



DLT THERMAL PACKER, EPDM

7" X 3-1/2"

Manual No:
DL-740-7000-1697

Revision: **A**

Revision Date:
08/17/2023

Authored by: J.Anderson

Approved by: E.Visaez

A) DESCRIPTION

The DLT Thermal Packer is used in steam injection/production applications. This packer maintains the design features of our reliable ASI-X Packer and includes a packing element that can be packed-off with tension to allow the packer to be set at shallow depth. This packer is capable of setting in shallow wells, and will hold pressure from above and below. Its design also features an adjustable safety shear release. This packer needs 1/4 right-hand rotation to set it, and 1/4 right-hand rotation to release it (other J-slot designs are available). The thermal elements are available in 450° F to 650° F versions.

An Expansion Joint can be run above this packer to allow for tubing expansion and contraction.

B) 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	17.0 – 26.0	6.276 – 6.538	6.000 6.062*	3.00	3-1/2" EUE	74074

NOTE₁: Tools listed are right-hand set / right-hand release. *across retracted drag blocks

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)	TORQUE THRU TOOL (MAX)	TEMPERATURE RATING (MAX)
3,000 PSI	90,000 LBS	1,500 FT-LBS	625 °F

C) 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

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

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C) PRE-INSTALLATION INSPECTION PROCEDURES (cont'd)

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.

D) 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.

D-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 (14,000 lbs). Pull at least 14,000 lbs to assure that the element is set. The work string can then be left in tension, compression or neutral.

D-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 (14,000 lbs). Repeat the setting procedure. After setting the packer, the work string can be left in compression, tension or neutral.

E) 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 the packer – refer to Pressure Affected Area Guide. Continue to pick up to release the upper slips, relax the elements and release the lower slips so the packer can be re-set or removed from the well.

CAUTION₃: High differential pressure below the anchor may cause the upper slips to wedge in tighter, requiring an extra amount of tension to release the upper slips.

E-1) EMERGENCY RELEASE

In the event the packer will not release in the normal manner, the J-pin ring is equipped with an emergency shear release. The shear screws can be sheared with straight pickup above tubing weight. The shear release value is adjustable from 22,000 lbs to 66,000 lbs (5,500 lbs/screw) by adding or removing shear screws from the J-pin ring. When released in this manner, the anchor will reset when moved down the hole.



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F) 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	2.375	5.191 (DOWN)	-6.495 (UP)
	2.875	3.129 (DOWN)	-4.941 (UP)
	3.500	0.000	-2.590 (UP)

Example: Consider a 7" X 2-7/8" DLT Thermal 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 7" X 2-7/8" DLT Thermal 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 3.129 in². Multiplying the differential pressure (3,000 psi) by the pressure affected area (3.129 in²) results in a force of 9,387 lbs. The piston effect on the packer mandrel is a downward force of 9,387 lbs.

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) RECOMMENDED TOOLS

H-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

H-2) SPECIAL TOOLS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	DRAG BLOCK ASSEMBLY TOOL	AT070110



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I) DISASSEMBLY

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

I-1.1) Unscrew and remove bottom gage ring (10) from bottom sub (28).

I-1.2) Unscrew bottom sub (28) from inner mandrel (2). Remove bottom sub assembly and disassemble:

NOTE₂: Drag block body assembly must be free to rotate.

I-1.2.1) Unscrew and remove shear screws (15) from J-pin ring (23).

I-1.2.2) Remove J-pin ring (23) from bottom sub (28).

I-1.3) Unscrew and remove set screws (32) from J-body (20).

I-1.4) Unscrew and remove J-body (20) from drag block body (18) (**NOTE₃:** Left-hand threads).

I-1.5) Unscrew and remove recovery sleeve cap (19) from recovery sleeve (14). Move drag block body (18) as necessary to access recovery sleeve cap (19).

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

I-1.6.1) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (26) from lower slip body (12).

I-1.6.2) Unscrew and remove set screws (32) from lower slip body (12).

I-1.6.3) Unscrew and remove lower slip body (12) from drag block body (18).

I-1.6.4) Compress drag blocks (22) with drag block body assembly tool (T1).

I-1.6.5) Remove drag block retainer (21) from drag block body (18).

I-1.6.6) Remove drag block assembly tool (T1). Remove drag blocks (22) and drag block springs (3) from drag block body (18).

I-1.7) Unscrew and remove lower cone (16) from lower gage ring (30).

I-1.8) Unscrew and remove recovery sleeve (14) from rubber mandrel (11).

I-1.9) Remove lower gage ring (30), mesh back-ups (33), and element (13) from rubber mandrel (11).

I-1.10) Unscrew and remove upper gage ring (29) from rubber mandrel (11).

I-1.11) Unscrew and remove rubber mandrel (11) from upper cone (9).

CAUTION₄: Do **NOT** wrench or clamp on seal surface.

I-1.11.1) Remove seal (24) from rubber mandrel (11).

I-1.11.1.1) Remove o-ring (34) from seal (24).

I-1.12) Remove upper cone (9) from inner mandrel (2).

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

CAUTION₄: Do **NOT** wrench or clamp on seal surface.

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

CAUTION₅: Compression spring (4) is compressed with spring tension against upper slip body assembly.

I-2.2) Unscrew and remove top sub (1) from inner mandrel (2).

I-2.3) Remove compression spring (4) from inner mandrel (2).

I-2.4) Unscrew and remove spring cage (5) from upper slip body (6).

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

I-2.5.1) Remove wedges (if needed). Remove spring retainer ring (31), releasing slip (7), upper slips (8), and upper slip springs (25) from upper slip body (6).

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



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J) ASSEMBLY

NOTE₄: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.

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

CAUTION₄: Do NOT wrench or clamp on seal surface.

J-1.1) Assemble upper slip body assembly:

J-1.1.1) Install upper slips (8), releasing slip (7), upper slip springs (25), and spring retaining ring (31) into upper slip body (6). Wedge slips (7, 8) outwards.

NOTE₅: Install two (2ea) springs per slip (Fig. 2).

J-1.1.2) Install upper slip body assembly onto inner mandrel (2). Remove wedges.

J-1.2) Screw spring cage (5) into upper slip body (6).

J-1.3) Install compression spring (4) onto inner mandrel (2).

J-1.4) Screw top sub (1) onto inner mandrel (2).

J-1.5) Screw spring cage cap (27) onto upper slip body (6).

CAUTION₅: Compression spring (4) will be compressed with spring tension against upper slip body assembly.

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

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

J-2.2) Install o-ring (34) in o-ring groove in seal (24).

J-2.3) Install seal (24) into rubber mandrel (11).

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

J-2.4) Install rubber mandrel (11) onto inner mandrel (2). Screw rubber mandrel (11) into upper cone (9).

CAUTION₇: Do not damage seal during installation.

J-2.5) Screw upper gage ring (29) onto rubber mandrel (11).

J-2.6) Install mesh back-ups (33), element (13), and lower gage ring (30) onto rubber mandrel (11).

J-2.7) Screw recovery sleeve (14) onto rubber mandrel (11).

J-2.8) Screw lower cone (16) into lower gage ring (30).

J-2.9) Assemble drag block body assembly and install:

J-2.9.1) Install drag blocks (22) and drag block springs (3) into drag block body (18). Compress drag blocks (22) with drag block assembly tool (T1).

NOTE₆: Install six (6ea) springs per block (Fig. 3).

J-2.9.2) Install drag block retainer (21) onto drag block body (18) capturing ends of drag blocks (22).

J-2.9.3) Screw lower slip body (12) onto drag block body (18).

J-2.9.4) Screw set screws (32) into lower slip body (12).

J-2.9.5) Install lower slips (17) and lower slip springs (26) into lower slip body (12). Wedge lower slips (17) outward.

NOTE₇: Install two (2ea) springs per slip (Fig. 4).

J-2.9.6) Install drag block body assembly. Remove wedges.

J-2.10) Screw recovery sleeve cap (19) onto recovery sleeve (14). Move drag block body (18) as needed to access threaded connection of rubber mandrel (11)

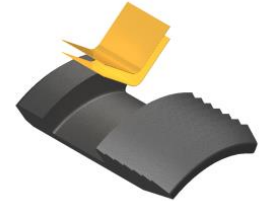


Fig. 2

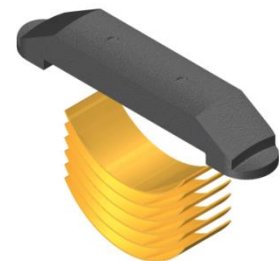


Fig. 3

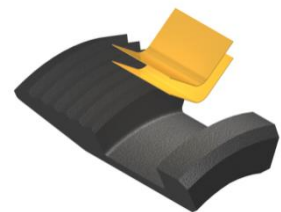


Fig. 4



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J) ASSEMBLY (cont'd)

J-2.11) Screw J-body (20) onto drag block body (18) (**NOTE₃**: Left-hand threads.)

NOTE₂: Drag block body assembly must be free to rotate.

J-2.12) Screw set screws (32) into J-body (20).

J-2.13) Assemble bottom sub assembly and install:

J-2.13.1) Install J-pin ring (23) onto bottom sub (28). Align threaded holes in J-pin ring (23) with pocket holes in bottom sub (28).

J-2.13.2) Screw shear screws (15) into J-pin ring (23). Tighten until shear screws (15) contact bottom sub (28). Back shear screws (15) out 1/4 turn.

J-2.13.3) Screw bottom sub (28) onto inner mandrel (2).

J-2.14) Screw gage ring (10) onto bottom sub (28).

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

K) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER
1	1	TOP SUB	DLMS80	74073610
2	1	INNER MANDREL	DLMS80	74070210
3	18	DRAG BLOCK SPRING	STEEL	9101900
4	1	COMPRESSION SPRING	DLMCRSP	60073920
5	1	SPRING CAGE	DLMS60	60073310
6	1	UPPER SLIP BODY	DLMS60	60073320
7	1	RELEASE SLIP	DLMS110	60073125
8	2	UPPER SLIP	DLMS35	60073115
9	1	UPPER CONE	DLMS80	60473410
10	1	BOTTOM GAGE RING	DLMS35	74070840
11	1	RUBBER MANDREL	DLMS80	74073220
12	1	LOWER SLIP BODY	DLMS80	60474325
13	1	ELEMENT	80 DURO EPDM	74070512E
14	1	RECOVERY SLEEVE	DLMS60	74070912
15	12	1/2-13 UNC X 7/16 SLOTTED SHEAR SCREW (5500#)	DLM360BRS	BSSSLT050C043
16	1	LOWER CONE	DLMS80	74070420
17	3	LOWER SLIP	DLMS35	60073135
18	1	DRAG BLOCK BODY		74070335
19	1	RECOVERY SLEEVE CAP	DLMS60	74070230
20	1	J-BODY	DLMS35	74070340
21	1	DRAG BLOCK RETAINER	DLMS35	74070910
22	3	800 DRAG BLOCK	DLMSDB8	9080900
23	1	J-PIN RING	DLMS110	74070875
24	1	4" EPDM SEAL		93077520E



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K) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER
25	6	UPPER SLIP SPRING	STEEL	7170902
26	6	LOWER SLIP SPRING	STEEL	7170901
27	1	SPRING CAGE CAP	DLMS35	60074810
28	1	BOTTOM SUB	DLMS80	74073630
29	1	UPPER GAGE RING	DLMS35	74073830
30	1	LOWER GAGE RING	DLMS35	74073835
31	1	SPRING RETAINER RING	DLMS60	60073820
32	6	3/8-16 UNC X 3/8 SOCKET SET SCREW	STEEL	SSS037C037
33	2	MESH BACK UP	-	74070600
34	1	154 O-RING	90 DURO EPDM	90154E

REDRESS KIT (RDK)		273 LBS
ASSEMBLED WEIGHT		74070050



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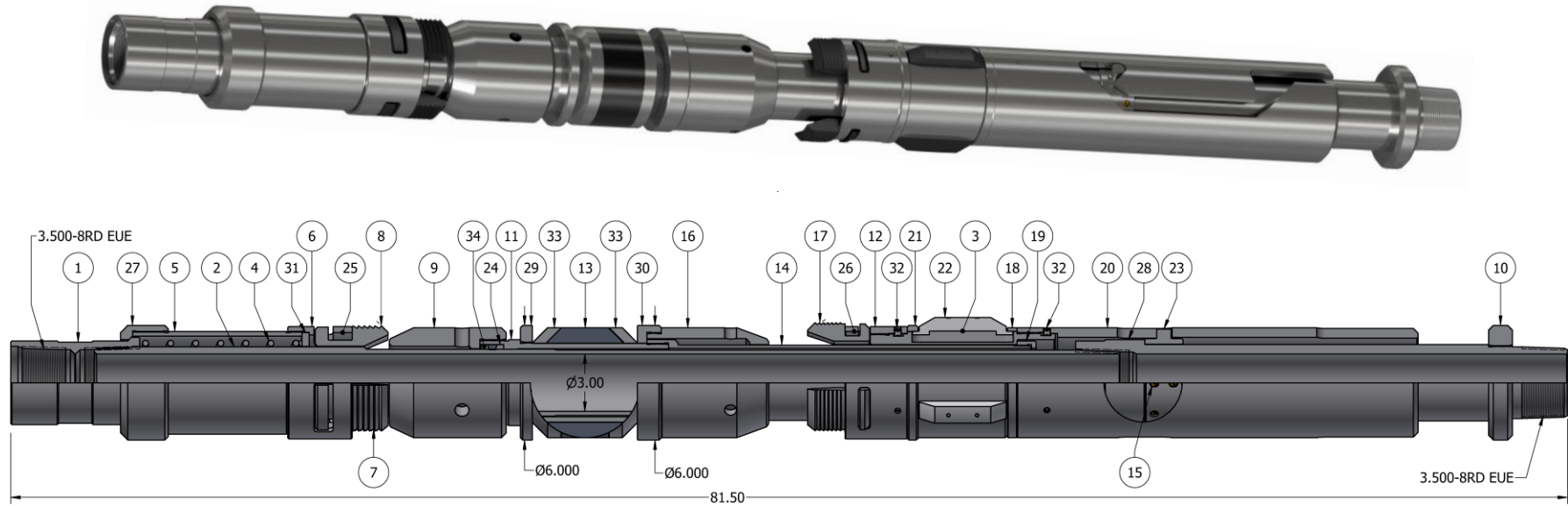
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L) TECHNICAL ILLUSTRATION



M) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
08/17/2023	A	Created manual	-	-