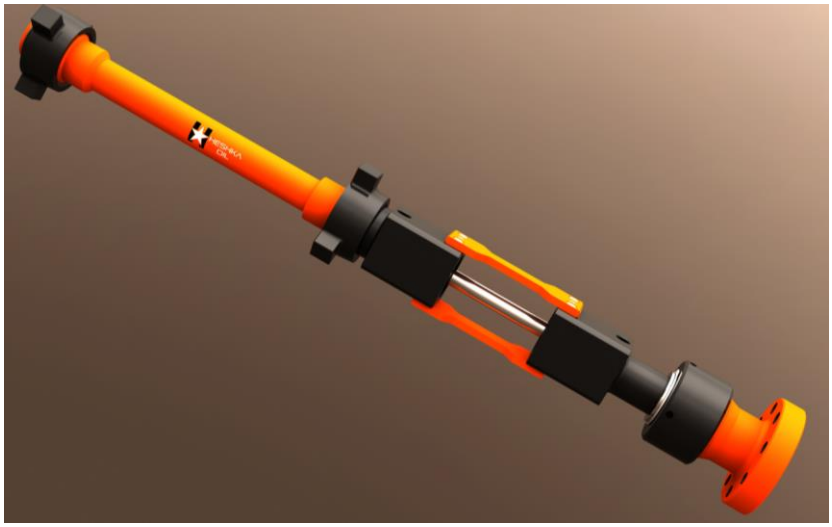
Pressure Balanced Manually Operated VR Lubricator Operation & Maintenance Manual

H-OMM-0008



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Revision History

Revision A

Original Issue of Operating Manual

Safety Hazard Indicators

Indicates a hazardous situation which, if not avoided, could result in injury.

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Indicates a hazardous situation which, if not avoided, will result in death.

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General Safety Guidelines

Read and understand all instructions herein prior to operating any equipment. Failure to follow may result in serious personal injury and damage not only to the equipment but also the environment.

1. Stay alert, use common sense and experience when using oilfield equipment.
2. Operators should be trained and exhibited a level of competency running this equipment in a facility prior to running in the field.
3. Always use proper PPE and the correct tools during the operation.
4. It is recommended that a Job Safety Analysis be performed prior to work commencing.
5. Be aware of unexpected circumstances that may arise during operations. Stop work and assess the hazards that may be posed and develop a plan to mitigate them.
6. When handling and lifting equipment always be sure to use the correct lifting devices and follow company rules when lifting heavy equipment.

Warning

The purpose of this document is to describe the correct process for running and retrieving a BPV or TWCV with PBMO Lubricator through the tree or BOP stack.

Running and Retrieving should be operated by a reputable service company and with qualified personnel.

Several factors are particularly important to consider prior to performing this potentially dangerous procedure.

- Always conduct a Job Safety Analysis on the rig and prior to starting the job.
- If working on an offshore platform or workover rig never place yourself in a tight space when checking for trapped pressure
- When working on land always have a man basket to work from.
- Always have proper lifting and holding devices to enable the safe manipulation of the lubricator.

1.0 Introduction

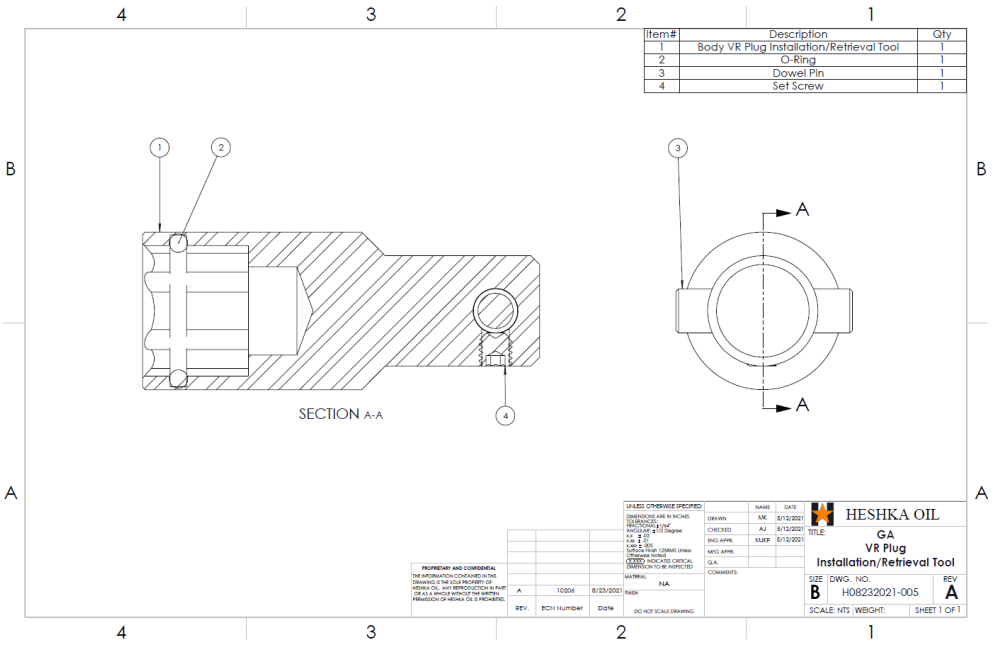
The information and procedures that follow serve as a guide for the installation and retrieval of Medium Pressure (<=10,000 psi) V Thread VR and High Pressure (>10,000 psi) ACME Threaded VR Plugs utilizing the appropriate tools supplied by HESHKA Oil LLC.

A **VR plug** is a device that seats in a mating thread located in the tubing/Casing Spool outlet. It enables the isolation of the wing valves from the casing/tubing annulus pressure that may exist, in order to remove, refurbish and replace them.

Note: VR Plugs should not be left in place for extended period of time since pressure can build up behind it making it more difficult to retrieve especially if there is no way to release the pressure from the annulus.

2.0 VR Plug Installation/Retrieval Tool

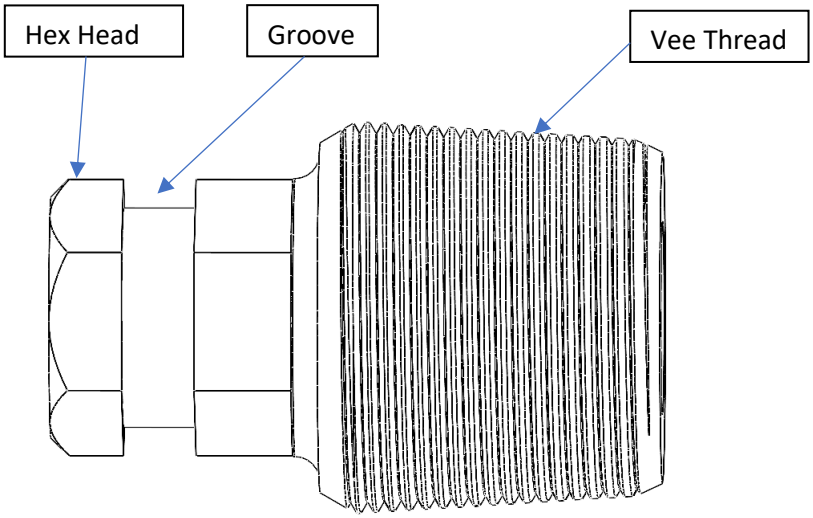
2.1 The Installation/Retrieval tool is a Socket that includes an O-Ring attached to the end of the polished rod by means of a pin and set screw. The O-Ring is there to hold the VR Plug in place during installation and removal.



Installation/Retrieval Tool

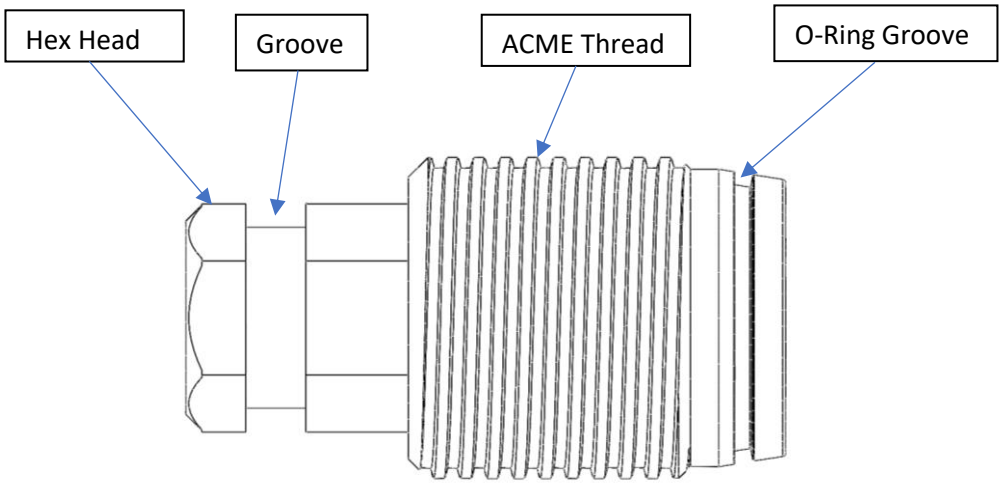
2.2 VR Plug (Medium Pressure) Features

The medium pressure VR plug consists of a body with a tapered sharp V thread a Hex End and Groove. The V thread is a sealing thread and mates with the wellhead outlet thread. The Hex End mates with the Hex in the Installation/Retrieval Tool and the Groove allows the O-Ring to engage with it and hold the plug in the socket.



2.3 VR Plug (High Pressure) Features

The High Pressure VR plug consists of a body with an ACME thread, a Hex End and a Groove with each feature mimicking what the medium pressure VR plug does. There is an additional groove in the nose of the plug that houses an O-Ring and is what seals the plug with the wellhead tubing/casing spool.



3.0 Specifications

Medium Pressure VR Plug

	Nominal Outlet Size	Nominal Thread OD A	Threads Per Inch TPI	Thread Type
Part Number	Tolerance		(REF.)	NA
VR-114-LP-DD	1- 13/16	1.660	11-1/2	Line Pipe
VR-112-SV-DD	2-1/6	1.900	11-1/2	Sharp Vee
VR-238-SV-DD	2-9/16	2.375	11-1/2	Sharp Vee
VR-278-SV-DD	3-1/8	2.875	11-1/2	Sharp Vee
VR-312-SV-DD	4-1/16	3.500	11-1/2	Sharp Vee

High Pressure VR Plug

	Nominal Outlet Size in	Nominal Thread SIze A	Threads per Inch TPI
Part Number	Tolerance		(Ref.)
HPVR-134-DD	1-13/16	1-3/4	6
HPVR-200-DD	2-1/16	2	6
HPVR-250-DD	2-9/16	2-1/2	6
HPVR-300-DD	3-1/16	3	6

4.0 VR Lubricator

4.1 The Heshka Oil LLC. Pressure Balanced Manually Operated (PBMO) VR lubricator is designed to run and retrieve threaded type VR Plugs. The following are the features of this lubricator.

- Polished rod offered in 2 diameters – 1-1/8” and 1-1/4”
- Connection can be either Flanged, Weco or API Acme style
- High Pressure Needle Valves
- Manifold to manage the pressure that may be in the well during operations.
- 10,000 psi rated components (Flanged or Heshka Slik Connect style 15,000 psi)
- H2S/CO2 or General/Sweet Service

4.2 This lubricator is designed to attach to the outlet of the Wellhead Spool or Tubing Head wing Gate Valves. The needle valves are to enable the isolation and monitoring of pressure both in the well and the lubricator. It is an open yoke design

allowing for the manipulation of the rod in and out as well as rotation, even with pressure in the system. The yokes house the low friction seals that contain the pressure. The outer portion of the lubricator is made up of tubular sections connected by means of couplings (WECO/Slik Connect) or API flanges. This modularity of the system can accommodate various stroke lengths.

5.0 Running Procedure

5.1 Running procedure is the same for either the Medium or High Pressure VR Plugs.

5.2 PBMO VR Lubricator

5.2.1 Pre-Run Checks

- Lubricator was tested prior to shipping to site.
- Ensure all tools are on hand.
- Determine the size of the VR Plug.
- Inspect VR Plug Threads for damage
- Gage thread with a No-Go Gage
- Confirm material/class of Tubing Head/Wellhead Spool is sufficient for rating of the VR Plug.
- Make up VR plug to Installation/Retrieval tool and confirm there is resistance from release by the O-Ring
- Make up Installation/Retrieval tool to the Coupling attached to the Polished Rod using the Dowel pin and Set screw
- Ensure correct stroke of Lubricator by manipulating the Polished rod out of the lubricator until the no go stops in the outermost Yoke. Measure distance from Flange face to end of VR Plug and compare with the valve distance you are passing through.
- Follow Company Safety Guidelines and Protocols prior to mounting the VR lubricator to the Wellhead Valve Flange.

5.3 VR Plug Lubricator Operation (Refer to Drawing PBMO-GA-OP-MAN)

- Close Inner & Outer (if fitted) Gate valves on Wellhead Tubing Head/Spool.
- Bleed down pressure from all cavities that may contain pressure including the casing/tubing annulus
- Once confirmed that there is no pressure in the valves and annulus the blind flange may be removed from the Gate Valve.
- Make up correct flange adapter to VR Lubricator
- Pick up lubricator and manipulate the rod out the bottom until the Coupling (1) is exposed.
- Close Valves A & B and open Valves C & D.
- Install hydraulic jumper line to the available port on Valve D.
- Insert top end of VR running/retrieval tool into the coupling (1) aligning the holes enabling the fitting of the pin.

- Lock the pin in place with the 3/8” set screw.
- Make up VR Plug to Installation/retrieval Tool.
- Install VR lubricator onto the outermost Gate Valve and make up the connection pressure tight.
- Connect the hydraulic jumper to the tubing head or whatever setup you have for running the lubricator. Ideally if the jumper can be attached to the blind flange on the opposite outlet it will ensure the pressure in the Lubricator is the same as in the annulus.
- If unable to jumper to the annulus and pressure is known to be in the Tubing Head/Spool Annulus, pressure the system to well pressure through the hydraulic line attached to valve D on the lubricator. Monitor for leaks. If leaks present, bleed down pressure and repair.

  Note: If there is the possibility of there being gas condensate present on the well it is recommended to use a solution of glycol and water or other freeze resistant fluid in the lubricator. This will assist in eliminating the freezing of the lines.

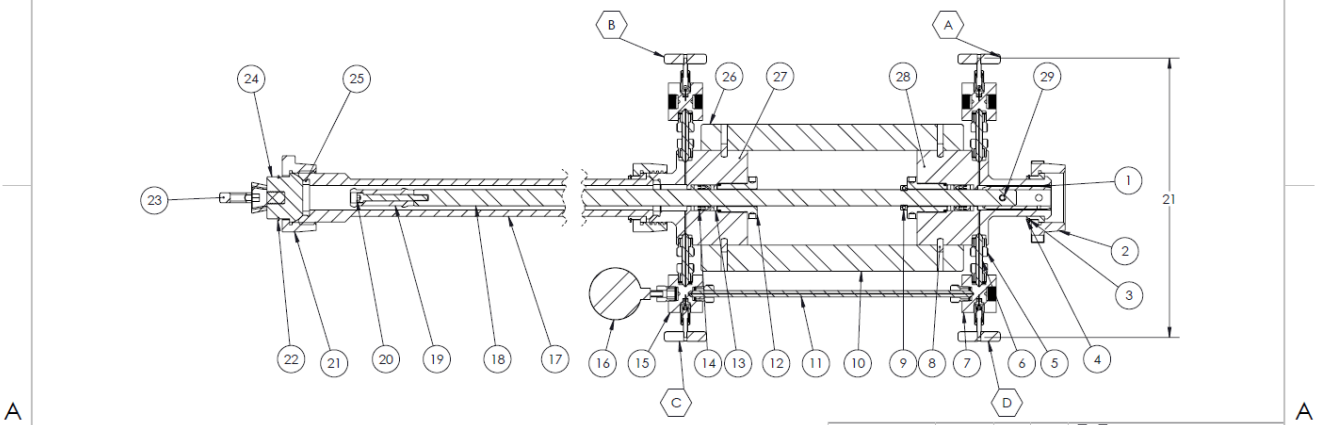
- With pressure maintained on the system open the Gate Valve/s. The lubricator pressure should now be the same as the well pressure.
- Attach the Parmalee Wrench to the polished rod. Commence advancing the Polished Rod until the VR Plug comes in contact with the wellhead threaded outlet.
  Note: The distance from the face of the top Packing Gland Nut (PGN) (12) to the face of the bottom PGN is approximately 7”. By marking the polished rod at the start of each stroke and counting the number of strokes it took to reach the hanger threads and comparing with the known measurement from earlier will give an indication of whether you are at the correct location.
-  Warning: Never allow any part of your body to be placed above or below the Parmalee wrench or its handle in the lubricator window. Should the polished rod move up or down suddenly the wrench could result in serious injury or death to personnel.
- After confirming you are in the right place mark the polished rod at the outermost yoke. Pull on the Parmalee Wrench and rotate clockwise at the same time. Continue to rotate the polished rod noting the change in position of the mark on the polished rod. When the VR Plug gets tight apply approximately 50-65 ft-lbs at the end to be sure the seal is effective.
- Once the VR Plug is installed, pull on the polished rod to disengage the tool from the plug.

- The polished rod complete with Installation/Retrieval tool can be pulled back to a position beyond the outermost gate valve gate.
  Note: Monitor pressure throughout the operation.
- On reaching the correct location bleed pressure from manifold on Lubricator by opening Valve A. This bleeds pressure from gate valves and if jumper is connected to annulus it will bleed this down also. If there is a Bleed Point on the Wellhead Tree it can be used also.
- Remove or close jumper to wellhead annulus at wellhead connection.
- Monitor pressure gage on lubricator (5minutes) for increase in pressure. Any pressure increase is an indication the VR Plug is not set correctly. If this is the case it will be necessary to run back in and tighten the plug.
- If there is no indication of pressure rise on the Gage valve A on the lubricator can be opened and monitored for fluid release. Before proceeding ensure that any fluid stream coming from valve A reduces to no fluid coming from the valve. This ensures that the VR plug is leak tight.
- On completion of all checks the VR Lubricator may be removed from the Valve flange.

  Note: if the valves are being repaired in-situ the lubricator can remain connected.

- Gate Valve/s may now be removed for replacement with new ones.

Item #	Description	Qty.	Item #	Description	Qty.	Item #	Description	Qty.	Item #	Description	Qty.
1	BPV Coupling	1	9	Shaft Collar	1	17	HP Tubing 2" 1502 Weco Male x Female	1	25	2" 1502 Weco Seal Ring	2
2	2" 1502 Weco Hammer Union	3	10	Side Plate	2	18	Polished Rod	1	26	Cap Screw (Side Plate)	16
3	Retainer Ring	3	11	HP Tubing	1	19	No-Go	1	27	Upper Yoke Body	1
4	Lock Ring	2	12	Packing Gland Nut	2	20	Cap Screw	1	28	Lower Yoke Body	1
5	HP A/Clave Nut	8	13	Backup Washer	4	21	2" 1502 Weco Hammer Union	1	29	Set Screw	4
6	HP A/Clave Tubing	2	14	Packing	2	22	Retainer Ring	1			
7	HP A/Clave Valve 2 Way	3	15	HP A/Clave Valve 3 Way	1	23	Lift Eye	1			
8	Dowel Pin	4	16	Pressure Gage	1	24	2" 1502 Weco Hammer Union Plug	1			



6.0 Retrieval Procedure (New or Refurbished Valves Installed)

- Inspect the Installation/Retrieval tool for signs of damage.
- Measure and record the distance from the wellhead outlet face to the outermost flange face.
- Check for pressure and bleed off if present. Close the Gate Valves (if not already closed) on the Wellhead Tubing Head/Spool.
- Once confirmed that there is no pressure in the system pick up the VR lubricator with tool installed.
- Install lubricator onto the outermost valve flange and make up the connection pressure tight.
- Connect the hydraulic jumper to the tubing head or whatever setup you have for running the lubricator. Ideally if the jumper can be attached to the blind flange on the opposite outlet it will ensure the pressure in the Lubricator is the same as in the annulus.
- If unable to jumper to the annulus and pressure is known to be in the Tubing Head/Spool Annulus, pressure the system to well pressure through the jumper

line attached to valve D on the lubricator. Monitor for leaks. If leaks present, bleed down pressure and repair.

- Note: If there is the possibility of there being gas condensate present on the well it is recommended to use a solution of glycol and water or other freeze resistant fluid in the lubricator. This will assist in eliminating the freezing of the lines.
- With pressure maintained on the system open the Gate Valves. The lubricator pressure should now be the same as the well pressure.
- Attach the Parmalee Wrench to the polished rod. Commence pulling the polished rod with the parmalee through the valves toward the wellhead. Continue until the desired distance has been achieved.
  Note: The distance from the face of the top Packing Gland Nut (12) to the face of the bottom PGN is approximately 7". By marking the polished rod at the start of each stroke and counting the number of strokes it took to reach the VR Plug and comparing with the known measurement from earlier will give an indication of whether you are at the correct depth.
-  Warning: Never allow any part of your body to be placed above or below the Parmalee wrench or its handle inside the lubricator window. Should the polished rod move up or down suddenly the wrench could result in serious injury or death to personnel.
- After contact has been made, pull down on the Parmalee wrench and at the same time slowly rotate the polished rod clockwise (right). Check for downward movement (approx. 1"- 1.25") of the rod as you rotate aligning the Hex on the socket with the Hex on the VR Plug. Once connected apply approximately 65-85 ft-lbs in a counterclockwise direction with the parmalee wrench to start backing out the VR plug.

: It is important to watch the pressure situation as you retrieve the VR plug. Should the pressure start to rise in the system give it time to settle before finally retrieving the VR plug.

- Once pressure has stabilized continue rotating and pulling on the polished rod with the parmalee wrench. You will know when the plug is fully released as it will be significantly easier to retrieve the polished rod.
- The rod complete with tool and VR Plug can be retrieved back to a position beyond the gate of the outermost valve.
- On reaching the correct position close the outermost gate valve.
- Bleed pressure from manifold on Lubricator by opening Valve A. This bleeds pressure from downstream side of valve also.

- Once pressure is confirmed to be 0 psi, remove Lubricator assembly, and replace blind flange as required.

> **DANGER** **UNDER NO CIRCUMSTANCES IS A VR PLUG TO BE LEFT IN A WELLHEAD OUTLET LONGER THAN THE PERIOD OF TIME NEEDED TO CONDUCT THE NECESSARY CHANGE OUT OF EQUIPMENT.**
>
> **LEAVING THE VR PLUG IN THE WELLHEAD OUTLET LONGER THAN IS NECESSARY MAY RESULT IN A MORE COMPLICATED SHUT DOWN PROCEDURE HAVING TO BE FOLLOWED**

7.0 Maintenance

The following section describes maintenance guidelines that will extend the life of the lubricator and ensure it works reliably and safely during each use.
The following steps should be taken on completion of a job. Refer to the GA drawing for your lubricator.

i. Visual inspection of external components. Ensure all Valves and Hydraulic Tubing are free from damage. If any of the tubing should be bent or kinked it should be replaced. If the Valve handles are bent, they should be replaced. Inspect the condition of the rod around the window to ensure it is damage free. If any signs of gouges, deep scratches, or sharp edges appear in the rod, it should be removed for a complete inspection.
ii. Drain system of all fluids. This can be done by removing the top connection(24) from the extended pipe spools (17) and raising the lower end off the ground.
iii. Before replacing the weco plug (24) or flange on the spool fill the assembly using a 50/50 water/glycol mix. This will protect the carbon steel components from internal corrosion.
iv. Replace the end connection (24) and pressure test unit to operating pressure for your lubricator to evaluate the effectiveness of the sealing elements, valves, and manifold system.
v. If the unit holds pressure steady for 3-5 minutes without any visible leaks from the connections, packing or valves the unit can be stored safely for the next job.
vi. Heshka Oil LLC. Strongly recommends the use of a Maintenance Form for each lubricator in use to capture the history of the tool.
vii. If there are any issues with equipment leaking, go to section 8 for instructions to inspect and replace the failed components.

8.0 Disassembly/Assembly Instructions

Note: this section covers Polished Rod and Packing removal and replacement. Refer to the GA drawing for your lubricator.

i. If Polished Rod Shaft collar (9) is attached to the rod (18), remove it.
ii. Remove the Weco Hammer Union Plug (24) or Blind flange from the top end of the pipe spool (17).
Note: Check for corrosion of the threads, sealing surfaces or ring grooves. Clean items and coat with grease prior to installation.
iii. Pull the rod (18) out of the lower yoke of the lubricator until the No Go (19) meets the upper yoke (27) and cannot be removed anymore.
iv. Remove the upper pipe spool (17) by disconnecting the weco nut (2) from the upper yoke body (27).
Note: Check for corrosion of the threads, sealing surfaces or ring grooves. Clean items and coat with grease prior to installation.
v. Remove BPV/TWCV No Go (19) attached to the top of the polished rod. Manually move the rod out enough to remove the No Go. You will need to hold the polished rod (18) with a Parmelee wrench to keep it from rotating as you remove the No Go Cap Screw (20)
vi. Manipulate the rod downwards/out the bottom end of the lubricator.
vii. Pull the rod completely out and place it on a suitable surface for inspection. If there are no signs of gouging or deep scratches and the overall surface is smooth, set the rod aside until needed.
viii. Unscrew the Packing Gland Nuts (12)x2 using a face spannere from the lower & Upper yokes and set them aside.
ix. Remove the packing Backup washers (13)x2.
x. Using a pick remove the packing elements (14)x2 individually. Ttaking care not to scratch the sealing surface in the Yoke Body.
xi. Inspect the seal bore in the Yoke Bodies (27) & (28) for damage. Should there be significant scratching or gouging it will be necessary to rework or replace the component.
xii. Assembly of new packing (14) is done by placing it in the seal bore of the YOKE then using the Packing Gland Nut (12) to install it. You will need to leave the metal backup washer (13) out until packing has been installed.
xiii. With packing (14) installed remove Packing Gland Nut (12) and insert backup washer (13) and hold it in place by threading the Packing Gland Nut into the yoke body.
xiv. Repeat process for second seal set.
xv. Replace polished rod by inserting through the lower yoke and pushing it through until it passes both sets of packing. Extending it out the top sufficiently to install the No Go.

Note: install polished rod leading with tapered edge to ensure there is no damage done to the packing. Also mineral oil may be used to lubricate the rod prior to installation.

xvi. Make up any spools that were removed replacing seal gaskets, as necessary.

xvii. Prior to replacing the top weco blanking plug(24) and weco nut (21) it would be a good time to fill the spool with a 50/50 glycol water mix.

xviii. With top Weco connection tightened down the unit is ready to test.

9.0 Pressure Testing

9.1 It is important to understand the dangers of pressure testing as an incorrectly made up fitting or connection could lead to catastrophic failure ejecting parts that could cause death to personnel and or extensive damage to equipment. Ensure all high pressure hoses/tubing are in excellent condition with no signs of damage.

9.2 Prior to testing ensure company protocols are followed with respect to safety, including the wearing of appropriate PPE and location of the test, either in a walled test bay or with other appropriate barriers in place.

9.3 It is recommended that a 50% Water 50% Glycol mix be used for testing. This fluid can be left in place as a protection against corrosion.

9.4 Push polished rod/coupling inside lubricator until flush with the lower yoke body.

9.5 Refer to the GA drawing in an earlier section of this document

9.6 Attach appropriate test adapter to the lower yoke body and make up pressure tight.

9.7 Connect hydraulic pump hose connection to the port on valve D and confirm it is open.

9.8 Ensure valve C is open and valves A & B are closed.

9.9 Depending on the spacer spool end connection it is recommended that the lubricator be raised up such that the air can be bled from the system during filling.

Note: If fitted with a weco connection it can be removed and the lubricator filled using a water hose (adding the appropriate portion of Glycol).

Note: If fitted with a test port at the end of the spool it can be used to bleed the air during the filling process.

9.10 Once filled with fluid replace the weco union or test port fitting.

9.11 Commence pumping until a pressure of 25% of working pressure is reached. Hold for 30 seconds checking for any visible signs of leakage.

9.12 If O.K. continue pumping until a pressure equal to the working pressure has been reached. Once at pressure hold for 15 minutes monitoring for signs of leakage.

9.13 On completion of the test, release pressure back to 0psi.

9.14 Repeat pressure testing to working pressure and hold for 15 minutes monitoring for signs of leakage.

9.15 On completion of a successful pressure test release pressure back to 0 psi.

9.16 Close valve D remove test flange and store.

9.17 Lubricator is now ready to be transported to and used in the field.

Working Pressure (PSI)	25% of Working Pressure (PSI)	Maximum Test Pressure (PSI)*
5,000	1,250	5,250
10,000	2,500	10,500
15,000	3,750	15,500

Note: *Per API 6A the initial test pressure shall not be greater than 5% above the working pressure. Monitored pressure shall not vary from the test pressure at the start of the test by more than 5% or 3.45 MPa(500psi) whichever is less, during the entire hold period. During the entire hold period, the monitored pressure shall not drop below the specified working pressure.

Note: All hold periods shall not start until the test article and the pressure measuring/recording equipment has been isolated from the pressure source, pressure in the lubricator has stabilized and the external surfaces of the shell members have been thoroughly dried.

Note: If at any time during the pressure testing of the unit there are signs of leakage from the packing located in the upper or lower yoke bodies, refer to the relevant disassembly/assembly instruction located in this document for instructions to fix the issue.