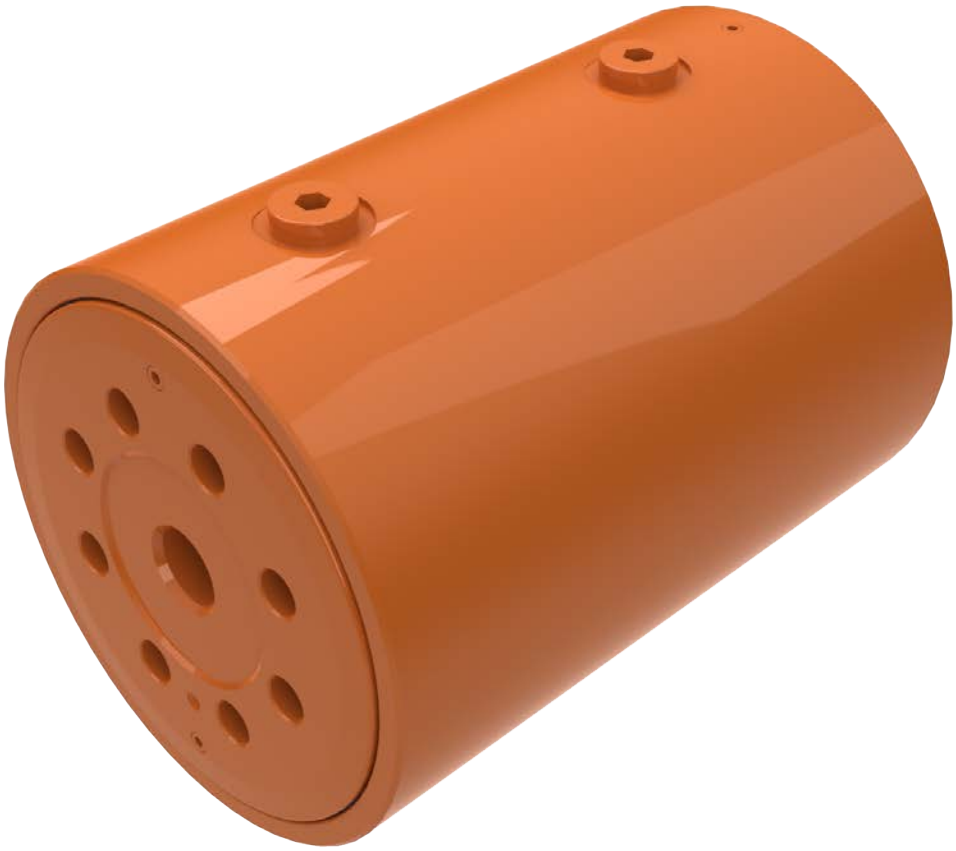

Helical Hydraulic Rotary Actuators

L10 Series Service & Repair Manual

Parker HELAC®

ENGINEERING YOUR SUCCESS.

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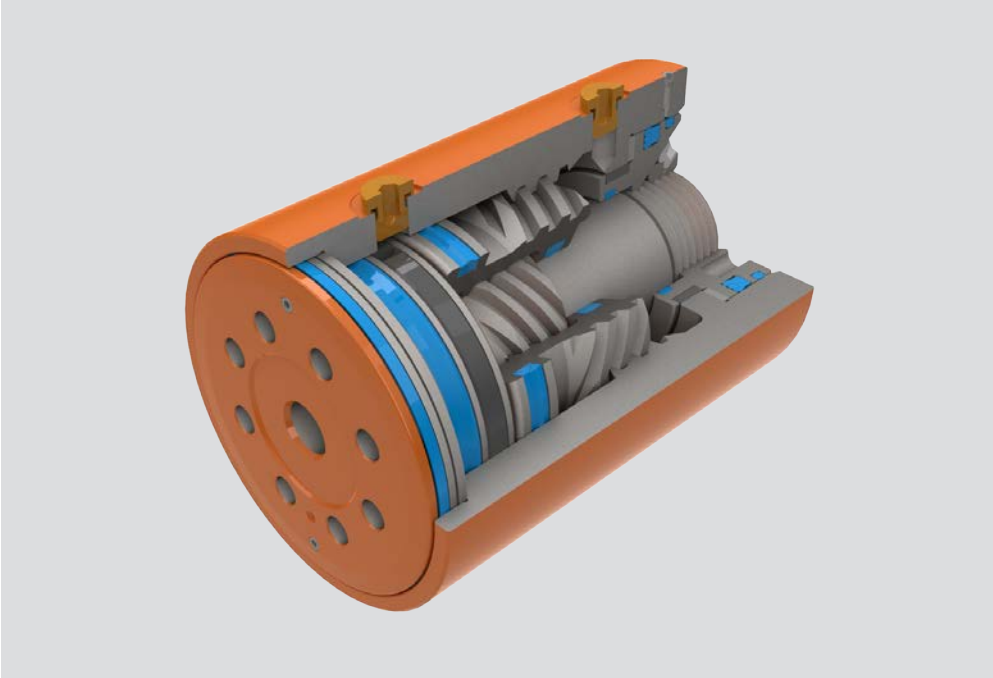
Product Introduction



For over 50 years, Parker-Helac has been recognized for innovation in design of hydraulic rotary actuators and construction equipment attachments. Helac products are known for their tremendous torque output, compact configurations, exceptional load bearing capabilities, and rugged, reliable performance.

Over 1,000 mobile, industrial, construction and mining machinery manufacturers around the world depend on Helac actuators to perform such functions as rotation, positioning, manipulation, vehicle steering and indexing. Helac's L10 Series rotary actuators are used widely on utility aerials (basket rotation), rock drills (drill rod magazine rotation), industrial vehicles (steering), robotic equipment (joint movement) and jib cranes (boom rotation), along with many other positioning, lifting and processing applications.

All L10 Series actuators incorporate the same internal design, though they vary in size depending on model.

Many actuators are equipped with a factory installed counterbalance valve, which performs three major functions.

- Protects the actuator in the event of overload
- Prevents drifting of the actuator and the assembly/component mounted to it
- Keeps the actuator pressurized in a holding position to reduce hydraulic backlash

General Safety Guidelines

Many actuator applications have several pinch points with the potential for severe injuries. Use extreme caution and remain clear of all rotating components whenever the machine is in operation.

Product Identification

Each Helac actuator is individually serial numbered. The serial number is a five or six digit number and must be provided before parts and/or service issues can be addressed.

The serial number can be found on the Identification (ID) Tag that is affixed to all actuators. The tag is a thin, silver colored, plastic label with a self-adhesive backing. Information is imprinted in black. The tag is located on the housing tube of the actuator. In some cases, the ID tag may be painted over by the OEM (Original Equipment Manufacturer).

Additionally, the serial number of the actuator is stamped onto the housing tube. It may be necessary to remove paint to expose the serial number.

If the ID tag is not attached to the actuator and/or the stamped serial number cannot be located, the basic actuator model can be identified by measuring the outside diameter of the actuator.

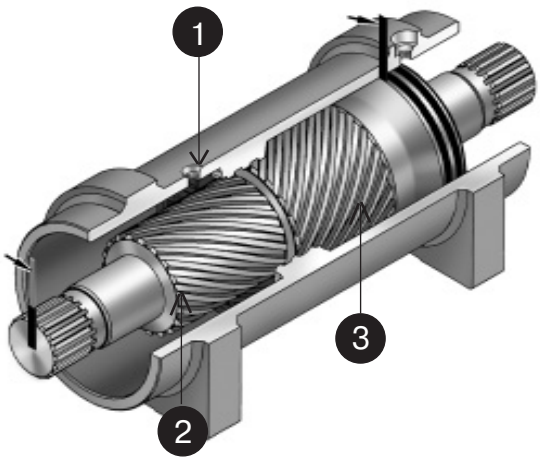
Theory of Operation

The L10 Series rotary actuator is a simple mechanism that uses Helac's sliding spline technology to convert linear piston motion into powerful shaft rotation. Each actuator is composed of a housing with an integral ring gear (1) and only two moving parts: the central shaft with an integrated bearing and mounting flange (2), and the annular piston sleeve (3).

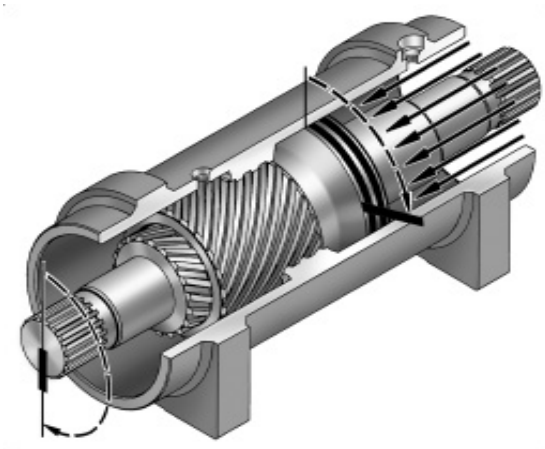
Helical spline teeth machined on the shaft engage matching splines on the inside diameter of the piston. The outside diameter of the piston carries a second set of splines, of opposite hand, which engage the matching splines of the housing's ring gear.

As hydraulic pressure is applied, the piston is displaced axially within the housing - similar to the operation of a hydraulic cylinder - while simultaneously, the splines cause the shaft to rotate. When the control valve is closed, oil is trapped inside the housing, preventing piston movement and locking the shaft firmly in position.

The shaft is supported radially by the large upper radial bearing and the lower radial bearing. Axially, the shaft is separated from the housing by the upper and lower thrust washers. The end cap is adjusted for axial clearance and locked in position by set screws or pins.

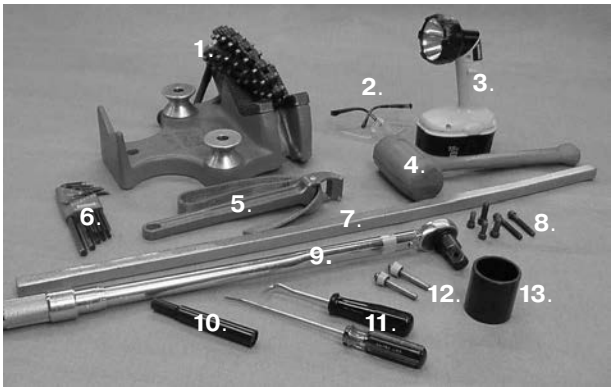


Bars indicate starting positions of piston and shaft. Arrows indicate direction they will rotate. The housing with integral ring gear remains stationary. For clarity, the shaft flange, bearings, and end cap are not shown.



Applying fluid pressure will displace the piston axially while the helical gearing causes the piston and shaft to rotate simultaneously. The double helix design compounds rotation: shaft rotation is about twice that of the piston. Applying pressure to the opposite port will return the piston and shaft to their original starting positions.

Tools Required



Several basic tools are required for the disassembly and the assembly of the actuator. The tools and their intended functions are outlined below:

1. **PIPE VISE**
   To secure the actuator to the work bench.
2. **SAFETY GLASSES**
3. **FLASH LIGHT**
   Helps in locating and examining timing marks, component failure and overall conditions.
4. **RUBBER MALLET**
   Removal and installation of shaft and piston sleeve
5. **STRAP WRENCH**
   Used to turn the piston onto and off of the shaft
6. **HEX WRENCH SET**
   Removal and replacement of port plugs and set screws (106, 110).
7. **PRY BAR**
   Removal of end cap and manual rotation of shaft.
8. **ASSORTED SCREWS**
   Removal and installation of shaft and piston sleeve.
9. **TORQUE WRENCH**
   Use when achieving certain torque specifications.
10. **FELT MARKER**
    Makes timing marks and outlines troubled areas. Permanent ink is recommended.
11. **SEAL TOOLS**
    Removal and installation of seals and wear guides.
12. **DOWEL PINS**
    Removal and installation of end cap.
13. **PROTECTIVE SLEEVE** (see details on page 10)
    Protects the internal gear teeth and threads during disassembly and assembly. (Provided with Helac seal kit for most models)

MAKING A SEAL TOOL

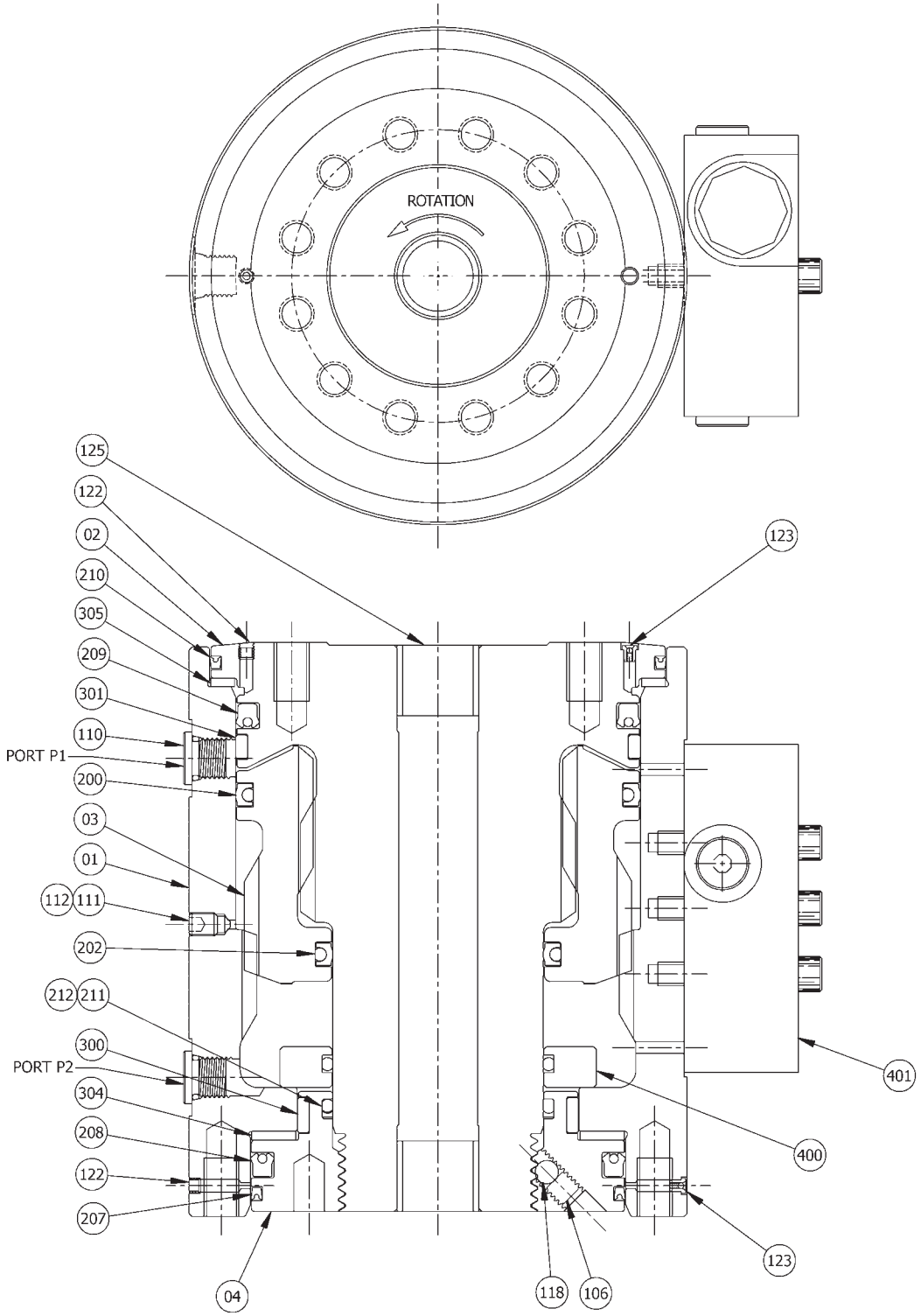
The seal tool is merely a customized standard flat head screwdriver.

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 to a polished finish. The tool may be modified slightly to your own personal preference.

⚠ CAUTION

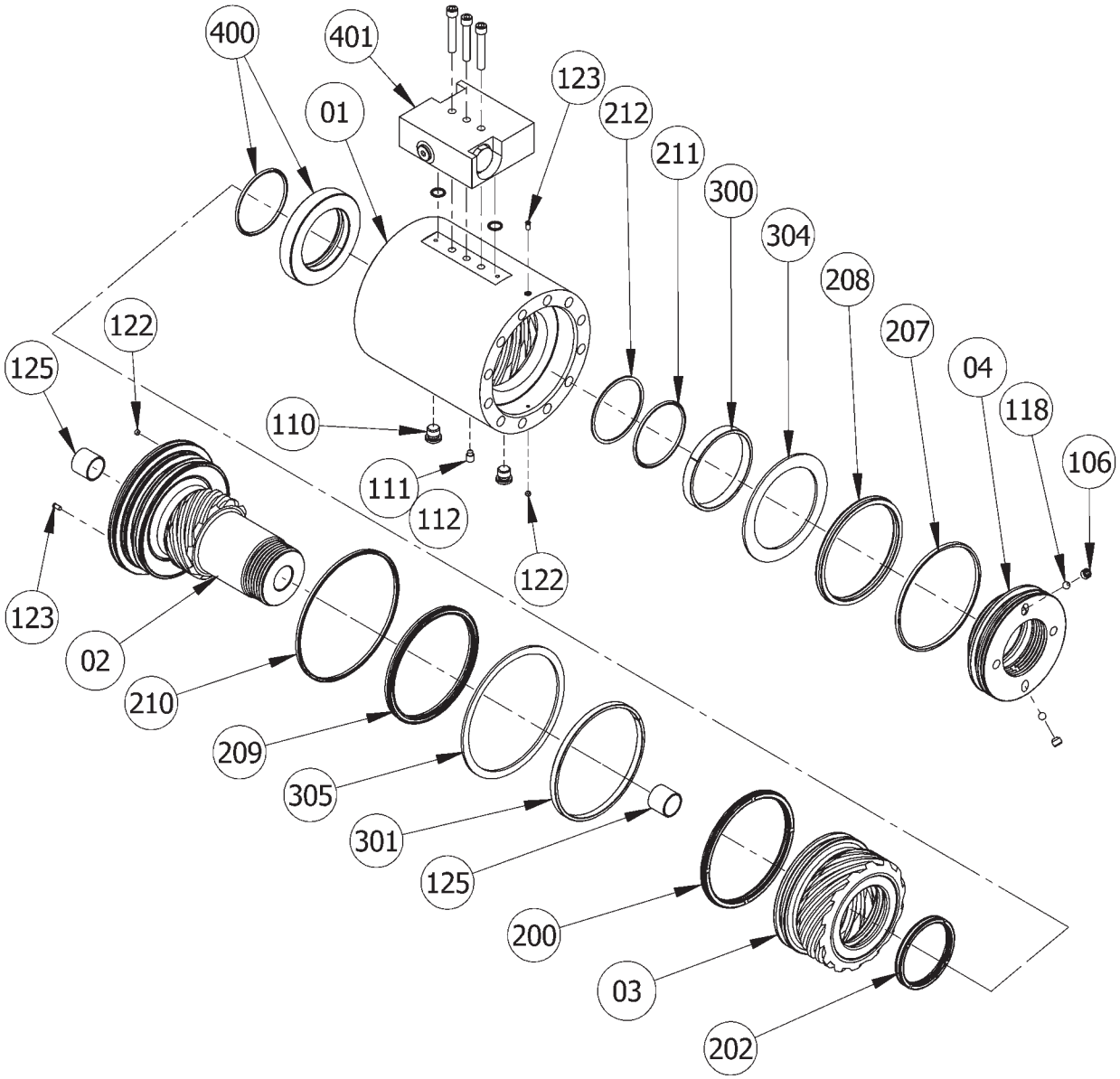
To avoid injury:
Be careful when handling the screwdriver when hot.

Assembly Drawing



Exploded View

Typical
L10 Series Actuator



Parts List - L10-3.0

Parts listed are standard components per the catalog. Parker-Helac has and does make special designs for OEM's that may differ. Model codes beginning with L10-3.0-S, L10-3.0-ES or L10-3.0-MS could use different parts.

"E" SAE threads in housing and shaft and SAE oil ports in housing
"M" Metric threads in housing and shaft and BSPP oil ports in housing

Parts

Part Number	Item #	Description	Qty
53496	1	Housing 180° "E" (no valve flat)	1
53502	1	Housing 180° "E" (with valve flat)	1
53584	1	Housing 180° "M" (no valve flat)	1
53959	1	Housing 180° "M" (with valve flat)	1
53528	1	Housing 360° "E" (no valve flat)	1
53963	1	Housing 360° "E" (with valve flat)	1
53605	1	Housing 360° "M" (no valve flat)	1
53942	1	Housing 360° "M" (with valve flat)	1
53493	2	Shaft 180° "E"	1
53583	2	Shaft 180° "M"	1
53526	2	Shaft 360° "E"	1
53604	2	Shaft 360° "M"	1
53494	3	Piston Sleeve 180°	1
53529	3	Piston Sleeve 360°	1
53272	4	End Cap	1
53013	111	Bleeder hole port plug	1
937001	112	Bleeder fitting (if used) Steel, per MS-4501	1
936005	123	Grease fitting (if used); NAS 516-1, Swayne; Midget flush type. May use Item 122 plug instead	2
53831		**Hardware Kit "E"**	
	106*	Socket head set screw: 5/16"-18 x 0.25", Grade 8	2
	110	Port plug: SAE-4 Hollow hex, o-ring	4
	118*	Ball bearing: 250-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4

*Items included in seal kit

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

Part Number	Item #	Description	Qty
53856		**Hardware Kit "M"**	
	106*	Socket head set screw: 5/16"-18 x 0.25", Grade 8	2
	110	Port plug: BSPP G1/8 Hollow hex	4
	118*	Ball bearing: 250-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4
S26553		**Counterbalance Valve Kit: SAE-4 Ports (includes valve, mounting screws and o-rings)**	
		CB Valve	1
		Socket head cap screw; 1/4"-20 x 1.50" ASTM A574	3
		Port plug: SAE-4 Hollow hex, o-ring	2
S53376		**Bearing Kit - Service Includes items below**	
	300	Wear Band	1
	301	Wear Band	1
	304	Thrust Washer	1
	305	Thrust Washer	1
S53375		**Seal Kit- Service Includes items below**	
		Service protection sleeve	1
	200	Seal	1
	202	Seal	1
	207	Seal	1
	208	Seal	1
	209	Seal	1
	210	Seal	1
	211	Seal - O-Ring	1
	212	Seal - Backup Ring	1
		Seal; O-ring - for Stop Tube (if used) 2-226, 70 durometer	1
	106	Socket head set screw: 5/16"-18 x 0.25", Grade 8	2
	118	Ball bearing: 250-52100 Chrome , Grade 25	2
	Parts in kits not sold individually		

Parts List - L10-5.5

Parts listed are standard components per the catalog. Parker-Helac has and does make special designs for OEM's that may differ. Model codes beginning with L10-5.5-S, L10-5.5-ES or L10-5.5-MS could use different parts.

"E" SAE threads in housing and shaft and SAE oil ports in housing
"M" Metric threads in housing and shaft and BSPP oil ports in housing

Parts

Part Number	Item #	Description	Qty
53342	1	Housing 180° "E" (no valve flat)	1
53378	1	Housing 180° "E" (with valve flat)	1
53463	1	Housing 180° "M" (no valve flat)	1
53609	1	Housing 180° "M" (with valve flat)	1
53386	1	Housing 360° "E" (no valve flat)	1
53389	1	Housing 360° "E" (with valve flat)	1
53415	1	Housing 360° "M" (no valve flat)	1
53972	1	Housing 360° "M" (with valve flat)	1
53285	2	Shaft 180° "E"	1
53464	2	Shaft 180° "M"	1
53388	2	Shaft 360° "E"	1
53416	2	Shaft 360° "M"	1
53343	3	Piston Sleeve 180°	1
53383	3	Piston Sleeve 360°	1
53929	4	End Cap	1
53013	111	Bleeder hole port plug	1
937001	112	Bleeder fitting (if used) Steel, per MS-4501	1
936005	123	Grease fitting (if used); NAS 516-1, Swayne; Midget flush type. May use Item 122 plug instead	1
931046	125	Shaft Bushing (if used) ; GARLOCK 12DU12; .875 OD X .76 ID X .875 Long	2
53831		**Hardware Kit "E"**	
	106*	Socket head set screw: 5/16"-18 x 0.25", Grade 8	2
	110	Port plug: SAE-4 Hollow hex, o-ring	4
	118*	Ball bearing: 250-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4

*Items included in seal kit

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

Part Number	Item #	Description	Qty
53856		**Hardware Kit "M"**	
	106*	Socket head set screw: 5/16"-18 x 0.25", Grade 8	2
	110	Port plug: BSPP G1/8 Hollow hex	4
	118*	Ball bearing: 250-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4
S26553		**Counterbalance Valve Kit: SAE-4 Ports (includes valve, mounting screws and o-rings)**	
		CB Valve	1
		Socket head cap screw; 1/4"-20 x 1.50" ASTM A574	3
		Port plug: SAE-4 Hollow hex, o-ring	2
S52989		**Bearing Kit - Service Includes items below**	
	300	Wear Band	1
	301	Wear Band	1
	304	Thrust Washer	1
	305	Thrust Washer	1
S53683		**Seal Kit- Service Includes items below**	
		Service protection sleeve	1
	200	Seal	1
	202	Seal	1
	207	Seal	1
	208	Seal	1
	209	Seal	1
	210	Seal	1
	211	Seal - O-Ring	1
	212	Seal - Backup Ring	1
		Seal; O-ring - for Stop Tube (if used) 2-226, 70 durometer	1
	106	Socket head set screw: 5/16"-18 x 0.25", Grade 8	2
	118	Ball bearing: 250-52100 Chrome , Grade 25	2
	Parts in kits not sold individually		

Parts List - L10-9.5

Parts listed are standard components per the catalog. Parker-Helac has and does make special designs for OEM's that may differ. Model codes beginning with L10-9.5-S, L10-9.5-ES or L10-9.5-MS could use different parts.

"E" SAE threads in housing and shaft and SAE oil ports in housing
"M" Metric threads in housing and shaft and BSPP oil ports in housing

Parts

Part Number	Item #	Description	Qty
53486	1	Housing 180° "E" (no valve flat)	1
53536	1	Housing 180° "E" (with valve flat)	1
53664	1	Housing 180° "M" (no valve flat)	1
53612	1	Housing 180° "M" (with valve flat)	1
53433	1	Housing 360° "E" (no valve flat)	1
53435	1	Housing 360° "E" (with valve flat)	1
54028	1	Housing 360° "M" (no valve flat)	1
53616	1	Housing 360° "M" (with valve flat)	1
53484	2	Shaft 180° "E"	1
53613	2	Shaft 180° "M"	1
53427	2	Shaft 360° "E"	1
53617	2	Shaft 360° "M"	1
53482	3	Piston Sleeve 180°	1
53423	3	Piston Sleeve 360°	1
53930	4	End Cap	1
53013	111	Bleeder hole port plug	1
937001	112	Bleeder fitting (if used) Steel, per MS-4501	1
936005	123	Grease fitting (if used); NAS 516-1, Swayne; Midget flush type. May use Item 122 plug instead	1
53833		**Hardware Kit "E"**	
	106*	Socket head set screw: 3/8"-16 x 0.313", Cup, Grade 8	2
	110	Port plug: SAE-4 Hollow hex, o-ring	4
	118*	Ball bearing: 312-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4

*Items included in seal kit

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

Part Number	Item #	Description	Qty
53848		**Hardware Kit "M"**	
	106*	Socket head set screw: 3/8"-16 x 0.313", Cup, Grade 8	2
	110	Port plug: BSPP G1/8 Hollow hex	4
	118*	Ball bearing: 312-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4
S26553		**Counterbalance Valve Kit: SAE-4 Ports (includes valve, mounting screws and o-rings)**	
		CB Valve	1
		Socket head cap screw; 1/4"-20 x 1.50" ASTM A574	3
		Port plug: SAE-4 Hollow hex, o-ring	2
S53007		**Bearing Kit - Service Includes items below**	
	300	Wear Band	1
	301	Wear Band	1
	304	Thrust Washer	1
	305	Thrust Washer	1
S53678		**Seal Kit- Service Includes items below**	
		Service protection sleeve	1
	200	Seal	1
	202	Seal	1
	207	Seal	1
	208	Seal	1
	209	Seal	1
	210	Seal	1
	211	Seal - O-Ring	1
	212	Seal - Backup Ring	1
		Seal, O-ring for CB valve	2
	106	Socket head set screw: 3/8"-16 x 0.313", Cup, Grade 8	2
	118	Ball bearing: 312-52100 Chrome , Grade 25	2
	Parts in kits not sold individually		

Parts List - L10-15

Parts listed are standard components per the catalog. Parker-Helac has and does make special designs for OEM's that may differ. Model codes beginning with L10-15-S, L10-15-ES or L10-15-MS could use different parts.

"E" SAE threads in housing and shaft and SAE oil ports in housing
"M" Metric threads in housing and shaft and BSPP oil ports in housing

Parts

Part Number	Item #	Description	Qty
53210	1	Housing 180° "E" (no valve flat)	1
53703	1	Housing 180° "E" (with valve flat)	1
53847	1	Housing 180° "M" (no valve flat)	1
53226	1	Housing 180° "M" (with valve flat)	1
53730	1	Housing 360° "E" (no valve flat)	1
53793	1	Housing 360° "E" (with valve flat)	1
54024	1	Housing 360° "M" (no valve flat)	1
53923	1	Housing 360° "M" (with valve flat)	1
53212	2	Shaft 180° "E"	1
53229	2	Shaft 180° "M"	1
53734	2	Shaft 360° "E"	1
53922	2	Shaft 360° "M"	1
53217	3	Piston Sleeve 180°	1
53731	3	Piston Sleeve 360°	1
53214	4	End Cap	1
53013	111	Bleeder hole port plug	1
937001	112	Bleeder fitting (if used) Steel, per MS-4501	1
936005	123	Grease fitting (if used); NAS 516-1, Swayne; Midget flush type. May use Item 122 plug instead	1
53833		**Hardware Kit "E"**	
	106*	Socket head set screw: 3/8"-16 x 0.313", Cup, Grade 8	2
	110	Port plug: SAE-4 Hollow hex, o-ring	4
	118*	Ball bearing: 312-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4

*Items included in seal kit

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

Part Number	Item #	Description	Qty
53848		**Hardware Kit "M"**	
	106*	Socket head set screw: 3/8"-16 x 0.313", Cup, Grade 8	2
	110	Port plug: BSPP G1/8 Hollow hex	4
	118*	Ball bearing: 312-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4
S26553		**Counterbalance Valve Kit: SAE-4 Ports (includes valve, mounting screws and o-rings)**	
		CB Valve	1
		Socket head cap screw; 1/4"-20 x 1.50" ASTM A574	3
		Port plug: SAE-4 Hollow hex, o-ring	2
S53219		**Bearing Kit - Service Includes items below**	
	300	Wear Band	1
	301	Wear Band	1
	304	Thrust Washer	1
	305	Thrust Washer	1
S53218		**Seal Kit- Service Includes items below**	
		Service protection sleeve	1
	200	Seal	1
	202	Seal	1
	207	Seal	1
	208	Seal	1
	209	Seal	1
	210	Seal	1
	211	Seal - O-Ring	1
	212	Seal - Backup Ring	1
		Seal, O-ring for CB valve	2
	106	Socket head set screw: 3/8"-16 x 0.313", Cup, Grade 8	2
	118	Ball bearing: 312-52100 Chrome , Grade 25	2
	Parts in kits not sold individually		

Parts List - L10-25

Parts listed are standard components per the catalog. Parker-Helac has and does make special designs for OEM's that may differ. Model codes beginning with L10-25-S, L10-25-ES or L10-25-MS could use different parts.

"E" SAE threads in housing and shaft and SAE oil ports in housing
"M" Metric threads in housing and shaft and BSPP oil ports in housing

Parts

Part Number	Item #	Description	Qty
53520	1	Housing 180° "E" (no valve flat)	1
53578	1	Housing 180° "E" (with valve flat)	1
53753	1	Housing 180° "M" (no valve flat)	1
53747	1	Housing 180° "M" (with valve flat)	1
53445	1	Housing 360° "E" (no valve flat)	1
53451	1	Housing 360° "E" (with valve flat)	1
53991	1	Housing 360° "M" (no valve flat)	1
53985	1	Housing 360° "M" (with valve flat)	1
53518	2	Shaft 180° "E"	1
53748	2	Shaft 180° "M"	1
53448	2	Shaft 360° "E"	1
53986	2	Shaft 360° "M"	1
53516	3	Piston Sleeve 180°	1
53446	3	Piston Sleeve 360°	1
53276	4	End Cap	1
53013	111	Bleeder hole port plug	1
937001	112	Bleeder fitting (if used) Steel, per MS-4501	1
936005	123	Grease fitting (if used); NAS 516-1, Swayne; Midget flush type. May use Item 122 plug instead	1
53866		**Hardware Kit "E"**	
	106*	Socket head set screw: 1/2"-13 x 0.50", Cup, Grade 8	2
	110	Port plug: SAE-4 Hollow hex, o-ring	4
	118*	Ball bearing: 375-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4

*Items included in seal kit

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

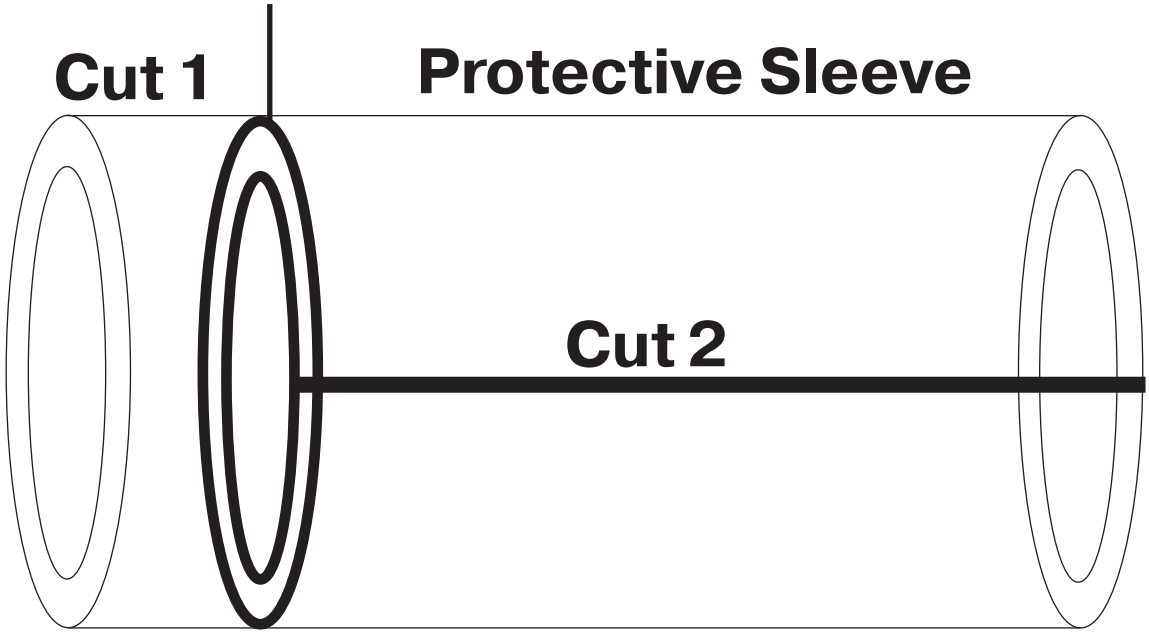
Part Number	Item #	Description	Qty
53867		**Hardware Kit "M"**	
	106*	Socket head set screw: 1/2"-13 x 0.50", Cup, Grade 8	2
	110	Port plug: BSPP G1/8 Hollow hex	4
	118*	Ball bearing: 375-52100 Chrome , Grade 25	2
	122	Socket head set screw: #8-32 x 0.125", Grade 8	4
S26553		**Counterbalance Valve Kit: SAE-4 Ports (includes valve, mounting screws and o-rings)**	
		CB Valve	1
		Socket head cap screw; 1/4"-20 x 1.50" ASTM A574	3
		Port plug: SAE-4 Hollow hex, o-ring	2
S53316		**Bearing Kit - Service Includes items below**	
	300	Wear Band	1
	301	Wear Band	1
	304	Thrust Washer	1
	305	Thrust Washer	1
S53361		**Seal Kit- Service Includes items below**	
		Service protection sleeve	1
	200	Seal	1
	202	Seal	1
	207	Seal	1
	208	Seal	1
	209	Seal	1
	210	Seal	1
	211	Seal - O-Ring	1
	212	Seal - Backup Ring	1
		Seal, O-ring for CB valve	2
	106	Socket head set screw: 3/8"-16 x 0.313", Cup, Grade 8	2
	118	Ball bearing: 312-52100 Chrome , Grade 25	2
	Parts in kits not sold individually		

Protective Sleeve

Protective Sleeve

The protective sleeve is included with each seal kit, and is pre-cut to a length determined by the base model configured with a 360 degree rotation. The sleeve needs to be cut down to a length that is approximately ¼" longer than the exposed shaft, after the shaft flange has been rotated to the most clockwise position. (Refer to Step 7, page 12.) The sleeve protects the internal gear teeth, threads and housing bore during the disassembly and assembly process. Using a vise and a fine tooth hack saw or similar cutting tool, cut (1) (see illustration below) to length.

Note: The second cut (2) is only needed for the L25 model and for models when the protective sleeve is difficult to slide over the shaft. Then cut (2) (see Note above and illustration below) lengthwise down the entire body of the sleeve, this will allow the sleeve to open slightly and slide over the shaft without damaging the threads.



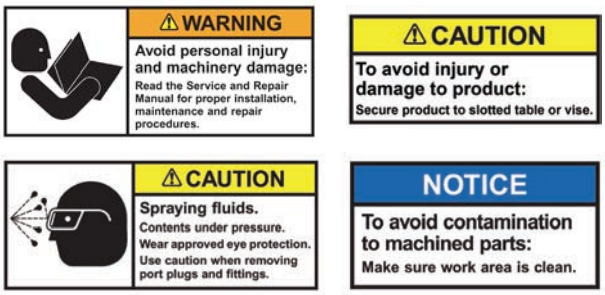
Disassembly

Before Disassembly

NOTICE All numbers that appear in parenthesis ( ) are referring to items on page 8-13. All letters that appear in parenthesis ( ) are referring to a reference mark or timing mark.

Inspect the actuator for corrosion prior to disassembly. Severe corrosion can make it difficult to remove the set screws (106) and unthread the end cap (4). If corrosion is evident, soak the set screws with penetrating oil for several hours before disassembly. Disassembly of entire actuator is considerably easier if the actuator is placed in a vise or metal table equipped with a slotted channel.

Disassembly

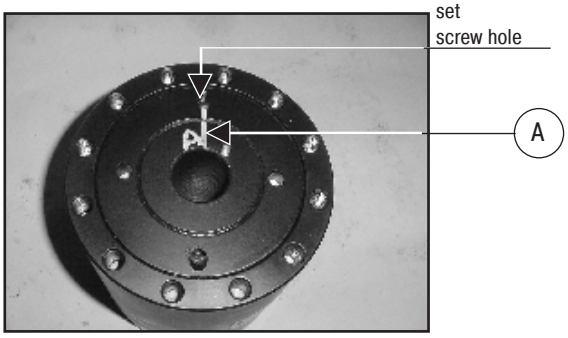


1. Using a hex wrench, remove all port plugs.

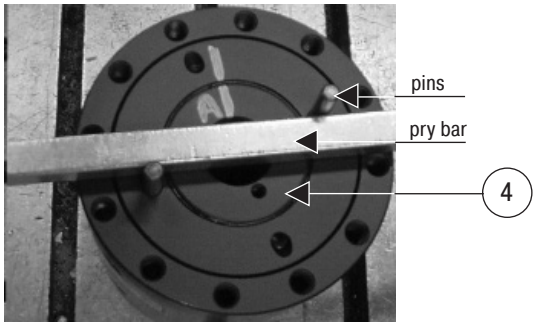
2. Drain the actuator of all oil into a suitable container. Examine oil for signs of contamination.

3. Insert two cap screws into the housing and secure the actuator, shaft flange facing up, to a slotted table. Insert two dowel pins into the shaft flange, place a pry bar between the dowel pins and rotate the shaft flange to end of rotation.

4. Remove cap screws and dowel pins, turn actuator over (end cap (04) side up). Using a sharp tool or permanent marker, make a reference mark (A) from the end cap set screw hole to the middle of the shaft. This reference mark will be needed for the assembly process on page 22. See Photo Below



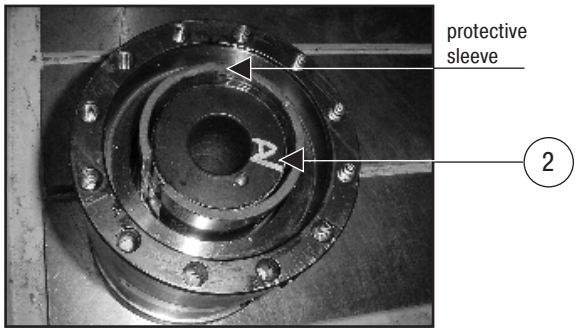
5. Using a hex wrench, remove the set screws (106) and steel balls (118) from the end cap.



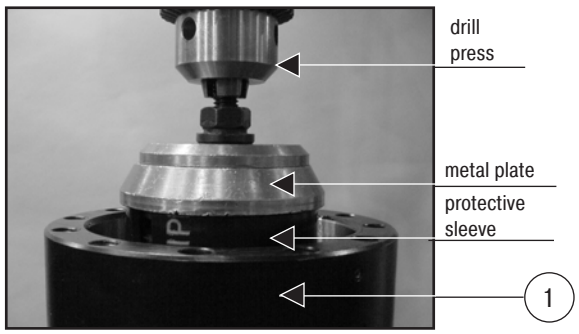
Disassembly

6. Insert two cap screws into the shaft flange and secure the actuator to the slotted table. Insert the dowel pins into the end cap (4) spanner holes. Using a metal bar or something similar, unscrew the end cap by turning it counterclockwise.

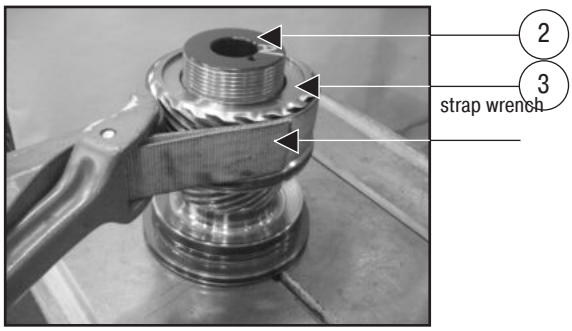
7. Place the protective sleeve from the seal kit, down over the threaded end of the shaft (2) until contact is made with the piston.



8. Place a round wooden block or round metal plate on top of the protective sleeve, apply even pressure from a drill press, or gently tap evenly with a rubber mallet, until the shaft gently disengages from the housing. Lift the housing up and away from the shaft.



9. Insert two cap screws into the shaft flange (02) and secure to slotted table with threads facing up. Place a strap wrench around the piston (03) gear teeth, turn clockwise until the piston is seated against the shaft.



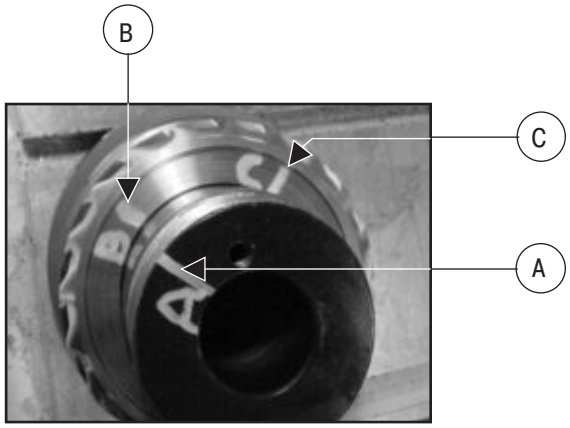
10. Using the reference mark (A) on top of the threaded end of the shaft, make a timing mark (B) on the piston surface closest to the shaft in direct radial alignment with reference mark (A). Marks (A and B) must line up with each other. Count the appropriate number of gear teeth clockwise from the first piston timing mark (B), make another timing mark (C), at this location. (See chart below for proper gear teeth count for timing mark (C)). See Photo Below for example.

Model	Gear Teeth Count
L10 - 3.0 (all models)	6 1/2 gear teeth clockwise
L10 - 5.5 (all models)	6 3/4 gear teeth clockwise
L10 - 9.5 (all models)	8 1/2 gear teeth clockwise
L10 - 15 (180°) L10 - 15 (360°)	10 gear teeth clockwise 16 3/4 gear teeth clockwise
L10 - 25 - (360°)	18 1/2 gear teeth clockwise

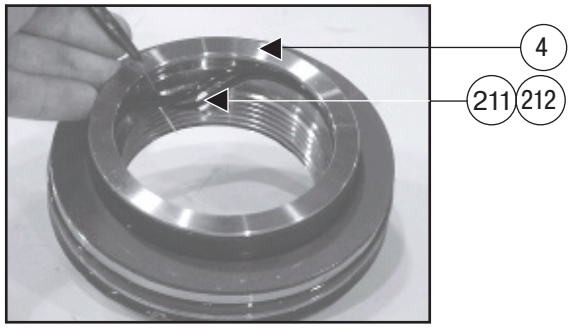
Disassembly

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

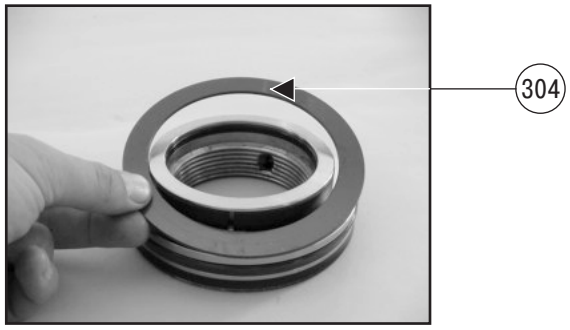
11. Using the strap wrench, remove the piston by rotating counterclockwise slowly until the piston disengages, continue turning counterclockwise while gently lifting the piston off of the shaft.



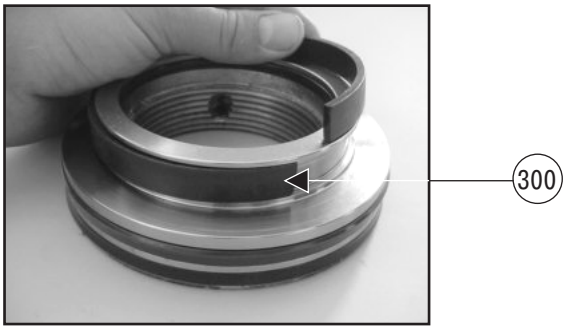
12. Remove the O-ring (211) and the backup ring (212) from the end cap (4).



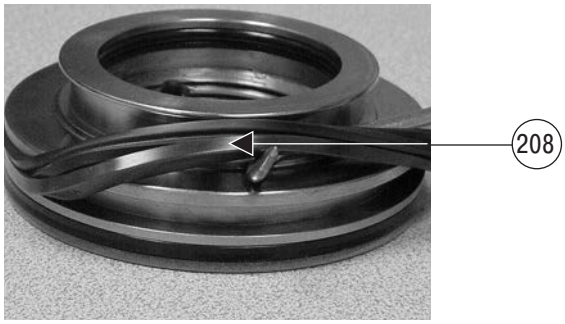
13. Remove the thrust washer (304) from the end cap (4)



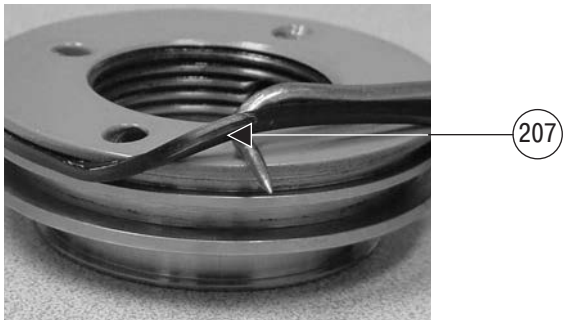
14. Remove the wear guide (300) from the end cap (4).



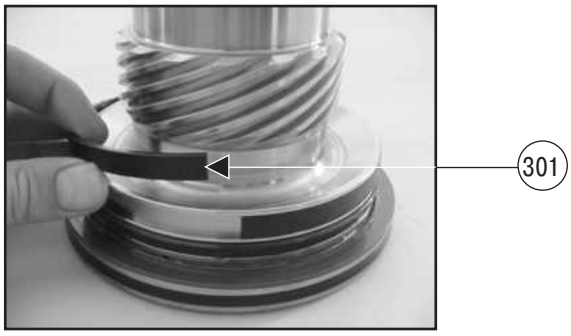
15. Remove the main pressure seal (208).



16. Remove the exclusion seal (207).

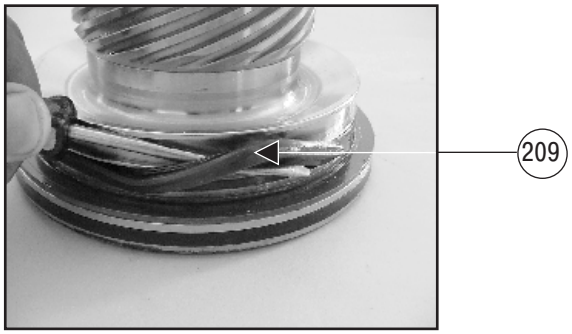


17. Remove the wear guide (301) from the shaft (2)

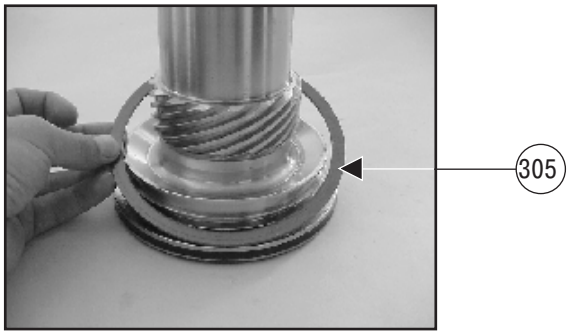


Disassembly

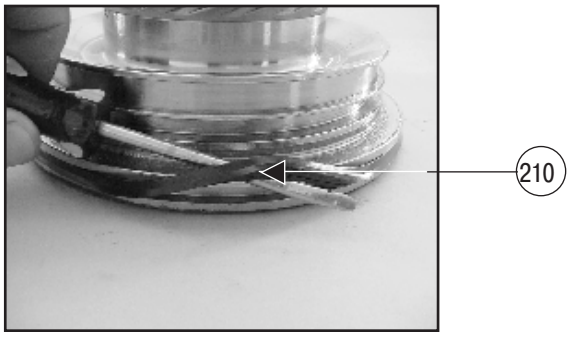
18. Remove the main pressure seal (209).



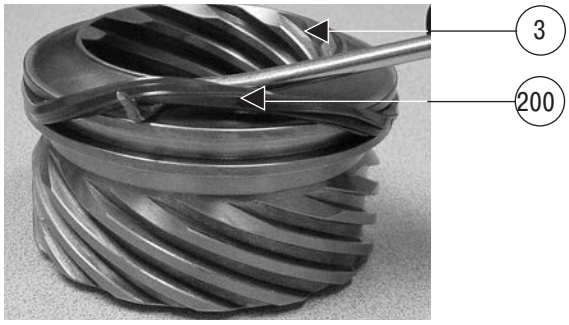
19. Remove the thrust washer (305).



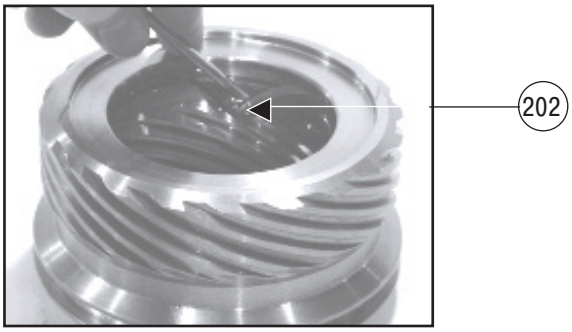
20. Remove the exclusion seal (210), from the shaft (02).



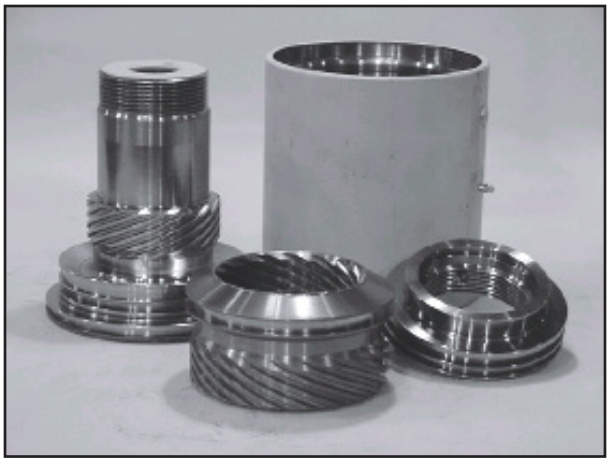
21. Remove the piston sleeve (3) OD seal (200).



22. Remove the piston sleeve (3) ID seal (202) using a small pick or seal tool.



Inspection



NOTICE Prior to assembly of actuator, these steps must be closely followed to insure proper operation of the actuator.

1. Clean all parts in a wash tank and dry with compressed air prior to inspecting.
2. Carefully inspect all critical areas for any surface finish abnormalities: Seal grooves, bearing grooves, thrust surfaces, shaft surface, housing bore and gear teeth.

NOTICE Small or minor surface scratches can be carefully polished.

Seal and Bearing Installation

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

Pre-Assembly

All actuators are timed according to OEM specifications at Helac's production facility. The timing ensures that the actuator will stop at the required position at the end of the rotation in either direction. Wrong timing can cause the actuator to over rotate resulting in interference and damage of equipment components. Rotation being too short can limit the operating range of the equipment. The proper gear engagement of shaft, piston and housing ensures the correct timing. The gear teeth are obstructed from view during the assembly of the L10 actuator, so following the manual step by step is crucial for a successful repair.

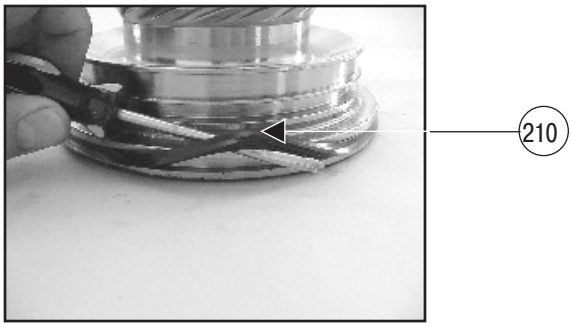
Dry Run

For repair personnel not familiar with the L10 actuator, it is recommended that a "dry run" with the following configuration be performed: Install only the inner piston seal (202) on page 22 step 10. The seal will prevent the piston from sliding off of the shaft during installation. Install the thrust washer (305) onto the shaft for proper internal spacing of components. Proceed to assembly procedures starting on page 23, ensure proper fit and timing of actuator, then disassemble and apply all seals and bearings. For seal and bearing orientation use the cut-away drawing on page 7 as a reference.

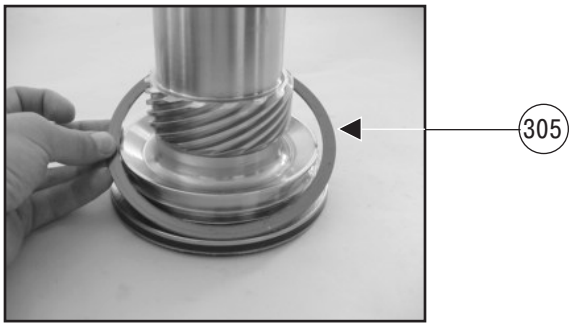
NOTICE Remove the end cap and shaft grease relief set screws (122) prior to assembly. This will allow excess grease applied to the thrust washers to escape during assembly. Failure to do so may prevent the end cap and/or shaft from fully seating into position.

NOTICE The set screws are recessed down deep below the surface of each grease relief port, be sure to use the appropriate size hex wrench for these set screws .

1. Using a seal tool (see Page 6) install the exclusion seal (210) onto the shaft.

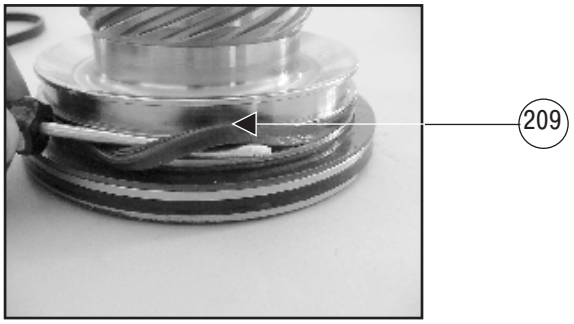


2. Lightly grease the thrust washer (305) with Lithium grease and install onto the shaft (2).

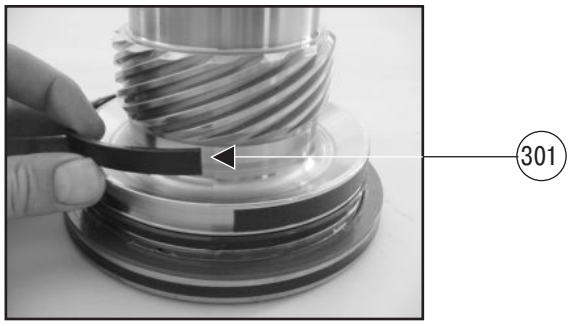


Seal and Bearing Installation

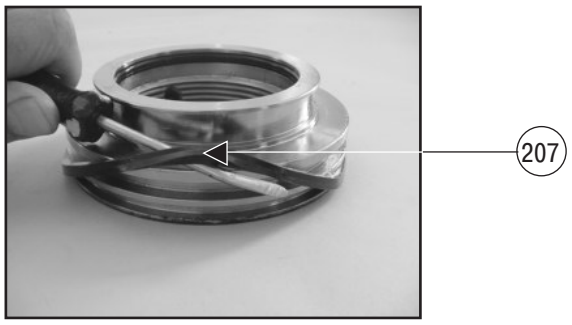
3. Install the main pressure seal (209) onto the shaft (2) using the seal tool.



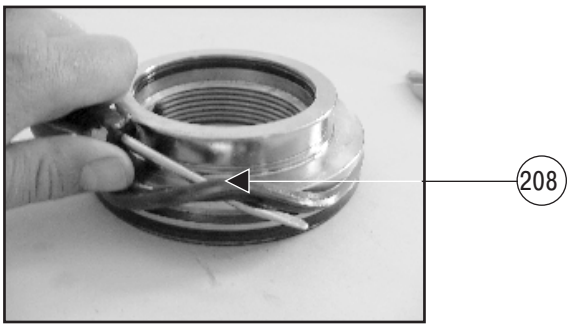
4. Install the wear guide (301) onto the shaft (2).



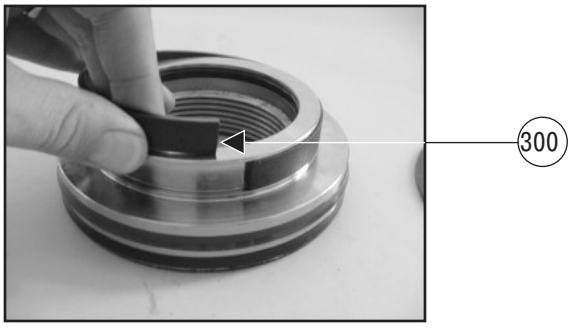
5. Install the exclusion seal (207) onto the end cap (4).



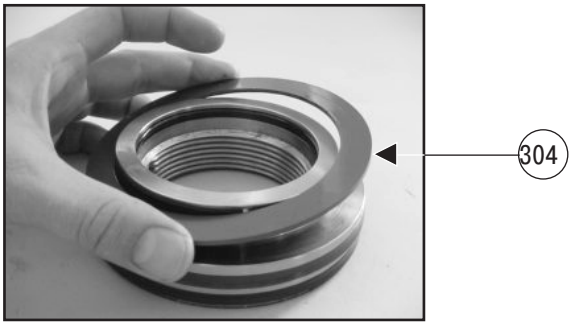
6. Install the main pressure seal (208) onto the end cap (4).



7. Install the wear guide (300) onto the end cap (4).

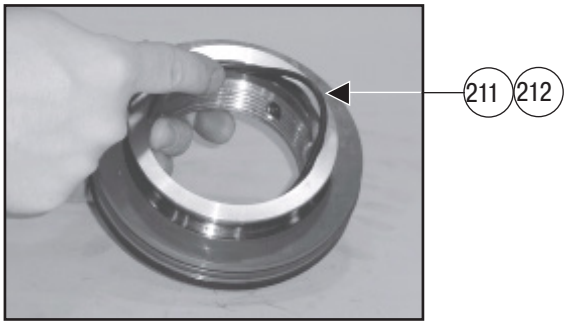


8. Lightly grease the thrust washer (304) with Lithium grease and install onto the end cap (4).

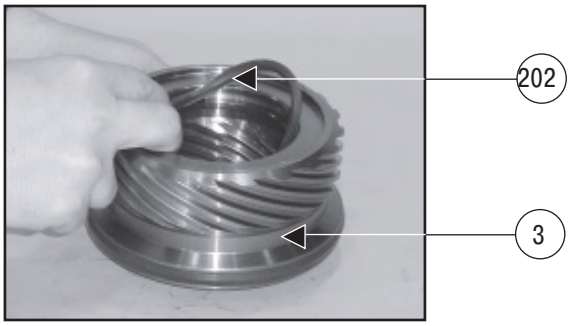


Seal and Bearing Installation

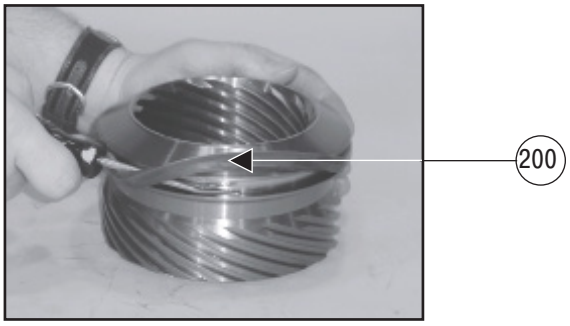
9. Install the O-ring (211) and backup ring (212) into the inner seal groove on the end cap (4).



10. Install the piston sleeve ID seal (202) into the piston (3) using a circular motion.

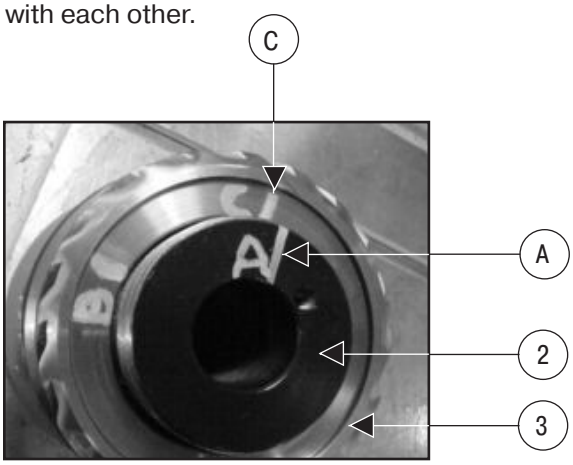


11. Install the piston sleeve OD seal (200) onto the piston sleeve (3).



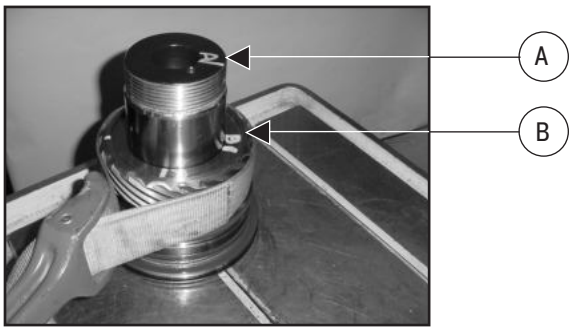
Assembly

1. Secure the shaft, flange down to a slotted table, then place the piston (3) onto the threaded end of the shaft (2). Align vertically, the shaft reference mark (A) and the second timing mark (C) on the piston. Press the piston (3) down firmly over the shaft (2) until the piston ID seal (202) slides over the shaft chamfer (you will feel a pop or click) and the piston contacts the shaft gear teeth. Make sure the two marks (A) and (C) are still in line with each other.



2. Place a strap wrench around the piston OD (3) gear teeth, rotate the piston clockwise. The piston will engage the shaft (2) gear teeth. Rotate piston until it is firmly seated against the shaft

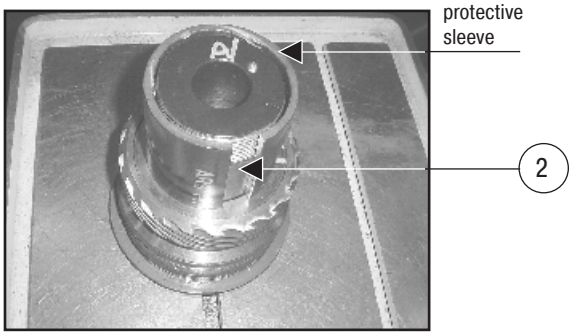
NOTICE The shaft (2) reference mark (A) and the first timing mark (B) on the piston (3) must be lined up. If not, repeat steps 1-2.



3. If applicable, slide the stop tube (400) over the shaft.

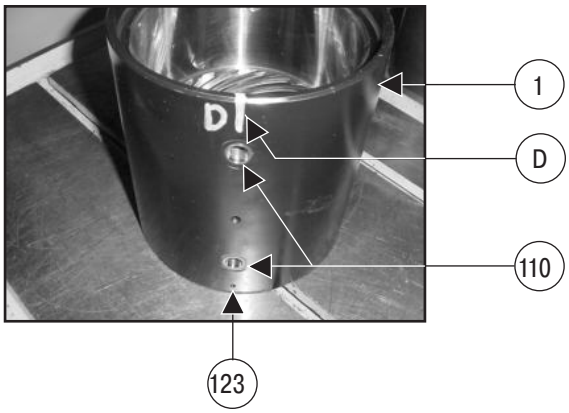
NOTICE The seal inside the stop tube does not function as a seal, it's purpose is to keep the stop tube stationary on the shaft.

4. Place protective sleeve over the shaft (2).



Assembly

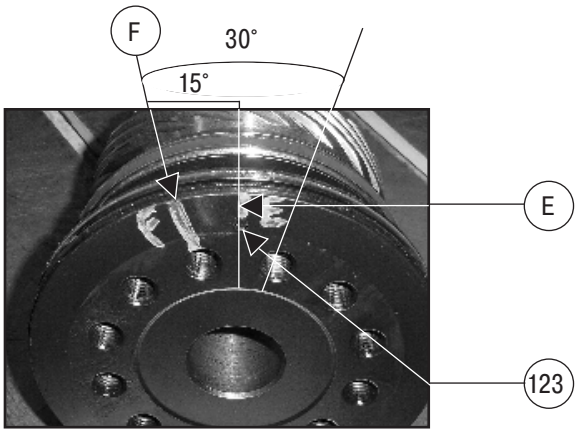
5. Make a timing mark (D) on the top lip of the housing (1), directly in line with the two hydraulic ports (110) on the side with the female grease zerk (123).



6. Make a timing mark (E) with a marker, in line with the female grease zerk (item 123 on assembly drawing page 7) on the shaft flange (2).

NOTICE Do not use the grease relief port (122) with threaded hole and set screw for timing procedure.

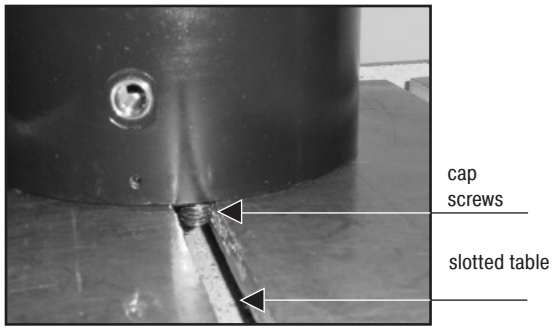
Using the timing mark (E) or female grease zerk (123) as a reference point, go counterclockwise by the degrees shown in the chart below, and make another timing mark (F). Photo below shows L10-9.5 actuator.



NOTICE Approximate Degree Offset chart below for placement of timing mark (F) for each model.

Model	Approximate Degree Offset
L10 - 3.0 (180° and 360°)	30° counterclockwise
L10 - 5.5 (180°-185° and 360°)	30° counterclockwise
L10 - 9.5 (185° and 360°)	15° counterclockwise
L10 - 15 (180°) L10 - 15 (360°)	15°counterclockwise 30°counterclockwise
L10 - 25 (180°)	30° counterclockwise
L10 - 25 (360°)	36° counterclockwise

7. Install two cap screws into the threaded mounting holes on the housing (1). Using a slotted table, secure the housing as shown.

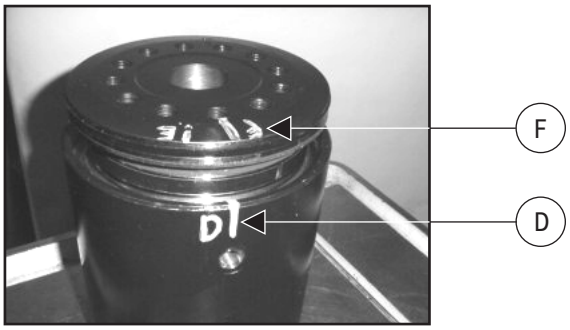


8. Generously apply the appropriate grease to the shaft thrust washer prior to inserting into housing.

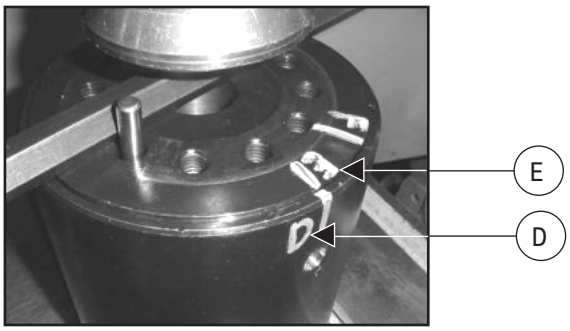
NOTICE Be sure the end cap and shaft grease relief set screws (122) are removed prior to inserting into housing.

Assembly

9. Insert the assembled piston (3) and shaft (2) with protective sleeve applied into the housing (1) (see photo below). The assembly will come to a stop when the main pressure seal (200) contacts the piston bore in the housing. At this point, the outer gear teeth of the piston are close to coming into engagement with the gear teeth in the housing. Align the two timing marks (D and F) from steps 5 and 6.



10. Install two dowel pins into the shaft flange, place a pry bar between the dowel pins. Gently apply pressure to the top of the pry bar. The main pressure seal (200) will compress and slip into the housing bore, and the gear teeth between the piston and housing will come in contact. Be careful, the gear teeth may not completely line up. Using the pry bar rotate the shaft slightly back and forth while continuously applying gentle pressure (see photo below). The gear teeth will start to mesh and the shaft/piston assembly will rotate counterclockwise into the housing until the shaft flange is almost flush with the face of the housing. The timing marks D and E should line up.



NOTICE

To avoid damage to machined parts:
Carefully remove seals using removal tools with rounded edges.

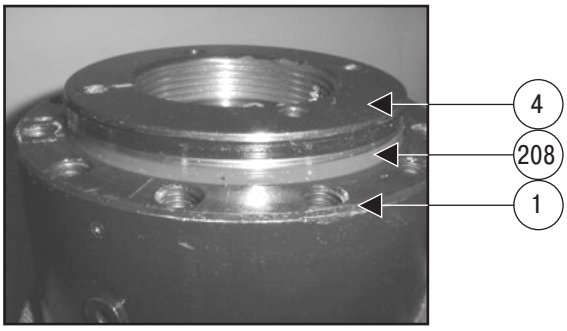
NOTICE If timing mark (E) goes past timing mark (D), press and rotate the shaft clockwise, back to timing mark (D).

NOTICE If the shaft raises (unseats) before timing mark (E) lines up with timing mark (D) going in either direction, the piston has moved from it's seated position against the shaft and you must disassemble and repeat steps 9-10.

11. Turn actuator over and place the shaft flange end down, with threaded bolts inserted, into a vise or slotted table. Remove the protective sleeve from the shaft.

NOTICE If there is not a slotted table available, place a strap wrench around the housing to secure it.

12. Coat the threads of the shaft (2) and the end cap (4) with Lithium grease prior to assembly to prevent galling. Thread the end cap onto the shaft until the seal (208) on the end cap contacts the housing (01).



Assembly

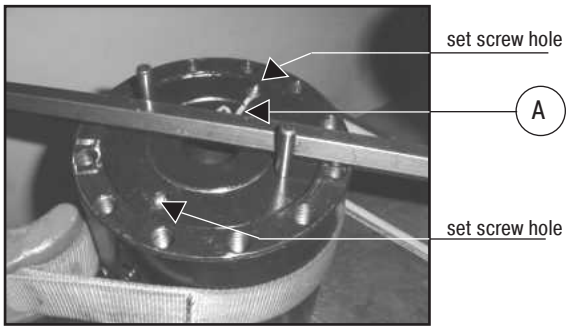
13. Insert pins into the end cap (4) spanner holes. Using a pry bar, screw the end cap on by turning it in a clockwise direction until it becomes tight (see General Torque Guidelines chart). Use the reference mark (A) made during the disassembly process, as a reference point to line up the two set screw holes in the end cap with the grind marks (dimples) on the shaft threads.

NOTICE

During the assembly process at the factory, there are two small grind marks (dimples) made in the threads of the shaft to lock the end cap and shaft in position. A steel ball is placed into each set screw hole on the end cap and locked in position by the set screw.

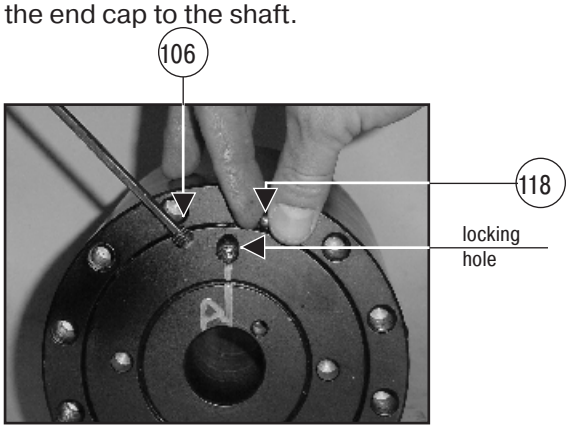
If the end cap gets tight and the grind marks (dimples) are not visible, you must use a small ball grinder similar in size to the steel balls (118) and make new grind marks (dimples). Be sure to clean out all of the grinding dust before continuing.

If any portion of the existing grind marks (dimples) are visible when the end cap gets tight, loosen or tighten the end cap until reference mark (A) is lining up.



Model	End Cap - General Torque Guideline	
L10 - 3.0	Approximately 40 ft-lbs	54 Nm
L10 - 5.5	Approximately 60 ft-lbs	81 Nm
L10 - 9.5	Approximately 90 ft-lbs	122 Nm
L10 - 15	Approximately 150 ft-lbs	202 Nm
L10 - 25	Approximately 225 ft-lbs	305 Nm

14. Visually inspect each locking hole in the end cap (4) for alignment and possible grease and/or debris. Clean as needed. Place the appropriate size steel ball (118) (see spec chart below) into each locking hole. Using the proper size hex wrench, insert a set screw (106) coated with Loctite 242 locking compound into each locking hole, securing the end cap to the shaft.



Model	Steel Ball Size Specifications
L10 - 3.0	.250 inch (1/4")
L10 - 5.5	.250 inch (1/4")
L10 - 9.5	.312 inch (5/16")
L10 - 15	.312 inch (5/16")
L10 - 25	.312 inch (5/16")

Grease Thrust Washers

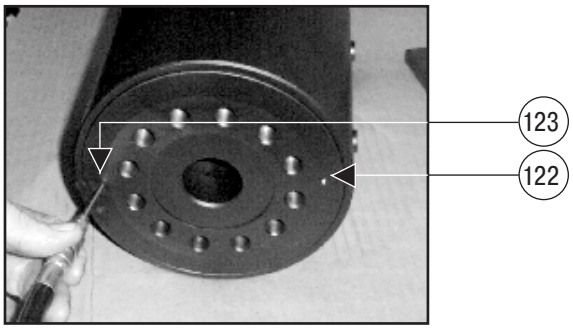
After the actuator is assembled but before it is put back into service, the thrust washers and exclusion seals must be packed with Lithium grease.

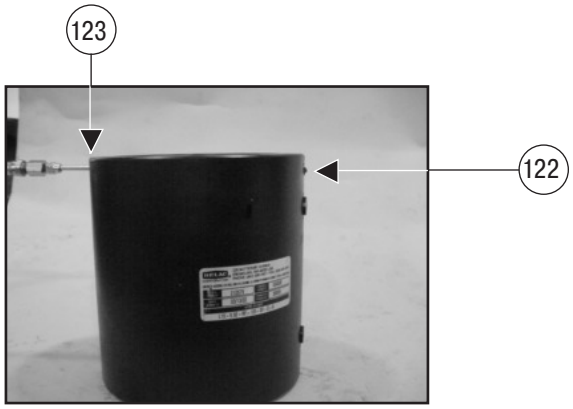
1. There are four grease ports, two of each are located on the shaft flange and the outer diameter of the housing (see exploded view on page 8 for reference). Some models will have a female grease zerk in one of each two ports. Using the appropriate size hex wrench, remove the grease port set screws from the shaft flange and the housing.

NOTICE The set screws are recessed below the surface of each grease port, be sure to use the appropriate size hex wrench for these set screws.

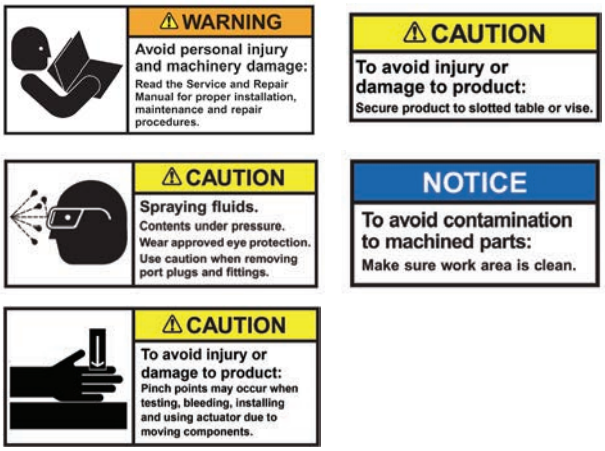
NOTICE If a hydraulic test bench is not available, the actuator can be rotated by hand, open the pressure ports and use a pry bar with cap screws inserted into the shaft flange to turn the shaft in the desired direction.

Insert the tip of the male grease needle nozzle into female grease zerk, if so equipped. Otherwise, put the nozzle into either grease port. Apply grease to the shaft flange. Continue applying until grease flows from the relief port. Cycle the actuator five times and apply grease again. Repeat this process at the housing. Insert the set screws into the grease port and tighten to 25 in-lbs (2.8 Nm).





Testing the Actuator



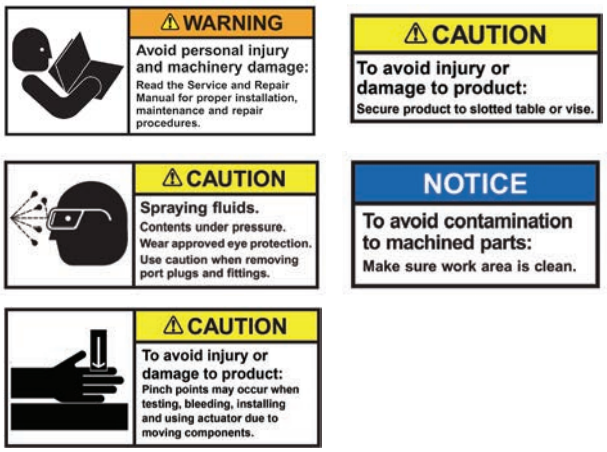
Testing the Actuator

If the equipment is available, the actuator should be tested on a hydraulic test bench. The breakaway pressure—the pressure at which the shaft begins to rotate—should be between 100 and 300 psi
(7 to 21 bar). Cycle the actuator at least 25 times at 3000 psi (210 bar) pressure. At the end of rotation, increase the pressure to 4500 psi (315 bar) to check for leaks and cracks. Perform the test again at the end of the rotation in the opposite direction.

Testing the Actuator for Internal Leakage

Rotate the shaft to the end of rotation at 3000 psi (210 bar) and maintain pressure. Remove the hydraulic line from the non-pressurized side. Continuous oil flow from the open pressure port indicates internal leakage across the piston. Replace the line and rotate the shaft to the end of rotation in the opposite direction. Repeat the test procedure outlined above for the other port.

Installation and Bleeding



The OEM has the choice to specify three different actuator versions for bleeding:

- single bleed screw (photo, page 29)
- single bleed plug (photo, page 30)
- dual bleed screw (photo, page 31)

Bleed screw assemblies can be ordered as an option. (Helac Part Number S52125)

Actuators with only a single bleed screw or plug will only bleed one side of the actuator.

Hydraulic systems with a flow rate of 2.0 gallons (7.5 liters) per minute or higher, and short return lines to tank may easily purge air from the actuator. In this case bleeding is not required.

NOTICE This procedure is only for actuators that are positioned vertically, with the shaft flange facing up. All other positioned actuators must use the procedure on page 28.

NOTICE For best bleeding results, the actuator should be mounted in such a way as to locate the ports as close to the top as possible.

After installation of the actuator onto the equipment, it is important that all safety devices such as tie rods or safety cables are properly reattached.

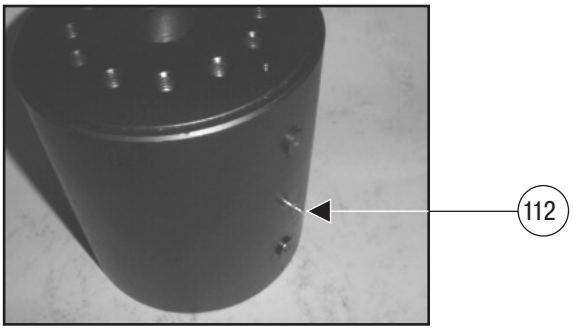
To purge air from the hydraulic lines, connect them together to create a closed loop and pump hydraulic fluid through them. Review the OEM's operating manual and/or hydraulic schematic to determine which hydraulic lines to connect. The length and inside diameter of the hydraulic supply lines together with pump capacity will determine the amount of pumping time required to fully purge the hydraulic system.

Bleeding will be necessary if excessive backlash is exhibited after the actuator is connected to the hydraulic system. The following steps are recommended when a minimum of two gallons (8 liters) is purged.

NOTICE The actuator will either have a bleed screw (112) inserted into the bleed plug location, or will have a bleed plug set screw (111) that can be removed and then bled with no bleed screw.

Actuators positioned vertically, with only a single bleed screw installed:

1. Connect a $^{3}/_{16}$" inside diameter, clear vinyl drain tube to the bleed screw (112). Secure it with a hose clamp. Place the vinyl tube in a clean 5 gallon container to collect the purged oil. The oil can be returned to the reservoir when the procedure is complete if needed.



Installation and Bleeding

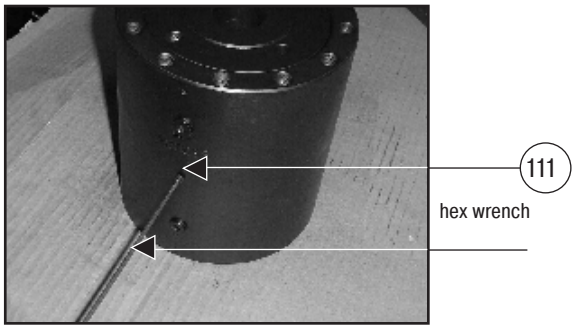
2. With an operator at the controls, open the bleed screw a 1/4 turn. Hydraulically rotate the shaft flange clockwise to the end of rotation and maintain hydraulic pressure. Oil with small air bubbles will be seen flowing through the tube.

3. Keep the fitting open and rotate the shaft flange in the opposite direction to the end position. Oil with small air bubbles will be seen flowing through the tube.

4. Repeat steps 2 & 3 until at least a 1/2 gallon of hydraulic fluid is purged and no bubbles can be seen in the oil. Close the bleed screw before rotating away from the end position.

Actuators positioned vertically, with only a single bleed plug installed:

5. Using a 1/8" size hex wrench, carefully remove the bleed plug (111), and insert a bleed screw (112).



Repeat steps 1 through 4.

Hydraulic systems with a flow rate of 2.0 gallons (7.5 liters) per minute or higher, and short return lines to tank may easily purge air from the actuator. In this case bleeding is not required.

NOTICE

Instructions for bleeding an actuator that is positioned vertically, with the shaft flange facing up, is on page 27. All other positioned actuators use this procedure.

After installation of the actuator onto the equipment, it is important that all safety devices such as tie rods or safety cables are properly reattached.

To purge air from the hydraulic lines, connect them together to create a closed loop and pump hydraulic fluid through them. Review the OEM's operating manual and/or hydraulic schematic to determine which hydraulic lines to connect. The length and inside diameter of the hydraulic supply lines together with pump capacity will determine the amount of pumping time required to fully purge the hydraulic system.

Bleeding may be necessary if excessive backlash is exhibited after the actuator is connected to the hydraulic system. The following steps are recommended when a minimum of two gallons (8 liters) is purged.

Installation and Bleeding

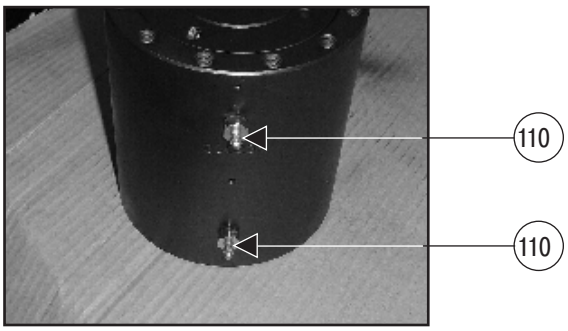
Actuators with two bleed screws installed:

1. Connect a 3/16" inside diameter, clear vinyl drain tube to each of the two bleed screws (110). Secure them with hose clamps. Place the vinyl tubes in a clean 5 gallon container to collect the purged oil. The oil can be returned to the reservoir when the procedure is complete if needed.

2. With an operator at the controls, open both bleed nipples a 1/4 turn. Hydraulically rotate the actuator to the end of rotation (either clockwise or counterclockwise), and maintain hydraulic pressure. Oil with small air bubbles will be seen flowing through the tubes. Allow a 1/2 gallon of fluid to be purged from the actuator.

3. Keep the fittings open and rotate the actuator in the opposite direction to the end position. Maintain hydraulic pressure until an additional 1/2 gallon of fluid is pumped into the container.

4. Repeat steps 2 & 3. After the last 1/2 gallon is purged, close both bleed screws before rotating away from the end position.



Troubleshooting Guide

PROBLEM	SEE CAUSES AND SOLUTIONS BELOW
Shaft rotates slowly or not at all	1-6
Operation is erratic or not responsive	7
Shaft will not fully rotate	8
Selected position cannot be maintained	3,4,7
CAUSE	**SOLUTION**
1. Insufficient torque output	Verify correct operating pressure. Do not exceed OEM's pressure specifications. Load may be above maximum capacity of the actuator.
2. Low rate of fluid flow	Inspect ports for obstructions and hydraulic lines for restrictions and leaks.
3. Control or Counterbalance valve has internal leak	Disconnect hydraulic lines and bypass valve. Leave valve ports open and operate the actuator through housing ports (do not exceed OEM's operating pressure). The valve must be replaced if a steady flow of fluid is seen coming from the valve ports.
4. Piston and/or shaft seal leak	Remove the plug and the housing's valve ports. Operate the actuator through the housing ports. Conduct the internal leakage test as described in the Testing Section on page 28 of this manual.
5. Corrosion build-up on the thrust surfaces	Re-build the actuator. Remove all rust and then polish.*
6. Swollen seals and composite bearings caused by incompatible hydraulic fluid	Re-build the actuator. Use fluid that is compatible with seals and bearings. Contact Helac for more information
7. Air in actuator	Purge air from actuator. See bleeding procedure starting on page 29.
8. Port fittings are obstructing the piston during stroke	Check thread length of port fittings. Fittings should not reach inside the housing bore.
9. Twisted or chipped gear teeth overload conditions.	Check for binding. Actuator may or may not be able to be rebuilt and may need to be replaced.

* Replacement part may be needed.

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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, NONINFRINGEMENT, 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".

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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.

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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.

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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

Notes

Notes

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