Tool Manual			
Assembly Procedure No.	M-0101-7000/8500/8500H	Revision	K
Tool Assembly Family	0101		
Tool Description	DT Surface Flapper Safety Valve 7" standard service, 8 ½" standard service, 8 ½" H2S service		

Issued By	Paul Hilliard
Date	18/07/2016
Checked By	Jeff Knight
Date	03/11/2016

Revision	Date	Changes
H	22-Aug-17	Update running procedures/specs
J	23-Mar-18	Update renders / latch rings
K	1-Aug-19	Update to include 8 ½" std and 8 ½" H2S tools

Table of Contents

1. Parts List

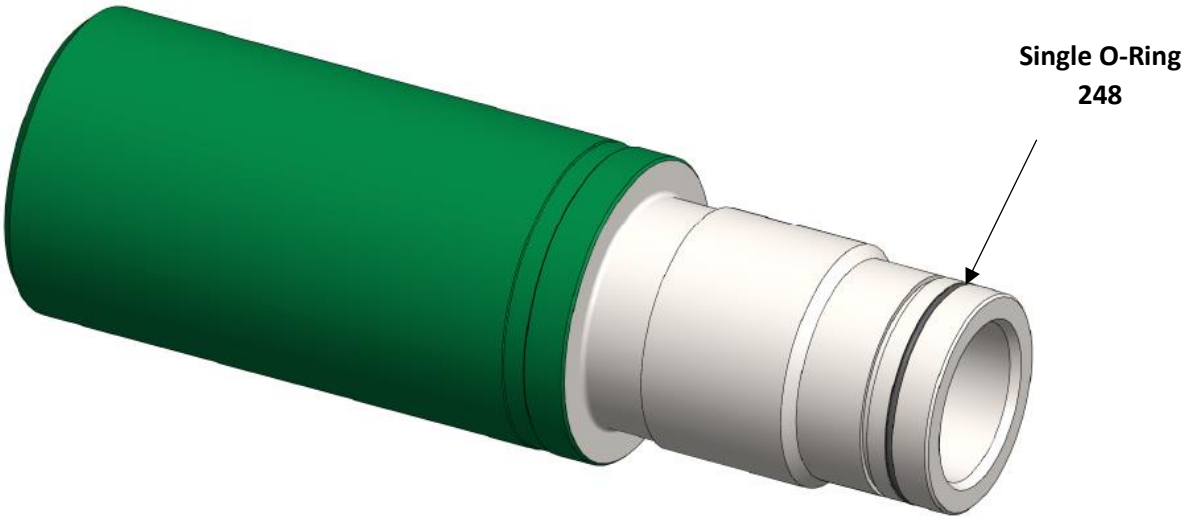
DT Surface Flapper Safety Valve

ITEM NO.	Part Description	Drwg/Part No.	Rev	QTY.	Full Redress Kit?	Seal Redress Kit?
1	7" Top Sub	2-0101-7000-01	F	1		
2	7" Grapple Body	2-0101-7000-02	C	1		
3	7" Mid Sub	2-0101-7000-03	D	1		
4	7" Main Body	2-0101-7000-04	D	1		
5	7" Bottom Sub	2-0101-7000-05	C	1		
6	Lock Open Sleeve	1-0101-7000-06	C	1		
7	Grapple Sleeve	2-0101-7000-07	B	1		
8	Upper Spring Spacer	2-0101-7000-08	A	1		
9	Lower Spring Spacer	2-0101-7000-09	A	1		
10	7.0" Cartridge Housing Assembly	1-0101-7000-10	C	2	**Y**	
11	CV Centraliser Ring	2-0101-7000-38	A	1		
12	Flapper	2-0101-7000-11	E	2	**Y**	
13	Spring Flange	2-0101-7000-12	C	1		
14	Latch Ring	2-0101-7000-13	D	2		
15	Lug	2-0101-7000-14	D	2		
16	Spring Spacer	2-0101-7000-15	A	1		
17	Torque Spacer 0.438" (split)	2-0101-7000-17	A	1		
18a	Torque Spacer 1" (split)	2-0101-7000-18	A	1		
18b	Upper Torque Spacer 1" (solid)	2-0101-7000-26	A	1		
19	Load Collars	2-0101-7000-19	B	1		
20	Locking Ring	2-0101-7000-20	A	1		
21	API Drift Rod	1-8001-2750-01	A	1		
22	Assembly Tool Cartridge Stopper	2-0101-7000-88	B	1		
23	Assembly Pulling Tool	1-0101-7000-82	A	1		
24	Assembly Sleeve	2-0101-7000-93	A	1		
25	Disassembly Sleeve	2-0101-7000-94	A	1		
26	8 1/2" Top Sub	2-0101-8500-01	A	1		
27	8 1/2" Grapple Body	2-0101-8500-02	A	1		
28	8 1/2" Mid Sub	2-0101-8500-03	A	1		
29	8 1/2" Main Body	2-0101-8500-04	A	1		
30	8 1/2" Bottom Sub	2-0101-8500-05	A	1		
31	8 1/2" Top Sub (H2S)	2-0101-8500-01H	A	1		
32	8 1/2" Grapple Body (H2S)	2-0101-8500-02H	A	1		
33	8 1/2" Mid Sub (H2S)	2-0101-8500-03H	A	1		
34	8 1/2" Main Body (H2S)	2-0101-8500-04H	A	1		
35	8 1/2" Bottom Sub (H2S)	2-0101-8500-05H	A	1		
The following parts have no drawing shown						

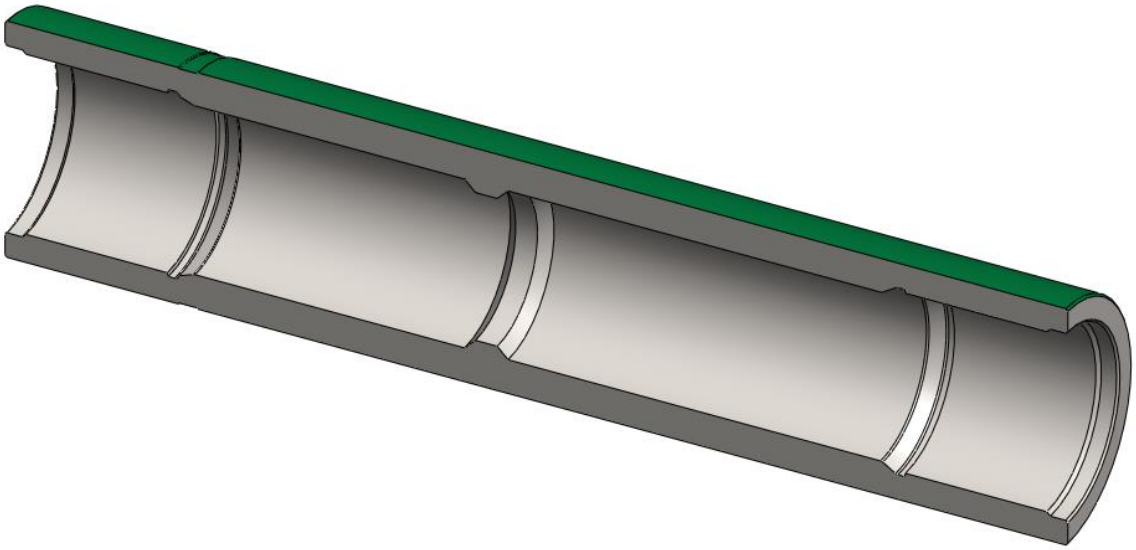
36	Grapple Spring	5-0101-7000-50	A	2		
37	CV Spring	5-0101-7000-51	A	1		
38	O-Ring 248	OR-248	-	6	**Y**	**Y**
39	O-Ring 041	OR-041	-	2	**Y**	**Y**
40	O-Ring 245	OR-245	-	2	**Y**	**Y**
Full Redress Kit (optional)		3-0101-7000-01h-1F				
Seal Redress Kit (optional)		3-0101-7000-01h-3S				

2. Parts Drawings (shown for 7” valve)

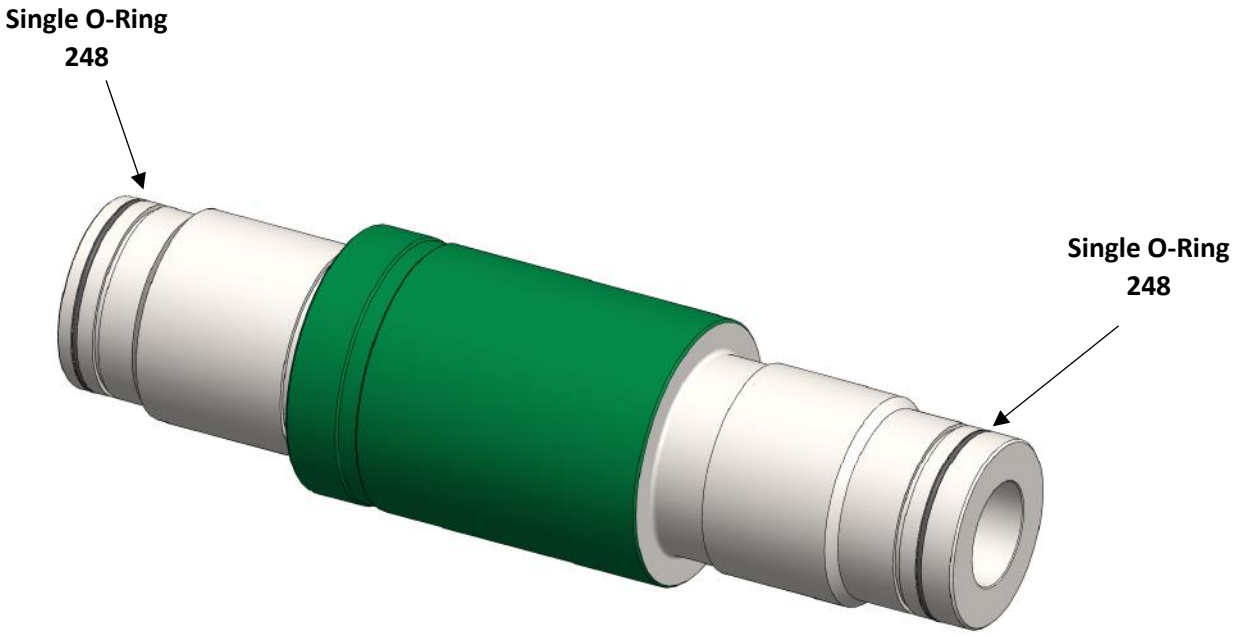
1) Top Sub 2-0101-7000-01



2) Grapple Body 2-0101-7000-02

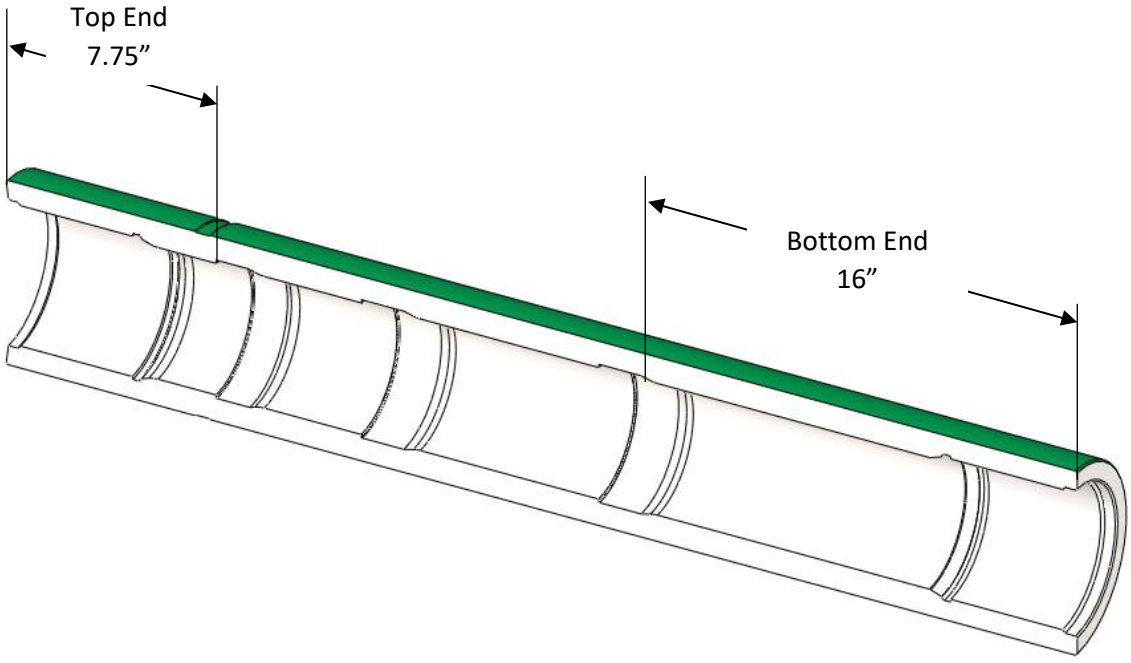


3) Mid Sub 2-0101-7000-03

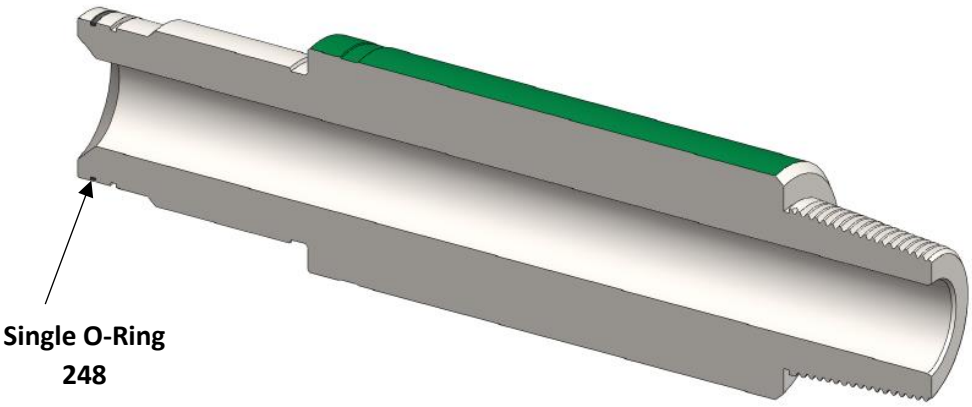


4) Main Body 2-0101-7000-04

The Main Body will be marked top at the top end, if not visible use the internal grooves to locate the top of the Main Body. The top end has grooves closer to the end of the body.

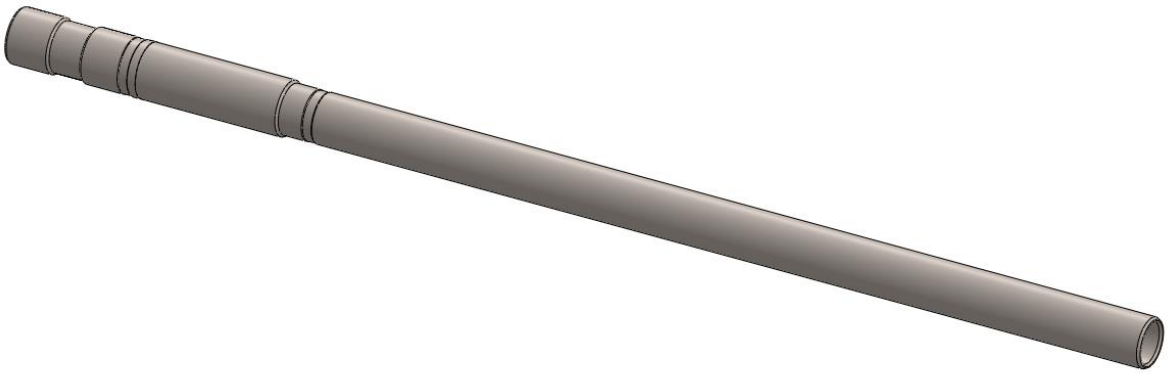


5) Bottom Sub 2-0101-7000-05

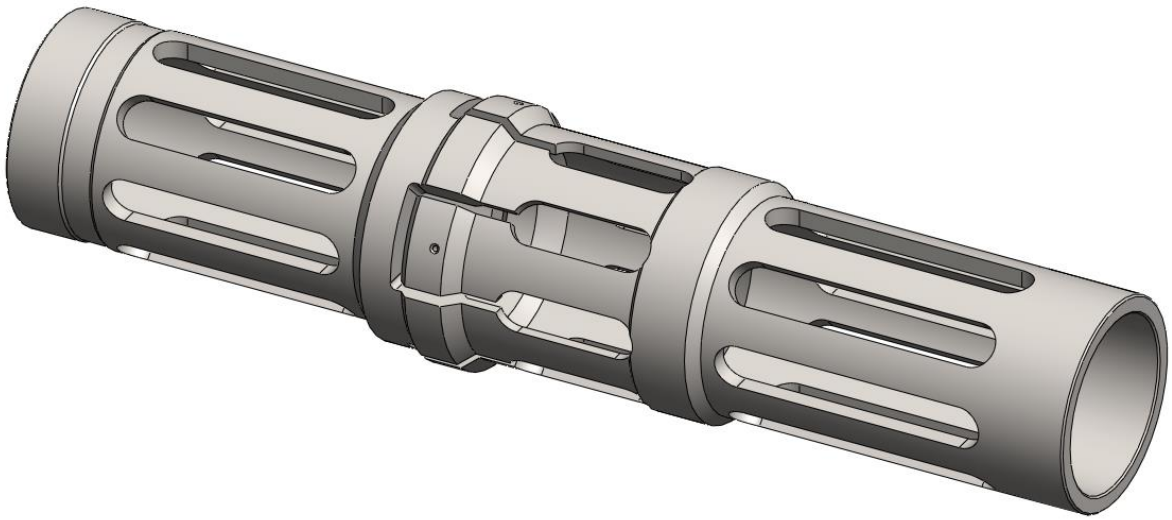


Single O-Ring
248

6) Lock Open Sleeve 1-0101-7000-06
c/w 3" GS (internal profile)

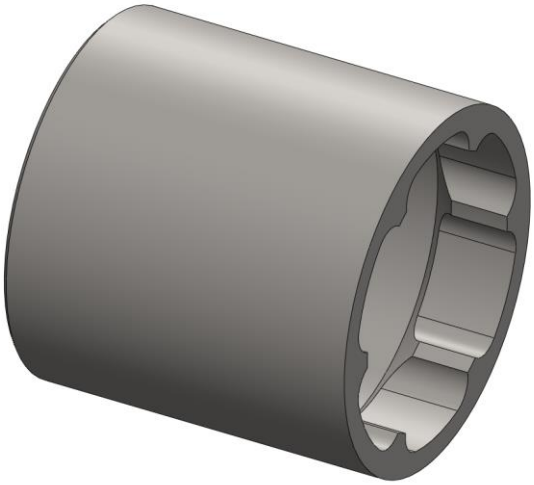


7) Grapple Sleeve 2-0101-7000-07

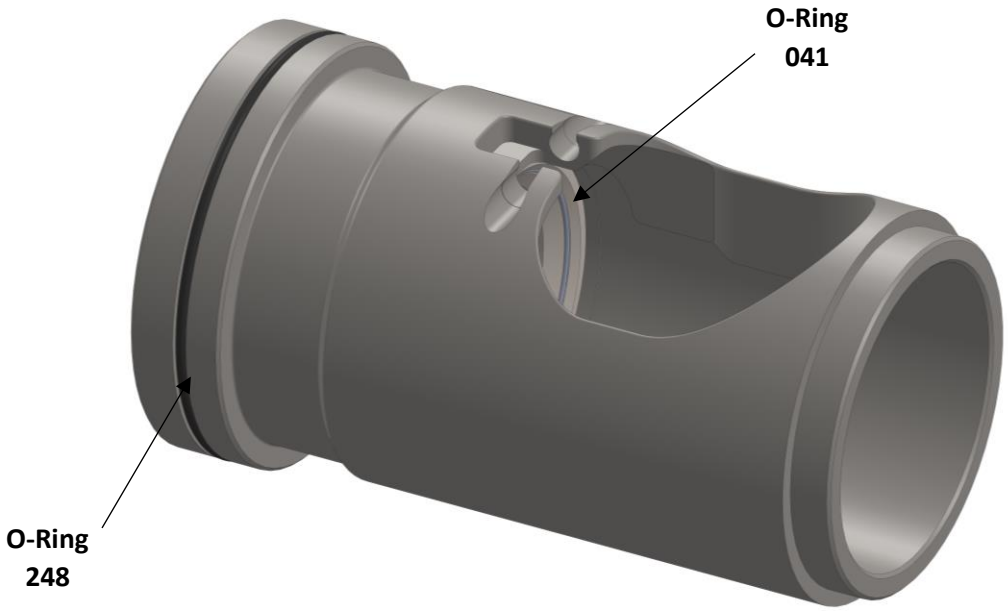


8) Upper Spring Spacer 2-0101-7000-08

9) Lower Spring Spacer 2-0101-7000-09

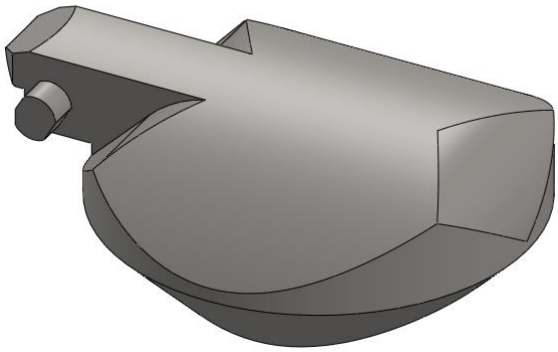


10) 7.0” Cartridge Housing Assembly 1-0101-7000-10



11) CV Centraliser Ring 2-0101-7000-38

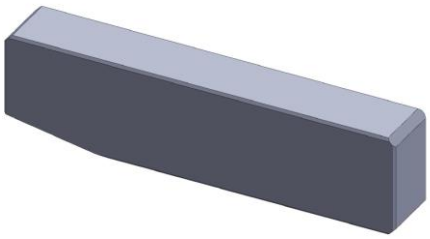
12) Flapper 2-0101-7000-11



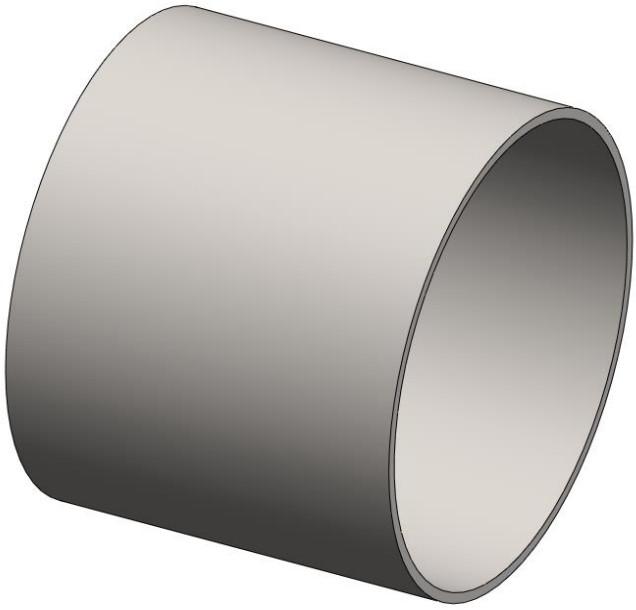
13) Spring Flange 2-0101-7000-12

14) Latch Ring 2-0101-7000-13

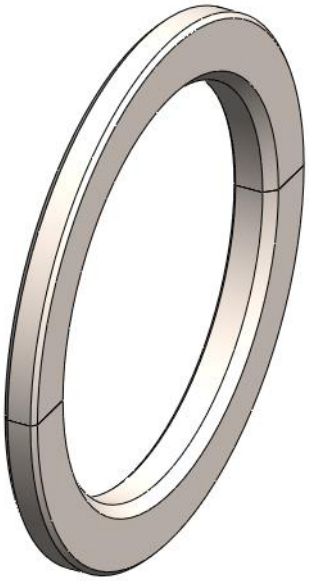
15) Lug 2-0101-7000-14



16) Spring Spacer 2-0101-7000-15

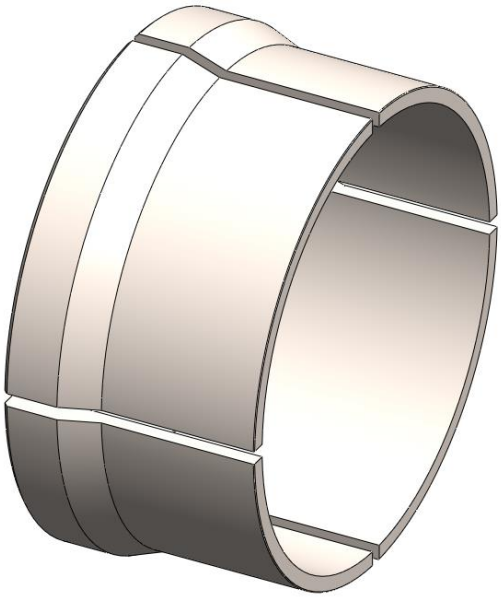


17) 0.438” Torque Spacer 2-0101-7000-17 (two equal halves)

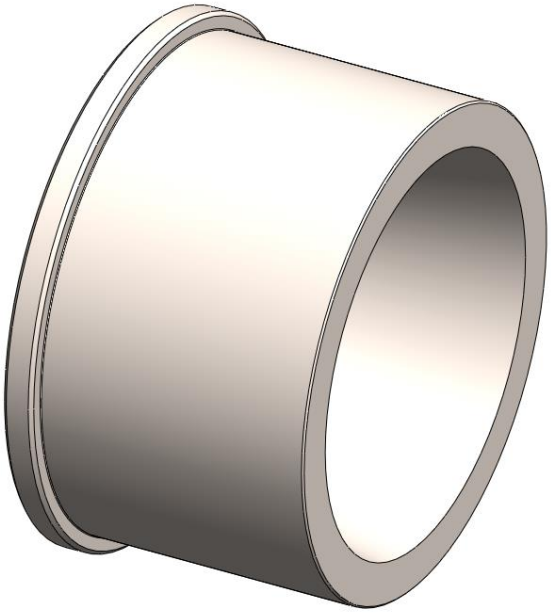


18) 1” Torque Spacer 2-0101-7000-18 and Upper Torque Spacer -26 (split or one piece solid ring)

19) Load Collars 2-0101-7000-19

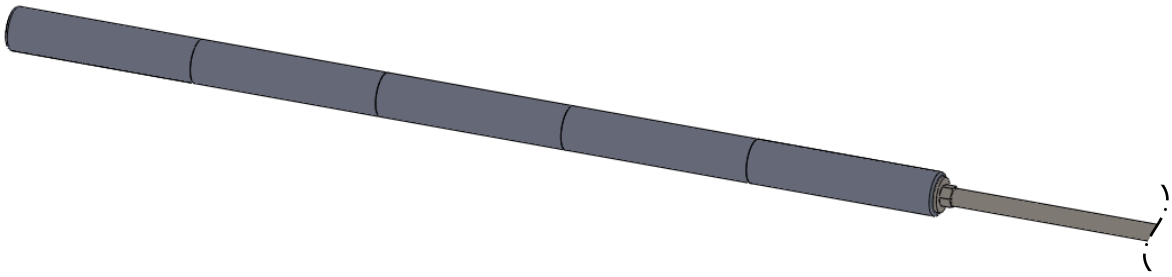


20) Locking Ring 2-0101-7000-20

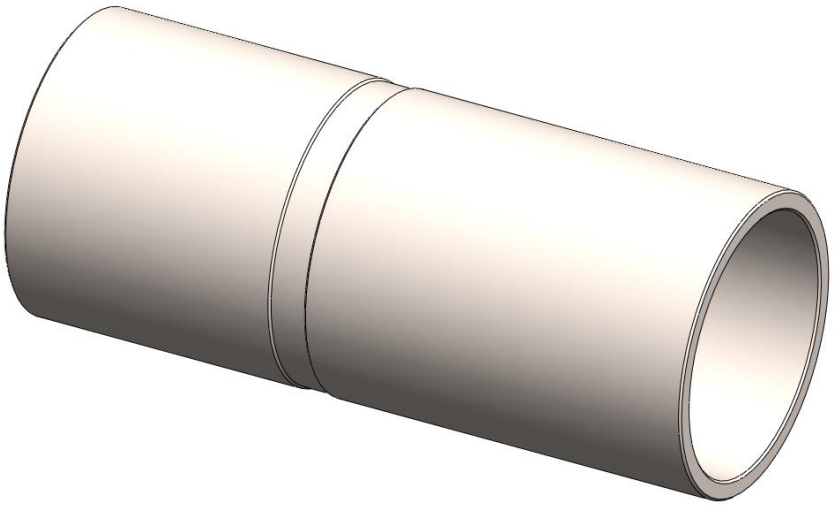


21) API Drift Rod 2-8001-2750-82

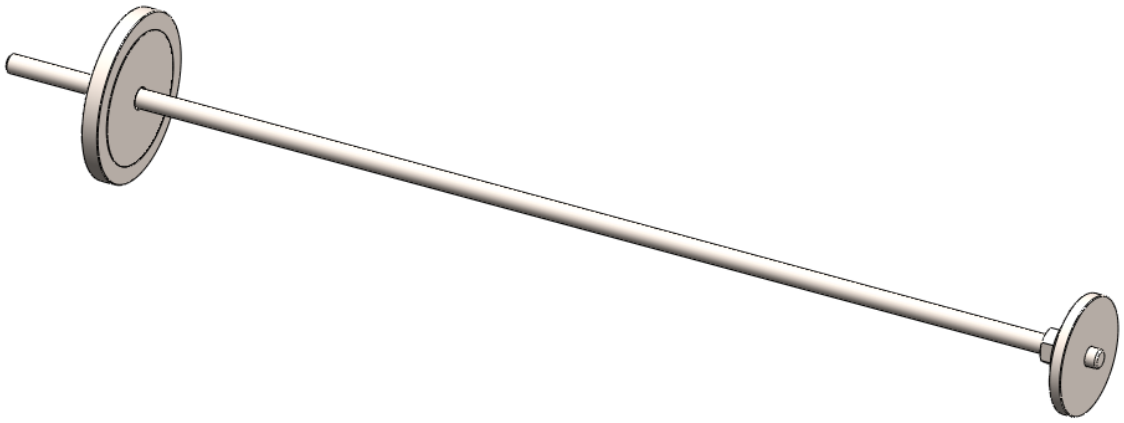
2.656” OD min 42” long



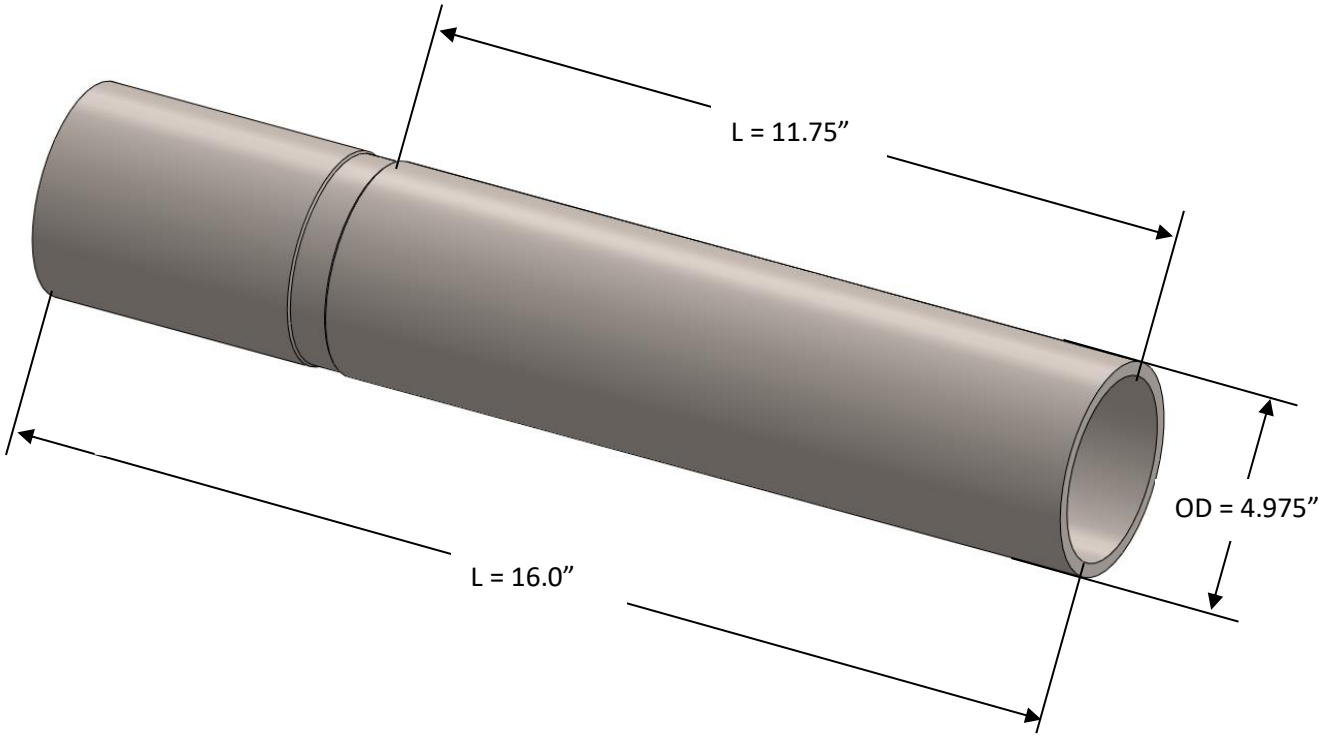
22) Assembly Tool Cartridge Stopper 2-0101-7000-84



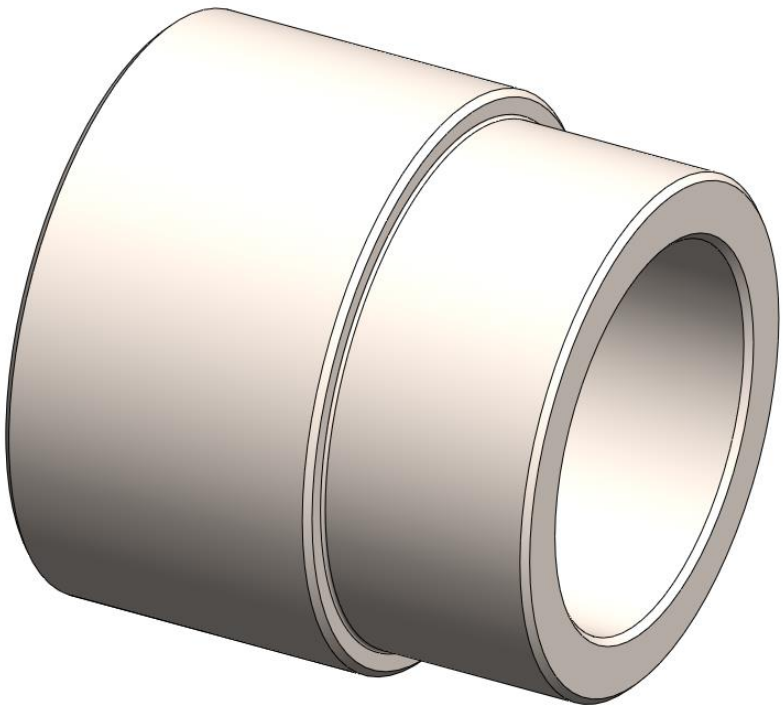
23) Assembly Pulling Tool 1-0101-7000-82



24) Assembly Sleeve 2-0101-7000-93



25) Disassembly Sleeve 1-0101-7000-94



3. Assembly Procedure

Note:

Ensure parts are free from burrs and any other damage.

Lightly grease all parts prior to assembly with a high temperature Lithium Complex based 'Blue Grease'.

Use Copper Slip for all connections.

O-Rings are lightly greased with 'Blue Grease' and installed to individual parts before assembling, use assembly drawing as guide.

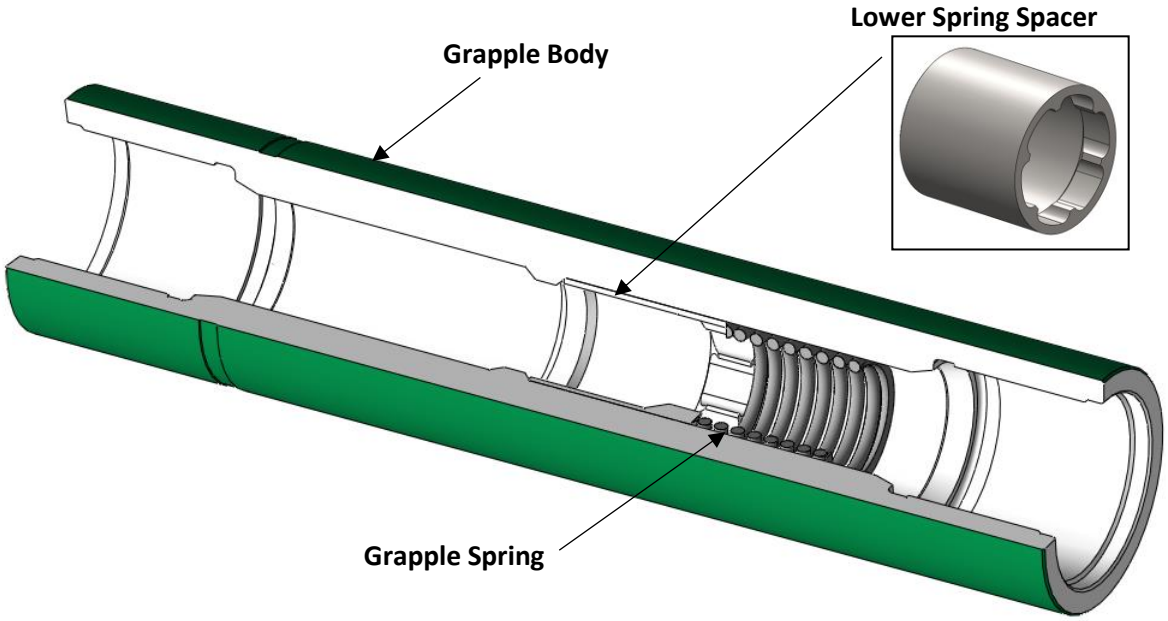
All part serial numbers and 'o'-ring batch numbers should be recorded on a build sheet which should be filed as part of the tool build and maintenance history after assembly.

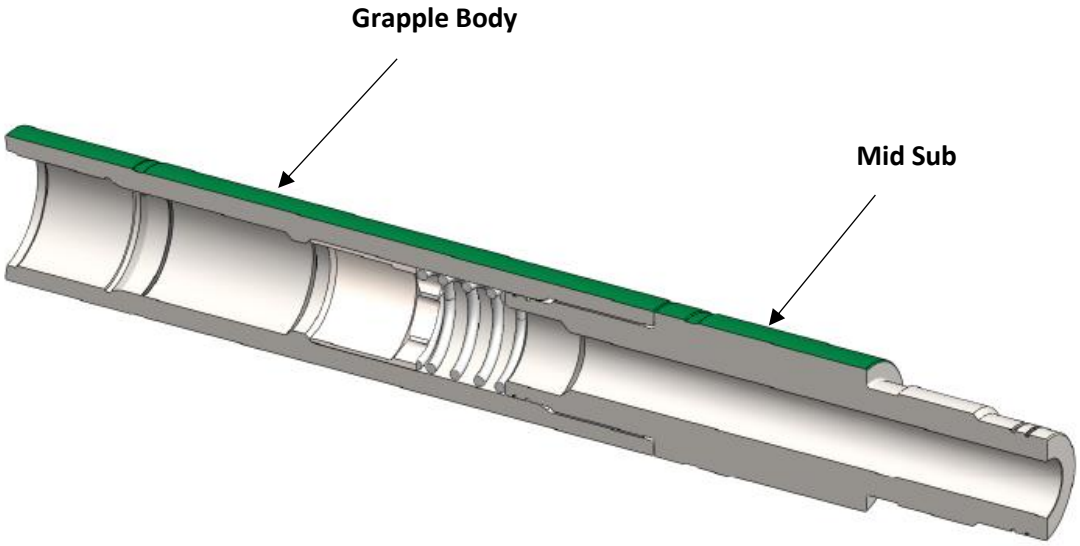
Some images will be sectioned for clarity.

Tool List:

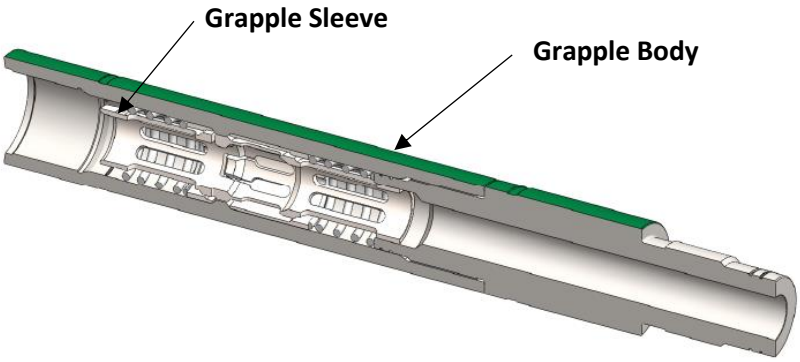
- Lifting device (min. 1100lbs/500kg)
- 3x Support Stand (suitable for Ø 7"/177.8mm)
- Brass hammer
- 2x Pipe / chain wrenches (suitable for Ø 7"/177.8mm)

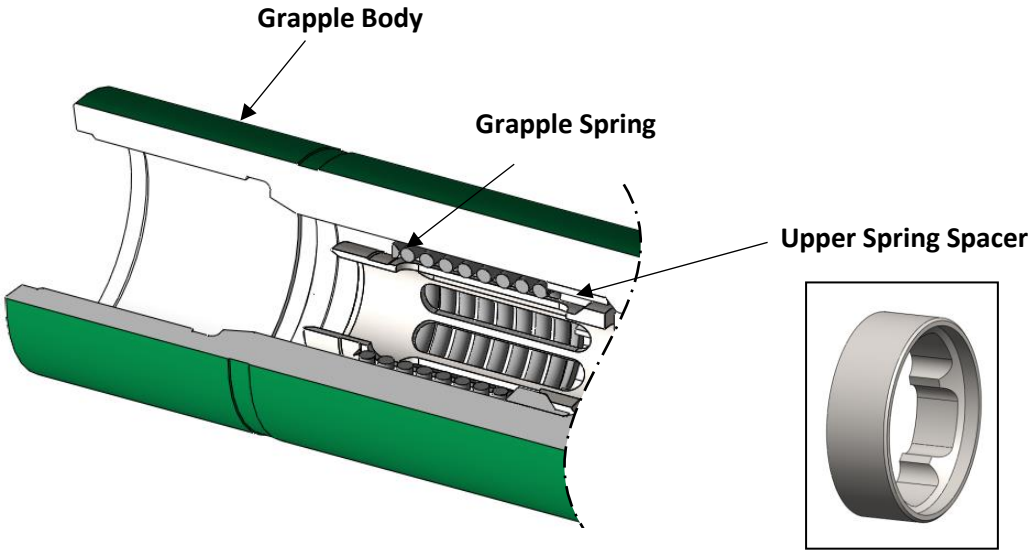
1) Slide the **Lower Spring Spacer** and the **Grapple Spring** into the **Grapple Body**. Connect the **Grapple Body** to the **Mid Sub.**

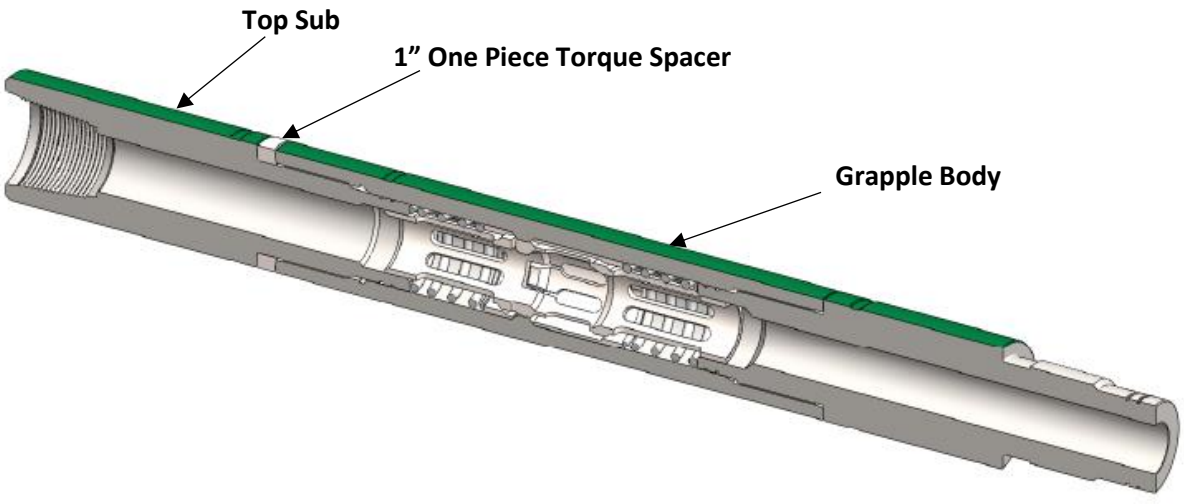




26) Slide the **Grapple Sleeve** into the **Grapple Body** as shown with the loose fingers pointing upwards. Install the **Upper Spring Spacer** and the second **Grapple Spring** in to the **Grapple Body**. Connect the **Top Sub** onto the **Grapple Body** inserting the **1" One Piece Torque Spacer** in the connection between the two with the chamfered side towards the **Grapple Body**.

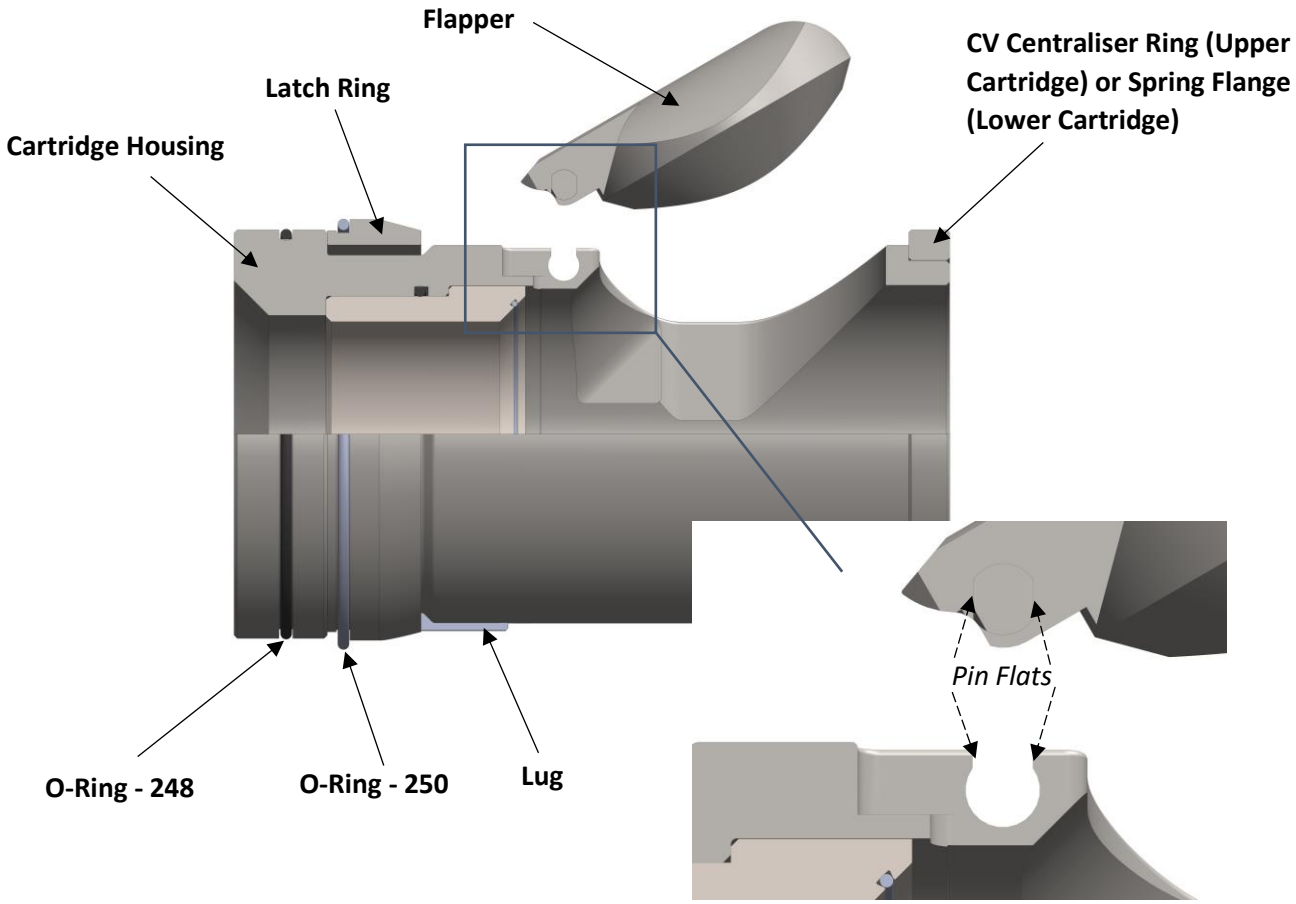






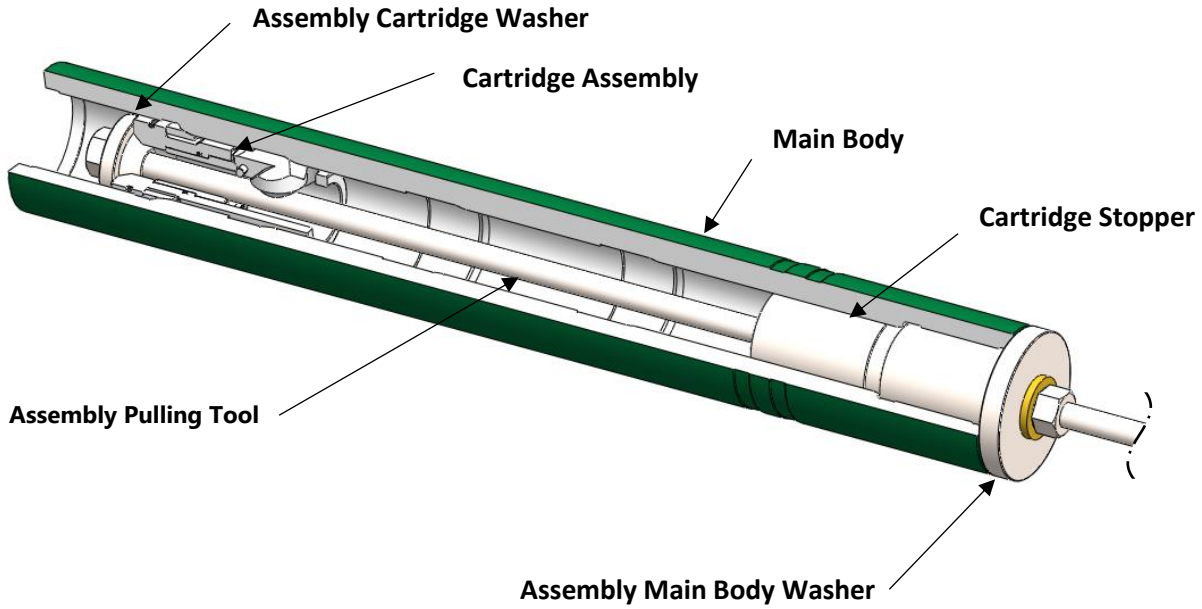
27) Assemble the **Cartridge Assemblies (x2)**; slide the **Latch Ring** over the **Cartridge Housing** until it shoulders out. Assemble the **Flapper** at a 30degree angle (use *Pin Flats* as a

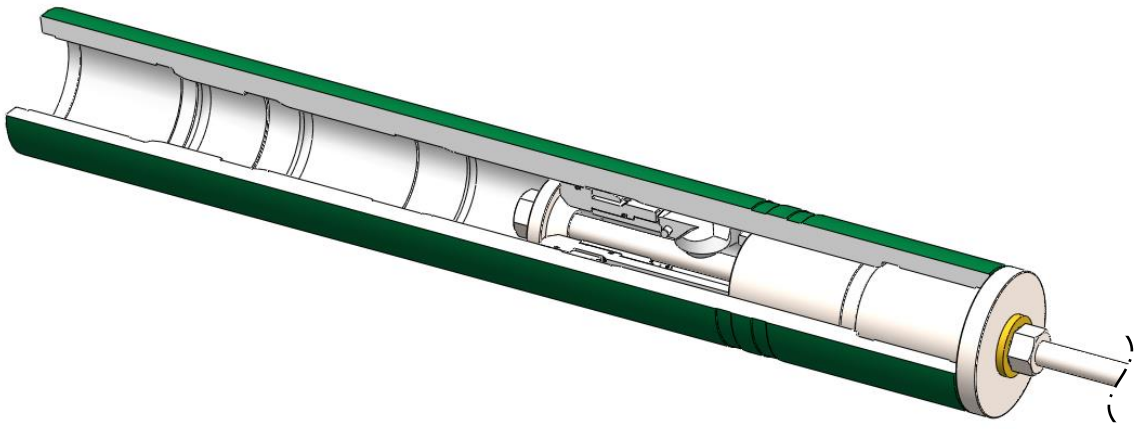
guide) into the **Cartridge Housing** until it locates into the pivot groove. Allow the flapper to pivot into the closed position and check it travels smoothly and easily from fully open to fully closed. Press the **Lug** into the slot on the opposite side of the **Cartridge Housing** to the **Flapper** such that it prevents the **Latch Ring** rotating. Test whether the **Flapper** is correctly seated by holding the assembled cartridge housing vertically supported by the closed flapper and pouring water in above the flapper. If the flapper and seal cartridge are correctly installed no water should leak past the flapper.



28) Arrange the **Main Body** horizontally in a vice. Use the **Cartridge Stopper** and the **Assembly Main Body Washer** in the bottom of the **Main Body** (as shown below) to prevent the **Cartridge Assembly** traveling too far down inside the body during assembly. Install/pull the first **Cartridge Assembly** into the **Main Body** from the top, the **Latch Ring** will collapse into the groove on the **Cartridge Housing** and expand into the groove on the **Main Body**. Use the **Assembly Tool** to pull the **Cartridge Assembly** down until it bottoms out with the **Cartridge Stopper** (as shown below in the second picture).

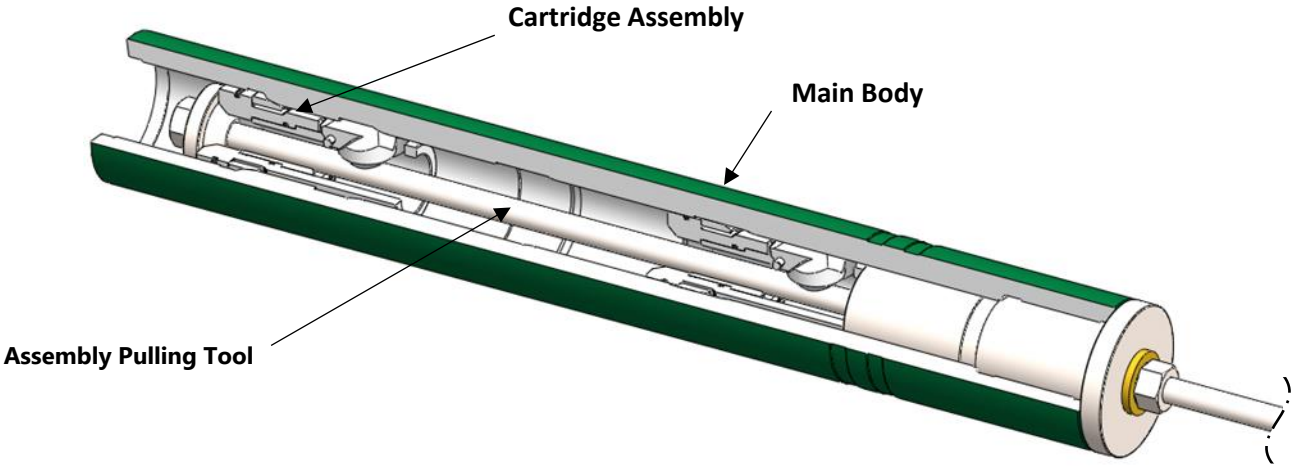
UNDER NO CIRCUMSTANCES INSTALL THE CARTRIDGE ASSEMBLIES FROM THE BOTTOM END OF THE TOOL!
THIS WILL RESULT IN THE CARTRIDGE ASSEMBLIES BEING STUCK IN THE HOUSING!
The Main Body will be marked top at the top end, if not visible use the internal grooves to locate the top of the Main Body. The top end has grooves closer to the end of the body.

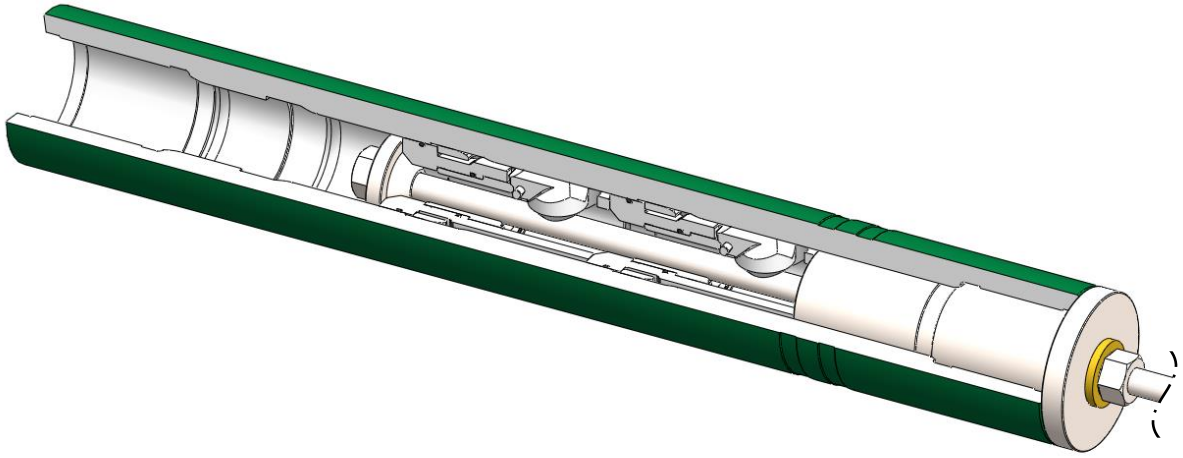




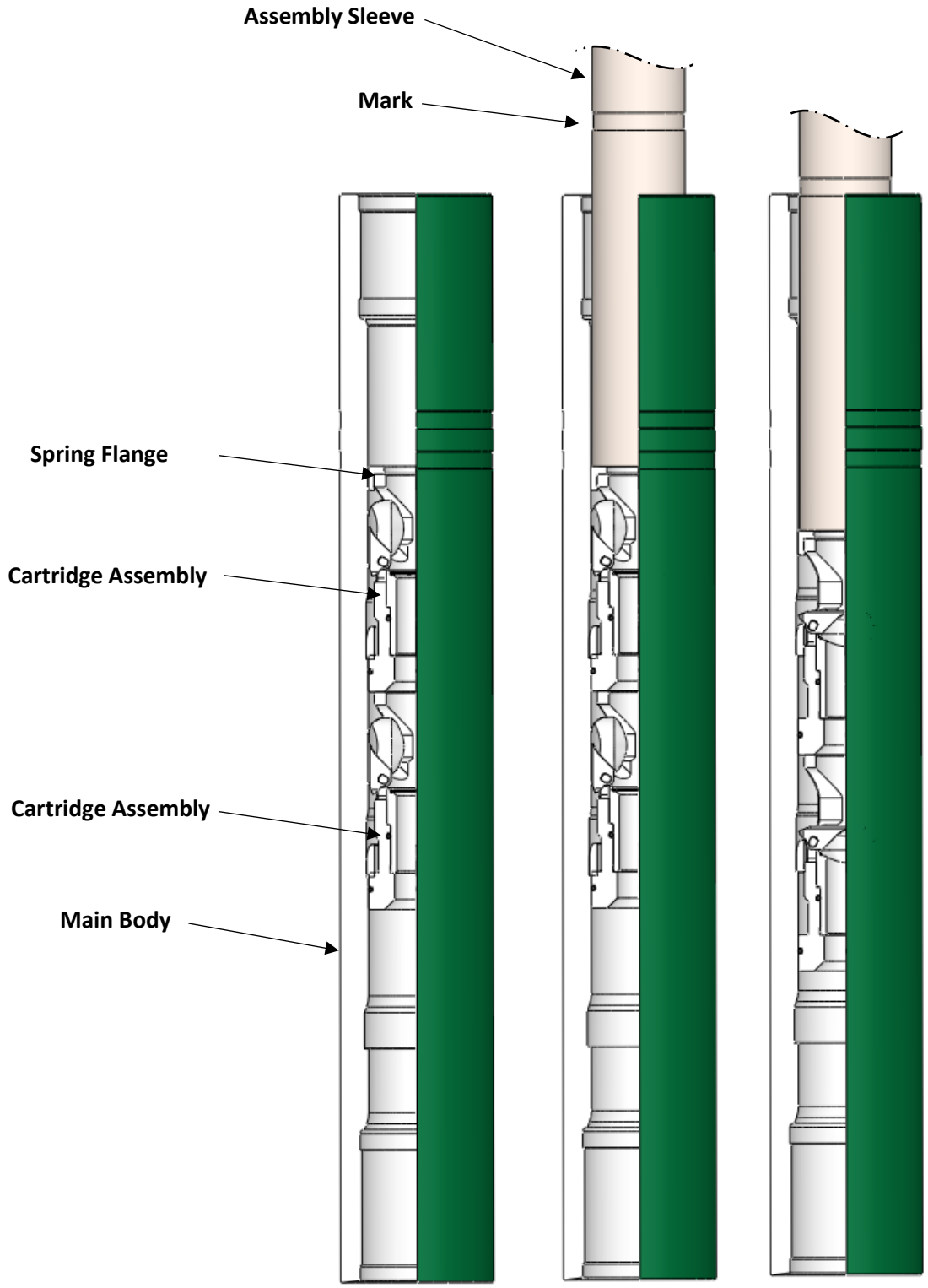
29) Insert the second **Cartridge Assembly** into the top of the **Main Body** and pull it into the **Main Body** using the **Assembly Pulling Tool**. The **Cartridge Assemblies** and the **Assembly Pulling Tool** will stop moving when the **Cartridge Stopper** is reached (as shown below in the second picture).

UNDER NO CIRCUMSTANCES INSTALL THE CARTRIDGE ASSEMBLIES FROM THE BOTTOM SIDE OF THE TOOL!
THIS WILL RESULT IN THE CARTRIDGE ASSEMBLIES BEING STUCK IN THE HOUSING!
The Main Body will be marked top at the top end, if not visible use the internal grooves to locate the top of the Main Body. The top end has grooves closer to the end of the body.

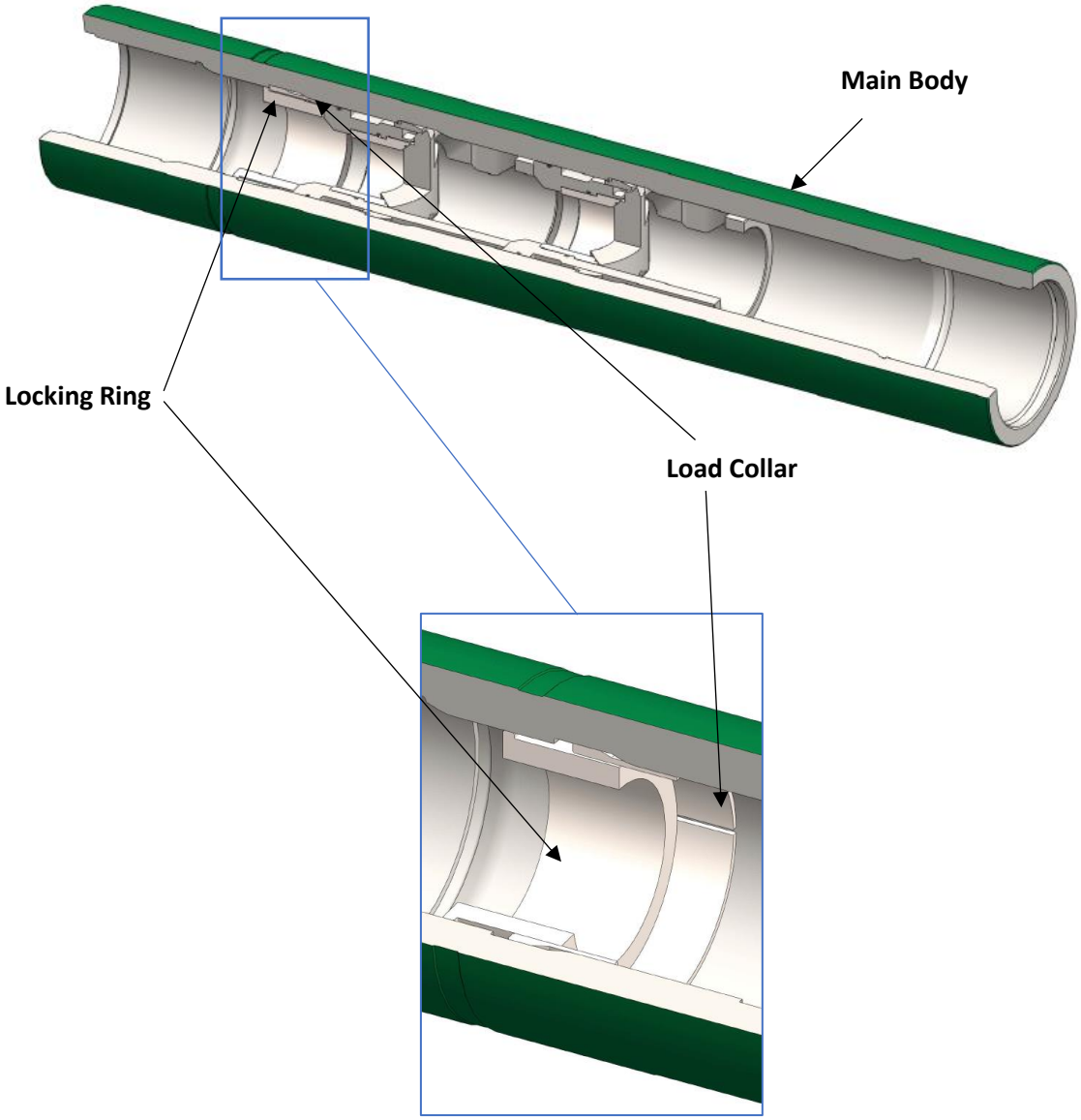




30) Turn the **Main Body** over so that it is upside down and remove the **Cartridge Stopper**. Insert the **Spring Flange** and use the **Assembly Sleeve** from the bottom end of the **Main Body** to push the **Cartridge Assemblies** and the **Spring Flange** back up the inside of the **Main Body** to correctly locate the **Latch Rings** below the flapper tangs. Ensure that the **Cartridge Assemblies** are pushed into the **Main Body** to the mark on the **Assembly Sleeve**.

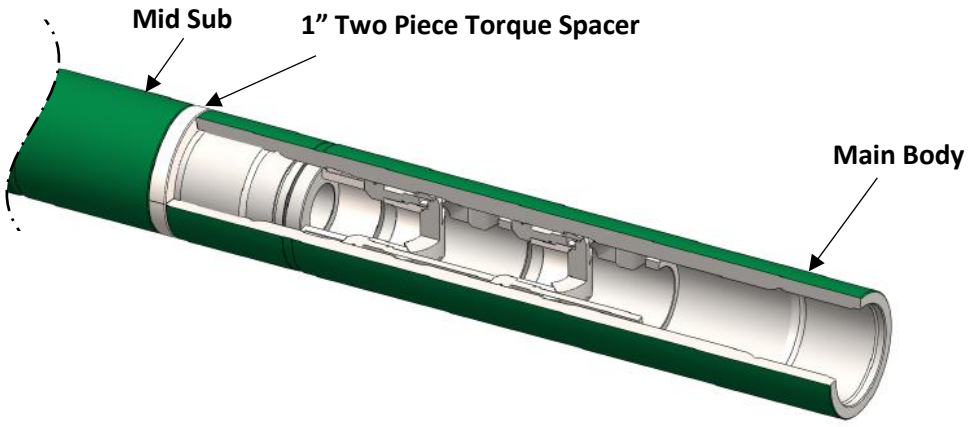


31) Insert the **Load Collars** into the top of the **Main Body** and lock them in place with the **Locking Ring.**

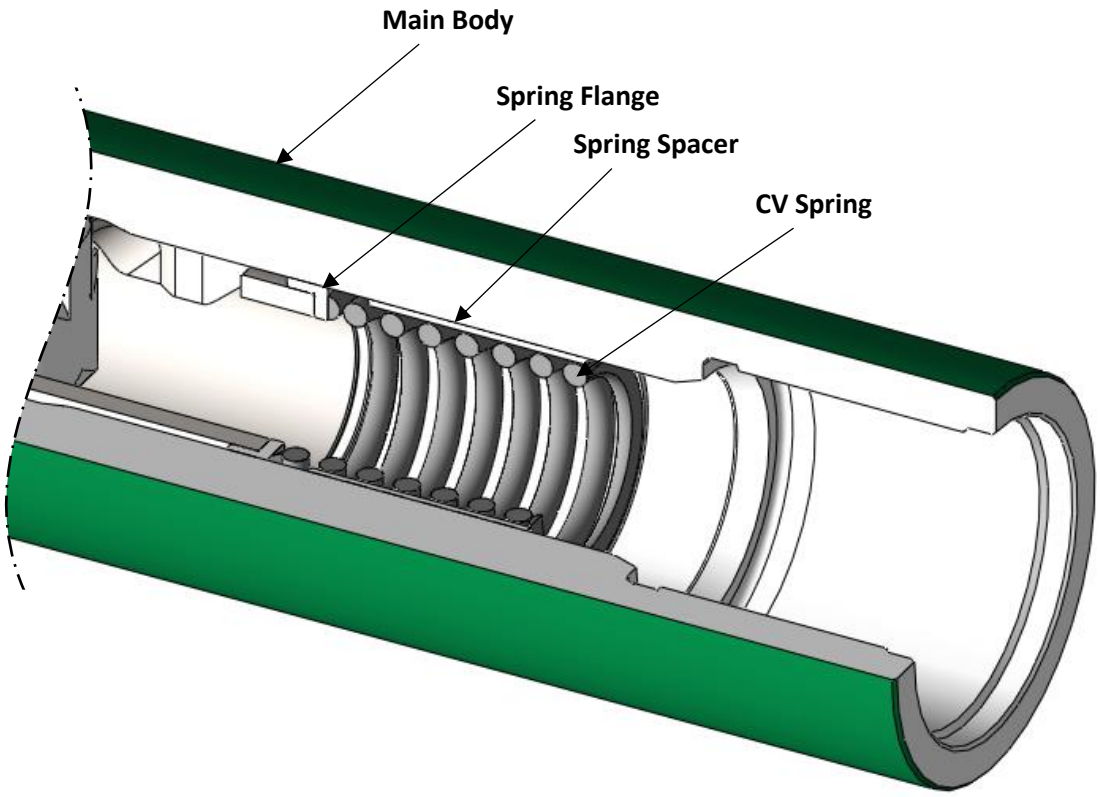


32) Screw the **Main Body** onto the **Mid Sub** and insert the two halves of the **1" Two Piece Torque Spacer** between them with the chamfer on the collar facing the main body.

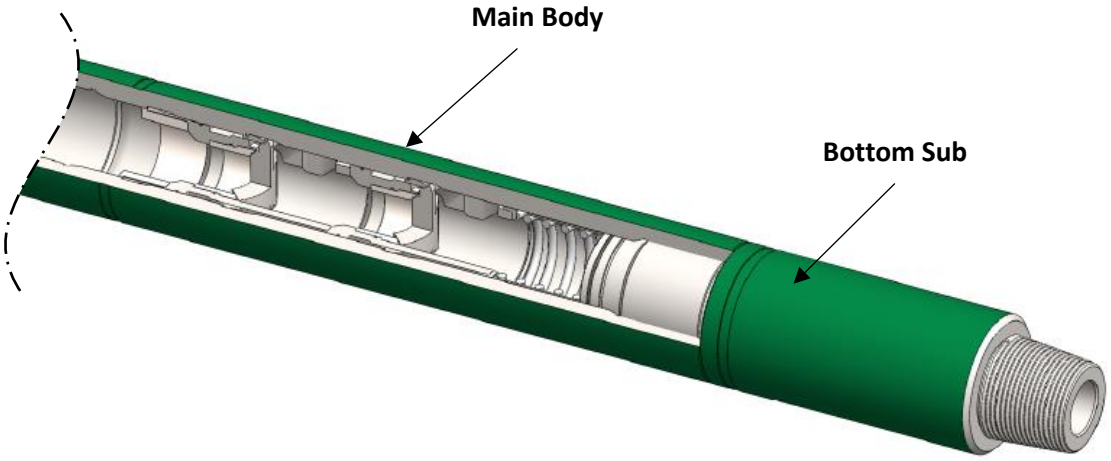
Note: If a tool is being prepared for BHA use rather than surface use without the lock open facility the **Top Sub** takes the place of the **Mid Sub** at this step and the **Grapple Housing** and **Mid Sub** are not used in the tool.


Mid Sub
1” Two Piece Torque Spacer
Main Body

33) Install the **Spring Spacer** and **CV Spring** from the bottom end of the tool. Ensure the **Spring Spacer** is located all the way in against the **Spring Flange**.



34) Install the **Bottom Sub** to the **Main Body**.



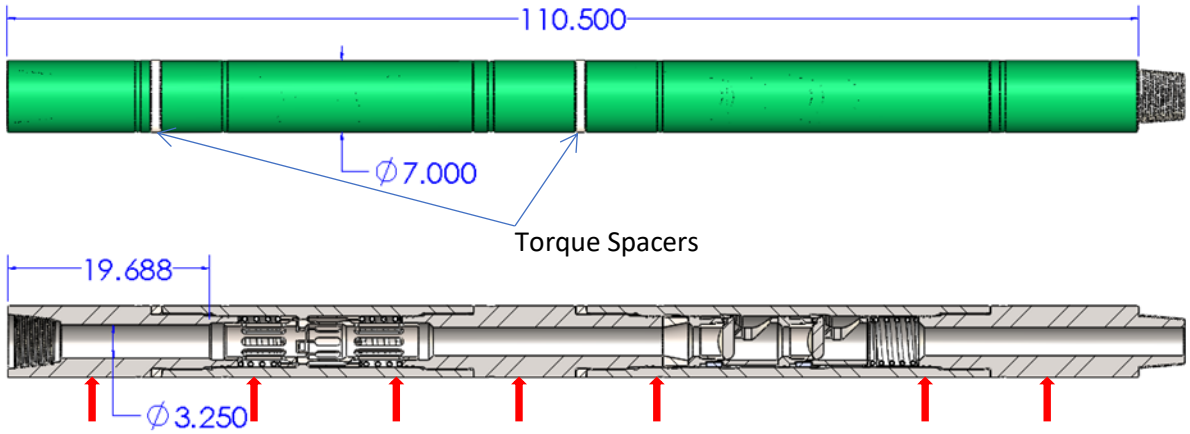
35) The tool will normally be shipped pre-torqued. Use a torque machine to torque each service connection to the required torque. In the full tool with lock open facility there are 4 service breaks. If the lock open facility is removed the tool has 2 service breaks. Ensure the **Torque Spacers** are correctly seated before torqueing.

7" Standard Service:
Maximum make up torque – 40,500 lbft.
Minimum make up torque – 33,750 lbft.

8 ½" Standard Service:
Maximum make up torque – 70,000 lbft.
Minimum make up torque – 84,000 lbft.

8 ½" H2S Service:
Maximum make up torque – 55,800 lbft.
Minimum make up torque – 46,500 lbft.

Drift the tool with a 2.656" API Drift before and after torqueing to ensure free opening and closing of the flappers.



Clamping points

The tool is now fully assembled ready for RIH.

4. Pressure Testing

Tools are pressure tested to their proof test pressure of 22,500psi on first assembly and should not be tested beyond the 15,000psi working pressure in the field unless fully inspected for wear and erosion before the test. The tools can be pressure tested un-torqued as all internal connections include o-ring seals.

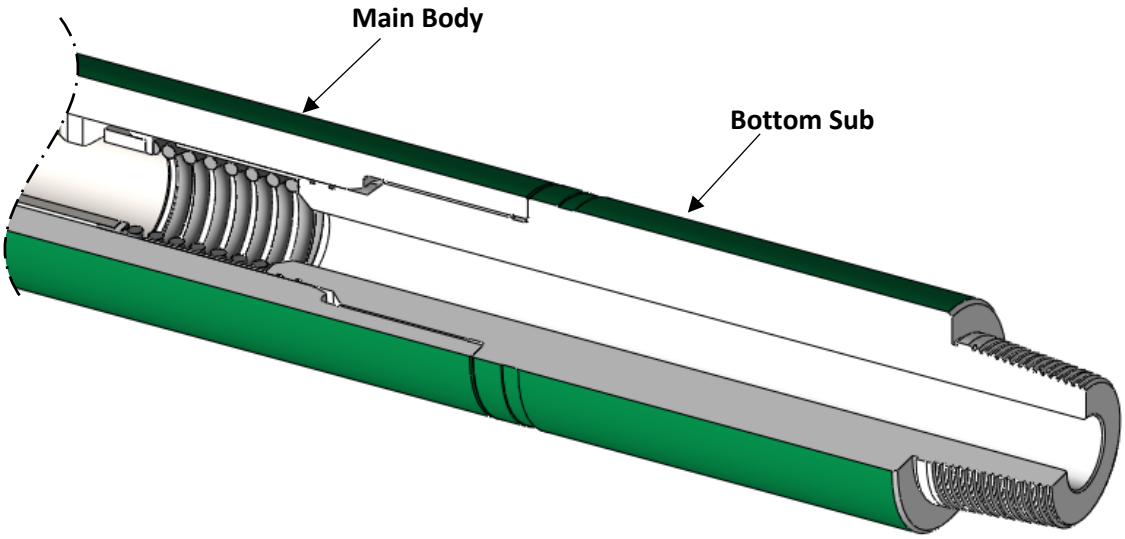
As many of the drillpipe connections being used with the tools are not rated for 15,000psi the test caps for the tools have inserts which seal on the inside of the bore of the top and bottom subs of the tools. The connection for pressure test pumps on the test caps is 3/8" HP F375C (Autoclave).

Connections are supplied at both ends of the tool and an isolation valve should be included on both ends of the tool for pressure testing.

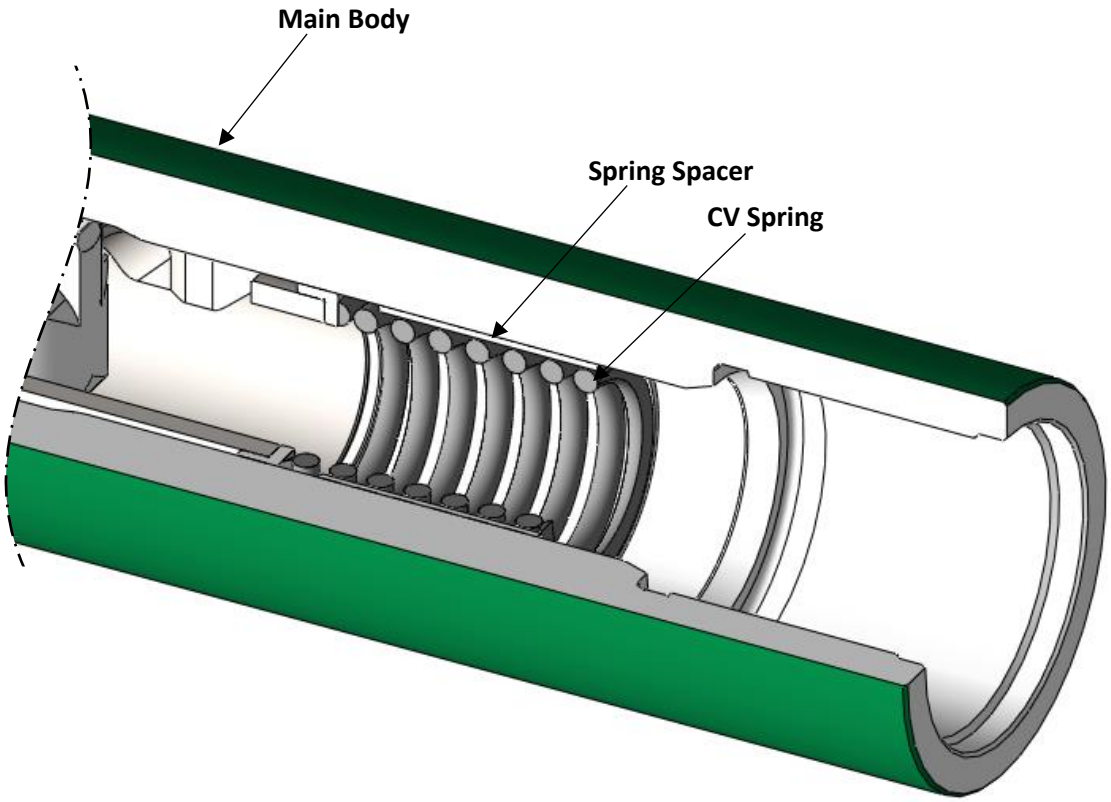
1. With the DT Valve upside down fill with water from the box end (top) venting air from the valve at the pin end (bottom). This will ensure that the flappers are pushed off seat as water passes through them to fill the DT Valve.
2. When all of the air is removed from the DT valve and water is coming out of the pin end isolation valve close the pin end isolation valve and lay the tool down horizontally.
3. Pressure test the body of the tool from the box end (top) to 200psi for 5 minutes.
4. Increase the pressure on the body of the tool to 15,000psi and hold for 15 minutes (constant pressure). Due to the low volume of water in the DT Valve and inevitable trapped air the pressure will likely drop in the first few minutes of the test then stabilise out due to compression. The pressure can either be pumped back up above 15,000psi or the starting pressure can be high (e.g. 15,500psi).
5. After a 15 minute stable test bleed off the pressure from the pin end of the DT Valve. This ensures that pressure is not trapped below the flappers. Do not bleed back to the pump as this will leave 15,000psi trapped pressure in the tool below the flappers.
6. Once the pressure is bled down close the isolation valves on both ends of the DT valve to keep it full of water.
7. Disconnect the test pump from the box end isolation valve and connect it to the pin end isolation valve.
8. Open both isolation valves and pressure test below the flappers from the bottom of the tool to 200psi for 5 minutes.
9. After 5 minutes increase the pressure below the flappers to 15,000psi and hold for 15 minutes (constant pressure). Due to the low volume of water in the DT Valve and inevitable trapped air the pressure will likely drop in the first few minutes of the test then stabilise out due to compression. The pressure can either be pumped back up above 15,000psi or the starting pressure can be high (e.g. 15,500psi). Whilst pumping the pressure up to 15,000psi it is normal to see some fluid coming out of the box end isolation valve due to components moving inside the DT Valve.
10. After a 15 minute stable test bleed off the pressure from the pin end of the DT Valve back to the pump. This ensures that pressure is not trapped below the flappers.
11. Remove the test caps and fully drain the DT Valve by opening the flappers using the drift and positioning the valve on a slope with the pin end down.
12. Once drained remove the drift and grease the pin and box threads. Replace the thread protectors ready for shipment.

5. Disassembly Procedure

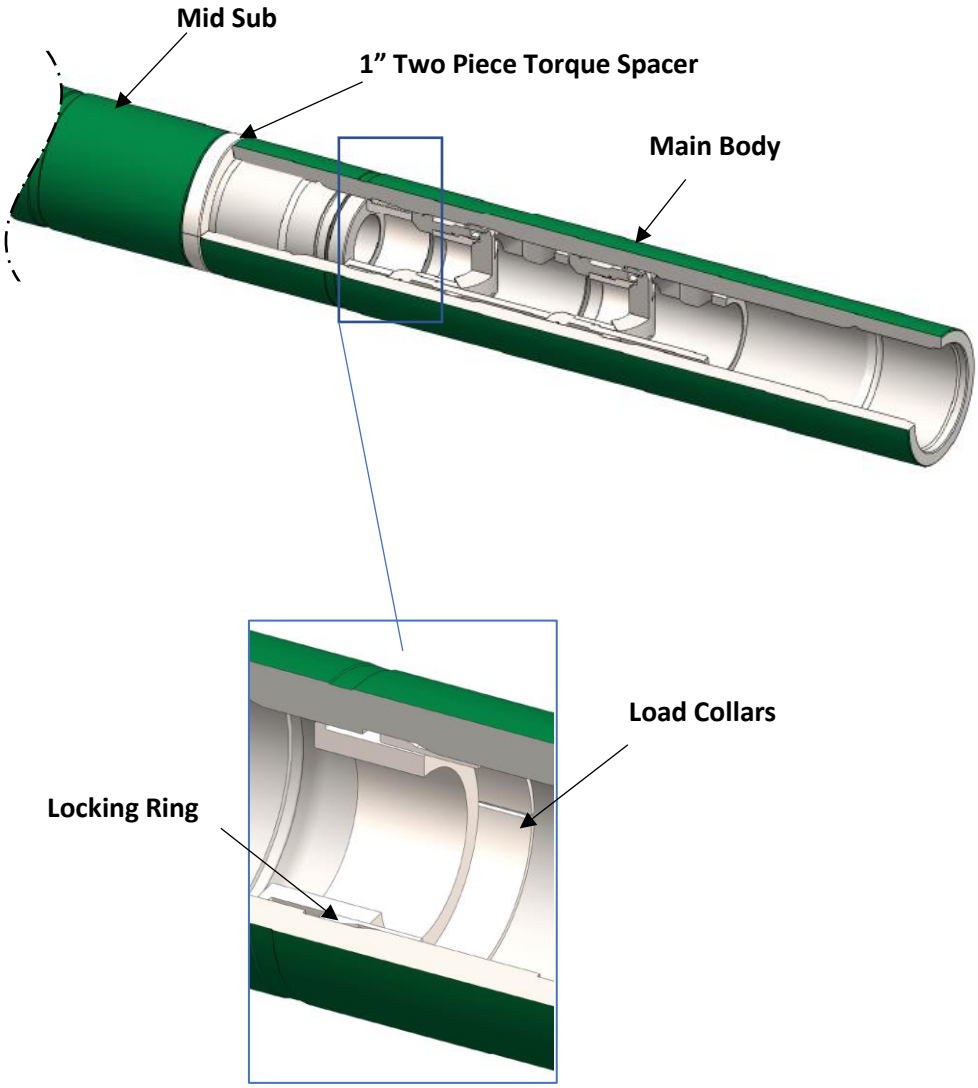
1) Remove the **Bottom Sub** from the **Main Body**.



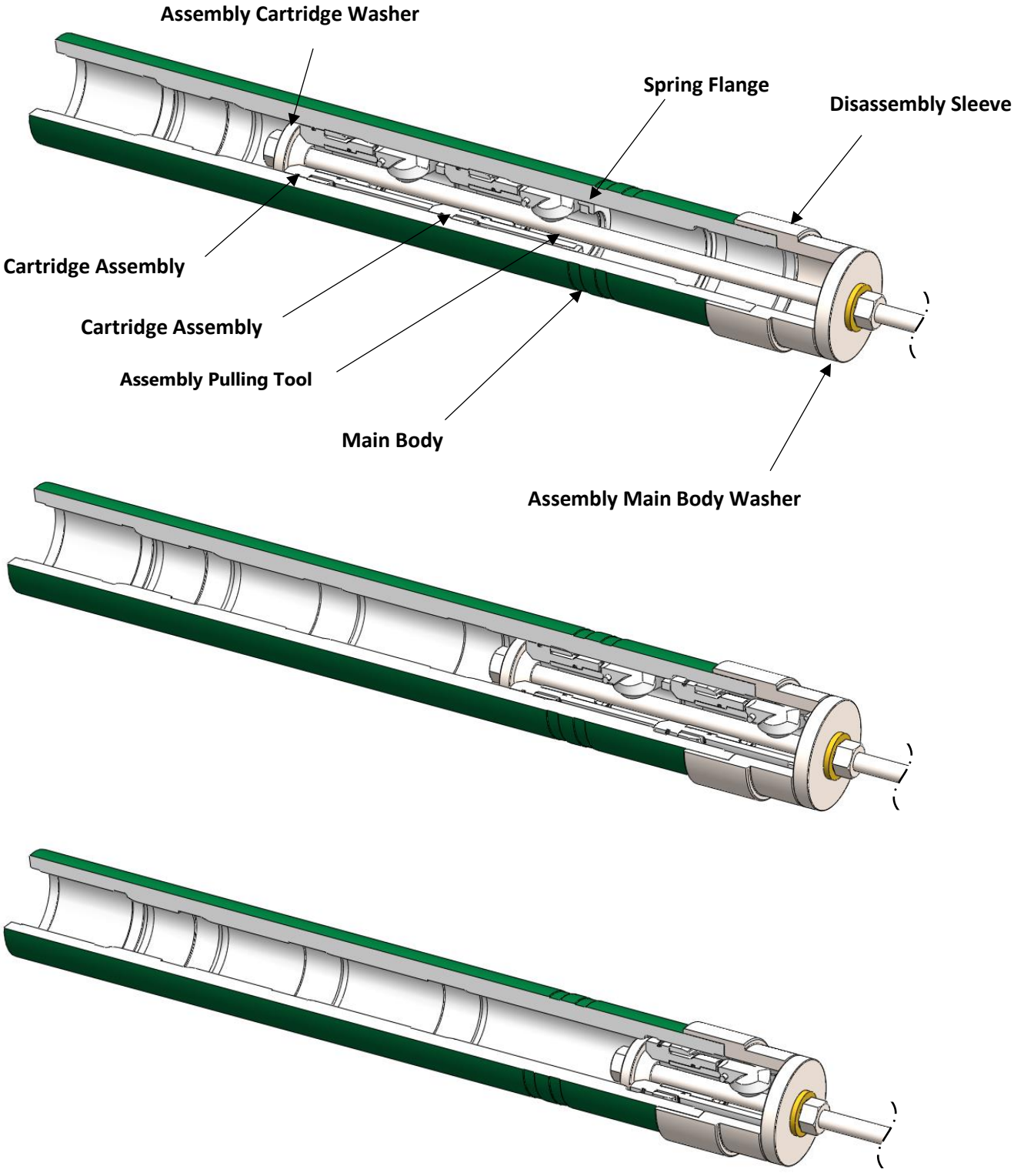
36) Pull the **CV Spring** and **Spring Spacer** out of the **Main Body**.



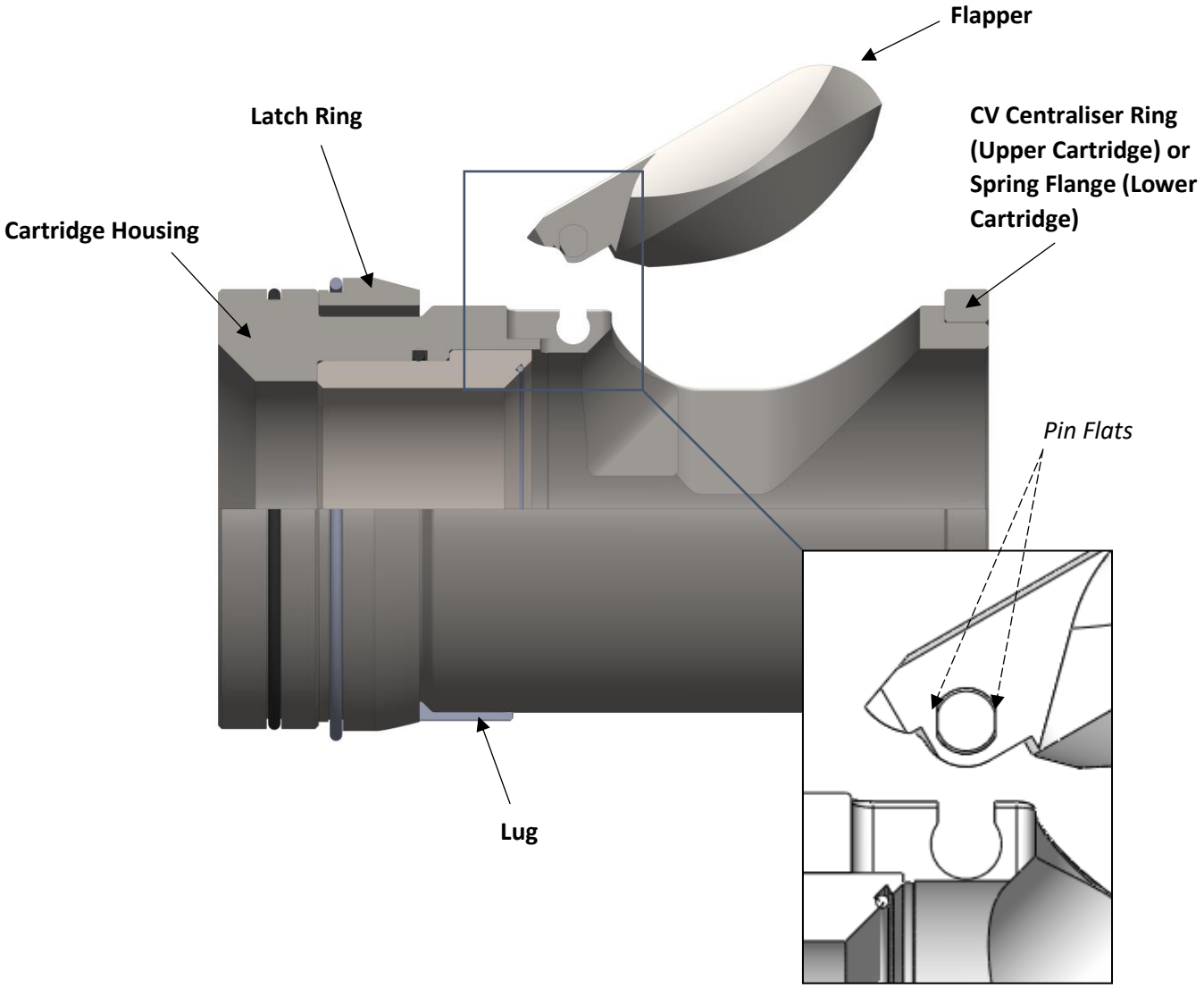
37) Unscrew the **Main Body** from the **Mid Sub** and remove the **1” Two Piece Torque Spacer**, the **Locking Ring** and the **Load Collars**.



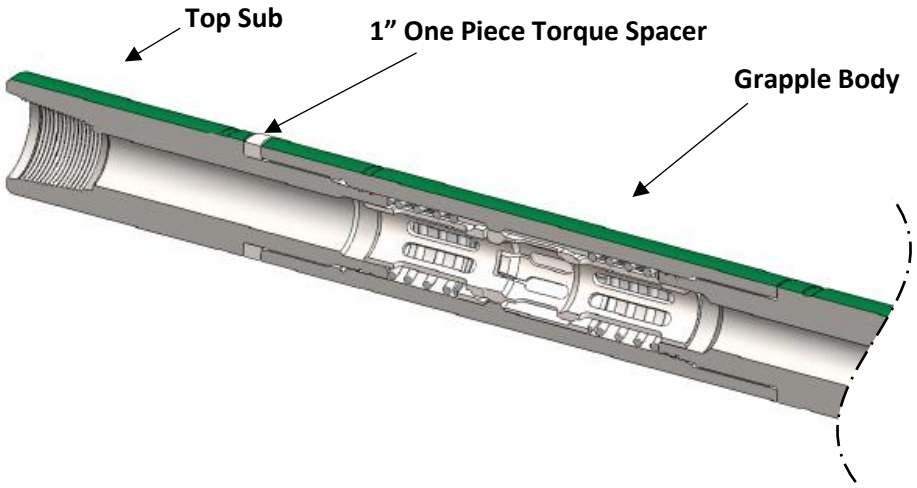
38) Hold the **Main Body** in a vice and pull the two **Cartridge Assemblies** from the bottom end of the **Main Body** with the **Assembly Pulling Tool**. Use the **Disassembly Sleeve** to allow the **Cartridge Assemblies** to be pulled out of the **Main Body** until they can be removed by hand. Depending on corrosion or debris in the valve the **Cartridge Assemblies** may have to be pressed out of the **Main Body** using a hydraulic press. If a press is used ensure the cartridges are pressed down and out of the bottom of the **Main Body**.



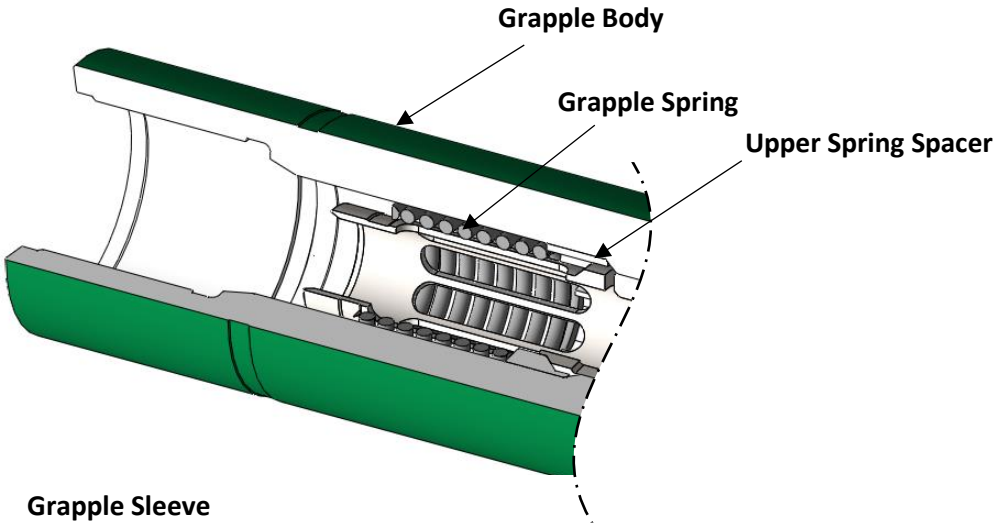
39) Disassembly of the **Cartridge Assembly (x2)**; Remove the **Flapper** at a 30 degree angle (use *Pin Flats* as guide) from the **Cartridge Housing**. Remove the **Latch Ring** from the **Cartridge Housing**. Pull the **Lug** out of the slot on the other side of the **Cartridge Housing**.

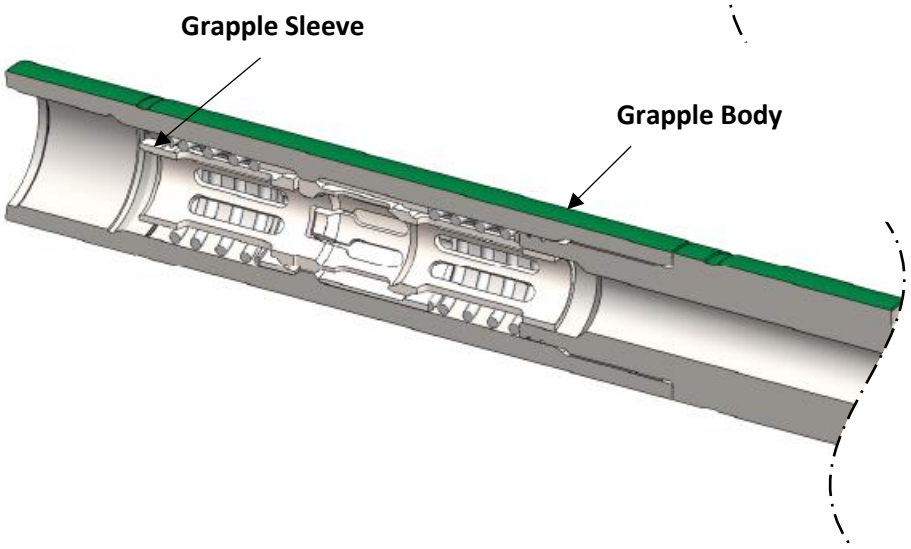


Unscrew the **Top Sub** from the **Grapple Body** and remove the **1" One Piece Torque Spacer**.

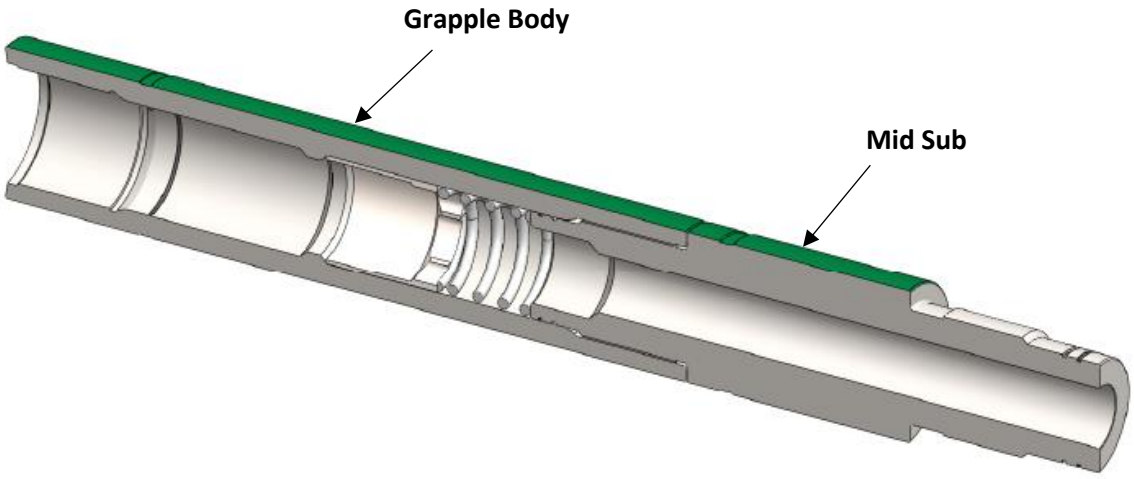


40) Pull the **Grapple Spring**, **Upper Spring Spacer** and **Grapple Sleeve** out of the **Grapple Body**.

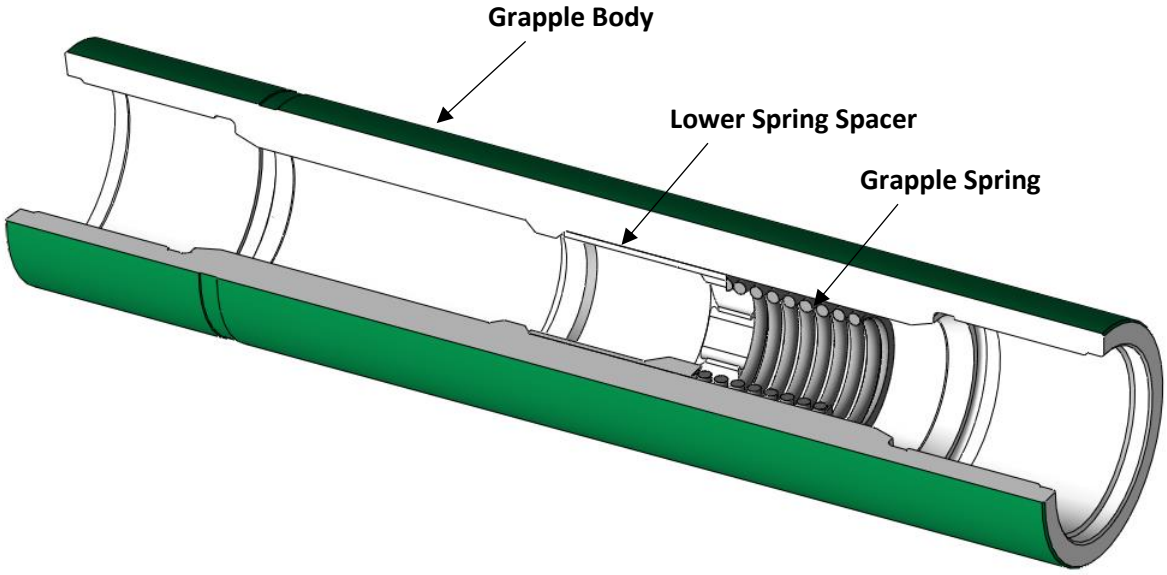




41) Unscrew the **Grapple Body** from the **Mid Sub**.



42) Pull the **Grapple Spring** and **Lower Spring Spacer** out of the **Grapple Body**.



43) Clean all parts and remove **O-Rings**.

Tool is now fully disassembled and ready for inspection.

Before next use to replace all O-rings and any components which fail inspection.

6. Inspection Procedure

On receiving the valve from wellsite for inspection and redress the tool should be pressure washed internally and externally to remove any residual mud and then visually inspected externally to identify any major damage. Particular attention should be paid to the main top and bottom threads and to the body for any major tong marks.

Disassemble the tool using procedure 4 above.

Remove all o-rings and thoroughly pressure wash all individual components to remove grease, mud and any debris.

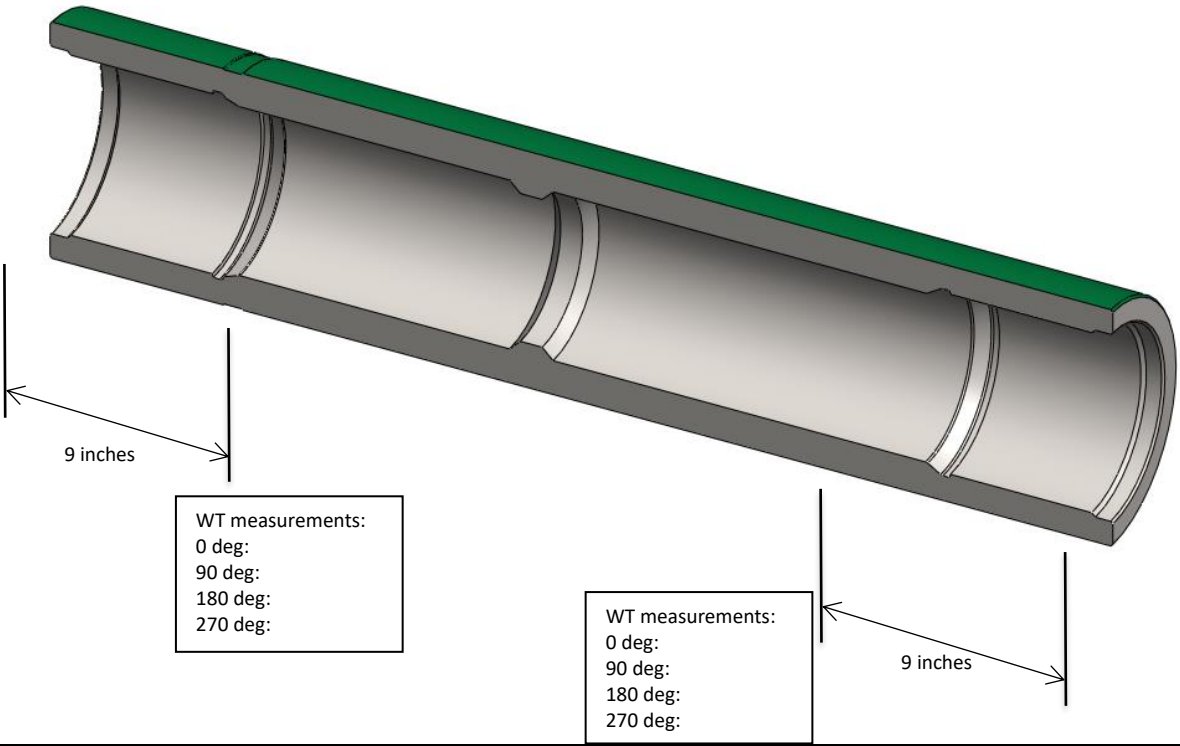
1) Top sub

Confirm serial number with build sheet.
Perform visual inspection - thread damage
external tong marks
internal erosion / corrosion.
MPI check on threads.

2) Grapple Body

Confirm serial number with build sheet.
Perform visual inspection - thread damage
external tong marks
internal erosion / corrosion.
MPI check on threads.

Perform wall thickness (WT) checks at a distance 9” in from the ends of the body radially at 90 degree intervals. Nominal thickness of the 7” tool at these points is 1 inch (+0.005/-0.0025) with minimum wall thickness of 0.75 inches (minimum required to maintain pressure integrity to 22,500psi). Nominal thickness of the 8 ½” tools at these points is 1.75 inches with a minimum wall thickness of 0.75 inches.



3) Mid Sub

Confirm serial number with build sheet.
Perform visual inspection - thread damage
external tong marks
internal erosion / corrosion.
MPI check on threads.

4) Grapple

Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.

5) Grapple Springs

Perform visual inspection - erosion / corrosion.

6) Upper Spring Spacer

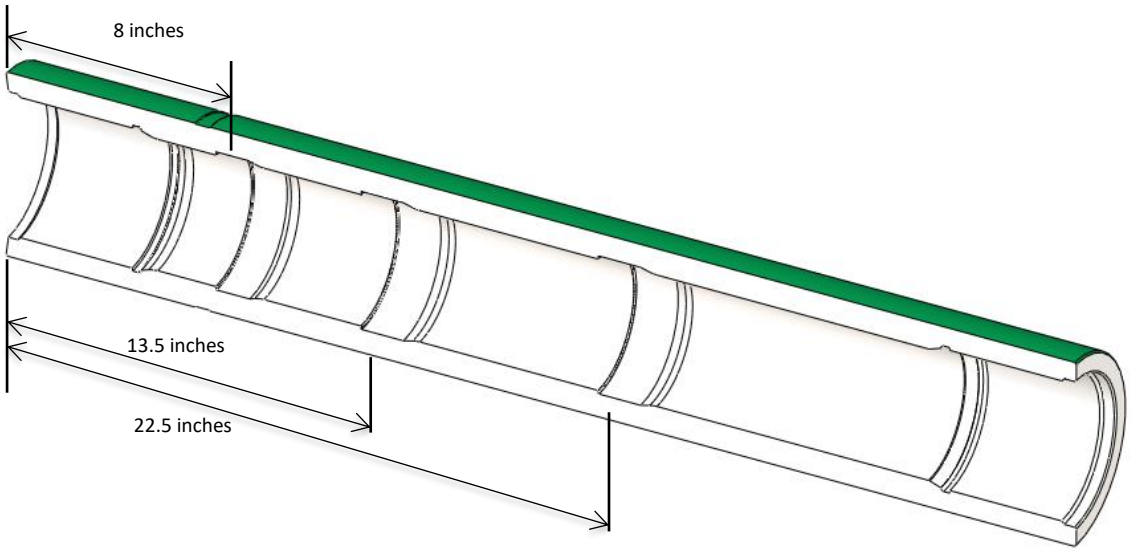
Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.

7) Lower Spring Spacer

Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.

8) Main Body

Confirm serial number with build sheet.
Perform visual inspection - thread damage
external tong marks
internal erosion / corrosion.
MPI check on threads.
Perform wall thickness checks at a distance 8”, 13.5” and 22.5” in from the top of the body radially at 90 degree intervals as with the grapple body. Nominal thickness of the 7” tool at these points is 0.875 inches (+0.005/-0.005) with minimum wall thickness of 0.75 inches (minimum required to maintain pressure integrity to 22,500psi). Nominal thickness of the 8 ½” tools at these points is 1.625 inches (+0.005/-0.005) with minimum wall thickness of 0.75 inches.



Additional wall thickness checks should be made at any point of major erosion or corrosion. The main body nominal wall thickness of the 7" tool is 1 inch (+0.005/-0.0025) with minimum wall thickness of 0.75 inches (minimum required to maintain pressure integrity to 22,500psi). The main body nominal wall thickness of the 8 ½" tools is 1.75 inches (+0.005/-0.0025) with minimum wall thickness of 0.75 inches.

9) Spring Spacer

Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.

10) Spring Flange

Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.

11) Upper Flapper

Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.

12) Lower Flapper

Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.

13) Bottom sub

Confirm serial number with build sheet.
Perform visual inspection - thread damage
external tong marks
internal erosion / corrosion.
MPI check on threads.

14) Upper Cartridge Housing Assembly

Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.
Check fit of latch ring on housing.
Check for excessive burring on latch ring at flapper contact point.
Note - some internal burring of the latch ring may occur due to bedding in of valve fit. This should be removed using a file prior to valve re-assembly. Cartridge housing assemblies should be retained as matched units for re-assembly and re-installed in the same position (upper or lower) in the valve as when stripped down.

15) Lower Cartridge Housing Assembly

Confirm serial number with build sheet.
Perform visual inspection - erosion / corrosion.
Check fit of latch ring on housing.
Check for excessive burring on latch ring at flapper contact point.
Note - some internal burring of the latch ring may occur due to bedding in of valve fit. This should be removed using a file prior to valve re-assembly. Cartridge housing assemblies should be retained as matched units for re-assembly and re-installed in the same position (upper or lower) in the valve as when stripped down.

Inspection results should be entered into the maintenance and inspection files for the tool. Any significant damage should be photographed and included with the inspection report.

Following inspection any parts needing dressing or re-work should be rectified and the rectification recorded on the maintenance sheet for the tool. Any parts showing excessive wear, erosion or corrosion should be replaced and the tool rebuilt as in Assembly Procedure 3 above. Cartridge housing assemblies should be re-assembled in the tool in the same position as before strip down. If any main body components of the tool are replaced the tool will require proof testing prior to use.

7. Operational Procedures

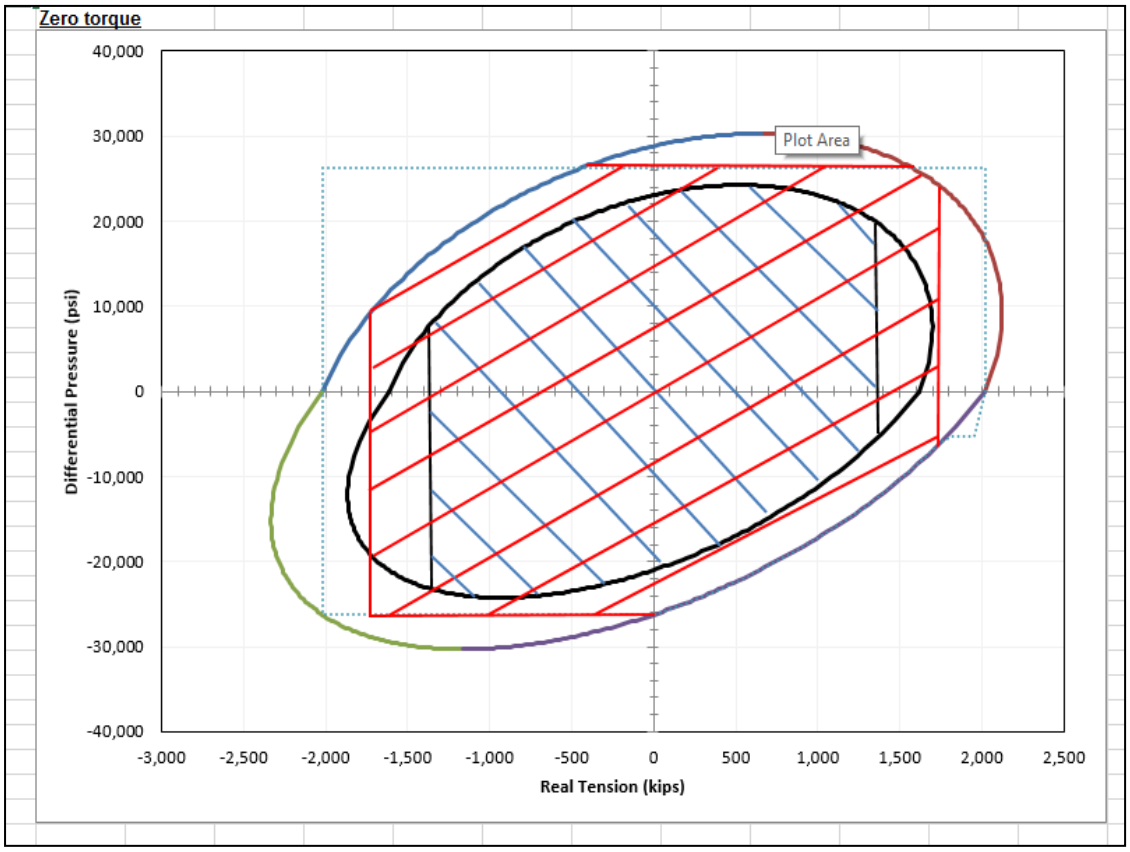
7.1. Tool Specifications

7.1.1. 7” DT SFSV AISI 4145, Standard Service Class 1

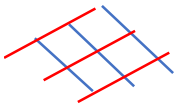
Tool Specification Data Sheet

Equipment Dimensions			
Tool OD	7.0”	**OAL**	115”
Tool ID	2.75” (2.25”)	**Effective Length**	110.5”
Drift Diameter	2.656” (min 42” long)	**Weight**	907 lbs (412 kgs)
Operational Specification			
Working Pressure Rating		15,000 psi	
API Internal Yield Pressure (at 190degC)		23,625 psi	
API Collapse Pressure (at 190 degC)		23,625 psi	
Min. Working Temperature Ration (Nitrile)		-4^{o}C	
Working Temperature Rating (Nitrile)		150^{o}C	
Working Temperature Rating (Viton)		190^{o}C	
Yield Specifications			
Tensile Yield (at 20^{o}C WT)		1,619,881 lbs	
Tensile Yield (at 150^{o}C WT)		1,538,887 lbs	
Tensile Yield (at 190^{o}C WT)		1,457,893 lbs	
Torsional Yield (at 20^{o}C WT)		67,500 ft-lbs	
Torsional Yield (at 150^{o}C WT)		64,125 ft-lbs	
Torsional Yield (at 190^{o}C WT)		60,750 ft-lbs	
Make Up Torque Values			
All Connections (min.)		33,750 ft-lbs	
All Connections (max.)		40,500 ft-lbs	

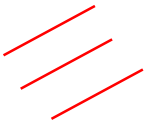
Triaxial Loading (at 20 degC)



Key



Loading to 80% VME yield



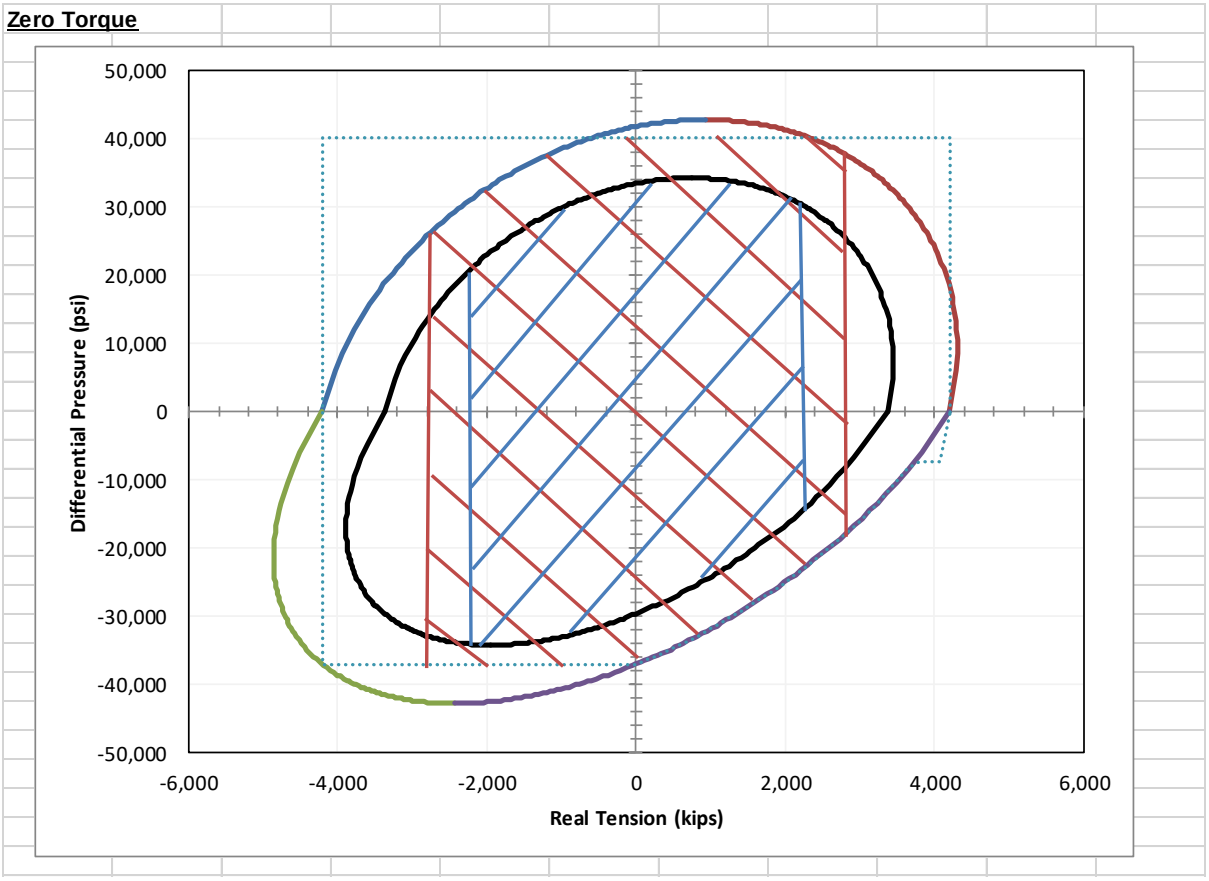
Loading to 100% VME yield (or API collapse / burst)

7.1.2. 8 ½" DT SFSV AISI 4145, Standard Service Class 1

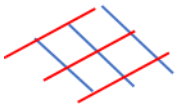
Tool Specification Data Sheet

Equipment Dimensions			
Tool OD	8.5"	**OAL**	115"
Tool ID	2.75" (2.25")	**Effective Length**	110.5"
Drift Diameter	2.656" (min 42" long)	**Weight**	1634 lbs (742 kgs)
Operational Specification			
Working Pressure Rating		15,000 psi	
API Internal Yield Pressure (at 190degC)		36,132 psi	
API Collapse Pressure (at 190 degC)		33,399 psi	
Min. Working Temperature Ration (Nitrile)		-4°C	
Working Temperature Rating (Nitrile)		150°C	
Working Temperature Rating (Viton)		190°C	
Yield Specifications			
Tensile Yield (at 20°C WT)		2,700,000 lbs	
Tensile Yield (at 150°C WT)		2,565,000 lbs	
Tensile Yield (at 190°C WT)		2,436,750 lbs	
Torsional Yield (at 20°C WT)		140,000 ft-lbs	
Torsional Yield (at 150°C WT)		133,000 ft-lbs	
Torsional Yield (at 190°C WT)		126,350 ft-lbs	
Make Up Torque Values			
All Connections (min.)		70,000 ft-lbs	
All Connections (max.)		84,000 ft-lbs	

Triaxial Loading (at 20 degC)



Key



Loading to 80% VME yield

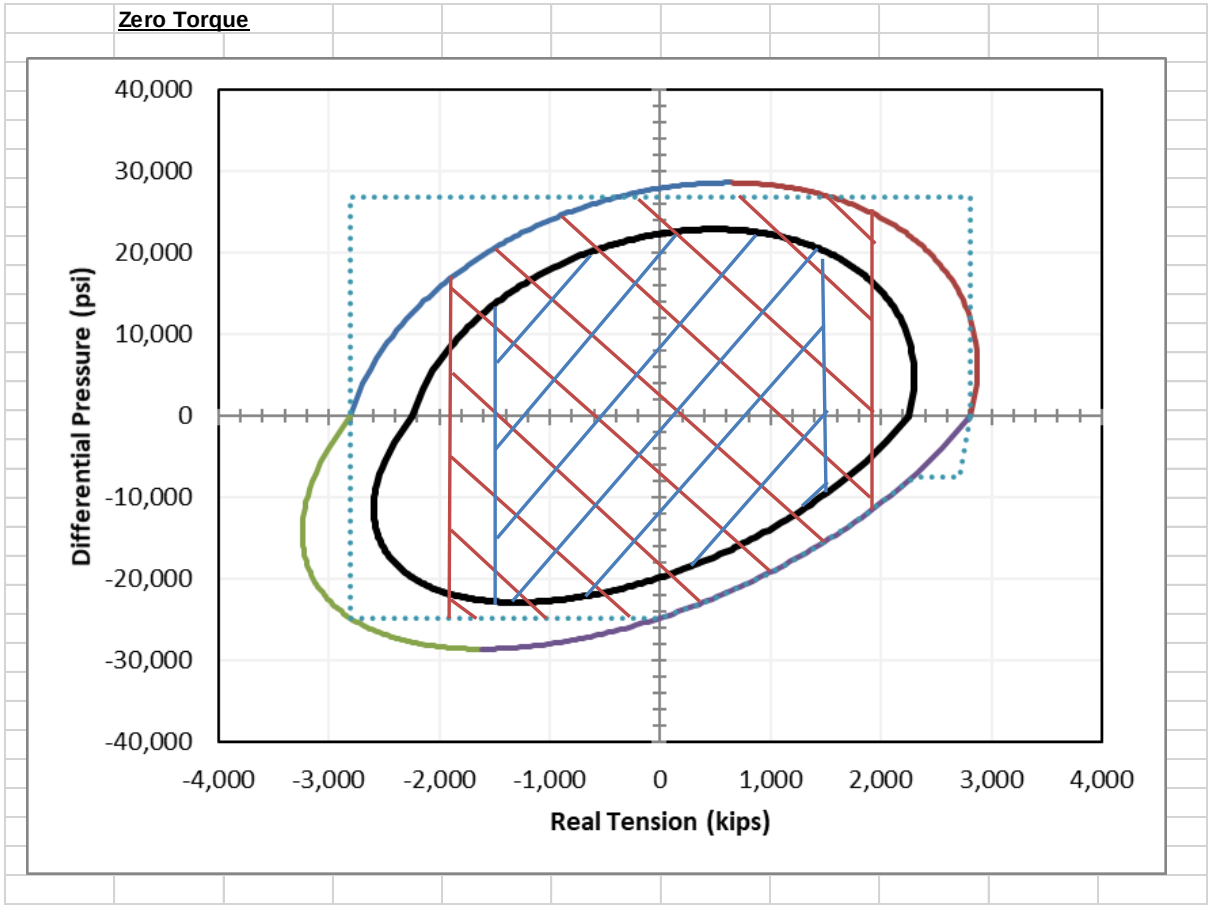
Loading to 100% VME yield (or API collapse / burst)

7.1.3. 8 ½" DT SFSV AISI 4140, H2S Service Class 2S

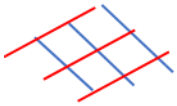
Tool Specification Data Sheet

Equipment Dimensions			
Tool OD	8.5"	**OAL**	115"
Tool ID	2.75" (2.25")	**Effective Length**	110.5"
Drift Diameter	2.656" (min 42" long)	**Weight**	1634 lbs (742 kgs)
Operational Specification			
Working Pressure Rating		15,000 psi	
API Internal Yield Pressure (at 200degC)		24,088 psi	
API Collapse Pressure (at 200 degC)		22,266 psi	
Min. Working Temperature Rating (HNBR)		-4°C	
Working Temperature Rating (HNBR)		150°C	
Working Temperature Rating (Aflas)		200°C	
Yield Specifications			
Tensile Yield (at 20°C WT)		1,800,000 lbs	
Tensile Yield (at 150°C WT)		1,710,000 lbs	
Tensile Yield (at 190°C WT)		1,620,000 lbs	
Torsional Yield (at 20°C WT)		93,000 ft-lbs	
Torsional Yield (at 150°C WT)		88,350 ft-lbs	
Torsional Yield (at 190°C WT)		83,700 ft-lbs	
Make Up Torque Values			
All Connections (min.)		46,500 ft-lbs	
All Connections (max.)		55,800 ft-lbs	

Triaxial Loading (at 20 degC)



Key



Loading to 80% VME yield

Loading to 100% VME yield (or API collapse / burst)

7.2. Storage

After using the tool…

…dismantle tool, clean and grease all parts and reassemble.

…pressure test the tool ready for re-use.

…make sure the tool is drained and that there is no water trapped in the flapper area.

…internally grease tool if possible to avoid internal corrosion during storage.

… use thread protectors on end threads (with hole bored in them to allow water drainage).

…Ideally store on a rack in a vertical position to allow any water or condensation to drain from the tool.

7.3. Handling

Use caution when handling. The 7” tool weighs in excess of 900 lbs (400kg) with the 8 ½” tools in excess of 1,600 lbs (720 kg). Beware of pinch points.

7.4. Lifting

To lift the DT Safety Valve please use suitable lifting equipment and two lifting points, one on each side of the *Centre of Gravity*.

8. Post Assembly Testing

Drift Tool with an API Drift Rod to ensure Flappers open and close correctly.
Install the Lock Open Sleeve to ensure Grapple latches correctly. This will involve putting 300 lbs down/up weight on the Lock Open Sleeve to latch and unlatch it.

9. Checklist

Topic	Check
Lock Open Sleeve Function Test	
Full Body Pressure Test	
Pressure Test against the flapper	
Drift with API Drift Rod	

10. DT Valve running procedure

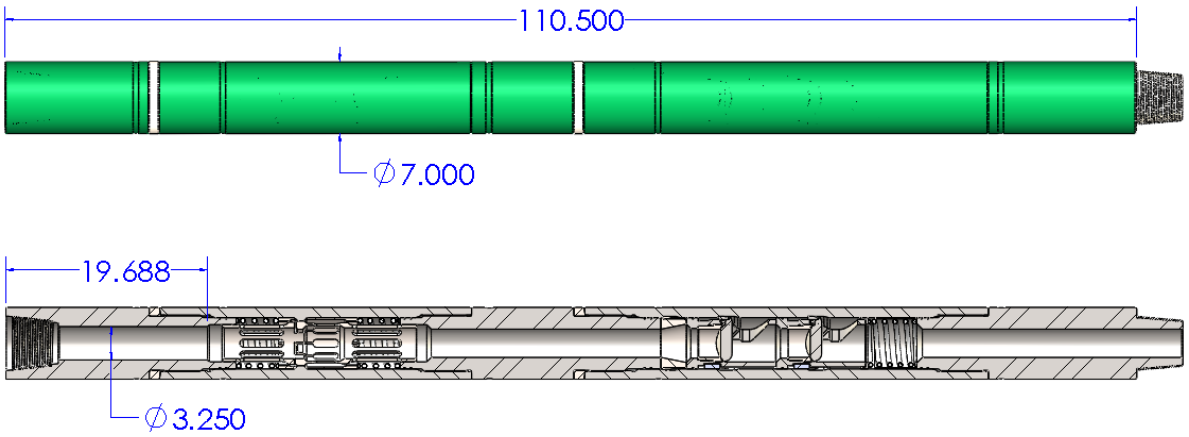
Running in hole

The DT Valve will be supplied on the rig torqued up to either the optimum drillpipe torque or the maximum recommended make-up torque of the valve, whichever is the greater. If optimum drillpipe torque is greater than the maximum recommended make-up torque of the valve discussion will be held to determine the make-up torque to be applied to the valve depending on positioning in the drillstring and torsional yield of the valve.

Before lifting the DT Valve to the rig floor drift using the API drift supplied to ensure the flappers of the valve open and close freely.

Ensure thread protectors are used on the upper and lower connections.

Confirm the OD, ID and length of the valve for fishing purposes. A fishing diagram of the tool is given below. Further detailed drawings are available on request. The 8 ½" tool has the same internal dimensions and length with an increased OD of 8.5".



Make up the DT Valve to the drillstring and run in hole one stand below the rotary table.

Install the top drive and initiate slow circulation to determine the flapper opening pressure for the valve.

Run in hole.

Pulling out of hole

Pull out of hole until the valve is one stand below the rotary.

Make up the top drive and initiate slow circulation to bump the flapper valves open. Record the flapper opening pressure. Compare this pressure to the initial flapper opening pressure recorded when running in hole. If the pressure when pulling out of hole is greater than that when running in hole there is trapped pressure below the valve (assuming the same mud weight). Circulate the drillstring to condition the mud and remove the trapped pressure. When it is confirmed there is no trapped pressure below the valve continue to pull out of hole and remove the DT Valve from the drillstring.

The flappers require a minimal pressure to open. This may result in some drilling fluids being retained above the flappers when the tool is broken out. In order to prevent spills lay the tool out on the drillfloor to remove retained fluid in a closed drain area prior to laying out on the pipe deck.

Do not put the tool on a rotary table pin to aid in breakout of connections as the pin may contact the lower flapper causing damage to the mechanism.

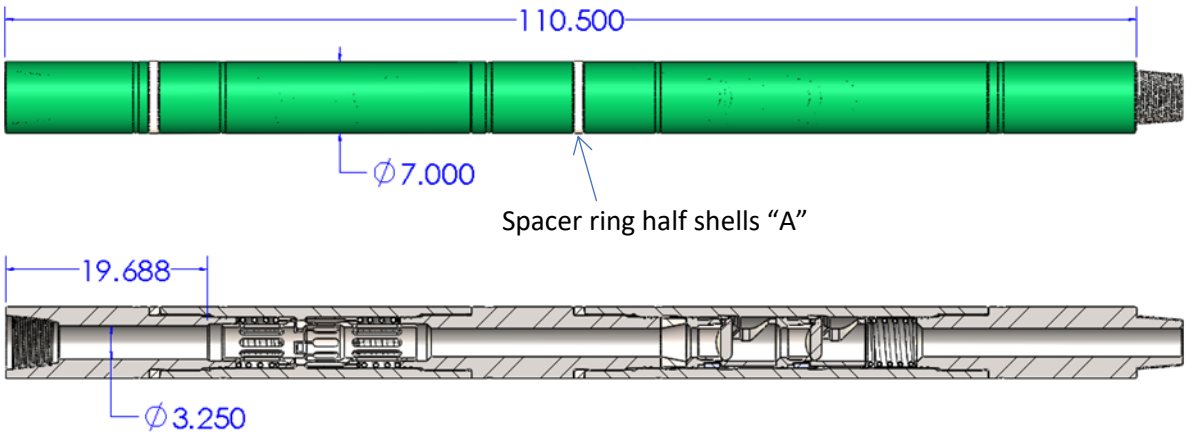
Always fit thread protectors before laying out the tool from the drillfloor.

11. Bleed-off procedures

During drilling operations using drillstring non-return valves either downhole or at surface it is not unusual to trap pressure below the valve. In conventional non-return valves this pressure is bled off by breaking the drillstring above the main body and using a bleed off tool to force the valve flappers open, thus allowing the pressure below the valve to be relieved to a bleed-off line.

For the DT valve pressure is bled off from below the valve either by running the lock open sleeve or the torque spacer rings (half shells) between the mid sub and main body can be removed allowing manual opening of the valve without losing pressure integrity in the string. The torque spacer ring is dovetailed into the connection such that when the connection is torqued up they cannot be dislodged from their correct position, however when the connection is backed out 1.5 turns they can easily be removed. The operating procedure is as follows:

i. Pick up the drillstring and set the slips below the DT valve.
ii. Break the connection between the mid sub and the main body and back off 1.5 turns.
iii. Remove the two piece torque spacer ring half shells “A” from between the mid sub and main body.
iv. Make up the connection between the mid sub and main body by 6 turns. At this point the flapper closure spring is disengaged by pushing the cartridge housings down with respect to the main body using the pin end of the mid sub.
v. Pump through the flappers to ensure they are in the open position.
vi. Bleed off any pressure in the drillstring slowly at surface.
vii. At this point either the valve can be re-activated by re-installing the original torque spacer ring half shells using the reverse of the removal procedure or the closure spring can be kept in the disengaged position by installing the thin torque spacer ring half shells. In either case the connection is re-torqued using the appropriate set of half shells prior to picking up the string to break the connection below the valve. When re-installing the half shells ensure they are the correct way round with the chamfered side facing downwards to enable full contact of the shoulder faces.



If the valve is being used without the lock open facility then the torque spacer ring half shells are located between the top sub and the main body. The bleed off procedure remains the same.

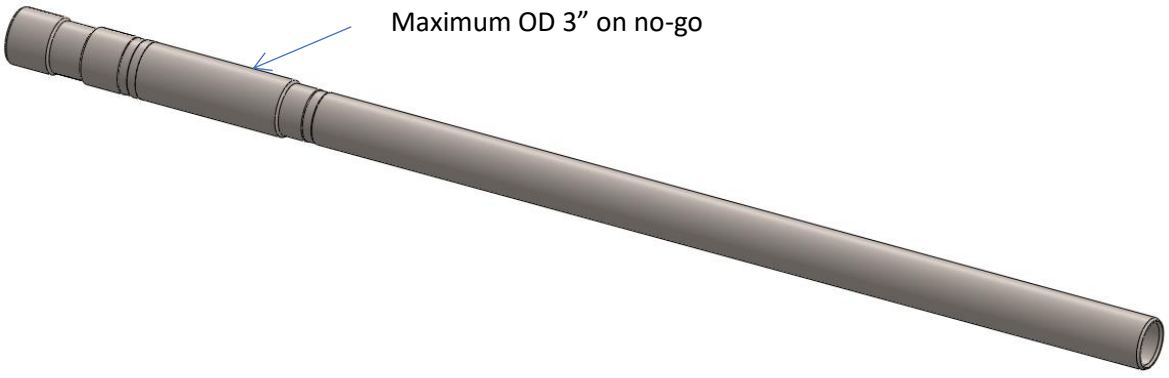
12. Lock open sleeve running procedure

Introduction

The lock open sleeve for the DT Valve is run in order to facilitate wireline runs through the flappers. This may be required in the event of stuck pipe situations where freepoint and back-off tools are required.

The lock open sleeve is run in hole to be located in the upper grapple section of the tool and extends through the lower section of the tool including the flappers giving a free clear passage for wireline tools through the valve. The lock open sleeve is retained by the grapple and as standard requires a 300lb force to latch it in place and a 300lb overpull to remove it from the grapple. The force requirements can be changed on request by changing the strength of the grapple springs.

The lock open sleeve has an industry standard 3” internal GS latch profile to be run on standard slickline tools or a wireline running tool in a dedicated run in hole. A GS type wireline running tool is supplied with the valve. The sleeve is 65” long with an ID of 2.25” and an upper no-go OD of 3”.



Running procedure

Make up the running / pulling toolstring to the lock open sleeve. It is recommended that the running / pulling string should as a minimum consist of enough layoff weight (standard 300lbs spring) to

allow the lock open sleeve to fully engage in the grapple downhole and a set of spang jars to facilitate release of the running tool from the lock open sleeve. For electric line operations the tool can be run in place using cable speed to facilitate shearing of the shear pins and setting of the sleeve rather than spang jars but a minimum of 300lbs layoff weight is still required.

Run in hole with the lock open sleeve taking care not to hang up in any restrictions in the drillstring.

At 100ft above the DT Valve stop to record up and down weights.

Run in hole slowly until lock open sleeve engages the grapple in the valve and lay off a minimum of 300lbs string weight to lock the sleeve in place.

If running on slickline

Pick up slowly and take a 150lb overpull to confirm that the sleeve has located correctly. If no overpull is seen repeat weight layoff procedure increasing layoff weight to maximum toolstring weight. Increasing the running speed will help to engage the sleeve and shear the running tool shear pins. Repeat overpull test. Be careful not to exceed 300lbs overpull as this will disengage the sleeve downhole.

When an overpull is obtained lay off weight on the running tool and jar down to release the running tool from the sleeve. Pick up slowly ensuring no overpull is seen. If possible check the up weight to ensure the weight of the lock open sleeve (36 lbs) has been lost.

Pull out of hole with slickline.

If running on electric line

Pick up slowly – no overpull should be seen and the running tool should release from the sleeve. If overpull is seen repeat weight layoff procedure increasing layoff weight to maximum toolstring weight. Increasing the running speed will help to engage the sleeve and shear the running tool shear pins.

Once no overpull is seen when picking up run back in hole and lay off 300lbs again to re-engage the running tool in the sleeve. Again pick up slowly and take a 150lb overpull to confirm that the sleeve has located correctly. Be careful not to exceed 300lbs overpull as this will disengage the sleeve downhole.

When an overpull is obtained, lay off weight on the running tool to release the running tool from the sleeve again. Pick up slowly ensuring no overpull is seen. If possible check the up weight to ensure the weight of the lock open sleeve (36 lbs) has been lost. If overpull is seen do not exceed 150lbs. Run in and lay off weight again to cycle the running tool and pick up again slowly. Repeat until the running tool releases from the sleeve with no overpull.

Pull out of hole with electric line.

Pulling procedure

Run in hole with the running / pulling tool.

At 100ft above the DT Valve stop to record up and down weights.

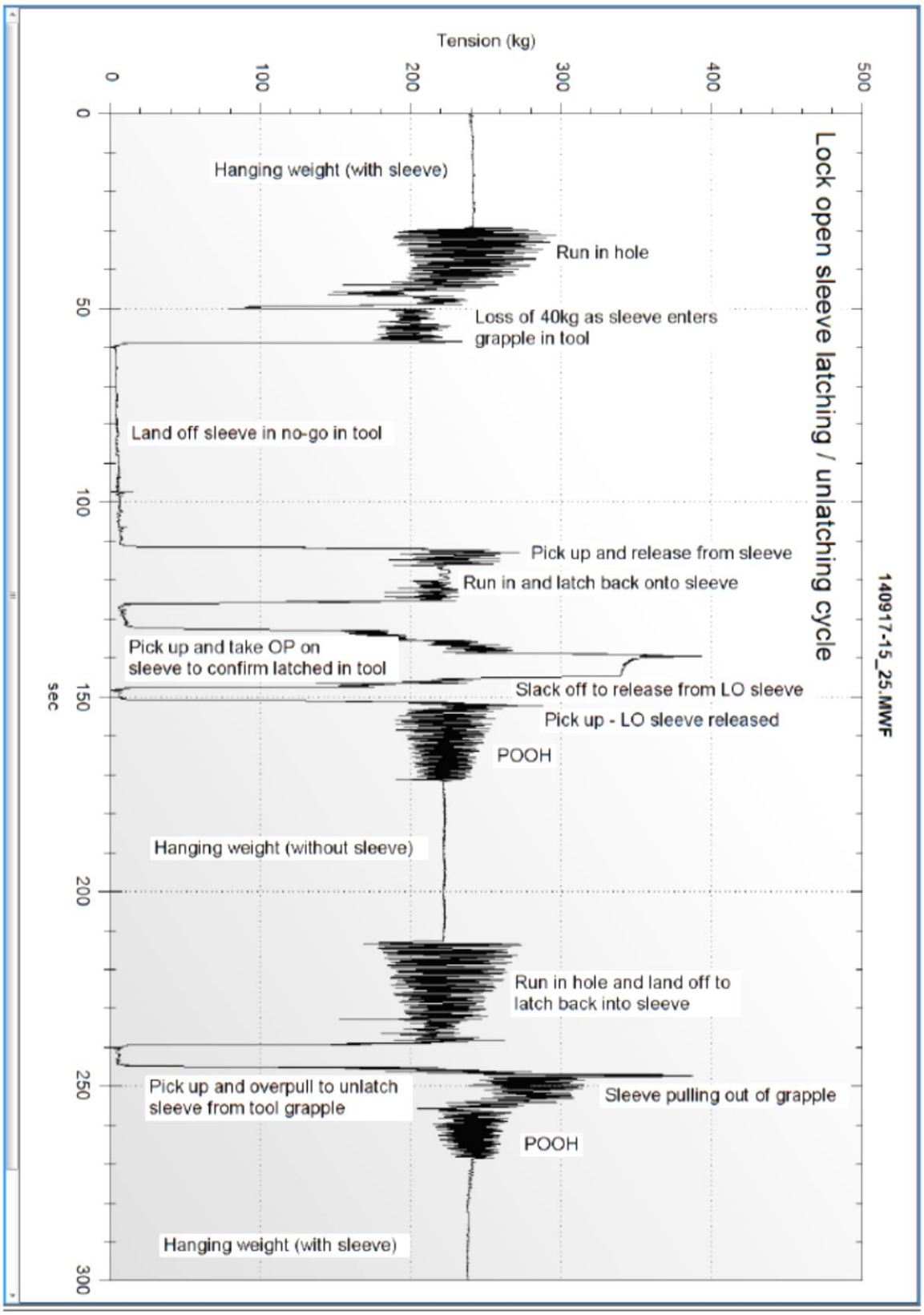
Run in slowly to the top of the DT Valve and engage the pulling tool in the lock open sleeve. Lay off 400lbs weight to ensure the pulling tool is engaged.

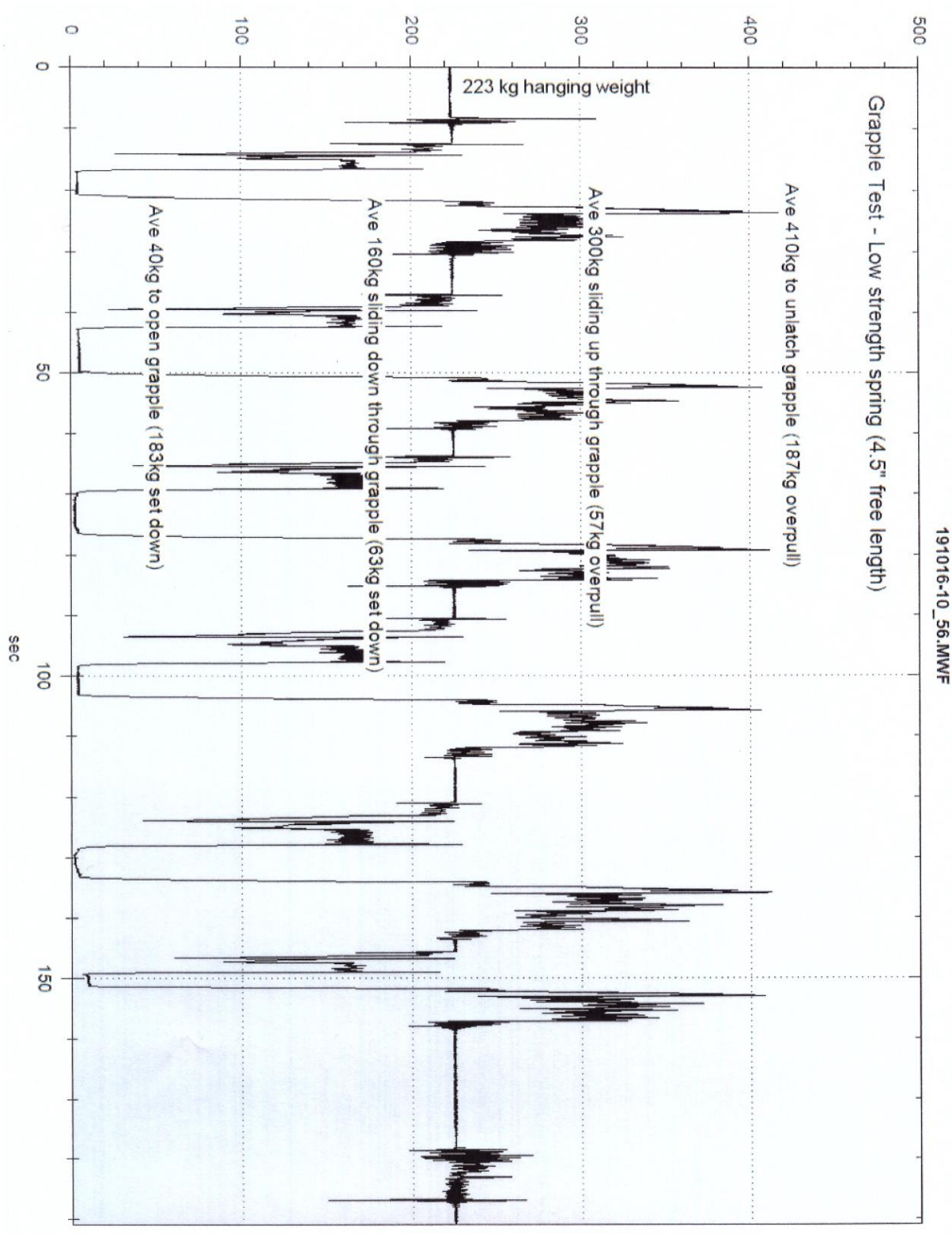
Pick up slowly. If the pulling tool is engaged in the lock open sleeve a 300lb overpull will be seen which will drop back to normal up weight with the addition of the lock open sleeve weight (additional 36 lbs) once the sleeve disengages from the grapple in the DT Valve.

If no overpull or additional weight is seen a further attempt should be made to engage the pulling tool in the lock open sleeve as above. If a high overpull is seen attempts to remove the sleeve from the DT Valve can be made by jarring up and maintaining overpull. If the sleeve cannot be removed from the DT Valve the running / pulling tool can be disengaged from the sleeve by laying off weight then picking up again.

Once the lock open sleeve has been disengaged from the DT Valve it can be pulled out of hole using normal wireline procedure.

A sequence of latching and unlatching load profiles is given below for reference when running and pulling the sleeve.


Tension (kg)
0
100
200
300
400
500
sec
0
50
100
150
200
250
300
Lock open sleeve latching / unlatching cycle
140917-15_25.MWF
Hanging weight (with sleeve)
Run in hole
Loss of 40kg as sleeve enters grapple in tool
Land off sleeve in no-go in tool
Pick up and release from sleeve
Run in and latch back onto sleeve
Pick up and take OP on sleeve to confirm latched in tool
Slack off to release from LO sleeve
Pick up - LO sleeve released
POOH
Hanging weight (without sleeve)
Run in hole and land off to latch back into sleeve
Pick up and overpull to unlatch sleeve from tool grapple
Sleeve pulling out of grapple
POOH
Hanging weight (with sleeve)


Grapple Test - Low strength spring (4.5" free length)
191016-10_56.MWF
223 kg hanging weight
Ave 410kg to unlatch grapple (187kg overpull)
Ave 300kg sliding up through grapple (57kg overpull)
Ave 160kg sliding down through grapple (63kg set down)
Ave 40kg to open grapple (183kg set down)
0
100
200
300
400
500
0
50
100
150
sec

13. Build Sheet

DT Flapper Safety Valve Build Sheet

Date	
Location	
Tool Serial number	
Client	
Name	

Tool Section	Serial Number	No. O-Rings	O-ring size	O-ring Material	O-Ring batch no	Comments
Top Sub		1	BS248			
1" Upper Torque Spacers		N/A				
Grapple Housing		N/A				
Grapple Springs		N/A				
Grapple		N/A				
Upper Spring Spacer		N/A				
Lower Spring Spacer		N/A				
Mid Sub		2	BS248			
1" Lower Torque Spacers		N/A				
1/2" Lower Torque Spacers		N/A				
Main Body		N/A				
Upper Cartridge Housing		1	BS248			
		1	BS237			
Upper Flapper		N/A				
Upper Latch Ring		N/A	BS245			
Upper Seal Cartridge		1	BS041			
Upper Lug		N/A				
Mid centraliser ring						
Lower Cartridge Housing		1	BS248			
		1	BS237			
Lower Flapper		N/A				
Lower Latch Ring		N/A	BS245			
Lower Seal Cartridge		1	BS041			
Lower Lug		N/A				
Load Collars		N/A				
Locking Ring		N/A				
CV Spring		N/A				
Spring Spacer		N/A				
Spring Flange		N/A				
Bottom Sub		1	BS 248			

14. Inspection Report

DT Flapper Safety Valve Inspection Report

Date
Location
Tool Serial number
Client
Job Description
Name

Tool Section	Serial Number	Inspection Comments	MPI/visual Inspection Pass/Fail	WT Check Pass/	
Top Sub				N/A	
1" Upper Torque Spacers				N/A	
Grapple Housing					
Grapple Springs				N/A	
Grapple				N/A	
Upper Spring Spacer				N/A	
Lower Spring Spacer				N/A	
Mid Sub				N/A	
1" Lower Torque Spacers				N/A	
1/2" Lower Torque Spacers				N/A	
Main Body				Pass	
Upper Cartridge Housing				N/A	
Upper Flapper				N/A	
Upper Latch Ring				N/A	
Upper Seal Cartridge				N/A	
Upper Lug				N/A	
Mid centraliser ring					
Lower Cartridge Housing				N/A	
Lower Flapper				N/A	
Lower Latch Ring				N/A	
Lower Seal Cartridge				N/A	
Lower Lug				N/A	
Load Collars				N/A	
Locking Ring				N/A	
CV Spring				N/A	
Spring Spacer				N/A	
Spring Flange				N/A	
Bottom Sub				N/A	

Grapple Housing

4 measurements 9inches in from each end of sub at 90 deg intervals
Nominal thickness 1" / 1.75"
Minimum thickness 0.75"

Measurement	9" from top	9" from bottom
0 deg		
90 deg		
180 deg		
270 deg		

Main Body

4 measurements at 8 inches, 13.5 inches and 22.5 inches from the top of sub at 90 deg intervals
Nominal thickness 0.875" / 1.625"
Minimum thickness 0.75"

Measurement	8" from top	13.5" from top	22.5" from top
0 deg			
90 deg			
180 deg			
270 deg			