



VSI-X PACKER, VITON WITH SHEAR RELEASE BOTTOM 5" X 2-3/8"

Manual No:
DL-601-5000-738

Revision: **C**

Revision Date:
01/31/2017

Authored by: J.Anderson

Approved by: J.McArthur

A) DESCRIPTION

The VSI-X 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.

This packer is released with either right-hand rotation or a straight pull to shear the J-pin ring. Shear values are adjustable. When shear released, the packer will reset when moved down hole.

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 off of the packer before fully setting the packer.

B) RELATED TOOLS (sold separately)

B-1) 5" X 2-3/8" Wireline Adapter Kit (WLAK) (P/N 97145)—refer to technical manual *DL-971-4500-542*.

B-2) 2-3/8" DT-2 On/Off Tool and Stinger (P/N varies)—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	18.0 – 20.8	4.156 – 4.276	4.000	1.94	2-3/8 EUE	60152SRV

NOTE₃: 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.

NOTE₄: Tool listed is right-hand set / right-hand release.

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)
7,000 PSI	30,000 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.

D & L OIL TOOLS
P.O. BOX 52220 TULSA, OK 74152
PHONE: (800) 441-3504 www.dloilttools.com

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D) PRE-INSTALLATION INSPECTION PROCEDURES (cont'd)

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 Packer may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

The packer J-pin ring is equipped with a shear release to allow the packer to be released with straight pickup above work string weight. The shear release value is adjustable from 5,550 lbs to 49,950 lbs (5,550 lbs/screw) by adding or removing screws from the J-pin ring. When released in this manner, the packer will reset when moved down the hole.

NOTE₅: To prevent unintentional release of the packer, be sure to reduce number of shear screws on the WLAK proportionally with the packer shear screws when adjusting the packer releasing shear value. D&L recommends that a four (4 qty) packer shear release screw to WLAK shear screw advantage be maintained.

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.



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G) PRESSURE AFFECTED AREA(S) 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.

SIZE (INCHES)	TUBING (INCHES)	ABOVE (SQ INCHES)	BELOW (SQ INCHES)
5	1.900	1.48 (DOWN)	-2.28 (UP)
	2.062	0.97 (DOWN)	-1.91 (UP)
	2.375	-0.11 (UP)	-1.19 (UP)

Example: Consider a 5" 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" VSI-X Packer run on 2.375" tubing. 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 -0.11 in². Multiplying the differential pressure (3,000 PSI) by the pressure affected area (-0.11 in²) results in a force of -330 lbs. The piston effect on the packer mandrel is an upward force of 330 lbs.

H) ELASTOMER TRIM TEMPERATURE GUIDE

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

RUBBER TYPE	TEMPERATURE RANGE
NITRILE	70° - 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



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I) RECOMMENDED TOOLS (cont'd)

I-2) SPECIAL TOOLS

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

J) DISASSEMBLY

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

J-1.1) Unscrew and remove cross over (28) 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 (22) from J-pin bottom sub (23). Move J-body (20) as needed for access to set screws (22).

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

NOTE₆: Drag block body assembly must be free to rotate.

J-1.4.1) Remove o-ring (31) from J-pin bottom sub (23).

J-1.4.2) Unscrew and remove shear screws (29) from J-pin ring (21).

J-1.4.3) Remove J-pin ring (21) from J-pin bottom sub (23).

J-1.5) Unscrew and remove set screws (22) from J-body (20).

J-1.6) Unscrew and remove J-body (20) from drag block body (18) (**NOTE₇:** Left-hand threads).

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

NOTE₈: 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 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).

NOTE₁₀: For added leverage, insert a rod through upper cone (9) as needed.

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 o-ring (32) and bonded seal (24) from center coupling (10).

J-1.12.1.1) Remove o-ring (30) 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).

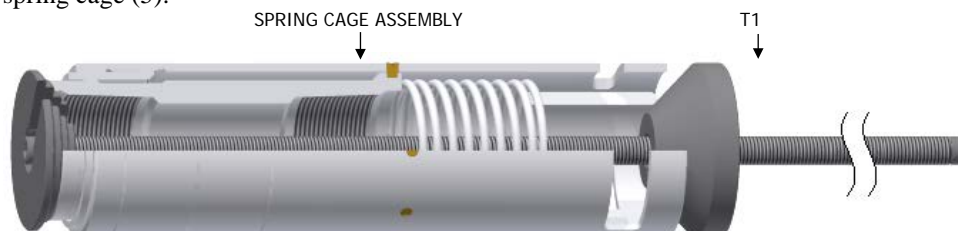


Fig. 2



VSI-X PACKER, VITON WITH SHEAR RELEASE BOTTOM 5" X 2-3/8"

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J) DISASSEMBLY (cont'd)

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).

CAUTION₃: Compression spring (4) is compressed with spring 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 (27) 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 (27), top sub (1), compression spring (4) and spring retaining ring (6) from spring cage (5).

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

K) ASSEMBLY

NOTE₉: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.

CAUTION₄: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs (Fig. 3).

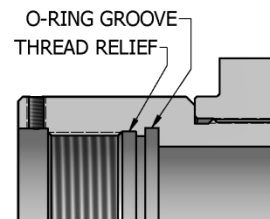


Fig. 3

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

K-1.1) Assemble spring cage assembly:

K-1.1.1) Install spring retaining ring (6), compression spring (4), and top sub (1) into spring cage (5).

K-1.1.2) Screw spring cage cap (27) into spring cage (5).

NOTE₁₁: Press down top sub (1) to compress compression spring (4) as necessary.

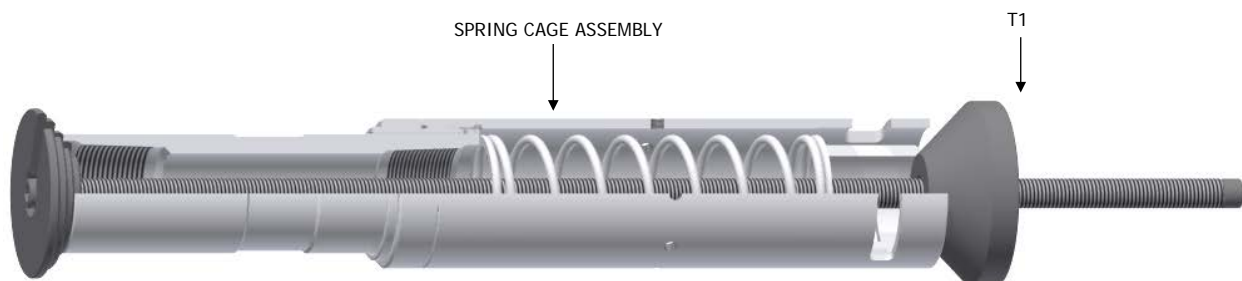


Fig. 4

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

K-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 (T-1) from spring cage assembly.

CAUTION₃: Compression spring (4) is compressed with tension against spring cage assembly.



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K) ASSEMBLY (cont'd)

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.

NOTE₁₂: Install one (1ea) spring per slip (Fig. 5).

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

K-1.3) Install upper cone (9) onto inner mandrel (2).

K-1.4) Install o-ring (32) in groove in center coupling (10).

K-1.5) Install o-ring (30) in groove in bonded seal (24).

K-1.6) Install bonded seal (24) in center coupling (10).

CAUTION₅: Do not rip or tear o-ring during installation.

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

NOTE₁₀: For added leverage, insert a rod through upper cone (9) as needed.

K-1.8) Assemble rubber mandrel assembly:

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) and screw rubber mandrel (11) into center coupling (10).

CAUTION₅: Do not rip or tear o-ring during installation.

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).

NOTE₁₂: Install one (1ea) spring per slip (Fig. 6).

K-1.10.2) Wedge lower slips (17) outwards. Install drag block body assembly onto rubber mandrel (11) and remove wedges.

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

NOTE₈: 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) (**NOTE₇:** Left-hand threads).

K-1.13) Align threaded holes in J-body (20) with groove in drag block body (18). Screw set screws (22) into J-body (20).

K-1.14) Install J-pin ring (21) onto J-pin bottom sub (23). Align threaded holes in J-pin ring (21) with recessed holes in J-pin bottom sub (23).

K-1.15) Screw shear screws (29) into J-pin ring (21). Tighten until shear screws (29) make contact with J-pin bottom sub (23). Back shear screws (29) out 1/4 turn.

K-1.16) Install o-ring (31) in groove in J-pin bottom sub (23).

K-1.17) Screw J-pin bottom sub (23) onto inner mandrel (2).

CAUTION₅: Do not rip or tear o-ring during installation.

NOTE₆: Drag block body assembly must be free to rotate.

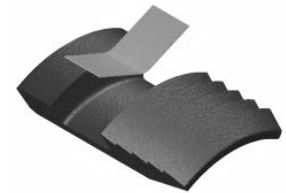


Fig. 5

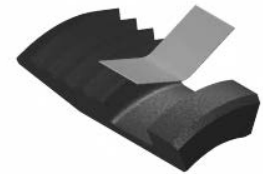


Fig. 6

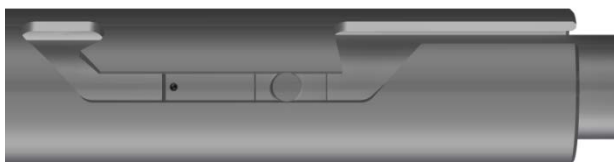


Fig. 7



Fig. 8



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K) ASSEMBLY (cont'd)

- K-1.18) Rotate J-body (20) as needed to position J-pin of J-pin ring (21) along J-slot to access threaded holes (Fig. 7). Screw set screws (22) into J-pin bottom sub (23).
- K-1.19) Position J-pin of J-pin ring (21) on tension shoulder in J-slot of J-body (20) (Fig. 8).
- K-1.20) Align threaded holes in J-body (20) with recessed holes in rubber mandrel cap (19). For added leverage, wrench on rubber retainer (15) as needed to properly align threaded holes.
- K-1.21) 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-1.22) Screw cross over (28) onto J-pin bottom sub (23).
- K-2) Unclamp spring cage (5) from vise and remove assembled tool.

L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER
1	1	TOP SUB	DLMS80	60145610
2	1	INNER MANDREL	DLMS80	60045210
3	16	SHEAR SCREW (2375#)	DLM360BRS	60100990
4	1	COMPRESSION SPRING	CHROME VANADIUM	60345920
5	1	SPRING CAGE	DLMS60	60150325
6	1	SPRING RETAINING RING	DLMS60	60045820
7	1	RELEASING SLIP	DLMS110	60050125
8	2	UPPER SLIP	DLMS35	60050115
9	1	UPPER CONE	DLMS60	60045410
10	1	CENTER COUPLING	DLMS60	60252620
11	1	RUBBER MANDREL	DLMS110	60045220
12	2	RUBBER SPACER	DLMS60	60252840
13	1	ELEMENT	70 DURO VITON	60252511V
14	2	ELEMENT	90 DURO VITON	60252513V
15	1	RUBBER RETAINER	DLMS60	60252850
16	1	LOWER CONE	DLMS60	60045420
17	4	LOWER SLIP	DLMS35	60050135
18	1	DRAG BLOCK BODY	DLMS60	60050335
19	1	RUBBER MANDREL CAP	DLMS60	60145230
20	1	J-BODY	DLMS60	60145340
21	1	J-PIN RING	DLMS110	60045875
22	6	SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037
23	1	BOTTOM SUB	DLMS60	60045655



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L) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER
24	1	BONDED SEAL	90 DURO VITON	60045520V
25	4	LOWER SLIP SPRING	-	7145901
26	3	UPPER SLIP SPRING	-	7145902
27	1	SPRING CAGE CAP	DLMS60	60145810
28	1	CROSS OVER	DLMS60	CH2375N2375E
29	9	SHEAR SCREW (5550#) 7/16-20 UNF X 3/8	DLM675BRZ	BZSSSLT043F037
30	1	145 O-RING	90 DURO VITON	90145V
31	1	228 O-RING	90 DURO VITON	90228V
32	1	232 O-RING	90 DURO VITON	90232V
33	8	SHEAR SCREW (4300#) 7/16-20 UNF X 7/16	DLM360BRS	BSSSLT043F043*

*Refer to WLAK technical illustration for placement

REDRESS KIT (RDK)	60152050SRV
ASSEMBLED WEIGHT	119 LBS



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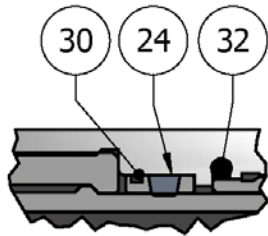
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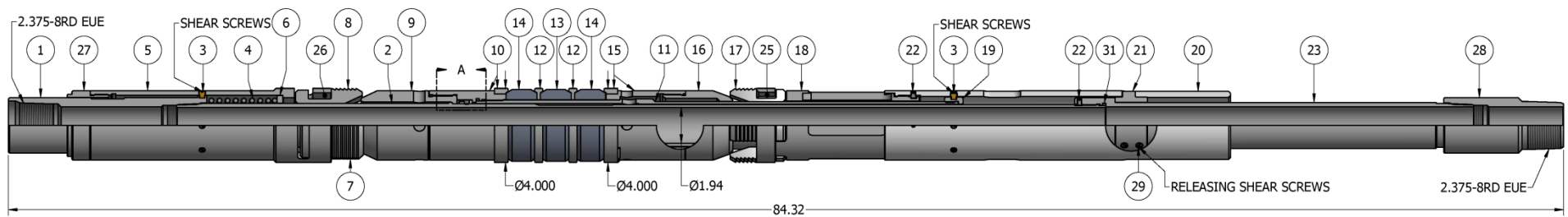
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M) TECHNICAL ILLUSTRATION



DETAIL A



	VSI-X PACKER, VITON WITH SHEAR RELEASE BOTTOM 5" X 2-3/8"		Manual No: DL-601-5000-738
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N) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
01/31/2017	C	Removed tool drift ID; Added General Screw Torque Recommendations; Revised max. tensile load 30,000 lbs was 40,000 lbs, Pressure Affected Area Guide, Elastomer Trim Temperature Guide Nitrile and HSN temp. ratings, P/N BZSSSLT043F037 was BSSSLT043F037, qty 9 was 8, shear rating 5,550 lbs was 4,300 lbs, Releasing Procedures	J.Anderson	K.Plunkett
08/04/14	B	Removed emergency release procedures.	J.Anderson	J.McArthur
08/01/14	A	Created a new tech manual.	-	-