



MECHANICAL SETTING TOOL

6-5/8" & 7"

Manual No:
DL-524-7000-401

Revision: **H**

Revision Date:
03/09/2021

Authored by: B.Mathis

Approved by: D.Hushbeck

A) DESCRIPTION

The Mechanical Setting Tool (MST) is designed to run and mechanically set a Cement Retainer or converted Bridge Plug at any depth on tubing or drill pipe. The MST is used anytime it is advantageous to run a Cement Retainer or Bridge Plug on tubing or drill pipe. Cement Retainers can be set, pressure tested and squeezed in a single trip.

The MST and Cement Retainer or Bridge Plug are shear pinned together and the slips are held in a retracted position for safer running.

B) RELATED TOOLS (sold separately)

B-1) 6-5/8" and 7" Cement Retainers (P/N varies)—refer to applicable technical manual.

C) SPECIFICATION GUIDE

CASING			TOOL OD (INCHES)	TOOL ID (INCHES)	THREAD CONNECTION BOX UP	PART NUMBER
SIZE (INCHES)	WEIGHT (LBS/FT)	RECOMMENDED HOLE SIZE (INCHES)				
6-5/8	17.0 – 32.0	5.675 – 6.135	5.375	1.12	2-7/8 EUE	52465
7	29.0 – 35.0*	6.004 – 6.538	5.500	1.12	2-7/8 EUE	52470*

*Tool can be run in 7" (17.0 – 29.0#) casing with alternative drag blocks (P/N 9090900, sold separately).

DIFFERENTIAL PRESSURE (MAX)
10,000 PSI

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									
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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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) GENERAL OPERATIONS

CAUTION: Do not run the tool without properly tightening connections. Running the tool with loose connections may damage the tool and cause malfunction.

When it is advantageous to run a Cement Retainer or a Bridge Plug on tubing or drill pipe, the MST is used. The MST is designed to contain the upper slips of the Cement Retainer or Bridge Plug in a safe retracted position while running to setting depth. The upper slips are released by right-hand rotation and slacking off on the work string. The Cement Retainer or Bridge Plug is then set and locked to the casing by pulling 27,000 to 50,000 lbs. tension (depending on size) at the tool. The slide valve on the Cement Retainer is in the open position while being run in the well. When the setting procedure is completed, the slide valve may be closed by picking up two inches (2") at the tool or opened by slacking off two inches (2") at the tool. With the slide valve in the closed position, the work string may be pressure tested.

The MST is released from the Cement Retainer or Bridge Plug by pulling tension and right-hand rotation at the tool. The MST contains a snap out feature that is actuated after it is rotationally released from the Cement Retainer. This feature allows it to be relatched to the Cement Retainer by setting weight down and released by picking up the work string. The stinger seal will remain in the Cement Retainer bore until the snap out retaining force is exceeded. The slide valve is closed each time the MST is snapped out.

The MST is equipped with drag springs to allow a single MST to cover the full casing range of the size Cement Retainer or Bridge Plug it is configured to run. This assures positive control during running and setting procedures at all depths or in deviated wells.

F) LOADING A CEMENT RETAINER OR BRIDGE PLUG ONTO A MST

F-1) Place coupling of MST in vise.

F-1.1) Rotate the drag spring assembly to the right until the control nut engages the control nut clutch and stops

NOTE: - On sizes 4-1/2" through 5-3/4", move drag spring assembly UP until it stops.

- On sizes 6-5/8" and larger, move drag spring assembly DOWN until stopped by snap ring.

NOTE: Ensure that the snap ring is properly installed before proceeding.

F-2) Screw setting sleeve up toward drag spring assembly until control latch is accessible.

F-3) Slide upper slips (non-wickered end first) over stinger sub body. Loosen clamp on slips only enough to slide slip segments over shoulder (or slip adapter) on control latch and then retighten.

F-4) Lubricate non-wickered portion of slips with grease. Rotate setting sleeve down over slips until about 3/4 of the non-wickered portion is covered. Loosen and move the clamp up over the setting sleeve. Let the clamp on the tool for later use.

F-5) Ensure that the control nut is still engaged with the control nut clutch by rotating drag spring assembly to the right.

F-6) Lubricate stinger seal and control latch threads with grease. Place a liberal amount of grease in Cement Retainer bore.



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F) LOADING A CEMENT RETAINER OR BRIDGE PLUG ONTO A MST (cont'd)

F-7) **FOR CEMENT RETAINERS ONLY:**

- F-7.1) Slide Cement Retainer over stinger.
- F-7.2) Use a wood block to protect the lower end of the Cement Retainer while driving it over the stinger seal with a heavy hammer until it bottoms out on the control latch.
- F-7.3) Rotate the Cement Retainer to the **LEFT** until it shoulders out on the control latch. Make up hand tight.

NOTE: It may be necessary to drive the Cement Retainer, rotate, drive, rotate and repeat until the Cement Retainer shoulders out.

F-8) **FOR BRIDGE PLUGS ONLY:**

- F-8.1) Slide Bridge Plug over stinger sub body until it bottoms out on the control latch.
- F-8.2) Rotate the Bridge Plug to the **LEFT** until it shoulders out on control latch. Make up hand tight.
- F-9) Back off the Cement Retainer or Bridge Plug slightly to align holes. Locate and install shear screw(s) in hole(s) in control latch.
- F-10) Rotate the setting sleeve down until it bottoms out on wickered portion of slip. Loosen setting sleeve 1/4 turn and secure with two (2ea) set screws.
- F-11) Move clamp down over wickers on upper slips and tighten securely for transport.
- F-12) Remove clamp from upper slips before running.

G) TO CONVERT THE MST TO RUN A BRIDGE PLUG:

- G-1) Remove stinger sub and seal. Replace with spacer and thread protector.
- G-2) Replace coupling with ported coupling to allow the tubing to fill while running in the hole.
- G-3) Follow instructions for loading a Cement Retainer or Bridge Plug.

H) RUNNING AND SETTING INSTRUCTIONS (Refer to sequence illustrations)

- H-1) During "Run In", extreme care should be taken to avoid any right hand rotation at the setting tool. As a precaution, one left hand turn should be placed in the work string every 10 to 15 stands.
- H-2) When the desired setting depth has been reached, the tools should be picked up two (2) feet above the desired setting point. This movement is necessary to provide the required tool stroke to release the upper slips and allow the control nut to move freely.
- H-3) Rotate the work string to the **RIGHT** sufficiently to transmit 10 turns to the tool. This right-hand rotation will thread the control nut off of its matching thread on the MST mandrel and release the control sleeve from the running in position.
- H-4) Lower the tools back down to the desired setting depth. The drag springs will support the control sleeve and setting sleeve. The downward motion will push the upper slips from under the setting sleeve. The upper slip segments are then forced out against the casing by the leaf springs attached to the inside of each slip segment. When the upper slips are released, the retaining sleeve is pulled from over the dog allowing it to move out and release the control latch from the stinger sub body.

TOOL SIZE (INCHES)	MIN TENSION (LBS)	MAX TENSION (LBS)
6-5/8 - 7	35,000	45,000



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H) RUNNING AND SETTING INSTRUCTIONS (cont'd)

H-5) Refer to the above chart and pull tension over pipe weight at the tool to set the slips and affect packoff. It is recommended that the maximum tension shown above be pulled when possible. However, to assure sufficient packoff and slip breakage, the minimum tension shown must be pulled. Set down weight equal to the calculated weight required to prevent the slide valve from closing during pumping operations. Do not apply tension after setting weight on retainer other than that required to release setting tool or close valve. Pull a slight strain on work string and pressure the work string to insure that the slide valve is closed.

NOTE4: In wells where paraffin or suspended solids in the well fluids are present, the dog on the control latch may not fully release from the stinger sub body. This is indicated when the Cement Retainer sets properly (as in steps F-1 through F-5), but the slide valve will not close so that the work string can be pressure tested. In this event the work string should be alternately picked up and slacked off. This movement will assist the dog to move outward on the inclined edges of the locking groove in the stinger sub body, thus freeing the stinger sub body for the required two (2) inches of vertical movement.

H-6) The MST is released from the Cement Retainer or Bridge Plug by pulling 500 to 1,000 lbs tension at the tool and then rotating the work string 10 turns to the **RIGHT** at the tool. This will shear the rotational lock screw and unscrew the control latch from the Cement Retainer or Bridge Plug.

H-7) After releasing from a Cement Retainer:

H-7.1) The MST can be relatched to the Cement Retainer by setting down 3,000 to 5,000 lbs of work string weight and snapped out again by pulling 8,000 to 10,000 lbs tension at the Cement Retainer.

H-7.2) The stinger seal will remain in the Cement Retainer until the snap-out retaining force is exceeded. Each time the MST is snapped in and snapped out, the snap-in and snap-out value is reduced until they stabilize at about 2,500 lbs snap-in and 5,000 lbs snap-out.

H-7.3) Two (2) inches of upward movement at the Cement Retainer will close the slide valve; two (2) inches of downward movement at the Cement Retainer will open the slide valve.

TOOL SIZE (INCHES)	MIN TENSION (LBS)	MAX TENSION (LBS)
6-5/8 and larger	45,000	50,000



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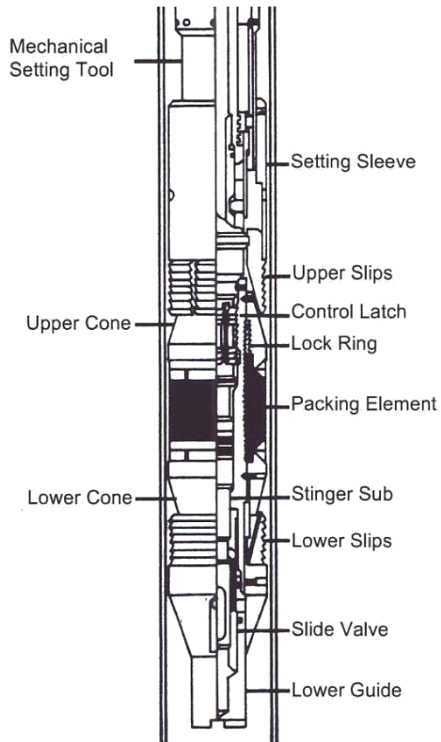
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I) SEQUENCE ILLUSTRATIONS

I-1) Set A



Running In

Slips and cones in safe position.
Slide valve open.



Upper Slips Released

Work string rotated 10 turns
to right and lowered 2 ft.



Setting Upper Slips

Beginning tension forces
upper cone under upper slips,
expands element back-up
rings and compresses packing
element.



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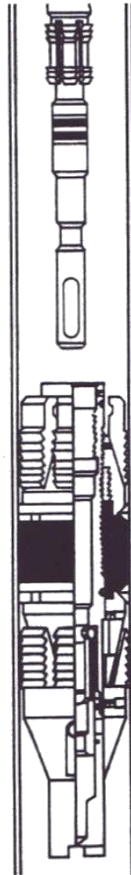
I) SEQUENCE ILLUSTRATIONS (cont'd)

I-2) Set B



Setting Lower Slips

Continued tension pulls lower guide against lower slips forcing them over lower cone and further compressing packing element. Pack-off complete. Pressure testing performed.



Setting Tool Released

Work string rotated 10 turns to right while holding 1,000 lbs tension. Control latch and stinger snapped-out allowing circulation above cement retainer.



Cementing

3,500 lbs set down to snap into cement retainer and open slide valve. Perform squeeze operation. Pick-up 2 inches to close slide valve and retain squeeze pressure. Pull 8,000 to 10,000 lbs over string weight to snap-out stinger.



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J) 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. 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.

K) RECOMMENDED TOOLS

K-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

K-2) SPECIAL TOOLS

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

L) MST CONVERSION FOR A SNAP-OUT SEAL ASSEMBLY CONFIGURATION

NOTE₇: If the MST is to be used to manipulate a wireline set cement retainer, it must be reconfigured per the following instructions.

L-1) Clamp mandrel (2) in a vise and remove stinger sub body (12), stinger seal (18) and stinger sub sub-assembly.

L-2) Loosen set screws (21) and remove setting sleeve (6) from control sleeve (7). Lay setting sleeve aside.

L-3) Rotate the drag spring assembly to the **LEFT** until the control nut (5) will slide up and down the mandrel.

L-4) Make up the stinger sub body (12) with the mandrel.

NOTE_s: **DO NOT** re-thread the control nut with the threads on the mandrel.

L-5) Run the MST as if it were a stinger seal assembly.

M) DISASSEMBLY

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

M-1.1) Unscrew and remove stinger (17) from stinger sub body (12).

M-1.2) Remove bonded seal (18) from stinger sub body (12).

M-1.2.1) Remove o-ring (28) from bonded seal (18).

M-1.3) Unscrew and remove set screws (21) from setting sleeve (6).

M-1.4) Move setting sleeve (6) downwards and unscrew and remove from control sleeve (7).

M-1.5) Unscrew and remove stinger sub body assembly from mandrel (2) and disassemble:

M-1.5.1) Remove o-ring (29) from stinger sub body (12).

M-1.5.2) Unscrew and remove socket set screws (22) from control latch (8).



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M) DISASSEMBLY (cont'd)

M-1.5.3) Remove dowel pins (26) from control latch (8). Depress dog (10) as necessary to free up dowel pins (26).

M-1.5.4) Remove dog (10) and dog springs (4) from stinger sub body (12).

M-1.5.5) Remove control latch (8) and key (24) from stinger sub body (12).

M-2) Unclamp top sub (1) from vise. Clamp control sleeve (7) in vise.

M-2.1) Unscrew and remove top sub (1) from mandrel (2).

M-2.2) Compress drag blocks (22) using drag block body assembly tool (T1).

M-2.3) Unscrew and remove socket cap screws (23) from segment support ring (20).

M-2.4) Temporarily screw cap screw (25) into mandrel lock segment (15).

M-2.5) Unscrew and remove drag block retainer (14) from drag block body (13). Pull mandrel lock segment (15) up with cap screw (25) as necessary to pass over upset in mandrel (2).

NOTE: Compression spring (27) has spring tension against segment support ring (20).

M-2.6) Unscrew and remove cap screw (25) from mandrel lock segment (15).

M-2.7) Remove compression spring (27), segment support ring (20), and mandrel lock segment (15) from drag block retainer (14).

M-2.8) Unscrew and remove set screws (19) from drag block body (13).

M-2.9) Unscrew and remove drag block body assembly from control sleeve (7) and disassemble:

M-2.9.1) Release drag blocks (16). Remove drag blocks (16) and drag block springs (3) from drag block body (13).

M-2.10) Remove mandrel assembly from control sleeve (7) and disassemble:

M-2.10.1) Unscrew and remove control nut (5) from mandrel (2).

M-2.10.2) Unscrew and remove control nut clutch (9) from mandrel (2).

M-2.11) Remove retaining sleeve (11) from control sleeve (7).

M-3) Unclamp and remove control sleeve (7) from vise.

N) ASSEMBLY

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

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

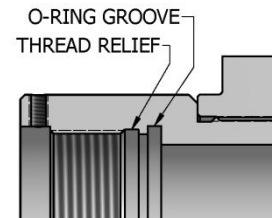


Fig. 2

N-1) Clamp control sleeve (7) in vise.

N-1.1) Install retaining sleeve (11) into control sleeve (7).

N-1.2) Assemble mandrel assembly and install:

N-1.2.1) Screw control nut clutch (9) onto mandrel (2).

N-1.2.2) Screw control nut (5) onto mandrel (2).

N-1.2.3) Install mandrel (2) into control sleeve (7). Align key in control nut (5) with key groove in control sleeve (7).

N-1.3) Assemble drag block body assembly and install:

N-1.3.1) Install drag blocks (16) and drag block springs (3) on drag block body (13). Compress drag blocks (16) with drag block assembly tool (T1).

N-1.3.2) Install drag block body (13) onto mandrel (2) and screw into control sleeve (7).



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N) ASSEMBLY (cont'd)

- N-1.4) Screw set screws (19) into drag block body (13).
- N-1.5) Install segment support ring (20), mandrel lock segment (15), and compression spring (27) into drag block retainer (14).
- N-1.6) Temporarily screw cap screw (25) into mandrel lock segment (15).
- N-1.7) Install drag block retainer (14) onto mandrel (2) and screw onto drag block body (13). Pull mandrel lock segment (15) up with cap screw (25) as necessary to pass over upset in mandrel (2).
- N-1.8) Screw top sub (1) onto mandrel (2).
- N-2) Unclamp and remove control sleeve (7) from vise. Clamp top sub (1) in vise.
 - N-2.1) Assemble stinger sub body assembly and install:
 - N-2.1.1) Install key (24) in key groove in stinger sub body (12).
 - N-2.1.2) From lower end of stinger sub body (12), install control latch (8) onto stinger sub body (12). Align key groove in control latch (8) with key (24).
 - N-2.1.3) Align cut out in control latch (8) with groove in stinger sub body (12) and install dog (10) and dog springs (4) into control latch (8).
 - N-2.1.4) Press down dog (10) and install dowel pins (26) into control latch (8).
 - N-2.1.5) Screw cap screws (22) into control latch (8).
 - N-2.1.6) Install o-ring (29) from stinger sub body (12).
 - N-2.1.7) Screw stinger sub body (12) into mandrel (2). Press down dog (10) as necessary to clear retaining sleeve (11).

CAUTION4: Do NOT rip or tear o-ring during installation.
 - N-2.2) Screw setting sleeve (6) onto control sleeve (7). Make up setting sleeve (6) past threads on control sleeve (7).
 - N-2.3) Screw set screws (21) into setting sleeve (6).
 - N-2.4) Install o-ring (28) into bonded seal (18).
 - N-2.5) Install bonded seal (18) onto stinger sub body (12).

CAUTION4: Do NOT rip or tear o-ring during installation.
 - N-2.6) Screw stinger (17) onto stinger sub body (12).
 - N-2.7) Unscrew and remove cap screw (25) from mandrel lock segment (15).
- N-3) Unclamp top sub (1) from vise and removed assembled tool.



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O) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	17.0 – 32.0# P/N 52465	29.0 – 35.0# P/N 52470
1	1	COUPLING	DLMS110	CP-BAC-C	
2	1	MANDREL	DLMS110	52470210	
3	-	DRAG BLOCK SPRING	-	9101900 30	36
4	2	COMPRESSION (DOG) SPRING	DLMSSP302	52470920	
5	1	CONTROL NUT	DLMS110/DLMSKS	52470711	
6	1	SETTING SLEEVE	DLMS110	52470470	
7	1	CONTROL SLEEVE	DLMS110	52465350	52470350
8	1	CONTROL LATCH	DLMS110	52470720	
9	1	CONTROL NUT CLUTCH	DLMS110	52470715	
10	1	DOG	DLMS80	52470500	
11	1	RETAINING SLEEVE	DLMS80	52470450	
12	1	STINGER SUB BODY	DLMS110	52470215	
13	1	DRAG BLOCK BODY	DLMS110	52465330	52470330
14	1	DRAG BLOCK RETAINER	DLMS110	52465910	52470910
15	1	MANDREL LOCK SEGMENT	DLMS80	52470506	
16	6	DRAG BLOCK	DLMSDB8	9080900	9080900 (29.0 – 35.0#) 9090900 (17.0 – 29.0#)*
17	1	STINGER	DLMS110	52470510	
18	1	BONDED SEAL	DLMS60 / 90 DURO NITRILE	52470520	
19	4	CAP SCREW 1/4-20 UNC X 1/4	STEEL	SCS025C025	
20	1	SEGMENT SUPPORT RING	DLMS80	52470505	
21	2	SET SCREW 3/8-16 UNC	STEEL	SSS037C031 (5/16" LONG)	SSS037C025 (1/4" LONG)
22	2	SET SCREW 1/4-20 UNC X 3/8	STEEL	SSS025C037	
23	3	CAP SCREW 5/16-18 UNC X 5/8	STEEL	SCS031C062	
24	1	KEY 1/4 X 1/4 X 2-9/16	DLMSKS	KS025X025X256	
25	1	CAP SCREW 1/4-20 UNC X 1-1/4	STEEL	SCS025C125	
26	2	DOWEL PIN 3/16 X 1-1/4	STEEL	DP018125	
27	1	COMPRESSION SPRING	DLMCRSP	36111GS	
28	1	030 O-RING	90 DURO NITRILE	90030	
29	1	225 O-RING	90 DURO NITRILE	90225	

*Sold separately. Contact D&L sales if needed.

REDRESS KIT (RDK)		52465050	52470050
ASSEMBLED WEIGHT		119 LBS	122 LBS



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P) OPTIONAL ACCESSORIES

NOTE: Ported top sub and thread protector available for running mechanical setting tool for a converted bridge plug.
All sold separately.

DESCRIPTION	MATERIAL	THREAD CONNECTION	17.0 – 32.0#	29.0 – 35.0#
			P/N 52465	P/N 52470
PORTED TOP SUB	J-55	2-7/8 EUE	52470615	
THREAD PROTECTOR	P-110	-	52470515	



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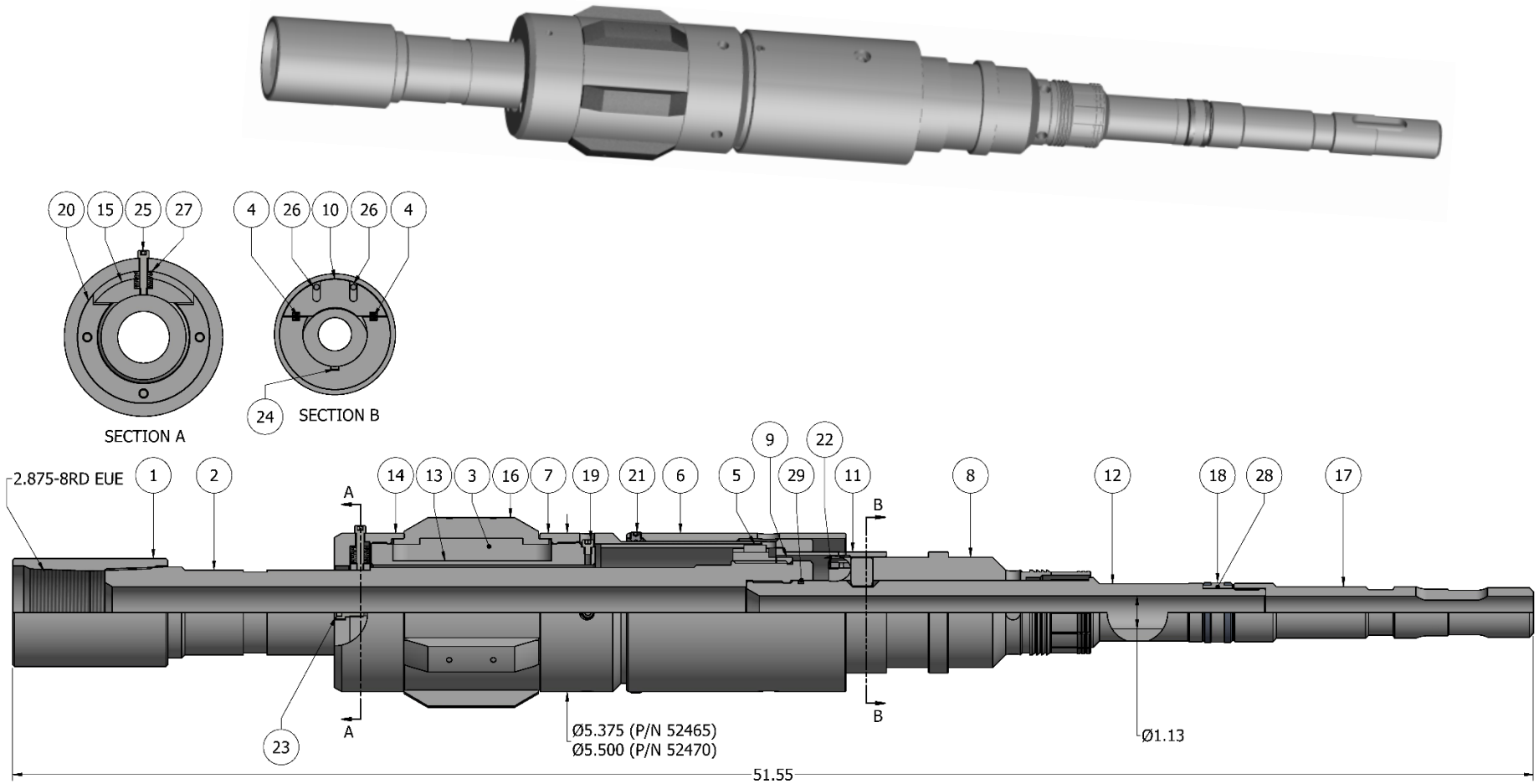
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Q) TECHNICAL ILLUSTRATION



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R) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
03/09/2021	H	9101900 qty 36 was 48	J.Anderson	K.Plunkett
03/25/2020	G	Revised Item # 25 was 30, P/N 52470711 was 52470710, P/N SCS031C062 qty was 2; Removed P/N KS025X025X075	J.Anderson	Z.Speer
04/24/2018	F	Added P/N 9090900 with note	J.Anderson	D.Hushbeck
03/28/2018	E	Revised P/N SCS025C025 qty was 2; Added General Screw Torque Recommendations	J.Anderson	C.Colvin
03/30/2016	D	Revised P/N 52470 weight range was 17.0-35.0#, qty. of drag block springs (P/N 9101900) for P/N 52470 was 30	J.Anderson	K.Riggs
02/18/2016	C	Revised P/N CP-BAC-C was CP2875E2875E, tool thread connection	J.Anderson	J.McArthur
08/13/14	B	Revised entire manual	J.Anderson	K.Riggs