POWERGRIP®
Instruction, Service and Repair Manual
PG and PGA Series
# Table of Contents

## Introduction
- Table of Contents .................................................................................................................. 2
- Product Overview ...................................................................................................................... 3
- Operation Technology .............................................................................................................. 4
- General Safety Guidelines ........................................................................................................ 5
- Product Identification .............................................................................................................. 6

## Installation and Maintenance
- Installation and Mounting .......................................................................................................... 7
- Hydraulic Requirements and Plumbing ........................................................................................ 8
- Installing and Removing Hydraulic Lines .................................................................................. 9
- Maintenance ............................................................................................................................... 11
- Trouble Shooting Guide ........................................................................................................... 12

## Tools
- Tools Required .......................................................................................................................... 13

## Drawings
- Assembly Drawing ..................................................................................................................... 14
- Exploded View — Bucket and Actuator ..................................................................................... 15
- Parts List — Bucket and Actuator ............................................................................................. 16
- Exploded View — Valve Manifold ............................................................................................. 17
- Parts List — Valve Manifold ...................................................................................................... 17

## Disassembly
- Product Inspection ...................................................................................................................... 18
- Before Disassembly .................................................................................................................. 19
- Disassembly ............................................................................................................................. 20
- Parts Inspection ......................................................................................................................... 23

## Assembly
- Seal and Bearing Installation ..................................................................................................... 24
- Assembly .................................................................................................................................... 26

## Post Assembly
- Testing ........................................................................................................................................ 28
- Warranty Information ................................................................................................................ 30
- Service Offering ....................................................................................................................... 31
- About Helac Corporation .......................................................................................................... 36
Helac PowerGrip®, a multi-purpose bucket from Helac Corporation, is a versatile, durable tool used as a trenching, grading or clamshell bucket and for gripping and loading. PowerGrip increases the tasks a single machine can perform, reducing the number of dedicated-task machines needed on a job site. PowerGrip also performs as a general purpose excavating bucket for everyday tasks.

Ideal for a broad range of applications, PowerGrip can be used during every step of the construction process. Since 2001, contractors have come to rely on PowerGrip for demolition, land clearing, tree/brush/stump removal, underground utilities, material handling and finish grading.

Each PowerGrip is built with the quality and durability Helac is known for – so we offer a one year warranty to ensure your complete satisfaction.

When used in combination with Helac PowerTilt®, a swing attachment, you can achieve unmatched, hand-like manipulation and dexterity, dramatically maximizing productivity.
PowerGrip 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 disassembly of the PowerGrip, there are several cautionary notices that should be considered. If you are not comfortable with repair or maintenance of this product, contact your local dealer or Helac Corporation’s Service Department for assistance.

Other Safety Guidelines and Precautions

1. PowerGrip 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 PowerGrip, carrier and/or other attachments.

2. The operation of the PowerGrip Bucket is similar to the operation of OEM buckets in trenching and material handling applications. However, the PowerGrip Bucket has the added ability to grip, hold and lift materials in a pick and place capability. This attachment is not designed for long term holding of materials.

   Refer to the carrier manufacturer’s instructions regarding safe material handling practices.

   The bucket jaw should only be opened when needed for specific tasks. Failure to close the jaw can result in damage to the dipper arm.

3. Modification to the PowerGrip is done at the owner’s risk and may void the Helac Corporation, Attachments Division warranty.

4. 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 10 feet, they should be replaced immediately.
INTRODUCTION

General Safety Guidelines

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

5. PowerGrip should be used in conjunction with attachments that do not adversely affect the stability of the machine.

Important Notice

Helac Corporation 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.

Product Identification

A unique serial number is located on each PowerGrip. This serial number is stamped on one end of the actuator and is also located on an Identification (ID) Tag. It may be necessary to remove paint to expose the serial number.

SERIAL # 3015
P/N # 314327-66076672767137
MODEL # TAKELIFT-T31015
WEIGHT: 765 LBS. CAPACITY: .289"
TOOTH NO: 2300-H DATE: 9/05
Each PowerGrip is engineered for a specific backhoe or excavator and is designed to be pin mounted directly to the machine. When using

**Installing the PowerGrip Bucket onto the Carrier**

All PowerGrip models should be mounted to the carrier according to the instructions outlined below.

1. Position the PowerGrip close to the carrier boom to ensure easy use of the lifting reach and range of the carrier boom.
2. Lower the dipper to approximately 2-3 inches (50-75 mm) above the PowerGrip. Roll out the bucket cylinder to lower the link bars to the PowerGrip.
3. Align the PowerGrip and link bar holes and install the link pin.
4. Slowly lift the PowerGrip to a safe height with the bucket and boom cylinders.
5. Curl the bucket cylinder until the PowerGrip and dipper holes align and install the bucket pivot pin. Rotate the pins as necessary and install the required retainers.

**Removing the PowerGrip Bucket from the Carrier**

To remove the PowerGrip bucket, follow the instructions outlined below.

1. Position the bucket so it is lightly supported by the ground and in a position so it will not move or fall when a pin is removed.
2. Remove the bucket pivot and link pins.

Universal or Hydraulic Quick Couplers, contact the respective coupler manufacturer for instructions and maintenance requirements.
Hydraulic Requirements

The Typical PowerGrip Circuit Chart and the Tool Circuit Requirements Table (shown on this page) illustrate the control circuit requirements for the PowerGrip. The hydraulic pressures and flow requirements must be observed or damage to the actuator can occur.

The installer of the PowerGrip is responsible for selecting control circuits that are compatible with the excavator and meet the tool circuit requirements. Helac can be contacted for additional control circuits and methods for controlling the PowerGrip.

**NOTICE**

PowerGrips are equipped with a standard pressure control/load lock manifold welded to the bucket shell.

Refer to the Suggested Hose Routings Diagram on Page 11 for the recommended routings.

### Tool Circuit Requirements

<table>
<thead>
<tr>
<th>Model Sizes</th>
<th>PG06</th>
<th>PG07</th>
<th>PG08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>in³ (cm³)</td>
<td>84.8 (1,390)</td>
<td>118.5 (1,942)</td>
</tr>
<tr>
<td>Required Oil Flow*</td>
<td>gpm (liters/minute)</td>
<td>2-7 (8-28)</td>
<td>3-10 (12-39)</td>
</tr>
<tr>
<td>Port Connections</td>
<td>SAE BSPP</td>
<td>6 (1/4)</td>
<td>6 (1/4)</td>
</tr>
<tr>
<td>Hydraulic Circuit Min. Hose Tube Size</td>
<td>in (mm)</td>
<td>1/2 (12)</td>
<td>5/8 (16)</td>
</tr>
<tr>
<td>Whip Hose Size</td>
<td>in (mm)</td>
<td>3/8 (10)</td>
<td>3/8 (10)</td>
</tr>
<tr>
<td>Hydraulic Pressures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross Port Relief Valve Pressure (Opening)</td>
<td>1,000-1,500 psi (70-103 bar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross Port Relief Valve Pressure (Closing)</td>
<td>3,200-3,300 psi (220-230 bar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit Pressure</td>
<td>3,650-3,750 psi (250-260 bar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Circuit Back Pressure</td>
<td>580 psi (40 bar)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 3-10 second open/close time
Installing and Removing Hydraulic Lines

The manifold incorporates two ports for hydraulic hose connections, Port V1 and Port V2. When pressure is applied to Port V1 the jaw opens; when pressure is applied to Port V2 the jaw closes.

After installing the PowerGrip onto the equipment and attaching the hydraulic lines, it is important that all safety devices are properly reattached.

---

Hose and tube size recommendations can be found in the Tool Circuit Requirements Chart shown on Page 9.

The position of the hoses is important for reliable operation. Refer to the Suggested Hose Routings Chart on Page 11 for suggested hose routings.

Connect hydraulic hoses to the appropriate ports. Be sure the hoses do not cross, foul, crush or chafe when operating the PowerGrip or machine. Verify proper hose routing for all possible positions of the PowerGrip and all attachments, which are to be used with the PowerGrip. Repair any oil leaks immediately.

---

When installing a new tool circuit or hydraulic lines, flush all the tool circuit lines with hydraulic oil prior to connecting the PowerGrip. This will help remove any contaminants from the circuit components which may have accumulated during manufacturing and/or installation.
Suggested Hose Routings
1. Grease the thrust washers at the two grease fittings with a high quality Lithium-based grease. Apply grease until clean grease flows from the grease reliefs. Severe operating conditions such as abrasive dust or prolonged submersion in water may require more frequent grease applications.

2. Make sure the grease reliefs are functioning properly. Open or replace non-functioning grease reliefs immediately.

   **NOTICE**
   
   Never replace the grease relief valves with grease fittings or plugs.

   **NOTICE**
   
   Do not operate the PowerGrip if the grease reliefs are not functioning.

3. Inspect the PowerGrip 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.
## Troubleshooting Guide

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>PowerGrip jaw does not hold</td>
<td>Excessive force being applied to jaw is causing relief valve to open.</td>
<td>This is normal. The relief valve limits the force applied to the bucket</td>
</tr>
<tr>
<td>problem position</td>
<td></td>
<td>jaw to prevent damage to the unit.</td>
</tr>
<tr>
<td></td>
<td>A bi-directional hydraulic motor control valve is being used without the</td>
<td>Install bucket load control valve.</td>
</tr>
<tr>
<td></td>
<td>bucket load control valve.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Load control valve is leaking.</td>
<td>Test, repair or replace as needed.</td>
</tr>
<tr>
<td></td>
<td>Seals are leaking oil.</td>
<td>Test and replace seals as necessary.</td>
</tr>
<tr>
<td>Jaw moves only in one direction</td>
<td>Single directional control valve is being used.</td>
<td>Replace with a bi-directional control valve.</td>
</tr>
<tr>
<td></td>
<td>Load control valve manifold is obstructed.</td>
<td>Clean manifold passageway(s).</td>
</tr>
<tr>
<td></td>
<td>Hydraulic hose is internally damaged.</td>
<td>Test and replace damaged hose.</td>
</tr>
<tr>
<td>PowerGrip Bucket has spongy</td>
<td>Air in PowerGrip actuator or hydraulic circuit.</td>
<td>Bleed air from circuit and check for cause.</td>
</tr>
<tr>
<td>feel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side to side (axial play)</td>
<td>Worn or missing thrust washers.</td>
<td>Replace or install thrust washers.</td>
</tr>
<tr>
<td>movement of jaw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PowerGrip will not accept grease</td>
<td>Grease relief not functioning or has been replaced with grease fitting or</td>
<td>Clean or replace grease relief valves.</td>
</tr>
<tr>
<td>at grease fittings</td>
<td>plug.</td>
<td></td>
</tr>
</tbody>
</table>
Several basic tools are required for the disassembly and reassembly of the PowerGrip. The suggested tools are outlined below:

1. Flashlight
2. Seal tool
3. Pin spanner wrench
4. Two metal dowels
5. Felt or paint marker
6. Pick
7. 1/8” T-handle allen wrench
8. Strap wrench
9. Plastic or rubber mallet
10. Utility knife
11. Two pry bars
12. Metal punch
13. Plastic drift
14. Tape measure
15. One #8-32 x 1.00” or longer machine screw

### Making a Seal Tool

The seal tool is merely a customized standard flat head screwdriver.

1. Heat the flat end with a torch until it glows.
2. Secure the heated end of the screwdriver in a vise and bend the heated end to a slight radius.
3. Round off all sharp edges of the heated tip to a polished finish. The tool may be modified slightly to your own personal preference.
Exploded View — Bucket and Actuator

* WELDED TO BUCKET
** WELDED TO DRIVE HUB
*** NOT INCLUDED ON ALL MODELS
# Parts List — Bucket and Actuator

## Parts

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Housing</td>
<td>1</td>
</tr>
<tr>
<td>02</td>
<td>Shaft</td>
<td>1</td>
</tr>
<tr>
<td>03</td>
<td>Piston Sleeve</td>
<td>1</td>
</tr>
<tr>
<td>04</td>
<td>Drive Hub</td>
<td>2</td>
</tr>
<tr>
<td>05</td>
<td>Lock Nut</td>
<td>2</td>
</tr>
<tr>
<td>06</td>
<td>Spline Adaptor</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Cover Plate</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>Housing Collar</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>Bucket</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Bucket Jaw</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Bucket Tooth Assembly</td>
<td>As ordered</td>
</tr>
<tr>
<td>101</td>
<td>Fitting Plug</td>
<td>10</td>
</tr>
<tr>
<td>105</td>
<td>Retainer Pin</td>
<td>4</td>
</tr>
<tr>
<td>107</td>
<td>Grease Relief Cover</td>
<td>2</td>
</tr>
<tr>
<td>122</td>
<td>Grease Fitting</td>
<td>2</td>
</tr>
<tr>
<td>123</td>
<td>Grease Relief Fitting</td>
<td>2</td>
</tr>
<tr>
<td>124</td>
<td>Port Plug-Fitting G-1/4&quot; BSPP</td>
<td>2</td>
</tr>
<tr>
<td>128</td>
<td>Port Plug-Fitting, 3/8&quot; SAE -6</td>
<td>2</td>
</tr>
</tbody>
</table>

## Seals

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>Seal Kit (includes all seals below)</td>
<td>1</td>
</tr>
<tr>
<td>207</td>
<td>O-Ring, Collar</td>
<td>2</td>
</tr>
<tr>
<td>230</td>
<td>O-Ring, Drive Hub ID</td>
<td>2</td>
</tr>
<tr>
<td>231</td>
<td>Back-Up Ring, Drive Hub ID</td>
<td>2</td>
</tr>
<tr>
<td>232</td>
<td>O-Ring, Lock Nut ID*</td>
<td>2</td>
</tr>
<tr>
<td>233</td>
<td>Back-Up Ring, Lock Nut ID*</td>
<td>2</td>
</tr>
<tr>
<td>234</td>
<td>Seal, Piston ID</td>
<td>1</td>
</tr>
<tr>
<td>235</td>
<td>Seal, Piston OD</td>
<td>1</td>
</tr>
<tr>
<td>236</td>
<td>Seal, Exclusion</td>
<td>2</td>
</tr>
<tr>
<td>237</td>
<td>O-Ring, Exclusion</td>
<td>2</td>
</tr>
<tr>
<td>238</td>
<td>Seal, Drive Hub</td>
<td>2</td>
</tr>
</tbody>
</table>

## Bearing Kit

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>Bearing Kit (includes all bearings below)</td>
<td>1</td>
</tr>
<tr>
<td>341</td>
<td>Bearing, Drive Hub</td>
<td>2</td>
</tr>
<tr>
<td>342</td>
<td>Bearing, Piston ID</td>
<td>1</td>
</tr>
<tr>
<td>343</td>
<td>Bearing, Piston OD/Drive Hub</td>
<td>3</td>
</tr>
<tr>
<td>344</td>
<td>Thrust Washer</td>
<td>2</td>
</tr>
</tbody>
</table>

## Miscellaneous

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>451</td>
<td>Warning Decal (see page 36)</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>Bucket Pin, Dipper (not shown)</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>Bucket Pin, Link (not shown)</td>
<td>1</td>
</tr>
</tbody>
</table>

**NOTE:** Seal Kits and Bearing Kits are separate, individual kits. They are not available as a single, combined Seal and Bearing Kit.

* Not included on all models
The manifold, cartridge valves and related parts are identical for all PowerGrip Models. Manifold can be provided with either SAE or BSPP ports. Seals are only available in kit form; individual seals are not available.

### Parts List — Valve Manifold

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>414</td>
<td>Low Pressure Cartridge</td>
<td>1</td>
</tr>
<tr>
<td>415</td>
<td>High Pressure Cartridge</td>
<td>1</td>
</tr>
<tr>
<td>416</td>
<td>Load Holding Cartridge</td>
<td>1</td>
</tr>
<tr>
<td>417</td>
<td>Low Pressure Cartridge Seal Kit</td>
<td>1</td>
</tr>
<tr>
<td>418</td>
<td>High Pressure Cartridge Seal Kit</td>
<td>1</td>
</tr>
<tr>
<td>419</td>
<td>Load Holding Cartridge Seal Kit</td>
<td>1</td>
</tr>
<tr>
<td>420</td>
<td>Port Plug</td>
<td>1</td>
</tr>
<tr>
<td>421</td>
<td>Relief Manifold-Block Only</td>
<td>1</td>
</tr>
</tbody>
</table>
Product Inspection

Make sure the PowerGrip is thoroughly cleaned prior to disassembly. Inspect the PowerGrip for corrosion prior to disassembly.

Severe corrosion can make it difficult to remove the fitting plugs (101) and lock nuts. If corrosion is evident, soak with penetrating oil for several hours before disassembly.

All numbers that appear in parenthesis ( ) in the following sections are referring to items on Page 17.
Before Disassembly

1. Close jaw fully and release hydraulic pressure. Secure jaw to bucket shell by tack welding tabs at three locations as shown on both sides of the jaw.

2. Mark the port access holes with P1 and P2 for future reference during disassembly and assembly.
Disassembly

1. Remove the hydraulic tubes from P1 and P2. Using a \(\frac{1}{8}\)" T-handle allen wrench, remove the 5 SAE #2 fitting plugs (101) from each lock nut (05).

2. Remove the two retainer pins (105) located on each lock nut (05) using a \#8-32 x 1.00" machine screw. Thread the machine screw into the end of each retainer pin (105) and pull on the machine screw to remove the retainer pin (105).

3. Using pin spanner wrench or two metal dowels and a pry bar, unthread and remove both lock nuts (05).

4. Using pry bars, remove P1 drive hub (04) first, then P2 drive hub (04).

5. Measure distance from piston sleeve (03) to edge of housing (01) bore at P2 Side. Record measurement.

**NOTICE**

Hydraulic oil will discharge when hub is removed.

**NOTICE**

It is very important to record the measurement of the piston sleeve position before further disassembly. Proper piston sleeve position ensures that the bucket will close before the piston sleeve reaches its internal stop. If improperly positioned, the piston sleeve will bottom out against the ring gear causing damage to the gear teeth.
6. Using a plastic mallet, drive the shaft (02) toward the P1 end until the shaft protrudes far enough to grasp. Carefully pull the shaft (02) out from the P1 side of the actuator.

7. Using a plastic drift and plastic mallet, carefully drive the piston sleeve (03) out the P2 port side of the actuator housing (01).

8. Some models have seals on the ID and / or OD of the lock nuts (05). If they exist, remove the seals and back-up rings from both lock nuts using a seal tool.

9. Remove the bearings (341,343) from both drive hubs (04).

10. Remove the drive hub seal (238) from the drive hubs (04) using a seal tool or a utility knife.

NOTICE

Be sure the piston sleeve (03) and housing (01) are not damaged during disassembly.

As seals are removed, note their orientation. Many seals work in one direction only.
11. Remove the thrust washer (344) from the drive hubs (04).

12. Remove the exclusion seal (236) from the drive hubs (04) using a seal tool or a utility knife.

13. Remove the o-ring exclusion (237) from each drive hub (04) using a seal tool.

14. Remove the drive hub ID o-ring (230) and drive hub back-up ring (231) from each drive hub (04).

15. Place the piston sleeve (03) flange side up to access the seals and bearings. Remove the piston OD bearing (343) from the piston sleeve (03).
16. Remove the piston OD seal (235) from the piston sleeve (03) using a seal tool or a utility knife.

18. Remove the piston ID seal (234) from the piston sleeve (03) using a seal tool.

17. Remove the piston ID bearing (342) from the piston sleeve (03) using a seal tool.

Parts Inspection

1. Prior to inspection, clean all parts in a wash tank and dry with compressed air.

2. Housing — Inspect the cylinder bore for wear and scratches. Local polishing can repair minor scratches and damage. Inspect all bearing and seal surfaces for signs of wear or damage. Check the condition of the gear teeth for any signs of extreme wear or chipping. Inspect the housing for signs of damage or cracking.

3. Shaft — Check the shaft surface for scratches from the piston seal or other damages. Small or minor scratches can be carefully polished. Examine the condition of the gear teeth.

4. Drive Hubs — Inspect the ID and OD splines for signs of chipping or serious wear. Evaluate the surface finish of the seal grooves.

5. Lock Nuts — Inspect the threads for galling or cross threading. Make sure that the end cap spins freely on the threads of the shaft. Evaluate the surface finish of the seal grooves.

6. Piston Sleeve — Inspect the condition of the gear teeth. Evaluate the surface finish of the seal grooves.

7. Seals — Helac recommends replacement of all seals and bearings.
Seal and Bearing Installation

NOTICE  Lightly oil all seals, seal grooves and bearings prior to installing.

1. Install the exclusion seal (236) onto each drive hub (04) using a seal tool.

2. Lightly grease the thrust washer (344) and install onto each drive hub (04).

3. Install drive hub seal (238) onto each drive hub (04).

4. Install the bearings (341,343) onto each drive hub (04).

5. Install the drive hub ID o-ring (230) and drive hub ID back-up ring (231) into each drive hub (04).

The orientations of seals are vital to PowerGrip functioning safely and correctly. Refer to the assembly drawing and details on page 15 for the correct orientation of each seal.
6. Depending on model, install the exclusion o-ring seal (237) into the ID of the drive hub (04) or the OD of the locknut (05).

7. Install the piston OD seal (235) (with back-up rings if applicable) onto the piston sleeve (03) using a seal tool.

8. Install the piston OD bearing (343) onto the piston sleeve (03).

9. Install the piston ID seal (234) (with back-up rings if applicable) into the piston sleeve (03).

10. Install the piston ID bearing (342) into the piston sleeve (03).

11. Some models have seals on the ID and / or OD of the lock nuts (05). If they exist, install the seals and backup rings onto lock nuts.

   **NOTICE** Be sure the lock nut ID back-up ring (233) is farthest from the threads.
Installation of the piston sleeve (03) into the housing (01) from the P2 side, engage the teeth and push in until the measured distance from the back of the piston sleeve (03) to outer edge of the housing bore at the P2 side is as recorded during step five of disassembly on page 21.

Proper piston sleeve position ensures that the bucket will close before the piston sleeve reaches its internal stop. If improperly positioned, the piston sleeve will bottom out against the ring gear causing damage to the gear teeth.

Install the shaft (02) in the P1 side and position it inside the housing (01) until it is even on both P1 and P2 sides, while keeping the piston (03) to housing bore distance unchanged. Confirm piston (03) to housing distance and adjust as needed while maintaining shaft (02) position.

Coat the drive hub ID splines with nickel anti-seize (Loctite 77169 or equivalent). Install drive hubs (04). If OD splines do not align with jaw splines, remove hub and index the hub until both ID and OD splines align.

Coat the lock nut (05) threads, OD, and flange mating surface with nickel anti-seize (Loctite 77169 or equivalent).

NOTICE Lightly oil inside the housing and each component as installed.
5. Install P1 and P2 lock nuts (05) onto shaft (02) and tighten snug.

6. Using a pin spanner wrench or two metal dowels and a pry bar, tighten the P1 lock nut (05) to 120 ft-lbs (162 Nm). Then loosen the lock nut just far enough until the two retainer pin (105) holes line up.

7. Install the two retainer pins (105) and the five fitting plugs (101) into the lock nut (05) on the P1 side.

8. Using a pin spanner wrench or two metal dowels and a pry bar, tighten the P2 lock nut (05) to 120 ft-lbs (162 Nm). Without over tightening, adjust the lock nut as needed to insert the two remaining retainer pins (105). Install and tighten the five fitting plugs (101) into the lock nut (05).

9. Remove the three tabs installed to secure the jaw to the bucket shell prior to disassembly.
Testing

Testing for Internal Leakage

1. Connect a 5,000 psi (350 bar) test gauge into the hydraulic line to Port P2. Pressurize P2 until the jaw closes fully.

   **NOTICE** If the jaw is not completely closed, hydraulic fluid will exhaust from Port P1 at a high velocity when Port P1 is uncapped.

2. Remove and cap the hydraulic line attached to Port P1. Pressurize port P2 to 2,500 psi (175 bar). Check for leakage at port P1 and from around the main shaft and end cap seals. Leaks indicate worn or improperly installed parts.

Testing Load Control Valve

See valve manifold drawing on page 18 for locations of ports and valves.

Valve Design

This valve has three separate cartridges that work together to provide:

1. Load holding with very low leakage to the tool circuit.
2. High pressure relief protection (when clamping).
3. Low pressure relief protection (when open and being pushed closed).

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 Corporation’s Service Department.

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.
Hydraulic Logic of Load Control Manifold

1. Hydraulic oil should require 3,000 psi (206 bar) to flow from port A2 to port V2.
2. Ports A1 and V1 are always common to each other.
3. With Port A1 blocked, hydraulic oil should require 1,000 to 1,500 psi (69 to 103 bar) to flow from port V1 to port A2/V2.
4. With Port A1 blocked and pressure applied to port V1, Port A2 should be common to port V2.
5. With Port A2 blocked and pressure applied to port V2, it should require 3,200 psi (220 bar) to pass oil to port V1/A1.
Warranty Information

Helac Corporation warrants its products to be free from defective material and factory workmanship for a period of one (1) year or 1000 service hours, whichever occurs first, for Helac Corporation approved applications, defined as medium duty service 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 by the return of the Warranty Registration Card to the factory. If the Registration Card is not returned, the warranty period will commence from the date the Helac Attachment was originally shipped from the factory. For products delivered from authorized dealer inventories, the warranty period shall commence no more than one (1) year from date of shipment from the factory.

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:

Direct Sales to End Users
This warranty covers repair or replacement of product or parts, which under normal use and service disclose defective material and/or factory workmanship. Only repairs completed at the Helac factory or factory replacement (at Helac’s option) will satisfy claims under this warranty. Products under warranty shall be returned to the Helac factory for evaluation and repair. The customer shall contact the Helac Warranty Department for a Return Authorization Number prior to shipping the product in question. The factory will not accept products returned without a Return Authorization Number. Transportation shall be prepaid by the purchaser. On receipt, Helac factory personnel will inspect the product for warrantable issue(s). Upon warranty acceptance, Helac Corporation will repair the warranty issue(s) of the product at no cost to the customer and return the product freight prepaid. If it is determined that the issue(s) are not covered by the warranty, the product (repaired or not) will be returned COD to the customer.

Sales Through Equipment Dealers
This warranty covers labor at predetermined, fixed flat rates and repair or replacement of products or parts, which under normal use and service disclose defective material and factory workmanship. Claims under this warranty will be satisfied only by repair or replacement of the unit or any defective part thereof. Products under warranty shall be returned to a factory authorized dealership location, transportation prepaid by the purchaser, for inspection by the dealer with factory consultation. Warranty repairs are only to be made at the selling dealer’s location according to time maximums and at rates pre-established by Helac Corporation. 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.
Helac Corporation’s Service Department can effectively tackle your service and repair needs and provide responsive customer support. Our 30 years of extensive rotary actuator expertise coupled with an in-depth understanding of our customers’ expectations, enables us to quickly and efficiently service your needs with the following three offerings:

### Technical Support

Our service representatives have been trained to answer the majority of your technical questions during the initial call. If your question can’t be answered immediately, our representative will return your call quickly.

Call our Technical Support Department at +1 800 797 8458 (U.S. and Canada) or +1 360 802 1039 (Worldwide) from 7 a.m. to 4 p.m. PST on weekdays (excluding holidays), or e-mail us at TechSupport@Helac.com.

### Repair Service

Our fully equipped repair department ensures factory specifications and customer expectations are met quickly and efficiently. Helac PowerTilt and PowerGrip can also be serviced through your local equipment dealer.

Call or e-mail our Repairs Department at +1 800 797 8458 (U.S. and Canada), +1 360 802 1039 (Worldwide) or Repairs@Helac.com.

### Parts Service

Our parts service team offers same day or 24 hour turnaround, depending on when the call is received, on all common items.

When ordering Spare and Replacement Parts, including Seal and Bearing Kits, please have the serial and/or model number available.

Spare parts can be ordered online at www.helac.com/service/parts.asp, or by calling or e-mailing our Parts Department at +1 800 797 8458 (U.S. and Canada), +1 360 802 1039 (Worldwide) or Parts@Helac.com.
As a leader in the fluid power industry for over 30 years, Helac Corporation manufactures a comprehensive line of hydraulic rotary actuators and construction equipment attachments. Helac rotary actuators are best known for their tremendous torque output, compact dimensions, exceptional load bearing capability and rugged, reliable performance. Helac PowerTilt and PowerGrip, two specialty products, increase the utilization of backhoes and excavators. Over 1,000 worldwide customers in diverse markets depend on Helac’s product lines to provide product quality, reliability, ease of use and durability.