



# ASI-X PACKER

## 4-1/2" X 2-3/8"

Manual No:  
**DL-603-4500-001**

Revision: **K**

Revision Date:  
**08/04/2022**

Authored by: *S.White*

Approved by: *J.McArthur*

### A) DESCRIPTION

The ASI-X Single String Double-Grip Production Packer is the most versatile of the mechanically set retrievable packers and may be used in any production application. This packer is suited for treating, testing, or injection applications, in pumping or flowing wells, either deep or shallow. This packer can be left in tension or compression depending on well conditions and the required application.

A large internal by-pass reduces swabbing when running and retrieving. The by-pass closes when the packer is set and opens prior to releasing the upper slips when retrieving to allow pressure equalization. The J-slot design allows easy setting and releasing; 1/4 turn right-hand set, 1/4 turn right-hand release.

The standard ASI-X Packer is designed for differential pressures up to 7,000 PSI (unless noted otherwise). This packer is also available in an HT version which 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.

### B) RELATED TOOLS (sold separately)

B-1) 2-3/8" DT-2 On/Off Tool (P/N varies)—refer to technical manual *DL-512-2375-360*.

B-2) 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)	GAGE OD (INCHES)	NOMINAL ID (INCHES)		
4-1/2	9.5 - 13.5	3.920 - 4.090	3.750	1.94	2-3/8 EUE	60345 60345H <sup>1</sup> 60345V <sup>2</sup> 60345C <sup>3</sup> 60345HC <sup>4</sup> 60345VC <sup>5</sup>
	13.5 - 15.1	3.826 - 3.920	3.650	1.94	2-3/8 EUE	60344 60344H <sup>1</sup> 60344V <sup>2</sup> 60344C <sup>3</sup> 60344HC <sup>4</sup> 60344VC <sup>5</sup>
	15.1	3.826	3.641	1.94	2-3/8 EUE	60346 60346H <sup>1</sup> 60346V <sup>2</sup> 60346C <sup>3</sup> 60346HC <sup>4</sup> 60346VC <sup>5</sup>

Tool Options: <sup>1</sup>HSN, <sup>2</sup>Viton, <sup>3</sup>Nitrile, Carbide, <sup>4</sup>HSN, Carbide, <sup>5</sup>Viton, Carbide

**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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## C) SPECIFICATION GUIDE (cont'd)

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)
7,000 PSI	40,000 LBS

**NOTE<sub>1</sub>:** Tools listed are right-hand set / right-hand release.

**NOTE<sub>2</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.

## 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 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 part information.

## E) SETTING PROCEDURES

**CAUTION<sub>2</sub>:** Do not run the tool without properly tightening connections. Running the tool with loose connections may damage the tool and cause malfunction.

### E-1) COMPRESSION SET

Run the packer to setting depth. Pick up the work string to allow for setting stroke (12-13") plus desired work string load. Rotate the work string 1/4 right-hand turn at the packer, and then lower the work string while releasing torque. Slack off on the work string sufficient weight to set the packer (10,000 lbs). Pull tension to assure that the upper slips are set. The work string can then be left in tension, compression or neutral. If insufficient weight is available to set the packer with compression, tension can be applied after slack-off to pack off the elements.



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### E) SETTING PROCEDURES (cont'd)

#### E-2) TENSION SET

Run to setting depth, pick up on the work string and rotate 1/4 turn to the right at the packer then lower the work string slacking off available weight to set the packer lower slips. Pull tension to set upper slips and pack off elements (10,000 lbs). After setting the packer, the work string can be left in compression, tension or neutral.

### F) 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:** High differential pressure below the packer may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

#### F-1) EMERGENCY RELEASE

In the event, the packer will not release in the normal manner, hard right-hand torque can be applied (800-1,000 Ft-lbs) which will break the tack weld on the J-pin ring. Continued rotation of approximately 15 turns will release the J-pin ring and allow the packer to be pulled. When released in this manner, the packer will reset when moved down the hole.

### G) 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.

### H) 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 to ensure that the packer remains set. 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.



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### H) PRESSURE AFFECTED AREA GUIDE (cont'd)

PACKER SIZE (INCHES)	TUBING SIZE (INCHES)	PRESSURE AFFECTED AREA (SQ. INCHES)	
		ABOVE	BELOW
4-1/2	1.900	1.48 (DOWN)	-2.28 (UP)
	2.063	0.97 (DOWN)	-1.91 (UP)
	2.375	-0.11 (UP)	-1.19 (UP)

**Example:** Consider a 4-1/2" X 2-3/8" ASI-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 4-1/2" X 2-3/8" ASI-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 in<sup>2</sup>. Multiplying the differential pressure (3,000 PSI) by the pressure affected area (-0.11 in<sup>2</sup>) results in a force of -330 lbs. The piston effect on the packer mandrel is an upward force of 330 lbs.

### I) 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

### J) RECOMMENDED TOOLS

#### J-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

#### J-2) SPECIAL TOOLS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	DRAW BLOCK ASSEMBLY TOOL	AT045110



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### K) DISASSEMBLY

K-1) Clamp top sub (1) in vise.

K-1.1) Move J-body (20) as needed to unscrew and remove set screws (6) from J-pin bottom sub (23).

K-1.2) Unscrew and remove J-pin bottom sub (23) from inner mandrel (2).

**NOTE<sub>3</sub>:** Drag block body assembly must be free to rotate.

K-1.2.1) Remove o-ring (29) from J-pin bottom sub (23).

K-1.3) Unscrew and remove set screws (6 or 21) from J-body (20).

K-1.4) Compress drag blocks (22) using drag block body assembly tool (T1). Unscrew and remove J-body (20) from drag block body (18) (**NOTE<sub>4</sub>:** Left-hand threads).

K-1.5) Unscrew and remove rubber mandrel cap (19) from rubber mandrel (11).

**NOTE<sub>5</sub>:** For added leverage, insert a rod through rubber retainer (15) and rubber mandrel (11) as needed.

K-1.6) Release and remove drag blocks (22) and drag block springs (3) from drag block body (18).

K-1.7) Wedge lower slips (17) outwards (if needed). Remove drag block body assembly and disassemble:

K-1.7.1) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

K-1.8) Unscrew and remove lower cone (16) from rubber retainer (15).

K-1.9) Unscrew and remove rubber mandrel (11) from center coupling (10).

**NOTE<sub>6</sub>:** For added leverage, insert a rod through upper cone (9) as needed.

K-1.10) Remove rubber mandrel assembly from inner mandrel (2) and disassemble:

K-1.10.1) Remove elements (13, 14), rubber spacers (12), and rubber retainer (15) from rubber mandrel (11).

K-1.11) Unscrew and remove center coupling (10) from upper cone (9).

K-1.11.1) Remove bonded seal (24) and o-ring (30) from center coupling (10).

K-1.11.1.1) Remove o-ring (28) from bonded seal (24).

K-1.12) Remove upper cone (9) from inner mandrel (2).

K-2) Remove top sub (1) from vise. Clamp lower part of inner mandrel (2) in vise.

**CAUTION<sub>4</sub>:** Do NOT wrench or clamp on seal surface.

K-2.1) Unscrew and remove spring cage cap (27) from spring cage (5).

**CAUTION<sub>5</sub>:** Compression spring (4) is compressed and has spring tension against spring cage assembly.

K-2.2) Unscrew and remove top sub (1) from inner mandrel (2).

K-2.3) Remove compression spring (4) from spring cage (5).

K-2.4) Wedge releasing slip (7) and upper slips (8) outwards (if needed). Remove spring cage assembly and disassemble:

K-2.4.1) Remove wedges (if needed). Remove releasing slip (7), upper slips (8) and upper slip springs (26) from spring cage (5).

K-3) Remove inner mandrel (2) from vise.



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### L) ASSEMBLY

**NOTE<sub>6</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>6</sub>:** To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread relief (Fig. 2).

L-1) Clamp inner mandrel (2) in vise.

**CAUTION<sub>4</sub>:** Do **NOT** wrench or clamp on seal surface.

L-1.1) Assemble spring cage assembly and install:

L-1.1.1) Install upper slips (8), releasing slip (7) and upper slip springs (26) into spring cage (5).

**NOTE<sub>8</sub>:** Install one (1ea) spring per slip (Fig. 3).

L-1.1.2) Wedge releasing slip (7) and upper slips (8) outwards. Install spring cage assembly onto inner mandrel (2). Remove wedges.

L-1.2) Install compression spring (4) into spring cage assembly.

L-1.3) Screw top sub (1) onto inner mandrel (2).

L-1.4) Screw spring cage cap (27) into spring cage (5).

**CAUTION<sub>5</sub>:** Compression spring (4) will be compressed with spring tension against spring cage assembly.

L-2) Remove inner mandrel (2) from vise. Clamp top sub (1) in vise.

L-2.1) Install upper cone (9) onto inner mandrel (2).

L-2.2) Install o-ring (28) in groove in bonded seal (24).

L-2.3) Install bonded seal (24) into center coupling (10).

**CAUTION<sub>7</sub>:** Do not rip or tear o-ring during installation.

L-2.4) Install o-ring (30) in groove in center coupling (10).

L-2.5) Screw center coupling (10) onto upper cone (9).

**NOTE<sub>6</sub>:** For added leverage, insert a rod through upper cone (9) as needed.

L-2.6) Assemble rubber mandrel assembly and install:

L-2.6.1) Install rubber retainer (15), elements (13, 14), and rubber spacers (12) onto rubber mandrel (11).

L-2.6.2) Install rubber mandrel assembly onto inner mandrel (2).

L-2.6.3) Screw rubber mandrel (11) into center coupling (10).

**CAUTION<sub>7</sub>:** Do not rip or tear o-ring during installation.

L-2.7) Screw lower cone (16) into rubber retainer (15).

L-2.8) Assemble drag block body assembly and install:

L-2.8.1) Install lower slips (17) and lower slip springs (25) into drag block body (18). Wedge lower slips (17) outwards.

**NOTE<sub>8</sub>:** Install one (1ea) spring per slip (Fig. 4).

L-2.8.2) Install drag block body assembly onto rubber mandrel (11). Remove wedges.

L-2.9) Screw rubber mandrel cap (19) onto rubber mandrel (11).

**NOTE<sub>5</sub>:** For added leverage, insert a rod through rubber retainer (15) and rubber mandrel (11) as needed.

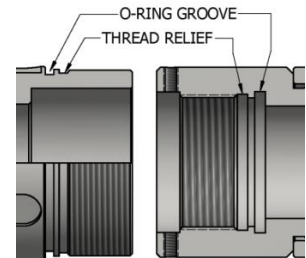


Fig. 2

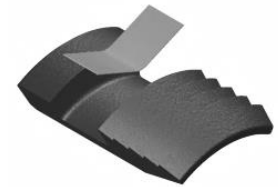


Fig. 3

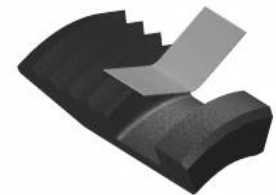


Fig. 4



# ASI-X PACKER

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### L) ASSEMBLY (cont'd)

L-2.10) Install drag blocks (22) and drag block springs (3) into drag block body (18).

**NOTE<sub>9</sub>:** Install three (3ea) springs per drag block (Fig. 5).

L-2.11) Compress drag blocks (22) with drag block assembly tool (T1).

L-2.12) Screw J-body (20) onto drag block body (18) capturing ends of drag blocks (22) (**NOTE<sub>4</sub>:** Left-hand threads).

L-2.13) Screw set screws (6 or 21) into J-body (20). Release drag blocks (22).

L-2.14) Install o-ring (29) in groove in J-pin bottom sub (23).

L-2.15) Screw J-pin bottom sub (23) onto inner mandrel (2).

**NOTE<sub>3</sub>:** Drag block body assembly must be free to rotate.

**CAUTION<sub>7</sub>:** Do not rip or tear o-ring during installation.

L-2.16) Move J-body assembly as needed to screw set screws (6) into J-pin bottom sub (23).

L-3) Unclamp top sub (1) from vise and remove assembled tool.

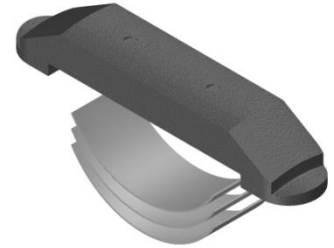


Fig. 5



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### M) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60345	P/N 60344	P/N 60346
1	1	TOP SUB	-	60145610		
2	1	INNER MANDREL	-	60045210	60044210	60046210HT
3	12	DRAG BLOCK SPRING	INCONEL	9100900		
4	1	COMPRESSION SPRING	DLMCRSP	60345920		
5	1	SPRING CAGE	-	60145325	60144325HT	60146325HT
6	-	SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037		
				6 EA		2 EA
7	1	RELEASING SLIP	DLMS110	60045125		
8	2	UPPER SLIP	DLMS60	60045115		
9	1	UPPER CONE	DLMS60	60045410	60044410	60046410
10	1	CENTER COUPLING	DLMS60	60245620	60244620	60246620
11	1	RUBBER MANDREL	DLMS110	60045220	60044220	60046220
12	2	RUBBER SPACER	DLMS60	60245840	60244840	
13	1	ELEMENT	70 DURO NITRILE	60245511	60244511	
14	2	ELEMENT	90 DURO NITRILE	60245513	60244513	
15	1	RUBBER RETAINER	DLMS60	60245850	60244850	60246851
16	1	LOWER CONE	DLMS60	60045420	60044420	60046420
17	4	LOWER SLIP	DLMS60	60045135		
18	1	DRAG BLOCK BODY	DLMS60	60045335	60044335	60046335
19	1	RUBBER MANDREL CAP	DLMS60	60145230		
20	1	J-BODY	DLMS60	60145340	60144340	60146340
21	4	SET SCREW 1/4-20 UNC X 5/16	STEEL	-	-	SSS025C031
22	4	DRAG BLOCK	DLMSDB8	9045900	9040900	9044900



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### M) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60345	P/N 60344	P/N 60346
23	1	J-PIN BOTTOM SUB	DLMS110 / DLMS80	60045650		
24	1	BONDED SEAL	DLMS60 / 90 DURO NITRILE	60045520		
25	4	LOWER SLIP SPRING	ELGILOY	7145901		
26	3	UPPER SLIP SPRING	ELGILOY	7145902		
27	1	SPRING CAGE CAP	-	60145810	60144810	60146810
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		

REDRESS KIT (RDK)		60345050	60344050		
ASSEMBLED WEIGHT		112 LBS	103 LBS	103 LBS	


### M-1) ELASTOMER TRIM OPTIONS

**NOTE<sub>10</sub>:** For temperature range, refer to Elastomer Trim Temperature Guide.

#### M-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60345H	P/N 60344H	P/N 60346H
13	1	ELEMENT	70 DURO HSN	60245511H	60244511H	
14	2	ELEMENT	90 DURO HSN	60245513H	60244513H	
24	1	BONDED SEAL	DLMS60 / 90 DURO HSN	60045520H		
28	1	145 O-RING	90 DURO HSN	90145H		
29	1	228 O-RING	90 DURO HSN	90228H		
30	1	232 O-RING	90 DURO HSN	90232H		

REDRESS KIT (RDK)		60345050H	60344050H		
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### M) PARTS LIST (cont'd)

#### M-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60345V	P/N 60344V	P/N 60346V
13	1	ELEMENT	70 DURO VITON	60245511V	60244511V	
14	2	ELEMENT	90 DURO VITON	60245513V	60244513V	
24	1	BONDED SEAL	DLMS60 / 90 DURO VITON	60045520V		
28	1	145 O-RING	90 DURO VITON	90145V		
29	1	228 O-RING	90 DURO VITON	90228V		
30	1	232 O-RING	90 DURO VITON	90232V		

REDRESS KIT (RDK)		60345050V	60344050V
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#### M-2) CARBIDE OPTIONS

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60345C	P/N 60344C	P/N 60346C
8	2	CARBIDE UPPER SLIP	DLMS110	60045115C		
17	4	CARBIDE LOWER SLIP	DLMS110	60045135C		
22	4	CARBIDE DRAG BLOCK	DLMSDB4	9045900	9040900	9044900



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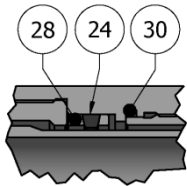
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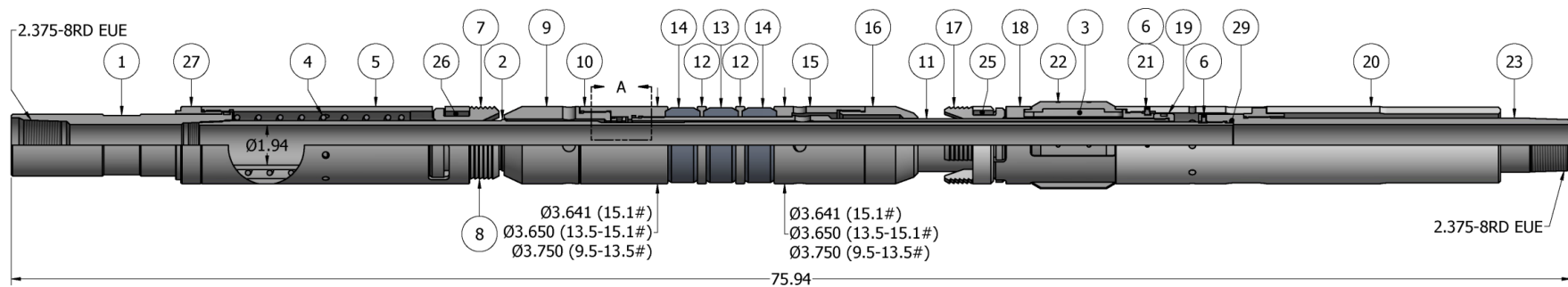
Authored by: S.White


Approved by: J.McArthur

## N) TECHNICAL ILLUSTRATION



DETAIL A



	<b>ASI-X PACKER</b> 4-1/2” X 2-3/8”	Manual No: <b>DL-603-4500-001</b>
		Revision: <b>K</b>
		Revision Date: <b>08/04/2022</b>
Authored by: S.White		Approved by: J.McArthur

## O) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
08/04/2022	K	Revised P/N 60146810 was 60046811, 60146340 was 60046340, 60146325HT was 60046325, Added carbide options	J.Anderson	E.Visaez
10/17/2018	J	Revised tensile load thru tool was 30,000 lbs, Elastomer Trim Temp. Guide Nitrile temp rating was 70-300; Added General Screw Torque Recommendations	J.Anderson	C.Colvin
10/07/2015	K	Revised P/N 9040900 was 9044900; Removed tool drift ID	J.Anderson	C.Colvin
06/29/2015	J	Added Related Tools, tool drift ID, Pre-Installation Inspection and Storage Procedures; Revised Pressure Affected Area Guide	J.Anderson	K.Plunkett
07/18/13	H	Revised Pressure Affected Area Guide Example, P/N 60046340 was 60146340, 60046811 was 60146811; Added note for substitute parts;	S.McEntire	D.Hushbeck
05/14/13	G	Revised P/N 60344 tool O.D., P/N 60145610 was 60045610, 60145325 was 60045325, 60144325HT was 60044325HT, 60145230 was 60045230, 60145340 was 60045340, 60144340 was 60044340, 60146340 was 60046340, 60145810 was 60045810, 60144810 was 60044810, 60146811 was 60046340; Added note for use of double hook J-slot packers;	J.Anderson	J.McArthur
04/11/13	F	Revised P/N 60344050 was 60346050; Added P/N 90232 to P/N 60346, recommended hand tools, revision history; Removed AFLAS from element selection guide;	J.Anderson	B.Oligschlaeger