



# WR BRIDGE PLUG

## 4-1/2"

Manual No:  
**DL-735-4500-894**

Revision: **J**

Revision Date:  
**10/17/2018**

Authored by: J.Anderson

Approved by: R.Dyer

### A) DESCRIPTION

The WR Bridge Plug is wireline set, wireline retrieve, packer-type bridge plug capable of holding differential pressure from above or below. The WR Bridge Plug is used for a temporary bridge plug for acidizing, fracturing, cementing, casing pressure tests, well head replacement, and zone isolation. The WR Bridge Plug utilizes standard wireline or hydraulic setting tools.

### B) RELATED TOOLS (sold separately)

B-1) 4-1/2" Wireline Adapter Kit (WLAK) (P/N 73545-10)—refer to technical manual *DL-735-4500-895*.

B-2) 4-1/2" Retrieving Tool (PN 73545RT)—refer to technical manual *DL-735-4500-896*.

### C) SPECIFICATION GUIDE

CASING			TOOL GAGE OD (INCHES)	THREAD CONNECTION PIN UP	PART NUMBER
SIZE (INCHES)	WEIGHT (LBS/FT)	RECOMMENDED HOLE SIZE (INCHES)			
4-1/2	9.5 – 13.5	3.920 – 4.186	3.750	1.0000-8 UNC	73545
	13.5 – 15.1	3.826 – 4.038	3.650	1.0000-8 UNC	73544

DIFFERENTIAL PRESSURE (MAX)		TENSILE LOAD SHEAR STUD RATING (MAX)	TENSILE LOAD RATING DURING RETRIEVAL (MAX)
FROM ABOVE	FROM BELOW		
10,000 PSI	10,000 PSI	25,000 LBS	19,000 LBS

### D) PRE-INSTALLATION INSPECTION PROCEDURES

**CAUTION:** 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									
(General screw torque recommendations not applicable to mated parts specified in SPEC014)									
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](http://www.dloiltools.com)

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### D) 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.

### E) 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.

The WR Bridge Plug is set on a #10 Baker E-4 wireline pressure setting assembly and wireline adapter kit.

The recommended running speed for the WR Bridge Plug is 100 ft/min. Well conditions may require much slower speeds to avoid damaging the tool.

During setting, a calculated force of 25,000 lbs may be pulled on the 4-1/2" Wireline Set Bridge Plug.

### F) RETRIEVING PROCEDURES

The WR Bridge Plug is retrieved using the WR Bridge Plug Retrieving Tool.

#### F-1.1) TUBING RETRIEVAL

Make up the retrieving tool on the work string and run it to the setting depth. In the event sand or other debris is present on top of the WR Bridge Plug, standard washing may be continued to equalize any differential pressure across the plug - set down approximately 1,200 - 4,800 lbs (1,200 lbs/screw). This shifts the equalizing sleeve downward opening the equalizing ports, and latches the retrieving collet into the latch of the WR Bridge Plug.

After the differential is equalized, the head is latched onto the plug. The tool is released by the application of a minimum of 3,600 lbs tension. Continue to move the tool up the hole to completely stretch out the slip system and retrieve the tool from the hole. Slowly retrieve the plug for 100 ft to allow the packing element system to relax and pass through the casing without hanging up. After the elements have relaxed, the recommended retrieving speed is 100 ft/min. Well conditions may require much slower speeds to avoid damaging the tool.

#### F-1.2) SANDLINE RETRIEVAL

Make up the retrieving tool with the stem and the jars. Position the jars immediately above the retrieving tool. Flag the line and run the tools to setting depth. Jar down to open the equalizing sleeve. Allow sufficient time for any pressure differential to equalize. Pull a minimum of 3,600 lbs or jar upward to release the plug. Continue to move the tool up the hole to completely stretch out the slip system and retrieve the tool from the hole. Slowly retrieve the plug for 100 ft to allow the packing element system to relax and pass through the casing without hanging up. After the elements have relaxed, the recommended retrieving speed is 100 ft/min. Well conditions may require much slower speeds to avoid damaging the tool.



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### 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) ELASTOMER TRIM TEMPERATURE GUIDE

NITRILE (STD)			
TEMPERATURE RANGE (F°)	DUROMETER		
	END	MIDDLE	END
70° - 125°	80	70	80
125° - 250°*	90	70	90

RUBBER TYPE	TEMPERATURE RANGE
NITRILE	70° - 250°F

\*Validated API 11D1, V6. No validation/data on other trim combinations.

### I) RECOMMENDED TOOLS

#### I-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

#### I-2) SPECIAL TOOLS

ITEM	QTY	DESCRIPTION	PART NUMBER
T1	1	4-1/2" ASSEMBLY TOOL	AT73545-1
T2	1	4-1/2" DISASSEMBLY TOOL	AT73545-2

### J) DISASSEMBLY

J-1) Clamp upper gage ring (23) in vise.

J-1.1) From upper end of tool, unscrew and remove shear stud (8) from inner plug (22).

J-1.2) Unscrew and remove clutch ring (10) from inner plug (22).

J-1.3) Unscrew and remove shear screws (24) from latch (4).

J-1.4) Remove latch (4) from inner plug (22).

J-1.5) Unscrew and remove shear screw (24) from equalizing sleeve (15).

J-1.6) Remove equalizing sleeve (15) from ratchet mandrel top (20).

J-1.6.1) Remove o-rings (29) from equalizing sleeve (15).



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### J) DISASSEMBLY (cont'd)

J-1.7) Moving to lower end of tool, unscrew and remove inner mandrel cap (19) from inner mandrel (2).

J-1.8) Moving to upper end of tool, pull on inner plug (22) to remove inner mandrel assembly from ratchet mandrel (2).

**NOTE<sub>1</sub>:** Additional pulling force may be required to overcome spring resistance of collet fingers on ratchet mandrel top (20).

J-1.9) Disassemble inner mandrel assembly:

J-1.9.1) Unscrew and remove inner plug (22) from inner equalizing body (21).

J-1.9.2) Unscrew and remove inner equalizing body (21) from inner mandrel (2).

J-1.9.2.1) Remove o-ring (27) from inner equalizing body (21).

J-1.10) Unscrew upper cone (9) from lower gage ring (5).

J-1.11) Unscrew ratchet mandrel (6) from ratchet mandrel top (20).

J-1.12) Remove slip body assembly from rubber mandrel (22). Set assembly aside temporarily to be disassembled in later steps.

J-1.13) Unscrew and remove shear screws (25) from upper gage ring (23).

J-1.14) Remove ratchet mandrel top (20) from upper gage ring (23).

J-1.14.1) Remove o-ring (28) from groove in ratchet mandrel top (20).

J-1.15) Unscrew and remove shear screw (30) from rubber mandrel (11).

J-1.16) Unscrew and remove ratchet ring (3) from rubber mandrel (11).

J-1.17) Unscrew rubber mandrel (11) from upper gage ring (23).

J-1.18) Remove rubber mandrel assembly and disassemble:

J-1.18.1) Unscrew shear screws (25) from lower gage ring (5).

J-1.18.2) Remove elements (13,14), rubber spacers (12), and lower gage ring (5) from rubber mandrel (11).

J-1.18.3) Remove o-ring (28) from rubber mandrel (11).

J-2) Unclamp and remove upper gage ring (23) from vise.

J-3) Clamp slip body assembly and disassemble using Disassembly Tool (T2):

J-3.1) Wedge slips (7) outwards.

J-3.2) Screw top plate (T2-2) onto upper end of ratchet mandrel (6).

J-3.3) Screw internal collet lug (T2-3) onto bottom end of threaded rod (T2-1).

J-3.4) Insert threaded rod (T2-1) through ratchet mandrel (6) from lower end of slip body assembly and out through top plate (T2-2).

J-3.5) Install welded housing assembly (T2-6) over threaded rod (T2-1). Screw welded housing assembly (T2-6) onto upper cone (9).

J-3.6) Install flat washers (T2-5) onto threaded rod (T2-1), then screw threaded lug (T2-4) onto threaded rod (T2-1).

J-3.7) Tighten threaded lug (T2-4) until collet fingers on ratchet mandrel (6) go through ID of lower end of lower cone (16), upper end of lower cone (16) and upper cone (9).

J-3.8) Remove disassembly tool (T2) and ratchet mandrel (6) from slip body assembly.

J-3.9) Separate disassembly tool (T2) from ratchet mandrel (6).



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### J) DISASSEMBLY (cont'd)

J-3.10) Disassemble slip body assembly:

J-3.10.1) Unscrew and remove low head cap screws (1) from lower cone (16).

J-3.10.2) Remove lower cone (16) from slip body (18).

J-3.10.3) Remove slips assemblies and disassemble. Remove wedges (if needed):

J-3.10.3.1) Remove slip assemblies from slip body (18).

J-3.10.3.2) Unscrew and remove button head cap screws (26) from slips (7).

J-3.10.3.3) Remove slip springs (17) from slips (7).

J-3.10.4) Remove upper cone (9) from slip body (18).

J-4) Unclamp and remove slip body (18) from vise.

### K) 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.

**CAUTION3:** To ensure tool operates properly, install O-rings in O-ring grooves - **NOT** in thread reliefs (unless stated otherwise) (Fig. 2).

K-1) Clamp slip body (18) in vise and assemble slip body assembly:

K-1.1) Install upper cone (9) into slip body (18) from lower end of slip body.

K-1.2) Assemble slips and install into slip body (18):

K-1.2.1) Set slip springs (17) in place on slips (7).

**NOTE3:** Install two (2 ea) springs per slip (Fig. 3).

K-1.2.2) Screw button head cap screws (26) into slips to secure lower slip springs (17).

K-1.2.3) Install slips (7) into slip body (18). Wedge slips outward.

K-1.3) Install lower cone (16) into slip body (18). Align slots in slip body (18) with threaded holes in lower cone (16).

K-1.4) Screw low head cap screws (1) into lower cone (16).

K-1.5) Use Assembly Tool (T1) to install ratchet mandrel (6) into upper cone (9) and lower cone (16):

K-1.5.1) Screw top plate (T1-2) onto upper end of ratchet mandrel (6).

K-1.5.2) Install flat washers (T1-5) onto threaded rod (T1-1).

K-1.5.3) Screw threaded lug (T1-4) partially onto threaded rod (T1-1).

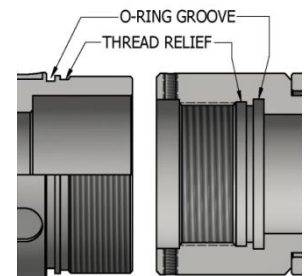


Fig. 2



Fig. 3



Fig. 4

K-1.5.4) From upper end of ratchet mandrel (6), install threaded rod (T1-1) through hole in top plate (T1-2) and through ratchet mandrel (Fig. 4).

K-1.5.5) Install ratchet mandrel (6) with threaded rod into upper end of upper cone (9).

K-1.5.6) Install bottom cap (T1-3) and flat washers (T1-5) onto lower end of threaded rod (T1-1).



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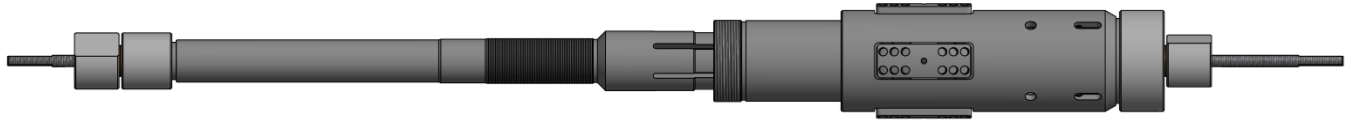


Fig. 5

K-1.5.7) Screw threaded lug (T1-4) onto threaded rod (T1-3) (Fig. 5).

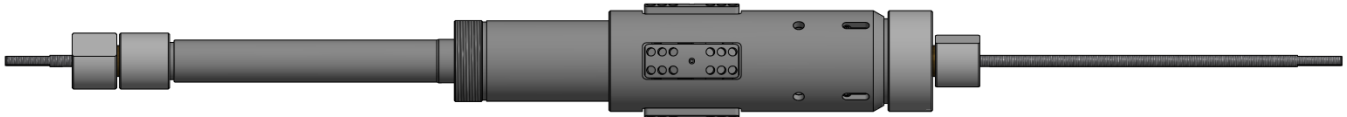


Fig. 6

K-1.5.8) Tighten threaded lug (T1-4) to pull collet fingers on ratchet mandrel (6) through upper and lower cones (Fig. 6). Remove wedges from slips.

**CAUTION4:** Ensure ratchet mandrel is centralized in the upper cone to ensure parts do not bind. Force cones together to push slips outward as needed.

K-1.5.9) Remove assembly tool (T1) from slip body assembly.

K-1.5.10) Unclamp slip body (18) and remove slip body assembly from vise. Set assembly aside temporarily to be installed in later steps.

K-2) Clamp upper gage ring (23) in vise.

K-2.1) Assemble rubber mandrel assembly and install:

K-2.1.1) Install o-ring (28) in o-ring groove in rubber mandrel (11).

K-2.1.2) Install lower gage ring (5), elements (13, 14), and rubber spacers (12) onto rubber mandrel (11).

K-2.1.3) Screw rubber mandrel (11) into upper gage ring (23). Align threaded holes in lower gage ring (5) with groove in rubber mandrel (11).

K-2.1.4) Screw shear screws (25) into lower gage ring (5). Tighten until shear screws contact rubber mandrel (11). Back shear screws out 1/4 turn.

K-2.2) Thread ratchet ring (3) into rubber mandrel (11) until flush with bottom edge of thread in rubber mandrel (11) (Fig. 7).

**NOTE4:** Threads on ratchet ring (3) are directional - it **MUST** be in installed in correct direction for tool to work properly.

K-2.3) Align gap in ratchet ring (3) with threaded hole in rubber mandrel (11).

**CAUTION5:** Should not require more than one revolution past flush to align ring with threaded hole. Back out ratchet ring as necessary.

K-2.4) Screw shear screw (30) into rubber mandrel (11). Tighten until shear screw is flush with bottom of counter bore of threaded hole in rubber mandrel (11) (Fig. 7).

K-2.5) Install o-ring (28) in o-ring groove in ratchet mandrel top (20).

K-2.6) Install ratchet mandrel top (20) into upper gage ring (23). Align lower groove in ratchet mandrel top (20) with threaded holes in upper gage ring (23).

K-2.7) Screw shear screws (25) into upper gage ring (23). Tighten until shear screws contact ratchet mandrel top (20). Back shear screws out 1/4 turn.

K-2.8) Install slip body assembly into rubber mandrel (11).

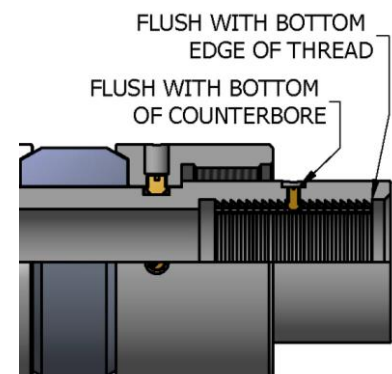


Fig. 7



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### K) ASSEMBLY (cont'd)

K-2.9) Screw ratchet mandrel (6) into ratchet mandrel top (20).

**CAUTION**<sub>6</sub>: Do not rip or tear o-rings during installation.

**NOTE**<sub>5</sub>: For added leverage, insert 1/4" rod through slip body (18) as needed.

K-2.10) Screw upper cone (9) into lower gage ring (5).

K-2.11) Assemble inner mandrel assembly and install:

K-2.11.1) Install o-ring (27) in o-ring groove in inner equalizing body (21).

K-2.11.2) Screw inner equalizing body (21) onto inner mandrel (2).

K-2.11.3) Install inner mandrel into ratchet mandrel (6).

**NOTE**<sub>6</sub>: Additional force may be required to get inner equalizing body (21) into collet fingers on ratchet mandrel top (20).

**CAUTION**<sub>6</sub>: Do not rip or tear o-ring during installation.

K-2.12) Moving to lower end of tool, screw inner mandrel cap (19) onto inner mandrel (2).

K-2.13) Moving to upper end of tool, install o-rings (29) in o-rings groove in equalizing sleeve (15).

K-2.14) Install equalizing sleeve (15) onto ratchet mandrel top (20). Align threaded hole in equalizing sleeve (15) with groove in ratchet mandrel top (20).

**CAUTION**<sub>6</sub>: Do not rip or tear o-ring during installation.

K-2.15) Screw shear screw (24) into equalizing sleeve (15). Tighten until shear screw contacts ratchet mandrel top (20). Back shear screw out 1/4 turn.

K-2.15.1) Screw inner plug (22) into inner equalizing body (21).

**CAUTION**<sub>6</sub>: Do not rip or tear o-ring during installation.

K-2.16) Install latch (4) onto inner plug (22). Align threaded holes in latch (4) with groove in inner plug (22).

K-2.17) Screw shear screws (24) into latch (4). Tighten until shear screws contact inner plug (22). Back shear screws out 1/4 turn.

K-2.18) Screw clutch ring (10) onto inner plug (22).

K-2.19) Screw shear stud (8) into inner plug (22).

K-2.20) Back up on shear stud (8) and apply 150 ft-lbs of torque between shear stud (8) and inner mandrel cap (19).

K-3) Unclamp upper gage ring (23) from vise and remove assembled tool.





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### L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	9.5 – 13.5# P/N 73545	13.5 – 15.1# P/N 73544
1	8	LOW HEAD CAP SCREW 3/8-16 UNC X 1/4	STEEL	LHSC037C025	
2	1	INNER MANDREL	DLMS125	73545205	
3	1	RATCHET RING	DLMS80	73545011	
4	1	LATCH	DLMS110	73545660	
5	1	LOWER GAGE RING	DLMS80	73545850	73544850
6	1	RATCHET MANDREL	DLMS110	73545210	
7	4	SLIP W/ CARBIDE	DLMS110	73545110C	73544110C
8	1	SHEAR STUD	DLMS110	73545901	
9	1	UPPER CONE	DLMS110	73545410	
10	1	CLUTCH RING	DLMS80	73545915	
11	1	RUBBER MANDREL	DLMS80	73545220	
12	2	RUBBER SPACER	1026	72045851	72044851
13	1	ELEMENT	70 DURO NITRILE	72045511	72044511
14	2	ELEMENT	90 DURO NITRILE	72045513	72044513
15	1	EQUALIZING SLEEVE	DLMS110	73545620	
16	1	LOWER CONE	DLMS110	73545420	
17	8	SLIP SPRING	INCONEL 625	32045950	
18	1	SLIP BODY	DLMS80	73545335	73544335
19	1	INNER MANDREL CAP	DLMS80	73545235	
20	1	RATCHET MANDREL TOP	DLMS110	73545610	
21	1	INNER EQUALIZING BODY	DLMS110	73545260	
22	1	INNER PLUG	DLMS110	73545250	
23	1	UPPER GAGE RING	DLMS80	73545830	73544830
24	4	SHEAR SCREW (1200#) 1/4-20 UNC X 3/8	BRASS	BSSSLT025C037	
25	7	SHEAR SCREW (2200#) 5/16-24 UNF X 5/16	BRASS	BSSSLT031F031	
26	4	BUTTON HEAD CAP SCREW #8-32 UNC X 1/4	STEEL	BHSC832C025	
27	1	211 O-RING	90 DURO NITRILE	90211	
28	2	222 O-RING	90 DURO NITRILE	90222	
29	2	226 O-RING	90 DURO NITRILE	90226	
30	1	SHEAR SCREW (750#) #10-32 UNF X 3/8	BRASS	BSSSLT1032F037	
REDRESS KIT (RDK)				73545050	73544050
ASSEMBLED WEIGHT				59 LBS	56 LBS





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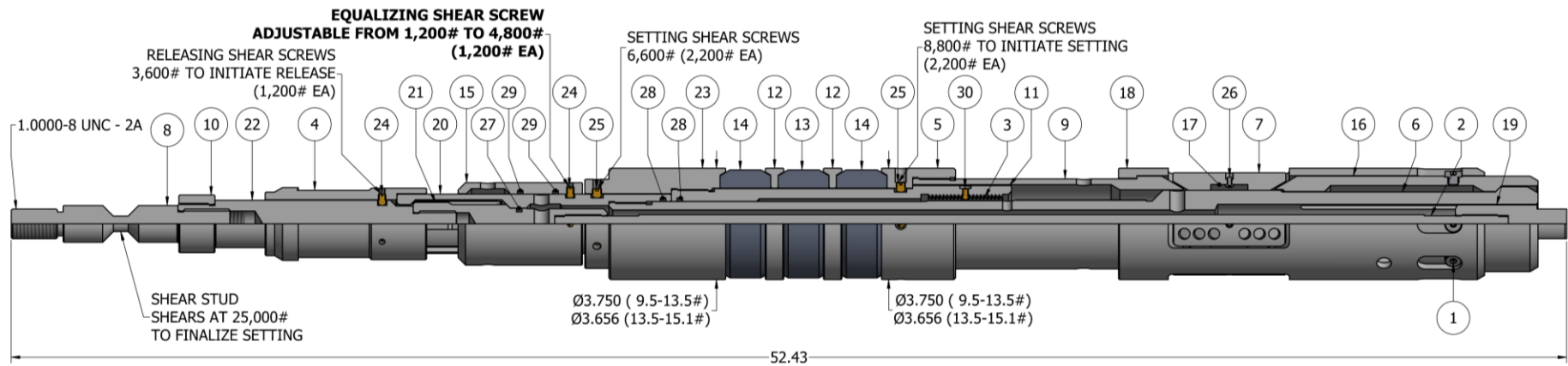
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## M) TECHNICAL ILLUSTRATION





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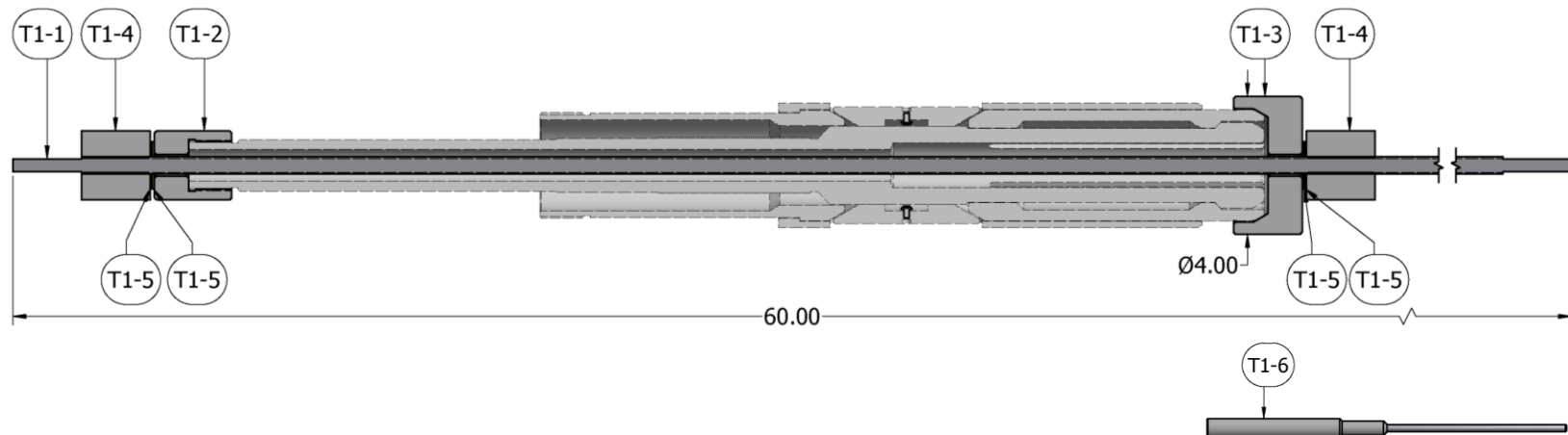
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## N) ASSEMBLY TOOL

### N-1) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N AT73545-1
T1-1	1	THREADED ROD	STEEL	AT7357-004
T1-2	1	TOP PLATE	DLMS110	AT73545-001
T1-3	1	BOTTOM CAP	DLMS110	AT73545-002
T1-4	2	THREADED LUG	DLMS110	AT73557-003
T1-5	4	1/2 LARGE FLAT WASHER	BRASS	FW050B-1
T1-6	1	ASSEMBLY PUNCH	-	AT735-PUNCH

### N-2) TECHNICAL ILLUSTRATION



**NOTE7:** Assembly tool is used when installing ratchet mandrel to safely deflect collet fingers.



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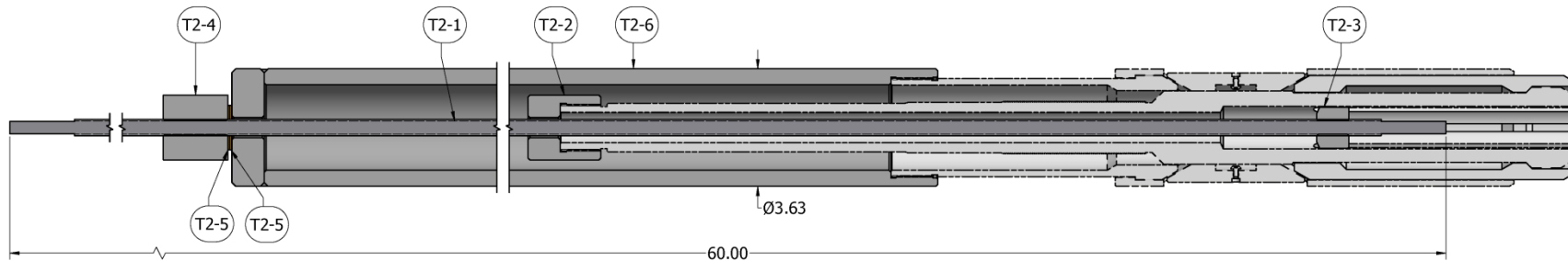
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## O) DISASSEMBLY TOOL


### O-1) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N AT73545-2
T2-1	1	THREADED ROD	STEEL	AT73557-004
T2-2	1	TOP PLATE	DLMS110	AT73545-001
T2-3	1	INTERNAL COLLET LUG	DLMS110	AT73545-005
T2-4	1	THREADED LUG	DLMS110	AT73557-003
T2-5	2	1/2 LARGE FLAT WASHER	BRASS	FW050B-1
T2-6	1	WELDED HOUSING ASSEMBLY	DLMS110	AT73545-008

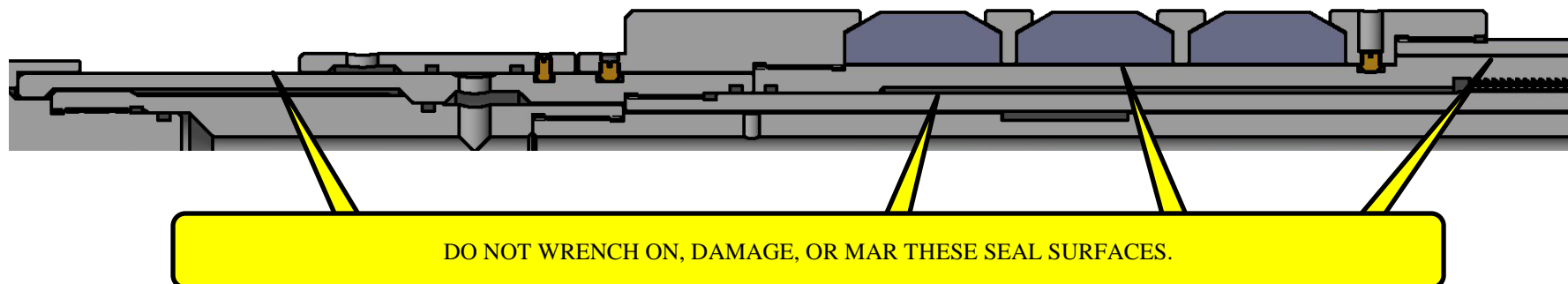
### O-2) TECHNICAL ILLUSTRATION



**NOTE:** Disassembly tool is used when removing ratchet mandrel to safely deflect collet fingers.

	<b>WR BRIDGE PLUG</b> <b>4-1/2"</b>	Manual No: <b>DL-735-4500-894</b>
		Revision: <b>J</b>
		Revision Date: <b>10/17/2018</b>
<i>Authored by: J.Anderson</i>		<i>Approved by: R.Dyer</i>

## P) SEAL SURFACES



## Q) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
10/17/2018	J	Revised LHSC037C025 was SCS025C025, LHSC037C025 was LHSC025C025, qty 8 was 4, Added General Screw Torque Recommendations	J.Anderson	C.Colvin
12/28/2015	H	Revised max. tensile load rating during retrieval 19,000 lbs was 12,000 lbs	J.Anderson	R.Dyer
12/11/2015	G	Revised Setting and Retrieving Procedures, P/N 73545205 material DLMS125 was DLMS110	J.Anderson	R.Dyer
12/08/2015	F	Revised max. tensile load during retrieval 12,000 lbs was 19,000 lbs	J.Anderson	R.Dyer
11/23/2015	E	Revised Elastomer Trim Temperature Guide; Removed max. temperature rating	J.Anderson	R.Dyer
11/10/2015	D	Added P/N 73544	J.Anderson	R.Dyer
10/14/2015	C	Revised Retrieving Procedures, step K-2.20 was K.2-13, P/N SCS025C025 was LHSC025C025, P/N BSSSLT025C037 qty was 4, Technical Illustration	J.Anderson	R.Dyer
09/04/2015	B	Added tensile load rating during retrieval, Fig. 7, K-2.13, Assembly Tool P/N AT735-PUNCH	J.Anderson	R.Dyer
06/29/2015	A	Created new manual	-	-