



VSI-X PACKER

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

Manual No:
DL-601-7625-1346

Revision: **A**

Revision Date:
04/06/2020

Authored by: J.Anderson

Approved by: K.Plunkett

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: 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.

NOTE₂: Stinger and Wireline Adapter Kit (WLAK) sold separately.

B) RELATED TOOLS (sold separately)

B-1) 7 and 7-5/8" X 2-7/8" WLAK (P/N 97174)—refer to technical manual DL-971-7000-247.

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)	GAGE OD (INCHES)	NOMINAL ID (INCHES)		
7-5/8	24.0 – 29.7	6.875 – 7.025	6.672	2.50	2-7/8 EUE	60175 60175H ¹ 60175V ²
	33.7 – 39.0	6.625 – 6.765	6.453	2.50	2-7/8 EUE	60176 60176H ¹ 60176V ²

¹HSN Option ²Viton Option

NOTE₄: Tools listed are right-hand set / right-hand release.

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)
7,000 PSI	105,000 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 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. Rotate the tubing 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.

CAUTION₃: 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.

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 or other 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 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
7-5/8	2.375	6.43 (DOWN)	-7.59 (UP)
	2.875	4.37 (DOWN)	-6.19 (UP)
	3.500	1.24 (DOWN)	-3.47 (UP)

Example: Consider a 7-5/8" 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. How much force is 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 7-5/8" X 2-7/8" VSI-X Packer run on 2.875" tubing. In this example, the differential pressure from above the packer acts down on the seal area of the mandrel area across a pressure affected area of 4.37 in². Multiplying the differential pressure (3,000 PSI) by the pressure affected area (4.37 in²) results in a downward force of 13,110 lbs. 13,110 lbs is the force which needs to be neutralized when releasing the packer.

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
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 4-1/2" - 7-5/8" VSI-XW	AT100

J) DISASSEMBLY

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

J-1.1) From lower end of tool, unscrew and remove set screws (31) from drag block body (18).

J-1.2) Unscrew and separate drag block body (18) from J-body (20) (**NOTE**₅: 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 (30) from J-pin bottom sub (23). Move J-body (20) as needed to access screws.

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

J-1.5.1) Remove o-ring (37) from J-pin bottom sub (23).

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

J-1.6.1) Remove drag block retaining ring (35) 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) Remove drag block body assembly and disassemble:

J-1.9.1) Wedge lower slips (17) outwards (if needed). Unscrew and remove cap screws (22) from drag block body (18).

J-1.9.2) Remove lower slip support (32) from drag block body (18). Remove wedges (if needed).

J-1.9.3) 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 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 (38) from center coupling (10).

J-1.13.1.1) Remove o-ring (36) from bonded seal (24).

J-1.14) Remove bearing bushing (34) from inner mandrel (2).

J-1.15) Remove upper cone (9) from inner mandrel (2).

J-1.16) Unscrew and remove inner mandrel (2) from top sub (1).



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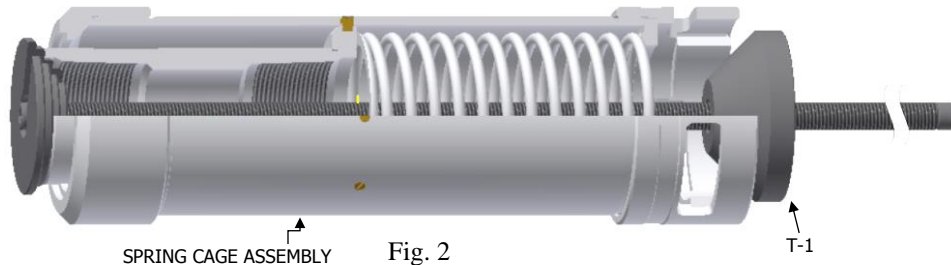
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J) ASSEMBLY (cont'd)



J-1.17) Disassemble spring cage assembly:

J-1.17.1) Unscrew and remove 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).

CAUTION₂: Compression spring (4) is compressed with 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 tool from assembly.

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

J-1.17.6) Unscrew upper slip support (33) from spring cage (5).

J-1.17.7) Remove upper slip body assembly and disassemble:

J-1.17.7.1) Remove spring retainer ring (28) from upper slip support (33).

J-1.17.7.2) Wedge slips (7, 8) outwards (if needed). Unscrew and remove upper slip body (6) from upper slip support (33).

J-1.17.7.3) Remove wedges (if needed). Remove releasing slip (7), upper slips (8) and upper slip springs (26) 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.

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

K-1.1) Assemble spring cage assembly:

K-1.1.1) Assemble upper slip body assembly and install:

K-1.1.1.1) Install spring retainer ring (28) into upper slip support (33).

K-1.1.1.2) Install releasing slip (7), upper slips (8) and upper slip springs (26) into upper slip body (6). Wedge slips (7, 8) outwards.

NOTE₁₃: Install two (2ea) springs per slip (Fig. 2).

K-1.1.1.3) Screw upper slip body (6) onto upper slip support (33). Remove wedges.

K-1.1.1.4) Screw upper slip support (33) onto spring cage (5).

K-1.1.2) Install compression spring (4) and top sub (1) into spring cage (5).

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

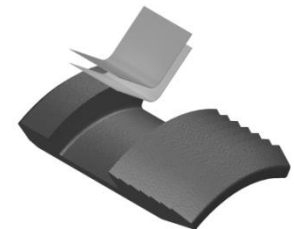


Fig. 2



VSI-X PACKER

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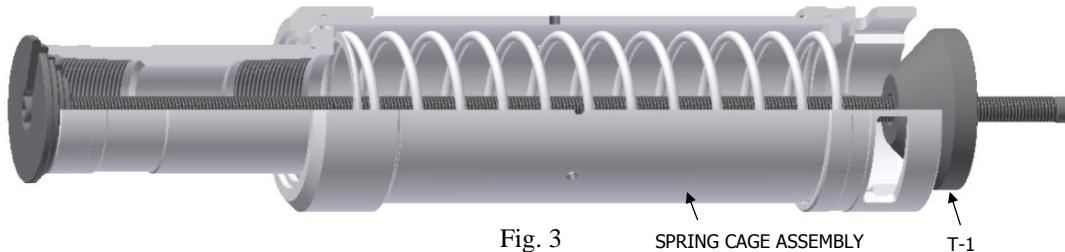
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K) ASSEMBLY (cont'd)



K-1.1.3) Compress compression spring (4) with assembly tool (T1) (Fig. 3).

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.

CAUTION₂: Compression spring (4) is compressed with tension against spring cage assembly.

K-1.1.6) Screw spring cage cap (27) onto spring cage (5).

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

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

K-1.4) Install o-ring (36) in groove in bonded seal (24).

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

CAUTION₃: Do not rip or tear o-ring during installation.

K-1.6) Install o-ring (38) in o-ring groove in center coupling (10).

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

NOTE₈: 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), rubber spacers (12), and gage ring (29) 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).

CAUTION₃: 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).

NOTE₁₃: Install two (2ea) springs per slip (Fig. 4).

K-1.10.2) Wedge lower slips (17) outwards. Install lower slip support (32) into drag block body (18).

K-1.10.3) Align pocket holes in lower slip support (32) with threaded holes in drag block body (18). Screw cap screws (22) into drag block body (18). Remove wedges.

K-1.10.4) Install drag block body assembly onto rubber mandrel (11).

K-1.11) 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-1.12) Install drag block retainer (21) onto drag block body (18).

K-1.13) Install drag block retaining ring (35) onto J-body (20).

K-1.14) Install J-body (20) onto inner mandrel (2) and over rubber mandrel cap (19). Do not make up J-body (20) yet.

K-1.15) Install o-ring (37) in o-ring groove in J-pin bottom sub (23).

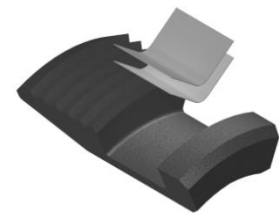


Fig. 4



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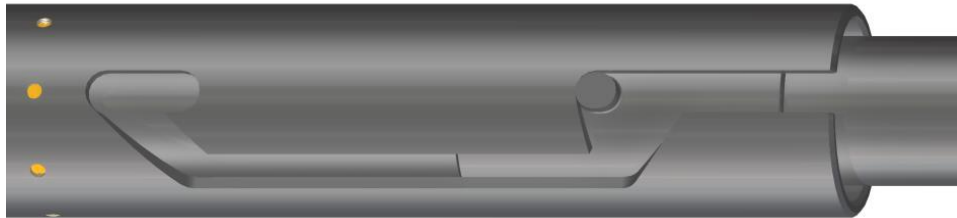
K) ASSEMBLY (cont'd)

K-1.16) Install J-pin bottom sub (23) in J-slots in J-body (20). Screw J-pin bottom sub (23) onto inner mandrel (2).

CAUTION₃: Do not rip or tear o-ring during installation.

K-1.17) Screw set screws (30) into J-pin bottom sub (23). Move J-body (20) as needed to access threaded holes in J-pin bottom sub (23).

Fig. 5



K-1.18) Position J-pin of J-pin bottom sub (23) on tension shoulder in J-slot of J-body (20). Rotate J-body (20) as necessary (Fig. 5).

K-1.19) Align threaded holes in J-body (20) with recessed holes in rubber mandrel cap (19). Screw shear screws (3) in J-body (20). Tighten until shear screws (3) contact rubber mandrel cap (19). Back shear screws (3) out 1/4 turn.

NOTE₁₁: If needed, back off J-pin bottom sub (23). No more than 1/8 turn (45°) should be needed.

K-1.20) Screw drag block body (18) onto J-body (20). (**NOTE₅:** Left-hand threads).

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

K-1.21) Screw set screws (31) into drag block body (18).

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



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L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	24.0 – 29.7# P/N 60175	33.7 – 39.0# P/N 60176
1	1	TOP SUB	DLMS80	60170610	
2	1	INNER MANDREL	DLMS41X80	60370210	
3	16	SHEAR SCREW (2375#)	DLM360BRS	60100990	
4	1	COMPRESSION SPRING	DLMCRSP	60370920	
5	1	SPRING CAGE	DLMS60	60170310	
6	1	UPPER SLIP BODY	DLMS80	60075320	
7	1	RELEASING SLIP	DLMS110	60075125	
8	2	UPPER SLIP	DLMS35	60075115	
9	1	UPPER CONE	DLMS60	60375410	
10	1	CENTER COUPLING	DLMS35	60370620	
11	1	RUBBER MANDREL	DLMS60	60370220	
12	2	RUBBER SPACER	DLMS35	60275840	60276840
13	1	ELEMENT	70 DURO NITRILE	60275511	60276511
14	2	ELEMENT	90 DURO NITRILE	60275513	60276513
15	1	RUBBER RETAINER	DLMS35	60275850	60276850
16	1	LOWER CONE	DLMS35	60375421	
17	4	LOWER SLIP	DLMS35	60075135	
18	1	DRAG BLOCK BODY	DLMS35	60075335	
19	1	RUBBER MANDREL CAP	DLMS60	60170230	
20	1	J-BODY	DLMS60	60170340	
21	1	DRAG BLOCK RETAINER	DLMS60	60075910	
22	2	SOCKET CAP SCREW 1/2-13 UNC X 3/4	STEEL	SCS050C075	
23	1	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	DLMS35	60170810	
28	1	SPRING RETAINING RING	DLMS60	60070820	
29	1	GAGE RING	DLMS35	60275830	60276830
30	2	SOCKET SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037	
31	3	SOCKET SET SCREW 5/16-18 UNC	STEEL	SSS031C050	SSS031C062
32	1	LOWER SLIP SUPPORT	DLMS60	60075912	
33	1	UPPER SLIP SUPPORT	DLMS60	60075880	



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L) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	24.0 – 29.7# P/N 60175	33.7 – 39.0# P/N 60176
34	1	BEARING BUSHING	DLMS60	60370224	
35	1	DRAG BLOCK RETAINING RING	DLMS35	60075911	
36	1	153 O-RING	90 DURO NITRILE	90153	
37	1	233 O-RING	90 DURO NITRILE	90233	
38	1	242 O-RING	90 DURO NITRILE	90242	
39	8	SLOTTED SHEAR SCREW (5500#) 1/2-13 UNC X 7/16	DLM360BRS	BSSSLT050C043*	

*Refer to WLAK tech manual for placement.

REDRESS KIT (RDK)		60175050	60176050
ASSEMBLED WEIGHT		330 LBS	326 LBS

L-1) ELASTOMER TRIM OPTIONS

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

L-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	24.0 – 29.7# P/N 60175H	33.7 – 39.0# P/N 60176H
13	1	ELEMENT	70 DURO HSN	60275511H	60276511H
14	2	ELEMENT	90 DURO HSN	60275513H	60276513H
24	1	BONDED SEAL	90 DURO HSN	60070520H	
36	1	153 O-RING	90 DURO HSN	90153H	
37	1	233 O-RING	90 DURO HSN	90233H	
38	1	242 O-RING	90 DURO HSN	90242H	

REDRESS KIT (RDK)		60175050H	60176050H
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L-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	24.0 – 29.7# P/N 60175V	33.7 – 39.0# P/N 60176V
13	1	ELEMENT	70 DURO VITON	60275511V	60276511V
14	2	ELEMENT	90 DURO VITON	60275513V	60276513V
24	1	BONDED SEAL	90 DURO VITON	60070520V	
36	1	153 O-RING	90 DURO VITON	90153V	
37	1	233 O-RING	90 DURO VITON	90233V	
38	1	242 O-RING	90 DURO VITON	90242V	

REDRESS KIT (RDK)		60175050V	60176050V
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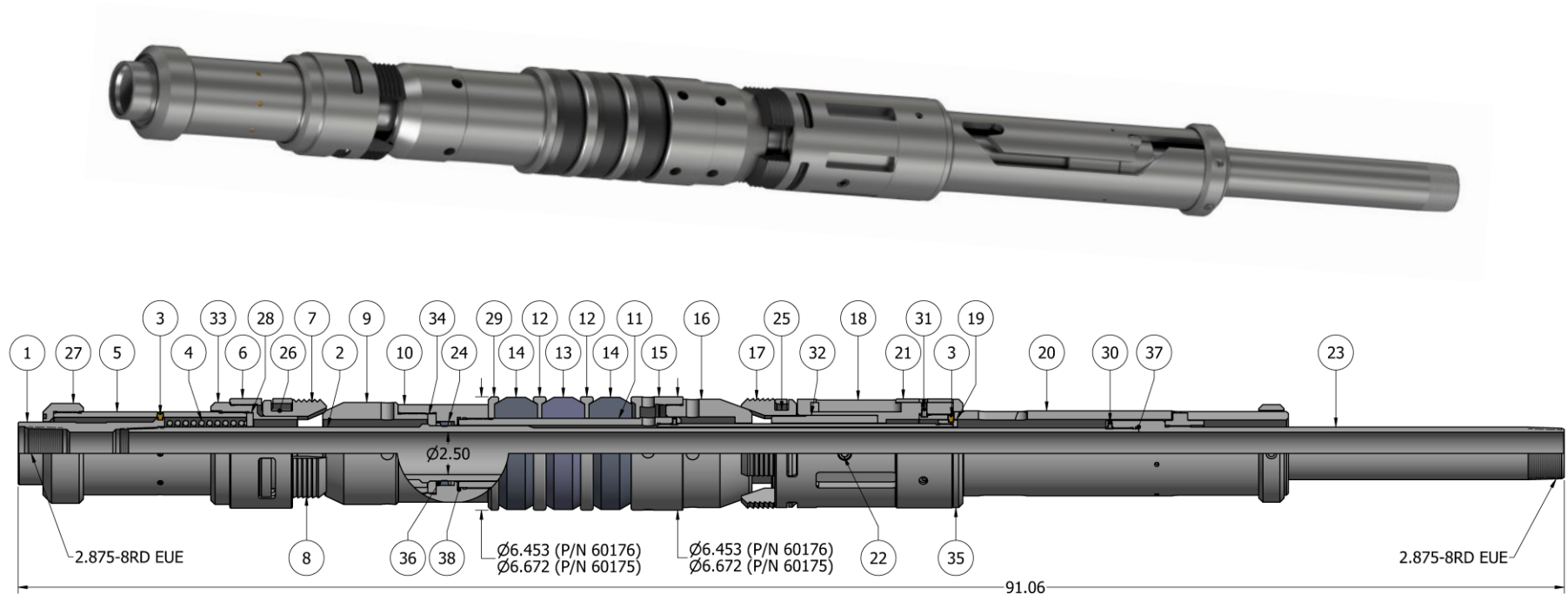
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M) TECHNICAL ILLUSTRATION



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N) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
04/06/2020	A	Created new manual	-	-