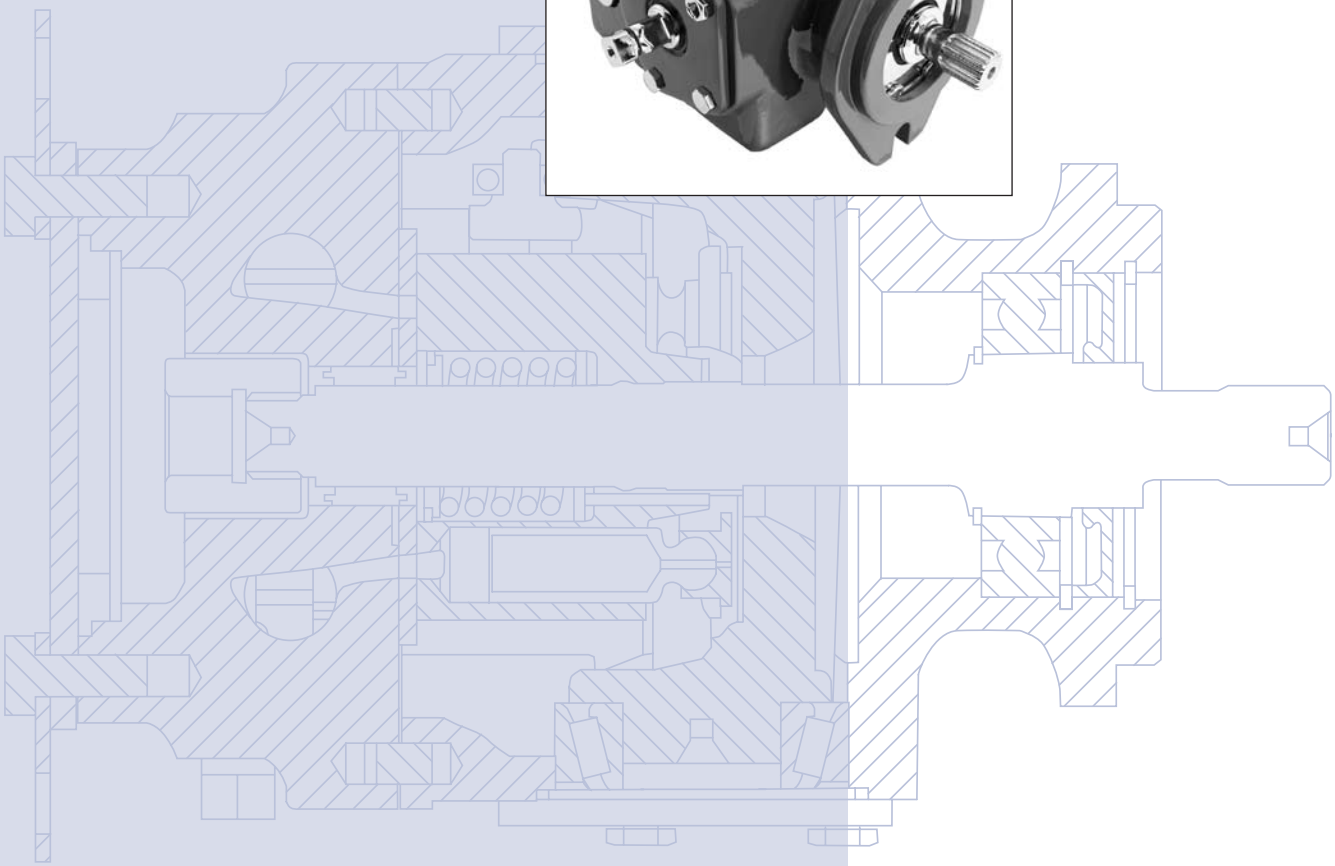
SAUER DANFOSS

Genuine Parts

LPV Closed Circuit Axial Piston Pumps

Repair Instructions



HISTORY OF REVISIONS

Table of Revisions

Date	Page	Changed	Rev.
January 2007	-	First printing	AA

LPV Closed Circuit Axial Piston Pumps Repair Instructions

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OVERVIEW

This manual details the major repair procedures for LPV pumps. These include the complete disassembly, inspection, and reassembly of the unit. Where rework of worn or damaged components is possible, specifications are given to ensure these parts meet factory tolerances. Only Sauer-Danfoss Global Service Partners are authorized to perform major repairs. Sauer-Danfoss trains Global Service Partners to perform major repairs and certifies their facilities on a regular basis.

⚠ Warning

Use of components that do not comply with rework specifications may result in loss of performance, which may constitute a safety hazard. Do not reuse components that don't comply to given specifications: replace with genuine Sauer-Danfoss service parts.

Minor repair procedures, adjustments, and troubleshooting information are given in the LPV Pump Service Manual **11004904**. Minor repairs include service operations that can be performed without removing the unit's endcap. Removal of the endcap voids your warranty unless performed by a Sauer-Danfoss Global Service Partner.

GENERAL INSTRUCTIONS

Follow these general procedures when repairing Series LPV variable displacement closed circuit pumps.

Remove the unit

Prior to performing major repairs, remove the unit from the vehicle/machine. Chock the wheels on the vehicle or lock the mechanism to inhibit movement. Be aware that hydraulic fluid may be under high pressure and/or hot. Inspect the outside of the pump and fittings for damage. Cap hoses after removal to prevent contamination.

Keep it clean

Cleanliness is a primary means of assuring satisfactory pump life, on either new or repaired units. Clean the outside of the pump thoroughly before disassembly. Take care to avoid contamination of the system ports. Cleaning parts using a clean solvent wash and air drying is usually adequate.

As with any precision equipment, you must keep all parts free of foreign materials and chemicals. Protect all exposed sealing surfaces and open cavities from damage and foreign material. If left unattended, cover the pump with a protective layer of plastic.

Lubricate moving parts

During assembly, coat all moving parts with a film of clean hydraulic oil. This assures that these parts will be lubricated during start-up.

Replace all O-rings and gaskets

We recommend you replace all O-rings, seals, and gaskets during repair. Lightly lubricate all O-rings with clean petroleum jelly prior to assembly.

Secure the unit

For major repair, place the unit in a stable position with the shaft pointing downward. It will be necessary to secure the pump while removing and torquing the endcap bolts.

SAFETY PRECAUTIONS

Always consider safety precautions before beginning a service procedure. Protect yourself and others from injury. Take the following general precautions whenever servicing a hydraulic system.

Unintended machine movement

⚠ Warning

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable/disconnect the mechanism while servicing.

Flammable cleaning solvents

⚠ Warning

Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.

Fluid under pressure

⚠ Warning

Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. This fluid may also be hot enough to cause burns. Use caution when dealing with hydraulic fluid under pressure. Relieve pressure in the system before removing hoses, fittings, gauges, or components. Never use your hand or any other body part to check for leaks in a pressurized line. Seek medical attention immediately if you are cut by hydraulic fluid.

Personal safety

⚠ Warning

Protect yourself from injury. Use proper safety equipment, including safety glasses, at all times.

SYMBOLS USED IN SAUER-DANFOSS LITERATURE

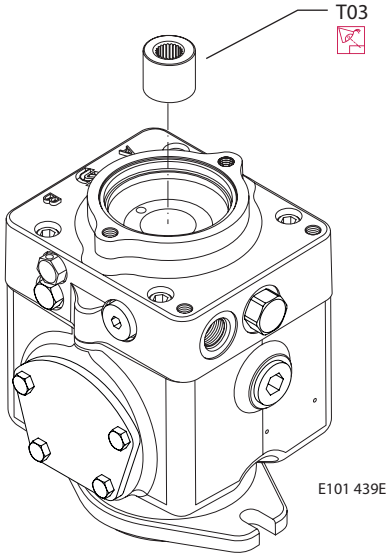
- WARNING may result in injury
- CAUTION may result in damage to product or property
- Reusable part
- Non-reusable part, use a new part
- Non-removable item
- Option – either part may exist
- Superseded – parts are not interchangeable
- Measurement required
- Flatness specification
- Parallelism specification
- External hex head
- Internal hex head
- Torx head
- O-ring boss port
- Tip, helpful suggestion
- Lubricate with hydraulic fluid
- Apply grease / petroleum jelly
- Apply locking compound
- Inspect for wear or damage
- Clean area or part
- Be careful not to scratch or damage
- Note correct orientation
- Mark orientation for reinstallation
- Torque specification
- Press in – press fit
- Pull out with tool – press fit
- Cover splines with installation sleeve
- Pressure measurement / gauge location or specification

The symbols above appear in the illustrations and text of this manual. They are intended to communicate helpful information at the point where it is most useful to the reader. In most instances, the appearance of the symbol itself denotes its meaning. The legend above defines each symbol and explains its purpose.

COUPLING

1. Remove auxiliary pump or cover (not shown).
2. Position pump with shaft end pointing down.
3. Remove coupling (T03). Use a small hook if necessary.

Remove coupling



SHAFT SEAL

Removal

4. Orient pump with the shaft pointing up.

5. Remove retaining ring (D03) using retaining ring pliers to release the shaft seal components.

Caution
Do not damage the housing bore, shaft or bearing when removing the shaft and shaft seal.

6. Remove the seal support washer (D02). Use a packing hook if necessary.

7. Remove the shaft seal and discard. Carefully drive a small sheet-metal screw into the shaft seal (D01) to facilitate removal. Be careful not to damage the bearing below the seal. Attach a slide hammer or appropriate puller to the screw head and pull to remove the seal.

INPUT SHAFT

Removal

8. Remove retaining ring (S09) using retaining ring pliers.

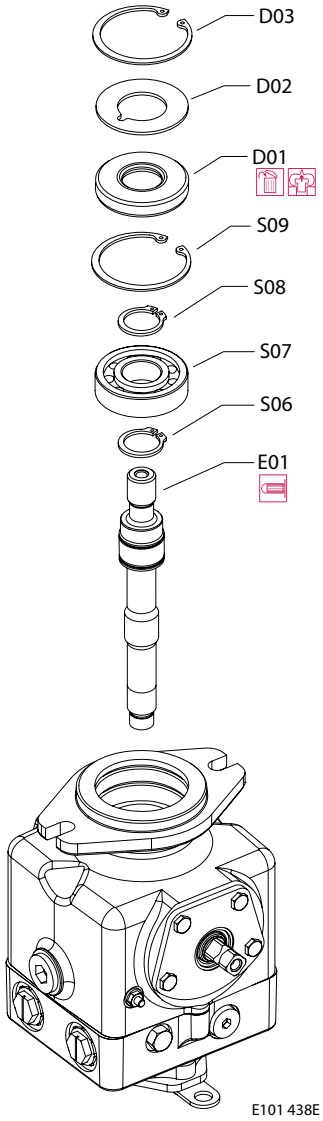
9. Pull shaft (E01) with bearing (S07) out of the pump. If necessary, tap lightly on the shaft to dislodge it from the internal pump components.

10. Remove retaining rings (S06, 8) using retaining ring pliers.

11. Press on the inner race to remove bearing from shaft.

Caution
Moving the pump with the shaft removed may dislodge the rotating group making reassembly impossible without removing the endcap. Use extreme caution removing the shaft and replace it immediately. Do not allow the pump to move while the shaft is out.

Remove shaft /seal/bearing



HIGH PRESSURE RELIEF VALVES

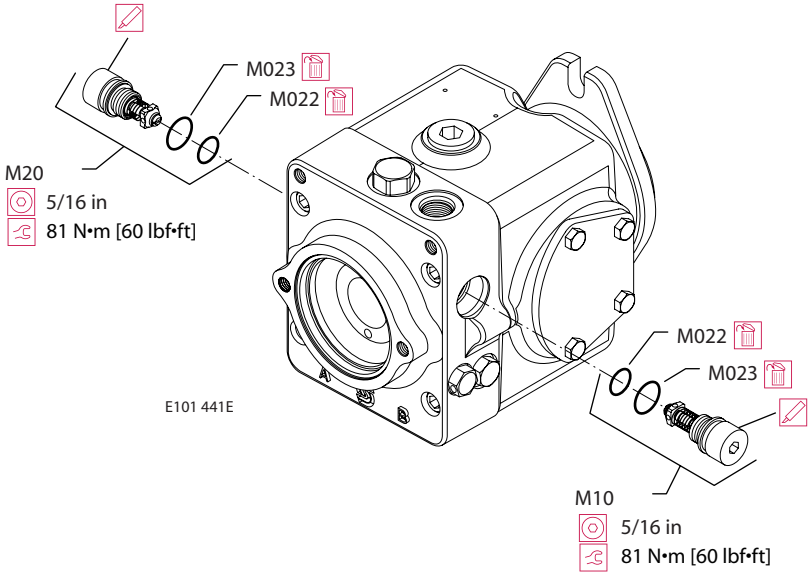
Removal

12 . Mark the location of each valve for proper reassembly.

13. Using a 5/16 internal hex wrench, remove the valves (M10) and (M20).

14. Remove and discard O-rings (M022) and (M023).

Disassemble HPRV valves



CHARGE PRESSURE RELIEF VALVE

Removal

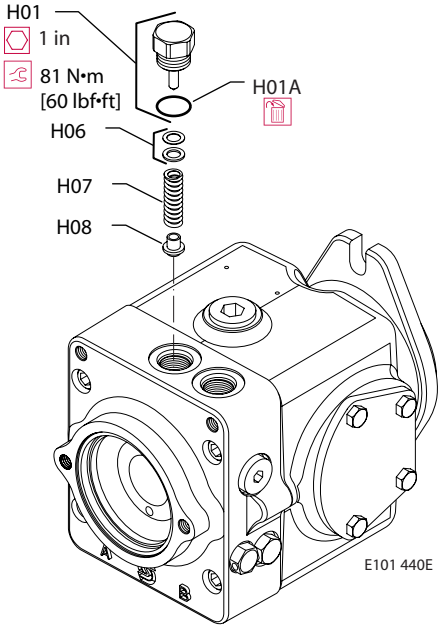
15. Using a 1 in hex wrench, remove the charge pressure relief valve plug (H01). Discard O-ring (H01A).

16. Charge relief valve shims (H06) may remain in plug (H01). Remove shims by tapping plug on the workbench.

17. Use a magnet to remove the spring (H07).

18. Use a magnet to remove the charge relief poppet (H08).

Charge pressure relief valve



LOOP FLUSHING VALVE

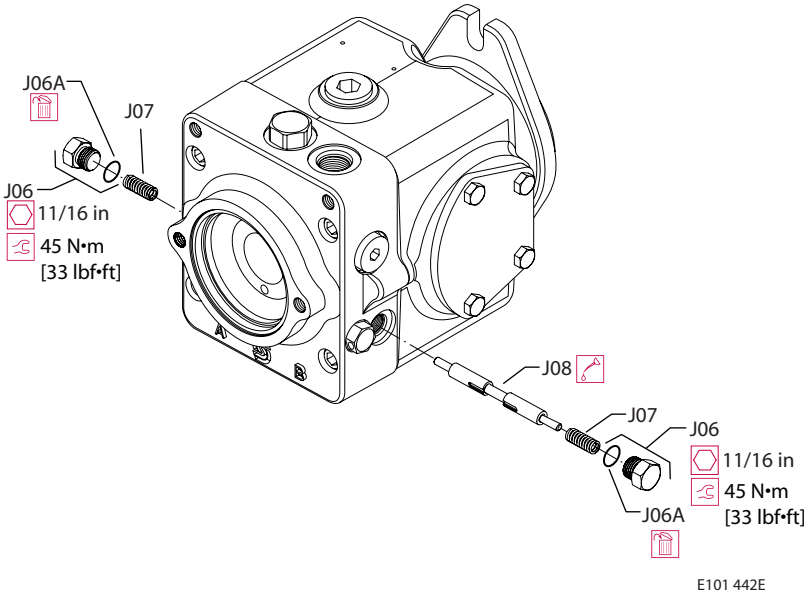
Removal

19. Using an 11/16 in hex wrench, remove the loop flushing valve plugs (J06). Discard O-ring (J06A).

20. Use a magnet to remove springs (J07).

21. Use a magnet to remove loop flushing spool (J08).

Disassemble loop flushing valve

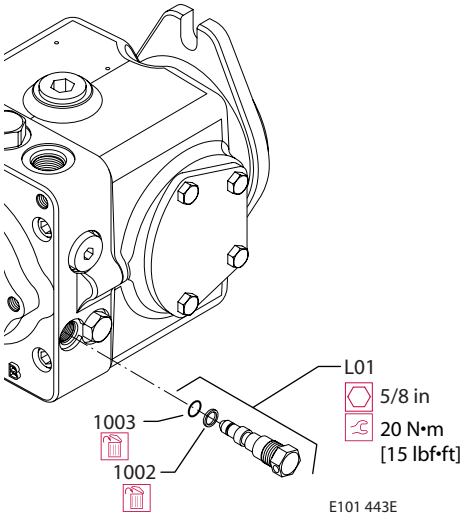


BYPASS VALVE

Removal

22. Using a 5/8 in hex wrench, remove the bypass valve cartridge (L01). Discard O-ring (1003) and backup ring (1002).

Bypass valve



ENDCAP

23. Orient the pump with the shaft pointing down and secure it.

24. Remove four endcap screws (J04) using a 8 mm internal hex wrench.

25. Carefully remove the endcap (J01).

Valve plate (F02) may be stuck to endcap. Take care not to scratch the surface.

26. Place the endcap and valve plate in a clean area, protecting them from contamination.

27. Remove and discard gasket (J02).

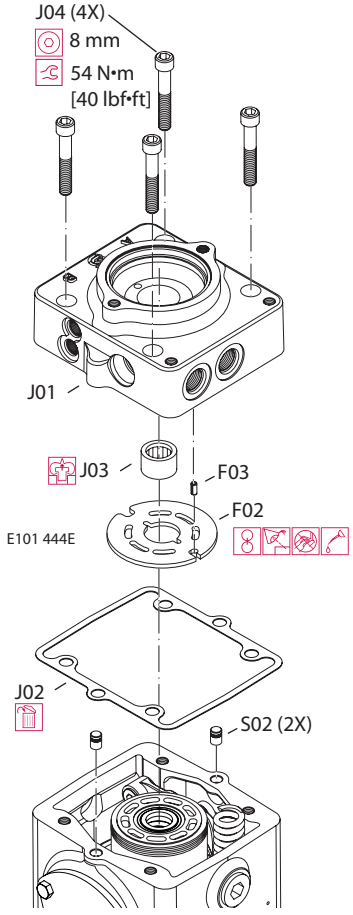
Caution
Do not remove the needle bearing unless it is necessary to replace it. Removal and replacement of needle bearing requires a press..

28. Remove timing pin (F03) from endcap.

29. If necessary, remove needle bearing (J03) by pressing out.

30. Remove locating pins (S02) from housing.

Remove endcap and components



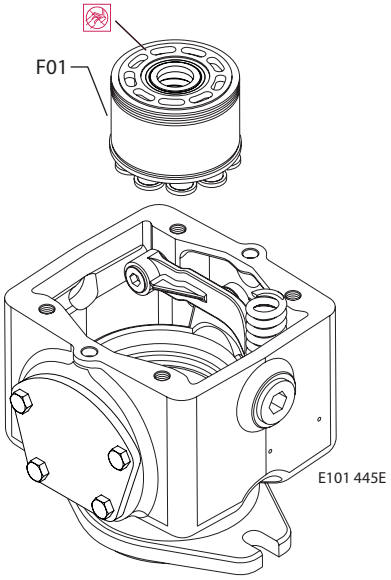
REMOVE CYLINDER BLOCK ASSEMBLY

Caution
Take care that the top and bottom of the cylinder block do not become contaminated or scratched: this may lead to poor performance or failure of the pump.

31. Remove cylinder block assembly (F01).

32. Set cylinder block and components on a clean dry surface.

Remove cylinder block



NEUTRAL RETURN ARM ASSEMBLY

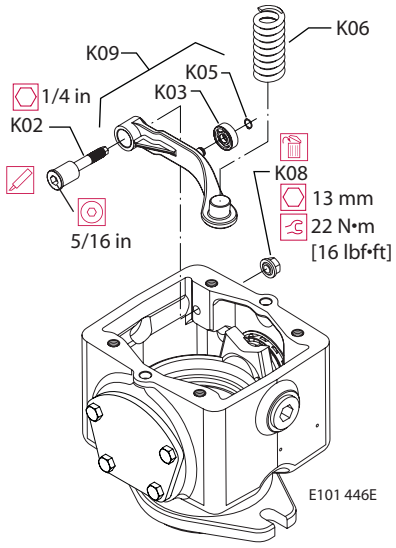
33. Remove neutral return spring (K06).

34. Mark the position of the neutral return pivot relative to the neutral return arm. Hold the neutral return pivot (K02) in place using a 5/16 in internal hex wrench. Remove and discard the seal nut (K08) using a 13 mm hex wrench.

35. Remove the neutral return pivot (K02) and neutral return arm assembly (K09).

36. If necessary, remove the retaining ring (K05) with retaining ring pliers to release the cam bearing (K03). Remove cam bearing.

Remove neutral return arm assembly



TRUNNION COVERS AND BEARINGS

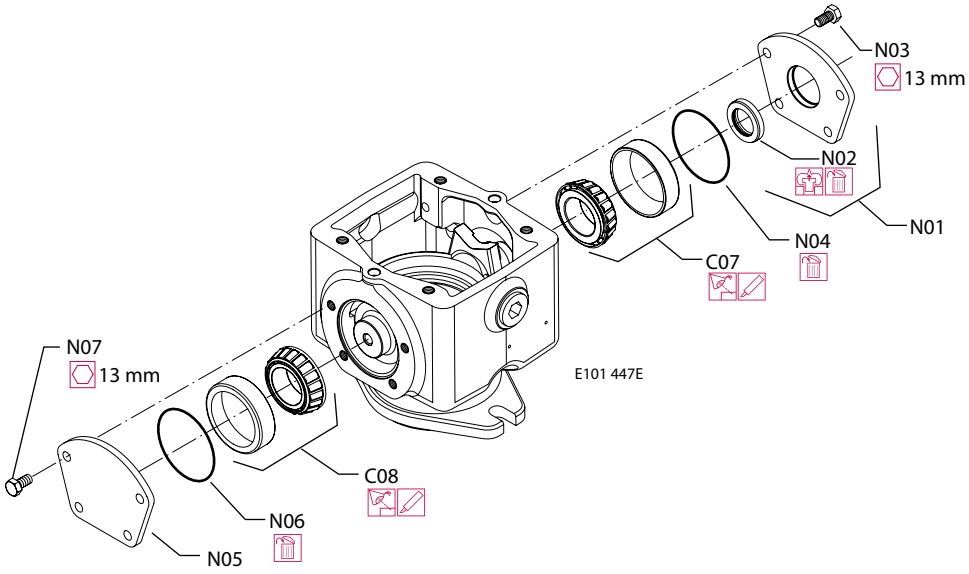
37. Remove four trunnion cover bolts (N03) and (N07) from each side of pump using a 13 mm hex wrench.

38. Remove trunnion covers (N01) and (N05). Remove and discard O-rings (N04) and (N06). Mark the trunion covers and bearings so they can be reassembled to the proper side.

39. Slide bearings (C07) and (C08) from pump housing to release the swashplate. If necessary, remove bearing cones using a bearing puller.

40. Remove and discard the lip seal (N02) from trunnion cover (N01).

Remove trunnion covers and bearings

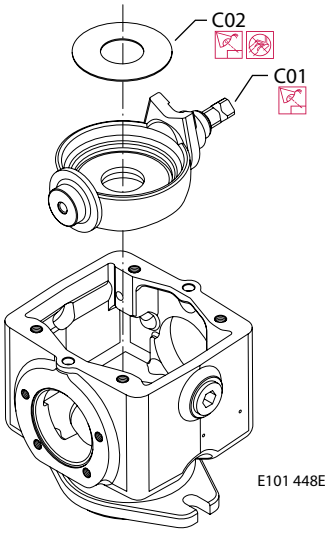


SWASHPLATE

41. Use a small hook to remove the thrust plate (C02).

42. Tilt the swashplate (C01) to remove it from the pump housing.

Remove swashplate



CYLINDER BLOCK KIT

Disassemble the cylinder block kit

43. Pull to remove the slipper retainer (C105) with the pistons (C103) from the cylinder block.

The pistons are not selectively fitted, however units with high hourly usage may develop wear patterns. Number the pistons and bores for reassembly if they are to be reused.

44. Remove the ball guide (C101).

45. Remove the three hold-down pins (C102).

46. Remove the hold-down pin retainer (C104).

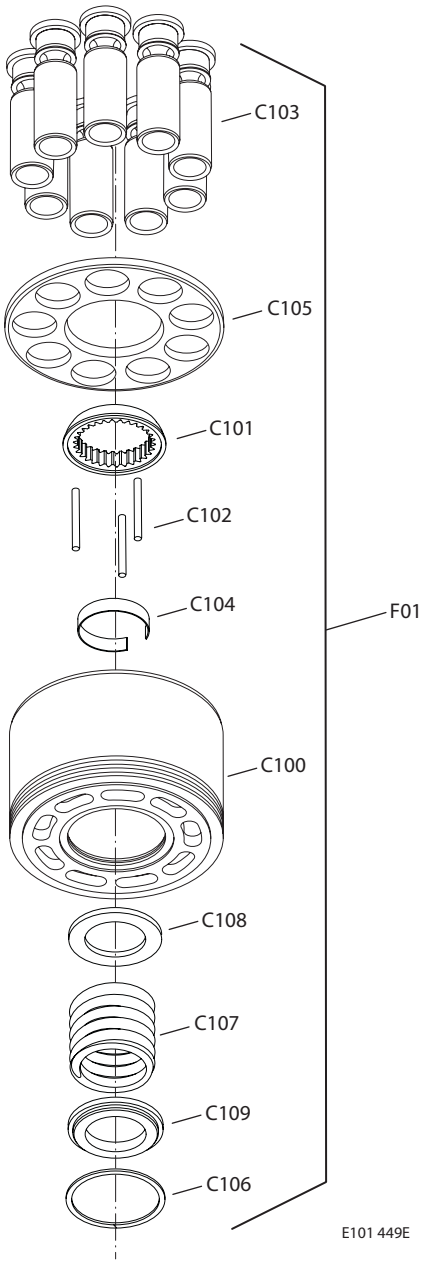
Block spring removal

Most repairs do not require block spring removal. Perform this procedure only if you suspect problems with the block spring.

47. Orient the block with the running face up. ⚠ Using a press, apply pressure on the block spring washer (C109) to compress the block spring (C107). Compress the spring enough to safely remove the spiral retaining ring (C106). While maintaining pressure, unwind the spiral retaining ring. Carefully release the pressure and remove the outer block spring washer (C109), block spring (C107), and inner block spring washer (C108) from the cylinder block.

⚠ Warning
Risk of personal injury: Compressing the block spring requires about 350 to 400 N [80 to 90 lbf]. Use a press sufficient to maintain this force with reasonable effort. Ensure the spring is secure before attempting to remove the spiral retaining ring. Release the pressure slowly after the retaining ring is removed.

Disassemble cylinder block kit



OVERVIEW

After disassembly, wash all parts (including the end-cap and housing) thoroughly with clean solvent and allow to air dry. Blow out oil passages in the housing and endcap with compressed air. Conduct inspection in a clean area and keep all parts free from contamination. Clean and dry parts again after any rework or resurfacing.

PISTONS AND SLIPPERS

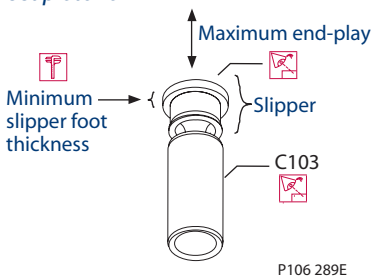
Inspect the pistons for damage and discoloration. Discolored pistons may indicate excessive heat; do not reuse.

Inspect the running surface of the slippers. Replace any piston assemblies with scored or rounded slipper edges. Measure the slipper foot thickness. Replace any piston assemblies with excessively worn slippers. Check the slipper axial end-play. Replace any piston assemblies with excessive end-play. Minimum slipper foot thickness and maximum axial end-play are given in the table to the right.

Slipper/piston specifications

Minimum slipperfoot thickness	2.712 mm [0.107 in]
Maximum slipper/piston end play	0.152 mm [0.006 in]

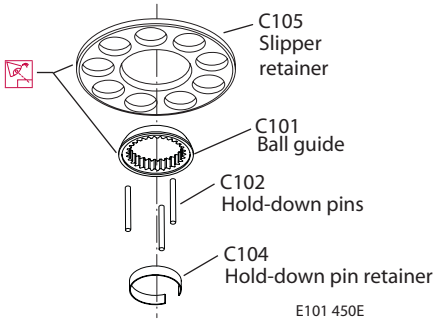
Inspect pistons



BALL GUIDE, SLIPPER RETAINER, AND HOLD-DOWN PINS

The ball guide should be free of nicks and scratches, and should not be excessively scored. Examine for discoloration that may indicate excessive heat or lack of lubrication. The slipper retainer should be flat, and slippers should fit in the retainer with minimal side play. Place the hold-down pins on a flat surface and roll them to make sure they are straight. Discard and replace any damaged parts.

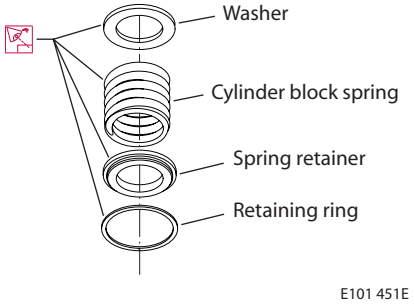
Inspect guide, retainer, and pins



BLOCK SPRING AND WASHERS

If cylinder kit is fully disassembled, visual inspection of the cylinder block, spring, and washers should indicate minimal wear. Replace if cracks or other damage is present.

Inspect block spring and washers



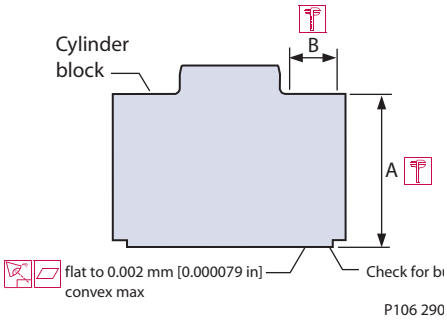
CYLINDER BLOCK

Examine the running face of the cylinder block. The surface should be smooth and free of nicks and burrs. Ensure that no scratches or grooves exist; these may drastically reduce output flow.

Cylinder block specifications

Minimum cylinder block height (A)	63.38 mm [2.495 in]
25 cc Maximum block bore diameter (B)	13.861 mm [0.546 in]
30 cc Maximum block bore diameter (B)	15.201 mm [0.598 in]
35 cc Maximum block bore diameter (B)	16.439 mm [0.647 in]

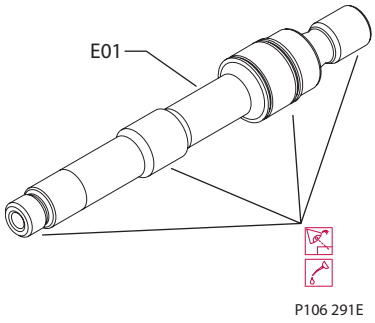
Inspect cylinder block



SHAFT

Check to see that the shaft (E01) and its splines are straight and free of damage or heavy wear. Inspect the shaft surface where it meets the shaft seal. Replace the shaft if a groove exists at the sealing land surface that may let dirt into or hydraulic fluid out of the unit. Clean the sealing area with a nonabrasive material if necessary. Lubricate the shaft with a light coat of hydraulic fluid before re-assembly.

Inspect shaft



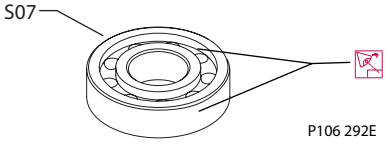
SHAFT BEARING

Clean bearing with a solvent and lubricate with hydraulic fluid. Inspect for wear, or pitting. Rotate the bearing in your hand. Replace if it does not rotate smoothly.

Replace the bearing if the problem is not remedied by cleaning,

If excessive wear is found, replace the bearing.

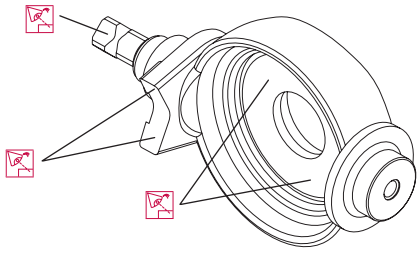
Inspect shaft bearing



SWASHPLATE

Carefully inspect each machined surface of the swashplate for wear. All swashplate surfaces should be smooth.

Inspect swashplate

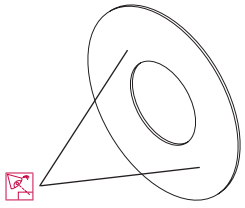


P106 293E

THUST PLATE

Carefully inspect the thrust plate for wear. Thrust plate surface should be smooth. Look for flatness and brass transfer. Excessive brass transfer from slippers may indicate that the slippers should be replaced. Replace thrust plate if necessary

Inspect thrust plate



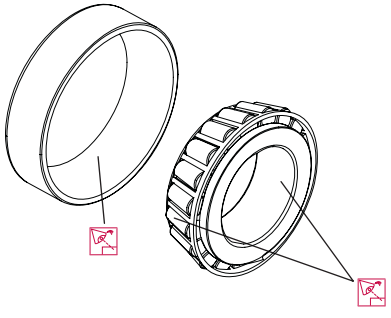
P106 294E

TRUNNION BEARINGS

Inspect the swashplate trunnion bearings for damage or excessive wear. Replace bearings if scratched, warped, or excessively worn. Rotate the bearings in your hand. Replace if they do not rotate smoothly.

Swashplate trunnion bearings must be replaced as a pair.

Inspect trunnion bearings

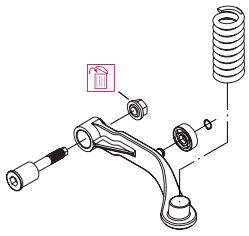


P106 295E

NEUTRAL RETURN MECHANISM

Inspect the neutral return arm, pivot, and spring. Replace spring if warped or bent. Inspect bearing. Spin bearing in your hand. Replace if it does not rotate smoothly.

Neutral return parts



E101 494

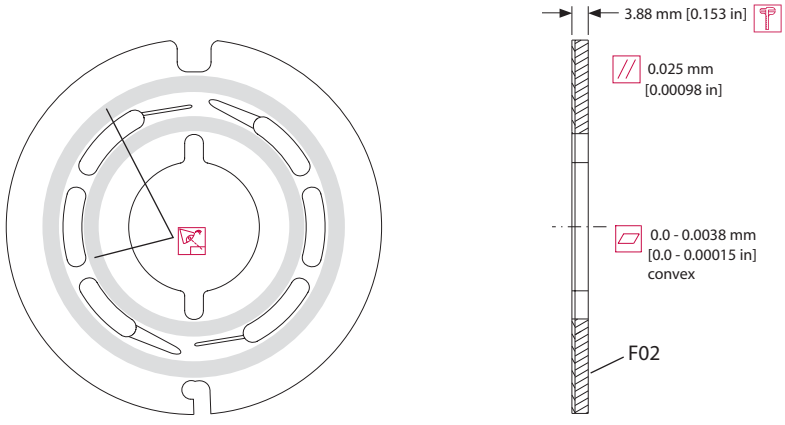
VALVE PLATE

Inspect the valve plate for scratches and grooves. Check the valve plate for evidence of cavitation along the running face. If pitting from cavitation exists, replace the valve plate. Check for excess wear on the brass running face. If any discoloration or burn marks are observed, replace the valve plate.

Run a fingernail or pencil tip across the diameter of the sealing land surface (see illustration). You should not feel deep or outstanding grooves, as these may decrease pump flow. Lap or replace valve plate if grooves or nicks are present. Inspect the mating surfaces of the endcap and valve plate for any possible contamination; even a few thousandths of an inch may affect pump operation.

Measure the thickness of the valve plate. Ensure that valve plate parallelism is equal to or less than 0.025 mm [0.00098 in]. Appearance should be flat and smooth on both the running face and the bottom surface. The valve plate should be flat to 0.0038 mm [0.00015 in] convex. We recommend you perform a magnetic particle inspection to detect cracks. Replace the valve plate if any cracks exist.

Inspect valve plate



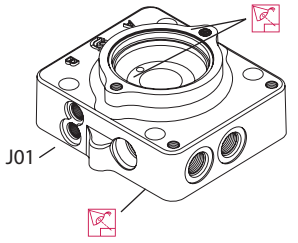
P106 296E

ENDCAP

Inspect the endcap (J01). Inspect all machined surfaces for scratches or pits. Ensure the housing mating surface of endcap is flat to 0.005 mm [0.0002 in]. Carefully check the bearing surface for wear.

Inspect the various valve seat surfaces carefully for wear or cracks. If damage is found, replace endcap.

Inspect endcap

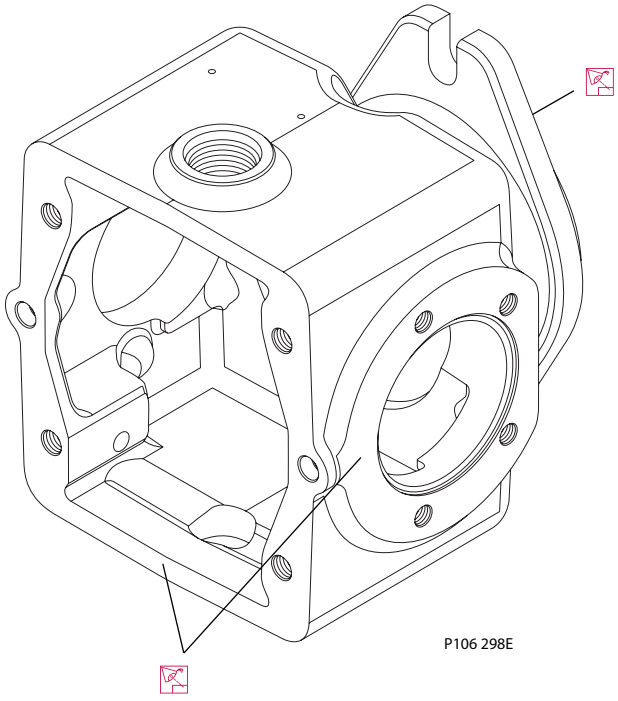


P106 297E

HOUSING

Inspect the housing to ensure that it is clean and free of foreign material. Inspect the swashplate trunnion bearing surfaces and endcap mating surfaces.

Inspect housing

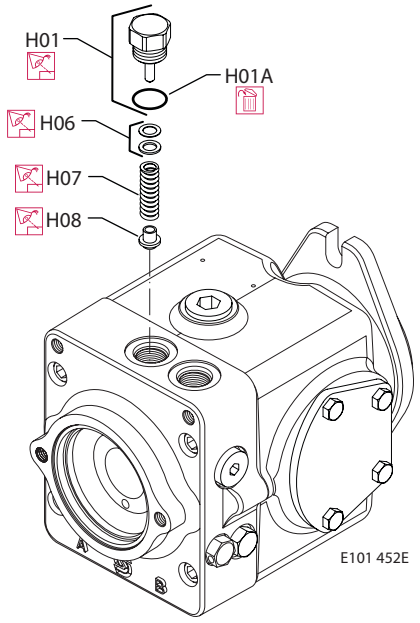


P106 298E

CHARGE RELIEF VALVE

Inspect charge relief valve plug (H01) for wear or damage. Inspect shims (A06), spring (H07), and poppet (H09). Replace spring if it is warped or bent.

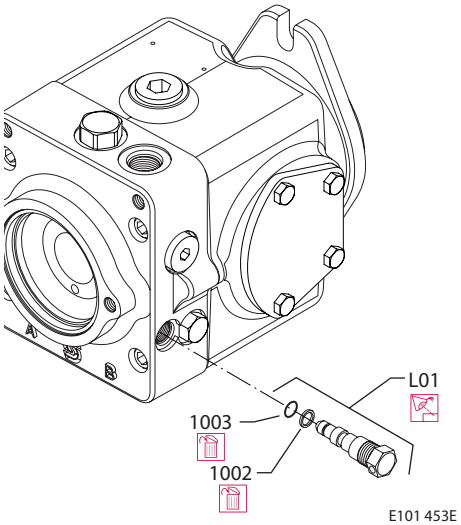
Inspect charge relief valve



BYPASS VALVE ASSEMBLY

Inspect bypass valve (L01). Replace if worn or damaged.

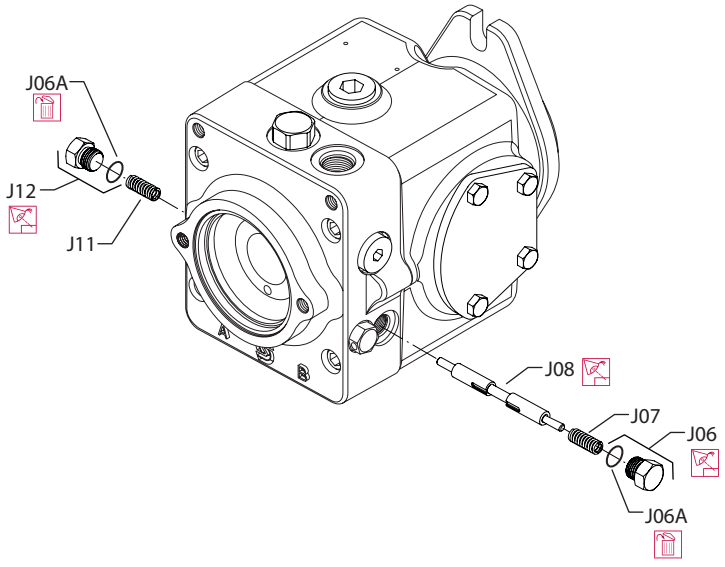
Inspect bypass valve assembly



LOOP FLUSHING VALVE

Inspect loop flushing valve plugs (J06). Inspect the springs (J07); replace if warped or bent. Inspect loop flush spool (J08), replace if worn or damaged.

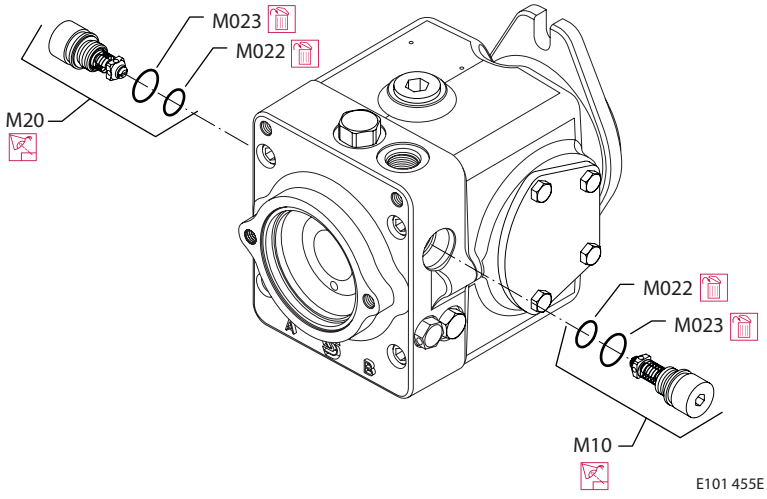
Inspect loop flushing valve



SYSTEM CHECK AND HPRV (HIGH PRESSURE RELIEF VALVE)

Inspect plug and cartridge (M10,20). Inspect internal parts of cartridge (spring and poppet). If internal parts are worn or damaged, replace entire cartridge.

Inspect system check/HPRV



OVERVIEW

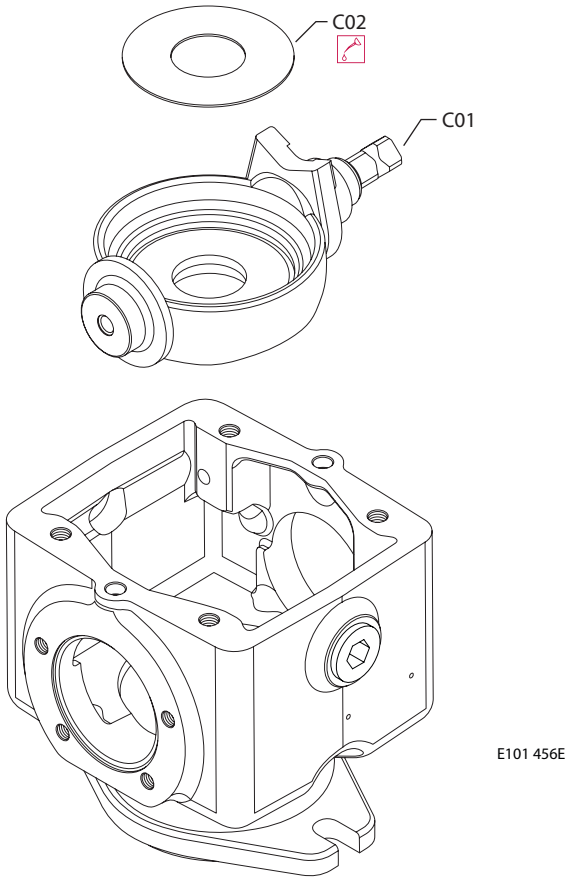
The following section describes assembly procedures for the LPV pump. If special tools are needed for assembly or adjustment, they are called out in this section. After assembly, adjust the pump according to the settings listed on the model code stamped on the serial number plate. You will find adjustment procedures in the *LPV Closed Circuit Axial Piston Pumps Service Manual,* **11004904**. Perform adjustments after the pump has been reinstalled on the machine or connected to an appropriate test stand.

SWASHPLATE

1. Using petroleum jelly to retain it, install thrust plate to swashplate. Lubricate the thrust plate with hydraulic oil.

2. Tip the swashplate and carefully install it into the housing.

Install swashplate



TRUNNION COVERS AND BEARINGS

If trunnion bearings are reused, reinstall them to the same side form which they were removed.

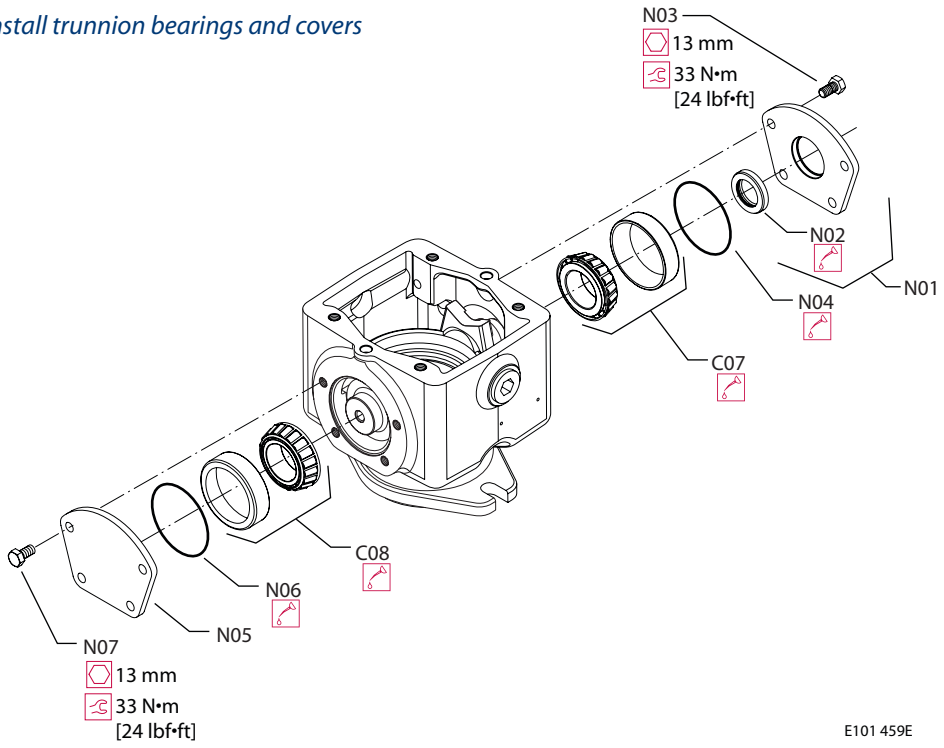
3. Coat the trunnion bearing cones with hydraulic fluid and install them onto the swashplate. Install the cup around the cone and into the housing to secure the swashplate.

4. Install new O-rings (N04) and (N06).

5. Press a new lip seal (N02) into trunnion cover (N01). Cover the trunnion shaft with packaging tape to protect the lip seal during installation.

6. Install the trunnion covers (N01) and (N05) with screws (N02) and (N07). Torque trunnion cover screws to 33 N•m [24 lbf•ft].

Install trunnion bearings and covers



NEUTRAL RETURN ARM ASSEMBLY

7. Lubricate and install cam bearing (K03) onto neutral return arm (K09).

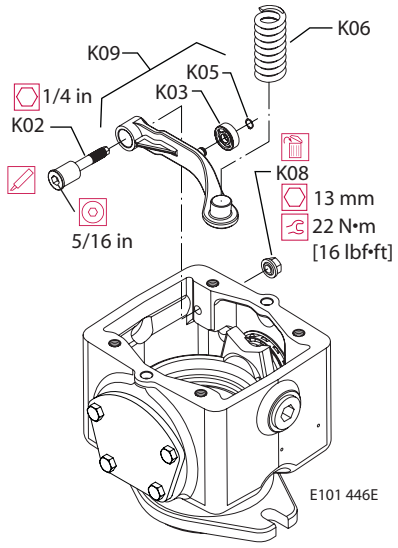
8. Use retaining ring pliers to install retaining ring (K05) on neutral return arm.

9. Insert neutral return pivot (K02) through the neutral return arm and into the housing. Align marks to install in original orientation.

10. Thread new seal nut (K08) onto the neutral return pivot.

11. Install the neutral return spring (K06) onto the neutral return arm assembly.

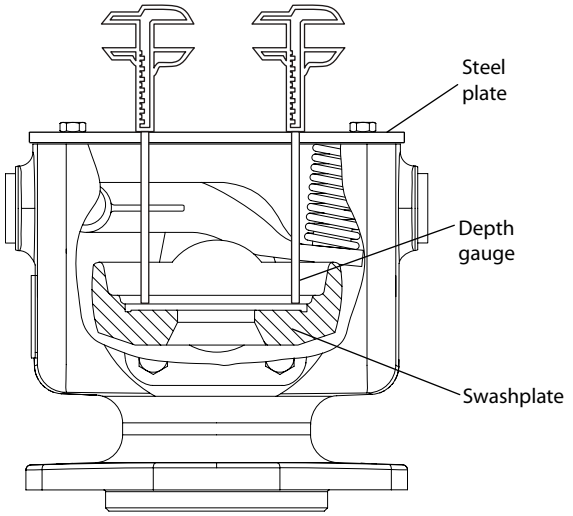
Install neutral return arm assembly



12. Using a depth gauge, measure from each side of swashplate to end of housing (see illustration below).

13. Turn neutral return pivot (K02) until swashplate is perpendicular to within 0.12 mm [0.005 in]. This will get you in the ball park. You must still perform neutral adjustment after assembly. Refer to *LPV Closed Circuit Axial Piston Pumps Service Manual*, **11004904**, for instructions.

Leveling the swashplate



Pump top view

14. Hold the neutral return pivot in place using a 5/16 in internal hex wrench and tighten the seal nut using a 13 mm hex wrench. Torque seal nut to 22 N•m [16 lbf•ft].

SHAFT AND SEAL

15. Orient pump with the shaft end pointing up.

16. Install first bearing retaining ring (S06) using retaining ring pliers.

17. Lubricate bearing (S07) with hydraulic fluid. Press bearing onto shaft by applying force to inner race.

18. Install second bearing retaining ring (S08) using retaining ring pliers.

19. Install shaft (E01) with bearing into housing. It may be necessary to tap lightly on the shaft to seat the bearing.

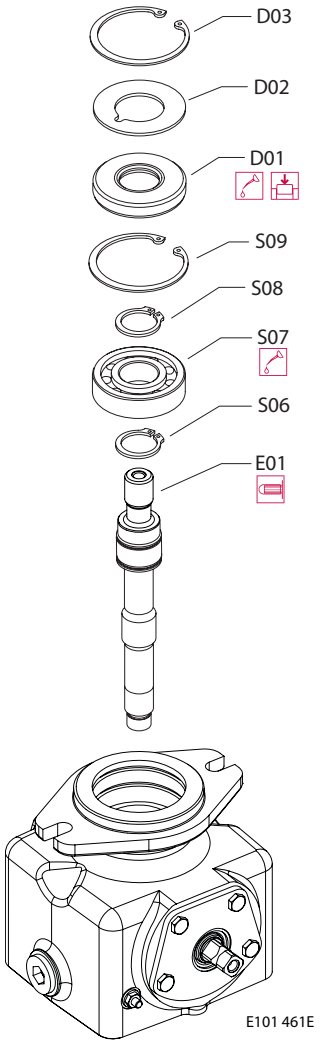
20. Using retaining ring pliers, install the shaft assembly retaining ring (S09).

21. Cover shaft splines with an installation sleeve or packaging tape to protect seal during installation. Using a new shaft seal (D01), press into housing until it bottoms out. Press evenly to avoid binding and damaging the seal.

22. Install the seal support washer (D02).

23. Install the seal retaining ring (D03) using retaining ring pliers.

Install shaft /seal/bearing



CYLINDER KIT REASSEMBLY

⚠ Warning
Risk of personal injury: Compressing the block spring requires about 350 to 400 N [80 to 90 lbf]. Use a press sufficient to maintain this force with reasonable effort. Ensure the spring is secure before attempting to install the spiral retaining ring. Release the pressure slowly after the retaining ring is installed.

24. Coat all parts with hydraulic fluid prior to reassembly.

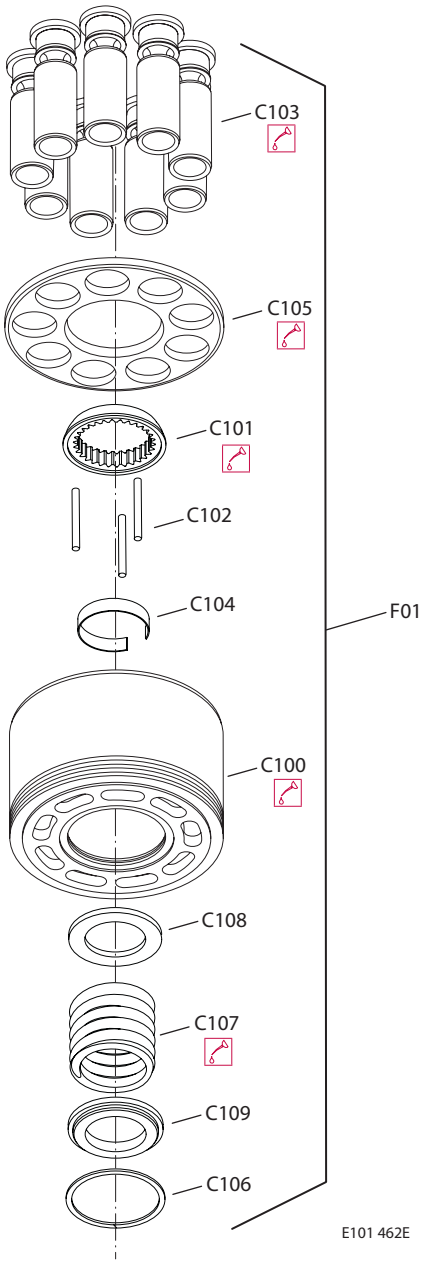
25. Install the inner block spring washer (C108), block spring (C107), and outer washer (C109) into the cylinder block. Using a press, compress the block spring enough to expose the retaining ring groove. Wind the spiral retaining ring (C106) into the groove in the cylinder block. ⚠

26. Turn the block over and install the hold-down pins (C102), retainer (C104), and ball guide (C101) into the cylinder block.

27. Insert the pistons (C103) into the slipper retainer (C105). Install the piston/retainer assembly into the cylinder block. Ensure the concave surface of the retainer seats on the ball guide. If you are reusing the pistons, install them to the original block bores. Lubricate the pistons, slippers, retainer, and ball guide before assembly. Set the cylinder kit aside on a clean surface until needed.

Be sure to install the slipper retainer (C105) so it mates correctly with the ball guide (C101) (concave side of the slipper retainer against the convex side of the ball guide).

Assemble cylinder block kit



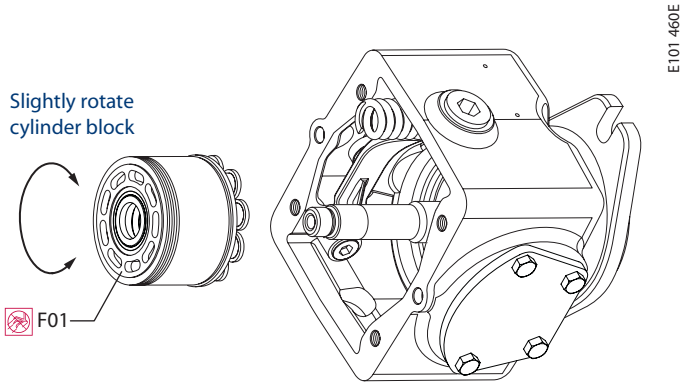
CYLINDER KIT INSTALLATION

28. Position pump with shaft pointing down.

29. Remove steel plate used in swashplate leveling procedure.

30. Insert the cylinder kit onto the shaft. While holding the shaft, slightly rotate the cylinder block kit to help start the shaft splines over the ball guide and align it with the block splines.

Install cylinder block

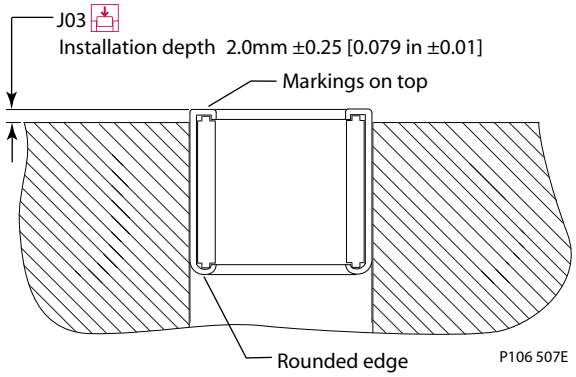


TIMING PIN AND NEEDLE BEARING

If previously removed:

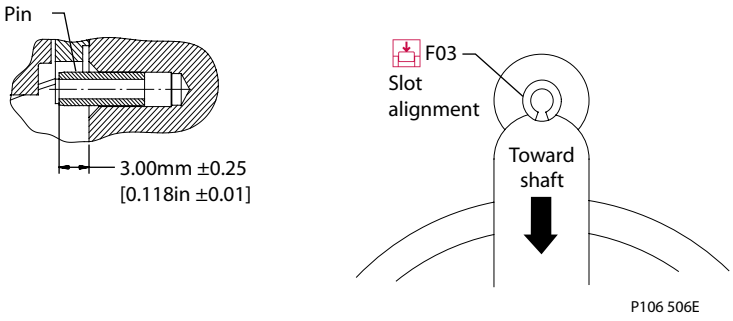
31. Press needle bearing to 2.0mm ±0.25 [0.079 in ±0.01] above surface with the rounded end facing into endcap bore and the markings on the top.

Install needle bearing



32. Install timing pin (F03) to 3.00mm ± 0.25 [0.118 in ±0.01] above surface with slot oriented toward shaft.

Install timing pin



VALVE PLATE AND ENDCAP

Caution
Pump will not operate properly if contamination exists between the endcap and valve plate. Ensure the surfaces are clean before installation.

33. Install alignment pins (S02) if previously removed.

34. Apply a liberal amount of assembly grease to the backside of the valve plate surface to hold it in place. Position it on the endcap with the bronze surface facing the cylinder block.

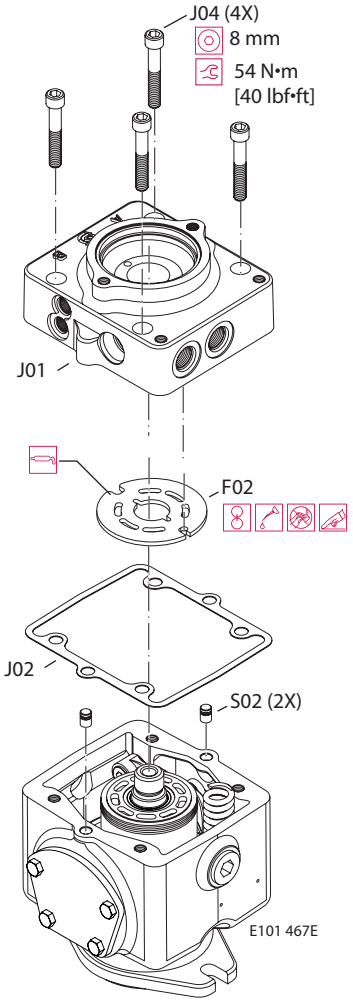
35. Install new gasket (J02).

Do not bend or warp the gasket. This may damage the embossing which is not visible under the rubber coating.

36. Install the endcap onto the housing. Make sure to align the shaft with the rear bearing and the neutral return spring with the cavity in the endcap.

37. Using a 8 mm internal hex wrench install cap screws (J04); torque to 54 N•m [40 lbf•ft].

Install endcap components

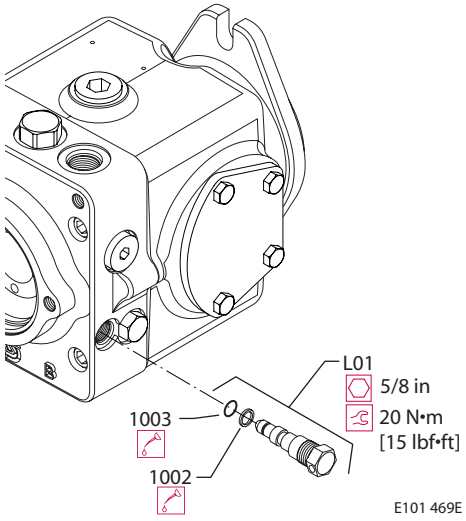


BYPASS VALVE

38. Install new O-ring (1002) and backup ring (1003) onto the cartridge.

39. Install the bypass valve cartridge (L01) using a 5/8 in. hex wrench; torque to 20 N•m [15 lbf•ft].

Install bypass valve



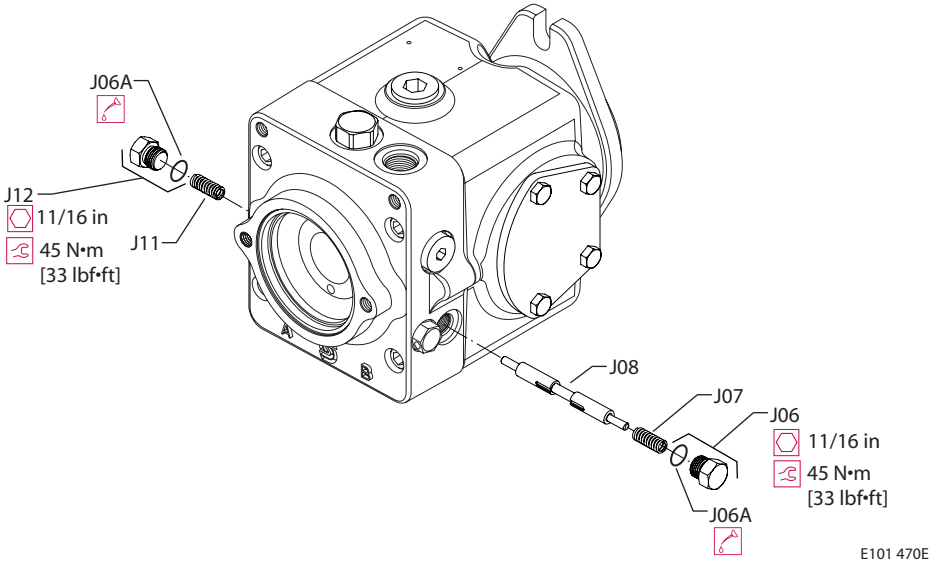
LOOP FLUSHING VALVE

40. Lubricate and install loop flushing spool (J08) and springs (J07) and (J11) into endcap. Ensure spool moves freely in its bore.

41. Lubricate and install new O-rings (J06A) onto loop flushing valve plugs (J06) and (J12).

42. Thread the loop flushing valve plugs into the housing. Torque to 45 N•m [33 lbf•ft] using an 11/16 in hex wrench.

Install loop flushing valve



CHARGE PRESSURE RELIEF VALVE

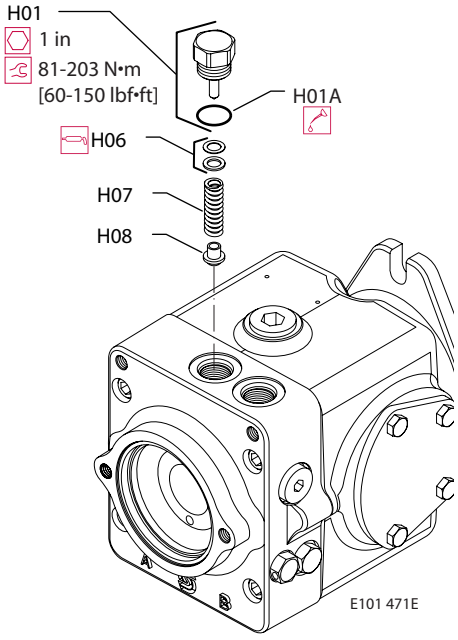
43. Insert charge relief valve poppet (H08) and spring (H07) into endcap.

44. Install shims (H06) into charge relief valve plug (H01). Use assembly grease to retain them on the plug.

45. Lubricate and install a new O-ring (H01A) onto the charge relief valve plug.

46. Install charge relief valve plug using a 1 in hex wrench. Torque to 81-203 N•m [60-150 lbf•ft].

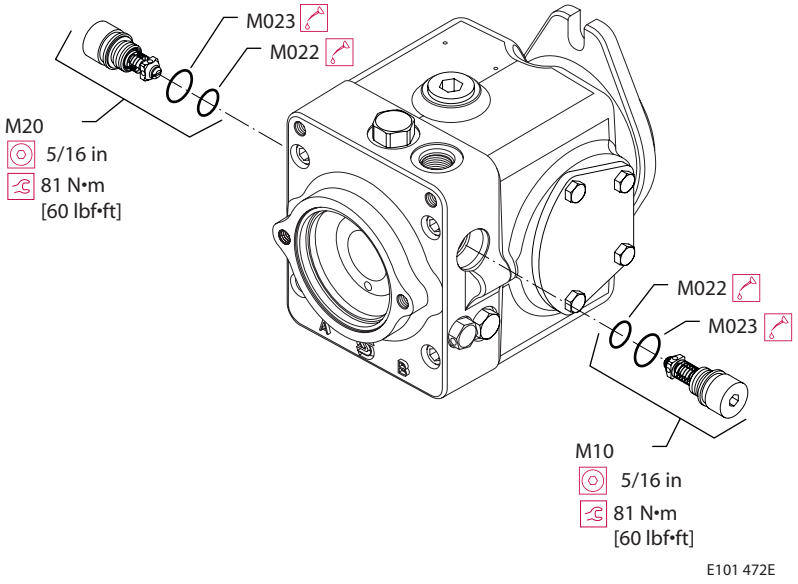
Install charge pressure relief valve



SYSTEM CHECK AND HPRV (HIGH PRESSURE RELIEF VALVE)

47. Lubricate and install new O-rings (M022) and (M023) onto each system check/HPRV (M10) and (M20).
48. Install each system check/HPRV in its proper position as noted during disassembly.
49. Use a 5/16 in internal hex wrench to torque valves to 81 N•m [60 lbf•ft].

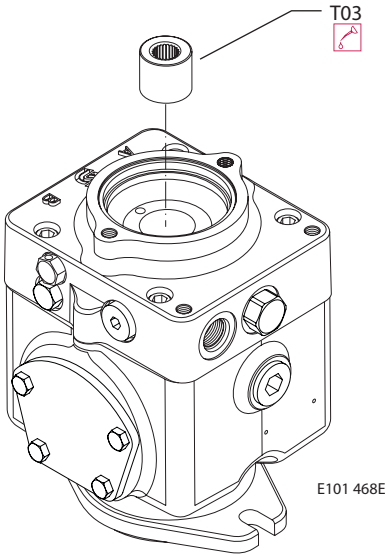
Install system check/HPRV



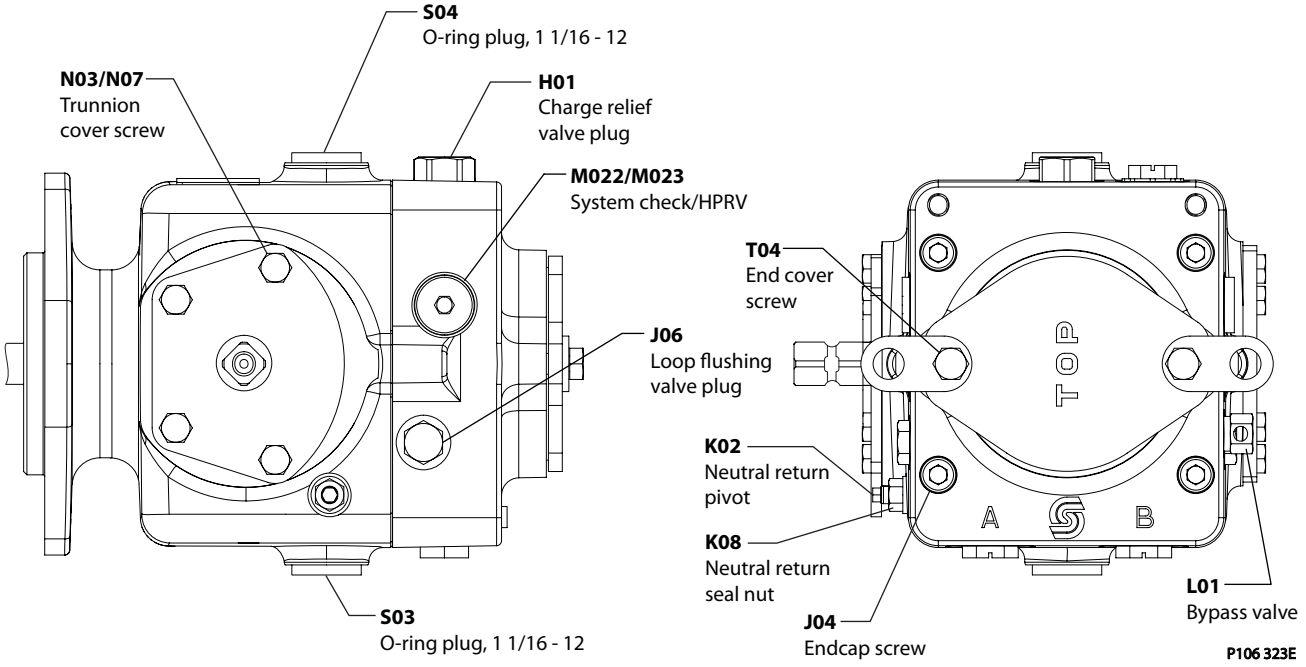
COUPLING

50. Lubricate and install coupling (T03).
51. Install cover or auxiliary pump (not shown) to retain coupling.

Install coupling



FASTENERS AND PLUGS



FASTENER SIZE AND TORQUE CHART

Item	Fastener	Wrench size	Torque
H01	Charge relief valve plug	1 in	81-203 N•m [60-150 lbf•ft]
J04	Endcap screw	8 mm internal hex	54 N•m [40 lbf•ft]
J06	Loop flushing valve plug	11/16 in	45 N•m [33 lbf•ft]
K02	Neutral return pivot	1/4 in	N/A
K08	Neutral return seal nut	13 mm	22 N•m [16 lbf•ft]
L01	Bypass valve	11/16 in	20 N•m [15 lbf•ft]
M022/M023	System check/HPRV	5/16 in internal hex	81 N•m [60 lbf•ft]
N03/N07	Trunnion cover screw	13 mm	33 N•m [24 lbf•ft]
T04	End cover screw	9/16 in	44 N•m [32 lbf•ft]

PLUG SIZE AND TORQUE CHART

Item	O-ring plug	Wrench size	Torque
S03, S04	1 1/16 - 12	15 mm internal hex	69 N•m [51 lbf•ft]

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