



Installation, Operation and Maintenance Manual

DAN-EX VALVE

Double Isolation / Double Block and Bleed Plug Valve







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INSTALLATION

Orientation

DAN-EX valves may be installed in any position, vertical, horizontal or inverted.

Flow direction

The DAN-EX valve is a bi-directional valve, so flow is not dependent upon installation. Flow shut-off is achieved equally on both sides of the plug independent of flow for 100% shutoff equally on both sides.

Note: The use of a Differential Thermal Relief (DTR) system as described on page 28, does result in a preferred flow direction, but does not mean the valve must be installed a certain way, the valve remains Bi-directional independent of the DTR. The DTR is recommended to be piped to the highest pressure or flow side usually the upstream side of the valve in most scenarios.

Clearance for Repair

For easy repair, ample space should be made available below the valve for removal of the lower plate and withdrawal of the seating slips. See Tables 1, 2, and 3 for dimensions. Sufficient clear space is required above the DAN-EX valve, to allow free movement of the position indicator flag and removal of the operator mechanism if necessary.

Table 1

Clearance required below for reduced ported valves slip removal.

Minimum Clearance				
Valve Size Inch	ASME Class 150	ASME Class 300	ASME Class 600	ASME Class 900
2"	N/A	3"	3"	---
3"	4-3/4"	4-3/4"	4-3/4"	---
4"	4-3/4"	4-3/4"	4-3/4"	4-3/4"
6"	7-1/4"	11-1/2"	7-1/2"	7-1/2"
8"	11-1/2"	11-1/2"	11-1/2"	11-1/2"
10"	16-1/4"	16-1/4"	---	---
12"	17-3/4"	17-3/4"	---	---
14"	17-3/4"	17-3/4"	---	---
16"	23-1/4"	24"	---	---
18"	22-3/4"	24"	---	---
20"	25-1/4"	---	---	---
24"	29"	---	---	---

Table 2

Clearance required below reduced round ported valves for slip removal.

Minimum Clearance				
Valve Size Inch	ASME Class 150	ASME Class 300	ASME Class 600	ASME Class 900
12"	---	---	11-1/4"	---
16"	---	---	15-1/2"	---
20"	18-1/2"	---	---	---
24"	22-3/4"	---	---	---

Table 3

Clearance required below full port piggable valves for slip removal.

Minimum Clearance				
Valve Size Inch	ASME Class 150	ASME Class 300	ASME Class 600	ASME Class 900
10"	---	---	11-1/4"	---
12"	---	---	15-1/2"	---
16"	18-1/2"	---	---	---
20"	22-3/4"	---	---	---

Note: Allowing more than the specified minimum amount of clearance will make servicing easier.

Flange Fasteners

Table 4

Required fasteners for reduced ported valves.

Valve Size Inch	ASME CLASS	Thread UNC	Length Required (Inch)/Qty			
			Stud/QTY		Cap Screw/QTY	
2"	150	5/8"-11	3-1/4"	8	---	---
	300	5/8"-11	3-1/2"	16	---	---
	600	5/8"-11	4-1/4"	16	---	---
3"	150	5/8"-11	---	---	1-3/4"	8
	300	3/4"-10	4-1/4"	16	---	---
	600	3/4"-10	5"	16	---	---
4"	150	5/8"-11	3-1/2"	8	1-3/4"	8
	300	3/4"-10	4-1/2"	16	---	---
	600	7/8"-9	5-3/4"	16	---	---
	900	1-1/8"-8	6-3/4"	16	---	---
6"	150	3/4"-10	4"	8	2"	8
	300	3/4"-10	4-3/4"	24	---	---
	600	1"-8	6-3/4"	24	---	---
	900	1-1/8"-8	7-1/2"	24	---	---
8"	150	3/4"-10	4-1/4"	8	2"	8
	300	7/8"-9	5-1/2"	24	---	---
	600	1-1/8"-8	7-1/2"	24	---	---
	900	1-3/8"-8	8-3/4"	24	---	---
10"	150	7/8"-9	4-1/2"	16	2"	8
	300	1"-8	6-1/4"	24	3"	8
12"	150	7/8"-9	4-3/4"	16	2	8
	300	1-1/8"-8	6-3/4"	24	3-1/2"	8
14"	150	1"-8	5-1/4"	16	2-1/2"	8
	300	1-1/8"-8	7"	40	---	---
16"	150	1"-8	5-1/4"	16	2-1/2"	16
	300	1-1/4"-8	7-1/2"	40	---	---
18"	150	1-1/8"-8	5-3/4"	16	2-1/2"	16
	300	1-1/4"-8	7-3/4"	48	---	---
20"	150	1-1/8"-8	6-1/2"	24	3"	16
24"	150	1-1/4"-8	6-3/4"	32	3-1/2"	8

Table 5

Required fasteners for reduced round ported valves.

Valve Size Inch	ASME CLASS	Thread UNC	Length Required (Inch)/Qty			
			Stud/QTY		Cap Screw/QTY	
12"	600	1-1/4"-8	8-3/4"	40	---	---
16"	600	1-1/2"-8	10"	40	---	---
20"	150	1-1/8"-8	6-1/2"	40	---	---
24"	150	1-1/4"-8	6-3/4"	40	---	---

Table 6

Required fasteners for full port piggyback valves.

Valve Size Inch	ASME CLASS	Thread UNC	Length Required (Inch)/Qty			
			Stud/QTY		Cap Screw/QTY	
10"	600	1-1/4"-8	8-1/2"	32	---	---
12"	600	1-1/4"-8	8-3/4"	24	4-1/2"	16
16"	150	1"-8	5-1/4"	32	---	---
20"	150	1-1/8"-8	6-1/2"	40	---	---

Table 7

Required torque values for all fasteners.

Nominal diameter of stud/cap screw (Inch)	Number of threads (Inch)	Stress: 30,000 PSI	
		Torque FT/LBS	Compression LBS
1/2"	13	30	3780
5/8"	11	60	6060
3/4"	10	100	9060
7/8"	9	160	12570
1"	8	245	16530
1-1/8"	8	355	21840

Pressure Test

DAN-EX valves can be hydrostatically pressure-tested after installation, to full API 6D limits per Table 8 below.

Table 8

Valve figure No.	271/201/291		273	275/205/295	276	Comments
ASME Class	150		300	600	900	
Shell Test Pressure (Valve Open)	(psig) (kg/cm ²)	435 31	1125 79	2250 158	3375 237	No leakage permitted
Seat Test Pressure	(psig) (kg/cm ²)	319 22	825 58	1650 116	2475 174	Test upstream & downstream seats. No leakage permitted
Supplementary (API 598) Air Seat Test Pressure	(psig) (kg/cm ²)	80 6	80 6	80 6	80 6	Test upstream & downstream seats. No leakage permitted

Operation of the DAN-EX Dual Expanding plug valve

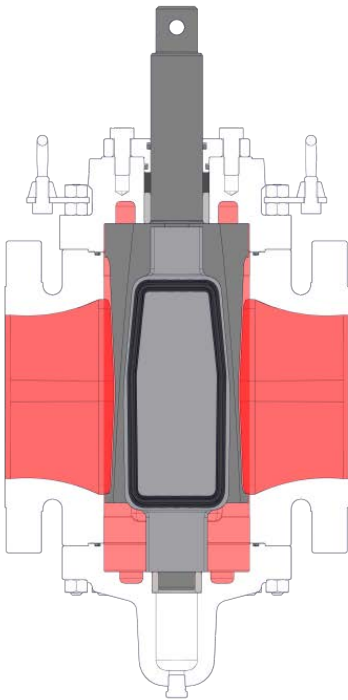
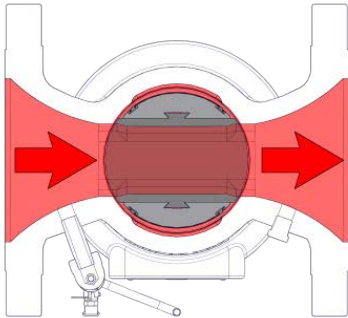
The DAN-EX valve is a dual expanding plug valve with two metal seating slips that come with a variety of elastomers seals bonded directly to them. When the valve is traveling into the closed position, the slips, which ride on tapered dovetails that are located on the plug, are forced apart. This downward force compresses the elastomers seals that are on the slips into the valve body, thus creating a leak proof seal. For maximum sealing, it is important to torque the valve closed to ensure that the elastomer seal is completely compressed into the valve body. When the valve is traveling into the open position, the seating slips begin to retract from the body before the plug begins its quarter turn rotation. Once the seating slips are free from contact with the body, the plug, which is mounted on trunnions, makes its quarter turn rotation to the open position.

The lifting, lowering, and rotation are all performed by the DAN-EX operator assembly. To operate the valve, turn the handwheel located on the operator, clockwise to close the valve and counter-clockwise to open the valve (similar to other valve types).

Each valve comes with a position indicator that gives a visual indication of whether the valve is in the open or closed position.

Located on a standard DAN-EX valve is a manual body bleed valve. The purpose of the manual body bleed valve is to check the integrity of the slip seals to ensure the valve is not leaking; this valve may only be opened when the valve is fully closed. Before opening the DAN-EX valve, the manual body bleed valve must be closed to prevent any product from escaping. Also, located on the DAN-EX valve is a differential thermal relief system. The purpose of the relief system is to relieve pressure from the valve body, to prevent the effects of thermal expansion on the valve due to an increase in ambient temperature and solar exposure, while the DAN-EX is in the closed position.

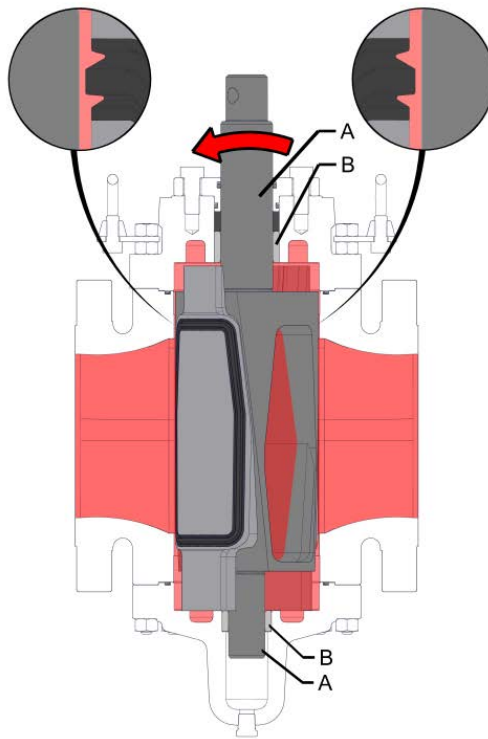
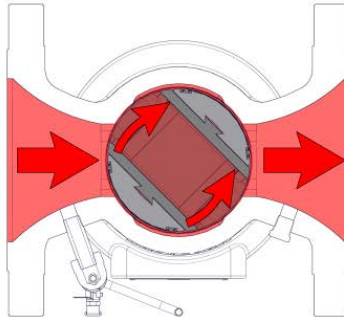
Valve operation explained



OPEN

Valve OPEN

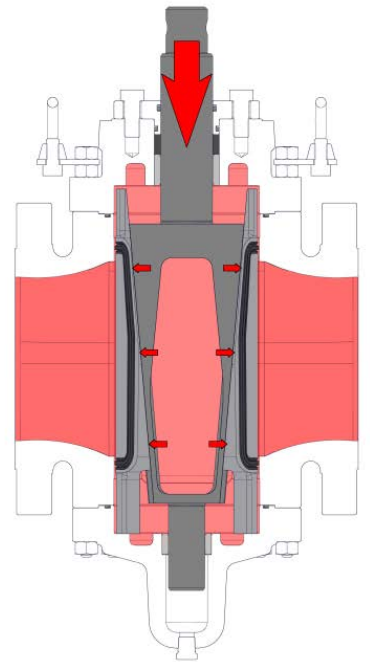
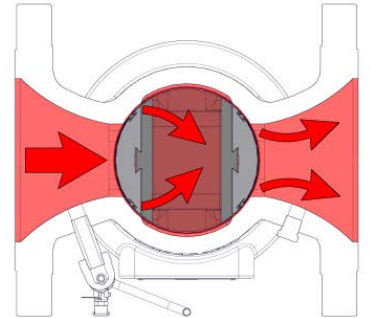
Seating slips with resilient seals are away from body and protected from the flow stream.



ROTATING

Plug/slip assembly being rotated. Slip seals and body clearance maintained by dovetail holding slips to plug.

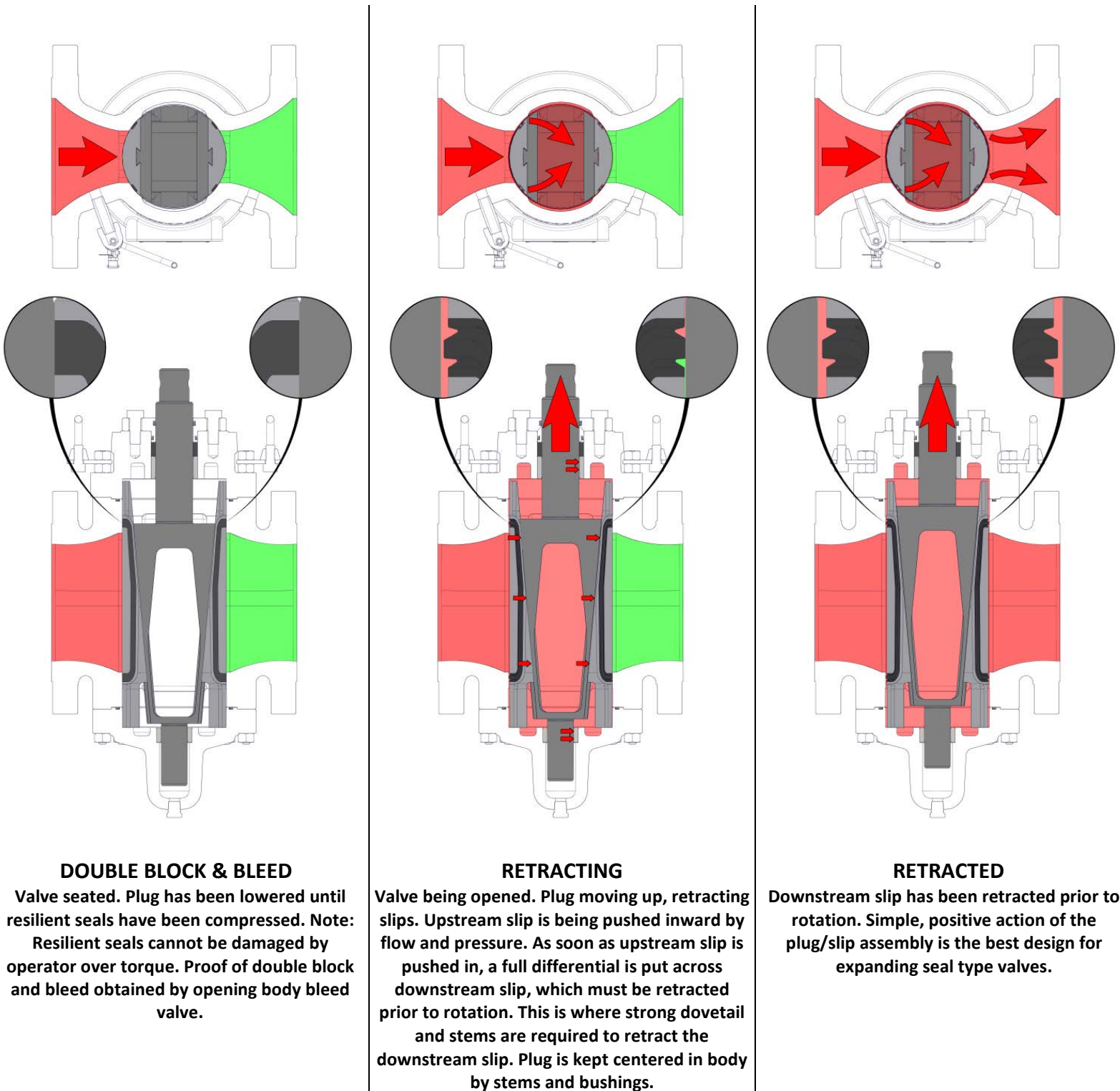
Plug/slip assembly is centered in body by strong stems (A) and Bushings (B)



EXPANDING

Plug/slips have rotated 90°, and plug starts down, expanding slips. Slips only move perpendicular to body seats. Upstream slip is being forced toward body seat against the flow and pressure. Downstream slips being held back from premature contact with body seat by dovetail. Plug/slip assembly is kept in body by top and bottom stems and bushings.

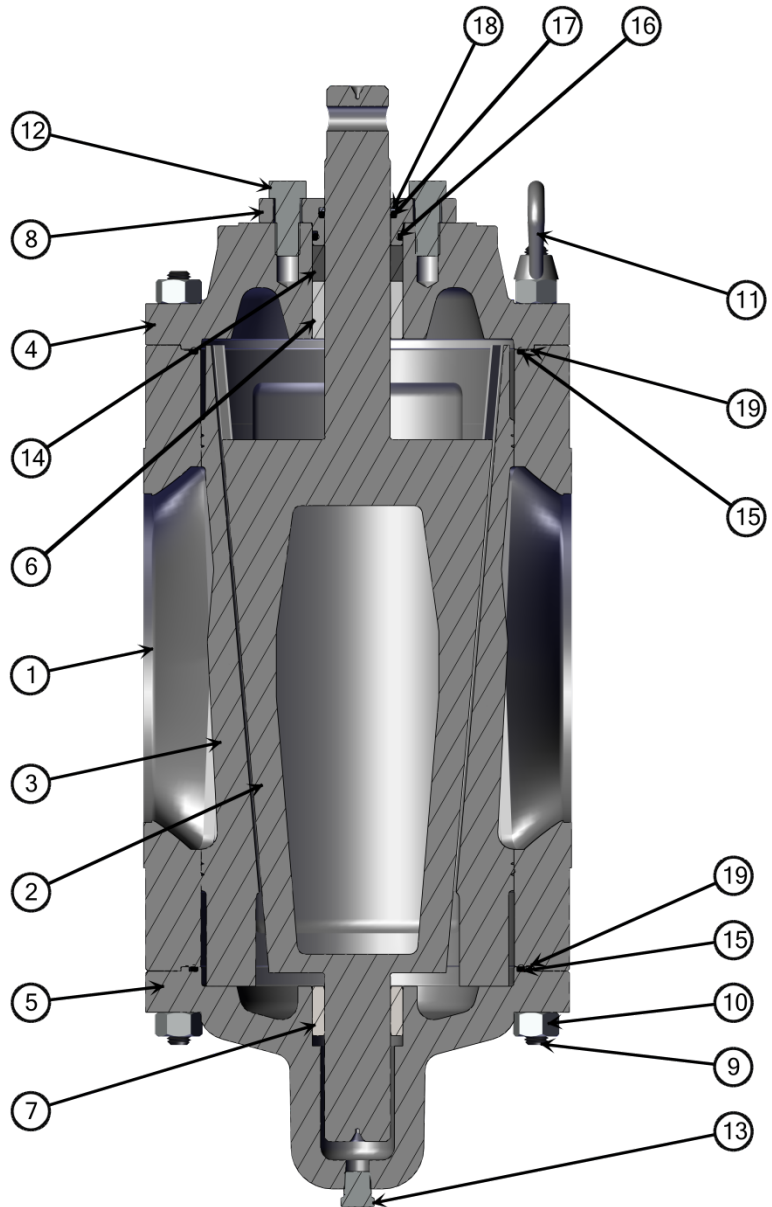
Valve operation explained



REDUCED PORT

BOM ID	Description
1	BODY
2	PLUG
3	SLIP
4	BONNET
5	LOWER PLATE
6	UPPER TRUNNION BUSHING
7	LOWER TRUNNION BUSHING
8	PACKING GLAND
9	STUD
10	HEAVY HEX NUT
11	EYE NUT
12	HEX HEAD CAP SCREW
13	PIPE PLUG
14	STEM PACKING
15	LOWER PLATE & BONNET O-RING
16	PACKING GLAND O.D. O-RING
17	PACKING GLAND I.D. O-RING
18	PACKING GLAND I.D. BACKUP RING
19	LOWER PLATE & BONNET GASKET

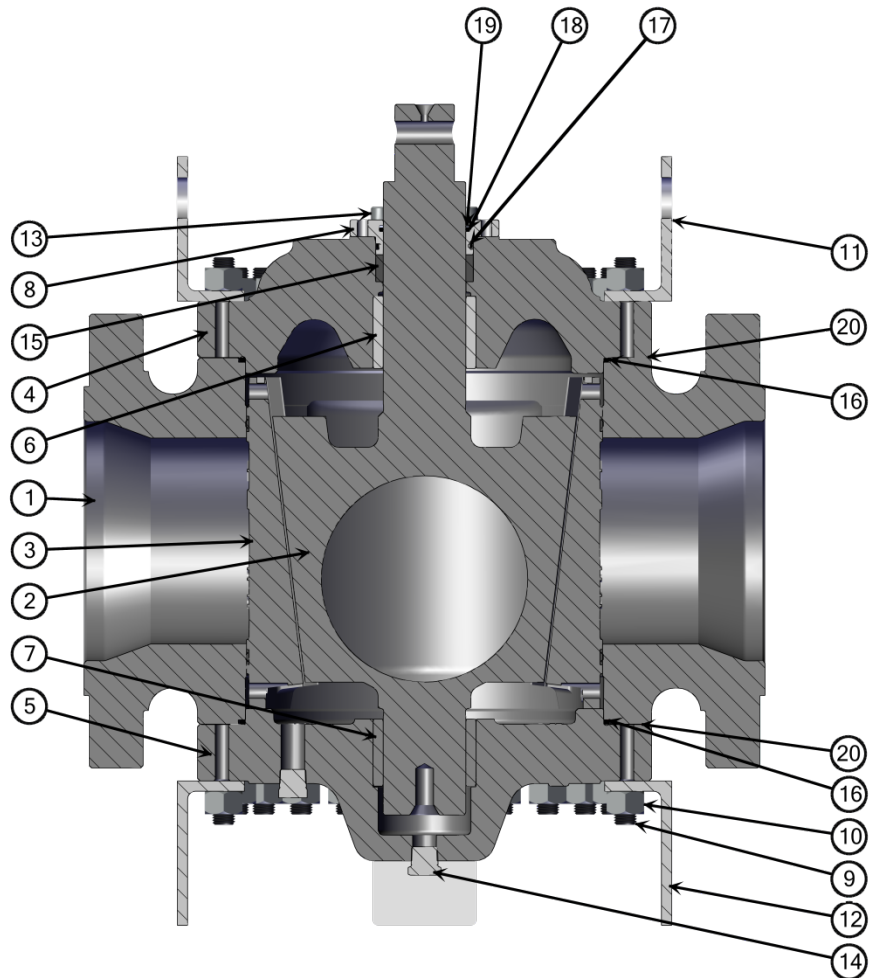
Typical Arrangement of:		
Size	ANSI	FIG.
2"	150	271A
2"	300	273
2"	600	275
3"	150	271
3"	300	273
3"	600	275
4"	150	271
4"	300	273
4"	600	275
4"	900	276
6"	150	271A
6"	300	273
6"	600	275
6"	900	276
8"	150	271A
8"	300	273
8"	600	275
8"	900	276
10"	150	271
10"	300	273
12"	150	271
12"	300	273
14"	150	271
14"	300	273
16"	150	271
16"	300	273
18"	150	271
18"	300	273
20"	150	271
24"	150	271



REDUCED ROUND PORT

BOM ID	Description
1	BODY
2	PLUG
3	SLIP
4	BONNET
5	LOWER PLATE
6	UPPER TRUNNION BUSHING
7	LOWER TRUNNION BUSHING
8	PACKING GLAND
9	STUD
10	HEAVY HEX NUT
11	LIFTING EYE
12	LIFTING LEG
13	SOCKET HEAD CAP SCREW
14	PIPE PLUG
15	STEM PACKING
16	LOWER PLATE & BONNET O-RING
17	PACKING GLAND O.D. O-RING
18	PACKING GLAND I.D. O-RING
19	PACKING GLAND I.D. BACKUP RING
20	LOWER PLATE & BONNET GASKET

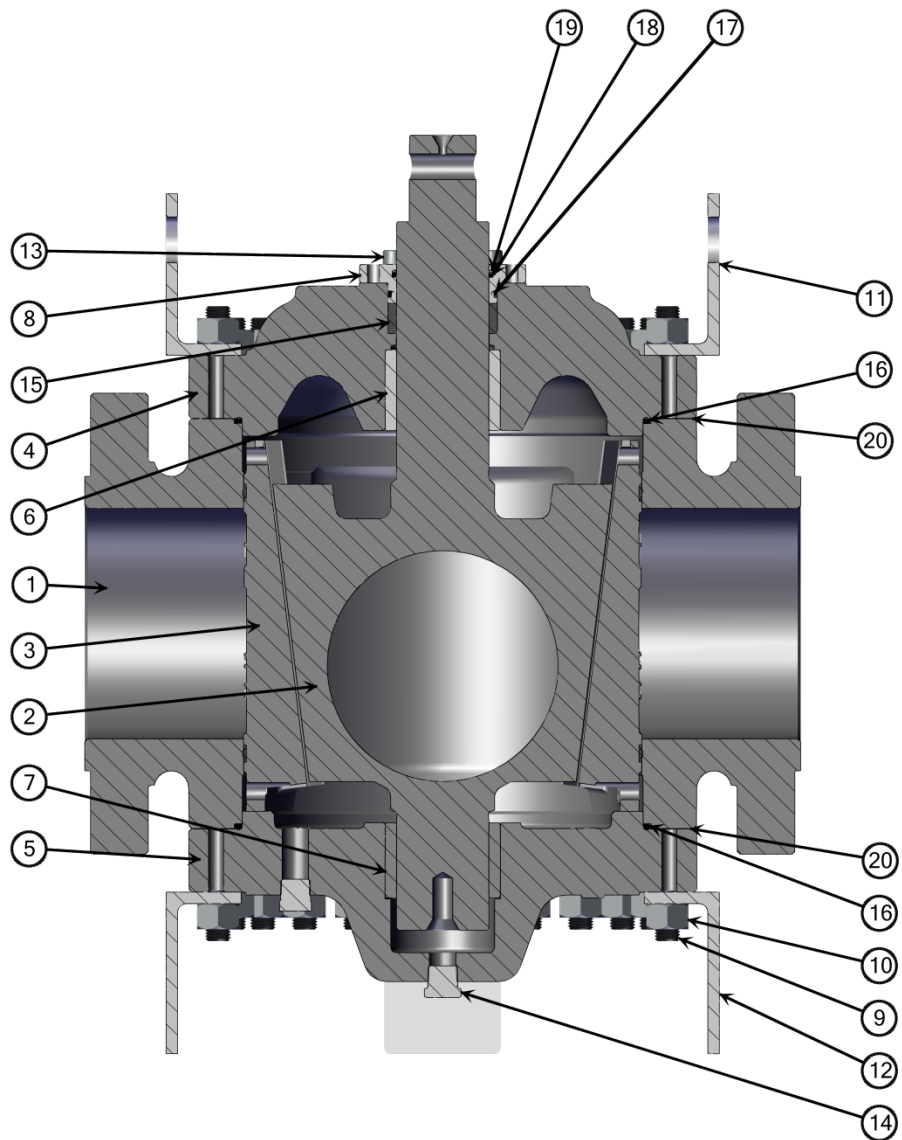
Typical Arrangement of:		
Size	ANSI	FIG.
12"	600	295
16"	600	295
20"	150	291
24"	150	291



FULL PORT PIGGABLE

BOM ID	Description
1	BODY
2	PLUG
3	SLIP
4	BONNET
5	LOWER PLATE
6	UPPER TRUNNION BUSHING
7	LOWER TRUNNION BUSHING
8	PACKING GLAND
9	STUD
10	HEAVY HEX NUT
11	LIFTING EYE
12	LIFTING LEG
13	SOCKET HEAD CAP SCREW
14	PIPE PLUG
15	STEM PACKING
16	LOWER PLATE & BONNET O-RING
17	PACKING GLAND O.D. O-RING
18	PACKING GLAND I.D. O-RING
19	PACKING GLAND I.D. BACKUP RING
20	LOWER PLATE & BONNET GASKET

Typical Arrangement of:		
Size	ANSI	FIG.
10"	600	205
12"	600	205
16"	150	201
20"	150	201



MAINTENANCE

The DAN-EX valve doesn't need day-to-day maintenance; there are a few procedures that may need to be done periodically

ANNUALLY

Drain plugs, located on the lower plate, should be removed in order to allow any collected sediment to drain out of the valve. This should only be done when the valve is in the closed position and be aware that fluid will drain from the valve. In colder climates, before freezing temperatures set in, any possible water collected under the plug trunnion needs to be drained to prevent water from freezing in the lower plate causing operating difficulties.

Note: Before replacing drain plugs ensure thread sealant, Loctite 577® preferably, is applied to the thread to prevent any possible leakage from the drain plugs.

SEMI-ANNUALLY

The operator housing should be lubricated to prevent condensation from collecting, especially in colder climates. The operator comes with grease fittings that allow lubricant to be injected directly into the crucial areas that need lubricant to function properly. Use Schaeffer Moly Pure® #197 for best results.

Note: This procedure may be done in either open or closed position, as a precaution do not overfill the operator housing with grease.

Overfilling of the operator housing or gearing could result in grease leaking down the operator housing and running out the bottom of the operator and appear to be a packing gland leak.

IF AT ANY TIME, WHILE THE VALVE IS IN THE CLOSED POSITION...

The manual body bleed valve indicates a leak, which cannot be stopped by ordinary hand force on the handwheel; this may be corrected with one of the following procedures:

1. Fully close and seat the DAN-EX valve, then reach down and close the isolation valve that is located on the differential thermal relief system. With both the DAN-EX valve and isolation valve closed, open the manual body bleed valve to check if the valve continues to leak. If the valve stops leaking, then you have a stuck check valve and it will need to be replaced using the following steps:
If the leak continues then proceed to step 2 leaving the isolation valve closed.
 - 1.1.1. ***For safety, the line should be brought down and the body bleed valve on the DAN-EX should be opened to ensure there is no pressure present before performing the following steps.*** With the DAN-EX valve and isolation valve closed, begin by removing the tubing by loosening the compression fitting nuts and setting it aside so that it can be reinstalled later.
 - 1.1.2. With the tubing removed you can now remove the compression fitting from the check valve.
 - 1.1.3. Next, you will need to remove the faulty check valve and replace it with the new one provided.
 - 1.1.4. Reinstall the compression fitting onto the new check valve.
 - 1.1.5. Line up the tubing with the compression fittings and tighten down the compression fitting nuts.
2. Close the manual body bleed valve and operate the DAN-EX valve through the Open & Closed cycle while product is flowing. This process is to attempt to "flush" out the valve of any sediment that may have collected under the valve plug.
 - 2.1. The travel of the valve can be checked by closing the valve and making a mark on the indicator rod to indicate the closed position then open the valve and measure between the 2 marks and compare to the below chart to determine if the valve is traveling the required amount.

5KL 1.25" (31.25mm)

10KL 1.75" (44.45mm)

50KL2 3.1" (78.74mm)

100KS2 depends on the valve size. Consult factory

250K depends on the valve size. Consult factory

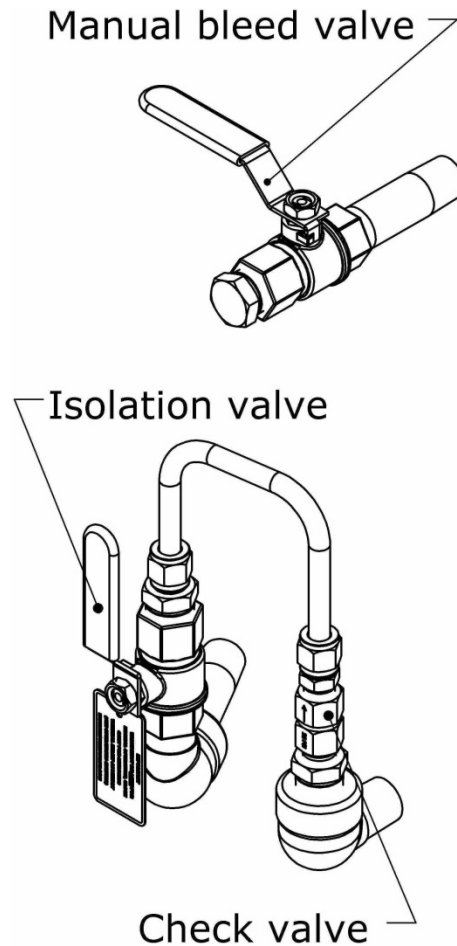
If the travel is determined to be less than required there could be debris in the lower trunnion that needs to be removed.

- 2.2. The first option is to flush the valve by partially opening the DAN-EX to allow the flow to wash under the plug, then close the valve and check the mark made previously on the indicator rod to see if more travel has been achieved. You may repeat this process a few times if it appears to be making progress. If more travel has been achieved then check for leakage again by opening the bleed valve after closing the DAN-EX. If no progress appears to be made in travel proceed to the next step.
- 2.3. Close the DAN-EX valve and remove the line pressure from the valve and remove the body pressure from the DAN-EX by opening the bleed valve. Remove the plug at the lowest point of the lower plate. Take care to have a Bucket or other method of capturing fluid that will be present in the lower trunnion area. Using a strong piece of wire or other such item insert it into the hole in the lower plate and check for debris in the lower trunnion cavity. Clean out any debris in the lower trunnion cavity and replace the pipe plug and close the bleed valve. Then charge the line and retest as before. If the manual body bleed valve persists to show a valve leak, proceed to the following step.
- 2.4. In order to replace the DAN-EX valve slips the entire line must be drained before proceeding. Once the line has been drained, begin by opening the DAN-EX valve and then open the manual body bleed valve to ensure that there is zero line pressure. After the line has been drained and the manual body bleed valve opened to check for zero pressure (See fig. 4) you may begin to remove the damaged slips. The damaged slips may be removed by either removing the lower plate or bonnet. The DAN-EX valve allows for both top and bottom entry to remove and replace slips.
 - 2.4.1. For lower plate entry:
 - 2.4.1.1. Remove the lower plate drain plug to drain the valve body of any trapped product. *Remove the drain plug that is not located directly below the plug trunnion* and open the body bleed valve to assist in draining.
 - 2.4.1.2. Remove two nuts and studs, preferably right across from one another.
 - 2.4.1.3. Install all-thread studs along with nuts in place of the removed studs and nuts. *Be sure the nuts are flush with the lower plate before proceeding.*
 - 2.4.1.4. Remove the remaining nuts from the lower plate. *The only nuts that should be left holding the lower plate should be the two nuts that are located on the all-thread studs.*
 - 2.4.1.5. Now, begin by unthreading the two nuts simultaneously so the lower plate and slips are lowered out of the valve body at the same time to prevent any damage to the slips during removal.
 - 2.4.1.6. With the slips mostly out of the valve body, you will want to grasp the slips before they come off of the dovetails that are located on the plug to prevent the slips from falling completely. *It is recommended to replace the O-ring and gasket that is located on the lower plate before installation.*
 - 2.4.1.7. With the old slips out of the body, you may now begin installing the new slips in the valve. It is recommended to lubricate the back of the slip to ease the installation of the slips onto the plug. It is also recommended that the O-Ring and gasket are replaced and to clean and lubricate the O-ring groove before replacing the O-ring. *You may follow the previous instructions in reverse order for installation. It is recommended that anti-seize be used when reinstalling the studs in the valve body.*
 - 2.4.1.8. With the lower plate installed you may now reinstall the drain plug. *Before replacing drain plug, ensure thread sealant, Loctite 577® preferably, is applied to the thread to prevent any possible leakage from the drain plug.*
 - 2.4.1.8.1. For bonnet entry:
 - 2.4.1.9. Remove the lower plate drain plug to drain the valve body of any trapped product. *Remove the drain plug that isn't located directly below the plug trunnion.*
 - 2.4.1.10. Close isolation valve.
 - 2.4.1.11. Remove the nuts that hold the bonnet onto the valve body.

- 2.4.1.12. Lift the bonnet and the operator assembly as a whole until slips can be seen. *It is recommended that the O-ring and gasket that is located on the bonnet be replaced before installation.*
- 2.4.1.13. Locate the hole that is provided on top of the slip and slide a pin through the hole to ensure that the slips don't fall into the valve body and potentially causing damage to the slips or valve body.
- 2.4.1.14. With the slips pinned to the plug, begin to lift the bonnet/operator assembly off of the valve body.
- 2.4.1.15. With the entire bonnet/operator assembly off of the valve, unpin the slips from the plug and replace with the new slips. It is recommended to lubricate the back of the slip to ease the installation of the slips onto the plug. It is also recommended that the O-Ring and gasket are replaced and to clean and lubricate the O-ring groove before replacing the O-ring.
- 2.4.1.16. With the slips on the plug, pin them to the plug to allow the assembly to be lifted into place over the valve body. Do not forget to install the O-ring and gasket before lifting bonnet assembly into place.
- 2.4.1.17. Line up the assembly with the body centering it and carefully lower into the body taking care not to cut the slip elastomers on the side of the body. Be sure that the bonnet is being installed the same way as it was removed if installed 90 deg. off the slips will be in the open position when the valve indicator flag is in the closed position.
- 2.4.1.18. Lower the assembly down until the pins holding the slips are away from the top of the plug. Not all valves will have enough clearance to accomplish this so it is sometimes necessary to bring the bonnet down to its lowest point while you can still get to the pins easily then pull the pins out letting the slips drop down into the valve body then continue to lower the bonnet until in contact with the body.
- 2.4.1.19. With the bonnet installed you may now reinstall the drain plug. *Before replacing drain plug, ensure thread sealant, Loctite 577® preferably, is applied to the thread to prevent any possible leakage from the drain plugs.*
- 2.5. Should the operator need to be changed, use the following steps to accomplish installation:
 - 2.5.1. Close the DAN-EX valve.
 - 2.5.2. Remove dust covers from the operator so that the trunnion pin can be seen. This applies to all operators except the 5KL operator.
 - 2.5.3. Remove one retainer ring from the trunnion pin and set it aside for reinstallation. This applies to all operators except the 5KL & 10KL operator.
 - 2.5.4. With one retainer ring removed, you may now remove the trunnion pin, which holds the plug trunnion and operator camshaft together. This applies to all operators except the 5KL.
 - 2.5.5. With the trunnion pin removed you can now remove the bolts holding the operator to the bonnet.
 - 2.5.6. Lift the operator directly upward to prevent damaging the plug trunnion.
 - 2.5.7. Lower the replacement operator onto the valve making sure the plug trunnion and camshaft are aligned.
 - 2.5.8. Now that the operator is on the bonnet you may follow the previous instructions in reverse order for installation. *It is recommended to use anti-seize on the bolts before reinstallation.*
- 2.6. Should the stem packing fail, then the following steps can be followed to replace the failed packing set:
 - 2.6.1. For safety, the line should be brought down and the body bleed valve on the DAN-EX should be opened to ensure there is no pressure present before performing the following steps.
 - 2.6.2. Remove the operator assembly, using step 2.5.
 - 2.6.3. With the operator removed and set aside, you may begin to replace the stem packing by removing the cap screws holding the packing gland to the bonnet.
 - 2.6.4. Lift the packing gland to expose the stem packing.
 - 2.6.5. With the stem packing exposed you may now remove the stem packing with a packing remover. Be sure not to damage or scratch the plug trunnion.
 - 2.6.6. With the packing out of the bonnet, you will need to ensure that the packing box is clean before installing the new stem packing. With the packing box clear of any debris and rust you may install the new stem packing.

- 2.6.7. Remove the old I.D. O-ring, backup ring, and the old O.D. O-ring, clean the packing gland and install a new O-ring and backup ring in the I.D. O-ring groove and a new O-ring on the O.D. O-ring groove of the packing gland. *Be sure to lubricate the O-rings.*
- 2.6.8. Re-install the packing gland onto the bonnet; being careful not to cut the O-rings or backup ring.
- 2.6.9. Line up the thru holes in the packing gland with the tapped holes located on the bonnet and bolt down the packing gland. It is recommended to use anti-seize on the bolts before reinstallation.
- 2.6.10. Re-install the operator assembly, using steps from 2.5. in reverse order.

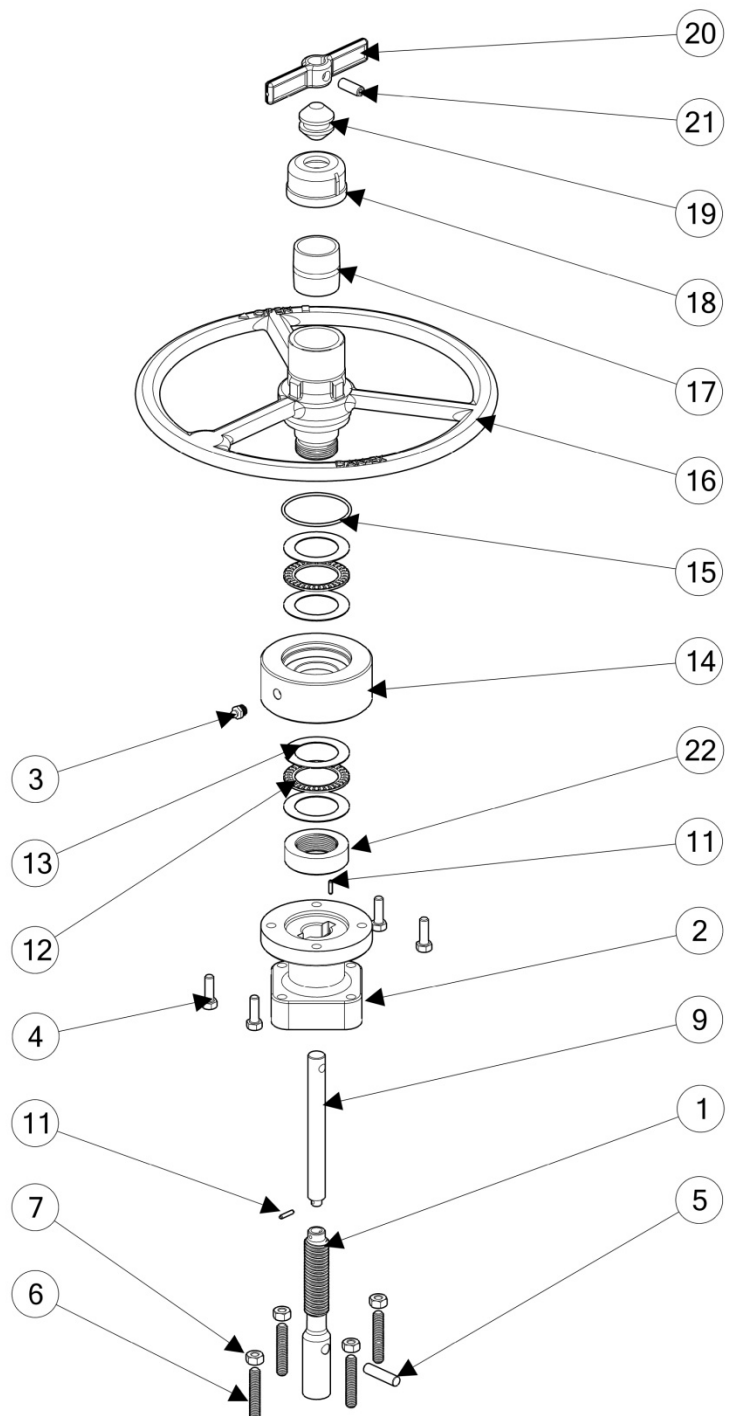
Fig. 4



DAN-EX 5KL Operator

BOM ID	Description	Qty
1	CAM SHAFT	1
2	OPERATOR HOUSING	1
3	GREASE FITTING	1
4	H/H CAP SCREW 5/16"-18 X 1"	4
5	DOWEL PIN	1
6	STUD 5/16"-18 X 2"	4
7	H/H NUT 5/16"-18	4
9	INDICATOR ROD	1
11	PIN SPRING	2
12	THRUST BEARING	2
13	THRUST WASHER	4
14	BEARING HOUSING	1
15	O-RING	1
16	HANDWHEEL	1
17	STEM PROTECTOR	1
18	STEM PROTECTOR CAP	1
19	GROMMET	1
20	INDICATOR FLAG	1
21	SET SCREW	1
22	BEARING RETAINER	1

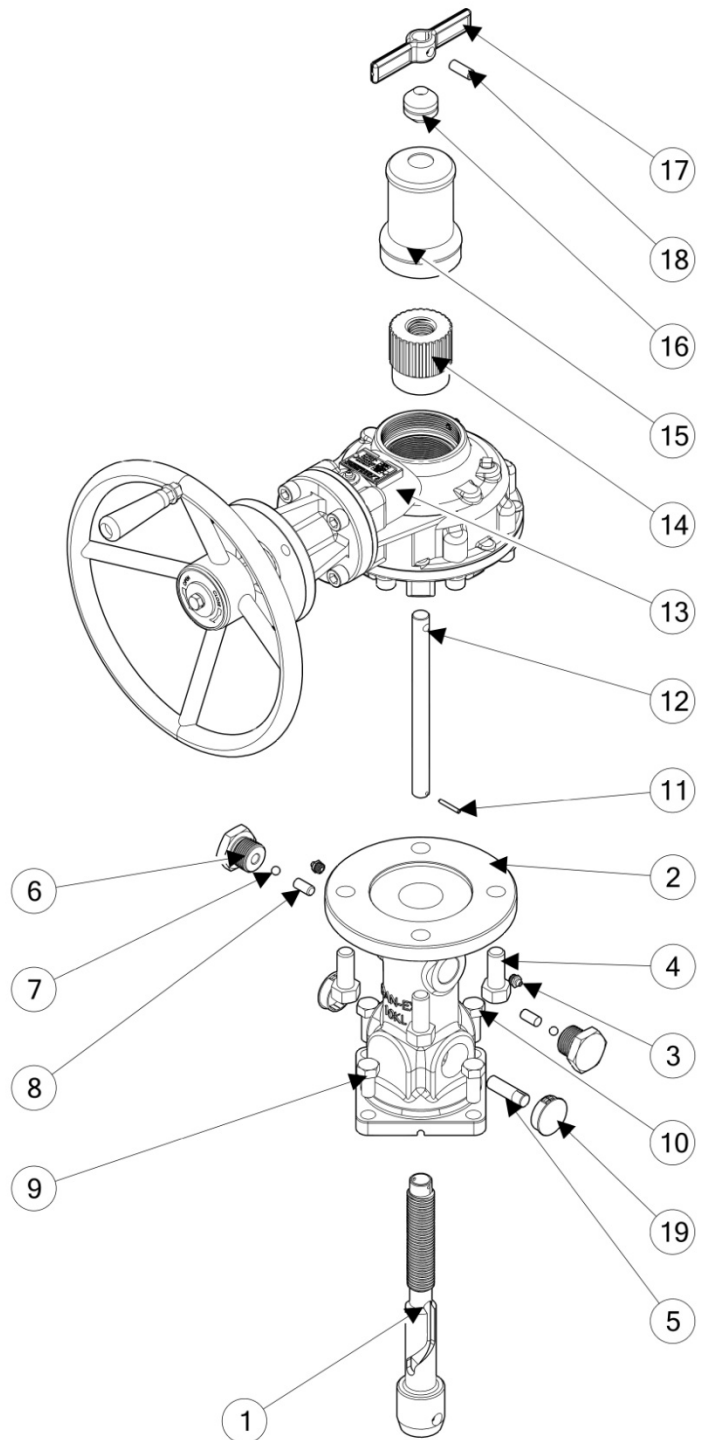
5KL Operator Used On:					
2"	150	271A	2"	600	275
2"	300	273			



DAN-EX 10KL Operator

BOM ID	Description	Qty
1	CAM SHAFT	1
2	OPERATOR HOUSING	1
3	GREASE FITTING	2
4	H/H CAP SCREW 5/8"-11 X 1-1/2"	4
5	TRUNNION PIN	1
6	CAM FOLLOWER HOUSING	2
7	STEEL BALL	2
8	DOWEL PIN	2
9	H/H CAP SCREW 1/2"-13 X 1"	1
10	H/H CAP SCREW 1/2"-13 X 1-1/4"	3
11	PIN SPRING	1
12	INDICATOR ROD	1
13	GEAR	1
14	STEM NUT	1
15	STEM PROTECTOR	1
16	GROMMET	1
17	INDICATOR FLAG	1
18	SET SCREW	1
19	LOCK PLUG	2

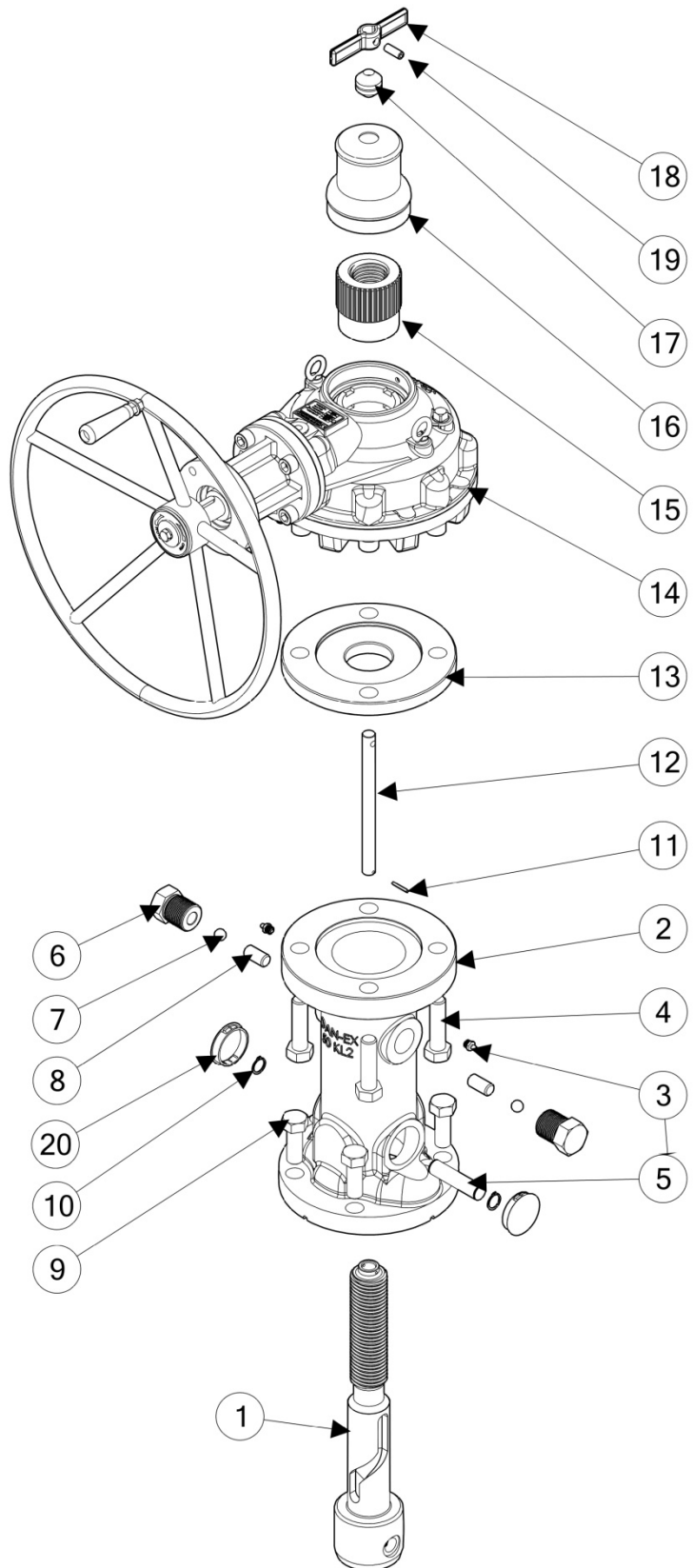
10KL Operator Used On:					
3"	150	271	4"	600	275
3"	300	273	4"	900	276
3"	600	275	6"	150	271A
4"	150	271	8"	150	271A
4"	300	273			



DAN-EX 50KL2 Operator

BOM ID	Description	Qty
1	CAM SHAFT	1
2	OPERATOR HOUSING	1
3	GREASE FITTING	2
4	H/H CAP SCREW 3/4"-10 X 2-3/4"	4
5	TRUNNION PIN	1
6	CAM FOLLOWER HOUSING	2
7	STEEL BALL	2
8	DOWEL PIN	2
9	H/H CAP SCREW 3/4"-10 X 2"	4
10	RETAINER RING	2
11	PIN SPRING	1
12	INDICATOR ROD	1
13	SPACER PLATE	1
14	GEAR	1
15	STEM NUT	1
16	STEM PROTECTOR	1
17	GROMMET	1
18	INDICATOR FLAG	1
19	SET SCREW	1
20	LOCK PLUG	2

50KL2 Operator Used On:					
6"	300	273	12"	150	271
6"	600	275	12"	300	273
6"	900	276	14"	150	271
8"	300	273	14"	300	273
8"	600	275	16"	150	271
8"	900	276	18"	150	271
10"	150	271	20"	150	271
10"	300	273			



Gear operator Orientation change for 10KL and 50KL2

If the gear orientation needs to be changed in the field then it can be done using the following steps:

1. Close the DAN-EX valve.
2. Once the closed position is achieved you may remove bolts #4 that hold the gear and the operator housing together.
3. Turn the handwheel in the clockwise direction in order to achieve desired handwheel orientation; be sure the tapped holes in the gear line up with the thru holes in the operator housing once the desired handwheel orientation has been established.
4. Replace bolts that were previously removed to secure the gear to the operator housing. *It is recommended to use anti-seize on the bolts before reinstallation.*
5. This is the same procedure for automated valve other than the electrical must be accounted for in rotation and the limit switches must be reset on the actuator or damage may occur, see actuator setting instructions.

10KL & 50KL2 Operator inspection

Cam follower #6, cam pin #8, and camshaft #1 inspection

This can be performed with the valve in the open or closed position.

Do not operate the valve with the cam followers removed as this will cause the camshaft to be misaligned with the operator housing.

Remove the cam followers #6 and check for damage on them and the cam pin #8. The cam pin #8 should fit in the cam follower #8 with a very close fit when the cam pin #8 is removed from the cam follower #6, it should pull a vacuum on the pin as it is removed. If the cam follower hole is damaged or the cam pin is damaged they need to be replaced. The camshaft #1 should also be inspected for any damage on the slot through the cam follower hole for any damage to the slot.

If no damage is found reinstall the cam followers.

Use the (2) grease ports on the side of the operator housing, above the cam followers, to add grease to the operator housing based on the amount of grease that was present during the inspection of the cam followers; a determination of how much grease should be added. Over greasing the operator housing will not damage the operation of the valve, but it could lead to grease running down the camshaft and out from under the operator housing over time and appear to be a leaking packing gland.

Gear maintenance

The only maintenance required for the gear is greasing. The gear is sealed so very little grease is required. A small amount added will ensure that all the internal parts are coated and help displace any condensation that might be present.

Actuator setting instructions for 5K, 10KL, and 50KL2

The following steps set the limit switch and torque to ensure proper actuator operation.

NOTE: limit and torque switches are factory set on new valves and do not need to be adjusted unless some modification to the orientation has been made.

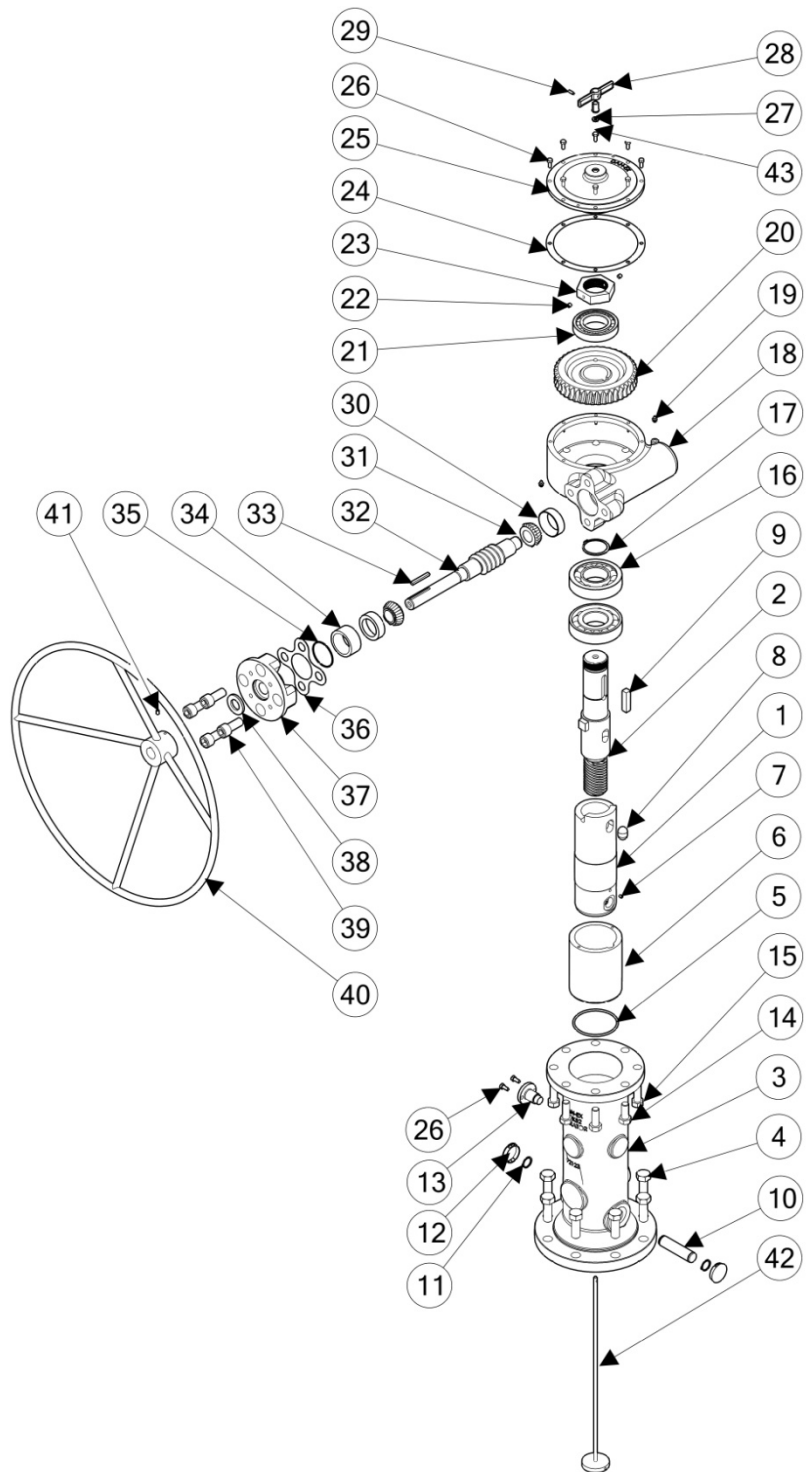
Before making any adjustments be sure that you are familiar with the operation of the actuator that is installed as damage can occur if improperly set.

1. Using the actuators manual override place the declutch lever in manual, rotate the handwheel in the open direction counter-clockwise until it stops with normal force to the handwheel no mechanical advantage is needed to achieve this.
2. Using the manual override rotate the handwheel clockwise closing the valve by making several handwheel turns. There is no exact number for turns to make as there are many different handwheel gear ratios from actuator manufactures and depending on if the actuator is top mounted on the operator or if side mounted on a gear. This is to leave enough room for the effects of inertia that the actuator will have once the limit is tripped during normal operation, so close the valve enough that there will not be a problem running the valve too far open. This may take a few tries to get open limit set properly but this is very important as over opening the valve will cause damage to the operator.
3. Set the actuator open torque switch to its lowest setting. *See actuator manufacturer's instructions*
4. Set the open limit switch on the actuator. *See actuator manufacturers limit setting procedures*
5. Set the close torque switch to the lowest setting. *See actuator manufacturer's instructions*
6. Put the actuator into local operation and close the valve electrically.
7. Using the actuators manual override place the declutch lever in manual and rotate the handwheel counter-clockwise 1 or 2 turns.
8. Set the closed limit switch. *See actuator manufacturers limit setting procedures*
9. Open the valve electrically being ready on the stop button as you do not want to torque the valve open.
10. Place the actuator into manual override and turn the handwheel counter-clockwise. If you are unable to rotate the handwheel or move it less than half a turn repeat steps 3 – 7 adding turns as in step 2. Once you can rotate the override handwheel half a turn proceed to step 11. Care must be taken not to over travel the operator in the open direction as it will damage the operator; you never want to allow the actuator to torque in the open position.
11. The closed torque switch may need to be adjusted to a higher setting depending on operational conditions. It is always a good practice to set the closed torque switch based on the operating conditions vs setting it based on published torque of the valve as the published torque is for max differential pressure plus safety factors. Setting a torque switch based on valve published torque can lead to unnecessary wear and tear on the operator and the actuator that is not required for operation of the valve.
12. Set the open torque switch to one above the closed torque switch setting, all actuator manufacturers are different. *See actuator manufacturer's instructions*

DAN-EX 100KS2 Operator

BOM ID	Description	Qty
1	LOWER STEM	1
2	UPPER STEM	1
3	OPERATOR HOUSING	1
4	H/H CAP SCREW 7/8"-9 X 2-1/2"	8
5	OPERATOR HOUSING O-RING	1
6	ROLLER GUIDE SLEEVE	1
7	LOWER STEM SET SCREW	1
8	ROLLER	1
9	UPPER STEM KEY	1
10	TRUNNION PIN	1
11	RETAINING RING	2
12	LOCK PLUG	2
13	GUIDE PIN	1
14	H/H CAP SCREW 3/4"-10 X 1-3/4"	1
15	H/H CAP SCREW 3/4"-10 X 2"	7
16	UPPER STEM BALL BEARING	2
17	UPPER STEM RETAINING RING	1
18	GEAR HOUSING	1
19	GREASE FITTING	2
20	WORM GEAR	1
21	WORM GEAR BALL BEARING	1
22	BEARING NUT SET SCREW	2
23	BEARING NUT	1
24	COVER GASKET	1
25	GEAR HOUSING COVER	1
26	H/H CAP SCREW 5/16"-18 X 3/4"	10
27	INDICATOR FLAG BUSHING	1
28	INDICATOR FLAG	1
29	S/H SET SCREW-HALF DOG	1
30	BEARING CUP	2
31	BEARING CONE	2
32	WORM SHAFT	1
33	GEAR SHAFT KEY	1
34	SPACER	1
35	GEAR SHAFT O-RING	1
36	ADAPTER SHIM	1
37	ADAPTER FLANGE	1
38	GEAR SHAFT OIL SEAL	1
39	S/H CAP SCREW 7/8"-9 X 2"	4
40	HANDWHEEL	1
41	SET SCREW 1/4"-20 X 3/8"	1
42	INDICATOR ROD	1
43	COVER OIL SEAL	1

100KS2 Operator Used On:					
10"	600	205	20"	150	201
12"	600	295	20"	150	291
16"	150	201	24"	150	271
16"	300	273	24"	150	291
18"	300	273			



100KS2 OPERATOR DIS-ASSEMBLY

1. Remove setscrew #29 and remove indicator flag #28
2. Unbolt and remove gear housing cover #25 and gasket #24
3. Remove #22 bearing nut setscrew (2)
4. Remove #23 bearing nut
5. Remove #21 worm gear bearing
6. Remove setscrew# 41, handwheel #40 and key #33
7. Unbolt and remove adapter flange #37 (keep shims #36)
8. Remove worm shaft #32 by unscrewing counter-clockwise, spacer #34 front bearing cup #30 and bearing #31 will come out with worm shaft. Rear bearing and cup can be removed from the gear housing once gear #20 has been removed.
9. Remove worm gear #20 and key #9 There are (2) ½-13 tapped holes to assist in removal of the gear
10. Unbolt and remove the gear housing #18
11. Remove retaining ring #17
12. Unbolt and remove guide pin #13
13. Pull the upper stem #2 out of the operator housing #3 with the lower stem #1, roller #8, bearings #16 and indicator rod #42. Take care when removing not to allow the lower stem to unscrew from the upper stem or drop the roller.
14. Remove the setscrew #7 and remove the indicator rod #42 from the lower stem.
15. Unscrew the upper stem #2 from the lower stem #1
16. Remove bearings #16 from upper stem #2
17. If needed the roller guide sleeve #6 can be removed from the operator housing #3 there are (2) 5/16"- 18 tapped holes in the top of the roller guide sleeve that will assist in removal.
18. Remove O-ring #5 from operator housing #3

100KS2 OPERATOR ASSEMBLY

1. Apply a liberal amount of grease to the surfaces of the upper stem especially to the threads.
2. Thread the upper stem#2 into the lower stem#1 in such a way that the upper stems stop pin comes into contact with the shoulder of the lower stem see **Fig 1** and that the roller recess and roller opening in the lower stem are perfectly in line see **Fig 2**. This may take several attempts as they have multi-start threads.
3. Pack the bearing #16 with grease
4. Install the bearing #16 on the upper stem #2. **WARNING: The bearings are radial thrust type and must be installed with the widest surface of the inner race back to back. INCORRECT INSTALLATION WILL RESULT IN BEARING FAILURE AND SERIOUS OPERATOR DAMAGE See Fig. 3**
5. Install the bearing retaining ring #17
6. Install the indicator rod # 42 into the lower stem #1
7. Install the setscrew #7 into the lower stem#1
8. Install the O-ring #5 in the operator housing #3
9. Install the roller guide sleeve #6 in the operator housing #3 ensure that the tapped holes are facing up when installing the roller guides sleeve and that the guide pin hole in the roller guide sleeve is aligned with the guide pin hole in the operator housing. Check the alignment of the roller guide sleeve#6 with the operator housing #3 by installing the guide pin#13 into the operator housing #3. Then remove the guide pin#13
10. Place the roller#8 into the slot in the lower stem#1. Adding extras grease to the roller and the lower stem will help hold the roller in place for assembly.

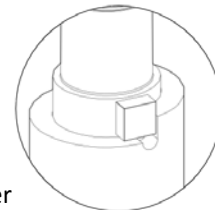
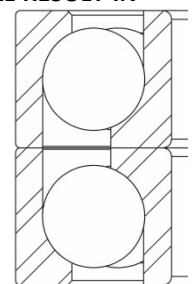

FIG. 1

FIG. 2

Fig. 3



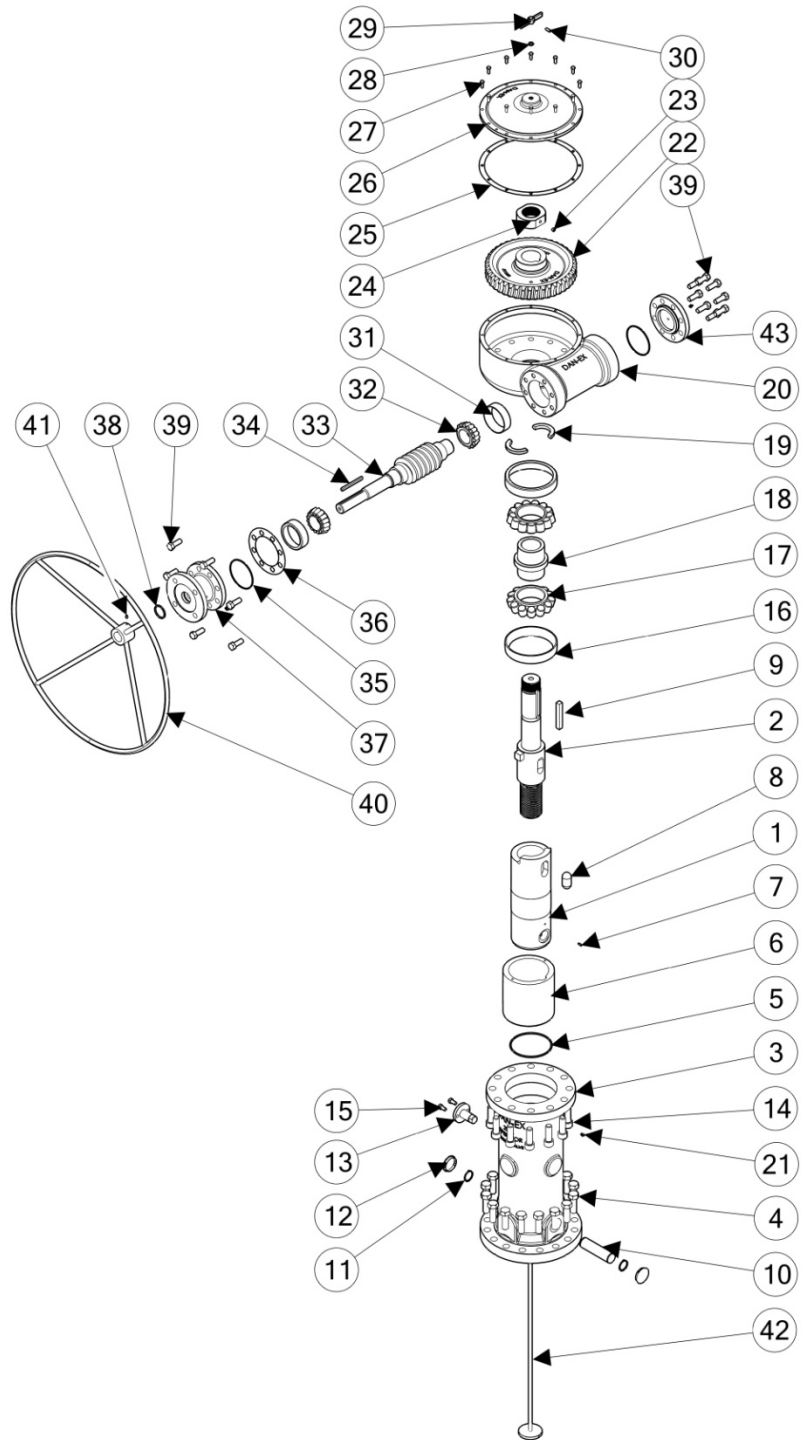
11. Place the stem assembly into the operator housing #3 Make sure the roller is aligned with the groove in the roller guide sleeve #6 then push the assembly down until the bearing #16 rests on the roller guide sleeve #6. Take care when lifting the stem assembly as the lower stem may try to unscrew from the upper stem.
12. Apply Permatex Form-A-Gasket or an industrial grade silicone evenly to the operator housing surface where the guide pin will be installed.
13. Install guide pin #13 in the operator housing #3 making sure it is fully engaged in the slot in the lower stem and fasten with cap screws #26
14. Install key #9 in the upper stem #2
15. Install tapered roller bearing cup #30 in the rear bearing area of gear housing #18 with the large diameter of taper facing out.
16. Install tapered roller bearing cone #31 on both ends of the worm shaft #32 and cup #30 on the handwheel end.
17. Install worm shaft #32 in gear housing #3 Make certain that rear bearing cone #31 is seated in the cup #30
18. Install oil seal #38 in adapter flange #37
19. Install adapter flange #37 on gear housing #18 making sure to install the adapter shims #36 between adapter flange and housing.
20. Install worm gear #20 into gear housing #18 with the hub facing down.
21. Apply thin film of Form-A-Gasket or industrial grade silicone to the top flange of the operator housing #3
22. Install the gear housing #18 with assembled parts on top of the operator housing #3 guiding the worm gear onto the shaft and over the key #9 in the upper stem #2
23. Install the worm gear ball bearing #21 on the upper stem #2 and bearing nut #23
24. Tighten bearing nut #23 and install setscrews #22 (do not over tighten bearing lock nut #23 bring to hand tight and then a ¼ turn)
25. Bolt gear housing #18 to the operator housing#3 using capscerws #14 and #15 NOTE: ensure that capscREW#15 is installed under the center of worm shaft #32
26. Fill gear housing #18 with grease to the top of the worm gear #20
27. Install cover oil seal #43 in gear housing cover #25
28. Apply grease to gasket #24 and to gear housing cover #25 where gasket sits.
29. Install cover by sliding over indicator rod #42 and worm gear bearing #21 and secure with capscREWS #26
30. Install indicator flag #28 and secure with setscrew #29
31. Install handwheel # 40 and secure with setscrew #41

DAN-EX 250K Operator

BOM ID	Description	Qty
1	LOWER STEM	1
2	UPPER STEM	1
3	OPERATOR HOUSING	1
4	H/H CAP SCREW 1"-8 X 3"	16
5	OPERATOR HOUSING O-RING	1
6	ROLLER GUIDE SLEEVE	1
7	LOWER STEM SET SCREW	1
8	ROLLER	1
9	UPPER STEM KEY	1
10	TRUNNION PIN	1
11	RETAINER RING	2
12	LOCK PLUG	2
13	GUIDE PIN	1
14	S/H CAP SCREW 1"-8 X 3"	12
15	H/H CAP SCREW 1/2"-13 X 1"	2
16	STEM BEARING CUP	2
17	STEM BEARING CONE	2
18	BEARING CARRIER	1
19	STEM COLLAR	2
20	GEAR HOUSING	1
21	GREASE FITTING	3
22	WORM GEAR	1
23	BEARING NUT SET SCREW	1
24	BEARING NUT	1
25	COVER GASKET	1
26	GEAR HOUSING COVER	1
27	H/H CAP SCREW 3/8"-16 X 1"	12
28	GEAR HOUSING O-RING	1
29	INDICATOR FLAG	1
30	SET SCREW	1
31	WORM BEARING CUP	2
32	WORM BEARING CONE	2
33	WORM SHAFT	1
34	GEAR SHAFT KEY	1
35	COVER PLATE O-RING	2
36	ADAPTER SHIM	1
37	ADAPTER FLANGE	1
38	GEAR SHAFT O-RING	1
39	H/H CAP SCREW 3/4"-10 X 2"	16
40	HANDWHEEL	1
41	SET SCREW 5/16"-18 X 1/2"	1
42	INDICATOR ROD	1
43	COVER PLATE	1

250K Operator Used On:

12"	600	205	16"	600	295
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250K OPERATOR DIS-ASSEMBLY

19. Remove setscrew #30 and remove indicator flag #29
20. Unbolt and remove gear housing cover #26 & gasket #25
21. Remove #23 bearing nut setscrew (2)
22. Remove #24 bearing nut
23. Remove #22 worm gear bearing
24. Remove setscrew# 41, handwheel #40 and key #34
25. Unbolt and remove adapter flange #37 (keep shims #36)
26. Remove O-ring #25 from adapter flange #37
27. Remove worm shaft #33 by unscrewing counter-clockwise, front bearing cup #33 and bearing #32 will come out with worm shaft.
28. Remove worm gear #22 and key #9 There are (2) ½-13 tapped holes to assist in removal of the gear
29. Unbolt and remove the cover plate #43 and O-ring #35
30. Remove bearing cup #31 from gear housing #20
31. Unbolt and remove the gear housing #20
32. Remove stem collar #19
33. Unbolt and remove guide pin #13
34. Pull the upper stem #2 out of the operator housing#3 with the lower stem #1, roller #8, bearings #17bearing carrier #18 and indicator rod #42. Take care when removing not to allow the lower stem to unscrew from the upper stem or drop the roller.
35. Remove the setscrew #7 and remove the indicator rod #42 from the lower stem.
36. Unscrew the upper stem #2 from the lower stem #1
37. Remove cup #16, bearings #17 and bearing carrier #18 from upper stem #2
38. Remove bearing cup #16 from operator housing #3
39. If needed the roller guide sleeve #6 can be removed from the operator housing #3 there are (2) 3/8"- 16 tapped holes in the top of the roller guide sleeve that will assist in removal.
40. Remove O-ring #5 from operator housing #3

250K OPERATOR ASSEMBLY

32. Apply a liberal amount of grease to the surfaces of the upper stem #2 especially to the threads.
33. Thread the upper stem #2 into the lower stem #1 in such a way that the upper stems stop pin comes into contact with the shoulder of the lower stem see **Fig 1** and that the roller recess and roller opening in the lower stem are perfectly in line see **Fig 2**. This may take several attempts as they have multi-start threads.
34. Pack the bearing #17 with grease
35. Install the bearing#17 on the bearing carrier #18 NOTE: the wide part of the bearing go toward the bearing carrier.
36. Install the bearing carrier #18 with installed bearing on the upper stem #2 NOTE: the word top is stamped on the bearing carrier this side must be installed up, on the upper stem.
37. Install stem collar #19 on upper stem #2
38. Install the indicator rod # 42 into the lower stem #1
39. Install the setscrew #7 into the lower stem#1 to attach indicator rod #42 NOTE line up hole in indicator rod #42 base with hole in lower stem #1
40. Install the O-ring #5 in the operator housing #3
41. Install the roller guide sleeve #6 in the operator housing #3 ensure that the tapped holes are facing up when being installed and that the guide pin hole in the roller guide sleeve is aligned with the guide pin hole in the

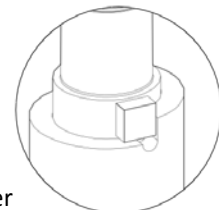


FIG. 1



FIG. 2



- operator housing. Check the alignment of the roller guide sleeve#6 with the operator housing #3 by installing the guide pin#13 into the operator housing #3. Then remove the guide pin#13
42. Install bearing cup #16 in operator housing #3
 43. Place the roller#8 into the slot in the lower stem#1. Adding extras grease to the roller and the lower stem will help hold the roller in place for assembly.
 44. Place the stem assembly into the operator housing #3 Make sure the roller is aligned with the groove in the roller guide sleeve #6 then push the assembly down until the bearing #17 rests in the bearing cup #16. Take care when lifting the stem assembly as the lower stem may try to unscrew from the upper stem.
 45. Apply Permatex Form-A-Gasket or an industrial grade silicone evenly to the operator housing surface where the guide pin will be installed.
 46. Install guide pin #13 in the operator housing #3 making sure it is fully engaged in the slot in the lower stem and fasten with cap screws #15
 47. Install key #9 in the upper stem #2
 48. Install tapered roller bearing cup #31 in the rear bearing area of gear housing #20 with the large diameter of taper facing inward to gear housing.
 49. Install O-ring #35 in cover plate #43
 50. Install cover plate #43 on gear housing and secure with capscrews #39
 51. Install tapered roller bearing cone #32 on both ends of the worm shaft #33 and cup #31 on the handwheel end.
 52. Install worm shaft #33 in gear housing #3 Make certain that rear bearing cone #32 is seated in the cup #31
 53. Install O-ring #35 and 38 in adapter flange #37
 54. Install adapter flange #37 on gear housing #20 making sure to install the adapter shims #36 between adapter flange and housing.
 55. Install worm gear #22 into gear housing #20 with the hub facing down.
 56. Apply thin film of Form-A-Gasket or industrial grade silicone to the top flange of the operator housing #3
 57. Install the gear housing #20 with assembled parts on top of the operator housing #3 guiding the worm gear onto the shaft and over the key #9 in the upper stem #2 ensure that that stem collar #19 is in place and has not slipped out.
 58. Install bearing nut #24
 59. Tighten bearing nut #24 and install setscrew #23 (do not over tighten bearing lock nut #23 bring to hand tight and then a ¼ turn)
 60. Bolt gear housing #20 to the operator housing #3 using capscrews #14
 61. Fill gear housing #20 with grease to the top of the worm gear #22
 62. Install O-ring #28 in gear housing cover #26
 63. Apply grease to gasket #25 and to gear housing cover #26 where gasket sits.
 64. Install cover by sliding over indicator rod #42 and secure with capscrews #27
 65. Install indicator flag #29 and secure with setscrew #30
 66. Install handwheel # 40 and secure with setscrew #41

Gear operator Orientation change for 100KS2 and 250K

Gear orientation can be changed in the field using the following steps:

1. Open the DAN-EX valve.
2. Remove cap screws #14 & #15 Note capscREW#15 is shorter than the other capscREW and must be replaced under in the hole under the worm shaft (100KS2 only)
3. Rotate the handwheel in the clockwise (open) direction until the desired orientation is achieved. DO NOT rotate the handwheel in the counter-clockwise (close) direction as this will unscrew the stem set losing their timing and require the operator to be completely disassembled to reset the stems to the proper timing.
4. Replace cap screws #14 and #15 remember that the #15 capscREW must be replaced in the hole under the worm shaft. (100KS2 only)

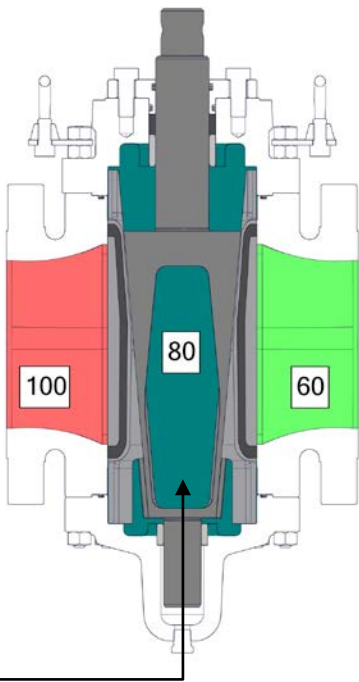
Actuator setting instructions on 100KS2 and 250K operator

NOTE: limit and torque switches are factory set and do not need to be adjusted unless an orientation change has been made or actuator removed.

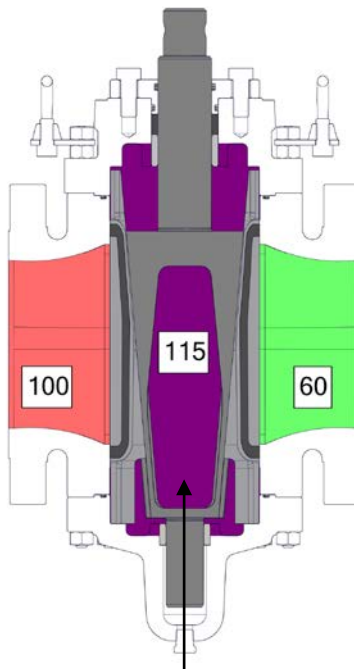
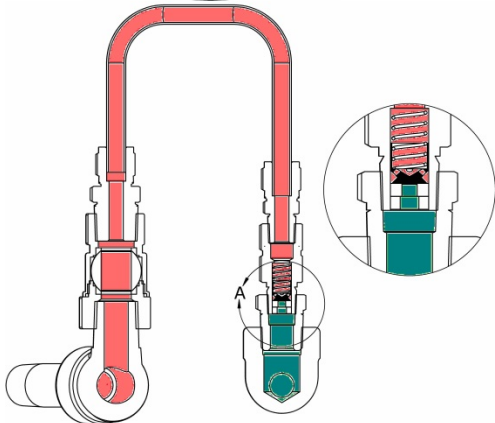
Before making any adjustments be sure that you are familiar with the operation of the actuator that is installed as damage can occur if improperly set.

1. Using the actuators manual override place the declutch lever in manual and rotate the handwheel in the open direction (counter-clockwise) until it stops with normal force to the handwheel, no mechanical advantage is needed to achieve this.
2. Using the manual override rotate the handwheel clockwise closing the valve by making 60 handwheel turns. This is to leave enough room for the effects of inertia that the actuator will have once the limit is tripped during normal operation.
3. Set the actuator open torque switch to its lowest setting. *See actuator manufacturer's instructions*
4. Set the open limit switch on the actuator. *See actuator manufacturers limit setting procedures*
5. Set the close torque switch to the lowest setting. *See actuator manufacturer's instructions*
6. Put the actuator into local operation and close the valve electrically.
7. Using the actuators manual override place the declutch lever in manual and rotate the handwheel counter-clockwise 10 turns.
8. Set the closed limit switch. *See actuator manufacturers limit setting procedures*
9. Open the valve electrically being ready on the stop button as you do not want to torque the valve open.
10. Place the actuator into manual override and turn the handwheel counter-clockwise. If you are unable to rotate the handwheel or move it less than one full turn then repeat steps 3 – 7 adding 5 turns to the 60 turns stated in step 2. Once you can rotate the override handwheel one full turn then proceed to step 11. Care must be taken not to over travel the operator in the open direction as it will damage the operator; you never want to allow the actuator to torque in the open position.
11. The closed torque switch may need to be adjusted to a higher setting depending on operational conditions. It is always a good practice to set the closed torque switch based on the operating conditions vs setting it based on published torque of the valve as the published torque is for max differential pressure plus safety factors. Setting a torque switch based on valve published torque can lead to undue wear and tear on the operator and the actuator that is not required for operation of the valve.
12. Set the open torque switch to one above the closed torque switch setting, all actuator manufacturers are different. *See actuator manufacturer's instructions*

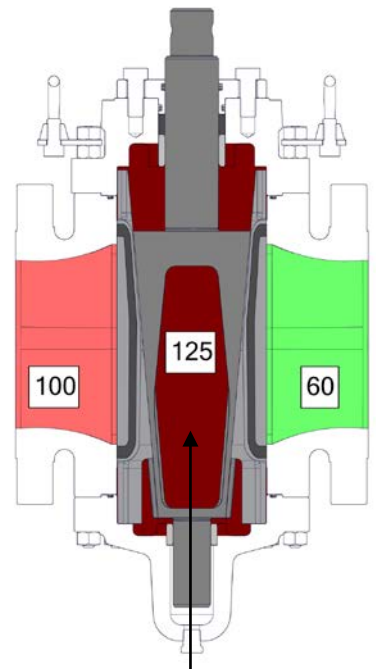
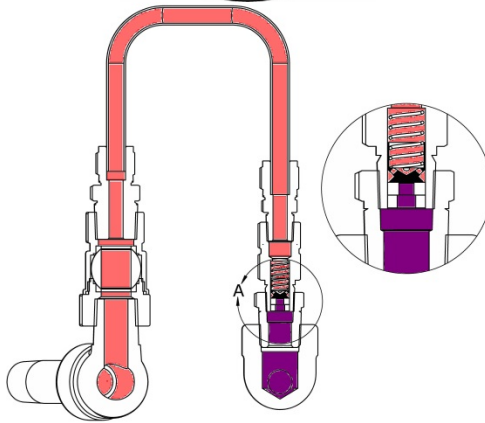
DTR EXPLANATION



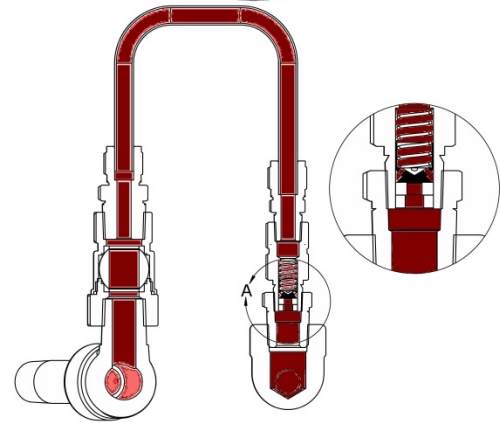
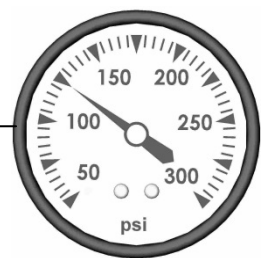
Valve after being closed



Body pressure increase due to thermal expansion



Body pressure rises to 125 psi.
Any rise above this will be relieved to the upstream port by 25 psi differential relief valve.





NOTES



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