



# VSI-X HT PACKER

w/CARBIDE  
5-1/2" X 2-3/8"

Manual No:  
**DL-601-5500-491**

Revision: **F**

Revision Date:  
**09/24/2019**

Authored by: B.Mathis

Approved by: B. Oligschlaeger

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

**NOTE<sub>1</sub>:** Stinger and Wireline Adapter Kit (WLAK) must be purchased separately.

**NOTE<sub>2</sub>:** 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—refer to technical manual *DL-512-2375-360*.

B-3) 2-3/8 Stinger—actual P/N varies depending on customer requirements.

## C) SPECIFICATION GUIDE

CASING			TOOL		THREAD CONNECTION BOX UP / PIN DOWN	PART NUMBER
SIZE (INCHES)	WEIGHT (LBS/FT)	RECOMMENDED HOLE SIZE (INCHES)	OD (INCHES)	NOMINAL ID (INCHES)		
5-1/2	23.0 - 26.0	4.548 - 4.670	4.375	1.94	2-3/8 EUE	60154HTC 60154HTHC <sup>1</sup> 60154HTVC <sup>2</sup>

Elastomer Trim Options: <sup>1</sup>HSN, <sup>2</sup>Viton

**NOTE<sub>3</sub>:** Tools listed are right-hand set / right-hand release.

**NOTE<sub>4</sub>:** 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 & L OIL TOOLS  
P.O. BOX 52220 TULSA, OK 74152  
PHONE: (800) 441-3504 [www.dloiltools.com](http://www.dloiltools.com)



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## D) PRE-INSTALLATION INSPECTION PROCEDURES

**CAUTION<sub>1</sub>:** 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 tools 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 part information.

## E) RELEASING PROCEDURES

The releasing procedures are the same whether the packer has been tension or compression set. Set down weight on the packer to unseat the J-pin from the tension shoulder of the J-slot. Refer to the Pressure Affected Area Guide to determine necessary set down weight on the packer. Rotate the work string 1/4 right-hand turn at the packer and pick up while holding right hand torque. Weight in addition to pipe weight may be required to pick up on packer – refer to Pressure Affected Area Guide. 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 thus allowing the packer to be re-set or removed from the well.

**CAUTION<sub>2</sub>:** High differential pressure below the VSI-X HT Packer may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

## 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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## w/CARBIDE

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## 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 (SQ. INCHES)	
		ABOVE	BELOW
5-1/2	2.375	-0.115 (UP)	-1.189 (UP)
	2.875	-2.177 (UP)	0.365 (DOWN)

**Example:** Consider a 5-1/2" X 2-3/8" VSI-X HT 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 5-1/2" X 2-3/8" VSI-X HT 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 -0.115 in<sup>2</sup>. Multiplying the differential pressure (3,000 PSI) by the pressure affected area (-0.115 in<sup>2</sup>) results in a force of -345 lbs. The piston effect on the packer mandrel is an upward force of 345 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
300° +	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



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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 shear screws (3) from J-body (20).

J-1.2) Unscrew and remove bottom nipple (28) from J-pin bottom sub (23).

J-1.3) Unscrew and remove set screws (22) from J-pin bottom sub (23). Move J-body (20) as needed.

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

**NOTE<sub>5</sub>:** Drag block body assembly must be free to rotate.

J-1.4.1) Remove o-ring (30) 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) (**NOTE<sub>6</sub>:** Left-hand threads).

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

**NOTE<sub>7</sub>:** For added leverage, insert a rod through rubber retainer (15) and rubber mandrel (11) as needed.

J-1.8) Remove retaining ring (6) from drag block body (18).

J-1.9) Wedge lower slips (17) outward (if needed). Remove drag block body assembly and disassemble:

J-1.9.1) Remove wedges (if needed) and remove lower slips (17) and lower slip springs (25) from drag block body (18).

J-1.10) Unscrew and remove lower cone (16) from rubber retainer (15).

J-1.11) Unscrew rubber mandrel (11) from center coupling (10).

**NOTE<sub>8</sub>:** For added leverage, insert a rod through upper cone (9) as needed.

J-1.12) Remove rubber mandrel assembly and disassemble:

J-1.12.1) Remove elements (13, 14), rubber spacers (12), and rubber retainer (15) from rubber mandrel (11).

J-1.13) Unscrew and remove center coupling (10) from upper cone (9).

J-1.13.1) Remove bonded seal (24) and o-ring (31) from center coupling (10).

J-1.13.1.1) Remove o-ring (29) from bonded seal (24).

J-1.14) Remove upper cone (9) from inner mandrel (2)

J-1.15) Wedge slips outwards (if needed). Unscrew and remove inner mandrel (2) from top sub (1).

J-1.16) Remove wedges (if needed) and remove releasing slip (7), upper slips (8) and upper slip springs (26) from spring cage (5).



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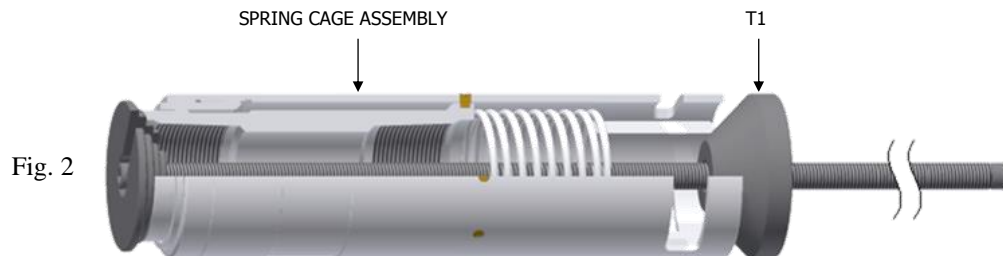
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## J) DISASSEMBLY (cont'd)



J-1.17) Disassemble spring cage assembly:

J-1.17.1) Position assembly tool (T1) hand-tight against top sub (1) and spring cage (5) of spring cage assembly (Fig. 2).

**CAUTION<sub>3</sub>**: Compression spring (4) is compressed with tension against spring cage assembly.

J-1.17.2) Unscrew and remove shear screws (3) from spring cage (5).

J-1.17.3) Release compression spring (4) tension by loosening assembly tool (T1) until enough space exists between stepped cone of assembly tool (T1) and spring cage cap (27) for spring cage cap (27) to be unscrewed from spring cage (5).

J-1.17.4) Unscrew spring cage cap (27) from spring cage (5).

J-1.17.5) Release remaining compression spring (4) tension by loosening assembly tool (T1). Remove tool from assembly.

J-1.17.6) Remove spring cage cap (27), top sub (1), compression spring (4) and spring retainer ring (21) from spring cage (5).

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

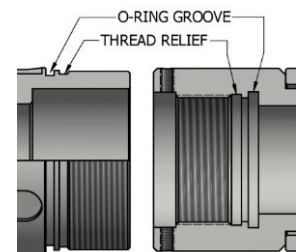


Fig 3

## K) ASSEMBLY

**NOTE<sub>9</sub>**: 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<sub>4</sub>**: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs (Fig 3).

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

K-1.1) Assemble spring cage assembly:

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

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

**NOTE<sub>10</sub>**: Press down top sub (1) to compress compression spring (4) as necessary.

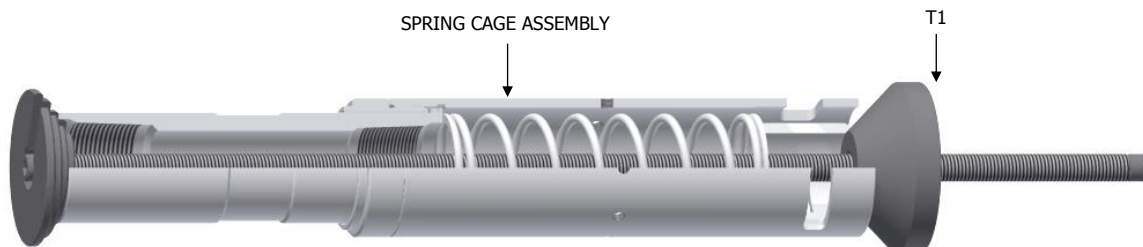


Fig. 4

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



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## 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) contact top sub (1). Back shear screws (3) out 1/4 turn.

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

**CAUTION<sub>4</sub>:** 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<sub>11</sub>:** Install two (2ea) springs 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 lower end of inner mandrel (2). Slide upper cone (9) until the flange of upper cone contacts shoulder of inner mandrel (2) (Refer to Technical Drawing Detail A).

K-1.4) Install o-ring (29) into o-ring groove in bonded seal (24).

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

**CAUTION<sub>5</sub>:** Do not rip or tear o-ring during installation.

K-1.6) Install o-ring (31) into o-ring groove in center coupling (10).

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

**NOTE<sub>8</sub>:** For added leverage, insert a rod through upper cone (9) as needed.

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<sub>5</sub>:** 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).

**NOTE<sub>12</sub>:** Install two (2ea) springs 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<sub>7</sub>:** For added leverage, insert a rod through rubber retainer (15) and rubber mandrel (11) as needed.

K-1.12) Install drag block retainer (6) onto drag block body (18).

K-1.13) Screw J-body (20) onto drag block body (18) (**NOTE<sub>6</sub>:** Left-hand threads).

K-1.14) Screw set screws (22) into J-body (20).

K-1.15) Install o-ring (30) into o-ring groove in J-pin bottom sub (23).

K-1.16) Screw J-pin bottom sub (23) onto inner mandrel (2).

**CAUTION<sub>5</sub>:** Do not rip or tear o-ring during installation.

**NOTE<sub>5</sub>:** Drag block body assembly must be free to rotate.

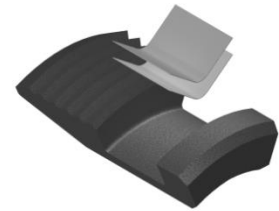


Fig. 5

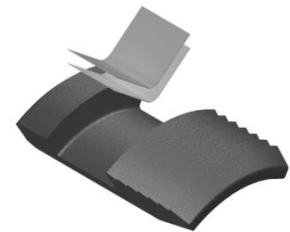


Fig. 6



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## K) ASSEMBLY (cont'd)

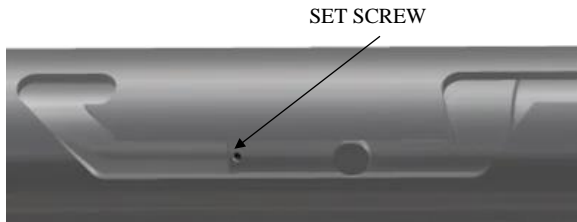


Fig. 7

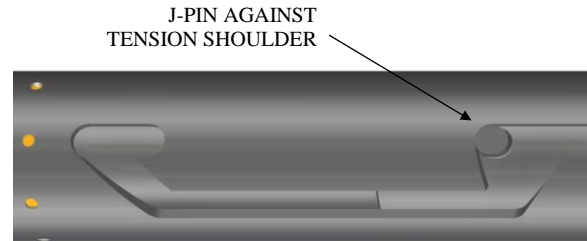


Fig. 8

- K-1.17) 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 screw (22) into J-pin bottom sub (23).
  - K-1.18) Position J-pin of J-pin bottom sub (23) on tension shoulder in J-slot of J-body (20) (Fig. 8).
  - K-1.19) 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-1.20) Screw shear screws (3) into J-body (20). Tighten until shear screws (3) contact rubber mandrel cap (19). Back shear screws (3) out 1/4 turn.
  - K-1.21) Screw bottom nipple (28) 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 60154HTC
1	1	TOP SUB	DLMS110	60145610HT
2	1	INNER MANDREL	DLMS110	60045210HT
3	16	SHEAR SCREW (2375#)	DLM360BRS	60100990
4	1	COMPRESSION SPRING	CHROME VANADIUM	60345920
5	1	SPRING CAGE	P-110/1026	60154325HT
6	1	DRAG BLOCK RETAINER	DLMS60	60354910
7	1	RELEASING SLIP	P-110	60054125
8	2	UPPER SLIP W/ CARBIDE	P-110	60054115C
9	1	UPPER CONE	DLMS110	60045410HT
10	1	CENTER COUPLING	1026	60254620
11	1	RUBBER MANDREL	DLMS110	60045220
12	2	RUBBER SPACER	DLMS35	60254840
13	1	ELEMENT	80 DURO NITRILE	60254512
14	2	ELEMENT	90 DURO NITRILE	60254513
15	1	RUBBER RETAINER	1026	60254850
16	1	LOWER CONE	DLMS110	60045420HT
17	4	LOWER SLIP W/ CARBIDE	P-110	60054135C
18	1	DRAG BLOCK BODY	1026	60354335



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## L) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60154HTC
19	1	RUBBER MANDREL CAP	DLMS60	60145230
20	1	J-BODY	P-110	60154340HT
21	1	SPRING RETAINER RING	DLMS60	60045820
22	6	SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037
23	1	J-PIN BOTTOM SUB	DLMS110	60045634HT
24	1	BONDED SEAL	90 DURO NITRILE	60045520
25	8	LOWER SLIP SPRING	ELGILOY	7155901
26	6	UPPER SLIP SPRING	ELGILOY	7145902
27	1	SPRING CAGE CAP	DLMS60	60145810
28	1	BOTTOM NIPPLE	DLMS80	60355636
29	1	145 O-RING	90 DURO NITRILE	90145
30	1	227 O-RING	90 DURO NITRILE	90227
31	1	231 O-RING	90 DURO NITRILE	90231
32	8	SHEAR SCREW (4600#) 7/16-20 UNF X 7/16	DLM360BRS	BSSSLT043F043*

\*Refer to WLAK technical illustration for placement.

REDRESS KIT (RDK)	60154050HT
ASSEMBLED WEIGHT	124 LBS

### L-1) ELASTOMER TRIM OPTIONS

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

#### L-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60154HTHC
13	1	ELEMENT	80 DURO HSN	60254512H
14	2	ELEMENT	90 DURO HSN	60254513H
24	1	BONDED SEAL	90 DURO HSN	60045520H
29	1	145 O-RING	90 DURO HSN	90145H
30	1	227 O-RING	90 DURO HSN	90227H
31	1	231 O-RING	90 DURO HSN	90231H

REDRESS KIT (RDK)	60154050HTH
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## L) PARTS LIST (cont'd)

### L-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60154HTVC
13	1	ELEMENT	80 DURO VITON	60254512V
14	2	ELEMENT	90 DURO VITON	60254513V
24	1	BONDED SEAL	90 DURO VITON	60045520V
29	1	145 O-RING	90 DURO VITON	90145V
30	1	227 O-RING	90 DURO VITON	90227V
31	1	231 O-RING	90 DURO VITON	90231V

REDRESS KIT (RDK)		60154050HTV
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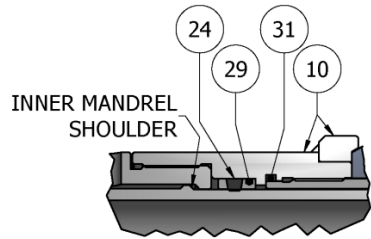
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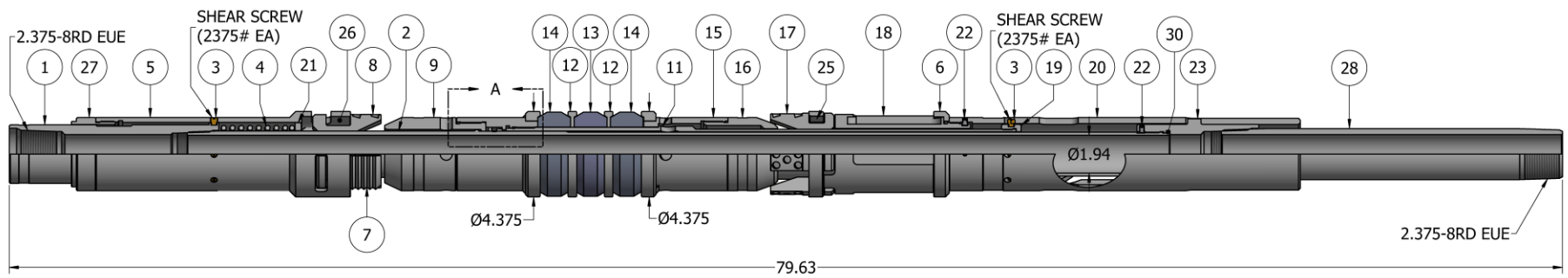
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## M) TECHNICAL ILLUSTRATION



DETAIL A



	<b>VSI-X HT PACKER</b> w/CARBIDE 5-1/2" X 2-3/8"	Manual No: <b>DL-601-5500-491</b>
		Revision: <b>F</b>
		Revision Date: <b>09/24/2019</b>
<i>Authored by: B.Mathis</i>		<i>Approved by: B. Oligschlaeger</i>

## N) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
09/24/2019	F	Added General Screw Torque Recommendations; Revised Elastomer Trim Temperature Guide nitrile temp. rating; P/N 7145902 was 7155902	J.Anderson	D.Hushbeck
12/01/2015	E	Revised Related Tools to reference 4-1/2" WLAK (P/N 97145) for use with tool, P/N BSSSLT043F043 shear value 4,600 was 4,300 lbs, Elastomer Trim Temperature Guide; Removed tool drift ID	J.Anderson	N.Banker
01/22/15	D	Revised P/N 60145810 material was L-80, Pressure Affected Area Guide; Added Related Tools, drift ID to Specifications Guide, Viton option (P/N 60154HTVC), Tensile Load Max, Pre-Installation Inspection Procedures, Storage Procedure and figures 3,5,6,7 and 8 to assembly instructions.	D. Barlow	R.Dyer
01/09/13	C	Revised technical illustration; Removed emergency release instructions from releasing procedures section, AFLAS from element selection guide; Added recommended tools, setting kit and revision history sections, HSN option (P/N 60154HTHC), P/N BSSSLT043F043, redress kit to parts list; Rewrote disassembly and assembly instructions	J.Anderson	J.McArthur