A) DESCRIPTION

The AS Retrievable Bridge Plug is a high pressure plug for multiple zone and selective single zone operations such as acidizing, fracturing, cementing and testing. It features a large internal by-pass to reduce swabbing when running and retrieving. The by-pass closes during the setting of the plug and opens prior to releasing the upper slips to equalize pressure when unsetting. The by-pass is located directly below the upper slips to help wash debris when the by-pass is open.

This tool can be set in tension or compression. It can be set shallow in unsupported casing to contain pressure while working on wellhead equipment. It can be set in tension making it ideal for setting shallow to test wellhead equipment and also deep, high-pressure wells.

CAUTION$_1$: When running this tool with a packer, make sure the J-slots in the plug, running/ retrieving tool, and packer are all compatible.

B) RELATED TOOLS (sold separately)

B-1) 4" X 1.900" Spring Loaded Retrieving Tool (P/N 57740) – refer to Technical Manual *DL-577-4000-350*.

C) SPECIFICATION GUIDE

CASING		RECOMMENDED HOLE SIZE (INCHES)	TOOL OD (INCHES)	THREAD CONNECTION PIN DOWN	PART NUMBER
SIZE (INCHES)	WEIGHT (LBS/FT)				
4	9.5 – 11.0	3.476 – 3.548	3.250	1.900 EUE	72540RR 72540RRH[1] 72540RRV[2]

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

NOTE$_1$: Tool listed is right-hand set / right-hand release. Additional J-slot designs are available.

NOTE$_2$: Tool is also available with a ball catcher.

DIFFERENTIAL PRESSURE (MAX)	HANGING WEIGHT ON SET TOOL (MAX)	TENSILE LOAD THRU TOOL (MAX)	TORQUE THRU TOOL (MAX)
10,000 PSI	27,500 LBS[†]	27,500 LBS	300 FT-LBS

[†]Casing must be cemented for this load rating.

D) PRE-INSTALLATION INSPECTION PROCEDURES

CAUTION$_2$: 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, elements, o-rings, shear screws, etc. Contact D&L sales for redress kit and/or other replacement part information.

E) SETTING PROCEDURES

CAUTION$_3$: Do not run the tool without properly tightening connections. Running the tool with loose connections may damage the tool and cause malfunction.

CAUTION$_4$: Lift the AS Retrievable Bridge Plug by placing the sling or chain just below the pulling head. **DO NOT** lift the bridge plug by the upper slip body assembly (Fig. 2).

Fig. 2

E-1) TENSION SET

Run to setting depth while latched to its spring loaded retrieving tool. Pick up, rotate 1/4 turn to the right at the plug, and lower tubing to set lower slips. Pull tension to pack-off elements, slack off, and then pick up again to assure plug setting (10,000 lbs minimum). After setting plug, slack off tubing weight, hold left-hand torque and pick up to free tubing from plug.

E-2) COMPRESSION SET

Run to setting depth while latched to its spring loaded retrieving tool. Pick up, rotate 1/4 turn to the right at the plug, and lower tubing to set lower slips. Slack off sufficient weight to pack-off elements, then pick up to firmly set upper slips and slack off again (10,000 lbs minimum). After setting plug, slack off tubing weight, hold left-hand torque and pick up the free tubing from plug.

F) RELEASING PROCEDURES

Lower tubing until the retrieving tool automatically latches to the AS Retrievable Bridge Plug. Sand may be washed from the upper slip by circulating through the upper portion of the plug. Slack off weight, hold right-hand torque pick up to open the by-pass valve, and wait until differential pressure has equalized. Continue upward movement to release upper slips, relax packing elements and re-latch. The plug may now be removed or re-located.

F-1) EMERGENCY RELEASE

If the plug will not release conventionally, slack off re-set, then pick straight up to shear J-pins and release the plug (standard J-pins will shear at 30,000 lbs each – refer to Parts List for J-pins with other shear values) Once the J-pins are sheared, the tool cannot be moved down hole.

NOTE3: Most of the component parts are manufactured from heat treated alloy steel. Therefore, extended exposure to corrosives can be detrimental to the metallurgy. Care in cleaning the tool soon after removal from the well can help extend the life of component parts. Close inspection of the parts is necessary, after removal, to identify any parts which require replacement.

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**
40° - 125°	80	70	80
125° - 250°	90	70	90
150° - 250°	90	80	90
250° +	Contact D&L Sales		

RUBBER TYPE	**TEMPERATURE RANGE** (F°)
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	AT045110

J) DISASSEMBLY

J-1) Clamp center coupling (10) in vise.

J-1.1) Unscrew and remove set screws (35) from lower end of body extension (37).

J-1.2) Unscrew and separate body extension (37) from J-pin body (23).

NOTE$_6$: Drag block body assembly must be free to rotate.

J-1.2.1) Remove J-pins (15) from J-pin body (23).

J-1.2.2) Remove J-pin body (23) from J-slot mandrel (20).

J-1.3) Unscrew and remove set screws (36) from upper end of body extension (37).

J-1.4) Compress drag blocks (22) using drag block body assembly tool (T1). Unscrew and remove body extension (37) from drag block body (18) (**NOTE$_5$**: 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).

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

J-1.8.1) Unscrew and remove socket cap screws (30) from drag block body (18).

J-1.8.2) Remove lower slip support (32) from drag block body (18).

J-1.8.3) Remove wedges (if needed). Remove lower slips (17) and lower slip springs (25) from drag block body (18).

J-1.9) Unscrew and remove set screws (29) from J-slot mandrel (20). Move rubber mandrel assembly as needed to access set screws (29).

J-1.10) Unscrew and remove J-slot mandrel (20) from sealing mandrel (27).

J-1.11) Unscrew rubber mandrel (11) from center coupling (10).

J-1.12) Remove rubber mandrel assembly and disassemble:

J-1.12.1) Remove elements (13, 14), rubber spacers (12), and lower cone (16) from rubber mandrel (11).

J-1.13) Moving to upper end of tool, unscrew and remove set screws (31) from pulling head (1).

J) DISASSEMBLY (cont'd)

J-1.14) Unscrew and remove pulling head (1) from upper mandrel (2).

CAUTION$_5$: Compression spring (4) is compressed with spring tension against pulling head (1).

J-1.15) Remove compression spring (4) from upper mandrel (2).

J-1.16) Wedge releasing slip (7) and upper slips (8) outward (if needed). Remove upper slip body assembly and disassemble:

J-1.16.1) Unscrew and remove upper slip support (33) from upper slip body (6).

J-1.16.2) Remove wedges (if needed). Remove releasing slip (7), upper slips (8) and upper slip springs (26) from upper slip body (6).

J-1.17) Unscrew and remove set screws (34) from upper mandrel (2).

J-1.18) Unscrew and remove upper mandrel (2) from sealing mandrel (27).

NOTE$_4$: If needed, align hole in upper cone (9) with slot in sealing mandrel (27) and insert punch (or other tool) to prevent tool components from rotating.

J-1.19) Remove plug (5) from sealing mandrel (27).

J-1.19.1) Remove o-ring (38) from plug (5).

J-1.20) Unscrew and remove set screws (35) from center coupling (10).

J-1.21)Unscrew and remove upper cone (9) from center coupling (10).

J-1.21.1) Remove o-rings (39, 40) and valve (24) from upper cone (9).

J-1.22) Remove sealing mandrel (27) from center coupling (10).

J-2) Unclamp and remove center coupling (10) from vise.

J-3) Remove o-rings (39) and valve (24) from center coupling (10).

NOTE$_7$: To redress tool assembly, follow disassembly instructions. It is recommended by D&L Oil Tools to replace all seals, elements, o-rings, shear screws, etc. when redressing tool.

K) ASSEMBLY

NOTE$_8$: Clean and inspect all parts. Replace all worn and damaged parts. Install parts in proper order, orientation and tighten/torque all connections properly.

CAUTION$_6$: To ensure tool operates properly, install o-rings in o-ring grooves NOT thread reliefs (Fig. 3).

K-1) Install o-rings (39) in grooves in center coupling (10).

K-2) Install valve (24) in center coupling (10).

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

K-3) Clamp center coupling (10) in vise.

K-3.1) Install o-ring (40) in upper outer groove and o-ring (39) in lower inner groove in upper cone (9).

K-3.2) Install valve (24) in upper cone (9).

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

K-3.3) Screw upper cone (9) into center coupling (10).

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

K-3.4) Screw set screws (35) into center coupling (10).

K-3.5) Install sealing mandrel (27) through valves (24) into center coupling (10).

CAUTION$_8$: Do not damage valves during installation.

K-3.6) Install o-ring (38) in groove in plug (5).

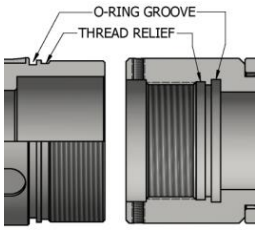


Fig. 3

K) ASSEMBLY (cont'd)

K-3.7) Install plug (5) into end of sealing mandrel (27).

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

K-3.8) Screw upper mandrel (2) onto sealing mandrel (27).

NOTE$_4$: If needed, align hole in upper cone (9) with slot in sealing mandrel (27) and insert punch (or other tool) to prevent tool components from rotating.

K-3.9) Screw set screws (34) into upper mandrel (2).

K-3.10) Assemble upper slip body assembly and install:

K-3.10.1) Install releasing slip (7), upper slips (8) and upper slip springs (26) into upper slip body (6).

NOTE$_9$: Install one (1ea) spring per slip (Fig. 4)

K-3.10.2) Wedge slips (7, 8) outward. Screw upper slip support (33) into upper slip body (6). Remove wedges.

K-3.10.3) Install upper slip body assembly onto upper mandrel (2).

Fig. 4

K-3.11) Install compression spring (4) onto upper mandrel (2).

K-3.12) Screw pulling head (1) onto upper mandrel (2).

CAUTION$_5$: Compression spring (4) is compressed with spring tension against pulling head (1).

K-3.13) Screw set screws (31) into pulling head (1).

K-3.14) Moving to lower end of tool, assemble rubber mandrel assembly and install:

K-3.14.1) Install lower cone (16), elements (13, 14), and rubber spacers (12) onto rubber mandrel (11).

K-3.14.2) Install rubber mandrel assembly onto sealing mandrel (27).

K-3.15) Screw rubber mandrel (11) into center coupling (10).

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

K-3.16) Screw J-slot mandrel (20) onto sealing mandrel (27).

K-3.17) Align threaded holes in J-slot mandrel (20) with holes in rubber mandrel (11). Screw set screws (29) into J-slot mandrel (20).

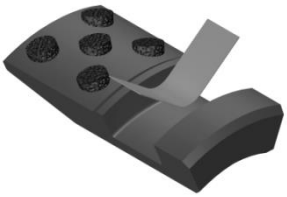


Fig. 5

K-3.18) Assemble drag block body assembly and install:

K-3.18.1) Install lower slips (17) and lower slip springs (25) into drag block body (18).

NOTE$_9$: Install one (1ea) spring per slip (Fig. 5)

K-3.18.2) Wedge lower slips (17) outwards. Install lower slip support (32) into drag block body (18).

K-3.18.3) Align threaded holes in drag block body (18) with pocket recessed holes in lower slip support (32). Screw socket cap screws (30) into drag block body (18). Remove wedges.

K-3.18.4) Install drag block body assembly onto rubber mandrel (11). Remove wedges.

K-3.19) Screw rubber mandrel cap (19) onto rubber mandrel (11).

K-3.20) Install drag blocks (22) and drag block springs (3) in drag block body (18). Compress drag blocks (22) using drag block body assembly tool (T1).

NOTE$_{10}$: Install two (2ea) springs per slip (Fig. 6).

K-3.21) Install drag block retainer (21) onto drag block body (18) capturing ends of drag blocks (22).

K-3.22) Back up on drag block body (18) with wrench. Screw body extension (37) onto drag b lock body (18) (**NOTE$_5$**: Left-hand threads).

K-3.23) Screw set screws (36) into body extension (37). Release drag blocks (22).

K-3.24) Install J-pin body (23) onto J-slot mandrel (20).

Fig. 6

K) ASSEMBLY (cont’d)

K-3.25) Align holes for J-pins in J-pin body (23) with slot in J-slot mandrel (20). Install J-pins (15) into J-pin body (23).

K-3.26) Slide drag block body assembly down and screw body extension (37) onto J-pin body (23).

NOTE$_6$: Drag block body assembly must be free to rotate.

K-3.27) Screw set screws (35) into body extension (37).

K-3.28) Screw crossover (28) onto J-slot mandrel (20).

K-4) Unclamp center coupling (10) from vise and remove assembled tool.

L) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 72540RR
1	1	PULLING HEAD	DLMS110	72535710
2	1	UPPER MANDREL	DLMS110	72535211
3	10	DRAG BLOCK SPRING	.014 INCONEL	9102900
4	1	COMPRESSION SPRING	CHROME VANADIUM	72535920
5	1	PLUG	DLMS110	72535216
6	1	UPPER SLIP BODY	DLMS110	72540320
7	1	RELEASING SLIP	DLMS110	60040125
8	2	UPPER SLIP W/ CARBIDE	DLMS110	60040115C
9	1	UPPER CONE	DLMS110	72540410
10	1	CENTER COUPLING	DLMS80	72540620
11	1	RUBBER MANDREL	DLMS110	72535220
12	2	RUBBER SPACER	DLMS35	72540840
13	1	ELEMENT	70 DURO NITRILE	72040511
14	2	ELEMENT	90 DURO NITRILE	72040513
15	2	J-PIN	DLMS110	72535870
16	1	LOWER CONE	DLMS110	72540420
17	4	LOWER SLIP W/ CARBIDE	DLMS110	60040135C
18	1	DRAG BLOCK BODY	DLMS110	72540335
19	1	RUBBER MANDREL CAP	DLMS60	60330230
20	1	J-SLOT MANDREL	DLMS110	72540230
21	1	DRAG BLOCK RETAINER	DLMS60	72540910
22	5	DRAG BLOCK W/ CARBIDE	DLMSDB4	9028900C
23	1	J-PIN BODY	DLMS110	72535875

L) PARTS LIST (cont’d)

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 72540RR
24	2	VALVE (MOLDED RUBBER TYPE)	1026/90 DURO NITRILE	60325520M
25	4	LOWER SLIP SPRING	-	7145900
26	3	UPPER SLIP SPRING	-	7045900
27	1	SEALING MANDREL	DLMS110	72540215
28	1	CROSSOVER	L-80	CH1050E1900E-B
29	3	SET SCREW 1/4-20 UNC X 1/4	STEEL	SSS025C025
30	2	CAP SCREW 1/4-20 UNC X 3/8	STEEL	SCS025C037
31	3	SET SCREW 5/16-18 UNC X 5/16	STEEL	SSS031C031
32	1	LOWER SLIP SUPPORT	DLMS60	72540912
33	1	UPPER SLIP SUPPORT	DLMS110	72540325
34	3	SET SCREW 5/16-18 UNC X 7/16	STEEL	SSS031C043
35	5	SET SCREW 5/16-18 UNC X 3/8	STEEL	SSS031C037
36	4	SET SCREW #10-24 UNC X 3/16	STEEL	SSS1024C018
37	1	BODY EXTENSION	DLMS110	72535370
38	1	203 O-RING	90 DURO NITRILE	90203
39	3	223 O-RING	90 DURO NITRILE	90223
40	1	227 O-RING	90 DURO NITRILE	90227

REDRESS KIT (RDK)		72540050
ASSEMBLED WEIGHT		77 LBS

L) PARTS LIST (cont’d)

L-1) ELASTOMER TRIM OPTIONS

NOTE$_{11}$: For temperature range, refer to Elastomer Trim Temperature Guide.

L-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 72540RRH
13	1	ELEMENT	70 DURO HSN	72040511H
14	2	ELEMENT	90 DURO HSN	72040513H
24	2	VALVE (MOLDED RUBBER TYPE)	90 DURO HSN	60325520MH
38	1	203 O-RING	90 DURO HSN	90203H
39	3	223 O-RING	90 DURO HSN	90223H
40	1	227 O-RING	90 DURO HSN	90227H

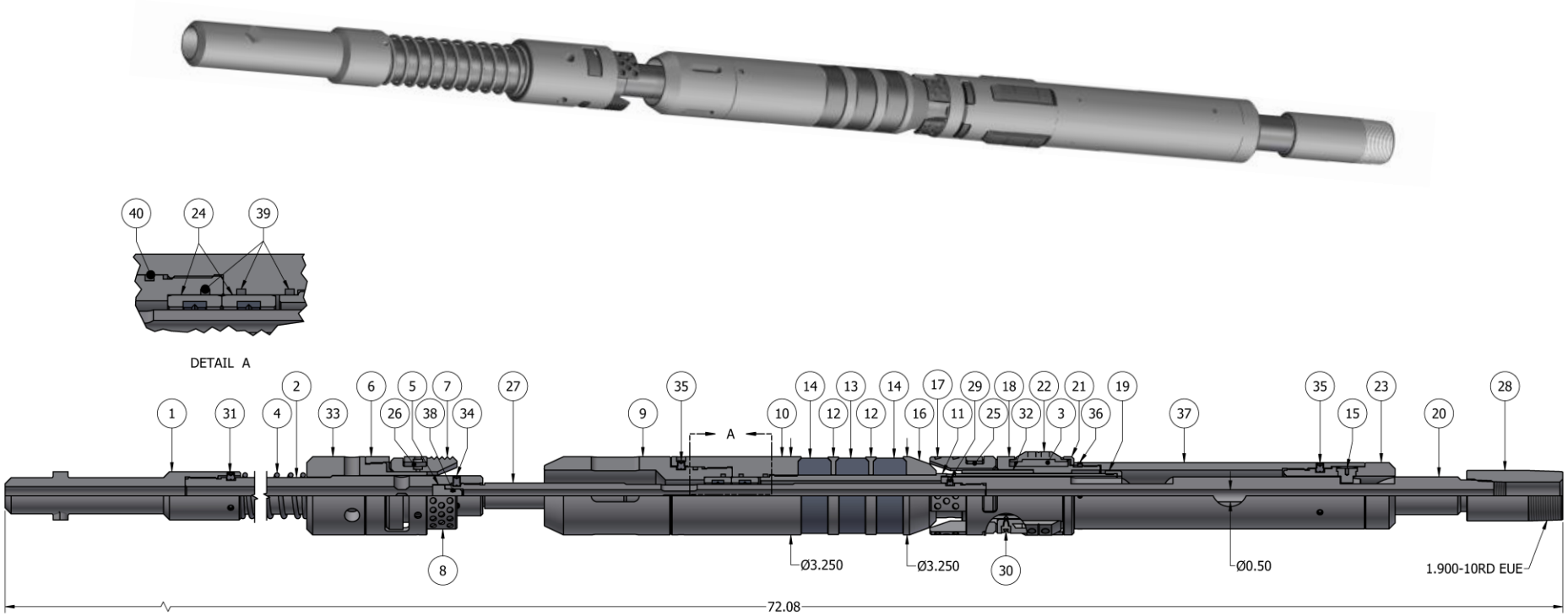
REDRESS KIT (RDK)		72540050H

L-1.2) VITON

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 72540RRV
13	1	ELEMENT	70 DURO VITON	72040511V
14	2	ELEMENT	90 DURO VITON	72040513V
24	2	VALVE (MOLDED RUBBER TYPE)	90 DURO VITON	60325520MV
38	1	203 O-RING	90 DURO VITON	90203V
39	3	223 O-RING	90 DURO VITON	90223V
40	1	227 O-RING	90 DURO VITON	90227V

REDRESS KIT (RDK)		72540050V

M) TECHNICAL ILLUSTRATION



N) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
05/31/2023	D	Revised elastomer trim temp. ratings; 72540215 was 72535215, 72540230 was 72535230	J.Anderson	E.Visaez
12/14/2015	C	Revised Elastomer Durometer Temperatures – Nitrile (90/80/90 Duro) was 250° - 300°F, Nitrile (Contact D&L Sales) was 300°F +, Rubber Type Temperature Ranges – Nitrile was 70° - 300°F, HSN was 70° - 325°F	J.Anderson	B.Oligschlaeger
10/23/2015	B	Added max. torque thru tool, max. hanging weight on set tool, max. tensile load thru tool, Pre-Installation Inspection Procedures, Storage Recommendations	J.Anderson	K.Riggs
08/16/13	A	Created new manual	-	-