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 ASI-X HT Packer 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)2-7/8" DT-2 On/Off Tool - refer to technical manual *DL-512-2875-146.*

B-2)2-7/8" 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)		
6-5/8	17.0 – 24.0	5.921 – 6.135	5.750	2.50	2-7/8 EUE	60367HT 60367HTH[1] 60367HTV[2]
	24.0 – 32.0	5.675 – 5.921	5.500	2.50	2-7/8 EUE	60365HT 60365HTH[1] 60365HTV[2]

Elastomer Trim Options: [1]HSN, [2]Viton

NOTE$_1$: Tools listed are right-hand set / right-hand release.

NOTE$_2$: 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	104,500 LBS

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

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 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

CAUTION$_2$: 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 (15,000 lbs minimum). 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.

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 (15,000 lbs minimum). 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$_3$: High differential pressure below the ASI-X Packer may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

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

PACKER SIZE (INCHES)	**TUBING SIZE** (INCHES)	**PRESSURE AFFECTED AREA** (SQ. INCHES)	
		ABOVE	**BELOW**
6-5/8 X 2-7/8	2.375	3.87 (DOWN)	-5.17 (UP)
	2.875	1.80 (DOWN)	-3.62 (UP)
	3.500	1.33 (UP)	-1.27 (UP)

Example$_1$: Consider a 6-5/8" X 2-7/8" ASI-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" ASI-X Packer set 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 in^2. Multiplying the differential pressure (3,000 psi) by the pressure affected area (1.80 in^2) results in a force of 5,400 lbs. The piston effect on the packer mandrel is a downward force of 5,400 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	DRAG BLOCK ASSEMBLY TOOL	AT070110

K) DISASSEMBLY

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

K-1.1) Unscrew and remove bottom nipple (35) from J-pin bottom sub (23).

K-1.2) Unscrew and remove set screws (37) from J-pin bottom sub (23). Move J-body (20) as needed to access screws.

K-1.3) Unscrew and remove J-pin bottom sub (23) from inner mandrel (2).

NOTE3: Drag block body assembly must be free to rotate.

K-1.3.1) Remove o-ring (41) from J-pin bottom sub (23).

K-1.4) Compress drag blocks (22) with drag block assembly tool (T1).

K-1.5) Unscrew and remove set screws (39) from drag block body (18). Rotate drag block retainer (21) as needed to access screws

K-1.6) Unscrew and remove J-body (20) from drag block body (18) (**NOTE4**: Left-hand threads).

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

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

K-1.8) Release drag blocks (22). Remove drag blocks (22) and drag block springs (3) from drag block body (18).

K-1.9) Unscrew and remove rubber mandrel cap (19) from rubber mandrel (11).

NOTE5: For added leverage, insert rod through rubber retainer (15) and rubber mandrel (11) as needed.

K-1.10) Wedge lower slips (17) outward (if needed). Remove drag block body assembly and disassemble:

K-1.10.1) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

K-1.11) Unscrew and remove lower cone (16) from rubber retainer (15).

K-1.12) Unscrew rubber mandrel (11) from center coupling (10).

K-1.13) Remove rubber mandrel assembly and disassemble:

K-1.13.1) Remove gage ring (29), elements (13, 14), rubber spacers (12), and rubber retainer (15) from rubber mandrel (11).

K-1.13.2) Unscrew and remove center coupling (10) from collet upper cone (9).

K-1.13.2.1) Remove o-ring (42) from center coupling (10).

K-1.13.3) Remove bonded seal (24) from center coupling (10).

K-1.13.3.1) Remove o-ring (40) from bonded seal (24).

K) DISASSEMBLY (cont'd)

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

K-2) Unclamp and remove top sub (1) from vise. Clamp lower end of inner mandrel (2) in vise.

CAUTION4: Do NOT wrench or clamp on seal surface.

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

CAUTION5: Compression spring (4) may have tension against upper slip body 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) Unscrew and remove spring cage (5) from upper slip body (6).

K-2.5) Unscrew and remove set screws (38) from cover sleeve (34).

K-2.6) Remove cover sleeve (34) from inner mandrel (2).

K-2.7) Wedge releasing slip (7) and upper slips (8) outwards (if needed). Remove upper slip body assembly and disassemble:

K-2.7.1) Remove spring retaining ring (28) from upper slip body (6).

K-2.7.2) Remove wedges (if needed). Remove releasing slip (7), upper slips (8), and upper slip springs (26) from upper slip body (6).

K-2.8) Remove snap ring (36) from inner mandrel (2).

K-2.9) Remove swivel sleeve (32) and bearing rings (33) from inner mandrel (2).

K-3) Unclamp and remove inner mandrel (2) from vise.

L) ASSEMBLY

NOTE6: 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 relief (Fig. 2).

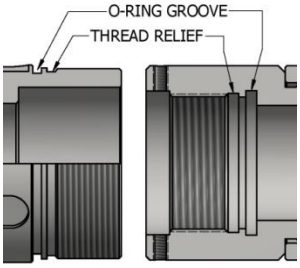


Fig. 2

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

CAUTION4: Do NOT wrench or clamp on seal surface.

L-1.1) Install bearing rings (33) and swivel sleeve (32) onto inner mandrel (2).

L-1.2) Install snap ring (36) in groove in inner mandrel (2).

L-1.3) Install upper slips (8), releasing slip (7), and upper slip springs (26) into upper slip body (6). Wedge slips outwards.

NOTE7: Install two (2ea) springs per slip (Fig. 3)

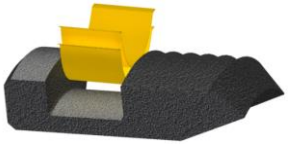


Fig. 3

L-1.4) Install upper slip body assembly onto inner mandrel (2). Remove wedges.

L-1.5) Install spring retaining ring (28) into upper slip body (6).

L-1.6) Install cover sleeve (34) onto inner mandrel (2).

L-1.7) Align threaded holes in cover sleeve (28) with groove in inner mandrel (2). Screw set screws (38) into cover sleeve (34).

L-1.8) Screw spring cage (5) into upper slip body (6).

L-1.9) Install compression spring (4) into spring cage (5).

L-1.10) Screw top sub (1) onto inner mandrel (2).

L-1.11) Screw spring cage cap (27) onto spring cage (5).

CAUTION5: Compression spring (4) may have tension against upper slip body assembly.

L-2) Unclamp and remove inner mandrel (2) from vise. Clamp top sub (1) in vise.

L) ASSEMBLY (cont'd)

L-2.1) Install collet upper cone (9) and bearing bushing (30) onto inner mandrel (2).

L-2.2) Install o-ring (42) in o-ring groove in center coupling (10).

L-2.3) Install o-ring (40) in o-ring groove in bonded seal (24).

L-2.4) Install bonded seal (24) into center coupling (10).

CAUTION$_7$: Do not rip or tear o-ring during installation.

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

L-2.6) Assemble rubber mandrel assembly and install:

L-2.6.1) Install rubber retainer (15), elements (13, 14), rubber spacers (12), and gage ring (29) onto rubber mandrel (11).

L-2.6.2) Install rubber mandrel assembly onto inner mandrel (2). Screw rubber mandrel (11) into center coupling (10).

CAUTION$_7$: 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 slips outward.

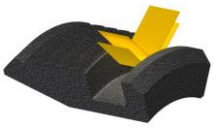


Fig. 4

NOTE$_8$: Install two (2ea) springs per slip (Fig. 4).

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

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

NOTE$_5$: For added leverage, insert rod through rubber retainer (15) and rubber mandrel (11) as needed.

L-2.10) Install drag blocks (22) and drag block springs (3) into drag block body (18). Compress blocks with drag block assembly tool (T1).

NOTE$_9$: Install six (6ea) springs per drag block (Fig. 5).

L-2.11) Install drag block retainer (21) onto drag block body (18) capturing ends of drag blocks (22).

L-2.12) Install retaining ring (31) onto J-body (20).

L-2.13) Screw J-body (20) into drag block body (18) (**NOTE**$_4$: Left-hand threads).

L-2.14) Screw set screws (39) into drag block body (18). Release drag blocks (22).

L-2.15) Install o-ring (41) into o-ring groove in J-pin bottom sub (23).

L-2.16) Screw J-pin bottom sub (23) onto inner mandrel (2).

Fig. 5

CAUTION$_7$: Do not rip or tear o-ring during installation.

NOTE$_3$**:** Drag block body assembly must be free to rotate.

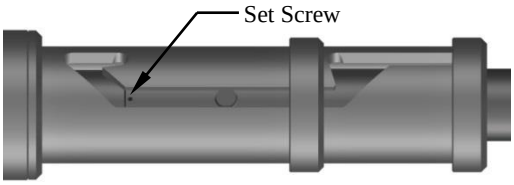


Fig. 6

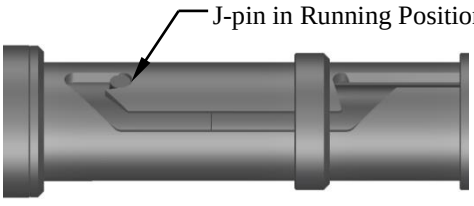


Fig. 7

L-2.17) Screw set screws (37) into J-pin bottom sub (23). Move J-body (20) as needed (Fig. 6).

L-2.18) Screw bottom nipple (35) into J-pin bottom sub (23).

L-2.19) Position J-pin in running position in J-slot of J-body (20) (Fig. 7).

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

M) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	24.0 – 32.0# 60365HT	17.0 – 24.0# 60367HT
1	1	TOP SUB	P-110	60370610HT	
2	1	INNER MANDREL	DLMS110	60370211HT	
3	24	DRAG BLOCK SPRING	-	9101900	
4	1	COMPRESSION SPRING	CHROME VANADIUM	60373920	
5	1	SPRING CAGE	DLMS110	60369310	60373310
6	1	UPPER SLIP BODY	DLMS60	60369320	60067320HT
7	1	RELEASING SLIP	DLMS110	60369125	60067125
8	2	UPPER SLIP	DLMS35	60369115	60067115
9	1	COLLET UPPER CONE	P-110	60365411HT	60370411HT
10	1	CENTER COUPLING	DLMS80	60365620	60370620
11	1	RUBBER MANDREL	DLMS60	60370220	60367220
12	2	RUBBER SPACER	DLMS35	60265840	60267840
13	1	ELEMENT	80 DURO NITRILE	60265512	60267512
14	2	ELEMENT	90 DURO NITRILE	60265513	60267513
15	1	RUBBER RETAINER	DLMS80	60365850	60367850
16	1	LOWER CONE	DLMS110	60065420HT	60067420HT
17	4	LOWER SLIP	DLMS35	60065135	60070135
18	1	DRAG BLOCK BODY	DLMS35 / DLMS60	60065335	60067335
19	1	RUBBER MANDREL CAP	DLMS60	60170230	
20	1	J-BODY	DLMS60	60165340HT	60170340HT
21	1	DRAG BLOCK RETAINER	DLMS60	60065910	60067910
22	4	DRAG BLOCK	DLMSDB8	9060900	
23	1	J-PIN BOTTOM SUB	DLMS110	60370634HT	
24	1	BONDED SEAL	90 DURO NITRILE	60070520	
25	8	LOWER SLIP SPRING	-	7170901	
26	6	UPPER SLIP SPRING	-	7170902	
27	1	SPRING CAGE CAP	DLMS110	60369810	60367810
28	1	SPRING RETAINING RING	DLMS35	60369820	60073820

M) PARTS LIST (cont’d)

ITEM	QTY	DESCRIPTION	MATERIAL	24.0 – 32.0# 60365HT	17.0 – 24.0# 60367HT
29	1	GAGE RING	DLMS80	60265830	60267830
30	1	BEARING BUSHING	DLMS60	60370224	
31	1	RETAINING RING	DLMS60	60065911	60070911
32	1	SWIVEL SLEEVE	DLMS110	60370100	
33	2	BEARING RING	DLMS110	60370103	
34	1	COVER SLEEVE	DLMS60	60370106	
35	1	BOTTOM NIPPLE	DLMS80	60370636	
36	1	SNAP RING	DLMS110	60370102	
37	2	SET SCREW 1/4-20 UNC	STEEL	SSS025C037	SSS025C043
38	3	SET SCREW 5/16-18 UNC X 3/8	STEEL	SSS031C037	
39	3	SET SCREW 5/16-18 UNC	STEEL	SSS031C043 (7/16" LONG)	SSS031C050 (1/2" LONG)
40	1	153 O-RING	90 DURO NITRILE	90153	
41	1	233 O-RING	90 DURO NITRILE	90233	
42	1	242 O-RING	90 DURO NITRILE	90242	

REDRESS KIT (RDK)		60365050HT	60367050HT
ASSEMBLED WEIGHT		275 LBS	292 LBS

M) PARTS LIST (cont'd)

M-1) ELASTOMER TRIM OPTIONS PARTS LIST

NOTE10: For temperature range, refer to Elastomer Trim Temperature Guide.

M-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	24.0 – 32.0# 60365HTH	17.0 – 24.0# 60367HTH
13	1	ELEMENT	80 DURO HSN	60265512H	60267512H
14	2	ELEMENT	90 DURO HSN	60265513H	60267513H
24	1	BONDED SEAL	90 DURO HSN	60070520H	
40	1	153 O-RING	90 DURO HSN	90153H	
41	1	233 O-RING	90 DURO HSN	90233H	
42	1	242 O-RING	90 DURO HSN	90242H	

REDRESS KIT (RDK)		60365050HTH	60367050HTH

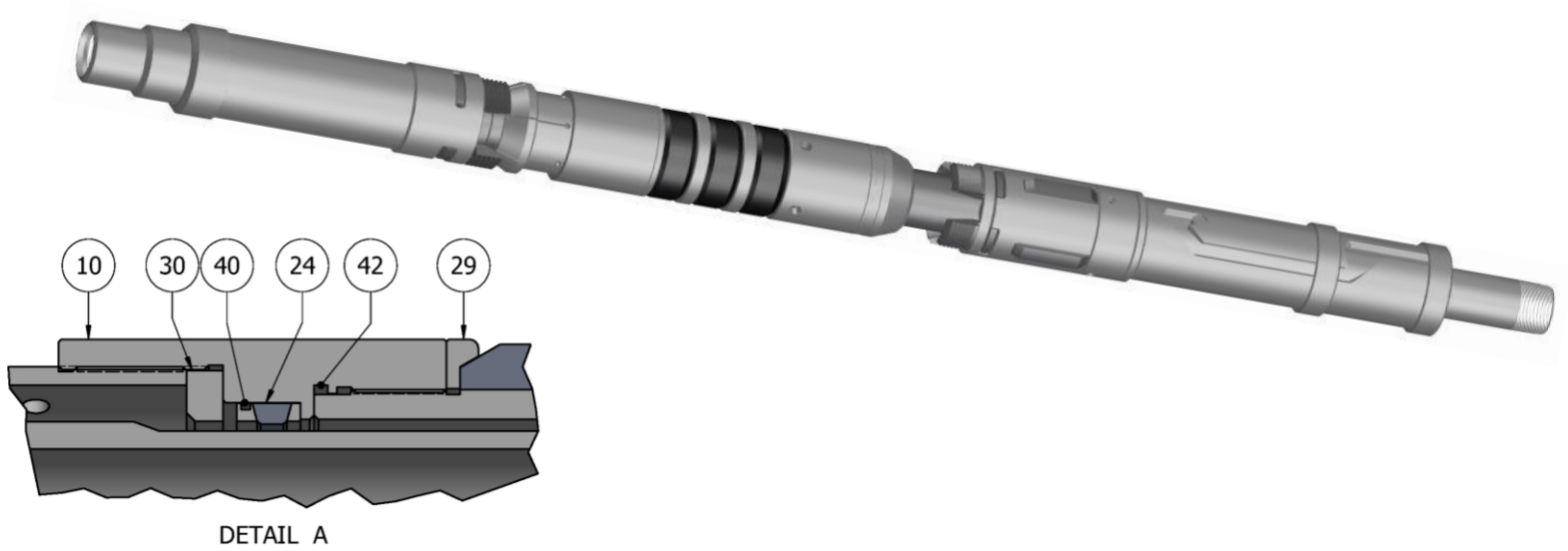
M-1.2) VITON

NOTE10: For temperature range, refer to Elastomer Trim Temperature Guide.

ITEM	QTY	DESCRIPTION	MATERIAL	24.0 – 32.0# 60365HTV	17.0 – 24.0# 60367HTV
13	1	ELEMENT	80 DURO VITON	60265512V	60267512V
14	2	ELEMENT	90 DURO VITON	60265513V	60267513V
24	1	BONDED SEAL	90 DURO VITON	60070520V	
40	1	153 O-RING	90 DURO VITON	90153V	
41	1	233 O-RING	90 DURO VITON	90233V	
42	1	242 O-RING	90 DURO VITON	90242V	

REDRESS KIT (RDK)		60365050HTV	60367050HTV

N) TECHNICAL ILLUSTRATION



O) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
03/28/2018	F	Remove tool drift ID; Added General Screw Torque Recommendations, Revised Elastomer Trim Temp. Guide temp. ratings	J.Anderson	C.Colvin
01/16/2015	E	Added B-2, Drift ID, Note2, Fig. 1, Note6, Caution6, Fig. 2, Fig. 6, Fig. 7, Material for P/N 60070520, P/N SSS025C037 (2ea); Revised Description, Max Tensile Load was 144,000 lbs, ELASTOMER TRIM TEMPERATURE GUIDE was ELEMENT SELECTION GUIDE, Pressure Affected Area Guide – Pressure Below for 2.375 was 5.56 UP, for 2.875 was4.29 UP, for 3.500 was 2.36 UP, Assembly instructions, Material was P-110/1026 (P/N’s 60369310, 60373310), Material was 1026 (P/N’s 60369320, 60067320HT, 60365620, 60370620), Material was P-110/1018 (P/N’s 60369810, 60367810), P/N 60067911 was 60067911, Qty for P/N 60365HT was 5ea (P/N SSS031C037), Technical Illustration - Detail A;	B.Mathis	R.Dyer
03/28/2014	D	Added HSN and Viton options (60365HTH, 60365HTV, 60367HTH, 60367HTV), related tools, pre-installation inspection and storage procedures, recommended hand tools, revision history; Revised - PN 60170230 was 60070230, PN 60170340HT was 60370340HT, PN 60165340HT was 60365340HT, Note10, Removed - AFLAS from element selection guide;	J.Anderson	K.Riggs