A) DESCRIPTION

The Storm Valve is designed to run above a compression set packer like the DLT Retrievable Packer. The Storm Valve allows the drill pipe or tubing close to the surface to be disconnected without tripping the entire string. It is designed to be used in situations where the rig must be abandoned quickly. It can also be used for changing surface equipment without tripping a drill string. And it will remain closed to provide a secure seal until the drill pipe or tubing is re-connected.

B) SPECIFICATION GUIDE

SIZE (INCHES)	**TOOL OD** (INCHES)	**TOOL ID** (INCHES)	**THREAD CONNECTION** BOX UP / PIN DOWN	**PART NUMBER**
6-1/8	6.125	2.00	4-1/2 IF TOOL JOINT	68220 68220H[1] 68220V[2]

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

DIFFERENTIAL PRESSURE (MAX)	**TORQUE THRU TOOL** (MAX)	**TENSILE LOAD THRU TOOL** (MAX)	**FLOW RATE** (MAX)
10,000 PSI	8,000 FT-LBS	300,000 LBS	25 BBL/MIN

C) PRE-INSTALLATION INSPECTION PROCEDURES

CAUTION$_1$: 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
600 – 800 FT-LBS

NOTE$_1$: General thread and screw torque recommendations not applicable to mated parts specified in SPEC014.

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.

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

When redressing the tool, D&L recommends replacement of all o-rings, shear screws, etc. Contact D&L sales for redress kit and/or other replacement part information.

D) OPERATING PROCEDURES

CAUTION$_2$: Do not run the tool without properly tightening connections. Running the tool with loose connections may damage the tool and cause malfunction.

Normal well conditions will allow ample drill pipe to be run below the storm packer for proper weight and for proper well circulation. If the drill pipe weight is less than the minimum weight required to set the packer (refer to packer technical manual), drill collars should be run below the tool for weight.

D-1) MAKE-UP (Recommended)

After the storm packer has been set in the slips on its pick-up joint, make up the lower half of the storm valve, making sure all breaks are tong tight and lock screws are secure. Hand make-up the top back-off sub on the drill pipe. Pick up on joint or stand and stab into the mating parts. Hand rotate 21 - 22 turns to the right. Tighten drill pipe connection holding back-ups on the top connector. Remove tongs and continue hand make-up of the back-off sub and tighten as you would any safety joint. Check the left-hand break out several times, assuring proper torque.

CAUTION$_3$: Do not lift drill string until back-out threads are fully engaged.

CAUTION$_4$: A torque limiter system is recommended to prevent over-torquing of threads.

D-2) SET AND BACK-OUT PROCEDURE

After reaching setting depth, rotate and set storm packer, set weight on packer. Maintain a neutral weight (0 lbs) and rotate the back-out sub 12 turns to the left. At this point the valve is closed and threads are still engaged. Pressure may now be applied to assure valve is operational. Test only to 1/2 the pressure required to shear the pump out plug. Release the pressure. An additional 9 - 10 turns will totally release from tool.

D-3) RE-CONNECT PROCEDURE

To re-connect drill pipe to storm valve, lower the drill pipe slowly and tag the top of the valve with a maximum of 1,000 lbs of weight on the valve. During re-connect, be prepared to handle any pressure from the drill pipe and casing side. With 1,000 lbs of weight set on the valve, rotate two (2) turns to the right and then pull 2,000 lbs tension on the tool to assure the threads are engaged. Slack down to neutral weight (0 lbs) and rotate an additional eight (8) turns to the right. At this point the valve is closed and in a position to pump out the pre-loaded plug. This procedure is recommended if extended circulation periods at rates of 10 bpm or greater are needed. If the pump out plug is not to be sheared, apply an additional 19 - 20 turns to the right. This will open the valve fully for pumping. A maximum rate of nine (9) barrels per minute is recommended with the plug in place.

If additional pump rate or a fuller opening is needed through the storm valve, the plug can be pumped out. Re-connect to the storm valve with eight (8) turns and apply pump pressure. The standard pin will take 5,500 psi on the drill pipe to pump the plug out. There is an optional shear screw arrangement available that adds shear screws to the standard shear pin at a rate of 1,433 psi/screw. There are a total of six (6) shear screws in this option.

E) 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.

F) ELASTOMER TRIM TEMPERATURE GUIDE

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

G) RECOMMENDED 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

H) DISASSEMBLY

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

H-1.1) Unscrew and remove set screws (15) from lower body (10).

H-1.2) Unscrew and remove lower body (10) from extension body (5).

H-1.3) If applicable, unscrew and remove shear screws (22) from circulating body (8).

H-1.4) Unscrew and remove pipe plugs (11) from circulating body (8).

H-1.5) Remove shear pin (21) from circulating body (8).

H-1.6) Remove plug (9) from circulating body (8).

H-1.7) Unscrew and rem set screws (13) from extension body (5).

H-1.8) Unscrew and remove circulating body (8) from extension body (5).

H-1.8.1) Remove o-ring (17) from circulating body (8).

H-1.9) Unscrew and remove set screws (15) from extension body (5).

H-1.10) Unscrew and remove extension body (5) from upper body (4).

H-1.10.1) Remove o-rings (16, 20) from extension body (5).

H-1.11) Remove valve (7) from valve mandrel (6).

H-1.11.1) Remove o-rings (18) from valve (7).

H-1.12) Unscrew and remove upper body (4) from top sub (1).

H-1.12.1) Remove o-ring (16) from upper body (4).

H-1.13) Unscrew and remove set screws (12) from top sub (1).

H-1.14) Unscrew and remove mandrel retainer (3) from top sub (1).

H-1.15) Remove valve mandrel (6) from top sub (1).

H-1.16) Remove o-rings (19) from top sub (1).

H-1.17) Unscrew and remove set screws (14) from gage ring (2).

H-1.18) Unscrew and remove gage ring (2) from top sub (1) (**NOTE$_5$**: Left-hand threads).

H-2) Unclamp and remove top sub (1) from vise.

I) 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.

NOTE3: If assembling tool with replacement mated parts (items 4 and 5; 10 and 5), match counterbore holes (aka drill flat bottom holes) to mating part according to SPEC014.

CAUTION5: To ensure tool operates properly, install o-rings in o-ring grooves **NOT** thread reliefs (Fig. 2).

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

I-1.1) Screw gage ring (2) onto top sub (1) (**NOTE5**: Left-hand threads).

I-1.2) Screw set screws (14) into gage ring (2).

I-1.3) Install o-rings (19) in o-ring grooves in top sub (1).

I-1.4) Install valve mandrel (6) into top sub (1).

I-1.5) Screw mandrel retainer (3) into top sub (1).

I-1.6) Screw set screws (12) into top sub (1).

I-1.7) Install o-ring (16) in o-ring groove in upper body (4).

I-1.8) Screw upper body (4) onto top sub (1).

CAUTION6: Do not rip or tear o-rings during installation.

I-1.9) Install o-rings (18) in o-ring grooves in valve (7).

I-1.10) Slide valve (7) onto valve mandrel (6).

I-1.11) Install o-rings (16, 20) in o-ring grooves in extension body (5).

I-1.12) Screw extension body (5) onto upper body (4). Align threaded holes in extension body (5) with counterbore holes in upper body (4).

CAUTION6: Do not rip or tear o-rings during installation.

I-1.13) Screw set screws (15) into extension body (5).

I-1.14) Install o-ring (17) in groove in circulating body (8).

I-1.15) Screw circulating body (8) into extension body (5).

CAUTION6: Do not rip or tear o-rings during installation.

I-1.16) Screw set screws (13) into extension body (5).

I-1.17) Install plug (9) into circulating body (8).

CAUTION6: Do not rip or tear o-ring during installation.

I-1.18) Align hole in plug (9) with hole in circulating body (8). Install shear pin (21).

I-1.19) Screw pipe plugs (11) into circulating body (8).

I-1.20) If applicable, screw shear screws (22) into circulating body (8). Tighten until shear screws (22) contact plug (9). Back shear screws (22) out 1/4 turn.

I-1.21) Screw lower body (10) onto extension body (5). Align threaded holes in lower body (10) with counterbore holes in extension body (5).

CAUTION6: Do not rip or tear o-rings during installation.

I-1.22) Screw set screws (15) into lower body (10).

I-2) Unclamp top sub (1) from vise and remove assembled tool.

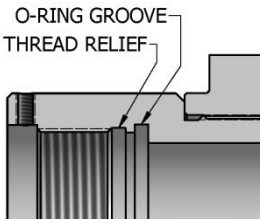


Fig. 2

J) PARTS LIST

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 68220
1	1	TOP SUB	DLMS110	68220610
2	1	GAGE RING, 7.900” OD	DLMS110	68295840†
3	1	MANDREL RETAINER	DLMS110	68220226
4	1	UPPER BODY **	DLMS110	68220385
5	1	EXTENSION BODY **	DLMS110	68220390
6	1	VALVE MANDREL	DLMS110	68220210
7	1	VALVE	DLMS110	68220666
8	1	CIRCULATING BODY	DLMS110	68220372
9	1	PLUG *	DLMS110	68220850
10	1	LOWER BODY **	DLMS110	68220620
11	2	PIPE PLUG 1/8 NPT *	STEEL	SPP012
12	3	SET SCREW 3/8-16 UNC X 3/8 *	STEEL	SSS037C037
13	2	SET SCREW 1/4-20 UNC X 3/8 *	STEEL	SSS025C037
14	3	SET SCREW 3/8-16 UNC X 5/8 *	STEEL	SSS037C062
15	8	FULL DOG POINT SET SCREW 5/8-11 UNC X 3/4	STEEL	DPS062C075§
16	2	347 O-RING *	90 DURO NITRILE	90347
17	1	329 O-RING *	90 DURO NITRILE	90329
18	4	332 O-RING *	90 DURO NITRILE	90332
19	2	O-RING *	85 DURO NITRILE	68220512
20	1	338 O-RING *	90 DURO NITRILE	90338
21	1	SHEAR PIN (5500 PSI) *	DLMS110	68220901

OPTIONAL:

22	6	SHEAR SCREW (1433 PSI) 1/2-13 UNC X 1/2	BRASS	BSSSLT050C050

* Common repair parts

** Mated parts cannot be replaced separately without field adaptation

§Set screw (P/N SSS062C075) used in Rev. M.

†For additional gage rings, refer to OPTIONAL GAGE RINGS table below.

REDRESS KIT (RDK)		68220050
ASSEMBLED WEIGHT		452 LBS

J) PARTS LIST (cont’d)

J-1) ELASTOMER TRIM OPTIONS

NOTE$_4$: For temperature range, refer to Elastomer Trim Temperature Guide.

J-1.1) HSN

ITEM	QTY	DESCRIPTION	MATERIAL	P/N 68220H
16	2	347 O-RING	90 DURO HSN	90347H
17	1	329 O-RING	90 DURO HSN	90329H
18	4	332 O-RING	90 DURO HSN	90332H
19	2	O-RING	80 DURO HSN	68220512H
20	1	338 O-RING	90 DURO HSN	90338H

REDRESS KIT (RDK)		68220050H

J-1.2) VITON

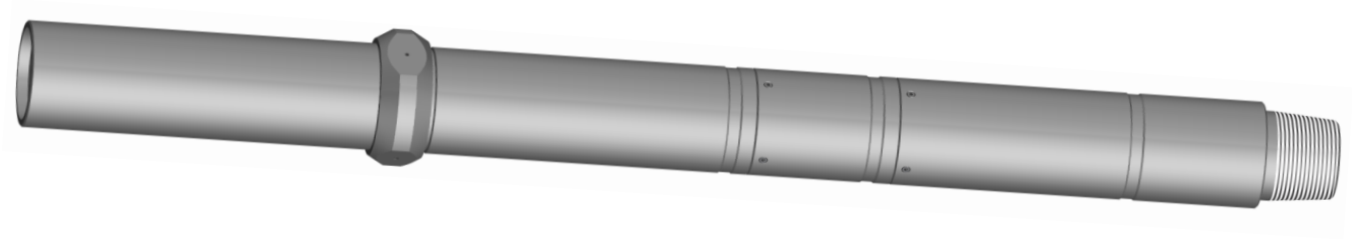
ITEM	QTY	DESCRIPTION	MATERIAL	P/N 68220V
16	2	347 O-RING	90 DURO VITON	90347V
17	1	329 O-RING	90 DURO VITON	90329V
18	4	332 O-RING	90 DURO VITON	90332V
19	2	O-RING	80 DURO VITON	68220512V
20	1	338 O-RING	90 DURO VITON	90338V

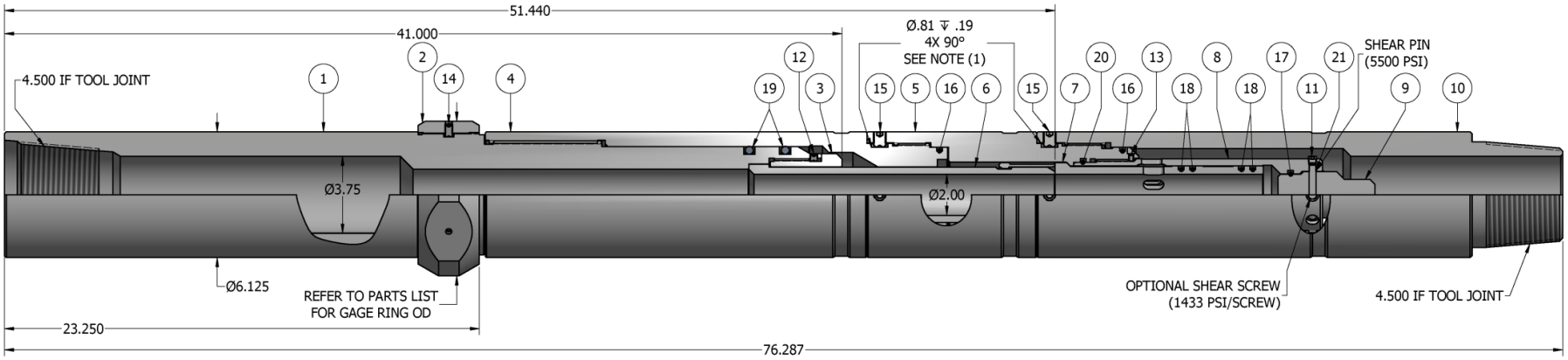
REDRESS KIT (RDK)		68220050V

J-2) OPTIONAL GAGE RINGS

ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER
2	1	GAGE RING, 8.375” OD	DLMS110	68210830
		GAGE RING, 9.500” OD	DLMS110	68210830-950
		GAGE RING, 9.750” OD	DLMS110	68211830
		GAGE RING, 11.000” OD	DLMS110	68213840
		GAGE RING, 14.375” OD	DLMS110	68216830
		GAGE RING, 16.687” OD	DLMS110	68218X830
		GAGE RING, 16.750” OD	DLMS110	68218Y830
		GAGE RING, 16.937” OD	DLMS110	68218830
		GAGE RING, 17.937” OD	DLMS110	68220830
		GAGE RING, 19.375” OD	DLMS110	68222830

K) TECHNICAL ILLUSTRATION





NOTE3: If assembling tool with replacement mated parts (items 4 and 5; 10 and 5), match counterbore holes (aka drill flat bottom holes) to mating part according to SPEC014.

L) REVISION HISTORY

DATE	REVISION	DESCRIPTION OF CHANGES	REVISED BY	APPROVED BY
10/10/2023	S	Revised material for P/Ns 68220512H, 68220512V	J.Anderson	E.Visaez
08/31/2022	R	Revised make-up, set and back-out procedure and re-connect procedure for clarity.	J.Anderson	J.Johnson
05/10/2021	Q	Added additional optional gage rings	J.Anderson	E.Visaez
09/20/2018	P	Revised Operating Procedures, Elastomer Trim Temp. Guide nitrile rating	J.Anderson	D.Hushbeck
12/07/2106	N	Revised P/N DPS062C075 was SSS062C075; Added NOTE$_1$ for mated parts	J.Anderson	D.Hushbeck
09/22/2016	M	Revised Assembly notes	J.Anderson	D.Hushbeck
04/05/2016	L	Added General Screw Torque Recommendations, Elastomer Trim Temperature Guide	J.Anderson	D.Hushbeck
06/16/2015	K	Added HSN and Viton options; Revised P/N 68211830 max. OD was 10.406	J.Anderson	B.Bishop
07/31/14	J	Added inspection and storage procedures, cautions for operating procedures and assembly	J.Anderson	H.Bringham
10/08/13	H	Revised max. torque was 20,000 ft-lbs and max. tensile load was 575,000 lbs	J.Anderson	H.Bringham
07/30/13	G	Added max flow rate.	J.Anderson	D.Hushbeck
04/08/13	F	Revised P/N BSSSLT050C050 shear value 1433 psi was 1433#, assembled weight 452 lbs was 454 lbs; Added recommended hand tools, revision history;	J.Anderson	D.Hushbeck