A) DESCRIPTION

The IE Thermal Packer is a CT Thermal Packer with an Internal Expansion (IE) Joint. This packer is a double-grip retrievable packer designed for steam injection/production. This packer’s design is based on our highly successful ASI-X Packer.

This packer features a double-grip hold down system capable of holding pressure from above and below. This feature allows the packer to maintain pack-off and prevent movement of the packing element without having the packer in tension or compression. The double-grip feature allows the packer to be ideally suited for huff and puff operations as well as continuous steam injection.

This packer is equipped with high temperature EPDM elements with wire mesh backups to prevent extrusion for service up to 450° F (an element package for 650° F is also available).

B) SPECIFICATION GUIDE

CASING		RECOMMENDED HOLE SIZE (INCHES)	GAGE OD (INCHES)	TOOL ID (INCHES)	THREAD CONNECTION BOX UP / PIN DOWN	PART NUMBER
SIZE (INCHES)	**WEIGHT** (LBS/FT)					
5	11.5 – 15.0	4.408 – 4.560	4.125 4.220*	1.50	2-3/8 EUE	74150
	18.0 – 20.8	4.156 – 4.276	4.000 4.010*	1.50	2-3/8 EUE	74152

*Maximum OD across retracted drag blocks.

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU TOOL (MAX)	TEMPERATURE RATING (MAX)
5,000 PSI	25,500 LBS	450°F

C) 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.

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 (Fig. 1).

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.

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

When redressing the tool, D&L recommends replacement of all seals, elements, shear screws, etc. Contact D&L sales for redress kit and/or other replacement part information.

D) 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.

Run the packer to setting depth, pick up on work string approximately one (1) foot, and rotate 1/4 turn to the right at the packer. Set down on work string while releasing torque until it takes weight. Set down weight (20,000 to 30,000 lbs) on the packer. Pick up on work string (20,000 to 30,000 lbs tension) and hold for 10 minutes to set the packer.

Since the thermal packing elements are more resistant to flowing than standard elastomeric elements, it is recommended to apply tension and slack off weight two (2) or three (3) cycles to ensure the elements are fully packed off.

To release the expansion joint, set down on work string then rotate and hold left-hand torque while picking up. Stroke the expansion joint to the desired position.

E) RELEASING PROCEDURES

Lower the tubing until it takes weight. Hold right hand torque and raise the tubing. This action will bring the J-pins of the packer into the releasing slots. Additional tension will release the upper slips, relax the packing element, release the lower slips and automatically re-jay the tool in the running position. The packer may now be removed from the well. Should the packer not release, there is a safety shear release built into the packer. Straight pull of 44,000 lbs (run with eight (8 qty) shear release screws at 5,500 lbs/ea) over tubing weight will shear the screws in the J-pin ring, allowing the packer to release.

F) STORAGE PROCEDURES

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) RECOMMENDED TOOLS

G-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

G-2) SPECIAL TOOLS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	5-1/2” DRAG BLOCK ASSEMBLY TOOL	AT055110

H) DISASSEMBLY

H-1) Clamp upper J-body (10) in vise.

H-1.1) Unscrew and remove set screws (31) from bottom sub (28).

H-1.2) Unscrew and remove bottom sub (28) from expansion joint mandrel (21) (**NOTE$_1$**: Left-hand threads).

H-1.3) Unscrew and remove set screws (31) from J-pin sub (23). Move J-body (20) as needed to access set screws.

NOTE$_2$: Drag block body assembly must be free to rotate.

H-1.4) Wrench on J-body (20), rotating to the right, to unscrew and remove J-pin sub (23) from inner mandrel (2) (**NOTE$_1$**: Left-hand threads).

H-1.4.1) Unscrew and remove shear screws (33) from J-pin sub (23).

H-1.4.2) Remove J-pin ring (24) from J-pin sub (23).

H-1.5) Unscrew and remove set screws (31) from J-body (20).

H-1.6) Compress drag blocks (22) with drag block assembly tool (T1). Unscrew and remove J-body (20) from drag block body (18) (**NOTE$_1$**: Left-hand threads).

H-1.7) Unscrew and remove rubber mandrel cap (19) from lower rubber mandrel (29).

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

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

H-1.9.1) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

H-1.10) Unscrew and remove lower cone (16) from rubber retainer (15).

H-1.11) Unscrew and remove lower rubber mandrel (29) from rubber mandrel (11).

H-1.12) Remove rubber retainer (15) and CDI element stack (12) from rubber mandrel (11).

H-1.13) Unscrew and remove rubber mandrel (11) from upper cone (9).

H-1.13.1) Remove CDI seal (14) from rubber mandrel (11).

H-1.14) Remove upper cone (9) from inner mandrel (2).

H-2) Unclamp and remove upper J-body (10) from vise. Clamp inner mandrel (2) in vise.

CAUTION$_3$: Do NOT wrench or clamp on seal surface.

H-2.1) Unscrew and remove upper J-pin sub (10) from expansion joint mandrel (21).

NOTE$_3$: Upper slip body assembly must be free to rotate.

H-2.2) Remove expansion joint mandrel (21) out upper end top of assembly.

H-2.3) Unscrew and remove set screws (32) from spring cage keeper (5).

H-2.4) Unscrew and remove top sub (1) from spring cage keeper (5).

H-2.5) Unscrew and remove spring cage cap (27) from upper slip body (6).

CAUTION$_4$: Compression spring (4) compressed with spring tension against upper slip body assembly.

H-2.6) Unscrew and remove spring cage keeper (5) from inner mandrel (2).

H-2.6.1) Remove CDI seal (13) from spring cage keeper (5).

H-2.7) Remove compression spring (4) from inner mandrel (2).

H-2.8) Wedge releasing slip (7) and upper slips (8) outwards (if needed). Remove upper slip body assembly and disassemble:

H-2.8.1) Remove spring retaining ring (30) from upper slip body (6).

H-2.8.2) Remove wedges (if needed). Remove upper slips (8), releasing slip (7) and upper slip springs (26) from upper slip body (6).

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

I) ASSEMBLY

NOTE$_4$: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.

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

CAUTION$_3$: Do NOT wrench or clamp on seal surface.

I-1.1) Assemble upper slip body assembly and install:

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

NOTE$_5$: Install two (2ea) springs per slip (Fig. 2).

I-1.1.2) Install spring retaining ring (30) into upper slip body (6).

I-1.1.3) Install upper slip body assembly onto inner mandrel (2). Remove wedges.

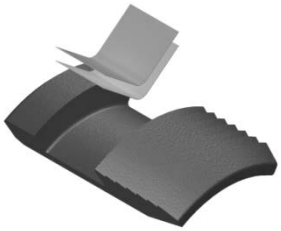


Fig. 2

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

I-1.3) Install CDI seal (13) into spring cage keeper (5).

I-1.4) Screw spring cage keeper (5) onto inner mandrel (2).

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

CAUTION$_4$: Compression spring (4) compressed with spring tension against upper slip body assembly.

I-1.6) Screw top sub (1) into spring cage keeper (5).

I-1.7) Screw set screws (32) into spring cage keeper (5).

I-1.8) Install expansion joint mandrel (21) into upper end top of assembly.

CAUTION$_5$: Do not rip or tear seal during installation

I-1.9) Screw upper J-pin sub (10) onto expansion joint mandrel (21).

NOTE$_3$: Upper slip body assembly must be free to rotate.

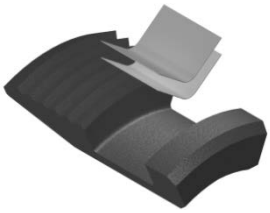


Fig. 3

I-2) Remove inner mandrel (2) from vise. Clamp upper J-body (10) in vise.

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

I-2.2) Install CDI seal (14) into rubber mandrel (11).

I-2.3) Screw rubber mandrel (11) onto upper cone (9).

CAUTION$_5$: Do not rip or tear seal during installation

I-2.4) Install CDI element stack (12) and rubber retainer (15) onto rubber mandrel (11).

I-2.5) Screw lower rubber mandrel (29) onto rubber mandrel (11).

I-2.6) Screw lower cone (16) into rubber retainer (15).

I-2.7) Assemble drag block body assembly and install:

I-2.7.1) Install lower slips (17) and lower slip springs (25) into drag block body (18). Wedge lower slips (17) outwards.

NOTE$_5$: Install two (2ea) springs per slip (Fig. 3).

Fig. 4

I-2.7.2) Install drag block body assembly onto inner mandrel (2). Remove wedges.

I-2.8) Screw rubber mandrel cap (19) onto lower rubber mandrel (29).

I-2.9) Install drag blocks (22) and drag block springs (3) in drag block body (18). Compress drag blocks (22) using drag block assembly tool (T1).

NOTE$_6$: Install three (3ea) springs per block (Fig. 4).

I-2.10) Screw J-body (20) onto drag block body (18) (**NOTE$_1$**: Left-hand threads) capturing ends of drag blocks (22).

I) ASSEMBLY (cont’d)

I-2.11) Screw set screws (31) into J-body (20). Release drag blocks (22).

I-2.12) Assemble bottom sub assembly and install:

I-2.12.1) Install J-pin ring (24) onto J-pin sub (23).

I-2.12.2) Align threaded holes in J-pin ring (24) with pocket holes in J-pin sub (23). Screw shear screws (33) into J-pin sub (23). Tighten until shear screws (33) make contact with J-pin sub (23). Back shear screws (33) out 1/4 turn.

I-2.13) Wrench on J-body (20) to screw J-pin sub (23) onto inner mandrel (2) (**NOTE$_1$**: Left-hand threads).

NOTE$_2$: Drag block body assembly must be free to rotate.

I-2.14) Screw set screws (31) into J-pin sub (23). Move J-body (20) as needed to access threaded holes in J-pin sub (23).

I-2.15) Screw bottom sub (28) onto expansion joint mandrel (21) (**NOTE$_1$**: Left-hand threads).

I-2.16) Screw set screws (31) into bottom sub (28).

I-3) Unclamp upper J-body (10) from vise and remove assembled tool

J) PARTS LIST

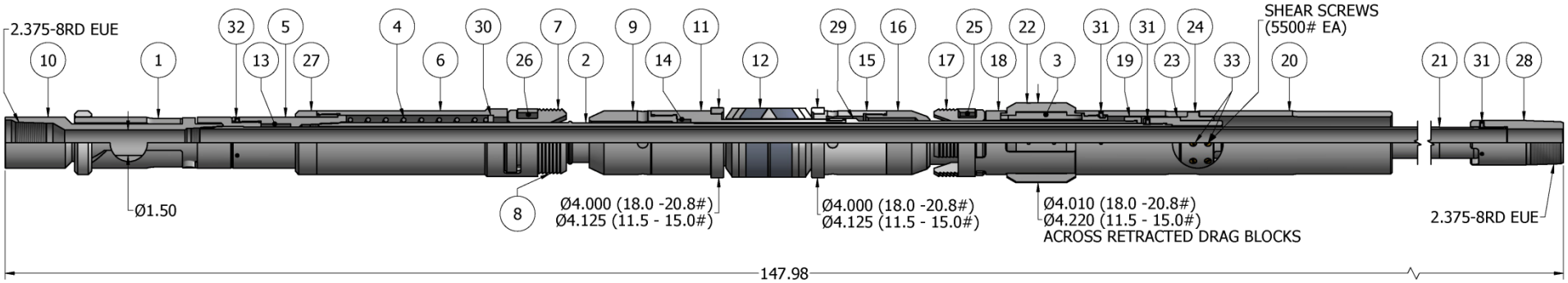
ITEM	QTY	DESCRIPTION	MATERIAL	P/N 74150 (11.5 – 15.0#)	P/N 74152 (18.0 – 20.8#)
1	1	TOP SUB	1018	74145610	
2	1	INNER MANDREL	L-80	74145210	
3	12	DRAG BLOCK SPRING	INCONEL	9100900	
4	1	COMPRESSION SPRING	CHROME VANADIUM	60345920	
5	1	SPRING CAGE KEEPER	L-80	74145811	
6	1	UPPER SLIP BODY	1026	60050325	
7	1	RELEASING SLIP	P-110	60050125	
8	2	UPPER SLIP	1026	60050115	
9	1	UPPER CONE	1026	60045410	
10	1	UPPER J-PIN SUB	L-80	74145700	
11	1	RUBBER MANDREL	L-80/1018	74150220	74152220
12	1	CDI ELEMENT STACK	-	S8587	S8588
13	1	CDI SEAL	-	S8590	
14	1	CDI SEAL	-	S8591	
15	1	RUBBER RETAINER	1026	60250850	60252850
16	1	LOWER CONE	1026	60045420	

J) PARTS LIST (cont’d)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 74150 (11.5 – 15.0#)	P/N 74152 (18.0 – 20.8#)
17	4	LOWER SLIP	1026	60050135	
18	1	DRAG BLOCK BODY	1026	60050335	
19	1	RUBBER MANDREL CAP	1026	60045230	
20	1	J-BODY	1026	60045340	
21	1	EXPANSION JOINT MANDREL	P-110	74145260	
22	4	DRAG BLOCK	8620	9057900	9056900
23	1	J-PIN SUB	L-80	74145640	
24	1	J-PIN RING	L-80	74145870	
25	8	LOWER SLIP SPRING	ELGILOY	7145901	
26	6	UPPER SLIP SPRING	ELGILOY	7145902	
27	1	SPRING CAGE CAP	1026	60045810	
28	1	BOTTOM SUB	L-80	74145630	
29	1	LOWER RUBBER MANDREL	P-110	74145250	
30	1	SPRING RETAINING RING	1026	60045820	
31	9	SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037	
32	3	SET SCREW 1/4-20 UNC X 5/16	STEEL	SSS025C031	
33	12	SHEAR SCREW (5500#) 1/2-13 UNC X 7/16	BRASS	BSSSLT050C043	

REDRESS KIT (RDK)		74150050	74152050
ASSEMBLED WEIGHT		143 LBS	142 LBS

K) TECHNICAL ILLUSTRATION



L) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
02/23/15	C	Revised P/N 74145250 material was L-80, P/N S8590 was S-8590, S8591 was S-8591; Added max. OD at drag blocks, pre-installation inspection and storage procedures, recommended hand tools, redress kit P/Ns, revision history	J.Anderson	K.Riggs