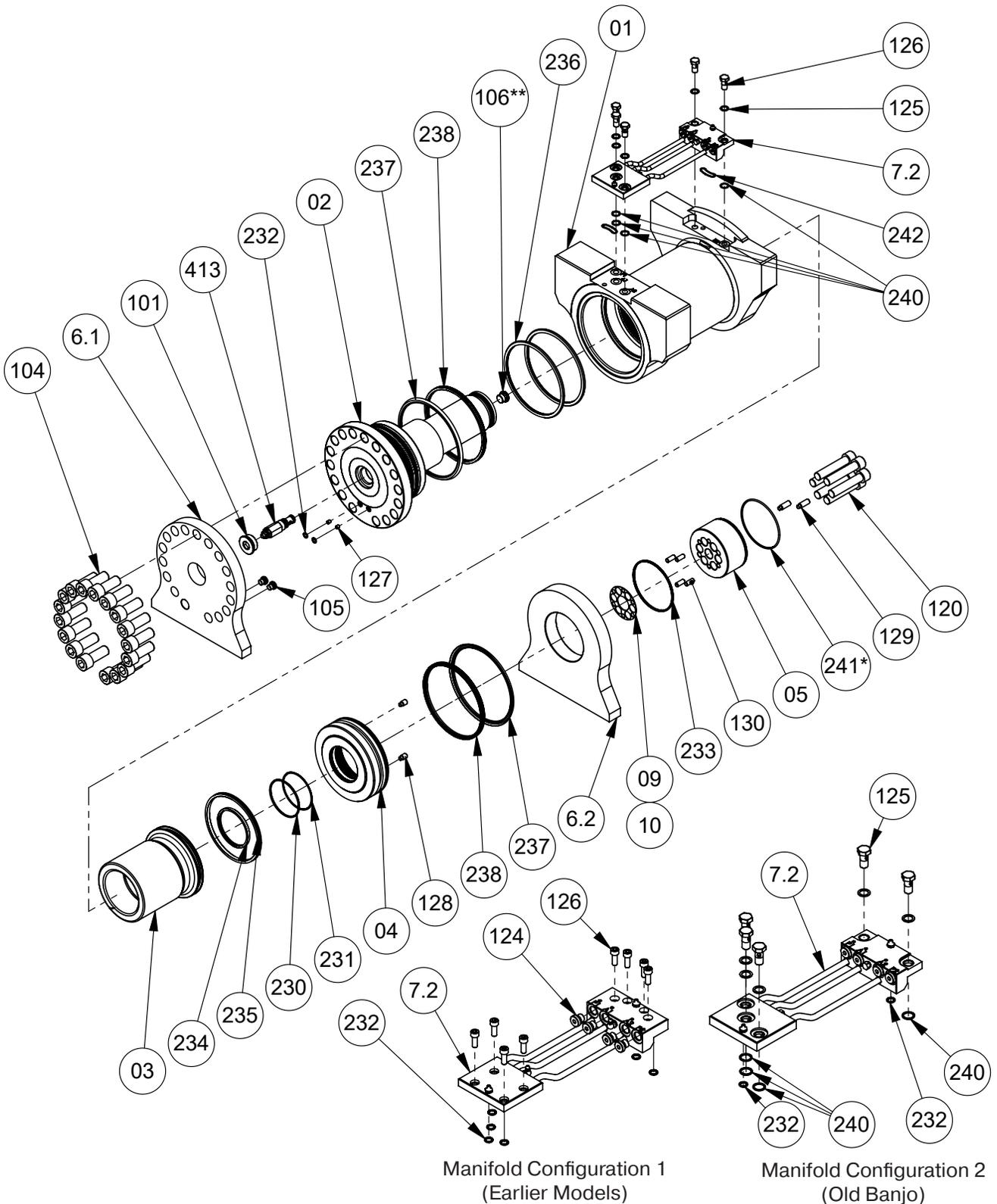


\*O-RING USED FOR SHIPPING LOOSE IDLER FOOT ONLY; REMOVE AFTER COUPLER IS WELDED.

\*\* PT-240 AND PT-300 ONLY

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

\*PT-180 with manifold configuration 3 Shown. See parts list for quantities of an item.



# Parts List - PT-030

## Parts

Part Number	Item #	Description	Qty
73846	01	PTA Housing BSPP ports, No Side plates (for banjo bolt manifold)	1
72903	02	Shaft (with relief valve cavity)	1
72924	02	Shaft (no relief valve cavity)	1
73843	03	Piston Sleeve	1
73844-H	04	End Cap	1
73845	05	Hub	1
72895-H	<b>Foot Kit (includes items 6.1, 6.2, 104, 2 x 232, 241)</b>		
	6.1	Torque Foot (Hydraulic)	1
	6.2	Idler Foot (for no flange hub)	1
	104	Torque Foot Bolts Socket Head (M12-1.75 x 035 Grade 12.9)	16
	232	*O-Ring - Shaft to Torque foot (2-110, 90D)	2
	241	O-Ring - Hub Shipping (2-151; 90 D)	1
72926-H	7.2	<b>Manifold Kit (includes manifold and hardware kit 72693)</b>	1
72693	<b>Manifold Hardware Kit (includes items: 125, 126, 240)</b>		
	125	*Copper Crush Washer	5
	126	Banjo bolt (BSPP G1/8)	5
	240	*O-Ring - Manifold (2-111, 90 D)	4
72893-020	09	Shim 0.020"	1
72893-007	09	Shim 0.007"	Variable
72893-004	09	Shim 0.004"	Variable
977031	101	Plug (SAE-20)	1
977022	124.1 / 105	Plug (BSPP G1/8 hollow hex)	2
9551158	120	Hub Bolts Socket Head (M16 - 1.5 x 060, Grade 12.9)	4
936002	122	Grease Fitting (BSPT 1/8-28 straight)	2
977022	124	Plug (BSPP G1/8 hollow hex)	4
977045	127	Plug (1/16 NPT Hollow Hex)	2
9601038	128	Screw, Set (M8-1.25-016 Dog Point: Grd 10.9)	2
9601025	129	Screw, Set (M8-1.25-020 Half Dog: Grd 10.9)	1
965031	130	Hub pin (12mm dia x 16 mm long: hardened)	4
949020 or 949105	413	Cross Port Relief Valve	1

\*Items included in seal kit

## Seal Kits

Part Number	Item #	Description	Qty
S72906	<b>08</b>	<b>Seal Kit (Service)</b>	<b>1</b>
		Relief Valve Seal Kit	1
	230	O-Ring	1
	231	Back-up O-Ring	1
	232	O-Ring - Shaft to Torque foot (2-110, 90 D)	2
	240 / 232.1	O-Ring - Manifold (2-111, 90 D)	4
	233	O-Ring ( 2-152 ) 90 D	1
	234	Seal	1
	235	Seal	1
	236	Seal	2
	237	Seal	2
	238	Seal	2
	239	Back-up ring only if alternate 238 B-lip seal used	2
	125	Crush Washer	5
	Only sold as kits, individual seals are not available.		

Seal kits can be ordered online at <http://www.parker.com/helac>

# Parts List - PT-050

## Parts

Part Number	Item #	Description	Qty
73932	01	PTA Housing BSPP ports No Side plates (for banjo bolt manifold)	1
72679	01	PTA Housing SAE ports No Side plates (no manifold available)	1
72688-H	02	Shaft (with relief valve cavity)	1
72705	02	Shaft (no relief valve cavity)	1
73933	03	Piston Sleeve	1
73934-H	04	End Cap	1
73935-H	05	Hub	1
72682-H		<b>Foot Kit (includes items 6.1, 6.2, 104, 232, 241)</b>	1
	6.1	Torque Foot (Hydraulic)	1
	6.2	Idler Foot (for no flange hub only)	1
	104	Torque Foot Bolts Socket Head (M16-2.0-040 Grade 12.9)	12
	232	*O-Ring - Shaft to Torque foot (2-110, 90D)	2
	241	O-Ring - Hub Shipping (2-152; 90 D)	1
73271	7.2	<b>Manifold Kit (includes manifold and hardware kit 72693)</b>	1
72693		<b>Manifold Hardware Kit (includes items: 125, 126, 240)</b>	1
	125	*Copper Crush Washer	5
	126	Banjo bolt (BSPP G 1/8)	5
	240	*O-Ring - Manifold (2-111, 90 D)	4
72687-004	09	Shim 0.004"	Variable
72687-007	09	Shim 0.007"	Variable
72687-020	09	Shim 0.020"	1
977031	101	Plug (SAE-20)	1
977022	124.1 / 105	Plug (BSPP G1/8 hollow hex)	2
9551161	120	Hub Bolts Socket Head (M16-1.5 x 070 Grade 12.9)	5
936002	122	Grease Fitting (BSPT 1/8-28 straight)	2
977022	124	Plug (BSPP G1/8 hollow hex)	4
977045	127	Plug (1/16 NPT Hollow Hex)	2
9601038	128	Screw, Set (M8-1.25-016 Dog Point; Grd 10.9)	2
9601008	129	Screw, Set (M12-1.75-020 Half Dog; Grd 10.9)	1
965031	130	Hub pin (12mm dia x 16 mm long: hardened)	5
949020 or 949105	413	Cross Port Relief Valve	1

\*Items included in seal kit

## Seal Kits

Part Number	Item #	Description	Qty
<b>S73267</b>	<b>08</b>	<b>Seal Kit (Service)</b>	<b>1</b>
		Relief Valve Seal Kit	1
	230	O-Ring	1
	231	Back-up Ring	1
	232	O-Ring - Shaft to Torque foot (2-110, 90 D)	4
	240 / 232.1	O-Ring - Manifold (2-111, 90 D)	4
	233	O-Ring (2-154, 90 D)	1
	234	Seal	1
	235	Seal	1
	236	Seal	2
	237	Seal	2
	238	Seal	2
	239	Back-up ring only if alternate 238 B-lip seal used	2
	125	Crush washer	5

Only sold as kits, individual seals are not available.

Seal kits can be ordered online at <http://www.parker.com/helac>

# Parts List - PT-070

## Parts

Part Number	Item #	Description	Qty
73979	01	PTA Housing BSPP ports No Side plates (for banjo bolt manifold)	1
73999	01	PTA Housing SAE ports No Side plates (no manifold available)	1
73093-H	02	Shaft (with relief valve cavity)	1
73445	02	Shaft (no relief valve cavity)	1
73971	03	Piston Sleeve Assy	1
73967	04	End Cap	1
73976	05	Hub	1
73079-H	<b>Foot Kit (includes items 6.1, 6.2, 104, 232, 241)</b>		
	6.1	Torque Foot (Hydraulic)	1
	6.2	Idler Foot	1
	104	Torque Foot Bolts (M20-2.5 x 50 Grade 12.9)	12
	232	*O-Ring - Shaft to Torque foot (2-110, 90D)	2
	241	O-Ring - Hub Shipping (2-241; 90 D)	1
74816	7.2	<b>Manifold Kit (Includes Manifold and Hardware kit 73358)</b>	1
73358	<b>Manifold hardware kit (Includes Items 123, 125, 126, 232, 240, 242)</b>		
	123	Plug BSPT 1/8-28 Hex Head	2
	125	* Copper Crush Washer	5
	126	Banjo bolt (for banjo manifold)	5
	232	*O-Ring - Manifold (2-110, 90 D)	2
	240	*O-Ring - Manifold (2-114, 90 D)	4
	242	*O-Ring - Manifold (2-123 90 D)	2
72842-004	09	Shim 0.004" (5 bolt)	Variable
72842-007	09	Shim 0.007" (5 bolt)	Variable
72842-020	09	Shim 0.020" (5 bolt)	1
977031	101	Plug (SAE -20)	1
977022	124.1 / 105	Plug (BSPP G1/8 hollow hex)	2
9551156	120	Hub Bolts (M20-1.5 x 100 Grade 12.9)	5
936012-H	122	Grease Fitting (BSPT 1/8-28 straight)	2

\*Items included in seal kit

Part Number	Item #	Description	Qty
977015	124	Port Plug BSPP G 1/4	4
977045	127	Plug (1/16 NPT Hollow Hex)	2
9601013	128	Screw, Set (M10-1.5-016 Full Dog; Grd 10.9)	2
9601009	129	Screw, Set (M16-2.0-030 Half Dog; Grd 10.9)	1
965017-H	130	Hub pin (10 mm dia x 20 mm; hardened)	5
949020 or 949105	413	Cross Port Relief Valve	1

## Seal Kits

Part Number	Item #	Description	Qty
S73072	08	<b>Service Kit (Service)</b>	<b>1</b>
		Relief Valve Seal Kit	1
	230	O-Ring	1
	231	Back-up Ring	1
	232	O-Ring - Shaft to Torque foot (2-110, 90 D)	2
	232	O-Ring - Manifold (2-110, 90 D)	2
	240 / 232.1	O-Ring - Manifold (2-114, 90 D)	4
	233	O-Ring ( 2-244, 90 D )	1
	234	Seal	1
	235	Seal	1
	236	Seal	2
	237	Seal	2
	238	Seal	2
	239	Back-up ring only if alternate 238 B-lip seal used	2
	242	O-Ring - Manifold (for kidney bean groove)	2
125	Crush washer	5	
Only sold as kits, individual seals are not available.			

Seal kits can be ordered online at  
<http://www.parker.com/helac>

# Parts List - PT-100

## Parts

Part Number	Item #	Description	Qty
73590-H	01	PTA Housing BSPP ports No Side plates (for banjo bolt manifold)	1
73181	01	PTA Housing SAE ports No Side plates (no manifold available)	1
72838	02	Shaft, (4 bolt hub) with relief valve cavity	**See Below
72837	02	Shaft, (4 bolt hub) no relief valve cavity	***See Below
73172-H	02	Shaft, (5 bolt hub) with relief valve cavity	1
72845	02	Shaft, (5 bolt hub) no relief valve cavity	1
73591-H	03	Piston Sleeve	1
72370	04	End Cap (4 bolt shaft)	1
73587	04	End Cap (5 bolt shaft)	1
72370	05	Hub (4 bolt shaft)	1
73588-H	05	Hub (5 bolt shaft)	1
72828	<b>Foot Kit (includes items 6.1, 6.2, 104, 232, 241)</b>		
	6.1	Torque Foot (Hydraulic)	1
	6.2	Idler Foot (for no flange hub only)	1
	104	Torque Foot Bolts (M20-2.5 x 55 Grade 12.9) - Part #9551137	14
	232	O-Ring - Shaft to Torque foot (2-110, 90D)	2
74813	7.2	<b>Manifold Kit (old, uses socket screws to attach) Includes manifold blocks, tubes, tube fittings, plus hardware and o-rings shown below.</b> (Replaces p/n 71963. Replacement has tubes and EO fittings instead of brazed tubes. Used on PTA-100 p/n 72830 and PTS-100 p/n's 72331 and 72850)	1
	122	Grease fitting; Straight BSPT 1/8-28	2
	123	Grease fitting; 90 degree BSPT 1/8-28	2
	124	Plug (BSPP G1/4 hollow hex)	4
	126	Screw; socket head M8-1.25-022 Grd. 12.9	8
	232	*O-ring; 2-110; 90 D	6
	74821	7.2	<b>Manifold Kit (Includes Manifold and Hardware kit 73358)</b>

Part Number	Item #	Description	Qty
73358	<b>Manifold hardware kit (Includes Items 123, 125, 126, 232, 240, 242)</b>		
	123	Plug BSPT 1/8-28 Hex Head	2
	125	*Copper Crush Washer	5
	126	Banjo bolt (for banjo manifold)	5
	232	*O-Ring - Manifold (2-110, 90 D)	2
	240	*O-Ring - Manifold (2-114, 90 D)	4
	242	*O-Ring - Manifold (2-123 90 D)	2
	71956-020	09	Shim 0.020" (4 bolt shaft)
71956-004	09	Shim 0.004" (4 bolt shaft)	Variable
72842-020	09	Shim 0.020" (5 bolt shaft)	1
72842-007	09	Shim 0.007" (5 bolt shaft)	Variable
72842-004	09	Shim 0.004" (5 bolt shaft)	Variable
977031	101	Plug (SAE -20)	1
977022	124.1 / 105	Plug (BSPP G1/8 hollow hex)	2
9551007	120	Hub Bolts for 4 bolt shaft (M20-2.5 x 100 mm Grade 12.9)	4
9551156	120	Hub Bolt (M20-1.5 x 100 Grade 12.9)	5
936012-H	122	Grease Fitting (BSPT 1/8-28 straight)	2
977015	124	Port Plug BSPP G 1/4	4
9551144	126	Screw, Socket Head M8-1.25-022 (for manifold 71963 and 74813)	8
977045	127	Plug (1/16 NPT Hollow Hex)	2
9601013	128	Screw, Set (M10-1.5-016 Full Dog; Grd 10.9)	2
9601009	129	Screw, Set (M16-2.0-030 Half Dog; Grd 10.9)	2
965017-H	130	Hub pin (10 mm dia x 20 mm; hardened)	5
949020 or 949105	413	Cross Port Relief Valve	1

Seal kits can be ordered online at <http://www.parker.com/helac>

\*Items included in seal kit

\*\*Replace with 73172-H shaft, 73587 end cap, 73588-H hub, 72842-xxx shims and 9551156 hub bolts and S72823 seal kit. PTA-100 p/n's that used this shaft: 72830-P041

\*\*\*Replace with 72845 shaft, 73588-H hub, 72842-xxx shims and 9551156 hub bolts. PTS-100 p/n's that used this shaft: 72331-P041, 73180-P041

## Parts List - PT-100

### Seal Kit

<i>Part Number</i>	<i>Item #</i>	<i>Description</i>	<i>Qty</i>
S72823	08	<b>Seal Kit 5 Bolt Shaft (Service)</b>	1
		Relief valve seal kit	1
	230	O-Ring	1
	231	Back-up Ring	1
	232	O-Ring - Shaft to Torque foot (2-110, 90 D)	2
	232	O-Ring - Manifold (2-110, 90 D)	2
	240 / 232.1	O-Ring - Manifold (2-114, 90 D)	4
	233	O-Ring ( 2-246, 90 D )	1
	234	Seal	1
	235	Seal	1
	236	Seal	2
	237	Seal	2
	238	Seal	2
	239	Back-up ring only if alternate 238 B-lip seal used	2
	242	O-Ring - Manifold (for kidney bean groove)	2
	125	Crush washer	5
72836-H	08	<b>Seal Kit 4 Bolt Shaft (Service) Includes items below</b>	1
	230	O-Ring	1
	231	Back-up Ring	1
	233	O-Ring	1
	234	Seal	1
	235	Seal	1
	236	Seal	2
	237	Seal	2
	238	Seal	2
	Only sold as kits, individual seals are not available.		

Seal kits can be ordered online at  
<http://www.parker.com/helac>

# Parts List - PT-180

## Parts

Part Number	Item #	Description	Qty
73016-H	01	PTA Housing BSPP ports No Side plates (for banjo bolt manifold)	1
**See Below	02	Shaft (M16 hub bolts)	
73026	02	Shaft, Relief from flange end (M20 fine thread hub bolts)	1
73379	03	Piston Sleeve	1
73378-H	04	End Cap	1
72232-H	05	Hub (for M16 bolts)	1
73377-H	06	Hub (for all M20 hub bolt shafts)	1
73351-H		<b>Foot Kit (includes items 6.1, 6.2, 104, 232, 241)</b>	
	6.1	Torque Foot (Hydraulic)	1
	6.2	Idle Foot (for no flange hub only)	1
	104	Torque Foot Bolts Socket Head (M24-3.0 x 60 Grade 12.9)	17
	232	*O-Ring - Shaft to Torque foot (2-110, 90D)	2
74808	241	O-Ring - Hub Shipping (2-248; 90 D)	1
	7.2	<b>Manifold Kit (old, uses socket screws to attach) Includes manifold blocks, tubes, tube fittings, plus hardware and o-rings shown below.</b> (Replaces 72236-H. Replacement has tubes and EO fittings instead of brazed tubes. Used on PTA-180 p/n 72491, 72140, 72119 and PTS-180 p/n 72130)	1
	122	Grease fitting; Straight BSPT 1/8-28	2
	123	Grease fitting; 90 degree BSPT 1/8-28	2
	124	Plug (BSPP G 1/4 hollow hex)	4
	126	Screw; socket head M8-1.25-022 Grd. 12.9	8
	232	*O-Ring; 2-110; 90 D	6
74823	7.2	<b>Manifold Kit (Includes Manifold and Hardware kit 73358)</b>	1
73358		<b>Manifold hardware kit (Includes Items 123, 125, 126, 232, 240, 242)</b>	
	123	Plug BSPT 1/8-28 Hex Head	2
	125	*Copper Crush Washer	5
	126	Banjo bolt (for banjo manifold)	5
	232	*O-Ring - Manifold (2-110, 90 D)	2
	240	*O-Ring - Manifold (2-114, 90 D)	4
242	*O-Ring - Manifold (2-123 90 D)	2	

Part Number	Item #	Description	Qty
73011-020	09	Shim 0.020" (for M20 and M16 hub bolts)	1
73011-007	09	Shim 0.007" (for M20 and M16 hub bolts)	Variable
73011-004	09	Shim 0.004" (for M20 and M16 bolts)	Variable
Obsolete	101	Push in Plug (for shaft w/ M16 Bolts)	1
977031	101	Plug (SAE -20)	1
9551024	104	Torque Foot Bolts Socket Head (M24-3.0 x 60 Grade 12.9)	17
977015	124.1 / 105	Plug (BSPP G 1/4 hollow hex)	2
9551048	120	Hub Bolts Socket Head (M16-2.0 x 100 mm Grade 12.9)	6
9551156	120	Hub Bolts Socket Head (M20-1.5 x 100 Grade 12.9)	6
936012-H	122	Grease Fitting (BSPT 1/8-28 straight)	2
936011-H	123	Grease Fitting (BSPT 1/8-28 Elbow)	2
977015	124	Port Plug BSPP G 1/4	4
9551144	126	Screw, Socket Head M8-1.25-022 (for manifold 72236-H)	8
977045	127	Plug (1/16 NPT Hollow Hex)	2
9601008	128	Screw, Set (M12-1.75-020 Half Dog; Grd 10.9)	2
9601036	129	Screw, Set (M12-1.75-035 Full Dog; Grd 10.9)	2
965029-H	130	Hub pin (10 mm dia x 25 mm; hardened)	4
949020 or 949105	413	Cross Port Relief Valve	1

\*Items included in seal kit

\*\*Replace with 73026 shaft, 73377-H hub and 9551156 hub bolts, PT-180's that used this are: PTA 72491-P041 and PTS 72130-P041

Seal kits can be ordered online at <http://www.parker.com/helac>

# Parts List - PT-180

## Seal Kits

<i>Part Number</i>	<i>Item #</i>	<i>Description</i>	<i>Qty</i>
<b>S72995</b>	<b>08</b>	<b>Seal Kit (Service)</b>	<b>1</b>
		Relief Valve Seal Kit	1
	230	O-Ring	1
	231	Back-up ring (8-240)	1
	232	O-Ring - Shaft to Torque foot (2-110, 90 D)	2
	232	O-Ring - Manifold (2-110, 90 D)	2
	240 / 232.1	O-Ring - Manifold (2-114, 90 D)	4
	233	O-Ring (2-251, 90 D)	1
	234	Seal	1
	235	Seal	1
	236	Seal	2
	237	Seal	2
	238	Seal	2
	239	Back-up ring only if alternate 238 B-lip seal used	2
	242	O-Ring - Manifold (for kidney bean groove)	2
	125	Crush washer	5
Only sold as kits, individual seals are not available.			

Seal kits can be ordered online at  
<http://www.parker.com/helac>

# Parts List - PT-240

## Parts

Part Number	Item #	Description	Qty
73501-H	01	PTA Housing BSPP ports No Side plates	1
73509	02	Shaft	1
73517-H	03	Piston Sleeve	1
73519	04	End Cap	1
73521-H	05	Hub	1
73516-H	<b>Foot Kit (includes items 6.1, 6.2, 104, 232, 241)</b>		
	6.1	Torque Foot (Hydraulic)	1
	6.2	Idler Foot	1
	104	Torque Foot Bolts Socket Head (M30-3.5 x 80 Grade 12.9)	16
	232	*O-Ring Shaft to Torque foot (2-110, 90D)	2
	241	O-Ring - Hub Shipping (2-255; 90 D)	1
74826	7.2	<b>Manifold Kit (Includes Manifold and Hardware kit 73358)</b>	1
73358	<b>Manifold hardware kit (Includes Items 123, 125, 126, 232, 240, 242)</b>		
	123	Plug BSPT 1/8-28 Hex Head	2
	125	*Copper Crush Washer	5
	126	Banjo bolt (for banjo manifold)	5
	232	*O-Ring - Manifold (2-110, 90 D)	2
	240	*O-Ring - Manifold (2-114, 90 D)	4
	242	*O-Ring - Manifold (2-123 90 D)	2
72191-020	09	Shim 0.020"	1
72191-007	09	Shim 0.007"	Variable
72191-004	09	Shim 0.004"	Variable
977031	101	Plug (SAE -20)	1
977015	124.1 / 105	Plug (BSPP G 1/4 hollow hex)	2
9551159	120	Hub Bolts Socket Head (M24-2.0 x 110 Grade 12.9)	6
936012-H	122	Grease Fitting (BSPT 1/8-28 straight)	2
936011-H	123	Grease Fitting (BSPT 1/8-28 Elbow)	2

\*Items included in seal kit

Part Number	Item #	Description	Qty
977015	124	Port Plug BSPP G 1/4	4
977045	127	Plug (1/16 NPT Hollow Hex)	2
9601008	128	Screw, Set (M12-1.75-020 Half Dog; Grd 10.9)	2
9601036	129	Screw, Set (M12-1.75-035 Full Dog; Grd 10.9)	2
965018-H	130	Hub pin (12 mm dia x 25 mm; hardened)	4
949020 or 949105	413	Cross Port Relief Valve	1

## Seal Kits

Part Number	Item #	Description	Qty
S72154	08	<b>Seal Kit (Service)</b>	1
		Relief valve seal kit	1
	230	O-Ring	1
	231	Back-up Ring	1
	232	O-Ring - Shaft to Torque foot (2-110, 90 D)	2
	232	O-Ring - Manifold (2-110, 90 D)	2
	240 / 232.1	O-Ring - Manifold (2-114, 90 D)	4
	233	O-Ring (2-258, 90 D)	1
	234	Seal	1
	235	Seal	1
	236	Seal	2
	237	Seal	2
	238	Seal	2
	239	Back-up ring only if alternate 238 B-lip seal used	2
	242	O-ring - Manifold (for kidney bean groove)	2
125	Crush washer	5	

Only sold as kits, individual seals are not available.

Seal kits can be ordered online at <http://www.parker.com/helac>

# Parts List - PT-300

## Parts

Part Number	Item #	Description	Qty
73621-H	01	PTA Housing BSPP ports No Side plates	1
73631	02	Shaft	1
73628	03	Piston Sleeve	1
73622-H	04	End Cap	1
73617	05	Hub	1
73647-H	<b>Foot Kit (includes items 6.1, 6.2, 104, 232, 241)</b>		
	6.1	Torque Foot (Hydraulic)	1
	6.2	Idler Foot	1
	104	Torque Foot Bolts Socket Head (M30-3.5 x 80 Grade 12.9)	18
	232	*O-Ring - Shaft to Torque foot (2-110, 90D)	2
	241	O-Ring - Hub Shipping (2-260; 90 D)	1
73646	7.2	<b>Manifold Kit (Includes Manifold and Hardware kit 73641)</b>	1
73641	<b>Manifold hardware kit (Includes items 124, 125, 126, 232, 240)</b>		1
	124	Plug (BSPP G1/4 hollow hex)	4
	125	*Copper Crush Washer	5
	126	Banjo bolt (for banjo manifold)	5
	232	*O-Ring - Manifold (2-110, 90 D)	2
	240	*O-Ring - Manifold (2-114, 90 D)	4
73611-020	09	Shim 0.020"	1
73611-007	09	Shim 0.007"	Variable
73611-004	09	Shim 0.004"	Variable
977031	101	Plug (SAE -20)	1
977015	124.1 / 105	Plug (BSPP G1/4 hollow hex)	2
9551157	120	Hub Bolts Socket Head (M30-2.0 x 120 Grade 12.9)	5
936012-H	122	Grease Fitting (BSPT 1/8-28 straight)	2
936011-H	123	Grease Fitting (BSPT 1/8-28 Elbow)	2
977015	124	Port Plug BSPP G 1/4	4
977045	127	Plug (1/16 NPT Hollow Hex)	2
9601008	128	Screw, Set (M12-1.75-020 Half Dog; Grd 10.9)	2
9601009	129	Screw, Set (M12-1.75-035 Full Dog; Grd 10.9)	2
965018-H	130	Hub pin (12 mm dia x 25 mm; hardened)	5
949020 or 949105	413	Cross Port Relief Valve	1

\*Items included in seal kit

## Seal Kits

Part Number	Item #	Description	Qty
S73612	08	<b>Seal Kit (Service)</b>	1
		Relief Valve Seal Kit	1
	230	O-Ring	1
	231	Back-up Ring	1
	232	O-Ring - Shaft to Torque foot (2-110, 90 D)	2
	232	O-Ring - Manifold (2-110, 90 D)	2
	240 / 232.1	O-Ring - Manifold (2-114, 90 D)	4
	233	O-Ring ( 2-262, 90 D )	1
	234	Seal	1
	235	Seal	1
	236	Seal	2
	237	Seal	2
	238	Seal	2
	239 / 238	Back-up Ring	2
	125	Crush Washer	5
Only sold as kits, individual seals are not available.			

Seal kits can be ordered online at  
<http://www.parker.com/helac>

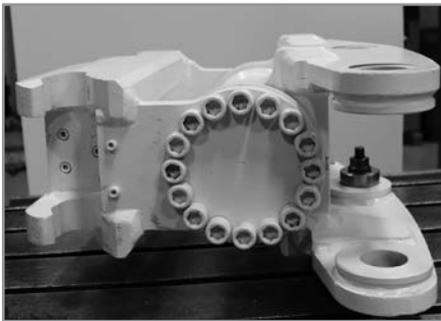
# Product Inspection

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.

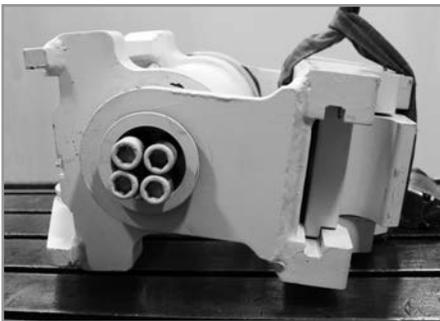
Severe corrosion can make it difficult to remove the hub, set screws or the end cap. If corrosion is evident, soak the screws with penetrating oil for several hours before disassembly.

# Removal of Coupler

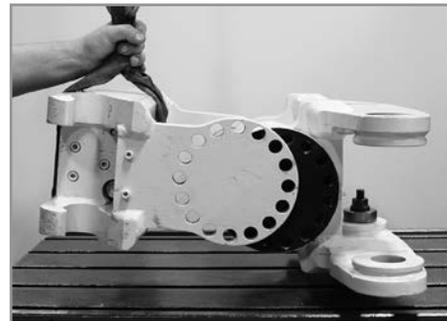
1. Clamp PowerTilt to a secure table.



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.



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

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

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

# Disassembly of PowerTilt

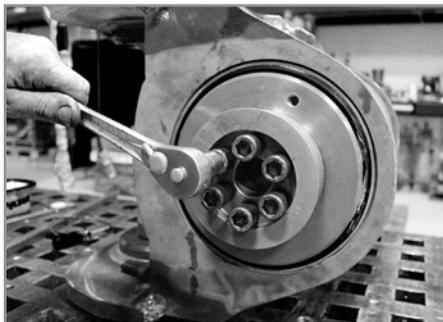
1. Remove manifold from PowerTilt.



2. Remove o-ring seals from manifold



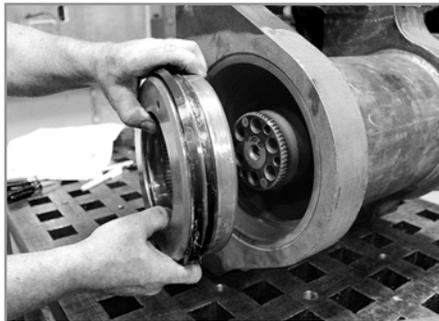
3. Remove hub screws from end cap if not already done.



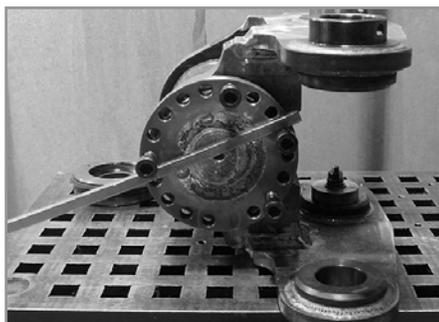
4. Remove hub from end cap if not already done.



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.



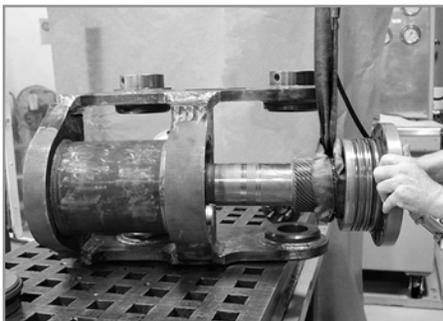
7. Continue to rotate the shaft but do not rotate shaft out of gear engagement with the piston. Look on the gear end of the piston sleeve (3) and locate the existing timing marks (center punches), make new timing marks if needed. Take a felt pen and clearly mark the gear engagement at the timing marks on both the piston and shaft. Upon reassembly the same gear engagement (timing) has to be achieved. Rotate the shaft out of the actuator. Support the weight of the shaft to prevent damage to the rod surface.



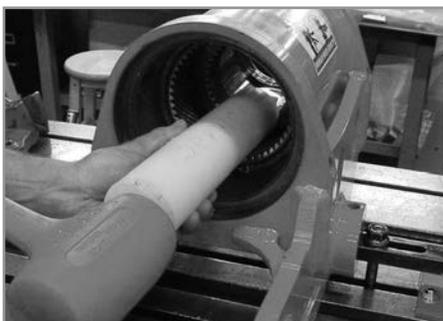
timing marks

# Disassembly of PowerTilt

9. Carefully remove the shaft.



10. Using a plastic mandrel and rubber mallet, drive the piston sleeve assembly towards the end cap end of the actuator. Stop when the gear end of the piston sleeve is flush with the Housing (1) ring gear.

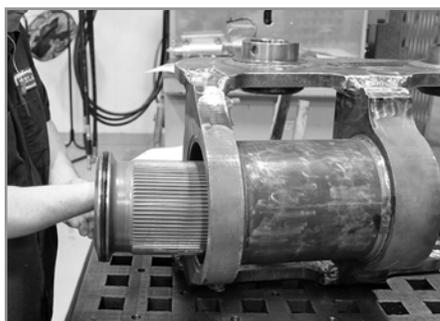


11. Locate the timing marks on the piston sleeve assembly (3) and the housing (1) ring gear, clearly mark them with a felt pen (make new timing marks if none are found). Continue to drive the piston sleeve assembly out of the housing ring gear. Stop immediately after the gear teeth come out of engagement. Take a felt pen and put a mark on top of the piston and a corresponding mark on the thrust surface of the housing (see photo below). This mark will simplify assembly later. Remove the piston sleeve assembly from the housing.



timing marks

12. Remove piston sleeve from housing.



13. Remove piston seal from piston sleeve.



14. Remove backup ring seal from piston sleeve.

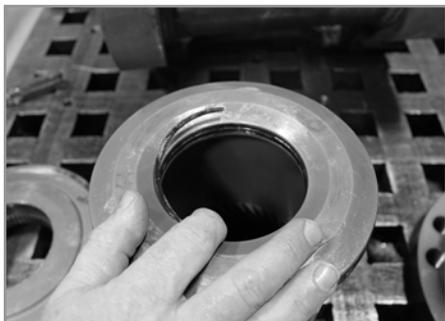


15. Remove rod seal from piston sleeve.



# Disassembly of PowerTilt

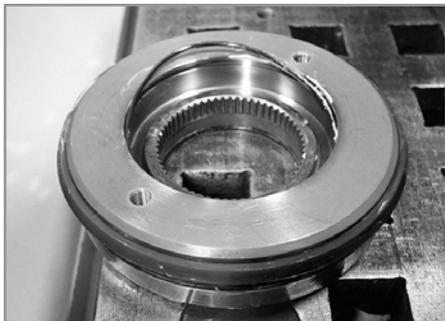
16. Remove backup ring seal from piston sleeve.



20. Remove pressure seal from end cap.



17. Remove o-ring seal from end cap.

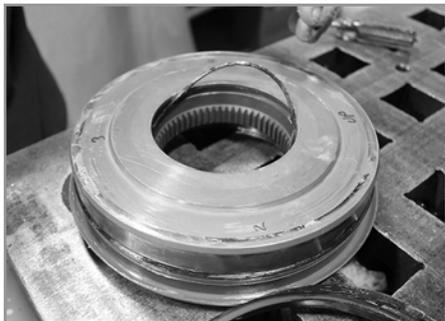


21. Remove first rotary seal from shaft.

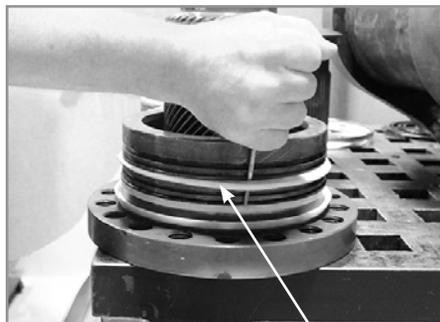


rotary seal

18. Remove backup ring seal from end cap.



22. Remove second rotary seal from shaft.

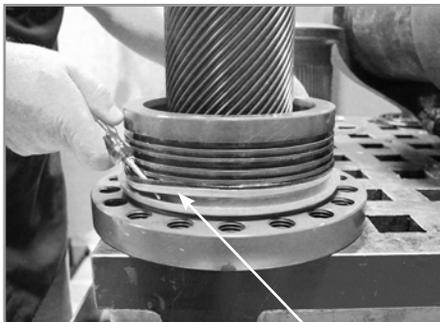


rotary seal

19. Remove exclusion seal from end cap.



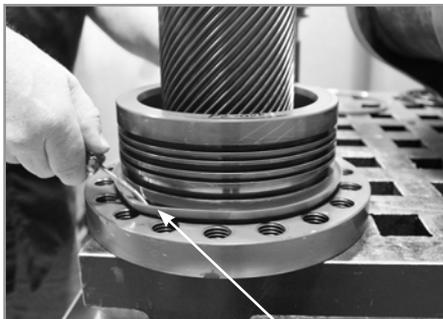
23. Remove pressure seal from shaft.



pressure seal

## Disassembly of PowerTilt

24. Remove exclusion seal from shaft.



exclusion 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 46.

## Dry Assembly

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

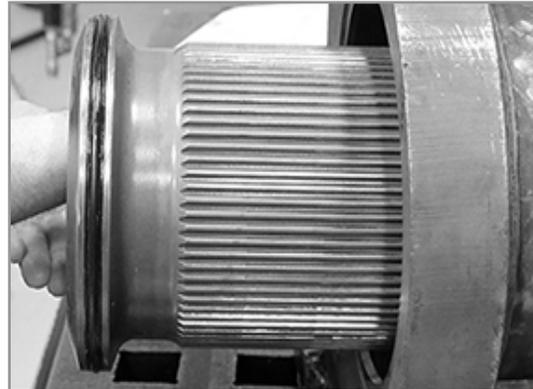
	<b>CAUTION</b>
	<b>To avoid injury or damage to product:</b> Secure product to work bench.

<b>NOTICE</b>
<b>To avoid contamination to machined parts:</b> Make sure work area is clean.

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.

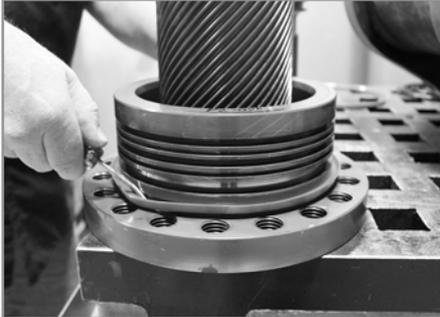
Align existing timing marks on Piston with those on the Ring Gear in the housing. Push Piston in until it bottoms out on the Ring Gear. Align existing timing marks on Shaft to those on the mating gear of Piston. Rotate Shaft into gearing until it bottoms out on housing thrust face. Install End cap, hub 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.



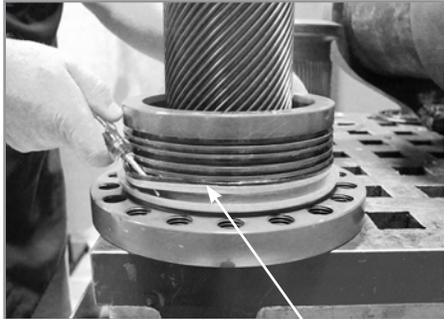
# Assembly of PowerTilt

**NOTICE** Wash and clean parts thoroughly.

1. Oil and install exclusion seal onto shaft.

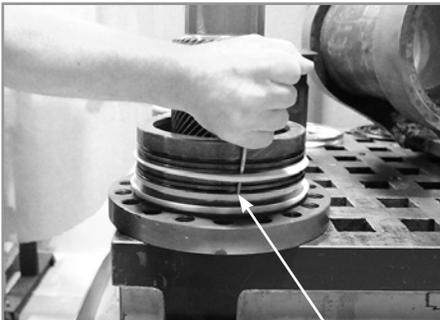


2. Oil and install pressure seal onto shaft.



pressure seal

3. Oil and install second rotary seal onto shaft.



rotary seal

4. Oil and install first rotary seal onto shaft.



rotary seal

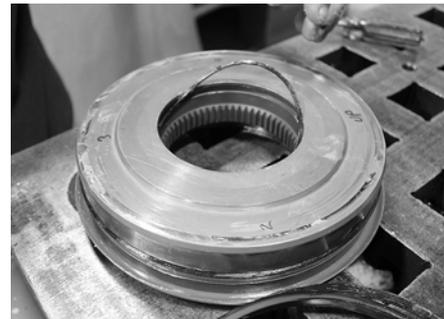
5. Oil and install pressure seal onto end cap.



6. Oil and install exclusion seal onto end cap.



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

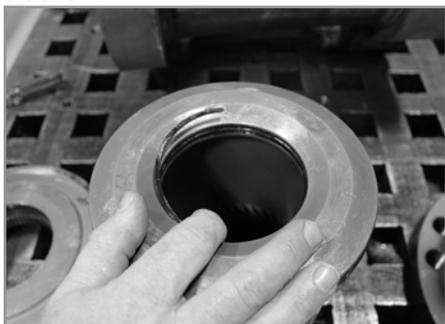


8. Oil and install o-ring seal onto end cap.



## Assembly of PowerTilt

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



10. Oil and install rod seal onto piston sleeve.



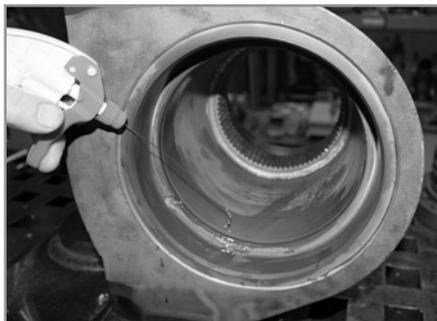
11. Oil and install backup ring seal onto piston sleeve.



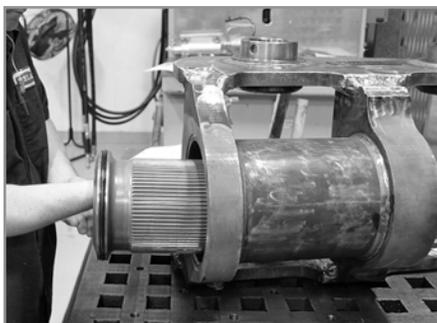
12. Oil and install piston seal onto piston sleeve.



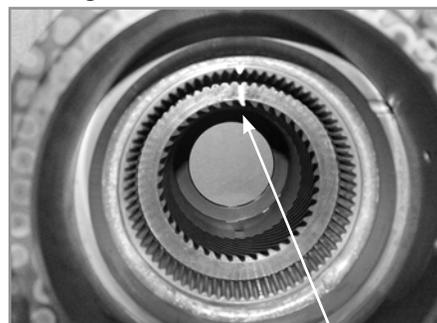
13. Oil housing and piston sleeve.



14. Install piston sleeve into housing.



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



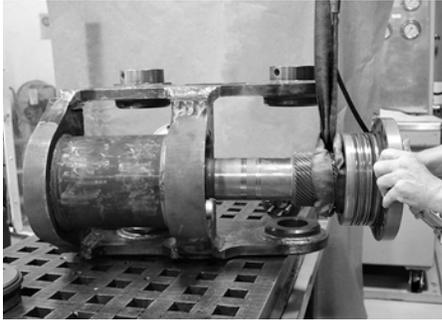
timing marks

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.

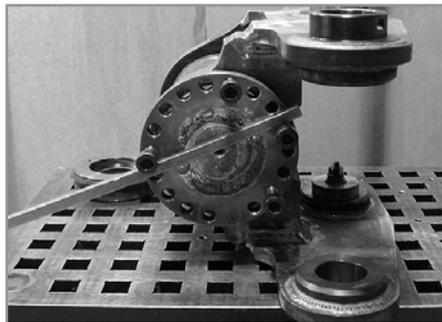


18. Align timing marks with piston sleeve and shaft.

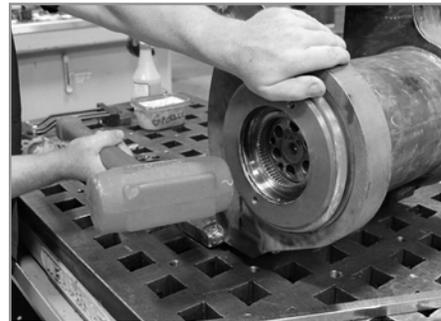
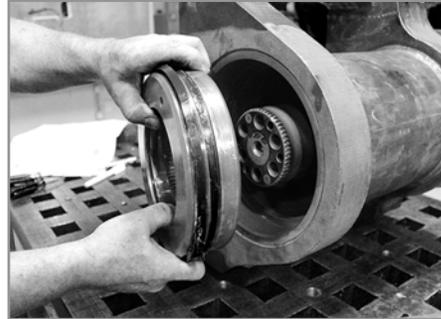


timing marks

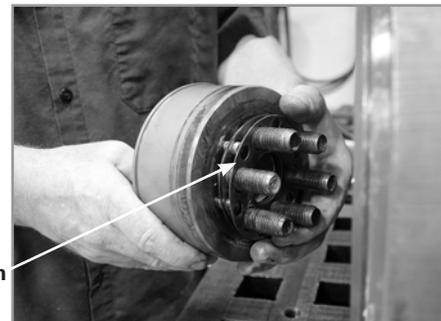
19. Use a bar to turn the shaft clockwise into the piston sleeve.



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.

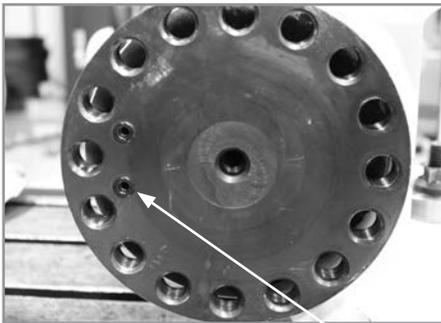
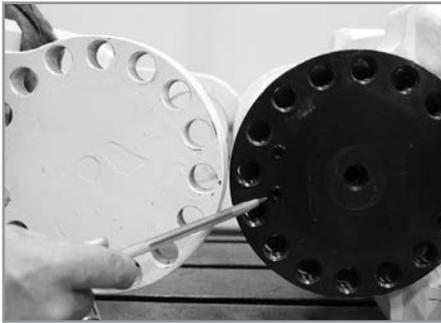


shim

# Assembly of PowerTilt

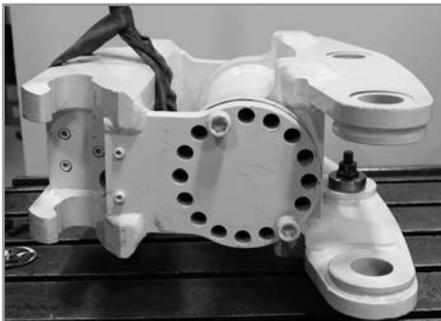
Coat bolt threads with Loctite Nickel Anti-Seize #77164 or equivalent and install bolts.

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.



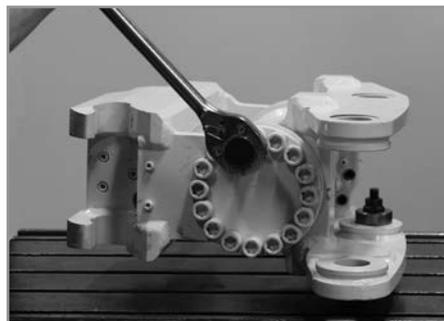
25. Coat bolt threads with Loctite Nickel Anti-Seize #77164 or equivalent. Insert hub bolts and tighten per table on page 44.



**NOTICE**

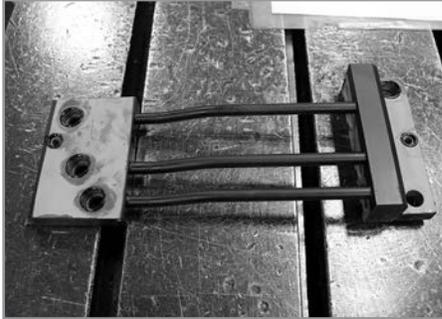
If the shaft, housing or end cap have been replaced the correct quantity of shims will have to be determined. See the instructions under Shims Replacement on page 29.

26. Coat bolt threads with Loctite Nickel Anti-Seize #77164 or equivalent. Insert bolts and tighten per table on page 44. 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 44.



## 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 (Ft-lbs)
BSPP G1/8	14 +/- 1 (10 +/- 1)
BSPP G1/4	31 +/- 1 (23 +/- 1)
BSPP G3/8	65 +/- 4 (48 +/- 3)

## Torque Values for Banjo Bolts

Size	Torque Nm (Ft-lbs)
BSPP G1/8	20 +/- 1 (15 +/- 1)
BSPP G1/4	50 +/- 3 (37 +/- 2)

## Torque Values for Metric Fasteners\*\*

### COARSE THREAD

Fastener Size	Socket Head Bolt (grd 12.9) Nm (Ft-lbs)
M10 x 1.50	70 +/- 3 (52 +/- 2)
M12 x 1.75	130 +/- 5 (96 +/- 4)
M16 x 2.00	325 +/- 7 (240 +/- 5)
M20 x 2.50	530 +/- 20 (390 +/- 15)
M24 x 3.00	915 +/- 27 (675 +/- 20)
M30 x 3.50	1815 +/- 41 (1340 +/- 30)

### FINE THREAD

Fastener Size	Socket Head Bolt (grd 12.9) Nm (Ft-lbs)
M10 x 1.50	70 +/- 3 (52 +/- 2)
M16 x 1.50	340 +/- 7 (250 +/- 5)
M20 x 1.50	660 +/- 20 (490 +/- 15)
M24 x 2.00	1140 +/- 27 (840 +/- 20)
M30 x 2.00	2270 +/- 41 (1675 +/- 30)

\* All fasteners must be grade 12.9

\*\* Lubricated torque - use anti-seize or oil on threads

# PowerTilt Specifications

## PowerTilt Specifications

	PT-030	PT-050	PT-070	PT-100	PT-180	PT-240	PT-300
<b>Maximum Machine Weight</b>							
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
<b>Output Torque</b>							
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
<b>Holding Torque</b>							
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
<b>Design Straddle Moment Load</b>							
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
<b>Torque Foot Bolt Size &amp; Quantity</b>							
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
<b>Hub Bolt Size &amp; Quantity</b>							
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
<b>Item 128 Quantity</b>	2	2	2	2	2	2	2
<b>Item 129 Quantity</b>	1	1	1	1	2	2	2
<b>Item 130 Quantity</b>	4	5	5	5	4	4	5
<b>Item 232 Quantity</b>	2	2	4	Manifold Configuration 1: 8 Manifold Configuration 2: 4 Manifold Configuration 3: 2	Manifold Configuration 1: 8 Manifold Configuration 2: 4 Manifold Configuration 3: 2	4	4
<b>Item 240 Quantity</b>	4	4	4	4 with banjo manifold	4 with banjo manifold	4	4

# Testing and Greasing

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

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

	<b>⚠ CAUTION</b>
	<b>To avoid injury or damage to product:</b> Secure product to work bench.

<b>NOTICE</b>
<b>To avoid contamination to machined parts:</b>  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 Parker.

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.

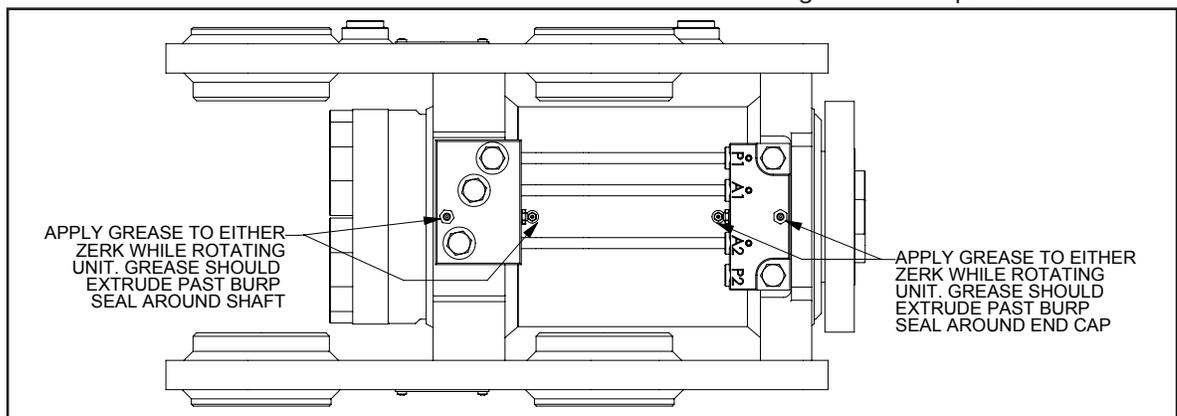
## Filling Rotary Union with Oil.

See page 10 for instructions.

## Testing and Greasing

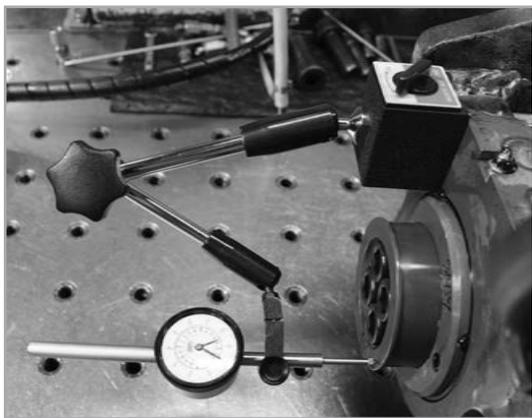
Attach the PowerTilt to either a hydraulic test bench, excavator or portable pump for greasing and testing. Make sure the PowerTilt is secured to prevent unwanted movement. Install the grease fittings.

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

3. 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.
4. 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

1. 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.

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.

3. Reconnect the hydraulic line to Port P2 and pressurize as in Step 1 above.
4. Check for leaks at Port P1 and around the main shaft and end cap seals as in Step 2 above.
5. Plug port A1 at the shaft ports or torque foot ports.
6. Remove the A2 and P1 hydraulic hose.
7. Apply pressure to A1 port.
8. There should be no flow from A2 or P1.
9. Remove the A1 hydraulic hose.
10. Apply pressure to A2.
11. 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:

1. 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.
2. Relieve pressure to P2 and disconnect the hydraulic hose and cap off the hose end.
3. 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.

4. Slowly pressurize Port P1 noting the pressure at which oil flows from P2. The relief should vent at approximately 3250 psi (225 bar).
5. Test at Port P2 using the same procedure.
6. 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.

## Offer of Sale

## PowerTilt Tilting Coupler PowerTilt NG Service & Repair Manual

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods, services or work described will be referred to as "Products".

1. **Terms.** All sales of Products by Seller are expressly conditioned upon, and will be governed by the acceptance of, these Terms. These Terms are incorporated into any Quote provided by Seller to Buyer. Buyer's order for any Products whether communicated to Seller verbally, in writing, by electronic data interface or other electronic commerce, shall constitute acceptance of these Terms. Seller objects to any contrary or additional terms or conditions of Buyer. Reference in Seller's order acknowledgement to Buyer's purchase order or purchase order number shall in no way constitute an acceptance of any of Buyer's terms or conditions of purchase. No modification to these Terms will be binding on Seller unless agreed to in writing and signed by an authorized representative of Seller.

2. **Price; Payment.** The Products set forth in the Quote are offered for sale at the prices indicated in the Quote. Unless otherwise specifically stated in the Quote, prices are valid for thirty (30) days and do not include any sales, use, or other taxes or duties. Seller reserves the right to modify prices at any time to adjust for any raw material price fluctuations. Unless otherwise specified by Seller, all prices are F.O.B. Seller's facility (INCOTERMS 2020). All sales are contingent upon credit approval and full payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. **Shipment; Delivery; Title and Risk of Loss.** All delivery dates are approximate, and Seller is not responsible for damages resulting from any delay. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage pass to Buyer, upon placement of the Products with the carrier at Seller's facility. Unless otherwise agreed prior to shipment and for domestic delivery locations only, Seller will select and arrange, at Buyer's sole expense, the carrier and means of delivery. When Seller selects and arranges the carrier and means of delivery, freight and insurance costs for shipment to the designated delivery location will be prepaid by Seller and added as a separate line item to the invoice. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions. Buyer shall not return or repackage any Products without the prior written authorization from Seller, and any return shall be at the sole cost and expense of Buyer.

4. **Warranty.** The warranty for the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of eighteen (18) months from the date of delivery or 2,000 hours of use, whichever occurs first; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the date of completion of the Services; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end-user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **EXEMPTION CLAUSE; DISCLAIMER OF WARRANTY, CONDITIONS, REPRESENTATIONS: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY, CONDITION, AND REPRESENTATION, PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, CONDITIONS, AND REPRESENTATIONS, WHETHER STATUTORY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THOSE RELATING TO DESIGN, NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED. UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER, THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".**

5. **Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

6. **LIMITATION OF LIABILITY.** IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCT, RE-PERFORM THE SERVICES, OR REFUND THE PURCHASE PRICE PAID WITHIN A REASONABLE PERIOD OF TIME. IN NO EVENT IS SELLER LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING ANY LOSS OF REVENUE OR PROFITS, WHETHER BASED IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCTS.

7. **Confidential Information.** Buyer acknowledges and agrees that any technical, commercial, or other confidential information of Seller, including, without limitation, pricing, technical drawings or prints and/or part lists, which has been or will be disclosed, delivered or made available, whether directly or indirectly, to Buyer ("Confidential Information"), has been and will be received in confidence and will remain the property of Seller. Buyer further agrees that it will not use Seller's Confidential Information for any purpose other than for the benefit of Seller.

8. **Loss to Buyer's Property.** Any tools, patterns, materials, equipment or information furnished by Buyer or which are or become Buyer's property ("Buyer's Property"), will be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer ordering the Products manufactured using Buyer's Property. Furthermore, Seller shall not be responsible for any loss or damage to Buyer's Property while it is in Seller's possession or control.

9. **Special Tooling.** "Special Tooling" includes but is not limited to tools, jigs, fixtures and associated manufacturing equipment acquired or necessary to manufacture Goods. Seller may impose a tooling charge for any Special Tooling. Such Special Tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in the Special Tooling, even if such Special Tooling has been specially converted or adapted for manufacture of Goods for Buyer and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property owned by Seller in its sole discretion at any time.

10. **Security Interest.** To secure payment of all sums due from Buyer, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect Seller's security interest.

11. **User Responsibility.** Buyer, through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and any technical information provided with the Quote or the Products, such as Seller's instructions, guides and specifications. If Seller provides options of or for Products based upon data or specifications provided by Buyer, Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event Buyer is not the end-user of the Products, Buyer will ensure such end-user complies with this paragraph.

12. **Use of Products; Indemnity by Buyer.** Buyer shall comply with all instructions, guides and specifications provided by Seller with the Quote or the Products. Unauthorized Uses. If Buyer uses or resells the Products in any

way prohibited by Seller's instructions, guides or specifications, or Buyer otherwise fails to comply with Seller's instructions, guides and specifications, Buyer acknowledges that any such use, resale, or non-compliance is at Buyer's sole risk. Further, Buyer shall indemnify, defend, and hold Seller harmless from any losses, claims, liabilities, damages, lawsuits, judgments and costs (including attorney fees and defense costs), whether for personal injury, property damage, intellectual property infringement or any other claim, arising out of or in connection with: (a) improper selection, design, specification, application, or any misuse of Products; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, tools, equipment, plans, drawings, designs, specifications or other information or things furnished by Buyer; (d) damage to the Products from an external cause, repair or attempted repair by anyone other than Seller, failure to follow instructions, guides and specifications provided by Seller, use with goods not provided by Seller, or opening, modifying, deconstructing, tampering with or repackaging the Products; or (e) Buyer's failure to comply with these Terms. Seller shall not indemnify Buyer under any circumstance except as otherwise provided in these Terms.

13. **Cancellations and Changes.** Buyer may not cancel or modify, including but not limited to movement of delivery dates for the Products, any order for any reason except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage and any additional expense. Seller, at any time, may change features, specifications, designs and availability of Products.

14. **Limitation on Assignment.** Buyer may not assign its rights or obligations without the prior written consent of Seller.

15. **Force Majeure.** Seller is not liable for delay or failure to perform any of its obligations by reason of events or circumstances beyond its reasonable control. Such circumstances include without limitation: accidents, labor disputes or stoppages, government acts or orders, acts of nature, pandemics, epidemics, other widespread illness, or public health emergency, delays or failures in delivery from carriers or suppliers, shortages of materials, war (whether declared or not) or the serious threat of same, riots, rebellions, acts of terrorism, fire or any reason whether similar to the foregoing or otherwise. Seller will resume performance as soon as practicable after the event of force majeure has been removed. All delivery dates affected by force majeure shall be tolled for the duration of such force majeure and rescheduled for mutually agreed dates as soon as practicable after the force majeure condition ceases to exist. Force majeure shall not include financial distress, insolvency, bankruptcy, or other similar conditions affecting one of the parties, affiliates and/or sub-contractors.

16. **Waiver and Severability.** Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice either party's right to enforce that provision in the future. Invalidation of any provision of these Terms shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.

17. **Termination.** Seller may terminate any agreement governed by or arising from these Terms for any reason and at any time by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms, (b) becomes or is deemed insolvent, (c) appoints or has appointed a trustee, receiver or custodian for all or any part of Buyer's property, (d) files a petition for relief in bankruptcy on its own behalf, or one is filed against Buyer by a third party, (e) makes an assignment for the benefit of creditors; or (f) dissolves its business or liquidates all or a majority of its assets.

18. **Ownership of Software.** Seller retains ownership of all Software supplied to Buyer hereunder. In no event shall Buyer obtain any greater right in and to the Software than a right in the nature of a license limited to the use thereof and subject to compliance with any other terms provided with the Software.

19. **Indemnity for Infringement of Intellectual Property Rights.** Seller is not liable for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights ("Intellectual Property Rights") except as provided in this Section. Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on a third party claim that one or more of the Products sold hereunder infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by Seller to Buyer. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of any such claim, and Seller having sole control over the defense of the claim including all negotiations for settlement or compromise. If one or more Products sold hereunder is subject to such a claim, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Products, replace or modify the Products so as to render them non-infringing, or offer to accept return of the Products and refund the purchase price less a reasonable allowance for depreciation. Seller has no obligation or liability for any claim of infringement: (i) arising from information provided by Buyer; or (ii) directed to any Products provided hereunder for which the designs are specified in whole or part by Buyer; or (iii) resulting from the modification, combination or use in a system of any Products provided hereunder. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for claims of infringement of Intellectual Property Rights.

20. **Governing Law.** These Terms and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.

21. **Entire Agreement.** These Terms, along with the terms set forth in the main body of any Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale and purchase. In the event of a conflict between any term set forth in the main body of a Quote and these Terms, the terms set forth in the main body of the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. These Terms may not be modified unless in writing and signed by an authorized representative of Seller.

22. **Compliance with Laws.** Buyer agrees to comply with all applicable laws, regulations, and industry and professional standards, including those of the United States of America, and the country or countries in which Buyer may operate, including without limitation the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti-Kickback Act"), U.S. and E.U. export control and sanctions laws ("Export Laws"), the U.S. Food Drug and Cosmetic Act ("FDCA"), and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), each as currently amended. Buyer agrees to indemnify, defend, and hold harmless Seller from the consequences of any violation of such laws, regulations and standards by Buyer, its employees or agents. Buyer acknowledges that it is familiar with all applicable provisions of the FCPA, the Anti-Kickback Act, Export Laws, the FDCA and the FDA and certifies that Buyer will adhere to the requirements thereof and not take any action that would make Seller violate such requirements. Buyer represents and agrees that Buyer will not make any payment or give anything of value, directly or indirectly, to any governmental official, foreign political party or official thereof, candidate for foreign political office, or commercial entity or person, for any improper purpose, including the purpose of influencing such person to purchase Products or otherwise benefit the business of Seller. Buyer further represents and agrees that it will not receive, use, service, transfer or ship any Products from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws. Buyer agrees to promptly and reliably provide Seller all requested information or documents, including end-user statements and other written assurances, concerning Buyer's ongoing compliance with Export Laws. 8/20



**EC Declaration of Incorporation**

We hereby declare that the following product and models are intended to be incorporated into other machinery, and must not be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with the essential requirements of the Machinery Directive 2006/42/EC

Product: **PowerTilt** \_\_\_\_\_

Model numbers beginning with: **PTA-4.5, PTS-4.5, PTA-030, PTS-030, PTA-050, PTS-050, PTA-070, PTS-070, PTA-100, PTS-100, PTA-180, PTS-180, PTA-240, PTA-300, PTA-465**

Manufactured by: Parker Hannifin Corporation  
225 Battersby  
Enumclaw, WA 98022  
USA  
360-825-1601

A technical construction file for this machinery is retained at the following address:

Parker Hannifin Corporation  
225 Battersby  
Enumclaw, WA 98022

Signed: Jonathan Wattelet  
Name: Jonathan Wattelet  
Company: Parker Hannifin

Date: March 11, 2021  
Position: Div Eng Mgr Iv

# Notes

# Notes

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