



MECHANICAL SETTING TOOL

4-1/2" & 5-1/2" CEMENT RETAINER

Manual No:
DL-524-4500-308

Revision: **E**

Revision Date:
03/25/2020

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) 4-1/2" and 5-1/2" 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)				
4-1/2	9.5 - 15.1#	3.826 - 4.090	3.750	0.75	2-3/8 EUE	52445
5-1/2	14.0 - 23.0#	4.670 - 5.012	4.500	0.75	2-3/8 EUE	52455

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.dloilttools.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 OPERATION

CAUTION₂: 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 CR 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 CR 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 CR 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 (2) inches at the tool or opened by slacking off two (2) inches 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 CR 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 CR 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 CR BRIDGE PLUG ONTO A MST

F-1) Place changeover coupling (13) of MST in vise.

F-1.1) Rotate drag block assembly to right until control nut (5) engages control nut clutch (12) and stops.

NOTE₁: 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.

NOTE₂: Be sure Snap Ring is properly installed before proceeding.

F-2) Screw setting sleeve (6) up toward drag block assembly until control latch (3) is accessible.

F-3) Install upper slips (non-wickered end first) of Cement Retainer (or CR Bridge Plug) over stinger sub body (2). Loosen clamp on upper slips only enough to slide upper slip segments over shoulder (or slip adapter) on control latch (3). Then re-tighten clamp.

F-4) Lubricate non-wickered portion of slips with grease. Rotate setting sleeve (6) down over upper slips until about 3/4 of non-wickered portion is covered. Loosen and move clamp up over setting sleeve (6). Let clamp hang there temporarily, it will be needed again later.

F-5) Check to ensure that control nut (5) is still engaged with control nut clutch (12) by rotating drag block assembly right.



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

F-6) Lubricate stinger bonded seal (23) and control latch (3) threads with grease. Place a liberal amount of grease in bore of Cement Retainer (or CR Bridge Plug) bore.

F-7) FOR CEMENT RETAINERS ONLY:

F-7.1) Install Cement Retainer over stinger (21).

F-7.2) Use a wood block to protect lower end of Cement Retainer while driving it over stinger bonded seal (23) with a heavy hammer until it bottoms out on control latch (3).

F-7.3) Rotate Cement Retainer to LEFT until it shoulders out on control latch (3). Make up hand tight.

NOTE₃: It may be necessary to drive Cement Retainer, rotate, drive, rotate and repeat until Cement Retainer shoulders out.

F-8) FOR CR BRIDGE PLUGS ONLY:

F-8.1) Install CR Bridge Plug onto stinger sub body (2) until it bottoms out on control latch (3).

F-8.2) Rotate CR Bridge Plug LEFT until it shoulders out on control latch (3). Make up hand tight.

F-9) Back off Cement Retainer or CR Bridge Plug slightly to align holes. Locate and install shear screw(s) in hole(s) in control latch (3).

F-10) Rotate setting sleeve (6) down until it bottoms out on wickered portion of slip. Loosen setting sleeve (6) 1/4 turn and secure with two (2ea) set screws (22 or 28).

F-11) Move clamp down over wickers on upper slips and tighten securely for transport.

F-12) BEFORE RUNNING - Remove clamp from upper slips.

G) CONVERTING MST TO RUN A CR BRIDGE PLUG:

When a CR Bridge Plug is to be run on MST, setting tool must be modified in following manner:

G-1) Remove stinger (21) and bonded seal (23). Replace with spacer and thread protector.

G-2) Replace changeover coupling (13) with ported coupling to allow tubing to fill while running in hole.

G-3) Follow instructions for loading a Cement Retainer or CR 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 setting tool. As a precaution, one left-hand turn should be placed in work string every 10 to 15 stands.

H-2) When desired setting depth has been reached, tools should be picked up two (2) feet above desired setting point. This movement is necessary to provide required tool stroke to release upper slips and allow control nut (5) to move freely.

H-3) Rotate work string RIGHT sufficiently to transmit ten (10) turns to tool. This right-hand rotation will thread control nut (5) off of its matching thread on MST mandrel and release control sleeve (7) from running-in position.

H-4) Lower tools back down to desired setting depth. Drag blocks (14) will support control sleeve (7) and setting sleeve (6). Downward motion will push upper slips from under setting sleeve (6). Upper slip segments are then forced out against casing by leaf springs attached to inside of each slip segment. When upper slips are released, retaining sleeve (4) is pulled from over dog (11) allowing it to move out and release control latch (3) from stinger sub body (2).



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H) RUNNING AND SETTING INSTRUCTIONS (cont'd)

TOOL SIZE (INCHES)	TENSION	
	MIN	MAX
4-1/2 - 5-1/2	25,000 LBS	30,000 LBS

H-5) Refer to chart above and pull tension over pipe weight at tool to set slips and affect packoff. It is recommended that maximum tension shown above be pulled when possible. However, to assure sufficient packoff and slip breakage, minimum tension shown must be pulled. Set down weight equal to calculated weight required to prevent 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 work string to insure that slide valve is closed.

NOTE4: In wells where paraffin or suspended solids in well fluids are present, dog on control latch (3) may not fully release from stinger sub body (2). This is indicated when Cement Retainer sets properly (as in steps F-1 through F-5), but slide valve will not close so that work string can be pressure tested. In this event, work string should be alternately picked up and slacked off. This movement will assist dog to move outward on inclined edges of locking groove in stinger sub body (2), thus freeing stinger sub body (2) for required two (2) inches of vertical movement.

H-6) MST is released from Cement Retainer or CR Bridge Plug by pulling 500 to 1,000 lbs tension at tool and then rotating work string 10 turns RIGHT at tool. This will shear rotational lock screw and unscrew control latch (3) from Cement Retainer or CR Bridge Plug.

H-7) After releasing from a Cement Retainer:

H-7.1) MST can be reattached to 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 Cement Retainer.

H-7.2) Bonded seal (23) will remain in Cement Retainer until snap-out retaining force is exceeded. Each time MST is snapped in and snapped out, 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 Cement Retainer will close slide valve; two (2) inches of downward movement at Cement Retainer will open slide valve.



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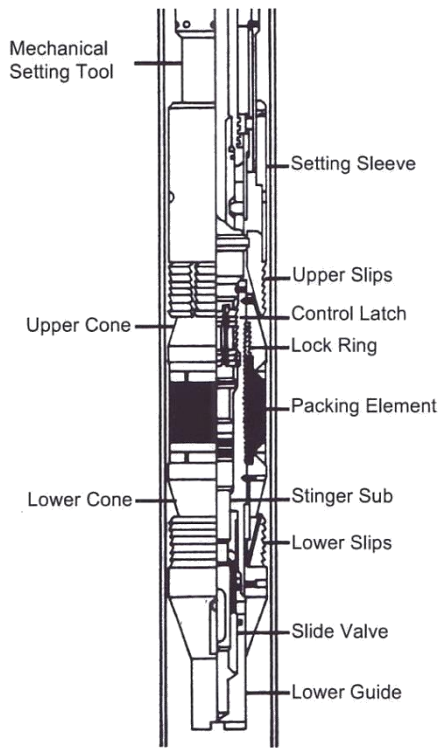
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I) SEQUENCE ILLUSTRATIONS

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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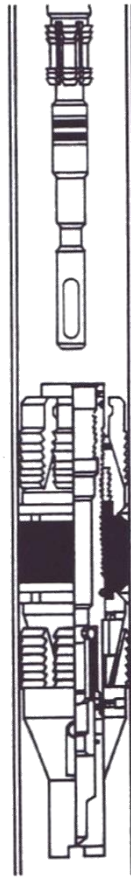
I) SEQUENCE ILLUSTRATIONS (cont'd)

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.

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.



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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
T-1	1	DRAG BLOCK ASSEMBLY TOOL	4-1/2" - AT045110 5-1/2" - AT055110

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

If MST is to be used to manipulate a wireline set Cement Retainer, it must be reconfigured per following instructions:

- L-1) Clamp mandrel (1) in vise and remove stinger sub body (2), bonded seal (23) and stinger (21). Loosen set screws (22 or 28) and remove setting sleeve (6) from control sleeve (7). Lay setting sleeve (6) aside.
- L-2) Rotate drag block assembly LEFT until control nut (5) will slide up and down mandrel (1).
- L-3) Make up stinger sub body (2) with mandrel (1). DO NOT re-thread control nut (5) with threads on mandrel (1).
- L-4) Run MST as if it were a stinger seal assembly.

M) DISASSEMBLY

- M-1) Clamp top sub (13) in vise.
 - M-1.1) Unscrew and remove stinger (21) from stinger sub body (2).
 - M-1.2) Remove bonded seal (23) from stinger sub body (2).
 - M-1.2.1) Remove o-ring (24) from bonded seal (23).
 - M-1.3) Unscrew and remove set screws (22) 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 (1) and disassemble:
 - M-1.5.1) Remove o-ring (19) from stinger sub body (2).
 - M-1.5.2) Unscrew and remove socket cap screws (27) from control latch (3).
 - M-1.5.3) Remove dowel pins (16) from control latch (3). Depress dog (11) as necessary to free up dowel pins (16).
 - M-1.5.4) Remove dog (11) and dog springs (26) from control latch (3).
 - M-1.5.5) Remove control latch (3) from stinger sub body (2).
 - M-1.5.6) Remove key (18) from stinger sub body (2).
- M-2) Unclamp top sub (13) from vise. Clamp control sleeve (7) in vise.
 - M-2.1) Unscrew and remove top sub (13) from mandrel (1).
 - M-2.2) Compress drag blocks (14) using drag block assembly tool (T1).
 - M-2.3) Unscrew and remove socket cap screws (15) from drag block housing (8).



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M) DISASSEMBLY (cont'd)

- M-2.4) Unscrew and remove drag block retainer (9) from drag block body (8).
- M-2.5) Unscrew and remove cap screws (25) from drag block body (8).
- M-2.6) Unscrew and remove drag block body assembly from control sleeve (7) and disassemble:
 - M-2.6.1) Remove DB guide (10) from drag block body (8).
 - M-2.6.2) Release drag blocks (14). Remove drag blocks (14) and drag block springs (20) from drag block body (8).
- M-2.7) Remove mandrel assembly from control sleeve (7) and disassemble:
 - M-2.7.1) Unscrew and remove control nut (5) from mandrel (1).
 - M-2.7.2) Unscrew and remove control nut clutch (12) from mandrel (1).
- M-2.8) Remove retaining sleeve (4) 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).

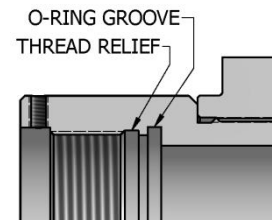


Fig. 2

- N-1) Clamp control sleeve (7) in vise.
 - N-1.1) Install retaining sleeve (4) into control sleeve (7).
 - N-1.2) Assemble mandrel assembly and install:
 - N-1.2.1) Screw control nut clutch (12) onto mandrel (1).
 - N-1.2.2) Screw control nut (5) onto mandrel (1).
 - N-1.2.3) Install mandrel (1) 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 (14) and drag block springs (20) on drag block body (8). Compress drag blocks (14) with drag block assembly tool (T1).
 - N-1.3.2) Install DB guide (10) onto lower end of drag block body and blocks (8, 14).
 - N-1.3.3) Install drag block body (8) onto mandrel (1) and screw into control sleeve (7).
 - N-1.4) Screw set screws (25) into drag block body (8).
 - N-1.5) Install drag block retainer (9) onto mandrel (1) and screw onto drag block body (8).
 - N-1.6) Screw top sub (13) onto mandrel (1).
- N-2) Unclamp and remove control sleeve (7) from vise. Clamp top sub (13) in vise.
 - N-2.1) Assemble stinger sub body assembly and install:
 - N-2.1.1) Install key (18) in key groove in control latch (3).
 - N-2.1.2) Align cut out in control latch (3) with groove in stinger sub body (2) and install dog (11) and dog springs (26) into control latch (3).
 - N-2.1.3) Press down dog (11) and install dowel pins (16) into control latch (3).
 - N-2.1.4) Screw cap screws (27) into control latch (3).
 - N-2.1.5) Install o-ring (19) from stinger sub body (2).



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N) ASSEMBLY (cont'd)

N-2.1.6) Screw stinger sub body (2) into mandrel (1). Press down dog (11) as necessary to clear retaining sleeve (4).

CAUTION: 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 (22) into setting sleeve (6).

N-2.4) Install o-ring (24) into bonded seal (23).

N-2.5) Install bonded seal (23) onto stinger sub body (2).

CAUTION: Do NOT rip or tear o-ring during installation.

N-2.6) Screw stinger (21) onto stinger sub body (2).

N-3) Unclamp top sub (13) from vise and removed assembled tool.



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O) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 52445 (9.5 – 15.1#)	P/N 52455 (14.0 – 23.0#)
1	1	MANDREL	DLMS110	52455210	
2	1	STINGER SUB BODY	DLMS110	52455215	
3	1	CONTROL LATCH	DLMS110	52455720	
4	1	RETAINING SLEEVE	DLMS80	52455450	
5	1	CONTROL NUT ASSY.	DLMS110/DLMSKS	52455711	
6	1	SETTING SLEEVE	P-110	52445470	52455470
7	1	CONTROL SLEEVE	DLMS110	52455350	
8	1	DRAG BLOCK HOUSING	P-110	52445330	52455330
9	1	DRAG BLOCK RETAINER	P-110	52445910	52455910
10	1	DB GUIDE	L-80	52445915	52455915
11	1	DOG	DLMS80	52455500	
12	1	CONTROL NUT CLUTCH	DLMS110	52455715	
13	1	CHANGEOVER COUPLING	DLMS80	CP2375E1900N	
14	4	550 DRAG BLOCK	DLMSDB8	9055900	
15	4	1/4-20 UNC X 1/4 SOCKET CAP SCREW	STEEL	SCS025C025	
16	2	3/16 X 1-1/4 DOWEL PIN	STEEL	DP018125	
19	1	219-90 O-RING	NITRILE	90219	
18	1	KEY	DLMSKS	KS025X025X250	
20	20	DRAG BLOCK SPRING		9100900	
21	1	STINGER	DLMS110	52445510	
22	2	3/8-16 UNC X 1/4 SOCKET SET SCREW	STEEL	SSS037C025	SSS037C037
23	1	BONDED SEAL	DLMS60 / 90 DURO NITRILE	52445520	
24	1	024-90 O-RING	NITRILE	90024	
26	2	COMPRESSION SPRING	DLMSSP302	52455920	
25	4	1/4-20 UNC X 3/8 SOCKET CAP SCREW	STEEL	SCS025C037	
27	2	1/4-20 UNC X 1/4 SOCKET SET SCREW	STEEL	SSS025C025	

ASSEMBLED WEIGHT	53 LBS	65 LBS
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MECHANICAL SETTING TOOL

4-1/2" & 5-1/2" CEMENT RETAINER

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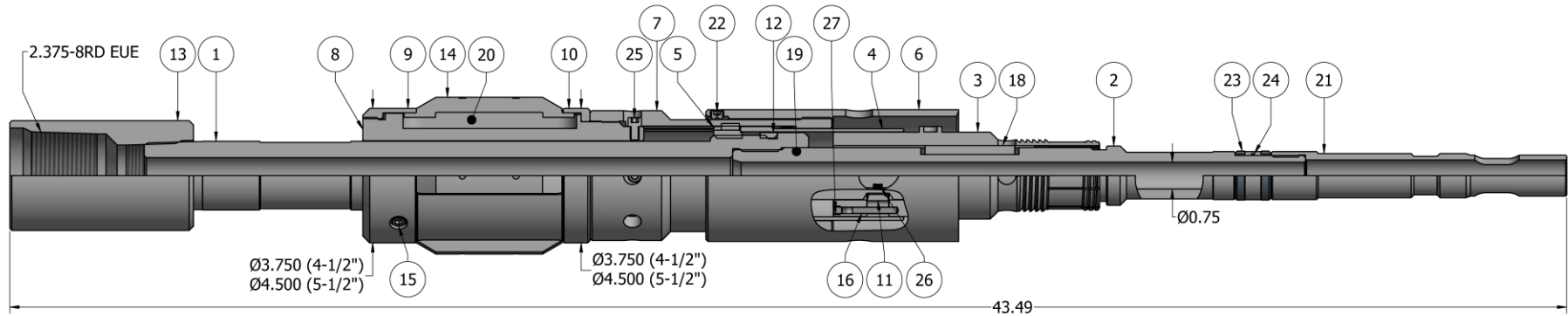
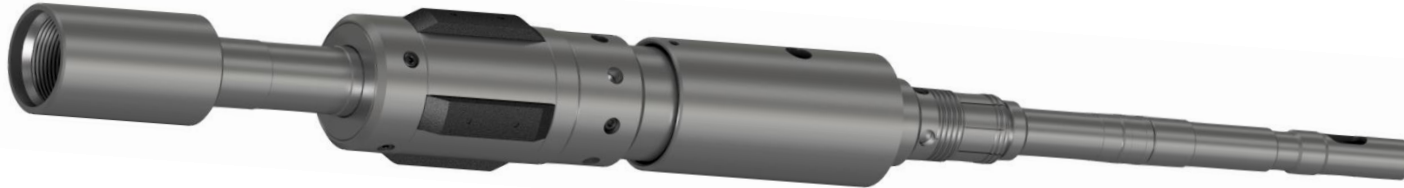
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P) TECHNICAL ILLUSTRATION



- OPTIONAL:
- PORTED TOP SUB FOR RUNNING BRIDGE PLUG (P/N 52445615)
 - THREAD PROTECTOR (P/N 52445515)



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Q) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
03/25/2018	E	Revised entire manual	J.Anderson	Z.Speer
07/15/13	D	Revised / Updated: Re-assigned Item Numbers; Technical Illustration; Removed: T2 in Tools List; Added: Table in Specification Guide for Differential Pressure, Max Torque, and Tensile Load, Recommended Hand Tools, Revision History	B.Mathis	K.Plunkett