



VSI-X PACKER

6-5/8" X 2-7/8"

Manual No:
DL-601-6625-1666

Revision: **A**

Revision Date:
07/21/2023

Authored by: J.Anderson

Approved by: E.Visaez

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.

NOTE1: Stinger and Wireline Adapter Kit (WLAK) 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) 5-1/2" to 7-5/8" X 2-7/8" Wireline Adapter Kit (WLAK) (PN 97156)—refer to technical manual *DL-971-5500-440*.

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

B-3) 2-7/8" Stinger—actual P/N varies depending on customer requirements.

C) SPECIFICATION GUIDE


CASING			TOOL		THREAD CONNECTIONS BOX UP / PIN DOWN	PART NUMBER
SIZE (INCHES)	WEIGHT (LBS/FT)	RECOMMENDED HOLE SIZE (INCHES)	GAGE OD (INCHES)	MINIMUM ID (INCHES)		
6-5/8	17.0 – 24.0	5.921 - 6.135	5.750	2.50	2-7/8 EUE	60167 60167H ¹ 60167V ² 60167C ³ 60167HC ⁴ 60167VC ⁵
	24.0 – 32.0	5.675 - 5.921	5.500	2.50	2-7/8 EUE	60165 60165H ¹ 60165V ² 60165C ³ 60165HC ⁴ 60165VC ⁵

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

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

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

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C) SPECIFICATION GUIDE (cont'd)

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)
7,000 PSI	101,500 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 Packer may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

E-1) EMERGENCY RELEASE

If the packer will not release in the normal manner, apply hard right-hand torque (800-1,000 ft-lbs) to break the tack weld on the J-pin ring. Rotate the work string to the right approximately 15 turns to release the J-pin ring and retrieve the packer. When released in this manner, the packer will reset when moved down the hole.

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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 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.

PACKER SIZE (INCHES)	TUBING SIZE (INCHES)	PRESSURE AFFECTED AREA (IN ²)	
		ABOVE	BELOW
6-5/8	2.375	3.87 (DOWN)	-5.17 (UP)
	2.875	1.80 (DOWN)	3.62 (DOWN)
	3.500	-1.33 (UP)	-1.27 (UP)

Example: Consider a 6-5/8" X 2-7/8" VSI-X Packer set on 2.875" 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 6-5/8" X 2-7/8" VSI-X Packer run on 2.875" 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 1.80 in². Multiplying the differential pressure (3,000 PSI) by the pressure affected area (1.80 in²) results in a force of 5,400 lbs. The piston effect on the packer mandrel is a downward force of 5,400 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 (F°)
NITRILE	40° - 250°F
HSN (HNBR)	70° - 300°F
VITON	100° - 350°F



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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 PACKER	AT100

J) DISASSEMBLY

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

J-1.1) Unscrew and remove set screws (32) from drag block body (18). Rotate drag block retainer (21) as needed to access set screws (32).

J-1.2) Unscrew and separate drag block body (18) from J-body (20) (**NOTE**s: Left-hand threads).

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

J-1.3) Unscrew and remove shear screws (3) from J-body (20).

J-1.4) Unscrew and remove set screws (22) from J-pin bottom sub (23). Move J-body (20) as needed to access set screws (22).

J-1.5) Unscrew and remove J-pin bottom sub (23) from inner mandrel (2).

J-1.5.1) Remove o-ring (34) from J-pin bottom sub (23).

J-1.6) Remove J-body (20) from inner mandrel (2).

J-1.6.1) Remove retaining ring (31) from J-body (20).

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) Remove drag block retainer (21) from drag block body (18).

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

J-1.9.1) Remove wedges (if needed). 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).

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

J-1.12) Remove rubber mandrel assembly from inner mandrel (2) and disassemble:

J-1.12.1) Remove gage ring (29), 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 (35) from center coupling (10).

J-1.13.1.1) Remove o-ring (33) from bonded seal (24).

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

J-1.15) Wedge slips (7, 8) outwards (if needed). Unscrew and remove inner mandrel (2) from top sub (1).



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J) DISASSEMBLY (cont'd)

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

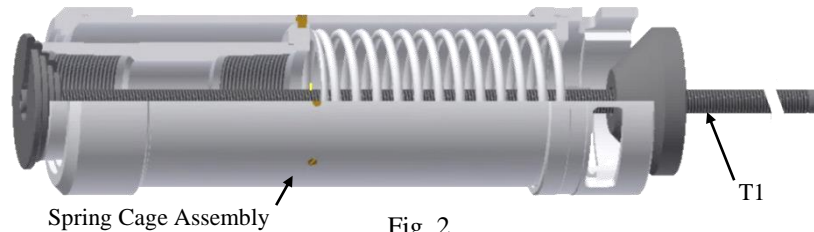


Fig. 2

J-1.17) Disassemble spring cage assembly:

J-1.17.1) Unscrew spring cage cap (27) from spring cage (5).

J-1.17.2) Position assembly tool (T1) hand-tight against top sub (1) and upper slip body (6) of spring cage assembly (Fig. 2).

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

J-1.17.3) Unscrew and remove shear screws (3) from spring cage (5).

J-1.17.4) Release compression spring (4) tension by loosening assembly tool (T1). Remove assembly tool (T1).

J-1.17.5) Remove spring cage cap (27), top sub (1), and compression spring (4) from spring cage (5).

J-1.17.6) Unscrew and remove upper slip body (6) from spring cage (5).

J-1.17.7) Remove spring retainer ring (28) from upper slip body (6).

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).

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

CAUTION₅: Do **NOT** wrench or clamp on seal surface.

K-1.1) Assemble spring cage assembly:

K-1.1.1) Install spring retaining ring (28) into upper slip body (6).

K-1.1.2) Screw upper slip body (6) onto spring cage (5).

K-1.1.3) Install compression spring (4) onto inner mandrel (2).

K-1.1.4) Screw top sub (1) onto inner mandrel (2).

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

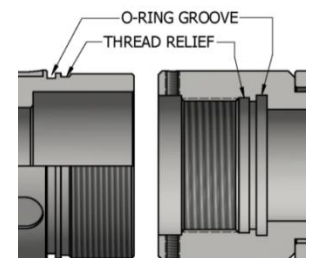


Fig. 3



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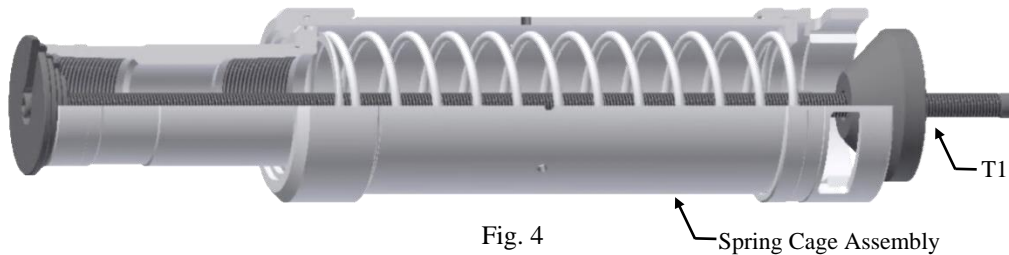
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K) ASSEMBLY (cont'd)



K-1.1.5) Compress compression spring (4) with assembly tool (T1) (Fig. 4).

K-1.1.6) Align threaded holes in spring cage (5) with counterbores 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-1.1.7) Remove assembly tool (T-1) from spring cage assembly.

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

K-1.1.8) Screw spring cage cap (27) onto spring cage (5).

K-1.1.9) Install upper slips (8), releasing slip (7) and upper slip springs (26) into upper slip body (6). Wedge releasing slip (7) and upper slips (8) outwards.

NOTE₁₁: Install two (2ea) springs per slip (Fig. 5).

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

K-1.3) Remove wedges from releasing slip (7) and upper slips (8).

K-1.4) Install upper cone (9) and bearing bushing (30) onto inner mandrel (2).

K-1.5) Install o-ring (33) in o-ring groove in bonded seal (24).

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

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

K-1.7) Install o-ring (35) in o-ring groove in center coupling (10).

K-1.8) Screw center coupling (10) onto upper cone (9).

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

K-1.9) Assemble rubber mandrel assembly and install:

K-1.9.1) Install rubber retainer (15), elements (13, 14) rubber spacers (12) and gage ring (29) onto rubber mandrel (11).

K-1.9.2) Install rubber mandrel assembly onto inner mandrel (2).

K-1.9.3) Screw rubber mandrel (11) into center coupling (10).

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

K-1.10) Screw lower cone (16) into rubber retainer (15).

K-1.11) Assemble drag block body assembly and install:

K-1.11.1) Install lower slips (17) and lower slip springs (25) into drag block body (18).

NOTE₁₂: Install two (2ea) springs per slip (Fig. 6).

K-1.11.2) Wedge lower slips (17) outwards. Install drag block body assembly onto rubber mandrel (11). Remove wedges.

K-1.12) Screw rubber mandrel cap (19) onto rubber mandrel (11).

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

K-1.13) Install drag block retainer (21) on drag block body (18).

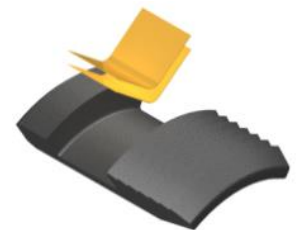


Fig. 5



Fig. 6



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K) ASSEMBLY (cont'd)

K-1.14) Install retaining ring (31) onto J-body (20).

K-1.15) Install J-body (20) onto inner mandrel (2) and over rubber mandrel cap (19).

K-1.16) Install o-ring (34) in o-ring groove in J-pin bottom sub (23).

K-1.17) Install J-pin bottom sub (23) into J-slots in J-body (20). Screw J-pin bottom sub (23) onto inner mandrel (2).

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

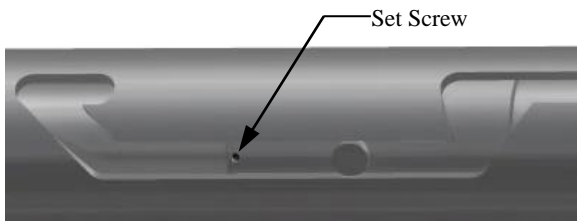


Fig. 7

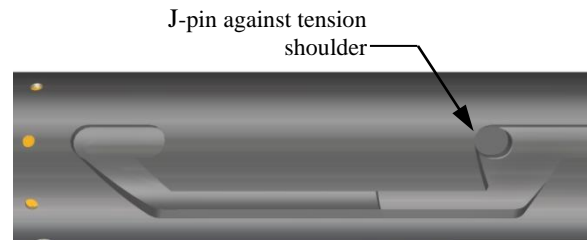


Fig. 8

K-1.18) Move J-body (20) as needed to access threaded holes in J-pin bottom sub (23) (Fig. 7). Screw set screws (22) into J-pin bottom sub (23).

K-1.19) Position J-pin of J-pin bottom sub (23) on tension shoulder in J-slot of J-body (20) (Fig. 8).

K-1.20) Align threaded holes in J-body (20) with counterbores in rubber mandrel cap (19). If necessary, insert a rod through rubber retainer (15) and rubber mandrel (11) to properly align threaded holes.

K-1.21) 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-1.22) Screw drag block body (18) onto J-body (20). (**NOTE₅:** Left-hand threads).

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

K-1.23) Move drag block retainer (21) as needed to align threaded holes.

K-1.24) Screw set screws (32) into drag block body (18).

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

L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60165	P/N 60167
1	1	TOP SUB	DLMS80	60170610	
2	1	INNER MANDREL	DLMS41X80	60370210	60367210
3	16	SHEAR SCREW (2375#)	DLM360BRS	60100990	
4	1	COMPRESSION SPRING	DLMCRSP	60370920	
5	1	SPRING CAGE	DLMS60	60170310	
6	1	UPPER SLIP BODY	-	60065320	60067320
7	1	RELEASING SLIP	DLMS110	60065125	60070125
8	2	UPPER SLIP	DLMS35	60065115	60070115
9	1	UPPER CONE	-	60365410	60367410
10	1	CENTER COUPLING	DLMS35	60365620	60370620



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L) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60165	P/N 60167
11	1	RUBBER MANDREL	DLMS60	60370220	60367220
12	2	RUBBER SPACER	DLMS60	60265840	60267840
13	1	ELEMENT	70 DURO NITRILE	60265511	60267511
14	2	ELEMENT	90 DURO NITRILE	60265513	60267513
15	1	RUBBER RETAINER	DLMS80	60365850	60367850
16	1	LOWER CONE	-	60065420	60067420
17	4	LOWER SLIP	DLMS35	60065135	60070135
18	1	DRAG BLOCK BODY	-	60065335	60067335
19	1	RUBBER MANDREL CAP	DLMS60	60170230	
20	1	J-BODY	DLMS60	60165340	60170340
21	1	DRAG BLOCK RETAINER	DLMS60	60065910	60067910
22	2	1/4-20 UNC X 3/8 SOCKET SET SCREW	STEEL	SSS025C037	
23	1	J-PIN BOTTOM SUB	DLMS110 / DLMS80	60370650	
24	1	BONDED SEAL	90 DURO NITRILE	60070520	
25	8	LOWER SLIP SPRING	DLMELG	7170901	
26	6	UPPER SLIP SPRING	DLMELG	7170902	
27	1	SPRING CAGE CAP	DLMS80	60165810	60067810
28	1	SPRING RETAINING RING	DLMS60	60070820	
29	1	GAGE RING	DLMS80	60265830	60267830
30	1	BEARING BUSHING	DLMS60	60370224	
31	1	RETAINING RING	DLMS60	60065911	60070911
32	3	5/16-18 UNC X 1/2 SOCKET SET SCREW	STEEL	SSS031C050	
33	1	153 O-RING	90 DURO NITRILE	90153	
34	1	233 O-RING	90 DURO NITRILE	90233	
35	1	242 O-RING	90 DURO NITRILE	90242	
36	8	1/2-13 UNC X 7/16 SLOTTED SHEAR SCREW (5500#)	DLM360BRS	BSSSLT050C043*	

*Refer to WLAK technical manual for placement.

REDRESS KIT (RDK)		60165050	60167050
ASSEMBLED WEIGHT		268 LBS	282 LBS



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L) PARTS LIST (cont'd)

L-1) ELASTOMER TRIM OPTIONS

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

L-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60165H	P/N 60167H
13	1	ELEMENT	70 DURO HSN	60265511H	60267511H
14	2	ELEMENT	90 DURO HSN	60265513H	60267513H
24	1	BONDED SEAL	90 DURO HSN	60070520H	
33	1	153 O-RING	90 DURO HSN	90153H	
34	1	233 O-RING	90 DURO HSN	90233H	
35	1	242 O-RING	90 DURO HSN	90242H	

REDRESS KIT (RDK)		60165050H	60167050H
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L-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60165V	P/N 60167V
13	1	ELEMENT	70 DURO VITON	60265511V	60267511V
14	2	ELEMENT	90 DURO VITON	60265513V	60267513V
24	1	BONDED SEAL	90 DURO VITON	60070520V	
33	1	153 O-RING	90 DURO VITON	90153V	
34	1	233 O-RING	90 DURO VITON	90233V	
35	1	242 O-RING	90 DURO VITON	90242V	

REDRESS KIT (RDK)		60165050V	60167050V
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L-2) CARBIDE OPTIONS

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60165C	P/N 60167C
8	2	CARBIDE UPPER SLIP	DLMS110	60065115C	60070115C
17	4	CARBIDE LOWER SLIP	DLMS110	60065135C	60070135C



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DL-601-6625-1666

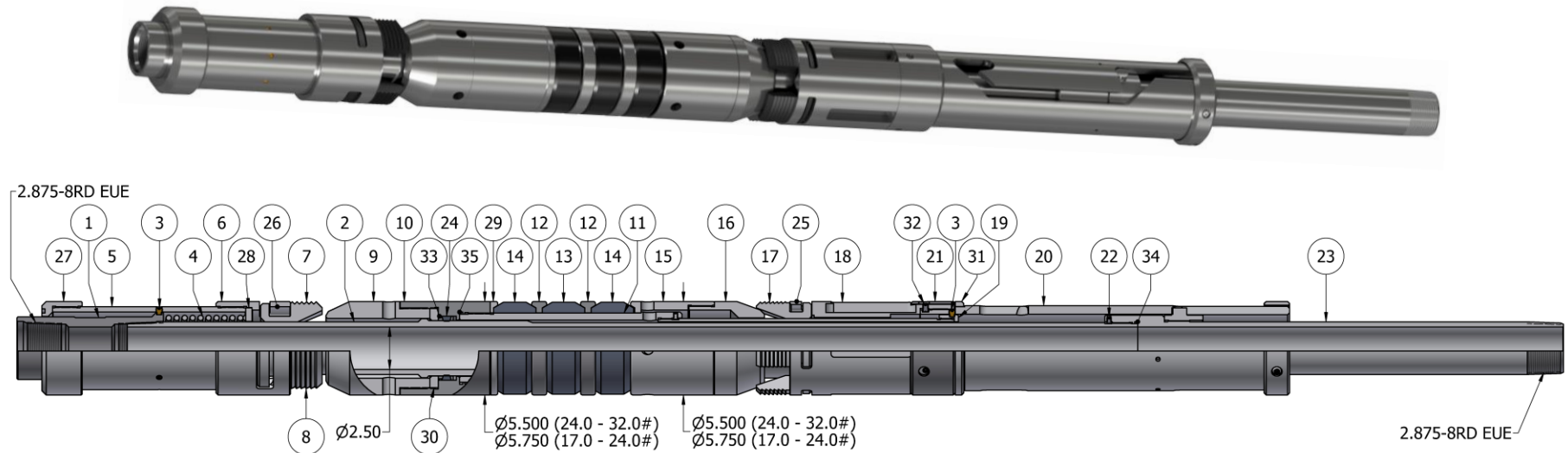
Revision: **A**

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Authored by: J.Anderson

Approved by: E.Visaez

M) TECHNICAL ILLUSTRATION



N) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
07/21/2023	A	Created manual	-	-