A) DESCRIPTION

The VSI-X HT Packer, a Single-String Double-Grip Production Packer, is one of the most versatile packers on the market. This packer is a modification of the ASI-X Packer with the advantage of being able to set on electric line or hydraulically.

An On-Off Tool Stinger with a Wireline Plug installed can be attached to the top of this packer. This packer can then be lubricated in the hole and set under pressure. Once set, casing pressure can be bled off, and the tubing with an On-Off Tool Overshot can be run and latched onto the packer. The Wireline Plug can then be removed.

The VSI-X HT Packer is designed for differential pressures up to 10,000 PSI (unless noted otherwise). The HT version allows this packer to be utilized in completions where high pressure treating operations are performed and it is desirable to leave the tool in the well for production.

This packer easily converts to a mechanically set ASI-X HT Packer – just remove the shear screws and install drag blocks and drag block springs. The ASI-X HT Packer sets with 1/4 right-hand rotation, and releases with 1/4 right-hand rotation. The ASI-X HT Packer can be left in tension, compression or neutral.

NOTE₁: Stinger and setting equipment must be purchased separately.

NOTE₂: This packer requires at least a 30 second burn on the wireline setting tool to ensure a proper set. A burn time less than 30 seconds may shear the setting tool from the packer before fully setting the packer.

B) RELATED TOOLS (sold separately)

B-1) 4-1/2” X 2-3/8” Wireline Adapter Kit (WLAK) (PN 97145)—refer to technical manual *DL-971-4500-542*.

B-2) 2-3/8” DT-2 On/Off Tool and Stinger—refer to technical manual *DL-512-2375-360*.

C) SPECIFICATION GUIDE

CASING			TOOL		THREAD CONNECTION BOX UP / PIN DOWN	PART NUMBER
SIZE (INCHES)	WEIGHT (LBS/FT)	RECOMMENDED HOLE SIZE (INCHES)	GAGE OD (INCHES)	NOMINAL ID (INCHES)		
5	11.5 – 15.0	4.408 – 4.560	4.125	1.94	2-3/8 EUE	60150HT 60150HTH[1] 60150HTV[2] 60150HTC[3] 60150HTHC[4] 60150HTVC[5]
	18.0 – 20.8	4.156 – 4.276	4.000	1.94	2-3/8 EUE	60152HT 60152HTH[1] 60152HTV[2] 60152HTC[3] 60152HTHC[4] 60152HTVC[5]
	21.4	4.126	3.938	1.94	2-3/8 EUE	60153HT 60153HTH[1] 60153HTV[2] 60153HTC[3] 60153HTHC[4] 60153HTVC[5]

Tool Options: [1]HSN, [2]Viton, [3]Nitrile, Carbide, [4]HSN, Carbide, [5]Viton, Carbide

C) SPECIFICATION GUIDE (cont’d)

NOTE3: Tools listed are right-hand set / right-hand release.

NOTE4: Use of a Double Hook J-slot Packer is recommended when running with a pumpjack to help prevent the packer from unsetting during well production.

DIFFERENTIAL PRESSURE (MAX)	**TENSILE LOAD THRU TOOL** (MAX)
10,000 PSI	55,000 LBS

D) PRE-INSTALLATION INSPECTION PROCEDURES

CAUTION1: D&L ships tool connections made-up **HAND TIGHT**—labeled with hand-tight tape on the tool (Fig. 1) — unless stated otherwise. Tighten/torque all connections properly before operating tool.

Fig. 1

GENERAL THREAD CONNECTION TORQUE RECOMMENDATIONS			
STUB ACME / ACME THREADS	**INTERNAL TAPERED TUBING THREADS**		**PREMIUM THREADS**
	UP TO 2-3/8”	**GREATER THAN 2-3/8”**	
600 – 800 FT-LBS	600 – 800 FT-LBS	800 – 1,200 FT-LBS	Consult thread manufacturer’s recommendations.

GENERAL SCREW TORQUE RECOMMENDATIONS									
SCREW SIZE (INCHES)	#6	#8	#10	1/4	5/16	3/8	7/16	1/2	5/8 and larger
TORQUE RANGE (INCH-POUNDS)	5 – 8	10 – 15	18 – 25	25 – 40	50 – 80	90 – 135	160 – 210	250 – 330	450 - 650

Before first use, D&L recommends disassembly and inspection of the tool unless stated otherwise. Ensure parts have not been damaged during shipping. Replace damaged parts with D&L replacement parts. Contact D&L sales for replacement part information.

Re-assemble the tool after inspection. Install parts in the correct order and orientation. Properly tighten connections.

Before re-using the tool, D&L recommends disassembly and inspection of the tool. Clean parts and ensure parts are in good working condition. Replace worn or damaged parts with D&L replacement parts.

When redressing the tool, D&L recommends replacement of all seals, elements, o-rings, shear screws, etc. Contact D&L sales for redress kit and/or other replacement part information.

E) RELEASING PROCEDURES

Set down weight on the packer and rotate the work string 1/4 turn to the right at the packer and pick up while holding right-hand torque. The internal by-pass will open, allowing pressure to equalize. After pressure is equalized, continue to pick up to release the upper slips, relax the elements and release the lower slips.

CAUTION2: High differential pressure below the VSI-X may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

E-1) EMERGENCY RELEASE

As a last resort, if the packer will not release in the normal manner, a minimum straight pull of 90,000 lbs (may have to pull as high as 125,000 lbs) over work string weight can be applied – this will shear the J-pins on the J-pin bottom sub allowing the packer to be pulled. Tensile strength of tubing and connections should be considered. When released in this manner, the packer will reset when moved down the hole.

F) STORAGE RECOMMENDATIONS

When preparing the tool for storage, follow the Pre-Installation Inspection Procedures. Re-assemble the tool with connections hand-tight only and in running position if applicable. Elements should be in a relaxed state—free from tension, compression, and other stresses that could cause deformation.

Store the tool, if possible, in an enclosed, temperature and humidity controlled environment. Avoid excessively high temperatures over long periods of time. Shield elastomeric parts from ultraviolet light sources. Keep tool dry and protected from condensation. Do not store in contact with or near volatile or corrosive chemicals. Do not store near ozone generating equipment or operations such as welding.

G) PRESSURE AFFECTED AREA GUIDE

When set downhole, the packer mandrel is subjected to a force created by differential pressure above or below the packer that acts on the pressure affected area (i.e., the piston effect). Depending on the tubing size and weight and the seal area of the packer the force created by differential pressure acts upwards or downwards on the packer mandrel. An upward force, designated as a negative (-) value, acts to push the packer mandrel up hole and must be accounted for when releasing the packer. A downward force, designated as a positive value, acts to push the packer mandrel down hole and must be accounted for when releasing the packer. Other factors (e.g., tubing movement due to temperature change) must be considered separately to determine all the forces acting on the packer.

PACKER SIZE (INCHES)	**TUBING SIZE** (INCHES)	**PRESSURE AFFECTED AREA** (IN^2)	
		ABOVE	**BELOW**
5	1.900	1.48 (DOWN)	-2.28 (UP)
	2.063	0.97 (DOWN)	-1.91 (UP)
	2.375	-0.12 (UP)	-1.19 (UP)

Example: Consider a 5” X 2-3/8” VSI-X Packer set on 2.375” tubing with a differential pressure of 3,000 psi in the annulus around the tubing above the packer. What is the force acting on the seal area of the mandrel?

To calculate the force (lbs) acting on the seal area of the mandrel, refer to the Pressure Affected Area Guide for a 5” X 2-3/8” VSI-X Packer run on 2.375”. In this example, the differential pressure from above the packer acts on the seal area of the packer mandrel across a pressure affected area of -0.12 in^2. Multiplying the differential pressure (3,000 psi) by the pressure affected area (-0.12 in^2) results in a force of -360 lbs. The piston effect on the packer mandrel is an upward force of 360 lbs.

H) ELASTOMER TRIM TEMPERATURE GUIDE

NITRILE (STD)			
TEMPERATURE RANGE (F°)	**DUROMETER**		
	END	**MIDDLE**	**END**
40° - 125°	80	70	80
125° - 250°	90	70	90
150° - 250°	90	80	90
250° +	Contact D&L Sales		

RUBBER TYPE	**TEMPERATURE RANGE**
NITRILE	40° - 250°F
HSN (HNBR)	70° - 300°F
VITON	100° - 350°F

I) RECOMMENDED TOOLS

I-1) HAND TOOLS

- VISE
- GLOVES
- ALLEN WRENCHES
- TAPE MEASURE
- O-RING PICK
- BAR
  - 1/2-INCH
  - 3/4-INCH
- PAINT BRUSH, 2-INCH
- PIPE WRENCH, 3-FT (2 EA)
- “CHEATER” PIPE, 4-FT LONG
- ADJUSTABLE WRENCH, 12-INCH
- CORDLESS DRILL, 18V
- SNAP RING SPREADER PLIERS
- ALIGNING PUNCH
- SCREWDRIVER SET, FLAT-TIPPED
- SOCKET SETS
  - 3/8-INCH DRIVE
  - 1/2-INCH DRIVE
- HAMMERS
  - SLEDGE
  - BALL PEEN
  - DEAD BLOW

I-2) SPECIAL TOOLS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	ASSEMBLY TOOL FOR 4-1/2” - 7-5/8” VSI-XW	AT100

J) DISASSEMBLY

J-1) Clamp spring cage (5) in vise.

J-1.1) From lower end of tool, unscrew and remove bottom nipple (27) from J-pin bottom sub (23).

J-1.2) Unscrew and remove shear screws (3) from J-body (20).

J-1.3) Unscrew and remove set screws (6) from J-pin bottom sub (23). Move J-body (20) as needed for access to set screws (6).

J-1.4) Unscrew and remove J-pin bottom sub (23) from inner mandrel (2).

NOTE5: Drag block body assembly must be free to rotate.

J-1.4.1) Remove o-ring (29) from J-pin bottom sub (23).

J-1.5) Unscrew and remove set screws (6) from J-body (20).

J-1.6) Unscrew and remove J-body (20) from drag block body (18) (**NOTE6**: Left-hand threads).

J-1.7) Unscrew and remove rubber mandrel cap (19) from rubber mandrel (11).

NOTE7: For added leverage, insert a rod through rubber retainer (15) and rubber mandrel (11) as needed.

J-1.8) Wedge lower slips (17) outwards (if needed). Remove drag block body assembly and disassemble:

J-1.8.1) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

J-1.9) Unscrew and remove lower cone (16) from rubber retainer (15).

J-1.10) Unscrew rubber mandrel (11) from center coupling (10).

J-1.11) Remove rubber mandrel assembly from inner mandrel (2) and disassemble:

J-1.11.1) Remove elements (13, 14), rubber spacers (12), and rubber retainer (15) from rubber mandrel (11).

J-1.12) Unscrew and remove center coupling (10) from upper cone (9).

J-1.12.1) Remove bonded seal (24) and o-ring (30) from center coupling (10).

J-1.12.1.1) Remove o-ring (28) from bonded seal (24).

J-1.13) Remove upper cone (9) from inner mandrel (2).

J-1.14) Wedge slips (7, 8) outwards (if needed). Unscrew and remove inner mandrel (2) from top sub (1).

J-1.15) Remove wedges (if needed). Remove releasing slip (7), upper slips (8) and upper slip springs (26) from spring cage (5).

J) DISASSEMBLY (cont’d)

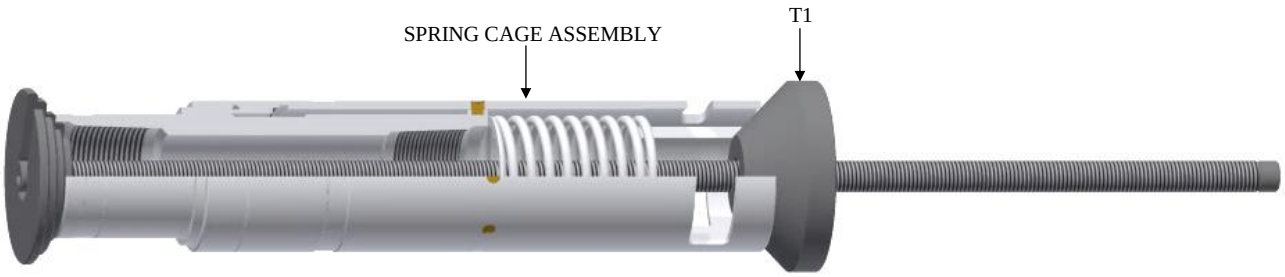


Fig. 2

J-1.16) Disassemble spring cage assembly:

J-1.16.1) Position assembly tool (T1) hand-tight against top sub (1) and spring cage (5) of spring cage assembly (Fig. 2).

CAUTION$_3$: Compression spring (4) is compressed with tension against spring cage assembly.

J-1.16.2) Unscrew and remove shear screws (3) from spring cage (5).

J-1.16.3) Unscrew spring cage cap (22) from spring cage (5).

J-1.16.4) Release compression spring (4) tension by loosening assembly tool (T1). Remove assembly tool (T1).

J-1.16.5) Remove spring cage cap (22), top sub (1), compression spring (4) and spring retaining ring (21) from spring cage (5).

J-2) Unclamp and remove spring cage (5) from vise.

K) ASSEMBLY

NOTE$_8$: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.

CAUTION$_4$: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs (Fig. 3).

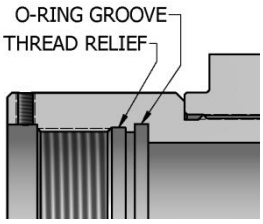


Fig. 3

K-1) Clamp spring cage (5) in vise.

K-1.1) Assemble spring cage assembly:

K-1.1.1) Install spring retaining ring (21), compression spring (4) and top sub (1) into spring cage (5).

K-1.1.2) Screw spring cage cap (22) into spring cage (5).

NOTE$_9$: Press down top sub (1) to compress compression spring (4) as necessary.

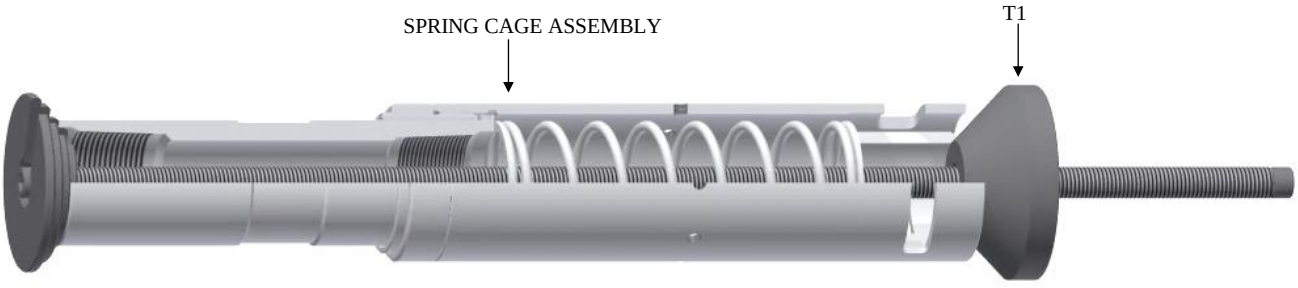


Fig. 4

K-1.1.3) Compress compression spring (4) with assembly tool (T1) (Fig. 4).

K) ASSEMBLY (cont’d)

K-1.1.4) Align threaded holes in spring cage (5) with recessed holes in top sub (1). Screw shear screws (3) into spring cage (5). Tighten until shear screws (3) make contact with top sub (1). Back shear screws (3) out 1/4 turn.

K-1.1.5) Remove assembly tool (T1) from spring cage assembly.

CAUTION$_3$: Compression spring (4) is compressed with tension against spring cage assembly.

K-1.1.6) Install upper slips (8), releasing slip (7) and upper slip springs (26) into spring cage (5). Wedge releasing slip (7) and upper slips (8) outwards.

NOTE$_{10}$: Install one (1ea) spring per slip (Fig. 5).

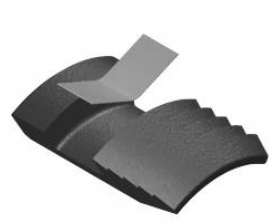


Fig. 5

K-1.2) Screw inner mandrel (2) into top sub (1). Remove wedges.

K-1.3) Install upper cone (9) onto lower end of inner mandrel (2). Slide upper cone (9) up inner mandrel (2) until the flange of upper cone (9) comes in contact with shoulder of inner mandrel (2). (Refer to Technical Illustration Detail A.)

K-1.4) Install o-ring (28) into groove in bonded seal (24).

K-1.5) Install bonded seal (24) into center coupling (10).

CAUTION$_5$: Do not rip or tear o-ring during installation.

K-1.6) Install o-ring (30) into center coupling (10).

K-1.7) Screw center coupling (10) onto upper cone (9).

K-1.8) Assemble rubber mandrel assembly and install:

K-1.8.1) Install rubber retainer (15), elements (13, 14), and rubber spacers (12) onto rubber mandrel (11).

K-1.8.2) Install rubber mandrel assembly onto inner mandrel (2).

K-1.8.3) Screw rubber mandrel (11) into center coupling (10).

CAUTION$_5$: Do not rip or tear o-ring during installation.

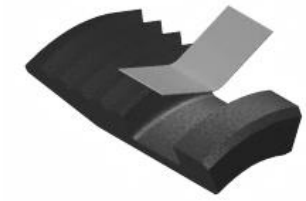


Fig. 6

K-1.9) Screw lower cone (16) into rubber retainer (15).

K-1.10) Assemble drag block body assembly and install:

K-1.10.1) Install lower slips (17) and lower slip springs (25) into drag block body (18). Wedge lower slips (17) outwards.

NOTE$_{11}$: Install one (1ea) spring per slip (Fig. 6).

K-1.10.2) Install drag block body assembly onto rubber mandrel (11). Remove wedges.

K-1.11) Screw rubber mandrel cap (19) onto rubber mandrel (11).

NOTE$_7$: For added leverage, insert a rod through rubber retainer (15) and rubber mandrel (11) as needed.

K-1.12) Screw J-body (20) onto drag block body (18) (**NOTE$_6$**: Left-hand threads).

K-1.13) Align threaded holes in J-body (20) with groove in drag block body (18). Screw set screws (6) into J-body (20).

K-1.14) Install o-ring (29) into groove in J-pin bottom sub (23).

K-1.15) Screw J-pin bottom sub (23) onto inner mandrel (2).

CAUTION$_5$: Do not rip or tear o-ring during installation.

NOTE$_5$: Drag block body assembly must be free to rotate.

K) ASSEMBLY (cont’d)

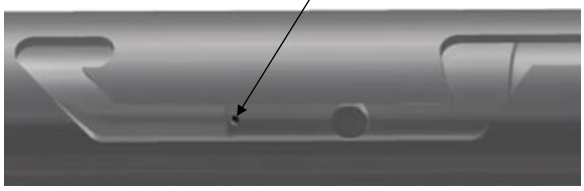


Fig. 7

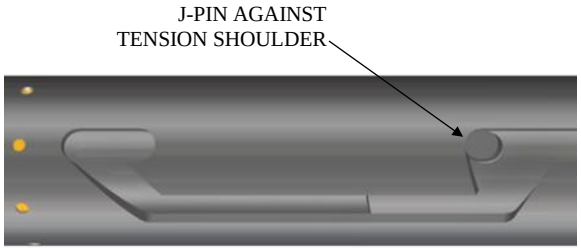


Fig. 8

K-1.16) Rotate J-body (20) as needed to position J-pin of J-pin bottom sub (23) along J-slot to access threaded holes (Fig. 7). Screw set screws (6) into J-pin bottom sub (23).

K-1.17) Position J-pin of J-pin bottom sub (23) against tension shoulder in J-slot of J-body (20) (Fig. 8).

K-1.18) Align threaded holes in J-body (20) with pocket holes in rubber mandrel cap (19). For added leverage, wrench on rubber retainer (15) as needed to properly align threaded holes.

K-1.19) Screw shear screws (3) into J-body (20). Tighten until shear screws (3) make contact with rubber mandrel cap (19). Back shear screws (3) out 1/4 turn.

K-1.20) Screw bottom nipple (27) into J-pin bottom sub (23).

K-2) Unclamp spring cage (5) from vise and remove assembled tool.

L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60150HT	P/N 60152HT	P/N 60153HT
1	1	TOP SUB	DLMS110	60145610HT		
2	1	INNER MANDREL	DLMS110	60045210HT		60044210HT
3	16	SHEAR SCREW (2375#)	DLM360BRS	60100990		
4	1	COMPRESSION SPRING	DLMCRSP	60345920		
5	1	SPRING CAGE	DLMS110	60150325HT		60153325HT
6	6	SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037		
7	1	RELEASING SLIP	DLMS110	60050125		
8	2	UPPER SLIP	DLMS35	60050115		
9	1	UPPER CONE	DLMS110	60045410HT		
10	1	CENTER COUPLING	DLMS60	60250620	60252620	60253620
11	1	RUBBER MANDREL	DLMS110	60045220		60044220
12	2	RUBBER SPACER	DLMS35	60250840	60252840	60253840
13	1	ELEMENT	80 DURO NITRILE	60250512	60252512	60253512
14	2	ELEMENT	90 DURO NITRILE	60250513	60252513	60253513
15	1	RUBBER RETAINER	-	60250850	60252850	60253850
16	1	LOWER CONE	DLMS110	60045420HT		
17	4	LOWER SLIP	DLMS35	60050135		
18	1	DRAG BLOCK BODY	DLMS60	60050335		60053335
19	1	RUBBER MANDREL CAP	DLMS60	60145230		
20	1	J-BODY	DLMS110	60145340HT		
21	1	SPRING RETAINING RING	DLMS60	60045820		

L) PARTS LIST (cont’d)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60150HT	P/N 60152HT	P/N 60153HT
22	1	SPRING CAGE CAP	DLMS60	60145810		
23	1	J-PIN BOTTOM SUB	DLMS110	60045634HT		
24	1	BONDED SEAL	90 DURO NITRILE	60045520		
25	4	LOWER SLIP SPRING	DLMELG/DLMINC625	7145901		
26	3	UPPER SLIP SPRING	DLMELG/DLMINC625	7145902		
27	1	BOTTOM NIPPLE	DLMS80	60355636		
28	1	145 O-RING	90 DURO NITRILE	90145		
29	1	228 O-RING	90 DURO NITRILE	90228		
30	1	232 O-RING	90 DURO NITRILE	90232		
31	8	SHEAR SCREW (5000#) 7/16-20 UNF X 7/16	DLM360BRS	BSSSLT043F043*		

* Refer to WLAK technical manual for placement

REDRESS KIT (RDK)	60150050HT	60152050HT	60153050HT
ASSEMBLED WEIGHT	118 LBS	118 LBS	115 LBS

L-1) CARBIDE OPTIONS

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60150HTC	P/N 60152HTC	P/N 60153HTC
8	2	UPPER SLIP W/CARBIDE	DLMS110	60050115C		
17	4	LOWER SLIP W/CARBIDE	DLMS110	60050135C		

L) PARTS LIST (cont’d)

L-2) ELASTOMER TRIM OPTIONS

NOTE12: For temperature range, refer to Elastomer Trim Temperature Guide.

L-2.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60150HTH	P/N 60152HTH	P/N 60153HTH
13	1	ELEMENT	70 DURO HSN	60250511H	60252511H	60253511H
14	2	ELEMENT	90 DURO HSN	60250513H	60252513H	60253513H
24	1	BONDED SEAL	90 DURO HSN	60045520H		
27	1	145 O-RING	90 DURO HSN	90145H		
28	1	228 O-RING	90 DURO HSN	90228H		
29	1	232 O-RING	90 DURO HSN	90232H		

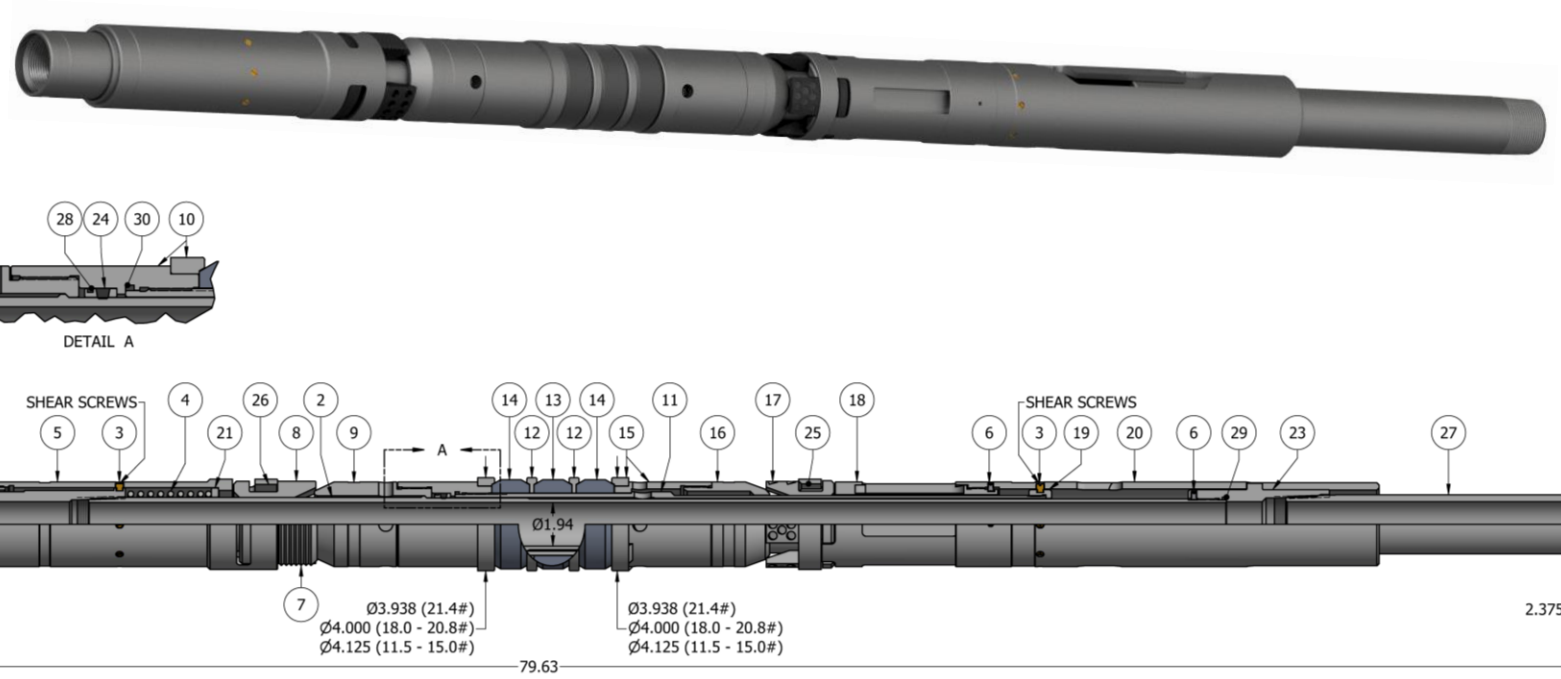
REDRESS KIT (RDK)	60150050H	60152050H	60153050H

L-2.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60150HTV	P/N 60152HTV	P/N 60153HTV
13	1	ELEMENT	70 DURO VITON	60250511V	60252511V	60253511V
14	2	ELEMENT	90 DURO VITON	60250513V	60252513V	60253513V
24	1	BONDED SEAL	90 DURO VITON	60045520V		
27	1	145 O-RING	90 DURO VITON	90145V		
28	1	228 O-RING	90 DURO VITON	90228V		
29	1	232 O-RING	90 DURO VITON	90232V		

REDRESS KIT (RDK)	60150050V	60152050V	60153050V

M) TECHNICAL ILLUSTRATION



N) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
05/11/2021	D	Added non-carbide options; corrected emergency release	J.Anderson	E.Visaez
10/31/2019	C	Revised P/N 60150325HT was 60150325	J.Anderson	E.Visaez
12/12/2018	B	Revised P/N 60050335 was 60352335	J.Anderson	D.Hushbeck
11/15/2017	A	Created new manual	-	-