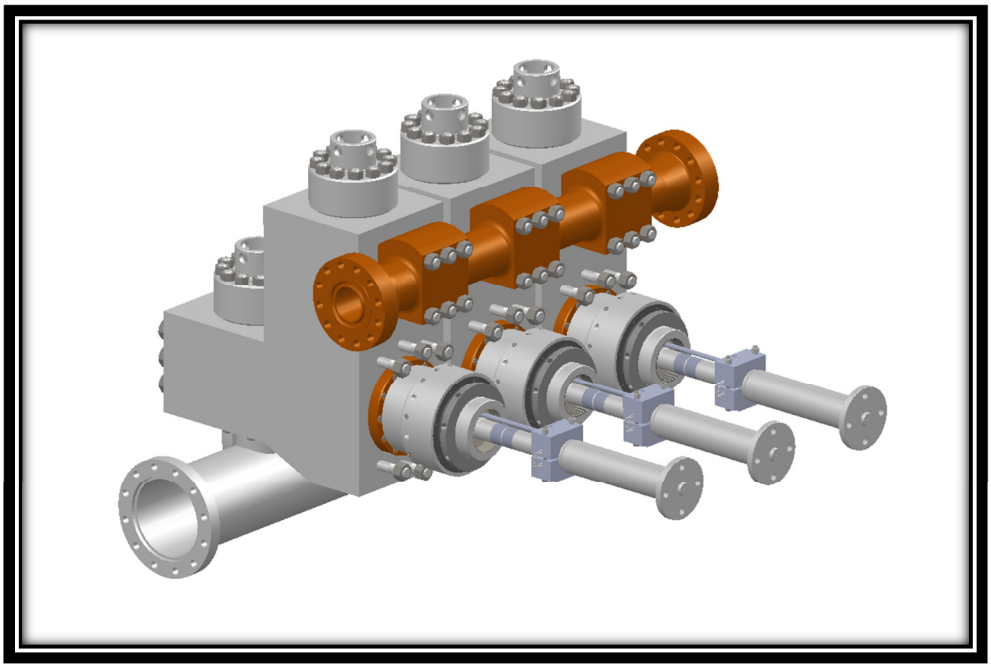
SOUTHWEST
OILFIELD PRODUCTS, INC.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS FOR THE SOUTHWEST OILFIELD PRODUCTS, INC. 6576-23A HYDRAULIC LINER RETAINER SYSTEM



online at www.swoil.com and www.swopparts.com

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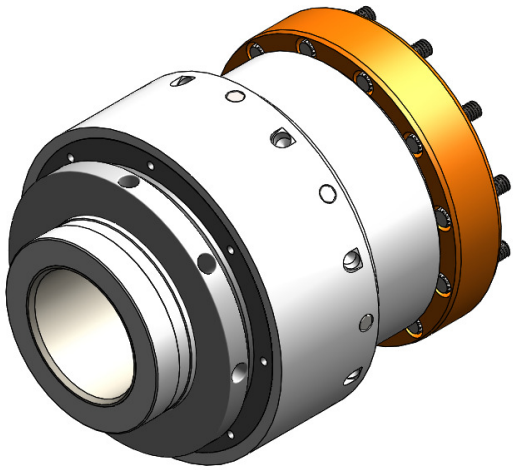
OVERVIEW

The 6576-23A hydraulic liner retainer (HLR) is a patented device (Patent No. US 6,209,445) that replaces screw-type manual liner retainers and provides a safe and easy-to-use procedure for changing liners and liner seals in mud pumps equipped with a 6490-25 liner retainer flange.

This HLR was designed to fit the Southwest 8490-25A (7,500 PSI) and 8431-A (7,500 PSI) fluid ends and is engineered to use the Southwest 1376 liner equipped with Grayloy or Zirconia liner sleeves. This unit operates using a pair of high- strength Bellville conical spring washers to retain the liner against the wear plate. When the liner must be removed, hydraulic pressure is supplied to the unit by a high pressure air-over-oil pump. The hydraulic pressure drives a piston in the HLR to compress the Bellville springs which allows the liner to be safely removed. When the new liner is installed, the hydraulic pressure is released and the Bellville springs return to their natural state to retain the liner against the wear plate.

No hammer wrenches or cheater bars are required for the operation of the HLR system. The air-over-oil pump is set at the factory to provide the exact pressure needed for energizing the springs so that no risky guesswork is needed in the liner change-out process.



GENERAL SAFETY

- Pump repair work should be performed only by authorized and trained service personnel
- Instructions contained in this manual should be thoroughly understood and respected. If questions arise, call Southwest Oilfield Product's service or engineering department
- Pumps should be shut down before any repair work is allowed; this includes
  - disengaging the pump's power source
  - depressurizing the fluid end modules and hydraulic flow lines
- Sufficient cooling time of parts involved in maintenance should be provided prior to servicing
- ALWAYS use the rig hoist, lifting appliance or jib crane to lift items over 40 lbs

****NOTE: the hydraulic liner retainer assembly weighs approximately 550 lbs.****

- Hydraulic hand pumps to be used in installation/maintenance should be routinely calibrated
- Work areas should be adequately lit and ventilated
- Proper safety attire should be worn by all personnel in the vicinity of the work area; this includes
  - Eye protection against solid and liquid objects which may suddenly come loose
  - Foot protection against cuttings, hot/cold liquids, and dropped objects
  - Hand protection against sharp edges, mineral oils, and for handling cumbersome loads

INSTALLATION

To install the Southwest 6576-23A Hydraulic Liner Retainer (HLR) system, perform the following steps:

Inspect the new liner retainer system parts and the discharge module power end face for debris and clean as necessary – these metal-to-metal contact areas MUST be completely free of dirt and other contaminants before being mated.

IMPORTANT: the HLR is shipped as a single unit – upon arrival to the rig, remove the liner retainer flange from the assembly.

1. **If the discharge module is still bolted to the power end frame, unmount it**
   - **IMPORTANT**: installation of the liner retainer flange onto the discharge module MUST be performed before the discharge module is bolted to the nose plate because the liner retainer flange is used to align the discharge module to the power end frame during pump installation
2. Fully tighten the twelve (12) 4019-51 cap screws to the discharge module with a torque of 282 ft-lbs using an anti-seize lubricant such as Southwest Hi-Pro 4000 or NeverSeez®
3. Mount the discharge module to the nose plate by sliding the liner retainer flange and power end studs through their respective holes
4. Tighten the power end stud nuts to a torque of 2025 ft-lbs using an anti-seize lubricant such as Southwest Hi-Pro 4000 or NeverSeez®
5. Grease and install a new wearplate and wearplate seal.
6. Lubricate the liner retainer flange threads and install the pre-assembled HLR. (If the HLR has not already been assembled, follow the instructions in the “Assembly” section below.) Tighten the housing (6576-23-2) with the tightening bar (6576-22ATBAR) until it is flush to the liner retainer flange.
7. Remove the pipe plug nearest to the top of the retainer housing and install the hydraulic pressure hose and hose connector.

8. Pressure the system up to approximately 4570 psi. DO NOT EXCEED 4570 psi. Watch your gauges closely; when the pressure nears this mark, the pop-off valve will open and hydraulic fluid will release – this is the indication that the system has reached its pre-set limit.
    - Notice that the hydraulic liner piston has moved outward by approximately 1/4”; this indicates that the spring washers have contracted and the nut (6576-23-4) can now be unscrewed.
9. Inspect and clean the new liner and liner seal before installing the seal into the liner
10. Slide the liner into the hydraulic liner retainer until it touches the wear plate
11. Screw the 6576-23-4 nut into the piston and tighten with the bar provided in the kit
12. Release system pressure but leave the hose connector installed and the dust cap tightened

The liner is now held securely in place, and the system is ready for pumping.

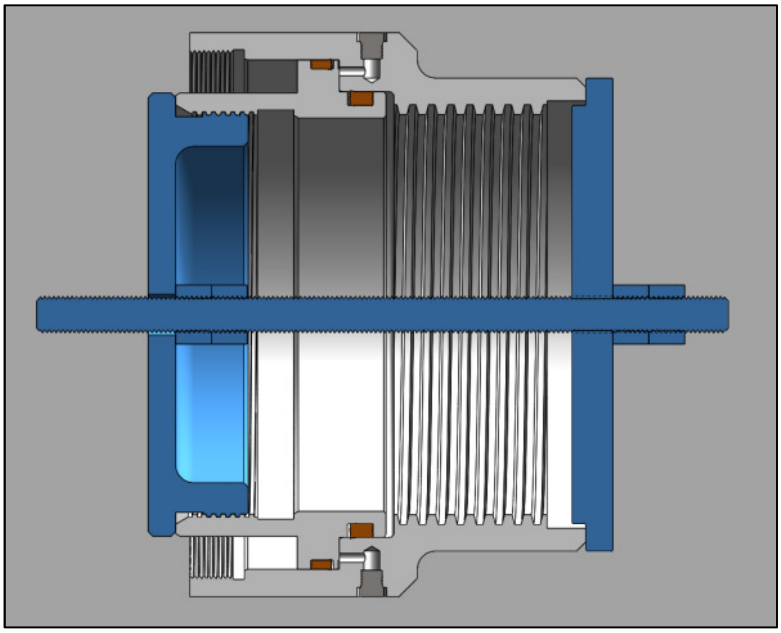
CHANGING A LINER

To change the liner, perform the following steps:

1. Shut down the mud pump and depressurize the hydraulic fluid lines.
2. If the hose connector has been removed from the HLR housing (6576-23-2), remove the pipe plug in the port closest to the top and reinstall the hose connector.
3. Connect the hydraulic hand pump to the hose connector and pressure up the system to approximately 4570 psi.
    - DO NOT EXCEED 4570 psi. Watch your gauge(s) closely: when the pressure nears this mark, the pop-off valve will open and hydraulic fluid will release indicating that the system has reached its pre-set limit.
    - Notice that the piston (6576-23-3) has moved outward by approximately 1/4" – this indicates that the Bellville springs have been compressed and the nut (6576-23-4) can now be unscrewed.
4. Remove the 6576-23-4 nut.
    - The nut may need to be loosened with the tightening bar; after a few slight turns, the nut should easily turn by hand.
5. Clean the bore area of the hydraulic liner retainer and re-apply lubrication as necessary.
6. MAKE SURE THE NEW LINER AND LINER SEAL ARE CLEAN. Install the new liner seal, and slide the new liner in until it contacts the wearplate.
7. Screw the nut back in to the piston. Use the tightening bar if necessary to ensure a snug fit.
8. Release the system pressure. The liner is now held securely in place and is ready for operation.

DISASSEMBLY

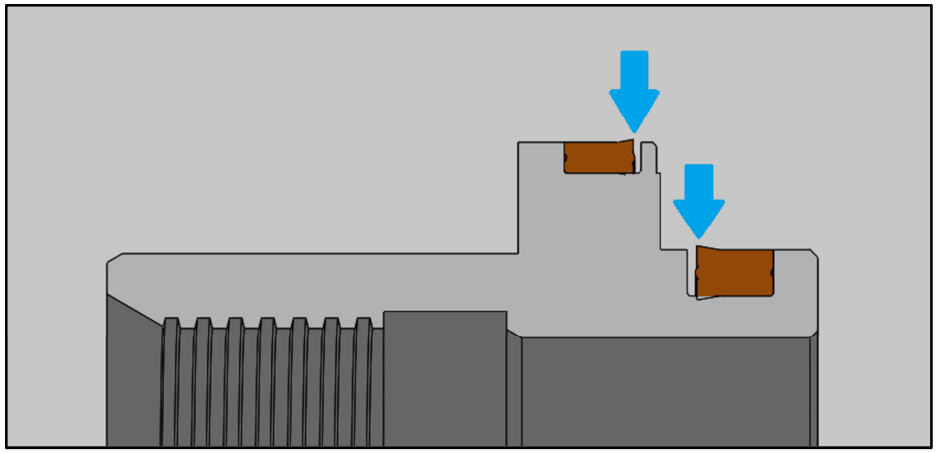
- Connect the hydraulic pump hose to the hose connector on the liner retainer housing; pressure the system up to no more than 4570 PSI.
- Remove the nut (6576-23-4) and liner.
- Depressurize the system.
- Unscrew the housing (6576-23-2) from the liner retainer flange and move it to a CLEAN work area. Set the assembly down on its smaller diameter and restrain the housing so that it cannot rotate.
- Insert the pins of the spring retaining ring removal tool (6576-22ASRRRTA) into the retaining ring (6576-22-5) and use a soft hammer to loosen and unscrew the ring from the housing.
- Remove the two Bellville washers from the assembly.
- Remove the piston (6573-23-3) from the assembly as follows:
  - Thread the draw-in plate (6576-22ADP) into the piston.
  - Thread two (2) of the 1”-8 heavy hex nuts onto one end of the pulling screw; allow a few inches of space between the nut and the end of the screw.
  - Insert the pulling screw through the housing assembly so that the nuts are INSIDE the draw-in plate.
  - Slide the bottom plate (6576-22ABP) over the other end of the pulling screw until it is flush with the housing; thread the remaining two (2) 1”-8 heavy hex nuts onto the pulling screw (note that these should be OUTSIDE of the bottom plate).



  - Twist the outer screw (red arrow below) clockwise; this action forces the pulling screw to move in towards the assembly thereby pushing the draw-in plate outward.
- Replace seals and spring washers as necessary.

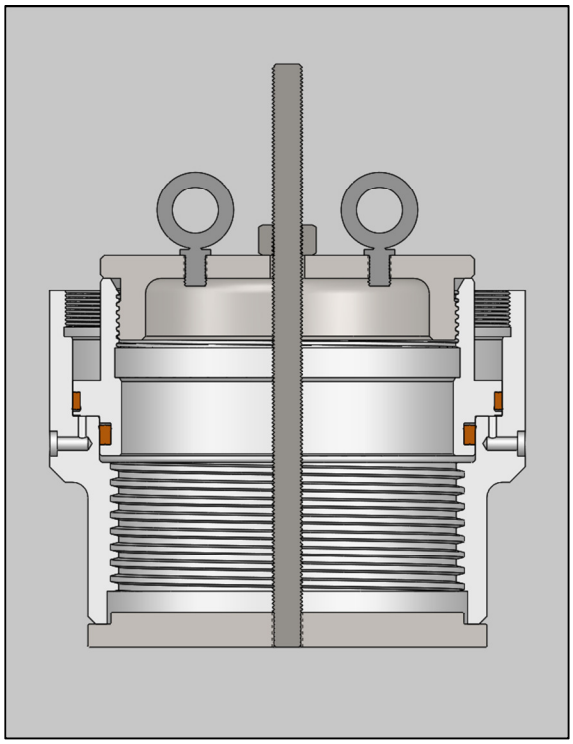
ASSEMBLY

1. Thoroughly clean all mating surfaces of the hydraulic liner retainer system and then coat the housing bore with Enerpac hydraulic fluid
2. Install the 6576-23-9 and 6576-22-10 seals as shown below

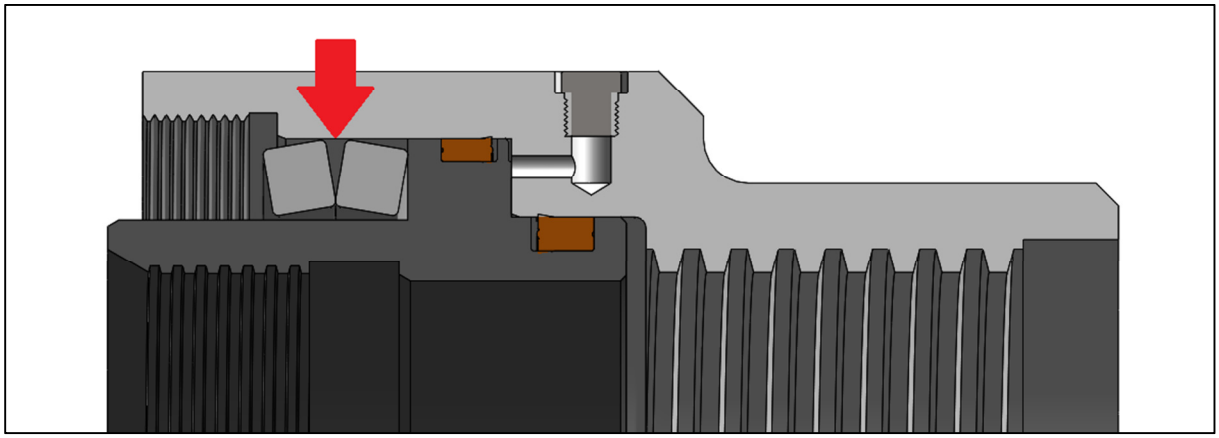


- Greasing the seals will help them to slide on easier
- NOTE the position of the seals – lips should be facing each other

3. Install the two lifting eye bolts (6576-22AEB) in the draw-in plate (6576-22ADP), then insert the plate into the piston. Set the bottom plate (6576-22ABP) on a work surface with the smaller diameter facing up; place the smaller diameter of the housing (6576-22-2) onto the bottom plate. Thread the pulling screw (6576-22APS) into the hole in the bottom plate.
4. Remove one NPT pipe plug from the housing – this prevents air from becoming trapped between the piston and housing
5. Position the assembled plate/piston parts over the pulling screw and slide them into the housing. Twist the 1-8 heavy hex nut to evenly install the piston into the housing.



6. Next install the Bellville springs facing each other exactly as shown in the figure below:

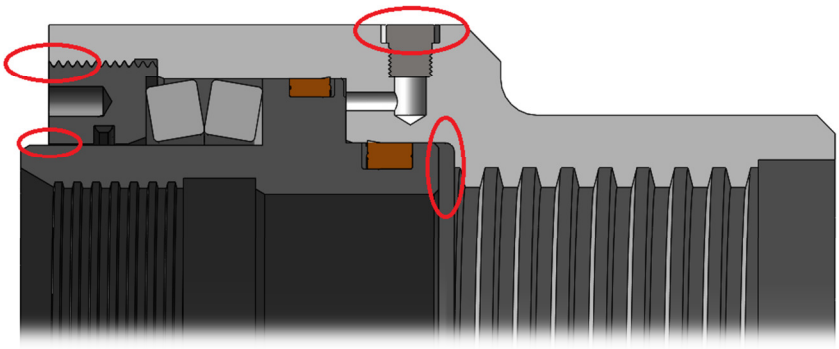


7. Discontinue threading motion when the piston is flush against the housing
8. Remove the bottom plate, draw-in plate, hex nut, and threaded rod.
9. Insert the 568-454 O-ring into the spring washer retaining ring (6576-22-5) before installing the retaining ring.

TESTING/TROUBLESHOOTING

To test the hydraulic liner retainer system:

1. Uninstall the housing assembly from the retainer flange and move it to a designated repair area.
2. Clean the areas around the spring retaining ring, pipe plugs, and the gap between the piston and housing (see areas in red in the illustration below).
3. Pressure the system up to – but DO NOT EXCEED – 4570 PSI.
4. DO NOT remove the hose connector or pipe plugs during this time.
5. Set a timer for 15 minutes.
6. Check for leaks around the spring washer, in the bore of the housing, and around the pipe plugs (see areas in red in the illustration below).
    a. If leaks are found at any point during the test, depressurize the assembly and replace the seal(s) which caused the leak(s).
    b. Start the test over; observe the re-pressurized system for another 15 minutes.
7. If no leaks are found during the 15-minute test interval, the unit may now be re-installed onto the pump.



NOTE: if repairs are necessary, they may be performed in the field; however, it is recommended that the hydraulic liner retainer system be returned to Southwest Oilfield Products, Inc.

PARTS LISTS

PARTS LIST FOR 6576-23A HYDRAULIC LINER RETAINER SYSTEM

PART NO.	DESCRIPTION	QTY.
6576-23-2	HOUSING	1
6576-22-5	BELLVILLE SPRING RETAINING RING	1
6576-22-6	BELLVILLE SPRING	2
6576-23-3	PISTON	1
6590-25	LINER RETAINER FLANGE	1
6576-23-4	HOLDING NUT	1
6576-23-9	PISTON SEAL (SMALLER)	1
6576-22-10	PISTON SEAL (LARGER)	1
568-454	O-RING	1
¼”-NPT	¼-18 NPT PIPE PLUG	8
4019-51	LINER RETAINER FERRY HEAD CAPSCREW	12

PARTS LIST FOR 6576-23A TOOL KIT

PART NO.	DESCRIPTION	QTY.
6576-22ASRRRT	SPRING RETAINING RING REMOVAL TOOL	1
6576-22AEB	¾-10 EYE BOLT	2
HHN1000-8	1-8 HEAVY HEX NUT	1
6576-22ADP	PISTON DRAW-IN PLATE	1
6576-22APS	PULLING SCREW	1
6576-23ABP	BOTTOM PLATE	1
6576-22AS	SET SCREW	8

APPENDIX: TOOLS, DRAWINGS, AND MISCELLANEOUS INFORMATION

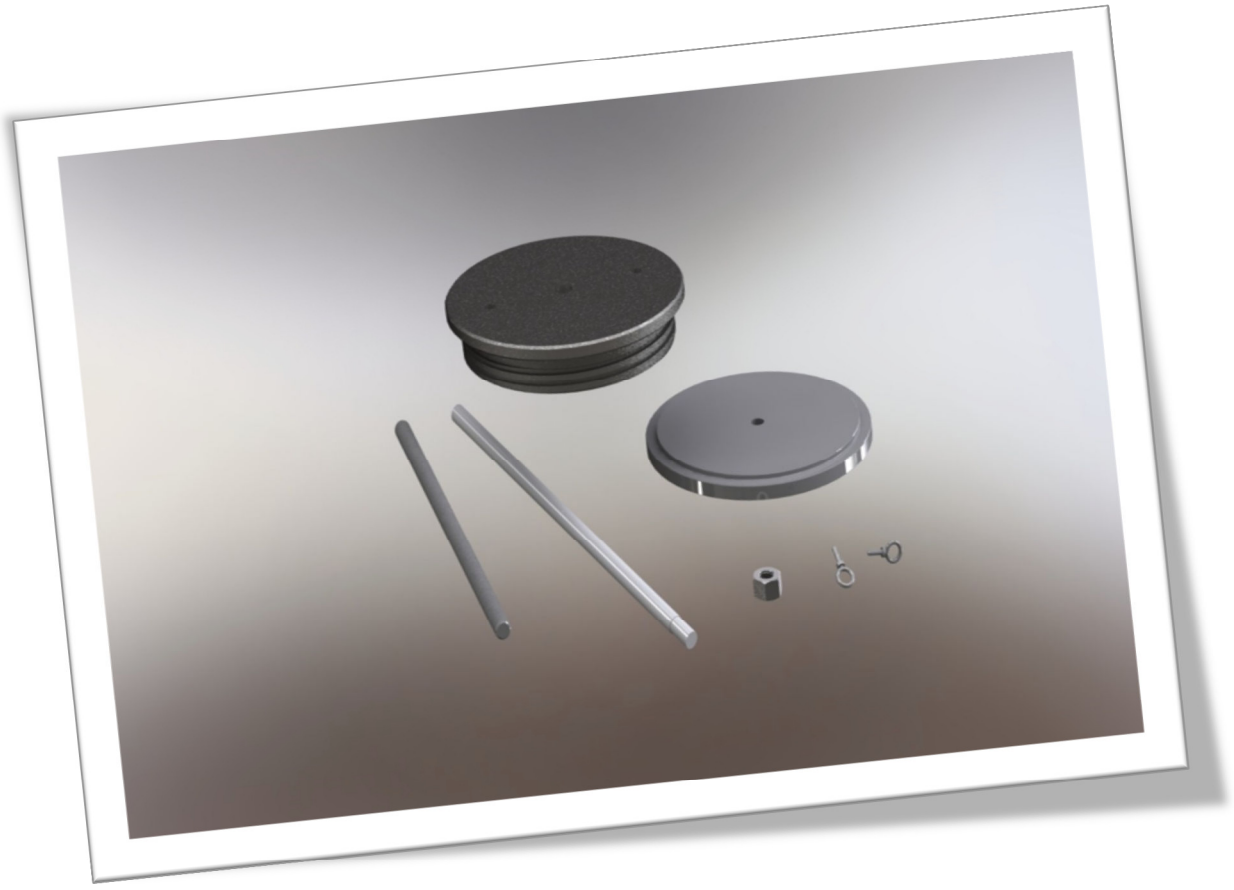
VIEW OF EXPLODED ASSEMBLY

RECOMMENDED OIL AND SPARE PARTS

HYRAULIC LINER RETAINER ASSEMBLY BILL OF MATERIAL

TOOLS

PUMPING UNIT BILL OF MATERIAL



This shows the exploded view of all components in the hydraulic liner retainer assembly.
(Note that seals were left in their installed positions for simplicity.)

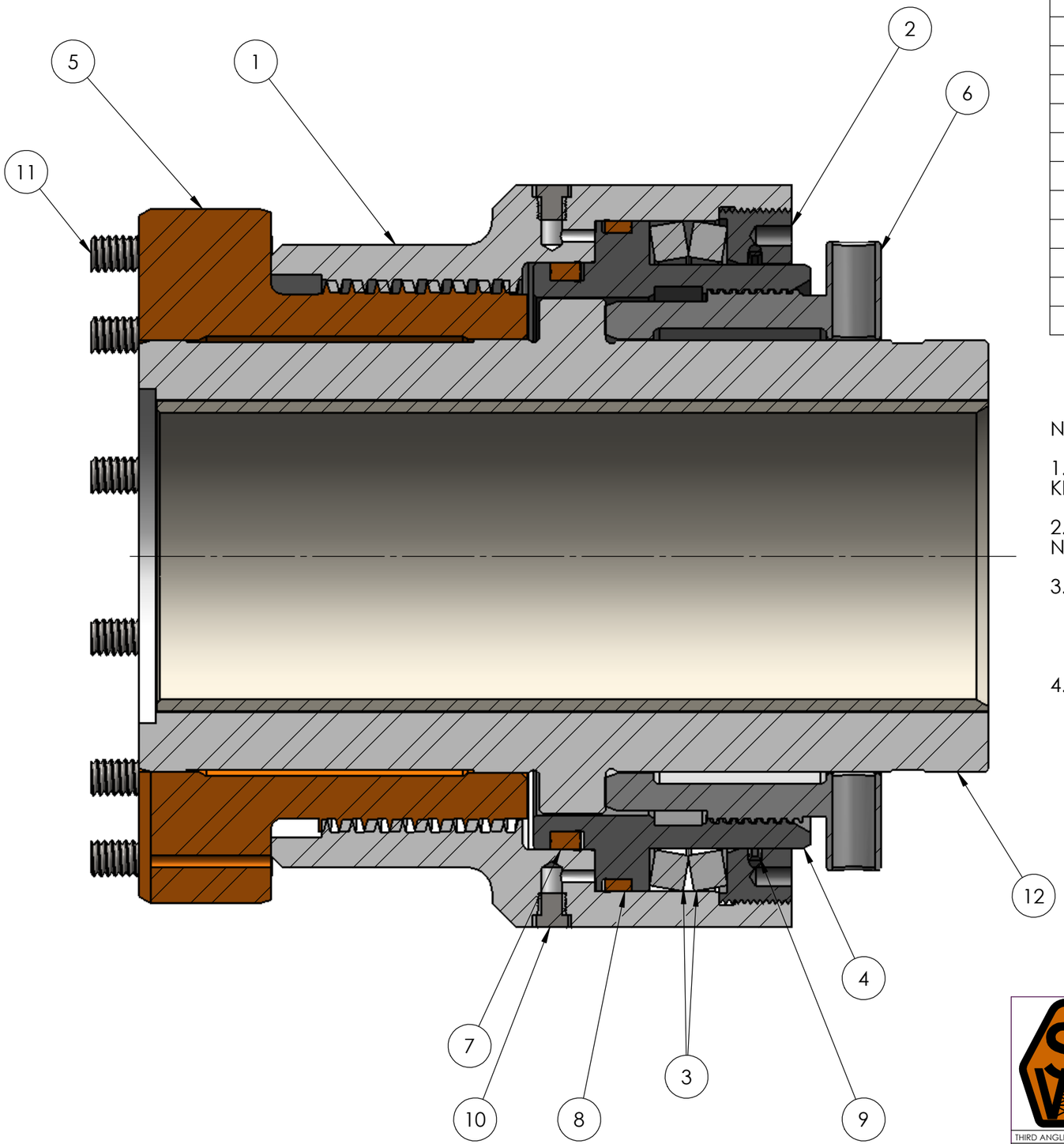
RECOMMENDED HYDRAULIC OIL

ENERPAC® OIL SPECIFICATION CHART	
Viscosity Index	100 min
Viscosity at 210 °F	42/45 S.U.S.
Viscosity at 100 °F	150/165 S.U.S.
Viscosity at 0 °F	<12,000 S.U.S.
API Gravity	31.0/33.0
Flash, C.O.C. °F	400
Pour Point, °F	-25
Aniline Point, °F	210/220
Paraffinic Base Color	Blue

RECOMMENDED SPARE PARTS

PART NO.	DESCRIPTION	QTY.
6576-22-6	BELLVILLE SPRING	2
6576-22-10	PISTON SEAL (LARGER)	1
6576-23-9	PISTON SEAL (SMALLER)	1
568-454	O-RING (SPRING WASHER RETAINER)	1

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	02/17/2015
B	DELETED 568-447 & 2981-8-13 FROM SPARE PARTS LIST	09/09/2016
C	CORRECTED PISTON SEAL (LARGER) & PISTON SEAL (SMALLER) PART NUMBERS ON PAGES 12 & 15 RESP.	10/31/2017



ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	6576-23-2	HOUSING	1
2	6576-22-5	BELLVILLE SPRING RETAINING RING	1
3	6576-22-6	BELLVILLE SPRING	2
4	6576-23-3	PISTON	1
5	6490-25	LINER RETAINER FLANGE	1
6	6576-23-4	GLAND NUT	1
7	6576-23-9	SMALL PISTON SEAL	1
8	6576-22-10	LARGE PISTON SEAL	1
9	568-454	O-RING	1
10	0.25-NPT	1/4-18 NPT PLUG	8
11	4019-51	FERRY HEAD CAP SCREW	12
12	1376ZIRC	LINER	1

NOTES:

1. ITEM 12 IS SHOWN FOR ILLUSTRATION PURPOSES ONLY; IT IS NOT SOLD WITH THE KIT AND MUST BE ORDERED SEPARATELY.

2. 4570 PSI IS THE MAXIMUM PRESSURE REQUIRED TO COMPRESS THE SPRINGS. DO NOT EXCEED THIS PRESSURE DURING OPERATION OF THE HYDRAULIC HAND PUMP.

3. ALSO INCLUDED WITH THE SYSTEM BUT NOT SHOWN IN THIS DIAGRAM ARE:
   - 6600-20-1-1 (3/4" FEMALE NPT QUICK DISCONNECT)
   - 6600-20-1-6 (PIPE ADAPTER)
   - 6600-20-1-18 (DUST CAP)

4. FITS SOUTHWEST 8490-25A (EMSCO FC-1600 & FD-1600 7500 PSI FLUID ENDS)

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/64
ANGULAR: ± 0.5°
DECIMAL +.005 / -.000
ALL FILLETS & RADII - 1/16 MAX
CHAMFERS 1/16 X 45° MAX
SURFACE FINISH 125 RMS MAX
CONCENTRICITY NOT TO EXCEED.005 T.I.R.
BREAK SHARP CORNERS 1/32 X 45° MAX

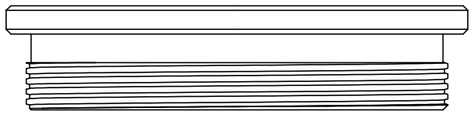
DRAWN BY	DATE
BH	01/23/2014
CHECKED BY	DATE
JM	01/24/2014
MATERIAL	
N/A	
HEAT TREAT	
N/A	

SOUTHWEST OILFIELD PRODUCTS
10340 WALLISVILLE ROAD, HOUSTON,TX 77013

TITLE:
SPECIAL 12P-STYLE HYDRAULIC LINER RETAINER FOR WEATHERFORD

SIZE	DWG. NO.	REV.
B	6576-23A	B

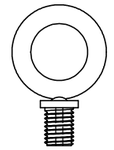
HHN1000-8 HEAVY HEX NUT (QTY 1)



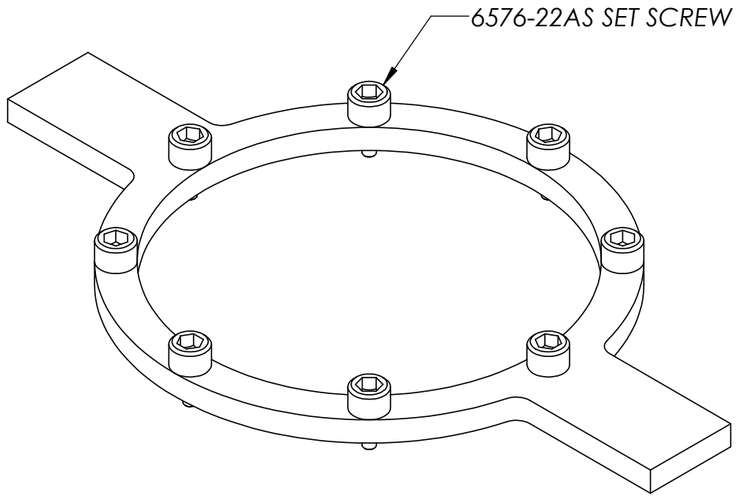
6576-22ADP PISTON DRAW-IN PLATE (QTY 1)

6576-22APS PULLING SCREW (QTY 1)

6576-23ABP BOTTOM PLATE (QTY 1)



6576-22AEB 3/4-10 EYE BOLT (QTY 2)



6576-22ASRRRT SPRING RETAINING RING REMOVAL TOOL ASSEMBLY (QTY 1)

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/64
ANGULAR: ± 0.5°
DECIMAL +.005 / -.000
ALL FILLETS & RADII - 1/16 MAX
CHAMFERS 1/16 X 45° MAX
SURFACE FINISH 125 RMS MAX
CONCENTRICITY NOT TO EXCEED.005 T.I.R.
BREAK SHARP CORNERS 1/32 X 45° MAX

DRAWN BY	DATE
EF	10/13/2014
CHECKED BY	DATE
BH	10/13/2014

MATERIAL: N/A

HEAT TREAT: N/A

SOUTHWEST OILFIELD PRODUCTS
10340 WALLISVILLE ROAD, HOUSTON,TX 77013

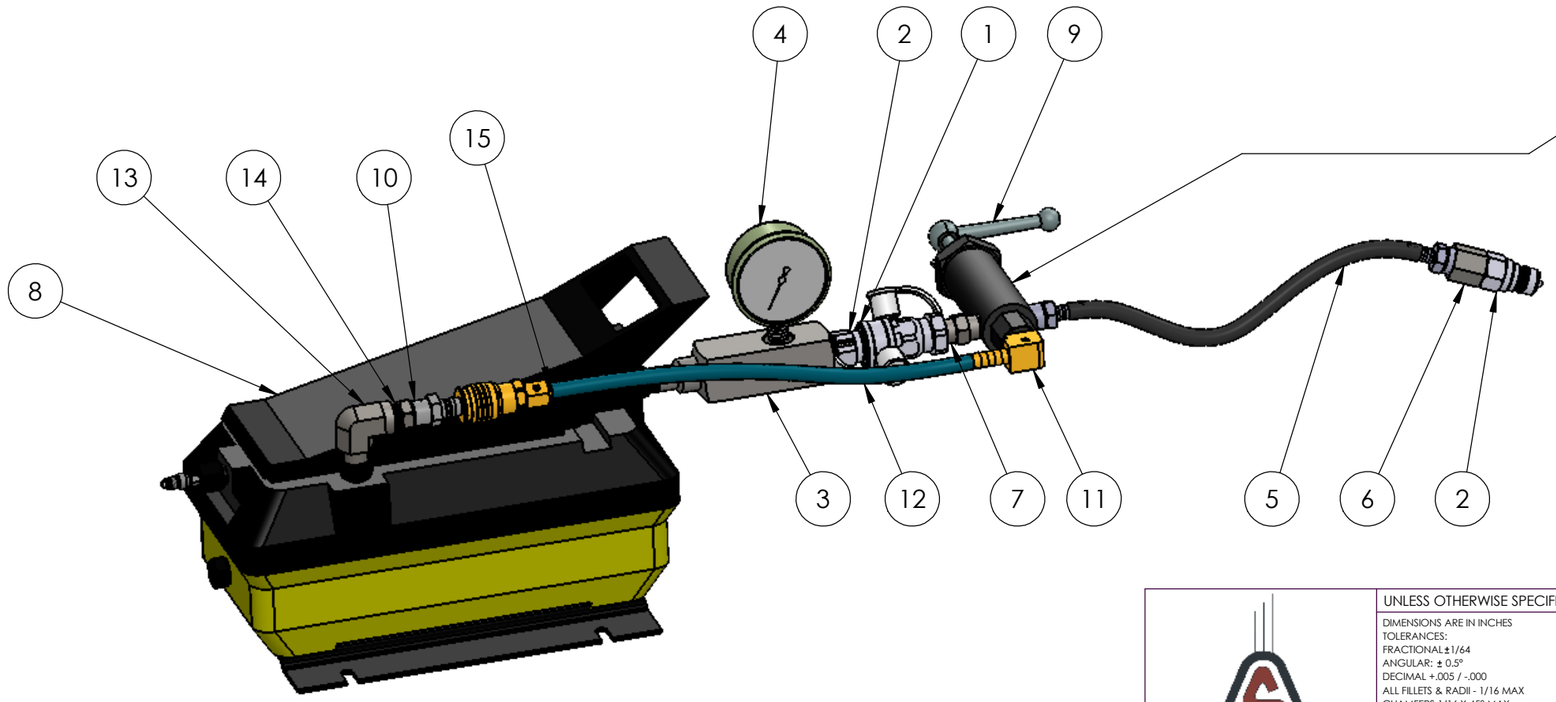
TITLE:
SPRING RETAINING RING REMOVAL TOOL ASSEMBLY

SIZE	DWG. NO.	REV.
B	6576-23ATK	B

SHEET 1 OF 1

HYDRAULIC POWER SYSTEM - PLUMBING FOR INSTALLATION AND REMOVAL OF LINER RETAINERS (BILL OF MATERIAL #6600-20-3-BM)

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	VENDER P/N *(FOR REFERENCE ONLY)*
1	6600-20-1-1	QUICK DISCONNECT, 10000 PSI, FEMALE HALF, 3/8 FNPT	2	ENERPAC CR-400
2	6600-20-1-2	QUICK DISCONNECT, 10000 PSI, MALE HALF, 3/8 MNPT	2	ENERPAC CH-604
3	6600-20-1-3	GAUGE ADAPTER, GAUAGE PORT 1/4 FNPT, 3/8 FNPT TO 3/8 MNPT	1	ENERPAC GA-3 / GRAINGER 3KD39
4	6600-20-1-4	GAUGE 2 1/2" DIA., 0-10000 PSI, 1/4 MNPT	1	ENERPAC G2535L / GRAINGER 3KD57
5	6600-20-1-5	HOSE, 10000 PSI, 15 FT (3/8 MNPT BOTH ENDS)	1	ENERPAC H9210 / GRAINGER 3KD68
6	6600-20-1-6	PIPE ADAPTER, 1/4 MNPT TO 3/8 FNPT, 10000 PSI	1	ENERPAC FZ-1055
7	6600-20-1-7	3/8 HEX NIPPLES (RATED FOR 10000 PSI)	1	ENERPAC FZ-1617
8	6600-20-1-8	TURBO AIR-POWERED PUMP, 10000 PSI	1	ENERPAC PATG-1102N
9	6600-20-1-10	HYDRAULIC PRESSURE RELIEF VALVE, 3/8 FNPT (PSI SET FOR PUMP)	1	ENERPAC V-152
10	6600-20-1-11	QUICK DISCONNECT WITH SHUT-OFF, 1/4 MNPT & 1/4 FNPT	1	GRAINGER 3KD28
11	6600-20-1-13	3/8 MALE BARB TO 3/8 MNPT FITTING ELBOW	1	MCMASTER-CARR 53525K18
12	6600-20-1-14	POLYETHELYNE TUBING, 100 FT. ROLL, 3/8 ID X 1/2 OD	1	GRAINGER 4HL98
13	6600-20-1-19	3/8 X 3/8 STREET ELBOW	1	ENERPAC FZ-1616
14	6600-20-1-20	3/8 X 1/4 REDUCING PIPE NIPPLE	1	MCMASTER-CARR 51205K133
15	6600-20-1-22	3/8 BARB X 1/4 FNPT	1	MCMASTER-CARR 5346K35



RELIEF VALVE PRESSURE SET AT

_____ PSI.

VALVES ARE PRE-SET AT FACTORY,
DO NOT TAMPER WITH SETTINGS.

NOTES: CONNECT HOSE WITH RELIEF VALVE AND PLASTIC HOSE TO HYDRAULIC PUMP. CONNECT OTHER END TO HYDRAULIC LINER RETAINER CONNECTION.

INSTALL DUST CAPS ON ALL CONNECTIONS WHEN NOT INUSE.

AIR LINE TO PUMP SHOULD HAVE A REGULATOR, FILTER, AND LUBRICATOR. USE ONLY GENUINE ENERPAC HYDRAULIC OIL.

6600-20-1-15 ALTERNATE HYDRAULIC HAND PUMP AVAILABLE (ENERPAC P-39 / GRAINGER 4Z480)

6600-20-1-16 HYDRAULIC LINER RETAINER HOSE ASSEMBLY CONSISTS OF ITEMS 2 (2), 5, 7, 10, 11, 13, 14, 22

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/64
ANGULAR: ± 0.5°
DECIMAL +.005 / -.000
ALL FILLETS & RADII - 1/16 MAX
CHAMFERS 1/16 X 45° MAX
SURFACE FINISH 125 RMS MAX
CONCENTRICITY NOT TO EXCEED.005 T.I.R.
BREAK SHARP CORNERS 1/32 X 45° MAX

DRAWN	DATE
BH	10/29/2012
CHECKED	DATE
EF	11/1/2012

MATERIAL
N/A

HEAT TREAT
N/A

SOUTHWEST OILFIELD PRODUCTS
10340 WALLISVILLE ROAD, HOUSTON,TX 77013

TITLE:
HYDRAULIC LINER RETAINER FOOT PUMP ASSEMBLY

SIZE	DWG. NO.	REV
B	6600-20-1-A	A

SHEET 1 OF 1