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$_1$: Stinger and setting equipment must be purchased separately.

NOTE$_2$: 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 off of the packer before fully setting the packer.

B) RELATED TOOLS (sold separately)

B-1) 3-1/2" X 1.900" Wireline Adapter Kit (WLAK) (PN 97130)—refer to technical manual DL-971-3500-550.

B-2) 1.900" DT-2 On/Off Tool and Stinger—refer to technical manual DL-512-3500-417.

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)	ID (INCHES)		
3-1/2	7.5 – 7.7	3.068 – 3.250	2.938	1.25	1.900 NUE	60136 60136H[1] 60136V[2] 60136C[3] 60136HC[4] 60136VC[5]
	7.7 – 10.2	2.922 – 3.068	2.781	1.25	1.900 NUE	60135 60135H[1] 60135V[2] 60135C[3] 60135HC[4] 60135VC[5]

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

NOTE$_3$: 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.

NOTE$_4$: Tools listed are right-hand set / right-hand release.

C) SPECIFICATION GUIDE (cont'd)

DIFFERENTIAL PRESSURE (MAX)	**TENSILE LOAD THRU TOOL** (MAX)
10,000 PSI	30,000 LBS

D) PRE-INSTALLATION INSPECTION PROCEDURES

CAUTION$_1$: 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 tubing 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.

CAUTION$_2$: 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.

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**
3-1/2	1.050	1.27 (DOWN)	-1.60 (UP)
	1.315	0.78 (DOWN)	-1.27 (UP)
	1.660	-0.03 (UP)	-0.64 (UP)
	1.900	-0.70 (UP)	-0.10 (UP)
	2.375	-2.29 (UP)	0.99 (DOWN)

Example$_1$: Consider a 3-1/2" VSI-X packer set on 1.900 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 1.900 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 -0.70 in^2. Multiply the differential pressure (3,000 psi) by the pressure affected area (-0.70 in^2) to find that the piston effect on the packer mandrel is an upward force of -2,100 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

I) RECOMMENDED 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) DISASSEMBLY

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

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

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

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

J-1.2.1) Remove o-ring (28) from J-pin bottom sub (23).

J-1.3) Unscrew and remove set screws (22) from J-body (20).

J-1.4) Unscrew and remove J-body (20) from drag block body (18) (**NOTE6**: Left-hand threads).

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

J-1.6) Wedge lower slips (17) outwards (if needed). Remove drag block body assembly and disassemble:

J-1.6.1) Remove drag block retainer (21) from drag block body (18) (if applicable).

J-1.6.2) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

J-1.7) Unscrew and remove lower cone (16) from rubber retainer (15).

J-1.8) Unscrew rubber mandrel (11) from center coupling (10).

J-1.9) Remove rubber mandrel assembly and disassemble:

J-1.9.1) Remove elements (13, 14), rubber spacers (12), and rubber retainer (15) from rubber mandrel (11).

J-1.10) Unscrew and remove center coupling (10) from upper cone (9).

J-1.10.1) Remove bonded seal (24) and o-ring (29) from center coupling (10).

J-1.10.1.1) Remove o-ring (27) from bonded seal (24).

J-1.11) Remove upper cone (9) from inner mandrel (2).

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

CAUTION5: Do NOT wrench or clamp on seal surface.

J-2.1) Unscrew and remove shear screws (3) from spring cage (5).

CAUTION4: Compression spring is compressed with spring tension against upper slip body assembly.

J-2.2) Unscrew and remove spring cage (5) from upper slip body (6).

J-2.3) Unscrew and remove top sub (1) from inner mandrel (2).

J-2.4) Remove compression spring (4) from inner mandrel (2).

J-2.5) Wedge releasing slip (7) and upper slips (8) outward (if needed). Remove upper slip body assembly and disassemble:

J-2.5.1) Remove wedges (if needed). Remove releasing slip (7), upper slips (8) and upper slip springs (26) from upper slip body (6).

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

K) ASSEMBLY

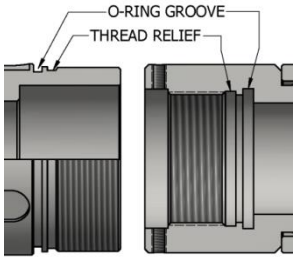


Fig. 2

NOTE7: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.

CAUTION6: To ensure tool operates properly, install o-rings in o-ring grooves, **NOT** thread reliefs unless stated otherwise (Fig. 2).

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

CAUTION5: Do NOT wrench or clamp on seal surface.

K-1.1) Assemble upper slip body assembly:

K-1.1.1) Install upper slips (8), releasing slip (7) and upper slip springs (26) into upper slip body (6).

NOTE8: Install one (1ea) spring per slip (Fig. 3).


Fig. 3

K-1.1.2) Wedge releasing slip (7) and upper slips (8) outwards. Install upper slip body assembly onto inner mandrel (2) and remove wedges.

K-1.2) Install compression spring (4) onto inner mandrel (2).

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

K-1.4) Screw spring cage (5) onto upper slip body (6).

K-1.5) 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) make contact with top sub (1). Back shear screws (3) out 1/4 turn.

CAUTION2: Compression spring is compressed with spring tension against upper slip body assembly.

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

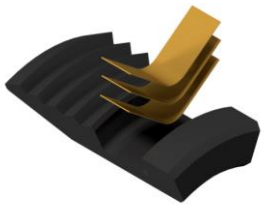


Fig. 4

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

K-2.2) Install o-ring (27) in groove in bonded seal (24).

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

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

K-2.4) Install o-ring (29) in groove in center coupling (10).

K-2.5) Screw center coupling (10) into upper cone (9).

K-2.6) Assemble and install rubber mandrel assembly:

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

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

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

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

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

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

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

NOTE8: Install three (3 ea) springs per slip (Fig. 4).

K-2.8.2) Install drag block retainer (21) onto drag block body (18) (if required).

K-2.8.3) Wedge lower slips (17) outwards. Install drag block body assembly onto rubber mandrel (11). Remove wedges.

K-2.9) Install rubber mandrel cap (19) onto rubber mandrel (11).

K-2.10) Screw J-body (20) onto drag block body (18) (**NOTE6**: Left-hand threads).

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

K-2.11) Screw set screws (22) into J-body (20).

K-2.12) Install o-ring (28) into groove in J-pin bottom sub (23).

K) ASSEMBLY (cont’d)

K-2.13) Screw J-pin bottom sub (23) onto inner mandrel (2).

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

Fig. 4

K-2.14) 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. 4).

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

K-2.15) Align threaded holes in J-body (20) with pocket holes in rubber mandrel cap (19). 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.

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

L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135	P/N 60136
1	1	TOP SUB	DLMS60	60130610	
2	1	INNER MANDREL	DLMS80	60330210	
3	4	SHEAR SCREW (2375#)	DLM360BRS	60100990	
4	1	COMPRESSION SPRING	DLMCRSP	60335920	
5	1	SPRING CAGE	DLMS60	60130310	
6	1	UPPER SLIP BODY	DLMS60	60030320	60336320
7	1	RELEASING SLIP	DLMS110	60030125	60036125
8	2	UPPER SLIP	DLMS35	60030115	60036115
9	1	UPPER CONE	DLMS60	60030410	
10	1	CENTER COUPLING	-	60230620	60336620
11	1	RUBBER MANDREL	DLMS60	60330220	
12	2	RUBBER SPACER	DLMS60	60230840	60336840
13	1	ELEMENT	70 DURO NITRILE	60230511	60236511
14	2	ELEMENT	90 DURO NITRILE	60230513	60236513
15	1	RUBBER RETAINER	DLMS60	60230850	60336850
16	1	LOWER CONE	DLMS60	60130420	
17	4	LOWER SLIP	DLMS35	60030135	60036135
18	1	DRAG BLOCK BODY	DLMS60	60330335	60336335
19	1	RUBBER MANDREL CAP	DLMS60	60130230	
20	1	J-BODY	DLMS60	60130340	
21	1	DRAG BLOCK RETAINER	DLMS60	60330910	-
22	3	#10-24 UNC X 3/16 SOCKET SET SCREW	STEEL	SSS1024C018	
23	1	J-PIN SUB	DLMS110	60330630	
24	1	BONDED SEAL	DLMS60 / 90 DURO NITRILE	60030520	

L) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135	P/N 60136
25	12	LOWER SLIP SPRING	-	7125900	
26	3	UPPER SLIP SPRING	-	61345975	
27	1	031 O-RING	90 DURO NITRILE	90031	
28	1	127 O-RING	90 DURO NITRILE	90127	
29	1	134 O-RING	90 DURO NITRILE	90134	
30	8	1/4-20 UNC X 3/8 SLOTTED SHEAR SCREW (1200#)	DLM360BRS	BSSSLT025C037	BSSSLT037C037

REDRESS KIT (RDK)		60135050	60136050
ASSEMBLED WEIGHT		45 LBS	46 LBS

L-1) ELASTOMER TRIM OPTIONS

NOTE$_8$: For temperature range, refer to Elastomer Trim Temperature Guide.

L-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135H	P/N 60136H
13	1	ELEMENT	70 DURO HSN	60230511H	60236511H
14	2	ELEMENT	90 DURO HSN	60230513H	60236513H
24	1	BONDED SEAL	90 DURO HSN	60030520H	
27	1	031-90 O-RING	90 DURO HSN	90031H	
28	1	127-90 O-RING	90 DURO HSN	90127H	
29	1	134-90 O-RING	90 DURO HSN	90134H	

REDRESS KIT (RDK)		60135050H	60136050H

L-1.2) VITON

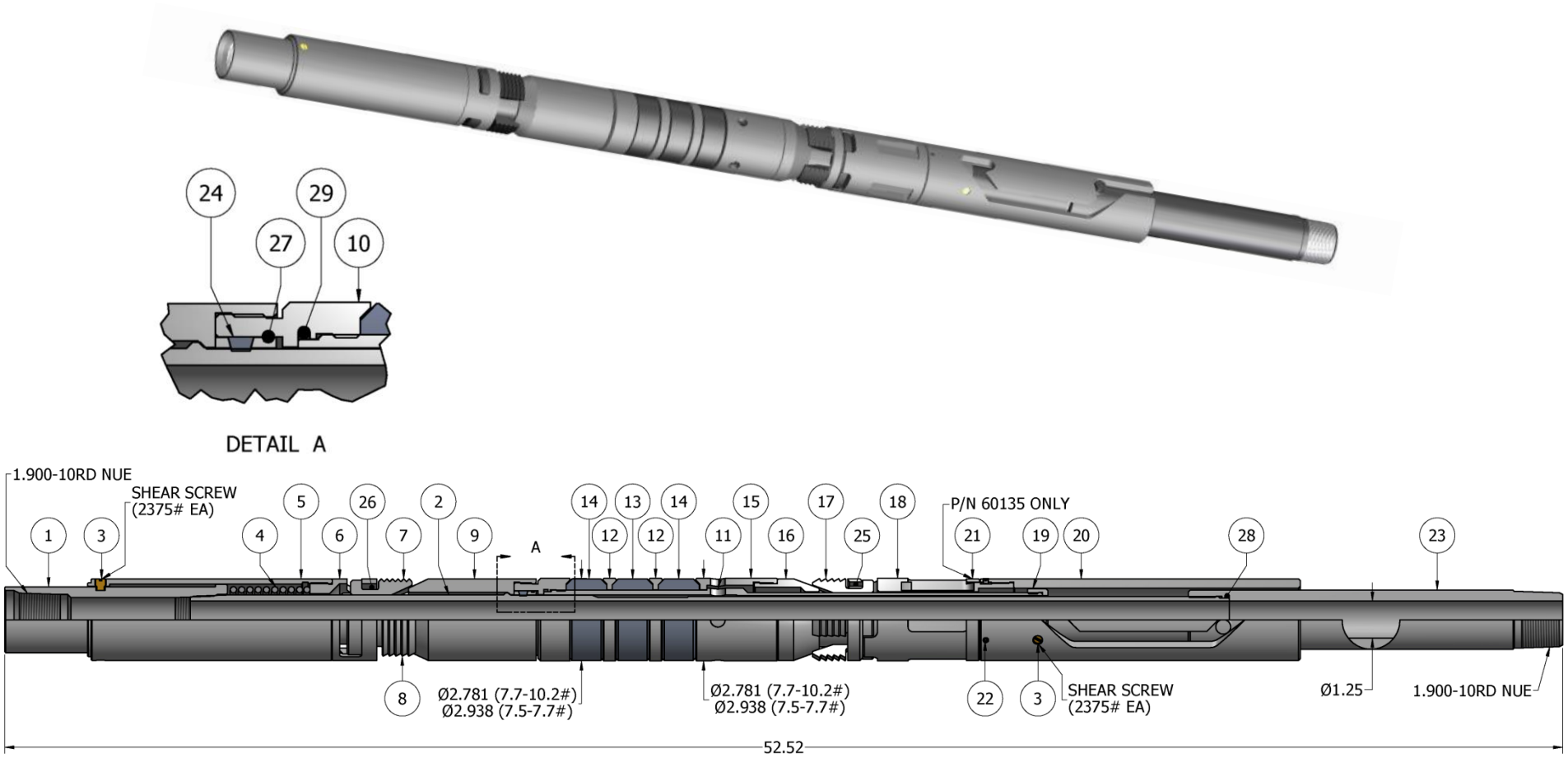
ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135V	P/N 60136V
13	1	ELEMENT	70 DURO VITON	60230511V	60236511V
14	2	ELEMENT	90 DURO VITON	60230513V	60236513V
24	1	BONDED SEAL	90 DURO VITON	60030520V	
27	1	031-90 O-RING	90 DURO VITON	90031V	
28	1	127-90 O-RING	90 DURO VITON	90127V	
29	1	134-90 O-RING	90 DURO VITON	90134V	

REDRESS KIT (RDK)		60135050V	60136050V

L-2) CARBIDE OPTIONS

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 60135C	P/N 60136C
8	2	CARBIDE UPPER SLIP	DLMS110	60030115C	60036115C
17	4	CARBIDE LOWER SLIP	DLMS110	60030135C	60036135C

M) TECHNICAL ILLUSTRATION



N) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
02/22/2022	G	Revised 7125900 qty 12 was4, elastomer trim options/ratings,; added carbide options	J.Anderson	E.Visaez
04/09/14	F	Revised PN 7125900 WAS 7145901, 61345975 WAS 7145902; Added related tools, note$_3$ for double hook j-slot packer, max. tensile load, pre-installation inspection and storage procedures	J.Anderson	K.Riggs
04/09/13	E	Revised 60036115 WAS 60336115, 60036125 WAS 60336125, 60036135 WAS 60336135; Added options parts lists.	J.Anderson	J.McArthur
04/03/13	D	Revised P/N 60236511 was 60336511; Added reference to tech manual *971-3500*-550, revision history, recommended tools section; Removed AFLAS from element selection guide	J.Anderson	J.McArthur