A) DESCRIPTION

The Bumper Sub is a heavy duty travel joint that is designed to transmit high torque. A hex-shaped mandrel is incorporated in the tool design providing a large contact surface which transmits the torque through the tool. Proven bonded seals are used to provide a seal across the full stroke of the bumper sub.

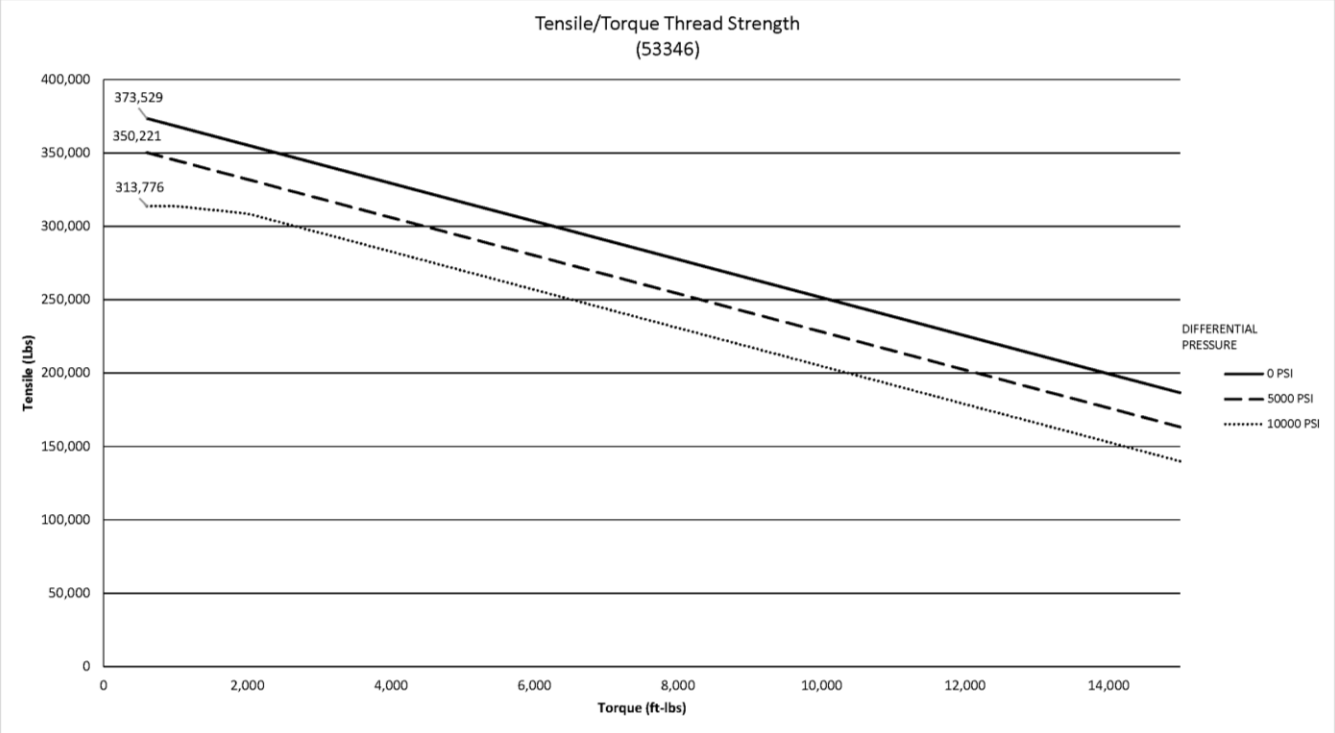
B) SPECIFICATION GUIDE

SIZE (INCHES)	**STROKE**	**TOOL OD** (INCHES)	**TOOL ID** (INCHES)	**THREAD CONNECTION** BOX UP / PIN DOWN	**PART NUMBER**
4-1/2	7 FT	6.50	3.75	4-1/2 IF TOOL JOINT	53346 53346H[1] 53346V[2]
	4 FT	6.50	3.75	4-1/2 IF TOOL JOINT	53346-48 53346H-48[1] 53346V-48[2]

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

DIFFERENTIAL PRESSURE (MAX)	**TENSILE LOAD THRU TOOL** (MAX)
10,000 PSI	373,500 LBS*

*Tensile load rating of tool can be affected by the amount of torque applied through the threads:



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

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.

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 and o-rings. Contact D&L sales for redress kit and/or other replacement part information.

D) 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.

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.

E) PRESSURE AFFECTED AREA(S) GUIDE

When run downhole, the bumper sub is subjected to the force created by differential pressure inside or outside the sub that acts on the pressure affected area (i.e., the piston effect). Depending on the drill pipe size and weight and the seal area of the bumper sub, the force created by differential pressure acts to expand or contract the sub. An upward force, designated as a negative (-) value, acts to expand the sub. A downward force, designated as a positive value, acts to contract the sub. These forces must be accounted for when operating the bumper sub. Other factors (e.g., drill pipe movement due to temperature change) must be considered separately to determine all the forces acting on the bumper sub.

DRILL PIPE SIZE (INCHES)	**PRESSURE AFFECTED AREA** (IN^2)	
	DRILL PIPE PRESSURE	**ANNULUS PRESSURE**
3-1/2	-19.02 (UP)	14.72 (DOWN)
4	-16.09 (UP)	11.77 (DOWN)
4-1/2	-14.72 (UP)	8.43 (DOWN)
5	-11.77 (UP)	4.70 (DOWN)
5-1/2	-7.21 (UP)	0

Example: Consider a 4-1/2” Bumper Sub set on 4-1/2” drill pipe with a differential pressure of 3,000 psi in the annulus outside the bumper sub. What is the force acting on the seal area of the sub?

To calculate the force (lbs) acting on the seal area of the sub, refer to the Pressure Affected Area Guide for a 4-1/2” Bumper Sub set on 4-1/2” drill pipe. In this example, the differential pressure from the annulus acts on the seal area of the sub across a pressure affected area of 8.43 in^2. Multiplying the differential pressure (3,000 psi) by the pressure affected area (8.43 in^2) results in a force of 25,290 lbs. The piston effect on the bumper sub is a downward force of 25,290 lbs.

F) ELASTOMER TRIM TEMPERATURE GUIDE

RUBBER TYPE	**TEMPERATURE RANGE**
NITRILE	40° - 250°F
HSN (HNBR)	70° - 300°F
VITON	100° - 350°F

G) 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

H) DISASSEMBLY

H-1) Clamp top sub (1) in vise.
- H-1.1) From lower end of tool, unscrew and remove set screws (11) from bottom sub (5).
- H-1.2) Unscrew and remove bottom sub (5) from mandrel (6).
  - H-1.2.1) Remove o-ring (14) from bottom sub (5).
- H-1.3) Unscrew and remove set screws (10) from lower end of outer cylinder (4).
- H-1.4) Unscrew hex sub (9) from outer cylinder (4).
- H-1.5) Pull mandrel assembly (including hex sub) out of outer cylinder (4). Set aside for disassembly.

  NOTE1: Extra force may be required to remove mandrel assembly. Be careful to not damage components during removal.
- H-1.6) Unscrew and remove set screws (10) from upper end of outer cylinder (4).
- H-1.7) Unscrew and remove outer cylinder (4) from top sub (1).

H-2) Unclamp and remove top sub (1) from vise.
- H-2.1) Remove o-ring (16) from top sub (1).

H-3) Slide hex sub (9) to upper end of mandrel (6) near seal mandrel (2).

H-4) Clamp mandrel assembly in vise – clamp on lower part of mandrel (6).
- H-4.1) Unscrew and remove seal retainer (3) from seal mandrel (2).
- H-4.2) Remove bonded seals (8) and seal spacer (7) from seal mandrel (2).
  - H-4.2.1) Remove o-rings (12) from bonded seals (8).
- H-4.3) Unscrew and remove seal mandrel (2) from mandrel (6).
  - H-4.3.1) Remove o-rings (13, 15) from seal mandrel (2).
- H-4.4) Remove hex sub (9) from upper end of mandrel (6).

H-5) Unclamp and remove mandrel (6) from vise.

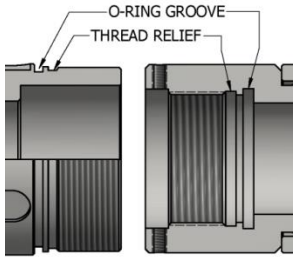


Fig. 2

I) ASSEMBLY

NOTE2: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.

CAUTION2: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs (Fig. 2).

I-1) Clamp lower end of mandrel (6) in vise.

NOTE3: Prior to clamping, provide adequate clearance to install all parts onto mandrel (6).
- I-1.1) Install hex sub (9) onto upper end of mandrel (6).
- I-1.2) Install o-ring (13) in inner o-ring groove and o-ring (15) in outer o-ring groove in seal mandrel (2).
- I-1.3) Screw seal mandrel (2) onto mandrel (6).

  CAUTION3: Do not rip or tear o-ring during installation.
- I-1.4) Install o-rings (12) in o-ring grooves in bonded seals (8).
- I-1.5) Install bonded seals (8) and seal spacer (7) in between onto seal mandrel (2).

  CAUTION3: Do not rip or tear o-rings during installation.
- I-1.6) Screw seal retainer (3) onto seal mandrel (2).

I-2) Unclamp and remove mandrel (6) from vise. Set mandrel assembly aside temporarily.

I-3) Install o-ring (16) in o-ring groove in top sub (1).

I) ASSEMBLY (cont’d)

I-4) Clamp top sub (1) in vise.

I-4.1) Screw outer cylinder (4) onto top sub (1).

CAUTION$_3$: Do not rip or tear o-ring during installation.

I-4.2) Screw set screws (10) into upper end of outer cylinder (4).

I-4.3) Install mandrel assembly into outer cylinder (4).

NOTE$_4$: Extra force may be required to install mandrel assembly. Be careful to not damage metal or elastomer components during installation.

CAUTION$_3$: Do not rip or tear o-ring or bonded seals during installation.

I-4.4) Screw hex sub (9) into outer cylinder (4).

I-4.5) Screw set screws (10) into lower end of outer cylinder (4).

I-4.6) Install o-ring (14) in o-ring groove in bottom sub (5).

I-4.7) Screw bottom sub (5) onto mandrel (6).

CAUTION$_3$: Do not rip or tear o-ring during installation.

I-4.8) Screw set screws (11) into bottom sub (5).

I-5) Unclamp top sub (1) from vise and remove assembled tool.

J) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 53346	P/N 53346-48
1	1	TOP SUB	DLMS110	53346610	
2	1	SEAL MANDREL	DLMS110	53346111	
3	1	SEAL RETAINER	DLMS110	53346112	
4	1	OUTER CYLINDER	DLMS110	53346104	53346104-48
5	1	BOTTOM SUB	DLMS110	53346630	
6	1	MANDREL	DLMS110	53346210	53346210-48
7	1	SEAL SPACER	1026	58055550-2000	
8	2	BONDED SEAL	1026/NITRILE	58055520	
9	1	HEX SUB	DLMS110	53346102	
10	8	SET SCREW 5/16-18 UNC X 3/8	STEEL	SSS031C037	
11	4	SET SCREW 5/16-18 UNC X 1/2	STEEL	SSS031C050	
12	2	160 O-RING	90 DURO NITRILE	90160	
13	1	247 O-RING	90 DURO NITRILE	90247	
14	1	350 O-RING	90 DURO NITRILE	90350	
15	1	353 O-RING	90 DURO NITRILE	90353	
16	1	354 O-RING	90 DURO NITRILE	90354	

REDRESS KIT (RDK)		53346050	
ASSEMBLED WEIGHT		680 LBS	510 LBS

J) PARTS LIST (cont’d)

J-1) ELASTOMER TRIM OPTIONS

NOTE3: For temperature range, refer to Elastomer Trim Temperature Guide.

J-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 53346H	P/N 53346H-48
8	2	BONDED SEAL	1026/HSN	58055520H	
12	2	160 O-RING	90 DURO HSN	90160H	
13	1	247 O-RING	90 DURO HSN	90247H	
14	1	350 O-RING	90 DURO HSN	90350H	
15	1	353 O-RING	90 DURO HSN	90353H	
16	1	354 O-RING	90 DURO HSN	90354H	

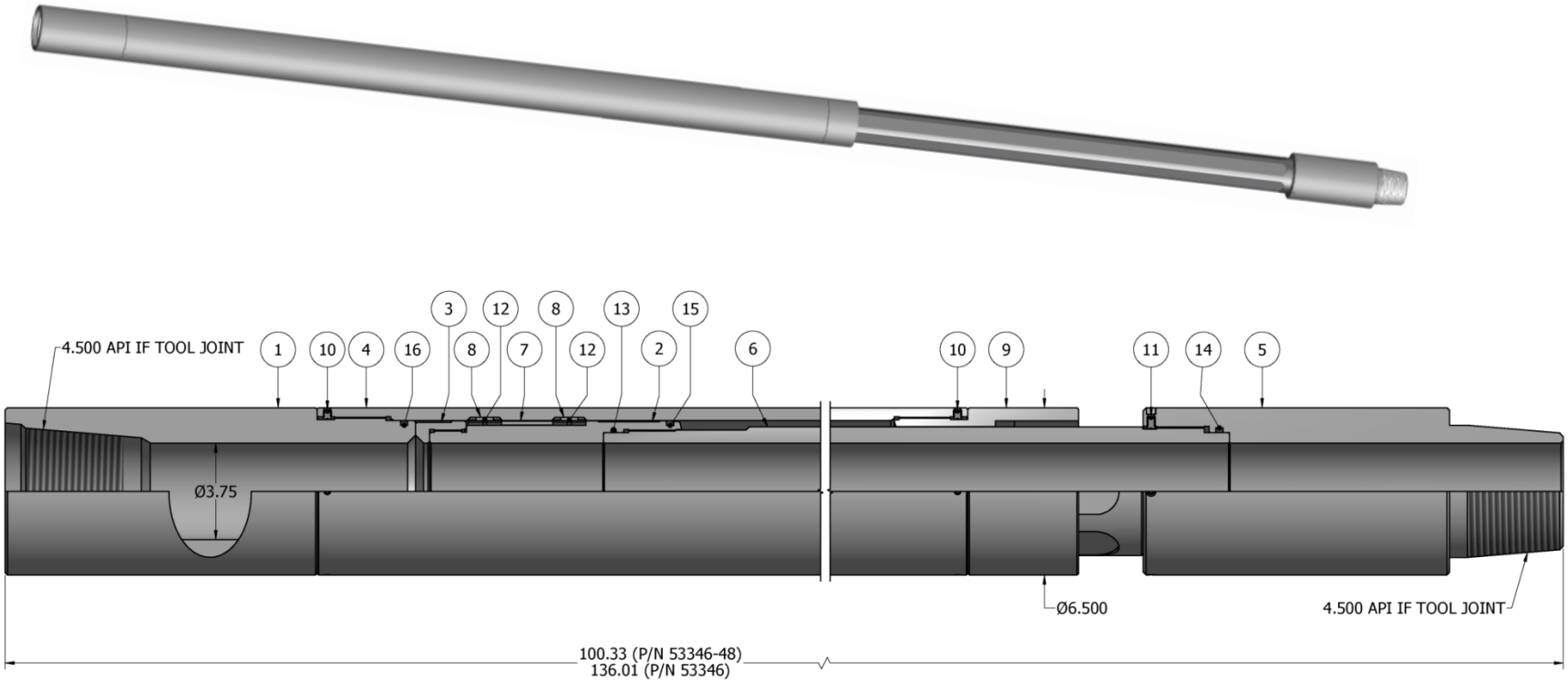
REDRESS KIT (RDK)		53346050H

J-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 53346V	P/N 53346V-48
8	2	BONDED SEAL	1026/VITON	58055520V	
12	2	160 O-RING	90 DURO VITON	90160V	
13	1	247 O-RING	90 DURO VITON	90247V	
14	1	350 O-RING	90 DURO VITON	90350V	
15	1	353 O-RING	90 DURO VITON	90353V	
16	1	354 O-RING	90 DURO VITON	90354V	

REDRESS KIT (RDK)		53346050V

K) TECHNICAL ILLUSTRATION



L) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
11/07/2017	E	Added Pressure Affected Area Guide; Revised Elastomer Trim Temp. Guide temp. ratings	J.Anderson	D.Hushbeck
12/19/2016	D	Added torque chart, General Screw Torque Recommendations; Revised Elastomer Trim Temperature Guide Nitrile and HSN temp. ratings; Remove Operating Envelope; Revised tensile load thru tool 373,500 lbs was 500,000 lbs	J.Anderson	N.Banker
08/11/2015	C	Added HSN and Viton options, Revised max. tensile load was 576,000 lbs, Operating Envelope, P/N SSS031C037 was item #11, P/N SSS031C050 was item #10, P/N 90160 was 90161	J.Anderson	B.Oligschlaeger
09/06/13	B	Added P/N 53346-48, revision history, recommended hand tools,	J.Anderson	D.Hushbeck