A) DESCRIPTION

The HD Retrievable Packer is a heavy duty service packer ideally suited for all types of squeeze cementing, formation fracturing, high pressure acidizing, etc. It is a large opening compression set packer with hydraulic button-type hold down. This packer withstands high pressure from above or below and uses a 3-element packing system, J-slot, and a drag block mechanism for easy setting. This packer has a built-in unloader which circulates across the hold down buttons to improve retrievability and run in performance.

B) SPECIFICATION GUIDE

CASING			TOOL		THREAD CONNECTIONS BOX UP / PIN DOWN	PART NUMBER
SIZE (INCHES)	WEIGHT (LBS/FT)	RECOMMENDED HOLE SIZE (INCHES)	GAGE OD (INCHES)	NOMINAL ID (INCHES)		
5-1/2	14.0 – 20.0	4.778 – 5.012	4.625	2.38	2-7/8 EUE	61358RS 61358RSH[1] 61358RSV[2]
	20.0 – 23.0	4.670 – 4.778	4.500	2.38	2-7/8 EUE	61359RS 61359RSH[1] 61359RSV[2]

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

NOTE$_1$: Tools listed are right-hand set/ straight pick-up release. Additional configurations are available. Contact D&L Sales for more information.

DIFFERENTIAL PRESSURE (MAX)	TENSILE LOAD THRU UNSET TOOL (MAX)	HANGING WEIGHT ON SET TOOL (MAX)*	TORQUE (MAX)
10,000 PSI	100,000 LBS	100,000 LBS*	2,000 FT-LBS

*Casing must be cemented for this load rating.

CAUTION$_1$: Before running the tool, check the pressure affected areas chart, and consider other effects to be certain that the unloader will remain closed during operation.

CAUTION$_2$: If the HD Packer is run with a retrievable bridge plug, make sure the bridge plug J-slot is compatible with the J-slot on the packer. Whichever direction you set the plug, the packer should set in the opposite direction.

C) PRE-INSTALLATION INSPECTION PROCEDURES

CAUTION$_3$: D&L ships tool connections made-up hand-tight—labeled with hand-tight tape on the tool—unless stated otherwise. Properly tighten connections before operating tool (Fig. 1).

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.

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

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, elements, o-rings, shear screws, etc. Contact D&L sales for redress kit and/or other replacement part information.

D) SETTING PROCEDURES

CAUTION4: Do not run the tool without properly tightening connections. Running the tool with loose connections may damage the tool and cause malfunction.

Run to setting depth. The unloader remains open while running in. Pick up the work string and rotate right-hand 1/4 turn at the packer. Slack off weight and set down on the packer to set the slips, close the unloader and compress the packing elements. A minimum weight of 14,000 lbs. at the packer is required to pack off the elements.

CAUTION5: Run the tool slowly, as with any hold down type packer, to help prevent dulling of the hydraulic buttons.

E) RELEASING PROCEDURES

Pick up on the tubing to open the unloader, allowing time for the tubing and casing pressure to equalize. Continued upward movement of the work string unsets the slips, relaxes the packing elements and re-jays the packer. The tool may now be moved and reset, or pulled from the well.

F) 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. Elastomers should be in a relaxed state—free from tension, compression or other 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) PRESSURE AFFECTED AREA GUIDE

When set downhole, the packer mandrel is subjected to a force created by differential pressure above or below the packer that acts on the pressure affected area (i.e., the piston effect). Depending on the tubing size and weight and the seal area of the packer the force created by differential pressure acts upwards or downwards on the packer mandrel. An upward force, designated as a negative (-) value, acts to push the packer mandrel up hole and must be accounted for to ensure that the packer remains set. A downward force, designated as a positive value, acts to push the packer mandrel down hole and must be accounted for when releasing the packer. Other factors (e.g., tubing movement due to temperature change) must be considered separately to determine all the forces acting on the packer.

PACKER SIZE (IN)	TUBING TO PACKER			PRESSURE AFFECTED AREA (IN^2)			
	SIZE (IN)	WEIGHT (LB/FT)	ID (IN)	ABOVE		BELOW	
5-1/2	2.375	4.00	2.041	-0.445	(UP)	3.557	(DOWN)
		4.70	1.995	-0.445	(UP)	3.412	(DOWN)
		5.95	1.867	-0.445	(UP)	3.023	(DOWN)
	2.875	6.50	2.441	-2.507	(UP)	4.965	(DOWN)
		7.90	2.323	-2.507	(UP)	4.524	(DOWN)
		8.70	2.259	-2.507	(UP)	4.294	(DOWN)
	3.500	7.70	3.068	-5.636	(UP)	7.678	(DOWN)
		9.30	2.992	-5.636	(UP)	7.317	(DOWN)
		10.20	2.922	-5.636	(UP)	6.991	(DOWN)
		12.95	2.750	-5.636	(UP)	6.225	(DOWN)

Example: Consider a 5-1/2" X 2-7/8" HD Packer set on 2.375", 4.70 lbs/ft tubing with a differential pressure of 3,000 PSI in the annulus around the tubing above the packer. What is the force acting on the seal area of the mandrel?

To calculate the force (lbs) acting on the seal area of the mandrel, refer to the Pressure Affected Area Guide for a 5-1/2" X 2-7/8" HD Packer run on 2.375", 4.70 lbs/ft tubing. In this example, the differential pressure from above the packer acts on the seal area of the packer mandrel across a pressure affected area of -0.445 in^2. Multiplying the differential pressure (3,000 PSI) by the pressure affected area (-0.445 in^2) results in a force of -1,335 lbs. The piston effect on the packer mandrel is an upward force of 1,335 lbs.

H) ELASTOMER TRIM TEMPERATURE GUIDE

NITRILE (STD)			
TEMPERATURE RANGE (F°)	DUROMETER		
	END	MIDDLE	END
40° - 125°	80	70	80
125° - 250°	90	70	90
150° - 250°	90	80	90
250° +	Contact D&L Sales		

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

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	DRAG BLOCK ASSEMBLY TOOL	AT055110
T2	1	BUTTON REMOVAL TOOL	AT-BRT000
T3	1 GAL	KOPR-KOTE® ANTI-SEIZE LUBRICANT	DL-KOPR-KOTE-1G

J) DISASSEMBLY

J-1) Clamp coupling (1) in vise.

J-1.1) Unscrew and remove J-pin bottom sub (23) from inner mandrel (2).

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

J-1.2) Unscrew and remove set screws (7) from J-body (20).

J-1.3) Compress drag blocks (22) with drag block assembly tool (T1).

J-1.4) Unscrew and remove J-body (20) from drag block body (18) (**NOTE$_3$**: Left-hand threads).

J-1.5) Remove drag block retainer (21) from drag block body (18).

J-1.6) Release drag blocks (22). Remove drag blocks (22) and drag block springs (3) from drag block body (18).

J-1.7) Unscrew and remove rubber mandrel cap (19) from rubber mandrel (11).

NOTE$_4$: For added leverage, insert a rod through rubber retainer (15) and rubber mandrel (11) as needed.

J-1.8) Wedge lower slips (17) outwards (if needed). Remove drag block body assembly and disassemble:

J-1.8.1) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

J-1.9) Unscrew and remove lower cone (16) from rubber retainer (11).

J-1.10) Unscrew rubber mandrel (11) from valve body (28).

J-1.11) Remove rubber mandrel assembly and disassemble:

J-1.11.1) Remove elements (13, 14), rubber spacers (12) and rubber retainer (15) from rubber mandrel (11).

J-1.12) Unscrew and remove valve body (28) from central body (10).

J-1.12.1) Remove o-ring (35) from valve body (28).

J-1.13) Unscrew and remove central body (10) from hold down body (6).

J) DISASSEMBLY (cont'd)

J-2) Unclamp and remove coupling (1) from vise. Clamp inner mandrel (2) in vise.

CAUTION$_6$: Do NOT wrench or clamp on seal surface.

J-2.1) Unscrew and remove coupling (1) from inner mandrel (2).

J-2.2) Unscrew and remove hold down cap (4) from hold down body (6).

J-2.3) Remove strap retainer (32) from hold down body (6) and move downwards out of way to be removed from inner mandrel (2) in later step.

J-2.4) Unscrew and remove flat head cap screws (29) from hold down body (6).

J-2.5) Remove hold down straps (31) from hold down body (6).

J-2.6) Remove hold down button springs (26) from hold down buttons (30).

J-2.7) Remove hold down buttons (30) from hold down body (6) with button removal tool (T2).

J-2.7.1) Remove o-rings (34) from hold down buttons (30).

J-2.8) Remove hold down body (6) from inner mandrel (2).

J-2.8.1) Remove o-rings (37, 38) from hold down body (6).

J-2.9) Remove strap retainer (32) from inner mandrel (2).

J-2.10) Unscrew and remove compensating mandrel (8) from seal receptacle (5).

J-2.10.1) Remove compensating piston (9) from compensating mandrel (8).

J-2.10.2) Remove o-rings (39, 40) from compensating piston (9).

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

J-3.1) Remove seal receptacle (5) from inner mandrel (2).

J-3.1.1) Unscrew and remove seal retainer (27) from seal receptacle (5).

J-3.1.1.1) Remove quad seal (24) from seal retainer (27).

J-3.1.2) Remove o-rings (33, 36) from seal receptacle (5).

K) ASSEMBLY

NOTE$_5$: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, and orientation and tighten/torque all connections properly.

NOTE$_6$: Apply KOPR-KOTE anti-seize lubricant (T1) on STUB ACME and drill pipe connections when making up connections.

CAUTION$_6$: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs unless stated otherwise (Fig. 2).

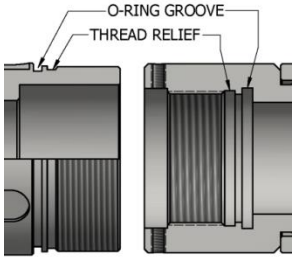


Fig. 2

K-1) Assemble seal receptacle assembly and install:

K-1.1) Install o-rings (33, 36) in o-ring grooves in seal receptacle (5).

K-1.2) Set quad seal (24) in place on seal retainer (27).

K-1.3) Screw seal retainer (27) onto seal receptacle (5).

CAUTION$_7$: Do not rip or tear o-ring or seal during installation.

K-1.4) Install seal receptacle assembly onto inner mandrel (2).

K-2) Clamp lower end of inner mandrel (2) in vise.

CAUTION$_6$: Do NOT wrench or clamp on seal surface.

K) ASSEMBLY (cont'd)

K-2.1) Assemble compensating mandrel assembly and install:

K-2.1.1) Install o-rings (39, 40) into o-ring grooves in compensating piston (9).

K-2.1.2) Install compensating piston (9) onto compensating mandrel (8).

NOTE7: Compensating piston (9) MUST be installed in correct direction (refer to Technical Illustration, Det. A).

CAUTION7: Do not rip or tear o-ring during installation.

K-2.2) Screw compensating mandrel (8) into seal receptacle (5).

K-2.3) Install strap retainer (32) onto inner mandrel (2).

K-2.4) Install o-rings (37, 38) in o-ring grooves in hold down body (6).

K-2.5) Install hold down body (6) onto inner mandrel (2).

K-2.6) Assemble hold down buttons (30) and install:

K-2.6.1) Install o-rings (34) in o-ring grooves in hold down buttons (30).

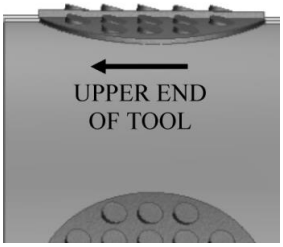


Fig. 3

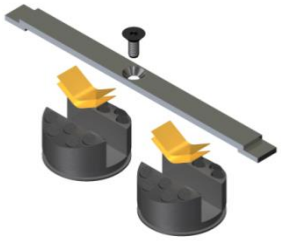


Fig. 4

K-2.6.2) Install hold down buttons (30) into hold down body (6) (Fig. 3). Align slot in hold down buttons (30) with slot in hold down body (6).

CAUTION7: Do not rip or tear o-rings during installation.

K-2.6.3) Install hold down button springs (26) into hold down buttons (30).

NOTE8: Install two (2ea) springs per button (Fig. 4).

K-2.6.4) Set hold down straps (31) in slots in hold down buttons (30) and hold down body (6).

K-2.6.5) Screw flat head cap screws (29) into hold down body (6).

K-2.7) Screw hold down cap (4) onto hold down body (6).

CAUTION7: Do not rip or tear o-ring during installation.

K-2.8) Install strap retainer (32) onto hold down body (6) to capture lower ends of hold down straps (31).

K-2.9) Screw coupling (1) onto inner mandrel (2).

K-3) Unclamp and remove inner mandrel (2) from vise. Clamp coupling (1) in vise.

K-3.1) Screw central body (10) onto hold down body (6).

CAUTION7: Do not rip or tear o-rings during installation.

K-3.2) Install o-ring (35) into o-ring groove in valve body (28).

K-3.3) Screw valve body (28) into central body (10).

K-3.4) Assemble rubber mandrel assembly and install:

K-3.4.1) Install rubber retainer (15), rubber spacers (12), and elements (13, 14) onto rubber mandrel (11).

K-3.4.2) Install rubber mandrel assembly onto inner mandrel (2) and screw rubber mandrel (11) into valve body (28).

CAUTION7: Do not rip or tear o-ring during installation.

K) ASSEMBLY (cont’d)

K-3.5) Screw lower cone (16) into rubber retainer (11).

K-3.6) Assemble drag block body assembly and install:

K-3.6.1) Install lower slips (17) and lower slip springs (25). Wedge slips outward.

NOTE$_9$: Install two (2ea) springs per slip (Fig. 5).

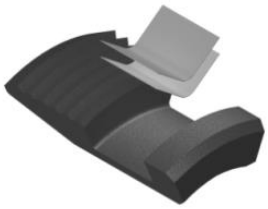


Fig. 5

K-3.6.2) Install drag block body assembly onto rubber mandrel (11). Remove wedges.

K-3.7) Screw rubber mandrel cap (19) onto rubber mandrel (11).

NOTE$_4$: For added leverage, insert a rod through rubber retainer (15) and rubber mandrel (11) as needed.

K-3.8) Install drag blocks (22) and drag block springs (3) into drag block body (18). Compress drag blocks (22) with drag block assembly tool (T1).

NOTE$_{10}$: Install five (5 ea) drag block springs per drag block (Fig. 6).

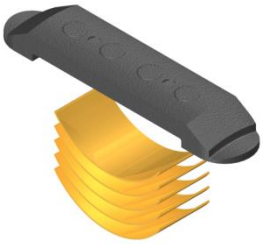


Fig. 6

K-3.9) Install drag block retainer (21) onto drag block body (18) to capture ends of drag blocks (22).

K-3.10) Screw J-body (20) onto drag block body (18) (**NOTE$_3$**: Left-hand threads).

K-3.11) Screw set screws (7) into J-body (20). Release drag blocks (22).

K-3.12) Screw J-pin bottom sub (23) onto inner mandrel (2).

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

K-4) Remove coupling (1) from vise and remove assembled tool.

L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 61358RS	P/N 61359RS
1	1	COUPLING	DLMS110	CP-BAC-BBC-C	
2	1	MANDREL	DLMS110	61358210	
3	30	DRAG BLOCK SPRINGS	-	9101900	9100900
4	1	HOLD DOWN BODY CAP	DLMS35	61358370	61359370
5	1	SEAL RECEPTACLE	DLMS110	61358730	
6	1	HYDRAULIC HOLD DOWN BODY	DLMS110	61358322	
7	3	SOCKET SET SCREW 5/16-18 UNC X 3/8	STEEL	SSS031C037	
8	1	COMPENSATING MANDREL	DLMS110	61358240	
9	1	COMPENSATING PISTON	DLMS110	61358710	
10	1	CENTRAL BODY	DLMS110	61358381	
11	1	RUBBER MANDREL	DLMS110	61358220	61359220
12	2	RUBBER SPACER	DLMS60	60256840	60259840
13	1	ELEMENT	80 DURO NITRILE	60256512	60259512
14	2	ELEMENT	90 DURO NITRILE	60256513	60259513
15	1	RUBBER RETAINER	DLMS110	61056850	61059850
16	1	LOWER CONE	DLMS110	61358420	61359420
17	4	LOWER SLIP	-	60056135	60056135C
18	1	DRAG BLOCK BODY	DLMS110	61358335	61359335
19	1	RUBBER MANDREL CAP	DLMS60	60056230	
20	1	J-BODY	DLMS110	61358340	
21	1	DRAG BLOCK RETAINER	DLMS60	61359910	
22	6	DRAG BLOCK	DLMSDB4	9055900C	9045900C
23	1	J-PIN BOTTOM SUB	DLMS110	61358630	
24	1	QUAD SEAL	90 DURO NITRILE	61358520	
25	8	LOWER SLIP SPRING	-	7155901	
26	12	HOLD DOWN BUTTON SPRING	-	61355975	
27	1	SEAL RETAINER	DLMS110	61358530	
28	1	VALVE BODY	DLMS110	61358350	61359350
29	3	FLAT HEAD SOCKET CAP SCREW 5/16-18 UNC X 1/2	STEEL	FHSC031C050	
30	6	HOLD DOWN BUTTON	DLMSSP	61358937C	
31	3	HOLD DOWN STRAP	DLMSFB4	61358360	
32	1	STRAP RETAINER	-	61355650	61357650

L) PARTS LIST (cont'd)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 61358RS	P/N 61359RS
33	1	153 O-RING	90 DURO NITRILE	90153	
34	6	224 O-RING	90 DURO NITRILE	90224	
35	1	235 O-RING	90 DURO NITRILE	90235	
36	1	238 O-RING	90 DURO NITRILE	90238	
37	1	240 O-RING	90 DURO NITRILE	90240	
38	1	336 O-RING	90 DURO NITRILE	90336	
39	1	340 O-RING	90 DURO NITRILE	90340	
40	1	342 O-RING	90 DURO NITRILE	90342	

REDRESS KIT (RDK)		61358050	61359050
ASSEMBLED WEIGHT		155 LBS	152 LBS

L-1) ELASTOMER TRIM OPTIONS

NOTE11: For temperature range, refer to Elastomer Trim Temperature Guide.

L-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 61358RSH	P/N 61359RSH
13	1	ELEMENT	80 DURO HSN	60256512H	60259512H
14	2	ELEMENT	90 DURO HSN	60256513H	60259513H
24	1	QUAD SEAL	90 DURO HSN	61358520H	
33	1	153 O-RING	90 DURO HSN	90153H	
34	6	224 O-RING	90 DURO HSN	90224H	
35	1	235 O-RING	90 DURO HSN	90235H	
36	1	238 O-RING	90 DURO HSN	90238H	
37	1	240 O-RING	90 DURO HSN	90240H	
38	1	336 O-RING	90 DURO HSN	90336H	
39	1	340 O-RING	90 DURO HSN	90340H	
40	1	342 O-RING	90 DURO HSN	90342H	

REDRESS KIT (RDK)		61358050H	61359050H

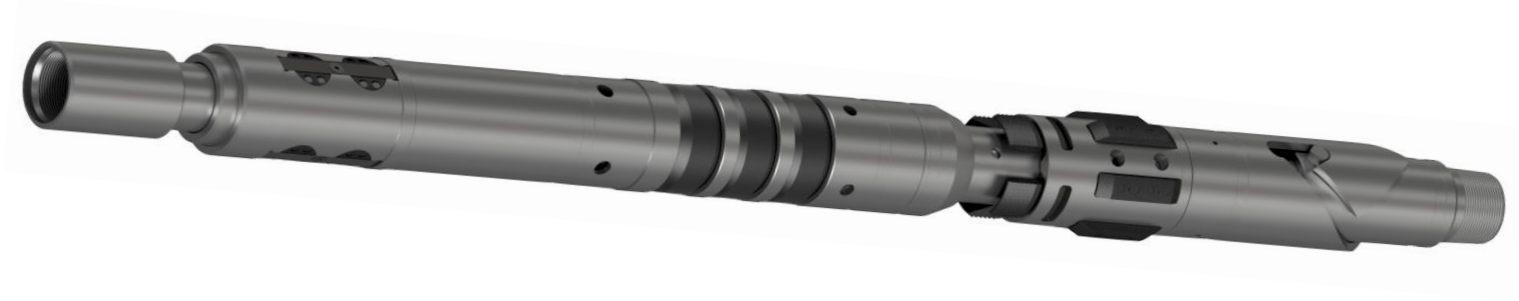
L) PARTS LIST (cont’d)

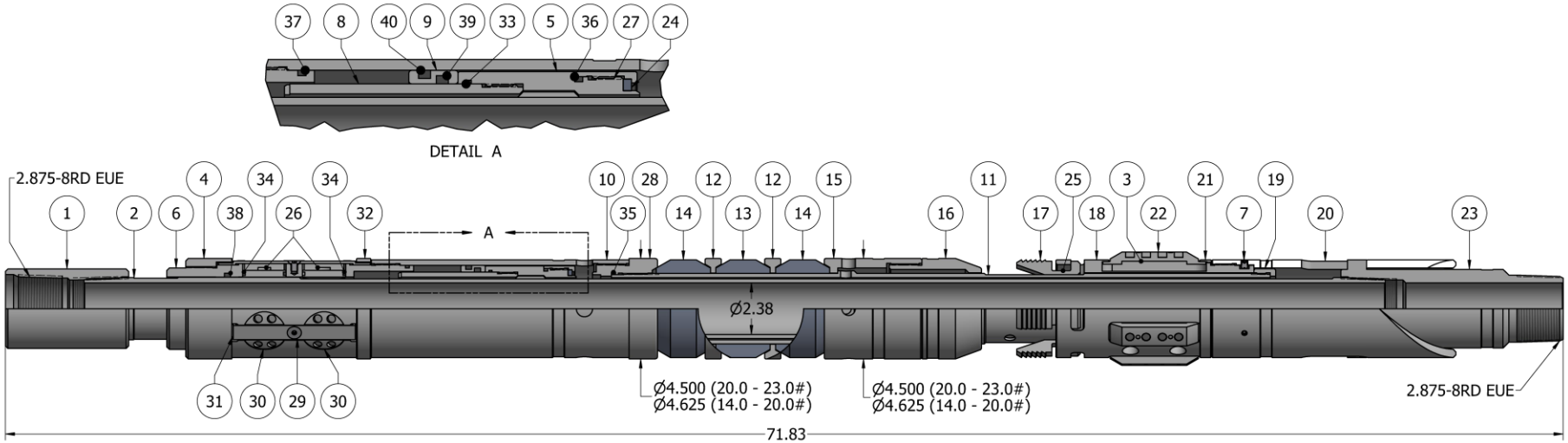
L-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 61358RSV	P/N 61359RSV
13	1	ELEMENT	80 DURO VITON	60256512V	60259512V
14	2	ELEMENT	90 DURO VITON	60256513V	60259513V
24	1	QUAD SEAL	90 DURO VITON	61358520V	
33	1	153 O-RING	90 DURO VITON	90153V	
34	6	224 O-RING	90 DURO VITON	90224V	
35	1	235 O-RING	90 DURO VITON	90235V	
36	1	238 O-RING	90 DURO VITON	90238V	
37	1	240 O-RING	90 DURO VITON	90240V	
38	1	336 O-RING	90 DURO VITON	90336V	
39	1	340 O-RING	90 DURO VITON	90340V	
40	1	342 O-RING	90 DURO VITON	90342V	

REDRESS KIT (RDK)		61358050V	61359050V

M) TECHNICAL ILLUSTRATION





N) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
03/12/2020	A	Created new manual	-	-