



VSI-X HT PACKER W/CARBIDE

5-1/2" X 2-7/8"

Manual No:
DL-601-5500-502

Revision: **E**

Revision Date:
08/16/2019

Authored by: *B.Mathis*

Approved by: *B. Oligschlaeger*

A) DESCRIPTION

The VSI-X HT Single String Double Grip Production Packer is one of the most versatile packers on the market. The VSI-X HT is a modification of the popular ASI-X HT Packer with the added 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 the packer which 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 retrieved.

The VSI-X HT Packer converts to a mechanically set ASI-X HT Packer by removing the shear screws and installing drag blocks and drag block springs. The ASI-X HT Packer sets with 1/4 right-hand rotation and is released with 1/4 right-hand rotation and can be left in tension, compression or neutral.

NOTE₁: Stinger and setting equipment sold 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) 5-1/2 X 2-7/8" Wireline Adapter Kit (WLAK) (PN 97151)—refer to technical manual *DL-971-5500-631*.

B-2) 2-7/8" DT-2 On/Off Tool and Stinger—refer to technical manual *DL-512-2875-146*.

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	4.406	2.38	2-7/8 EUE	60151HTC 60151HTHC ¹ 60151HTVC ²

Elastomer Trim Options: ¹HSN, ²Viton

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	83,000 LBS

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



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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 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) SETTING PROCEDURES

CAUTION₂: 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 tubing to allow for setting stroke (12-13") plus desired tubing load. Rotate the tubing 1/4 right-hand turn at the packer, and then lower the tubing while releasing torque. Slack off on the tubing sufficient weight to set the packer (11,000 lbs). Pull tension to assure that the upper slips are set. The tubing 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.

E-2) TENSION SET

Run to setting depth, pick up on the tubing and rotate 1/4 turn to the right at the packer then lower the tubing slacking off available weight to set the packer lower slips. Pull tension to set upper slips and pack off elements (11,000 lbs). After setting the packer, the tubing can be left in compression, tension or neutral.



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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 tubing 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 VSI-X HT Packer may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

G) STORAGE RECOMENDATIONS

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

PACKER SIZE (INCHES)	TUBING SIZE (INCHES)	PRESSURE AFFECTED AREA (SQ. INCHES)	
		ABOVE	BELOW
5-1/2	2.375	2.06 (DOWN)	-3.37 (UP)
	2.875	0.00	1.81 (UP)

Example: Consider a 5-1/2" 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" 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 2.06 in². Multiplying the differential pressure (3,000 PSI) by the pressure affected area (2.06 in²) results in a force of 6,180 lbs. The piston effect on the packer mandrel is an upward force of 6,180 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



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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) OPTIONAL SPECIAL TOOLS

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

K) DISASSEMBLY

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

K-1.1) Unscrew and remove shear screws (3) from J-body (20).

K-1.2) Unscrew and remove bottom nipple (22) from J-pin bottom sub (23).

K-1.3) Unscrew and remove set screws (28) from J-pin bottom sub (23). Move J-body (20) as needed.

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

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

K-1.4.1) Remove o-ring (32) from J-pin bottom sub (23).

K-1.5) Unscrew and remove set screws (29) from J-body (20).

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

K-1.7) Remove drag block retainer (21) from drag block body (18).

K-1.8) 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.

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

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

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

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

NOTE₈: For added leverage, insert a rod through upper cone (9) as needed.

K-1.12) Remove rubber mandrel assembly and disassemble:

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

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

K-1.13.1) Remove bonded seal (24) and o-ring (33) from center coupling (10).

K-1.13.1.1) Remove o-ring (31) from bonded seal (24).

K-1.14) Remove bearing bushing (30) and upper cone (9) from inner mandrel (2).

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

K-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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K) DISASSEMBLY (cont'd)

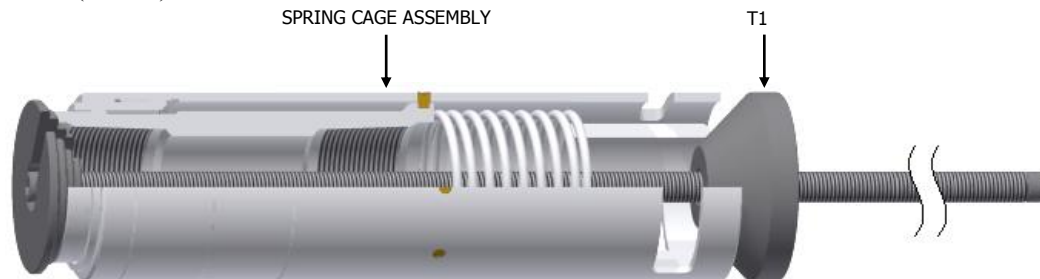


Fig. 2

K-1.17) Disassemble spring cage assembly:

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

CAUTION₄: Compression spring (4) is compressed with tension against spring cage assembly.

K-1.17.2) Unscrew and remove cap screws (34) and shear screws (6) from spring cage (5).

K-1.17.3) Release compression spring (4) tension by loosening assembly tool (T-1) until enough space exists between stepped cone of assembly tool (5) and spring cage cap (27) for spring cage cap (27) to be unscrewed from spring cage (5).

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

K-1.17.5) Release remaining compression spring (4) tension by loosening assembly tool (T-1). Remove tool from assembly.

K-1.17.6) Remove spring cage cap (27), top sub (1), and compression spring (4) from spring cage (5).

K-2) Remove spring cage (5) from vise.

L) 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.

CAUTION₅: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs unless stated otherwise (Fig. 3).

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

L-1.1) Assemble spring cage assembly:

L-1.1.1) Install compression spring (4) and top sub (1) into spring cage (5).

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

NOTE₁₀: Press down top sub (1) to compress compression spring (4) as necessary.

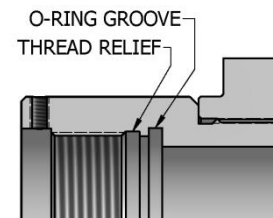


Fig. 3



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L) ASSEMBLY (cont'd)

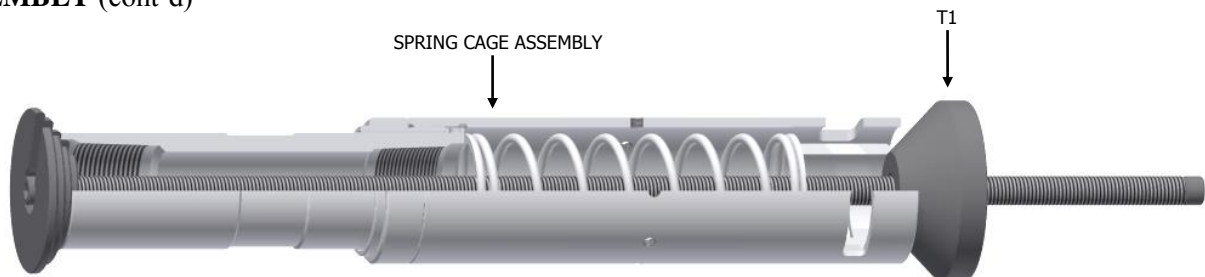


Fig. 4

- L-1.1.3) Compress compression spring (4) with assembly tool (T1) (Fig. 4).
- L-1.1.4) Align threaded holes in spring cage (5) with recessed holes in top sub (1). Screw cap screws (34) into spring cage (5) to centralize spring cage (5).
- L-1.1.5) Screw shear screws (6) into spring cage (5). Tighten until shear screws (6) make contact with top sub (1). Back shear screws (6) out 1/4 turn.
- L-1.1.6) Remove assembly tool (T1) from spring cage assembly.
CAUTION4: Compression spring (4) is compressed with tension against spring cage assembly.
- L-1.1.7) 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.
- L-1.2) Screw inner mandrel (2) into top sub (1). Remove wedges.
- L-1.3) Install upper cone (9) and bearing bushing (30) onto inner mandrel (2).
- L-1.4) Install o-ring (31) into groove in bonded seal (24).
- L-1.5) Install bonded seal (24) into center coupling (10).
CAUTION6: Do not rip or tear o-ring during installation.
- L-1.6) Install o-ring (33) in groove in center coupling (10).
- L-1.7) Screw center coupling (10) onto upper cone (9).
NOTE8: For added leverage, insert a rod thru upper cone (9) as needed.
- L-1.8) Assemble rubber mandrel assembly and install:
 - L-1.8.1) Install rubber retainer (15), elements (13, 14) and rubber spacers (12) onto rubber mandrel (11).
 - L-1.8.2) Install rubber mandrel assembly onto inner mandrel (2) and screw rubber mandrel (11) into center coupling (10).
CAUTION6: Do not rip or tear o-ring during installation.
- L-1.9) Screw lower cone (16) into rubber retainer (15).
- L-1.10) Assemble drag block body assembly and install:
 - L-1.10.1) Install lower slips (17) and lower slip springs (25) into drag block body (18).
 - L-1.10.2) Wedge lower slips (17) outwards. Install drag block body assembly onto rubber mandrel (11).
- L-1.11) Screw rubber mandrel cap (19) onto rubber mandrel (11).
NOTE7: For added leverage, insert a rod thru rubber retainer (15) and rubber mandrel (11) as needed.
- L-1.12) Install drag block retainer (21) onto drag block body (18).
- L-1.13) Screw J-body (20) onto drag block body (18) (**NOTE6:** Left-hand threads).
- L-1.14) Screw set screws (29) into J-body (20).
- L-1.15) Install o-ring (32) into groove in J-pin bottom sub (23).



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L) ASSEMBLY (cont'd)

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

T1

CAUTION₆: Do not rip or tear o-ring during installation.

NOTE₁₁: Drag block body assembly must be free to rotate.

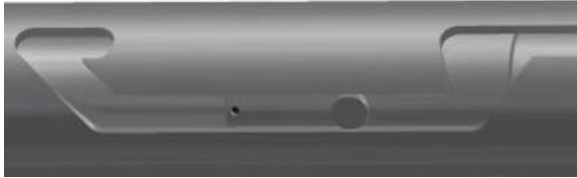


Fig. 5

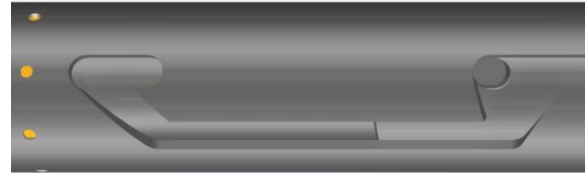


Fig. 6

L-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. 5). Screw set screw (28) into J-pin bottom sub (23).

L-1.18) Screw bottom nipple (22) into J-pin bottom sub (23).

L-1.19) Position J-pin of J-pin bottom sub (23) on tension shoulder in J-slot of J-body (20) (Fig. 6).

L-1.20) 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.

L-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.

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

M) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60151HTC
1	1	TOP SUB	DLMS110	60156610HT
2	1	INNER MANDREL	DLMS110	60351210HT
3	8	SHEAR SCREW (2375#)	DLM360BRS	60100990
4	1	COMPRESSION SPRING	DLMCRSP	60356920
5	1	SPRING CAGE	DLMS110	60151325
6	8	SHEAR SCREW (2375#)	DLM360BRS	90555990
7	1	RELEASING SLIP	DLMS110	60056125
8	2	UPPER SLIP - CARBIDE	DLMS110	60056115C
9	1	UPPER CONE	DLMS110	60351410
10	1	CENTER COUPLING	DLMS60	60051620
11	1	RUBBER MANDREL	DLMS110	60051220
12	2	RUBBER SPACER	DLMS60	60251840



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M) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60151HTC
13	1	ELEMENT	80 DURO NITRILE	60251512
14	2	ELEMENT	90 DURO NITRILE	60251513
15	1	RUBBER RETAINER	DLMS110	60251850
16	1	LOWER CONE	DLMS110	60051420
17	4	LOWER SLIP - CARBIDE	DLMS110	60056135C
18	1	DRAG BLOCK BODY	DLMS60	60051335
19	1	RUBBER MANDREL CAP	DLMS60	60156230
20	1	J-BODY	DLMS60	60151340
21	1	DRAG BLOCK RETAINER	DLMS60	60051910
22	1	BOTTOM NIPPLE	DLMS80	60370636
23	1	J-PIN BOTTOM SUB	DLMS110	60351634
24	1	BONDED SEAL	90 DURO NITRILE	60056520
25	8	LOWER SLIP SPRING	-	7155901
26	6	UPPER SLIP SPRING	-	7155902
27	1	SPRING CAGE CAP	DLMS60	60151810
28	2	SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037
29	3	SET SCREW 5/16-18 UNC X 5/16	STEEL	SSS031C031
30	1	BEARING BUSHING	DLMS60	60056224
31	1	151 O-RING	90 DURO NITRILE	90151
32	1	231 O-RING	90 DURO NITRILE	90231
33	1	235 O-RING	90 DURO NITRILE	90235
34	3	CAP SCREW 1/4-20 UNC X 1/2	STEEL	SCS025C050
35	8	SHEAR SCREW (5500#) 1/2-13 UNC X 7/16	DLM360BRS	BSSSLT050C043*

*Refer to WLAK technical illustration for placement

REDRESS KIT (RDK)		60151050HT
ASSEMBLED WEIGHT		162 S



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M) PARTS LIST (cont'd)

M-1) ELASTOMER TRIM OPTIONS

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

M-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60151HTHC
13	1	ELEMENT	80 DURO HSN	60251512H
14	2	ELEMENT	90 DURO HSN	60251513H
24	1	BONDED SEAL	90 DURO HSN	60056520H
31	1	151 O-RING	90 DURO HSN	90151H
32	1	231 O-RING	90 DURO HSN	90231H
33	1	235 O-RING	90 DURO HSN	90235H

REDRESS KIT (RDK)		60151050HTH
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M-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60151HTVC
13	1	ELEMENT	80 DURO VITON	60251512V
14	2	ELEMENT	90 DURO VITON	60251513V
24	1	BONDED SEAL	90 DURO VITON	60056520V
31	1	151 O-RING	90 DURO VITON	90151V
32	1	231 O-RING	90 DURO VITON	90231V
33	1	235 O-RING	90 DURO VITON	90235V

REDRESS KIT (RDK)		60151050HTV
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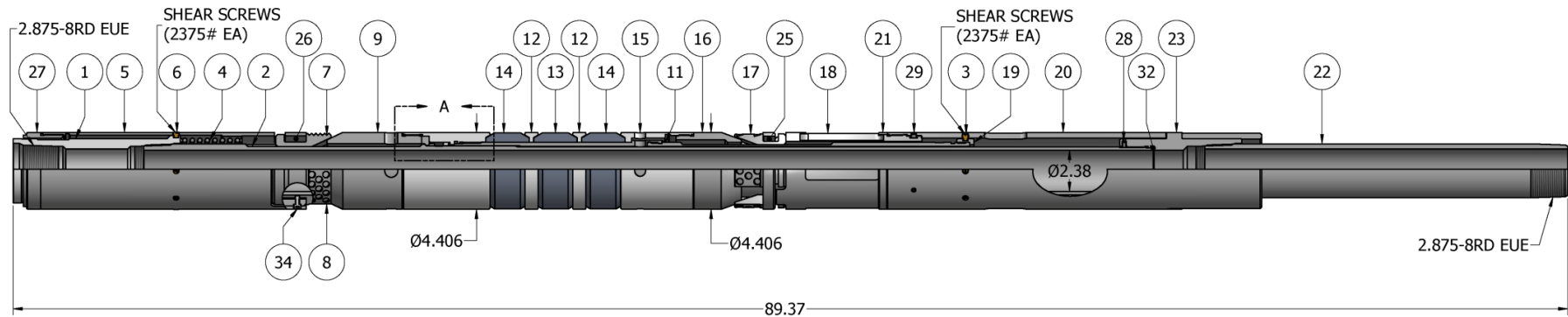
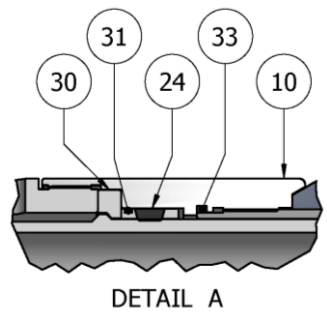
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N) TECHNICAL ILLUSTRATION



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O) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
08/16/2019	E	Removed tool drift ID, Revised Elastomer Trim Temperature Guide temp. ratings, 60351210HT was 60351210; Added General Screw Torque Recommendations	J.Anderson	K.Plunkett
07/11/14	D	Added related tools, tool drift diameter, note ⁴ for double hook j slot packer, max. tensile load, P/N SCS025C050 to parts list; Updated technical illustration.	D. Barlow	K. Riggs
01/09/13	C	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 60151HTHC), P/N BSSSLT050C043, redress kit to parts list; Rewrote disassembly and assembly instructions	J.Anderson	J.McArthur