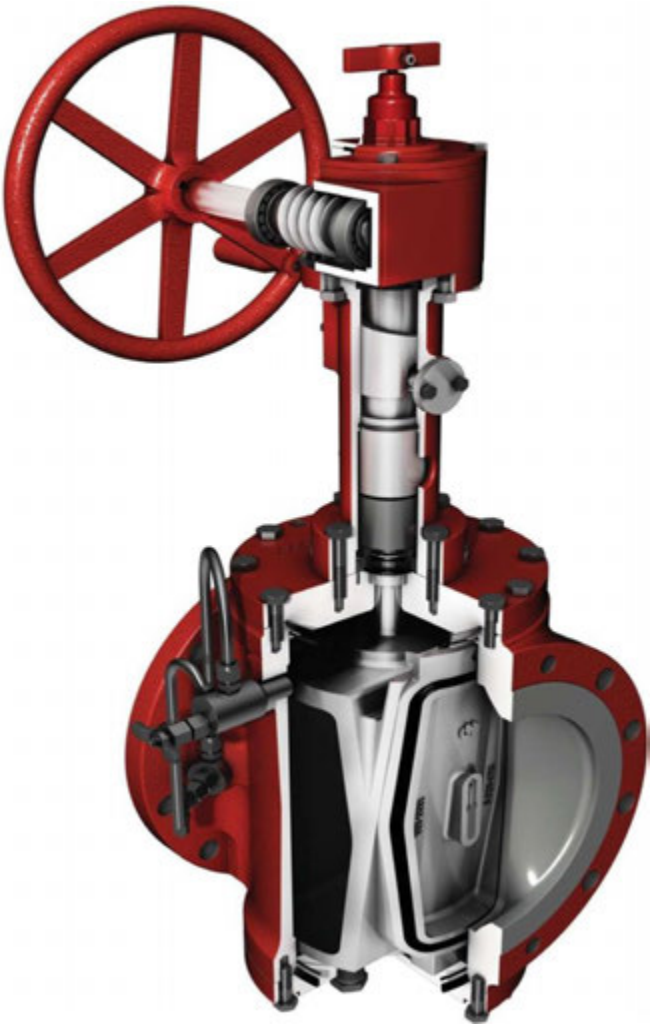
CAMERON

ENGINEERED & PROCESS VALVES

Installation, Operation and Maintenance Manual

GENERAL VALVE® Twin Seal™ Double Block and Bleed Plug Valve



GENERAL VALVE®

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TABLE OF CONTENTS

GENERAL VALVE® TWIN SEAL™

Installation....4
Operation....5
Series 400, 800 & 900
Integral Bushing/Retained Ring Gland....6
Integral Bushing/Bolted Gland....6
Bushings/One Gland....7
Bushings/Two Gland....7
Bearings/Duel Retention....8
Bearings/Internally & Externally Retained....9
Bearings/Internal Retained with Two Glands....9
Series 8800....10
Operators
Model 375H....11
Model 500H & 625H....12
Model 376G & 501G....14
Model 625G & 751G & 755G....17
Model 1261G & 1261-7G....20
Model 1276G....23
Model 1500G....26
Bleeds
The DTR System Explained....29
Miscellaneous
Operation & Maintenance....31
Parts....31
Lifting and handling guidelines....32

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INSTALLATION

Orientation
Twin Seal valves may be installed in any position.

Flow Direction
The Twin Seal design is symmetrical. Flow shut-off is achieved equally on both sides of the plug independent of flow direction.

Note: The use of a Differential Thermal Relief (DTR) as described on page 29 does result in a preferred flow direction.

Clearance for Repair
For easy repair, space should be allowed below the valve for removal of the lower plate and withdrawal of the seating slips. See Table 1 for dimensions. Sufficient clear space is required above the Twin Seal valve, to allow free movement of the position indicator flag and for removal of the operator mechanism.

TABLE 1
Clearance required below standard ported valves for slip removal.

Minimum Clearance				
Valve Size Inch	ASME Class 150	ASME Class 300	ASME Class 600	ASME Class 900
6”	9”	9”	10”	8”
8”	13”	11”	12”	10”
10”	15”	13”	8”	10”
12”	17”	16”	10”	10”
14”	19”	15”	10”	xxxx
16”	22”	19”	14”	xxxx
18”	23”	13”	xxxx	xxxx
20”	26”	14”	14”	xxxx
24”	28”	17”	12”	xxxx
28”	30”	12”	xxxx	xxxx
30”	30”	28”	xxxx	xxxx
36”	30”	xxxx	xxxx	xxxx

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

Flange Fasteners
Certain Twin Seal flange holes are drilled and tapped, when there is no possibility of fitting a hexagonal nut behind the flange. The quantity and size of these tapped holes is shown in Table 2. Capscrews or stud bolts may be used in these holes.

TABLE 2

Valve Size (inch)	ASME Class 150	Number of Tapped Holes per Flange	Thread UNC	Length Required (inch)	
				Cap Screws	or Stud Bolts
6	150	4	3/4”-10	2 1/4	3 1/4
8	150	4	3/4”-10	2 1/4	3 1/4
8	300	4	7/8”-9	3	4 1/4
10	150	4	7/8”-9	2 1/4	3 1/4
10	300	4	1”-8	3	4 1/4
12	150	4	7/8”-9	2 1/4	3 1/2
12	300	4	1 1/8”-8	3 1/2	5
14	150	8	1”-8	2 1/2	4
14	600	4	1 3/8”-8	3 3/4	4 3/4
16	150	8	1”-8	2 1/2	3 3/4
16	300	8	1 1/4”-7	3 1/2	7 1/2
18	150	8	1 1/8”-8	3	4 1/4
20	150	8	1 1/8”-8	3	4 1/2
24	150	8	1 1/4”-8	3 1/4	4 3/4
24	600	8	1 7/8”-8	5 1/4	6 3/4
26	150	8	3/4”-10	3	5 3/4
28	150	6	1 1/4”-8	3 1/4	4 1/2
28	300	6	1 1/4”-8	3 1/4	4 1/2
30	150	6	1 1/4”-8	3 1/4	4 1/2

Gear Housing Orientation
On gear-operated models the gear housing and associated hand wheel may be re-positioned as follows:

A) Place valve in fully open position.

B) Remove gear housing capscrews.

C) Turn hand wheel to further open the valve which will turn the gear housing. Continue until hand wheel comes to the desired position and gear housing mounting holes are aligned.

D) Replace gear housing mounting capscrews. NB: Short capscrew is inserted below the worm shaft.

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Pressure Test
Twin Seal valves can be hydrostatically pressure-tested after installation, to full API 6D limits per Table 3 below.

Table 3

Valve figure No.	C411; C811; C911; 8811; C1611; C1500		C421; C821; C921; 8821; C1621; C1521	C441; C841; C941; C1641; C1541	C851; C1651; C1551	Comments
ASME Class	150		300	600	900	
Shell Test Pressure (Valve Open)	(pisg) (kg/cm^2)	500 35	1200 85	2250 158	3350 235	No leakage permitted
Seat Test Pressure (Valve Closed)	(psig) (kg/cm^2)	300 21	800 56	1600 113	2400 168	Test upstream & downstream seats. No leakage permitted
Supplimentary (API 598) Air Seat Test Pressure (Vavle Closed)	(psig) (kg/cm^2)	80 6	80 6	80 6	80 6	Test upstream & downstream seats. No leakage permitted

OPERATION

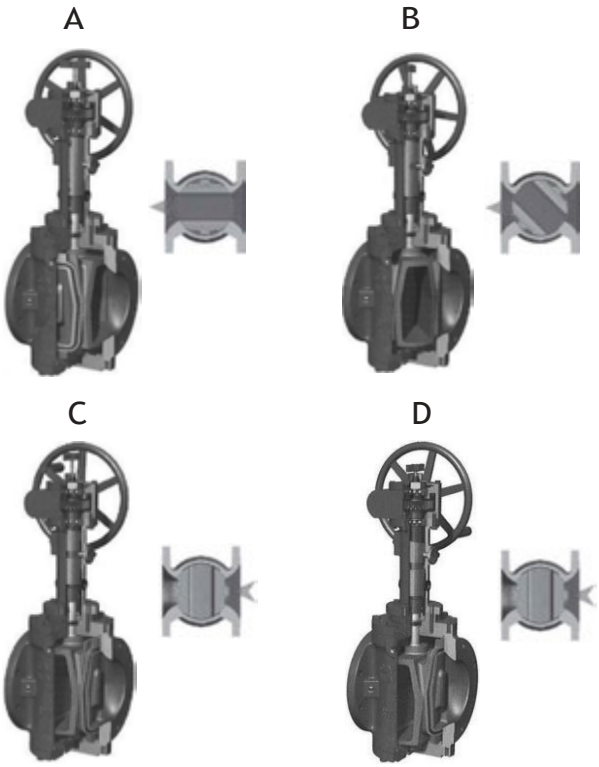
The Twin Seal valve is a non-lubricated, resilient seal, plug-type valve which has a mechanical means of freeing the plug before it is rotated from the closed to the open position. In opening the valve, the plug is raised, thus retracting the seating segments or slips through their tapered dovetail connections. Only after the slips are fully retracted perpendicularly from the body seat is the plug rotated to the open position.

Conversely, in closing the valve, the plug and slips are rotated freely, with no seal-to-body contact until the slips are positioned over the ports. Then the plug is driven down between the slips and the tapered surfaces wedge out the slips for a positive upstream as well as downstream shut-off. For maximum upstream sealing, do not back off the hand wheel. Warning: Do not over torque by using cheater bars.

The small Twin Seal valves are handwheel operated, and require up to 3 turns to open or close. Up to 2 3/4 turns expand or retract the slips, while 1/4 turn rotates the plug. Large valves operate in a similar manner, except that they have enclosed weather-proof worm gearing.

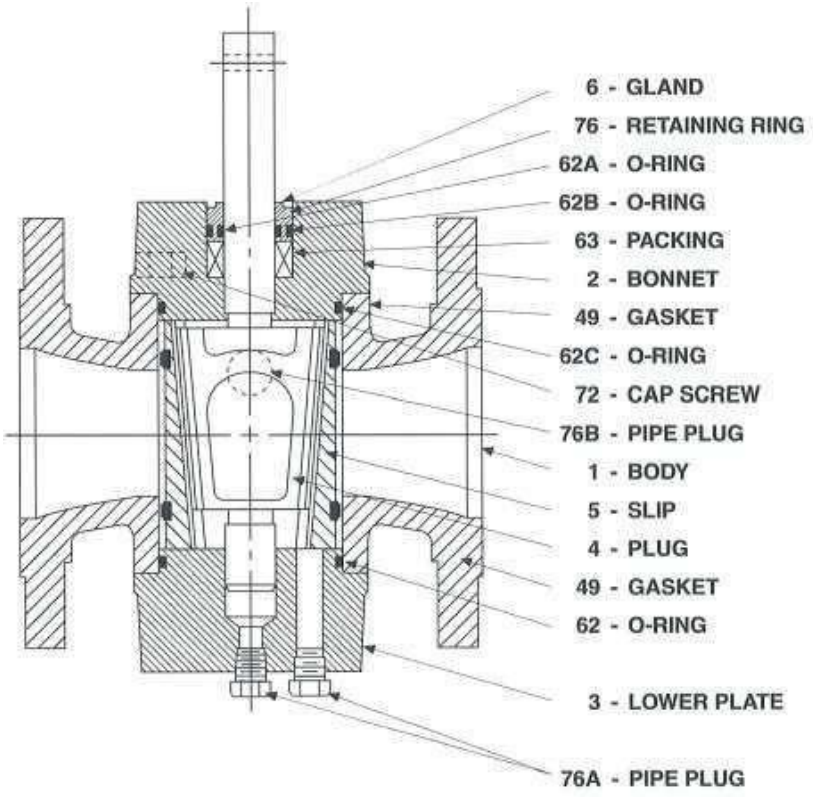
At the top of the valve, a position indicator flag shows the exact plug position. It appears in line with the flow when the valve is open, and perpendicular to the flow when the valve is closed.

Since Twin Seal valves hold bubble-tight, for ease of opening in liquid service, it is important to prevent trapped body pressure from exceeding the working pressure of the valve. Therefore, a relief system is required to prevent pressure buildup in the body cavity.



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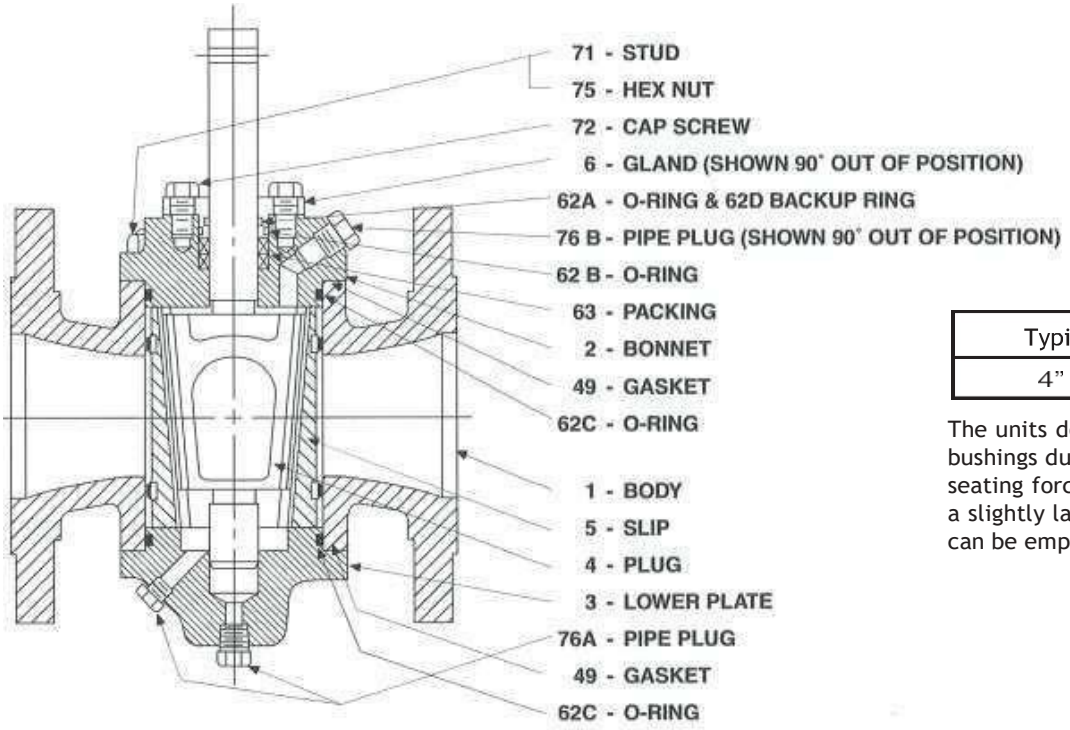
INTEGRAL BUSHING/RETAINING RING GLAND



Typical Arrangement of:	
2”	C811
2”	C821
3”	CA811
3”	CA821

The smallest of the Twin Seal valves do not require discrete bushings due to minimal hydro seating forces within the valve. Also note that due to the size of the operator, the gland is held in by a retaining ring backed up by the operator housing.

INTEGRAL BUSHING/BOLTED GLAND

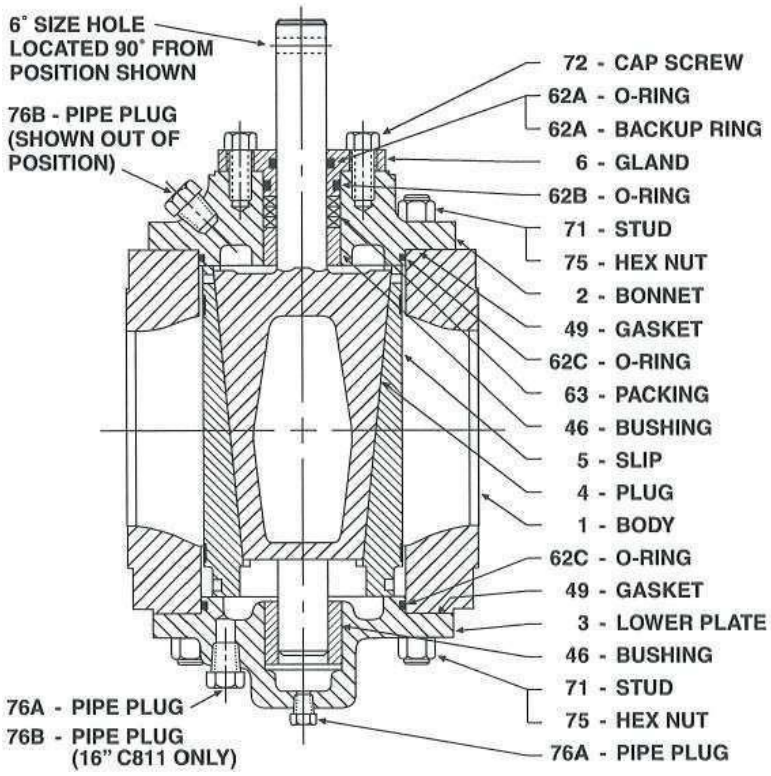


Typical Arrangement of:	
4”	C811

The units do not require discrete bushings due to small hydro seating forces and by incorporating a slightly larger operator a bolt gland can be employed.

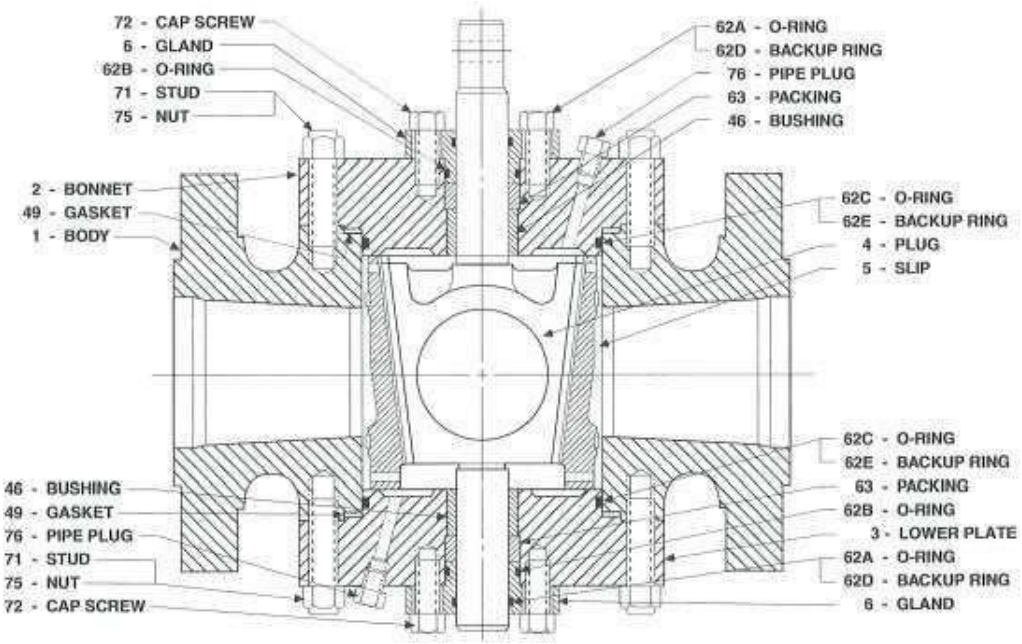
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BUSHINGS/ONE GLAND



Typical Arrangement of:					
2”	C841	6”	C911	12”	C811
2”	C851	6”	C921	12”	C821
2”	C861	6”	C941	12”	A1911
2”	C911	8”	C411	12”	C921
2”	C921	8”	C421	14”	C811
2”	C941	8”	C811	14”	C821
3”	C841	8”	C821	14”	C911
3”	C911	8”	C841	16”	C411
4”	C821	8”	C911	16”	C811
4”	C841	8”	C921	16”	C821
4”	C911	10”	C411	16”	C911/21
4”	C921	10”	C421	18”	C411
4”	C941	10”	CA811	18”	C811
6”	C411	10”	C821	20”	C411
6”	C421	10”	C911	20”	C421
6”	C821	10”	C921	20”	CA811
6”	C841	12”	C411	24”	C411
6”	CA811	12”	C421	24”	C421

BUSHINGS/TWO GLAND

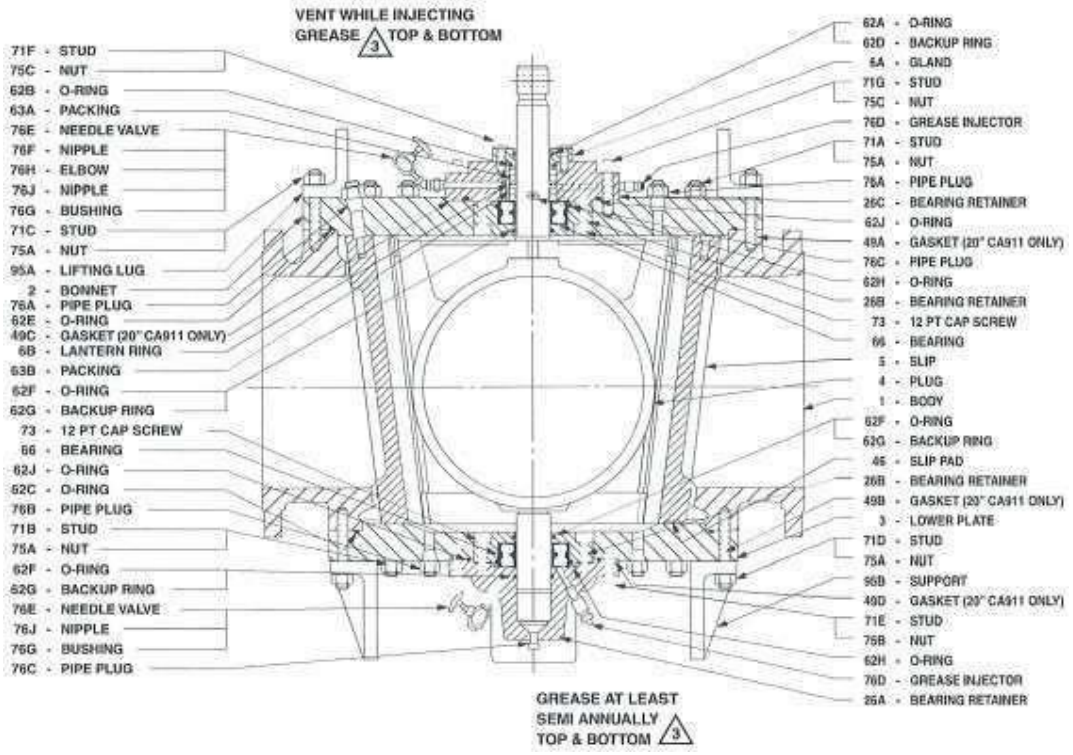


Typical Arrangement of:	
3”	C851
3”	C861
4”	C851
6”	C851

Higher pressure class valves employ the balanced plug design to minimize plug hydro forces which in turn requires two glands.

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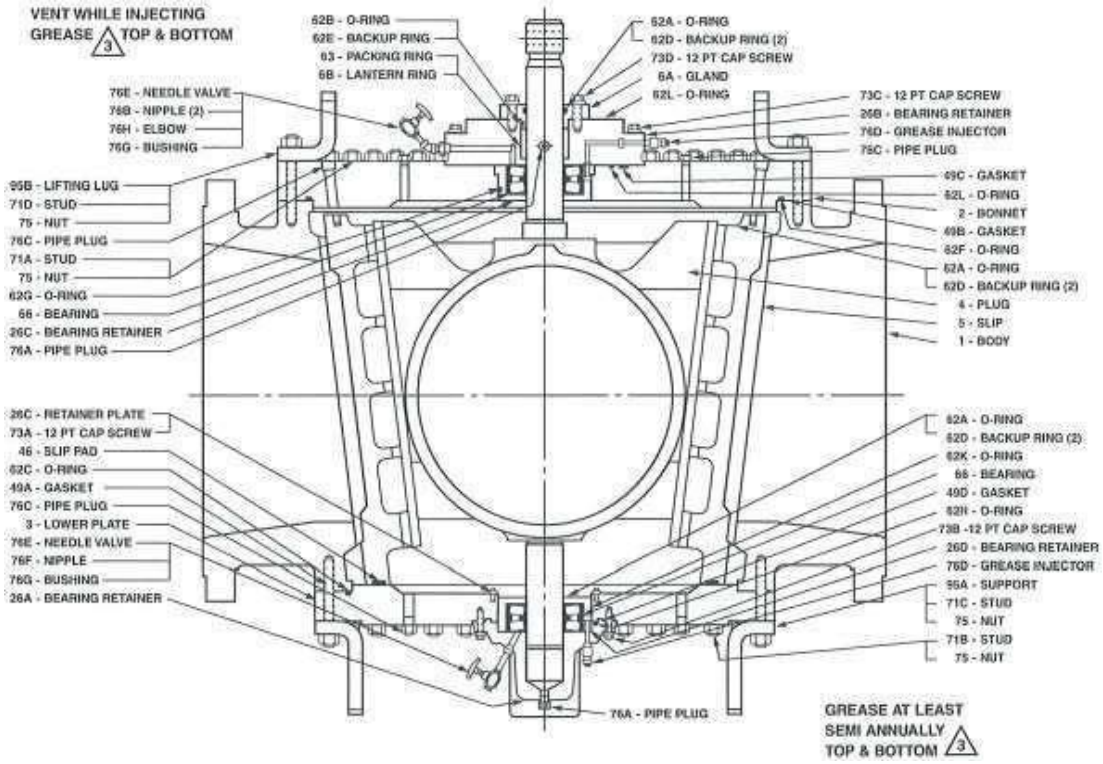
BEARINGS/DUAL RETENTION



As valve size increases so does the plug load, therefore, these sizes require bearings.

Typical Arrangement of:	
12”	C941
14”	C841
16”	C921
18”	CA821
18”	C911
20”	CA821
20	CA841
20”	C841
20”	CA911
20”	CA921
24”	CA811
24”	C811
24”	C821
24”	CA821
24”	C911
28”	C811
28”	CC821
30”	CC811
30”	C821

BEARINGS/DUAL RETENTION

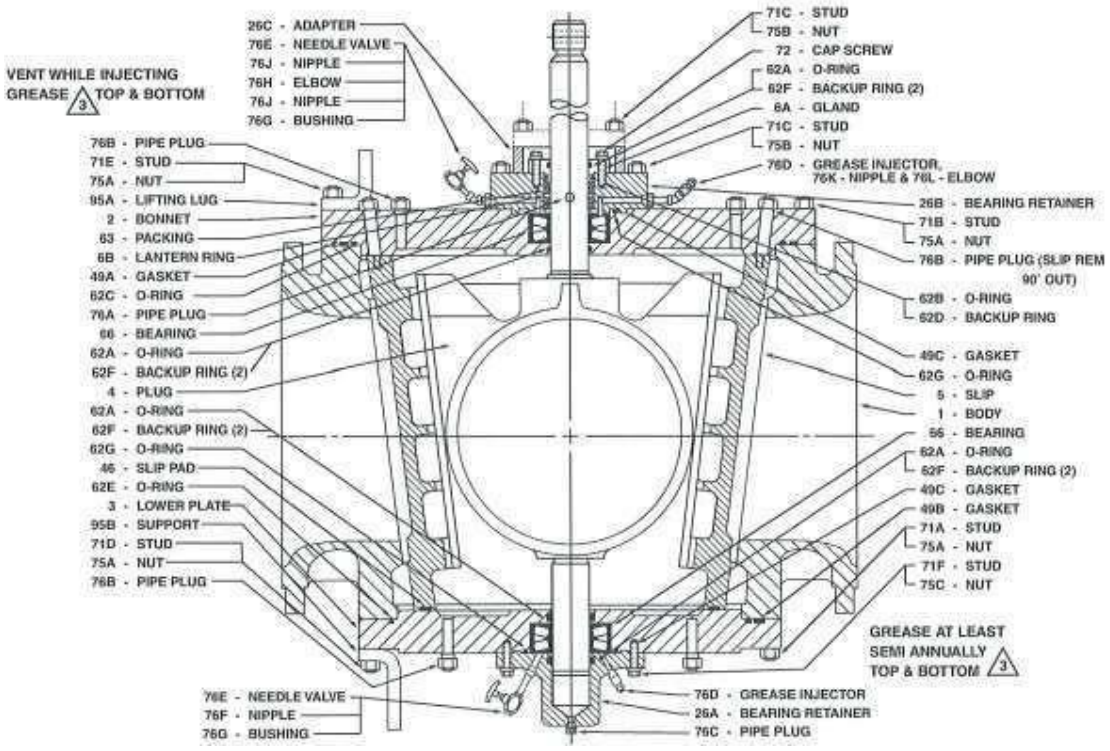


Typical Arrangement of:	
36”	CA811

This valve requires bearings. The inner bearing retainer is slightly different than the one above.

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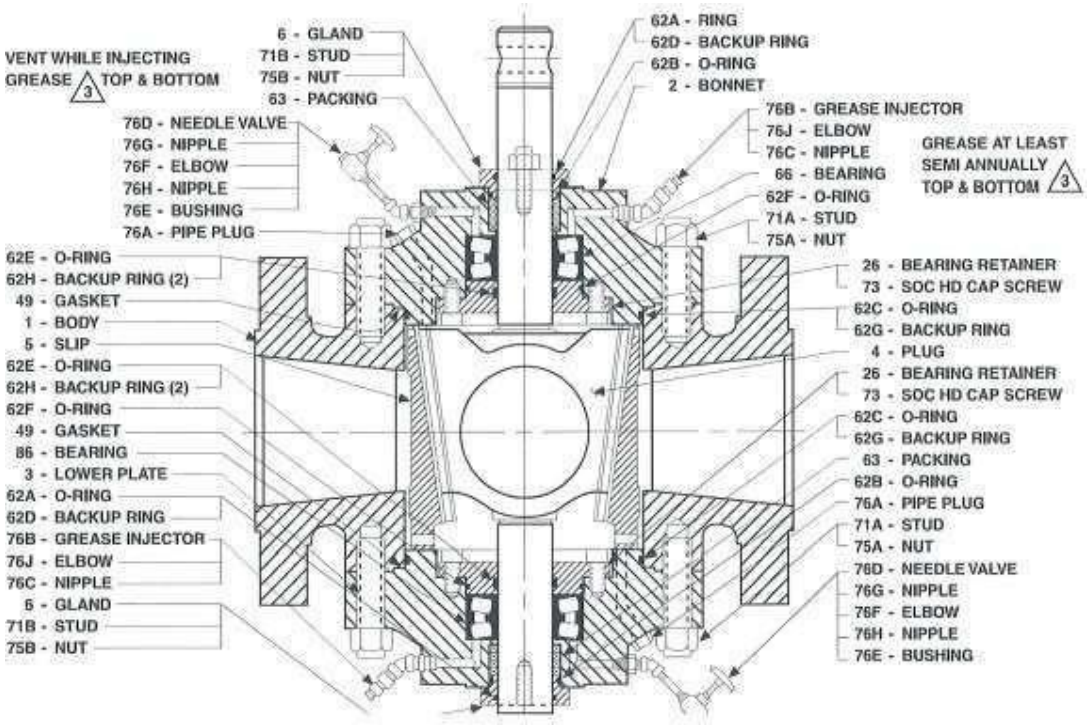
BEARINGS/INTERNALLY & EXTERNALLY RETAINED



Typical Arrangement of	
10”	CB841
10”	C941
12”	CB841
16”	CA841
16”	C941
20”	CA921
24”	C841

These valve sizes require bearings

BEARINGS/INTERNALLY & RETAINED WITH TWO GLANDS

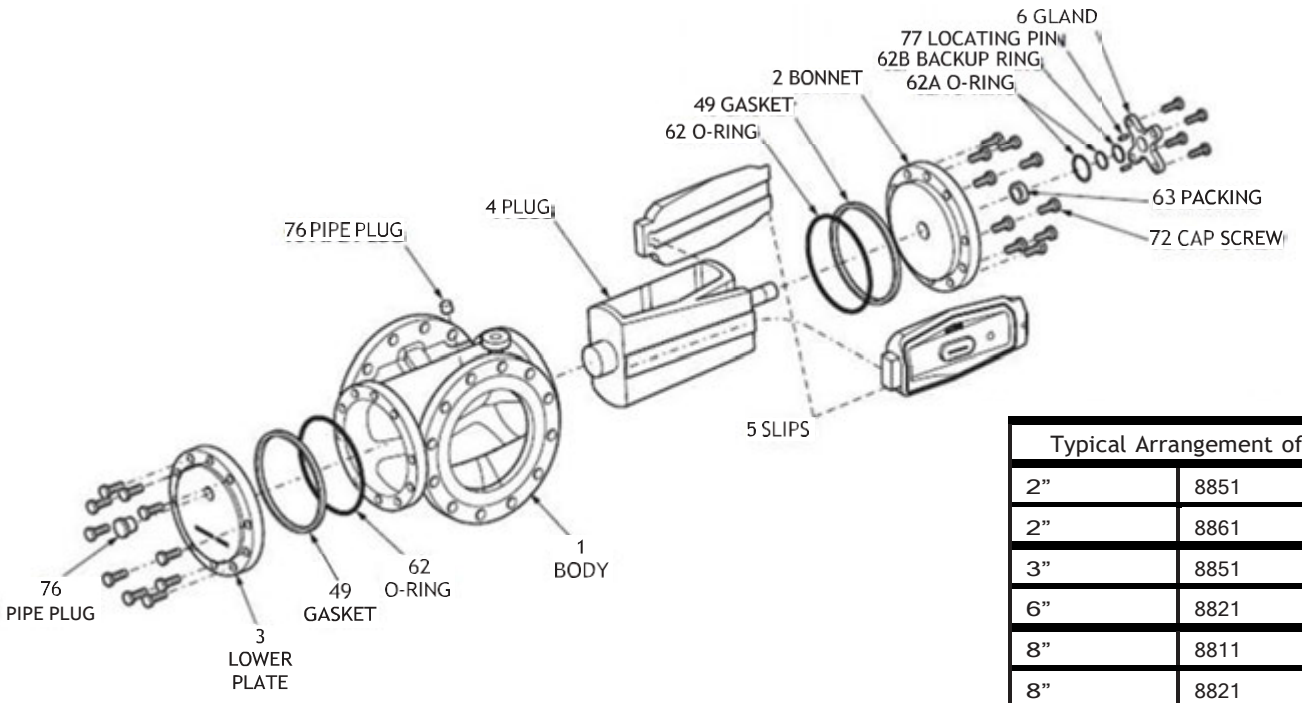


Typical Arrangement of	
8”	C851
8”	C961
10”	C851

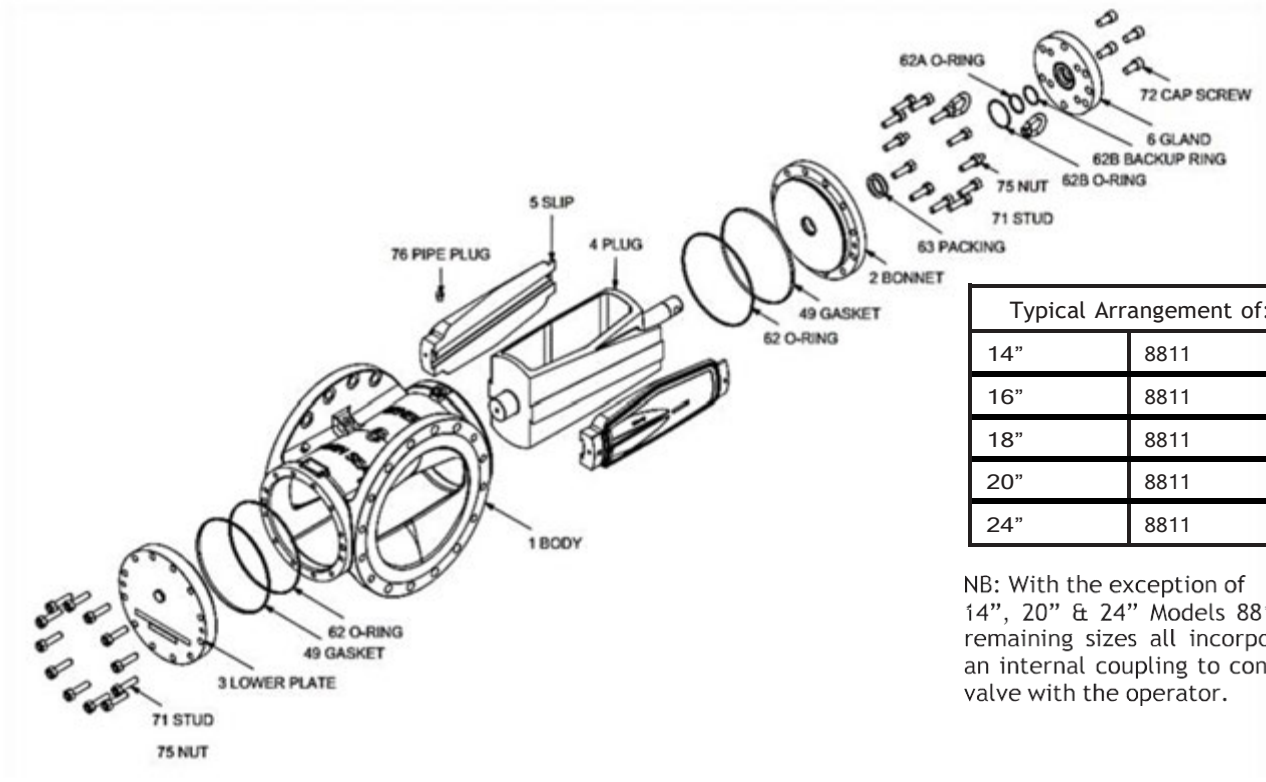
High pressures require hydrostatically balanced plugs and two glands.

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GENERAL VALVE® Twin Seal™ SERIES 8800



Typical Arrangement of:	
2”	8851
2”	8861
3”	8851
6”	8821
8”	8811
8”	8821
10”	8811
10”	8821
12”	8811
12”	8821



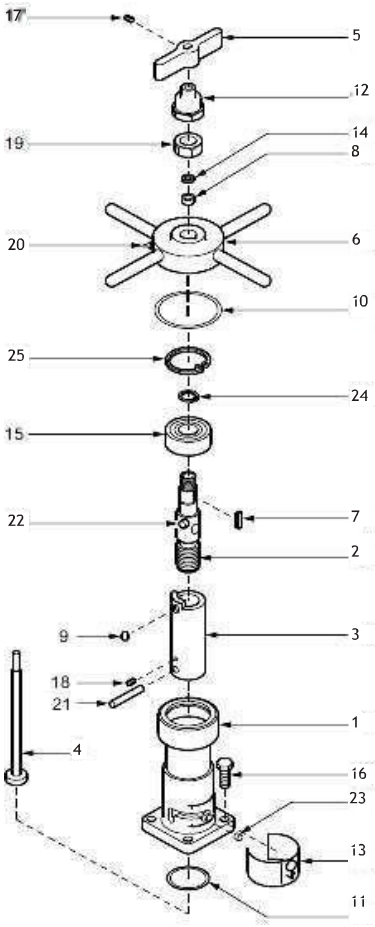
Typical Arrangement of:	
14”	8811
16”	8811
18”	8811
20”	8811
24”	8811

NB: With the exception of 14”, 20” & 24” Models 8811G, remaining sizes all incorporate an internal coupling to connect valve with the operator.

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GENERAL VALVE® Twin Seal™ MODEL 375H

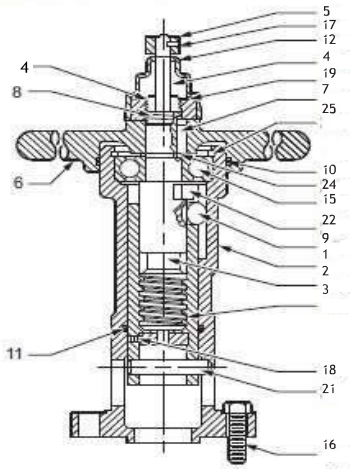
Exploded View



Item No.	375 H Part No.	Description	Req'd
1	21-419	Operator Housing	1
2	22-417	Upper Stem	1
3	22-418	Lower Stem	1
4	27-418	Indicator Shaft	1
5	27-419	Indicator Flag	1
6	28-406	Handwheel	1
7	45-411	Key	1
8	46-425	Bushing	1
9	48-405	Roller	1
10	50-402	Grease Retainer	1
11	62-32	O-Ring	1
12	64-415	Protector	1
13	64-417	Insignia Plate	1
14	65-402	Grease Seal	1
15	66-409	Ball Bearing	1
16	72-5	Capscrew	4
17	74-6	Screw	1
18	74-9	Set Screw	1
19	75-434	Nut	1
20	76-411	Lube Fitting	1
21	77-407	Guide Pin	1
22	77-423	Drive Pin*	1
23	77-453	Roll Pin	1
24	78-413	Retaining Ring	1
25	78-414	Retaining Ring	1

* not available separately.

Cross Section



375 H is Used on Models:	
2"	C811
2"	C821
3"	CA811
3"	CA821

OPERATOR DISASSEMBLY

1. Unscrew (17) and remove indicator flag (5).
2. Remove the stem protector (12).
3. Remove the handwheel nut (19), handwheel (6), key (7) and grease retainer ring (10).
4. Remove the retainer ring (25) and pull out the upper stem (2) with lower stem (3), bearing (15), roller (9) and indicator shaft subassembly (4) out through the top of the housing (1).
5. Remove set screw (18) from bottom of lower stem and push indicator shaft sub-assembly (4) out through the bottom of the lower stem.
6. Separate the stems and remove the retaining ring (24) and the bearing (15) from the upper stem.
7. Remove grease seal (14) and bushing (8) (if required) from top of upper stem (2).
8. Remove O-Ring (11) from inside housing.

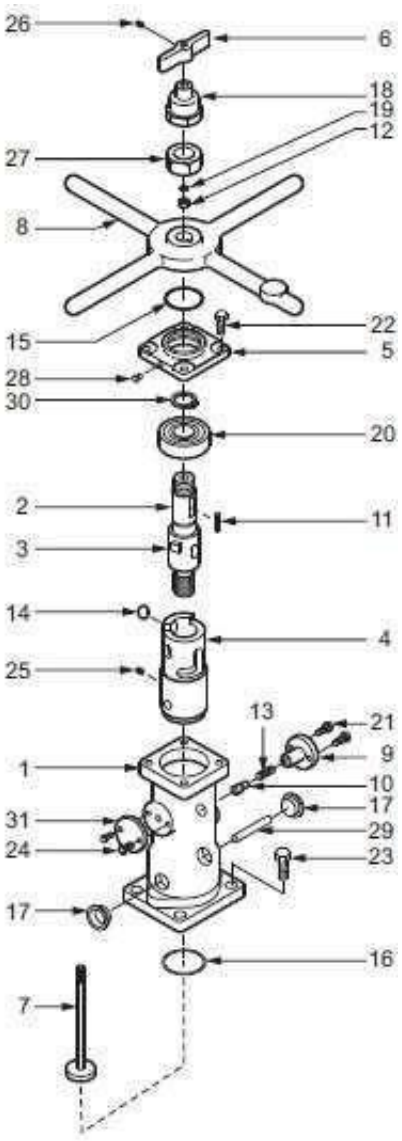
OPERATOR ASSEMBLY

1. Install O-Ring (11) in housing (1).
2. Place the bearing (15) on the top of the upper stem (2). Install retaining ring (24).
3. Apply a liberal coating of grease to all surfaces of upper stem (2) and inside and outside of lower stem (3).
4. Thread the upper stem and lower stem together such that the drive pin (22) in the upper stem comes against the shoulder at the TOP of the lower stem (3) and the detent recess in the upper stem is exactly in line with roller opening in the lower stem. NOTE: This operation may require several attempts as the threads are multiple start and do not always assemble correctly with the first try.
5. Install the indicator shaft sub-assembly (4) up through both stems. Align the detent hole in the indicator disc with the threaded hole in the lower stem and fasten with set screw (18). Set screw must be below the outside surface of the lower stem.
6. Place the roller (9) in the side opening of the lower stem. A liberal application of grease will hold the roller in position.
7. Place the stem assembly into the housing taking care that roller is aligned with roller groove in housing. Push the entire assembly down until the bearing rests on the shoulder in the housing.
8. Install the retaining ring (25) in the top of the housing (1).
9. Install grease retainer (10) in handwheel (6) and place handwheel and key (7) on upper stem. Install bushing (8) and grease seal (14) in handwheel nut (19). Screw the nut on the upper stem and tighten down on handwheel securely.
10. Install stem protector (12).
11. Install indicator flag (5) and secure with screw(17).

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GENERAL VALVE® Twin Seal™ MODEL 500H & 625H

Exploded View



Item No.	500 H Part No.	625 H Part No.	Description
1	21-411	21-407	Operator Housing
2	22-408	22-411	Upper Stem
3	41-405	41-406	Drive Pin*
4	22-409	22-413	Lower Stem
5	26-408	26-405	Housing Cap
6	27-406	27-406	Indicator Flag
7	27-404	27-438	Indicator Shaft
8	28-409	28-401	Handwheel
9	41-403	41-403	Guide Pin
10	41-404	41-404	Detent Pin
11	45-401	45-413	Key
12	46-424	46-424	Bushing
13	47-401	47-401	Spring
14	48-401	48-403	Roller
15	62-17	62-17	O-Ring

Item No.	500 H Part No.	625 H Part No.	Description
16	62-18	62-22	O-Ring
17	64-414	64-405	Plastic Plug
18	64-411	64-412	Protector
19	65-401	65-401	Grease Seal
20	66-402	66-403	Ball Bearing
21	72-4	72-4	Capscrew
22	72-5	72-6	Capscrew
23	72-6	72-11	Capscrew
24	72-21	72-21	Capscrew
25	74-1	74-3	Set Screw
26	73-28	74-6	Screw
27	75-427	75-429	Hex Nut
28	76-411	76-411	Lube Fitting
29	77-402	77-403	Coupling Pin
30	78-403	78-404	Retaining Ring
31	93-413	93-413	Cover

* not available separately

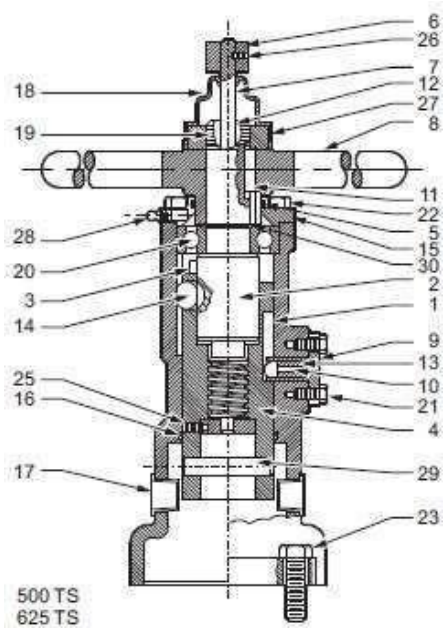
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OPERATOR DISASSEMBLY

1. Unscrew (26) and remove indicator flag (6).
2. Remove the stem protector (18).,
3. Remove bearing retainer nut (27).
4. Remove the handwheel (8) and key (11).
5. Unbolt and remove the housing cover (5).
6. Unbolt and remove the guide pin (9), with detent pin (10) and spring (13).
7. Pull the upper stem (2) with lower stem (4), roller (14), bearing (20) and indicator shaft (7) out through the top of the housing (1). If the bearing is snug in the housing, replace the handwheel and key. Turn the handwheel clockwise to raise the lower stem as far as possible. Insert a 3/8" diameter bar through the two holes in the bottom of the housing. Turn the handwheel clockwise and jack the bearing clear of the housing.
8. Remove the set screw (16) and push the indicator shaft subassembly (7) out through the bottom of the lower stem.
9. Remove the lower stem (4) from the upper stem (2).
10. Remove the retaining ring (30) and bearing (20) from the upper stem.
11. Remove the O-Ring (16) from the inside of the housing and grease seal (19) and bushing (12) (if required) from the top of the upper stem (2).

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Cross Section



625 H is Used on Models:	
2” C851	2” C941
2” C861	4” C941
3” C851	6” C911
3” C861	6” C921
4” C841	
4” C851	
6” C821	
8” C811	
10” CA811	

500 H is Used on Models:	
2” C841	2” C921
3” C841	3” C911
4” C811	4” C911
4” C821	4” C921
6” CA811	

OPERATOR ASSEMBLY

1. Place the bearing (20) on upper stem (2). Install a retaining ring (30) to lock bearing in place.

2. Apply a liberal coat of grease to all surfaces of upper stem (2) below the bearing, and to all surfaces of the lower stem (4). Thread the upper stem (2) into the lower stem (4) such that the drive pin (3) in the upper stem comes against the shoulder at the TOP of the lower stem and the detent recess in upper stem is exactly in line with the roller opening in lower stem.

NOTE: This operation may require several attempts as the threads are multiple start and do not always assemble correctly with the first try.

3. Install the indicator shaft assembly (7) up through both stems. Align the detent hole in the indicator disc with the threaded hole in the lower stem and fasten with set-screw (25). Set screw must be below the outside surface of the lower stem.

4. Install O-Ring (16) in housing (1).

5. Place roller (14) in opening of lower stem. A liberal application of grease will hold it in position.

6. Place the stem assembly into the housing - taking care that roller is aligned with roller groove in housing. Push entire assembly down until bearing rest on shoulder in housing.

7. Apply a smooth even coating of Form-a-Gasket® to surface of guide pin boss on housing (1).

8. Insert guide pin (14) with detent pin (10) and spring (13) to fully engage slot in lower stem and secure with capscrews (21).

9. Apply a smooth even coating of Form-a-Gasket® to top surface of housing (1).

10. Install O-Ring (15) in housing cover (5) and secure to housing (1) with capscrews (22).

11. Install the handwheel (8) and key (11).

12. Install the bearing retainer nut (27) and tighten securely.

13. Install grease seal (19) and bushing (12) in top of upper stem (2).

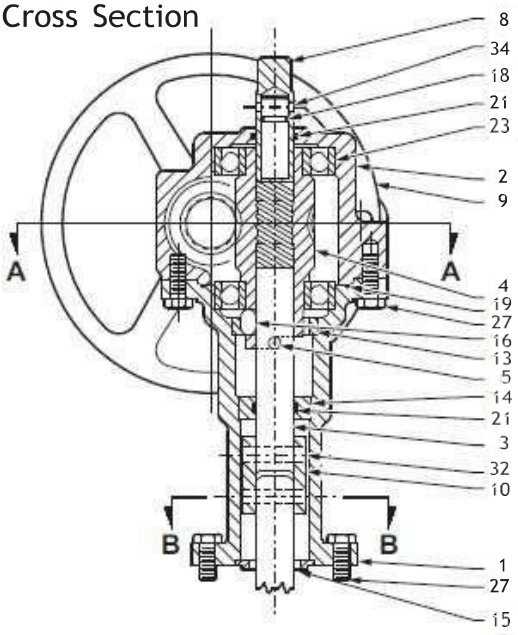
14. Install stem protector (18).

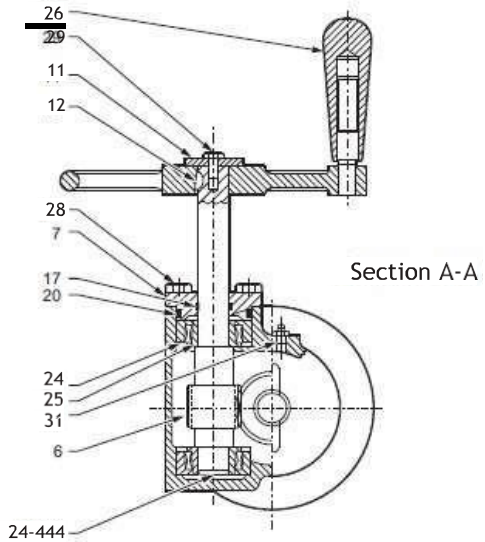
15. Install indicator flag (6) and secure with screw (26).

Schlumberger-Private
Schlumberger-Private

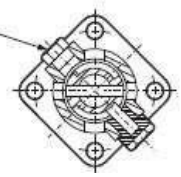
GENERAL VALVE® Twin Seal™ Model 376G & 501G

Cross Section





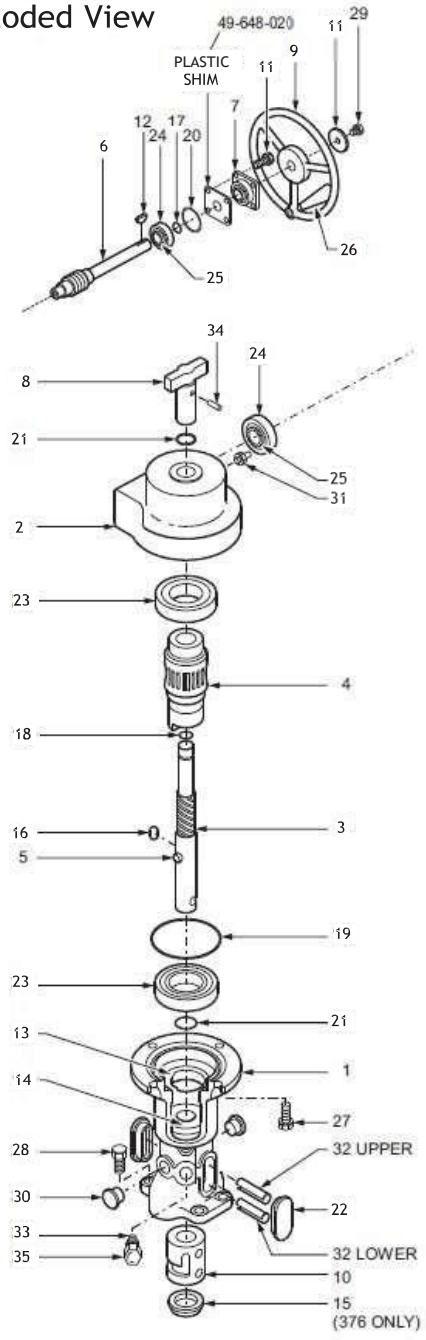
Section A-A



Section B-B

376 G is Used on Models:	
2” C811	2” C821
3” CA811	3” CA821

Exp oded View



501 G is Used on Models:	
2” C841	2” C921
3” C841	3” C911
4” C811	4” C911
4” C821	4” C921
6” CA811	

GENERAL VALVE® Twin Seal™ Model 376G & 501G

OPERATOR DISASSEMBLY

1. Remove the indicator pin (34) and pull the indicator stem (8) up through the gear housing (2).
2. Remove the stop screw (35) and dowel pin (33). Drive out the upper coupling pin (32) and remove the coupling (10).
3. Remove the capscrew (29), washer (11), handwheel (9) and key (12).
4. Remove the four capscrews (27) and the gear housing cover (7).
5. Remove four capscrews (27) and lift off the gear housing (2). It may be necessary to turn the worm shaft counterclockwise to back the worm clear of the gear while lifting off the gear housing. The worm shaft (6) and the tapered bearing cup (24) and cone (25) on each end may now be removed from the gear housing (2).
6. The operator stem (3), upper stem (4), bearings (23), and roller (16) may now be lifted out of the operator housing.

NOTE: The cam bushing (13) and stem bushing (14) are a press fit in the operator housing and should not be removed. Should the cam bushing require replacement, the operator housing must be returned.

Item No.	376G Part No.	501G Part No.	Description	Req'd
1	21-583	21-555	Operator Housing	1
2	21-584	21-554	Gear Housing	1
3	22-524	22-508	Operator Stem	1
4	23-560	23-525	Upper Stem	1
5	77-465	77-464	Pin*	1
6	24-451	24-445	Worm Shaft	1
7	26-632	26-580	Gear Housing Cover	1
8	27-545	27-504	Stem Indicator	1
9	28-441	28-442	Handwheel	1
10	32-476	32-469	Coupling	1
11	44-465	44-453	Handwheel Washer	1
12	45-431	45-431	Key	1
13	46-557	46-501	Cam Bushing	1
14	46-558	46-502	Stem Bushing	1
15	46-559	-	Pilot Bushing	1
16	48-405	48-401	Roller	1
17	62-71	62-34	O-Ring	1

Item No.	376G Part No.	501G Part No	Description	Req'd
18	62-83	62-70	O-Ring	1
19	62-398	62-79	O-Ring	1
20	62-91	62-91	O-Ring	1
21	62-371	62-339	O-Ring	2
22	-	64-424	Caplug	
23	66-483	66-476	Ball bearing	2
24	66-481	66-477	Cup Bearing	2
25	66-482	66-478	Cone Bearing	2
26	69-414	69-414	Spinner Handle	1
27	72-5	72-5	Capscrew	8
28	72-16	72-10	Capscrew	4
29	72-21	72-26	Capscrew	1
30	76-891	76-594	Plug	1
31	76-612	76-612	Lube Fitting	1
32	77-422	77-417	Coupling Pin	2
33	77-480	77-418	Dowel Pin	1
34	77-451	77-440	Indicator Pin	1
35	98-790	98-663	Stop Screw	1

* not available separately.

OPERATOR ASSEMBLY

1. Install O-Ring (21) in the stem bushing (14) in the operator housing (1). Place bearing (23) in the top of the operator housing (1).

2. Apply a liberal coating of grease to all surfaces of the operator stem (3) and the upper stem (4). Thread the operator stem into the upper stem such that the dowel pin (5) comes against the shoulder at the BOTTOM of the upper stem and the detent recess in the operator stem is exactly in line with the roller opening at the bottom of the upper stem. This operation may require several attempts as the threads are multiple start and do not always assemble correctly with the first try.

3. Place the roller (16) in the opening of the upper stem (4) and the detent recess of the operator stem (3). An application of grease will hold it in position.

4. Position the operator housing such that when viewed from above, the raised portion of the cam is in the lower left quadrant of the housing bore (see cross-section illustration). With the roller on the left side, place the upper stem, operator stem and roller (which have been assembled together–see steps 2 & 3) into the operator housing (1), down through the stem bushing (14) and cam roller bushing (13) until the shoulder of the upper stem (4) is against the bearing (23).

5. Install bearing (23) in the gear housing (2). Install the O-Ring (21) in the top of the gear housing (2).

6. Install the tapered roller bearing cup (24) in the recess of the gear housing with the large diameter of the taper facing out.

7. Install tapered roller bearing cup (24) and cone (25) on the handwheel end of the worm shaft (6). Place bearing cone (25) on the opposite end of the worm shaft with the large diameter of the taper against the shaft shoulder. Apply a liberal amount of grease to all parts.

8. Install the worm shaft in the gear housing. Make certain that the rear bearing cone has properly entered the rear bearing cup.

9. Install O-Rings (17) and (20) in the gear housing cover (7) and assemble to the gear housing (2) with four of the capscrews (27). Run the screws in just enough to keep parts in place but do not tighten at this time.

10. Install O-Ring (19) in the top of the operator housing. Place the gear housing on the operator housing with the worm gear on the left side as viewed from the top (same side as the roller) and fasten with four of the capscrews (27).

NOTE: Worm shaft must be moved out slightly to allow parts to assemble. Tighten capscrews (27) in gear housing cover (7).

11. Assemble handwheel (9), key (12), washer (11) and capscrew (29) on the worm shaft.

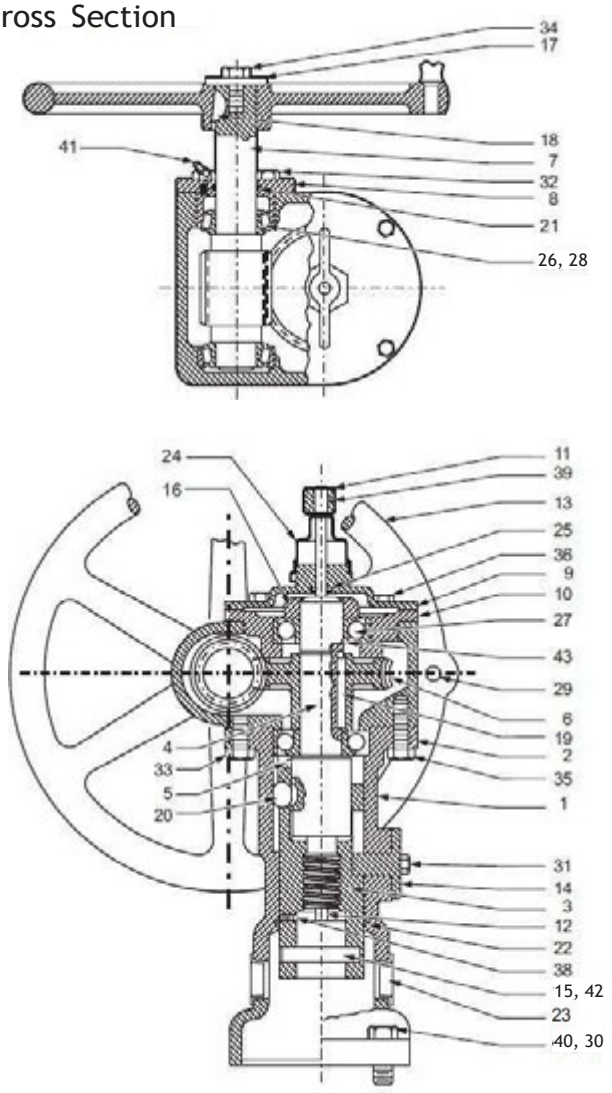
12. Place a drift punch through the hole in the top of the operator stem to prevent it from turning. With the punch at 90° to the worm shaft, turn the handwheel clockwise and run the upper stem down as far as it will go. Place the coupling (10) on the bottom of the operator stem with the horizontal portion of the L-shaped groove at the bottom. Turn the coupling until the coupling pin hole in the operator stem is aligned with the top hole in the coupling, and the vertical groove without the ramp is aligned with the stop screw boss in the housing. Drive the coupling (32) into the hole in the top of the coupling and the bottom hole of the operator stem. Install the stop screw (35) and the dowel pin (33).

NOTE: The coupling (10) has an L-shaped groove on both sides. The vertical portion of one of the grooves has a ramp at the top. The coupling must be installed such that the side without the ramp is adjacent to, and engages the stop screw. (The ramp is used to actuate the automatic body bleed valve when installed).

13. Install O-Ring (21) in the top of the gear housing and O-Ring (18) in the top of the lower stem (3). Place the indicator stem (8) on the top of the operator stem and down through the gear housing. Install the indicator pin (34).

GENERAL VALVE® Twin Seal™ Model 625G, 751G & 755G

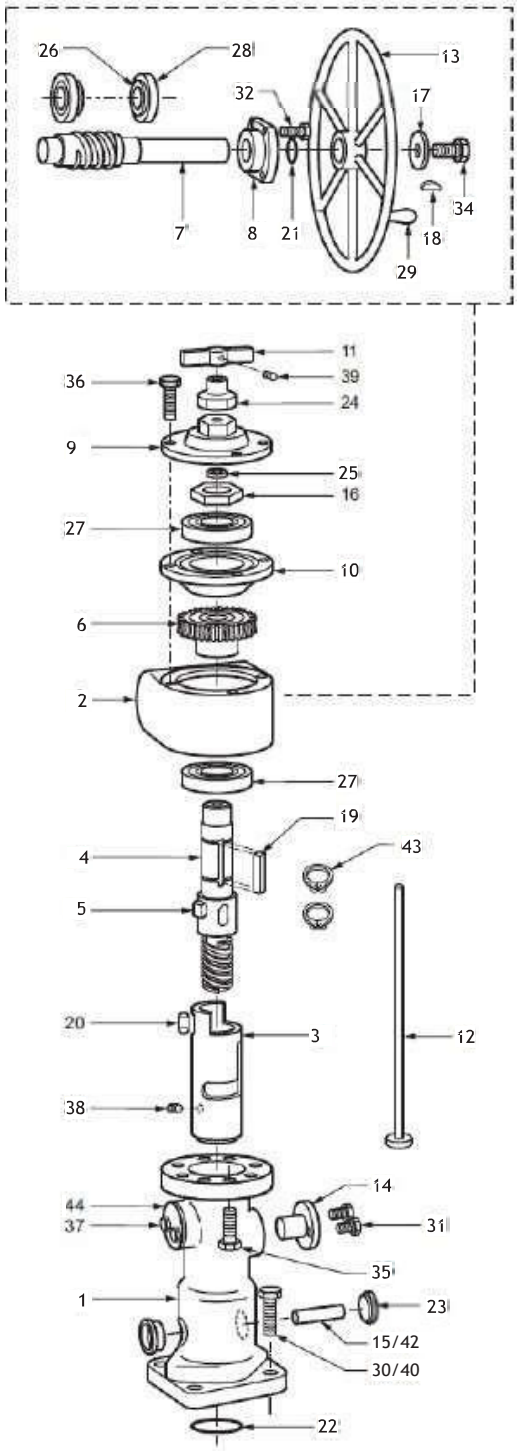
Cross Section



625G is Used on Models:	
2” C851	2” C941
2” C861	2” 8851
3” C851	2” 8861
3” 8851	4” C941
3” C861	6” C911
4” C841	6” C921
6” C821	6” 8821
8” C811	8” 8811
10” CA811	10” 8811

751G is Used on Models:	
6” C841	8” C911
8” C821	10” C911
10” C821	12” 8811
12” C811	14” 8811
14” C811	

Exploded View



755G is Used on Models:	
6” C851	8” C941
8” CA841	

GENERAL VALVE® Twin Seal™ Model 625G, 751G, & 755G

OPERATOR DISASSEMBLY

1. Unscrew (39) and remove indicator flag (11).
2. Remove stem protector (24).
3. Unbolt and remove gear housing cover (9).
4. Remove bearing retainer nut (16).
5. Remove bearing carrier (10) and upper bearing (27).
6. Remove upper retaining ring (43).
7. Remove capscrew (34), washer (17), handwheel (13) and key (18).
8. Unbolt and remove bearing cap (8).

CAUTION: DO NOT DAMAGE PLASTIC SHIMS.

9. Screw out the worm shaft (7). Front bearing cone (26) and cup (28) and rear bearing cone (26) will come out with the worm shaft. Rear bearing cup (28) can then be removed from gear housing (2).
10. Remove the worm gear (6) and key (19).
11. Unbolt and remove the gear housing (2).
12. Unbolt and remove the guide pin (14).
13. Pull the upper stem (4) with lower stem (3), roller (20), lower bearing (27) and indicator shaft (12) out through the top of the housing (1). If the bearing is snug in the housing, install the worm gear with its key on the upper stem upside down (hub up). Turn the gear counter clockwise to raise the lower stem as far as possible. Insert a 1/2" diameter bar through the two holes in the bottom of the housing. Using a pipe wrench on the gear hub, turn clockwise and jack the bearing clear of the housing.
14. Remove the set screw (38) and push the indicator shaft sub-assembly (12) out through the bottom of the lower stem.
15. Remove the lower stem (3) from the upper stem (4).
16. Remove the retaining ring (43) and lower bearing (27) from the upper stem.

Item No.	625G Part No.	751G Part No.	755G Part No.	Description
1	21-422	21-623	21-623	Operator Housing
2	21-408	21-405	21-443	Gear Housing
3	22-440	22-555	22-555	Lower Stem
4	22-439	22-554	22-554	Upper Stem
5	41-406	41-401	41-401	Drive Pin*
6	23-402	23-403	23-406	Worm Gear
7	24-404	24-404	24-403	Worm Shaft
8	26-401	26-401	26-401	Bearing Cap
9	26-413	26-403	26-403	Gear Housing Cover
10	26-412	26-411	26-423	Bearing Carrier
11	27-406	27-406	27-406	Indicator Flag
12	27-429	27-435	27-435	Indicator Shaft
13	28-404	28-402	28-402	Handwheel
14	41-407	41-498	41-498	Guide Pin
15	77-403	41-410	41-410	Coupling Pin
16	75-462	42-401	42-401	Hex Nut
17	44-401	44-401	44-401	Washer
18	45-402	45-402	45-402	Woodruff Key
19	45-403	45-406	45-406	Straight Key
20	48-403	48-413	48-413	Roller
21	62-13	62-13	62-13	O-Ring
22	62-22	62-209	62-209	O-Ring
23	64-405	64-402	64-402	Plastic Plug

Item No.	625G Part No.	751G Part No.	755G Part No	Description
24	64-411	64-411	64-411	Protector
25	65-401	65-401	65-401	Grease Seal
26	66-401	66-401	66-401	Bearing Cone
27	66-412	66-410	66-410	Bearing Ball
28	66-458	66-458	66-458	Bearing Cup
29	69-414	69-414	69-414	Spinner Handle
30	72-11	-	-	Stud
31	72-4	72-4	72-4	Capscrew
32	72-5	72-5	72-5	Capscrew
33	72-10	72-6	-	Capscrew
34	72-8	72-8	72-8	Capscrew
35	72-9	72-9	72-9	Capscrew
36	72-14	72-14	72-26	Capscrew
37	72-21	72-21	72-21	Capscrew
38	74-3	74-4	73-28	Set Screw
39	74-6	74-6	74-6	Screw
40	-	73-130	73-130	Hex Nut
41	76-612	76-612	76-612	Lube Fitting
42	-	78-406	78-406	Retaining Ring
43	78-404	78-408	78-408	Retaining Ring
44	93-413	93-413	93-413	Cover

OPERATOR ASSEMBLY

1. Place one of the two bearings (27) on upper stem (4). NOTE: This bearing is assembled such that the wide surface of the inner race seats on the upper stem shoulder. Install a retaining ring (43) to lock the bearing in place. NOTE: The retaining ring comes againstnarrow surface of inner race.

2. Apply liberal coat of grease to all surfaces of the upper stem below the bearing. Thread the upper stem (4) into the lower stem (3) such that stop pin (5) in the upper stem comes against the shoulder at the TOP of the lower stem and the detent recess in upper stem is exactly in line with the roller opening in lower stem. This operation may require several attempts as the threads are multiple start and do not always assemble correctly with the first try.

3. Install the indicator shaft assembly (12) up through both stems. Align the detent hole in the indicator disc with the threaded hole in the lower stem and fasten with set screw (38). Set screw must be below the outside surface of the lower stem.

4. Install O-Ring (22) in housing (1).

5. Place roller (20) in opening of lower stem. A liberal application of grease will hold it in position.

6. Place the stem assembly into the housing–taking care that roller is aligned with roller groove in housing. Push entire assembly down until bearing rests on shoulder in housing.

7. Apply a smooth even coating of Form-a-Gasket® to surface of guide pin boss on housing (1).

8. Insert guide pin (14) to full engage slot in lower stem and secure with capscrews (31).

9. Place gear key (19)

10. Install tapered roller bearing cup (28) in rear bearing recess of gear housing (2) with large diameter of taper facing out.

11. Install tapered roller bearing cup (28) and cone (26) on handwheel end of worm shaft (7). Place bearing cone (26) on opposite end with large diameter of taper against shaft shoulder.

12. Install worm shaft in gear housing. Make certain that rear bearing cone has properly entered rear bearing cup (28).

13. Install O-Ring (21) in bearing cap (8).

14. Apply a smooth even coating of Form-a-Gasket® to bearing cover boss on gear housing. Fasten bearing cap (8) in place with capscrews (32). Be sure to install the plastic shims between gear housing and bearing cap.

15. Install worm gear (6) in gear housing with hub down (toward smaller opening).

16. Apply Form-a-Gasket® to top flange of operator housing (1). Place gear housing (2) with assembled parts on top of operator housing guiding worm gear keyway over key (19) in upper stem (3).

17. Install retaining ring (43) to secure worm gear (6).

18. Fasten gear housing (2) to operator housing (1) with capscrews (35). CAUTION: NOTE THAT THE SHORT CAP SCREW (33) IS INSTALLED DIRECTLY UNDER THE CENTER OF THE WORM SHAFT (7).

19. Fill gear housing (2) with grease up to top of worm gear.

20. Install bearing (27) in bearing carrier (10). NOTE: The widest surface of the outer race goes against the shoulder in the bearing carrier.

21. Apply a smooth even coating of Form-a-Gasket® over top surface of gear housing (2).

22. Place bearing carrier (10) on top of gear housing (2). Install two capscrews (36) 180° apart to temporarily align the bearing carrier. They need only be partially screwed in.

23. Install lock nut (16) on upper stem and tighten snug with a wrench. Remove the two capscrews (36).

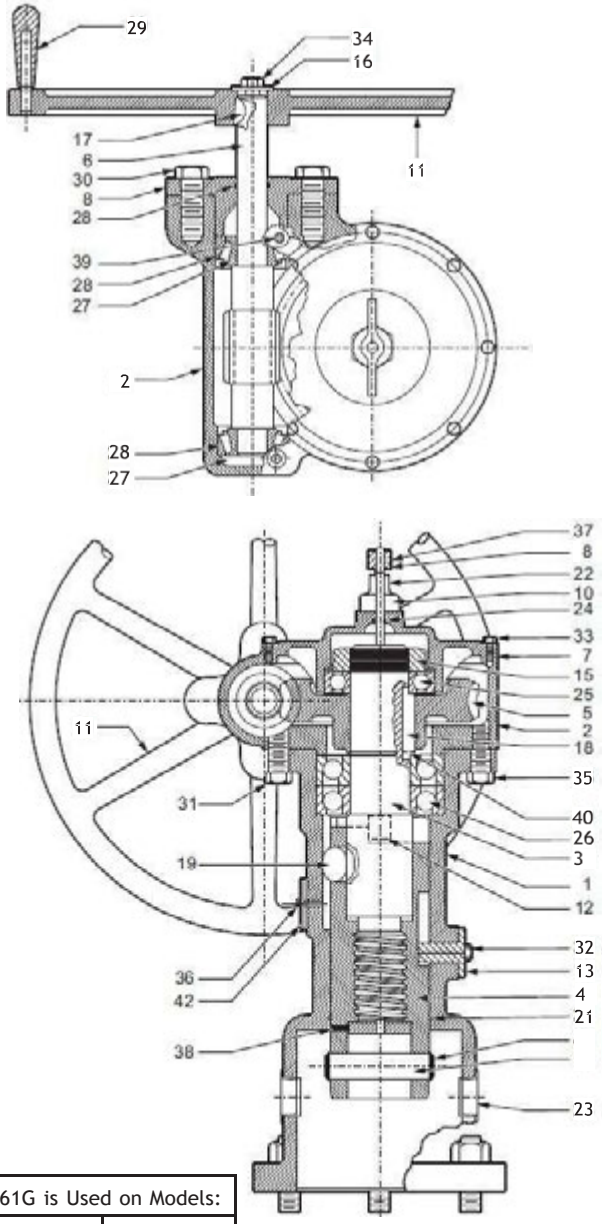
24. Install the grease seal (25) in the gear housing cover (9). Slide the cover over the indicator shaft (12) and secure to top of gear housing (2) with capscrews(36).

25. Install stem protector (24).

26. Install indicator (11) and secure with socket head capscrew (39).

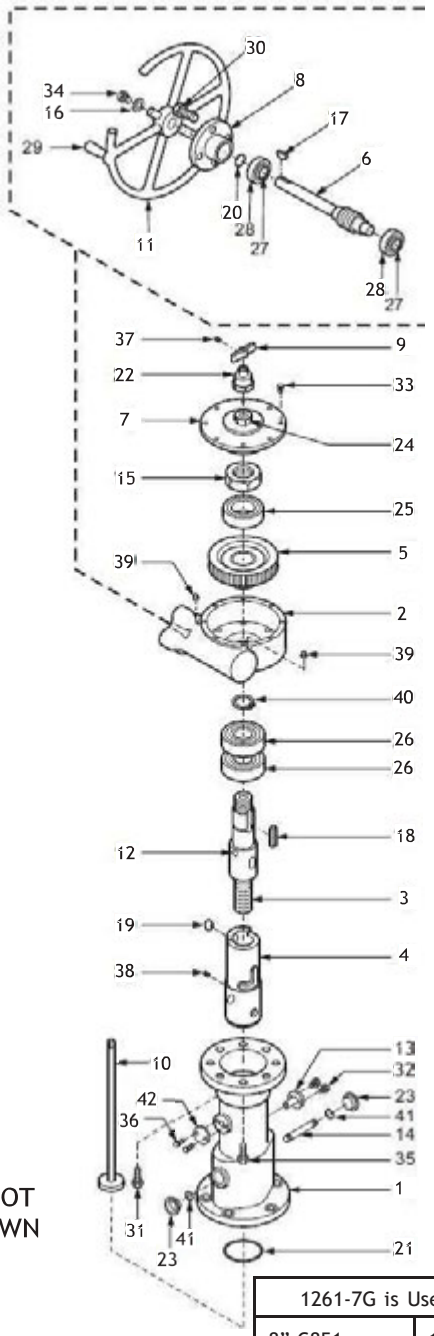
GENERAL VALVE® Twin Seal™ Model 1261G 1261-7G

Cross Section



1261G is Used on Models:	
12” C821	8” C921
14” C821	10” CA921
16” C811	12” CA911
16” 8811	14” C911
18” C811	16” C911
18” 8811	
20” CA811	
20” 8811	
24” 8811	

Exploded View



43 NOT SHOWN

1261-7G is Used on Models:	
8” C851	12” CA921
10” CB841	18” C911
12” CB8411	20” CA911
16” CA821	
18” CA821	
24” CA811	

GENERAL VALVE® Twin Seal™ Model 1261G & 1261-7G

OPERATOR DISASSEMBLY

1. Unscrew (37) and remove indicator flag (9).
2. Remove indicator shaft protector (22).
3. Unbolt and remove gear housing cover (7).
4. Remove upper stem nut (15).
5. Remove upper bearing (25).
6. Remove capscrew (34), handwheel washer (16), hand wheel (11) and woodruff key (17).
7. Unbolt and remove bearing cap (8). CAUTION: DO NOT DAMAGE PLASTIC SHIMS.
8. Screw out worm shaft (6). Front bearing cone (27) and cup (28) and rear bearing cone (27) will come out with the worm shaft. Rear bearing cup (28) can then be removed from gear housing.
9. Remove the worm gear (5) and key (18).
10. Unbolt and remove the gear housing (2).
11. Remove the retaining ring (40).
12. Unbolt and remove the guide pin (13).
13. Pull the upper stem (3) with the lower stem (4), roller (19), two bearings (26) and indicator shaft (10) out through the top of the housing (1). If the bearings are snug in the housing, install the worm gear (5) with its key (18) on the upper stem upside down (hub up). Turn the gear counter-clockwise to raise the lower stem as far as possible. Insert a 1 1/2" diameter bar through the two holes in the bottom of the housing. Using a pipe wrench on the gear hub, turn clockwise and jack the bearing clear of the housing.
14. Remove the socket head capscrew (38) and push the indicator shaft subassembly (10) out through the bottom on the lower stem (4).
15. Remove the lower stem (4) from the upper stem (3).
16. Remove the bearings (26) from the upper stem (3).

Item No.	1261G Part No.	1261-7G Part No.	Description	Req'd
1	21-621	21-621	Operator Housing	1
2	21-518	21-518	Gear Housing	1
3	22-552	22-552	Upper Stem	1
4	22-553	22-553	Lower Stem	1
5	23-472	23-472	Worm Gear	1
6	24-428	24-428	Worm Shaft	1
7	26-513	26-513	Gear Housing Cover	1
8	26-514	26-514	Bearing Cap	1
9	27-406	27-406	Indicator Flag	1
10	27-488	27-488	Indicator Shaft	1
11	28-402	28-402	Handwheel	1
12	41-402	41-402	Drive Pin*	1
13	41-496	41-496	Guide Pin	1
14	41-411	41-411	Coupling Pin	1
15	42-403	42-403	Nut	1
16	44-401	44-401	Handwheel Washer	1
17	45-402	45-402	Woodruff Key	1
18	45-404	45-404	Key	1
19	48-412	48-412	Roller	1
20	62-13	62-13	O-Ring	1
21	62-208	62-208	O-Ring	1
22	64-411	64-411	Protector	1
23	64-416	64-416	Plastic Plug	2

Item No.	1261G Part No.	1261-7G Part No.	Description	Req'd
24	65-401	65-401	Grease Seal	1
25	66-404	66-404	Ball Bearing	2
26	66-411	66-411	Ball Bearing	2
27	66-465	66-465	Bearing Cone	2
28	66-466	66-466	Bearing Cup	1
29	69-414	69-414	Spinner Handle	4
30	72-2	72-2	Capscrew	1
31	72-3	72-3	Capscrew	2
32	72-4	72-4	Capscrew	8
33	72-7	72-7	Capscrew	1
34	72-8	72-8	Capscrew	7
35	72-13	72-13	Capscrew	2
36	72-21	72-21	Capscrew	1
37	73-28	74-6	Screw	1
38	73-28	74-12	Set Screw	2
39	76-412	76-412	Lube Fitting	1
40	78-405	78-405	Retaining Ring	2
41	78-407	78-407	Retaining Ring	1
42	93-413	93-413	Cover	1
43	-	26-712	Adapter	1

GENERAL VALVE® Twin Seal™ Model 1261G & 1261-7G

OPERATOR ASSEMBLY

1. Install the two bearings (26) at top of upper stem (3). NOTE: These are radial thrust bearings and must be installed such that the widest surfaces of the inner raceways are back to back.

NOTE: INCORRECT INSTALLATION WILL RESULT IN SERIOUS DAMAGE.

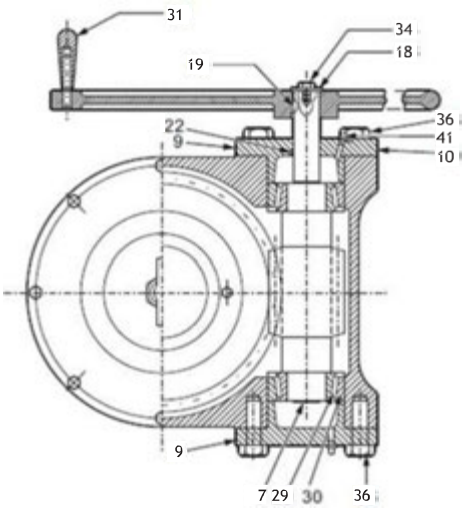
2. Install the bearing retaining ring (40).
3. Apply a liberal coating of grease to all surfaces of the upper stem (3).
4. Thread the upper stem (3) into the lower stem (4) such that the drive pin in the upper stem comes against the shoulder at the TOP of the lower stem and the detent recess in the upper stem is exactly in line with the roller opening in the lower stem. This operation may require several attempts as the threads are multiple start.
5. Install the indicator shaft sub-assembly (10) up through both stems.
6. Install O-Ring (21) in housing (1).
7. Place the roller (48) in the side opening of the lower stem (4).
8. Place the stem assembly into the housing (1) taking care that the roller (48) is aligned with the roller groove in the housing. Push the assembly down until the lower bearing (26) rests on the shoulder in the housing.
9. Apply a smooth even coating of Form-a-Gasket® to the surface of the guide pin boss on the housing (1).
10. Insert the guide pin (13) to full engage the slot in the lower stem (4) and fasten with capscrews (32).
11. Place gear key (18) in keyway of upper stem (3).
12. Install tapered roller bearing cup (28) in rear bearing recess of gear housing (2) with large diameter of taper facing out.
13. Install tapered roller bearing cup (28) and cone (27) on handwheel end of worm shaft (6).
14. Install worm shaft (6) in gear housing (2). Make certain that rear bearing cone (27) has properly entered the rear bearing cup (28).
15. Install O-Ring (20) in bearing cap (8).
16. Apply a smooth coating of Form-a-Gasket® to bearing cap boss on gear housing (2). Fasten bearing cap in place with cap screws (30). Be sure to install the plastic shims between the gear housing and the bearing cap.
17. Install worm gear (6) in gear housing (2) hub down (toward smallest opening).
18. Place the gear housing (2) with assembled parts on top of the operator housing guiding the worm gear keyway over key (18) in upper stem (3).
19. Install the ball bearing (25) on the upper stem (3) and secure with nut (15).
20. Apply a smooth coating of Form-a-Gasket® to top of operator housing.
21. Fasten the gear housing (2) to the operator housing with capscrews (35 and 3).

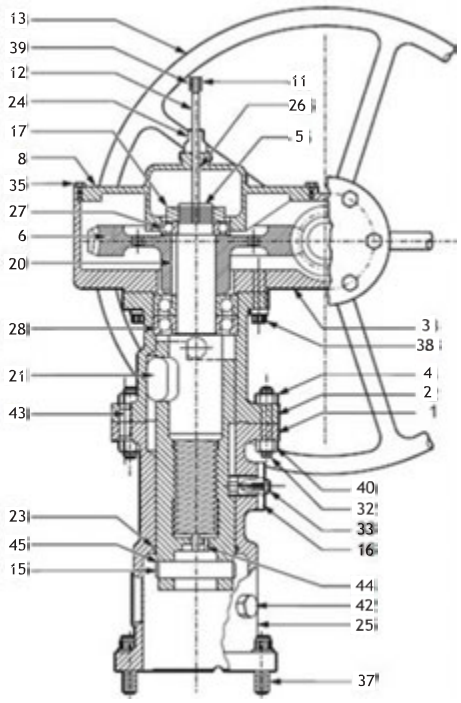
CAUTION: NOTE THAT THE SHORT CAPSCREW (72B) IS INSTALLED DIRECTLY UNDER THE CENTER OF THE WORM.

22. Fill the gear housing (2) with grease up to the top of the worm gear (5).
23. Apply a smooth coating of Form-a-Gasket® to top surface of gear housing (2).
24. Install grease seal (24) in gear housing cover (7). Slide cover over indicator shaft (10) and ball bearing (25) and secure to top of operator housing with capscrews (33).
25. Install the indicator shaft protector (22).
26. Install the indicator flag (9) and secure with screw (37).
27. Install handwheel (11) with woodruff key (17), washer (16) and capscrew (34).

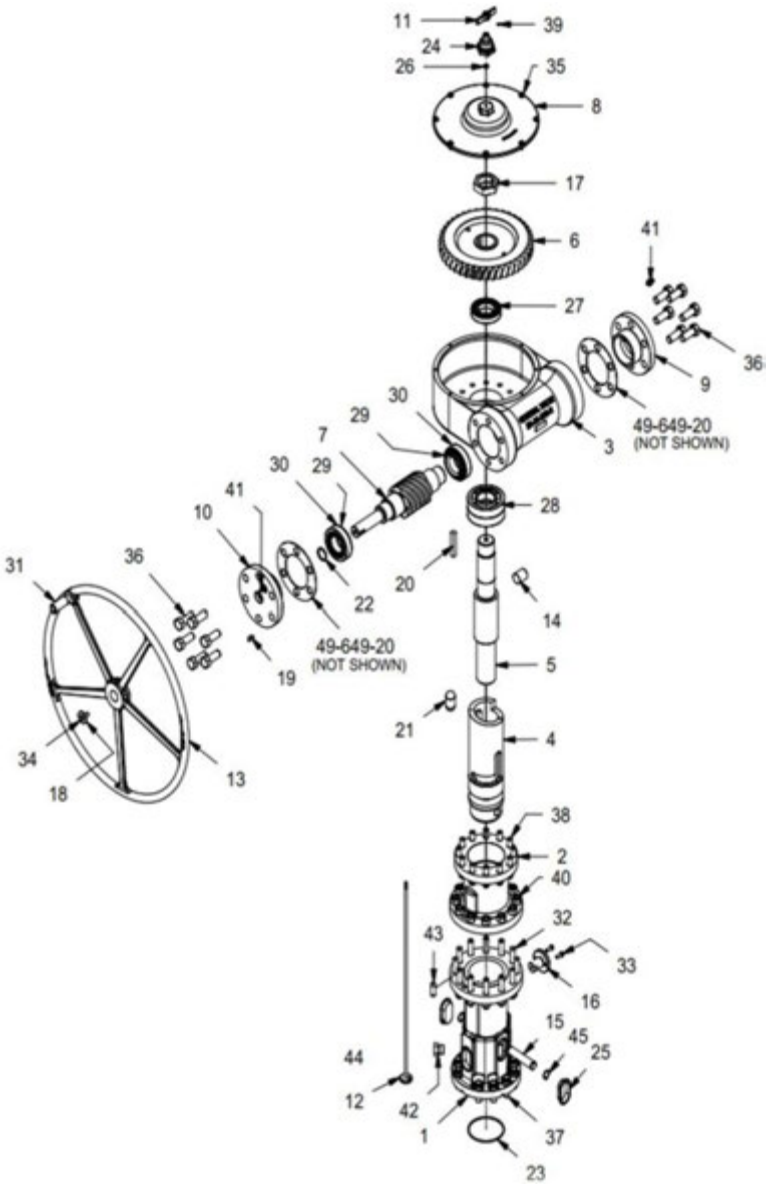
GENERAL VALVE® Twin Seal™ Model 1276G

Cross Section





Exploded View



1276G is Used on Models:	
10” C851	8” C961
16” CA841	16” C921
20” CA821	20” CB921
24” CA821	
30” CC811	

GENERAL VALVE® Twin Seal™ Model 1276G

OPERATOR DISASSEMBLY

1. Turn handwheel counter clockwise to full open position.
2. Remove set screw (39) and indicator flag (11).
3. Remove the stem protector (24).
4. Unbolt and remove the gear housing cover (8).
5. Remove the bearing retainer nut (17) and ball bearing (27).
6. Remove capscrew (34), washer (18), handwheel (13) and key (19).
7. Unbolt and remove the bearing caps (9) and (10).

CAUTION: DO NOT DAMAGE THE PLASTIC SHIMS UNDER FRONT BEARING CAP (10).

8. Remove worm shaft (7) and taper bearings consisting of cone (29) and cup (30).
9. Remove worm gear (6) and key (20).
10. Unbolt and remove the gear housing (3).
11. Unbolt and remove the guide pin (16).
12. Pull the upper stem (5) and lower stem (4) with bearings (28) and roller (21) out through the top of the upper housing (2). If bearings are snug in the upper housing, remove the upper and lower stems with the roller through the bottom of the lower housing (1). Unbolt the upper and lower housing and remove the bearings with a suitable puller.
13. Separate the upper and lower stems and remove indicator shaft assembly (12).

Item No.	1276G Part No.	Description	Req'd
1	21-594	Lower Housing	1
2	21-595	Upper Housing	1
3	21-505	Gear Housing	1
4	22-533	Lower Stem	1
5	22-534	Upper Stem	1
6	23-461	Worm Gear	1
7	24-425	Worm Shaft	1
8	26-487	Gear Housing Cover	1
9	26-488	Bearing Cap	1
10	26-489	Bearing Cap	1
11	27-406	Indicator Flag	1
12	27-541	Indicator Shaft	
13	28-432	Handwheel	
14	41-473	Drive Pin*	
15	41-476	Coupling Pin	
16	41-480	Guide Pin	
17	42-403	Nut	1
18	44-401	Washer	1
19	45-402	Key	1
20	45-428	Key	1
21	48-409	Roller	1
22	62-20	O-Ring	1
23	62-215	O-Ring	1
24	64-412	Protector	1
25	64-416	Plastic Plug	4
26	65-401	Grease Seal	1
27	66-404	Ball Bearing	1
28	66-452	Ball Bearing	2
29	66-454	Bearing Cone	2
30	66-463	Bearing Cup	2
31	69-414	Spinner Handle	1
32	71-47	Stud	12
33	72-5	Capscrew	2
34	72-8	Capscrew	1
35	72-26	Capscrew	8
36	72-64	Capscrew	12
37	73-111	Capscrew	12
38	73-131	Capscrew	12
39	74-6	Screw	1
40	75-406	Nut	24
41	76-412	Lube Fitting	2
42	76-536	Pipe Plug	1
43	77-454	Dowel Pin	1
44	77-481	Rollpin	1
45	78-407	Retaining Ring	2

*not available separately

GENERAL VALVE® Twin Seal™ Model 1276G

OPERATOR ASSEMBLY

1. Install the two bearings (28) at the top end of the upper stem (5).

NOTE: These are radial thrust bearings and must be installed such that the widest surfaces of the inner race ways are back to back. INCORRECT INSTALLATION WILL RESULT IN SERIOUS DAMAGE.

2. Apply a smooth even coating of Permatex Number 3D to the bottom flange of the upper housing (2) and fasten to the lower housing (1) with studs (32) and nuts (40). The dowel pin (43) is a press fit in the lower housing and a slip fit in the upper housing. Its function is to properly align the roller grooves.

3. Apply a liberal coating of grease to all surfaces of upper stem (5) and lower stem (4).

4. Thread the two stems together such that the drive pin (14) in the upper stem comes against the shoulder at the top of the lower stem and the detent recess in the upper stem is exactly in line with the roller opening in the lower stem. This operation may require several attempts as the threads are multiple start and do not always assemble correctly with the first try.

5. Install the indicator shaft sub-assembly up through both stems and secure with the roll pin (44) in the bottom of the lower stem.

6. Install O-Ring (23) in the lower housing (1).

7. Place the roller (21) in the side opening of the lower stem (4). A liberal application of grease will hold it in place.

8. Place the stems with bearings and roller assembled down through the top of the upper housing until the lower of the two bearings (28) rests on the shoulder in the upper housing.

9. Apply a smooth even coating of Form-a-Gasket® to the surface of the guide pin boss on the lower housing (1).

10. Insert the guide pin (16) to fully engage the slot in the lower stem and fasten with cap screws (33).

11. Place the gear key (20) in the keyway of the upper stem (5).

12. Place the tapered roller bearing cones (29) on each end of the worm shaft (7) with the large diameter of the cone taper against each shaft shoulder.

13. Assemble the cups (30) on the cones (29).

14. Apply a smooth even coating of Form-a-Gasket® to the surfaces of the bearing retainer bosses on the gear housing (3).

15. Fasten the blind bearing cap (9) in place with capscrews (36).

16. Install the worm shaft (7) in the gear housing.

17. Install the O-Ring (22) in the bearing cap (10) and fasten in place with capscrews (36). Be sure to re-install the plastic shims between the gear housing and the bearing cap.

18. Install worm gear (6) in gear housing with hub down. (Toward smallest opening).

19. Apply a smooth coating of Form-a-Gasket® to top flange of upper housing.

20. Place the gear housing with assembled parts on top of the upper housing guiding the worm gear keyway over the key (20) in the upper stem, and fasten to the upper housing with capscrews (38).

21. Install ball bearing (27) over upper stem and secure with nut (17).

22. Fill the gear housing with grease up to the top of the worm gear.

23. Apply a smooth even coating of Form-a-Gasket® around top surface of gear housing.

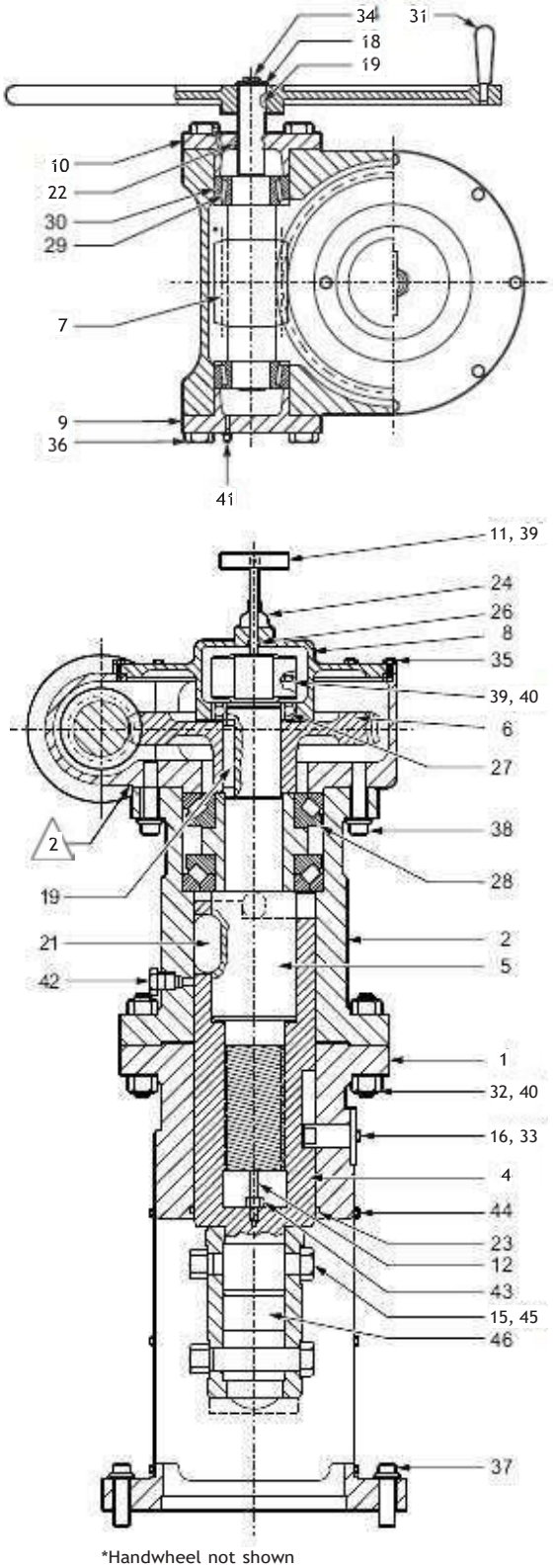
24. Install the grease seal (26) in the gear housing cover (8). Slide the cover over the indicator shaft (12) and the ball bearing (27) and secure to the top of the operator housing with capscrews (35).

25. Install the stem protector (24) and secure the indicator flag (11) in place with set screw (39).

26. Install the handwheel (13) with key (19), washer (18), capscrew (34) and spinner handle (31).

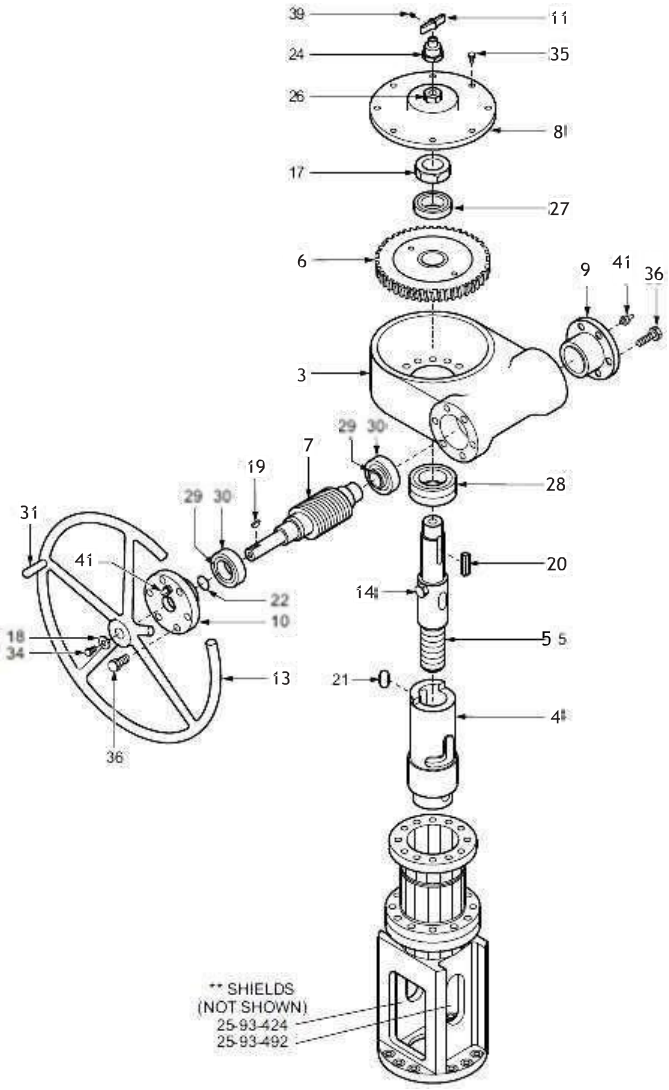
GENERAL VALVE® Twin Seal™ Model 1500G

Cross Section



*Handwheel not shown

Exploded View



1500F is Used on Models:	
20” C841	16” C941
30” CC821	
36” CA811	

GENERAL VALVE® Twin Seal™ Model 1500G

OPERATOR DISASSEMBLY

1. Turn worm shaft counter-clockwise to full open position.
2. Remove set screw (39) and indicator flag (11)
3. Remove the stem protector (24).
4. Unbolt and remove the gear housing cover (8).
5. Remove the set screw (39), and upper stem nut (17).
6. Remove the ball bearing (27).
7. Unbolt and remove bearing cap (10).

CAUTION: DO NOT DAMAGE THE PLASTIC SHIMS UNDER MOTOR ADAPTER.

8. Remove the worm shaft (7) and taper bearings consisting of cones (29) and cups (30).
9. Remove worm gear (6) and key (20).
10. Unbolt and remove the gear housing (3).
11. Unbolt and remove the guide pin (16).
12. Pull the upper stem (5) and lower stem (4) with bearings (28), bearing retainer and roller (21) out through the top of the upper housing (2). If bearings are snug in the upper housing, remove the upper and lower stems with the roller through the bottom of the lower housing. Unbolt the upper and lower housings and remove the bearings with a suitable puller.
13. Separate the upper and lower stems and remove the nut (43) and indicator shaft (12).

Item No.	1500G Part No.	Description	Req'd
1	21-572	Lower Housing	1
2	21-571	Upper Housing	1
3	21-573	Gear Housing	1
4	22-510	Lower Stem	1
5	22-509	Upper Stem	1
6	23-411	Worm Gear	1
7	24-425	Worm Shaft	1
8	26-515	Gear Housing Cover	1
9	26-488	Bearing Cap	1
10	26-489	Bearing Cap	1
11	27-406	Indicator Flag	1
12	27-450	Indicator Shaft	1
13	28-432	Handwheel	1
14	41-474	Drive Pin*	1
15	32-410	Coupling Pin	1
16	41-474	Guide Pin	1
17	75-441	Nut	1
18	44-401	Washer	1
19	45-402	Key	1
20	45-414	Key	1
21	48-408	Roller	1
22	62-20	O-Ring	1
23	62-89	O-Ring	1
24	64-412	Protector	1
25	-	Oper. Shield	2
26	65-401	Grease Seal	1

Item No.	1500G Part No.	Description	Req'd
27	66-424	Ball Bearing	1
28	66-425	Ball Bearing	1
29	66-454	Bearing Cone	2
30	66-463	Bearing Cup	2
31	69-414	Spinner Handle	1
32	71-109	Stud	12
33	72-5	Capscrew	2
34	72-8	Capscrew	1
35	72-26	Capscrew	8
36	72-64	Capscrew	12
37	73-87	Capscrew	12
38	73-124	Capscrew	12
39	74-6	Screw	1
40	75-408	Nut	24
41	76-412	Lube Fitting	2
42	76-470	Pipe Plug	1
43	75-441	Nut	1
44	72-21	Capscrew	30
45	75-442	Coupling Pin Nut	2
46	32-452	Spacer	1

*not available separately

GENERAL VALVE® Twin Seal™ Model 1500G

OPERATOR ASSEMBLY

1. Install the two bearings (28) and bearing retainer at the top end of the upper stem (5).

NOTE: These are radial thrust bearings and must be installed such that the widest surfaces of the inner raceways are back to back. INCORRECT INSTALLATION WILL RESULT IN SERIOUS DAMAGE.

2. Apply a smooth even coating of Form-a-Gasket® to the bottom flange of the upper housing (2) and fasten to the lower housing (1) with studs (32) and nuts (40).
3. Apply a liberal coating of grease to all surfaces of the upper stem (5) and lower stem (4).
4. Thread the two stems together such that the drive pin in the upper stem comes against the shoulder at the top of the lower stem and the detent recess in the upper stem is exactly in line with the roller opening in the lower stem. This operation may require several attempts as the threads are multiple start and do not always assemble correctly with the first try.
5. Install the indicator shaft (12) up through both stems and secure with nut (43) in the bottom of the lower stem.
6. Install O-Ring (23) in the lower housing.
7. Place the roller (21) in the side opening of the lower stem (4). A liberal application of grease will hold it in place.
8. Place the stems with bearings (28), bearing retainer and roller (21) assembled down through the top of the upper housing until the lower of the two bearings rests on the shoulder in the upper housing.
9. Apply a smooth even coating of Form-a-Gasket® to the surface of the guide pin boss on the lower housing.
10. Insert the guide pin (16) to fully engage the slot in the lower stem and fasten with cap screws (33).
11. Place the gear key (20) in the keyway of the upper stem.
12. Place the tapered roller bearing cones (29) on each end of the worm shaft (7) with the large diameter of the cone taper against each shaft shoulder.
13. Assemble the cups (30) on the cones.
14. Install the worm shaft in the gear housing.
15. Apply a smooth even coating of Form-a-Gasket® to motor adapter mounting surface of the gear housing.
16. Install O-Ring (22) in the bearing cap (10) and fasten to gear housing with screws (36). Be sure to re-install the plastic shims between the gear housing and motor adapter.
17. Install worm gear (6) in gear housing with hub down (toward smaller opening).
18. Apply a smooth even coating of Form-a-Gasket® to the top flange of the upper housing.
19. Place the gear housing with assembled parts on top of the upper housing guiding the worm gear keyway over the key (20) in the upper stem and fasten to the upper housing with capscrews (38).
20. Install ball bearing (27) over upper stem and secure with upper stem nut.
21. Install insert and set screw into upper stem nut.
22. Fill the gear housing with grease up to the top of the worm gear.
23. Apply a smooth even coating of Form-a-Gasket® around top surface of the gear housing.
24. Install the grease seal (26) in the gear housing cover (8). Slide the cover over the indicator shaft (12) and ball bearing (27) and secure to the top of the gear housing with capscrews (35).
25. Install stem protector (24) and secure indicator flag (11) in place with set screw (39).

UNDERSTANDING THE DIFFERENTIAL THERMAL RELIEF BLEED SYSTEM

SCOPE

This specification addresses the proper functioning, trouble shooting, and repair of the GENERAL VALVE TWIN SEAL differential (pressure) thermal relief (DTR) bleed system.

BACKGROUND

When the Twin Seal valve is seated and completely filled with a liquid, any slight variation in temperature due to the sun's rays or ambient thermal fluctuations will cause significant changes in body cavity pressure resulting from thermal expansion.

Valves filled with 330 API fuel oil have exhibited a 75 psi increase in pressure with a temperature rise of only 1°F. Putting this into perspective, a normal daily 30°F swing in ambient temperature may cause an increase of body cavity pressure of 2250 psi. While results vary under actual service conditions depending on media, pressure vessel rigidity, and presence of entraned gas it is known that dangerously high pressures will build up in liquid filled positive shut-off valves.

Therefore, the Twin Seal in liquid service requires a pressure relief device.

The Differential (pressure) Thermal Relief (DTR) system is one such automatic "device" and should be included on every automated valve.

HOW IT WORKS

The Differential (pressure) Thermal Relief (DTR) system is arranged as shown below. A variety of components are used in the DTR. As shown below, one can see that the relief valve mounted at the tee outlet on the bonnet pressurizes the upstream throat of the valve. The standard relief valve is set to open at 25 psi on all valves regardless of working pressure. With the valve closed, the relief valve will open at 25 psi above upstream pressure. This system functions only when the valve is closed.

A manual body bleed valve is included on the Twin Seal as standard. This bleed valve installed in the relief system is opened after the Twin Seal is closed. Seal effectiveness can be immediately evaluated, after allowing a few seconds for stabilization of cavity volume due to entrained air or gas. The bleed valve must be closed before the Twin Seal is reopened.

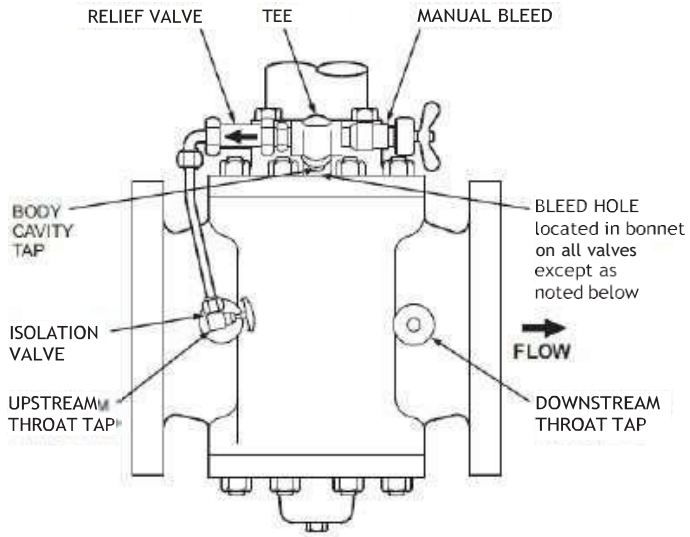
An isolation valve installed in the upstream throat tap is also included on the standard DTR. It must be left open to permit relief system to relieve pressure upstream.

The isolation valve will be used only for maintenance and trouble shooting which will be explained later.

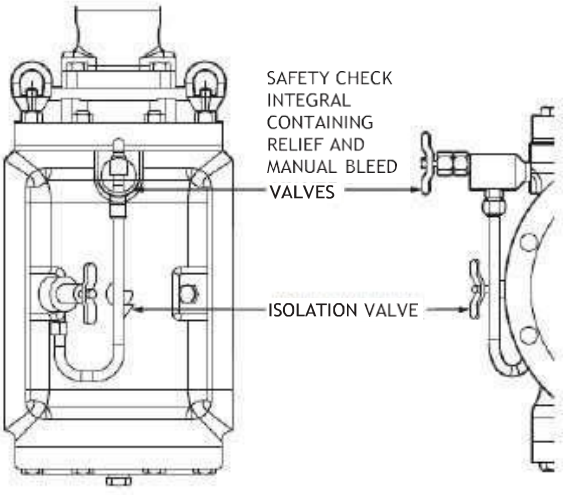
Valve is to be CLOSED ONLY FOR REPAIR. If closed during normal operation the automatic portion of the relief system (relief/check valve) will be defeated. (The outlet of the relief valve would close when closing the isolation valve).

The remaining components of the bleed system i.e., tube fittings, nipples, pipe fittings etc., are not functionally involved in "how it works" but may be involved in "why it doesn't work" which will be discussed later.

MODELS 400/800/900



MODELS 8800

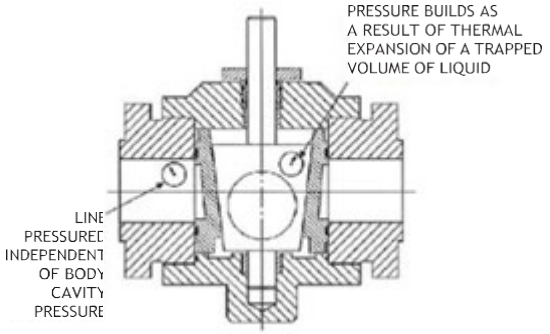


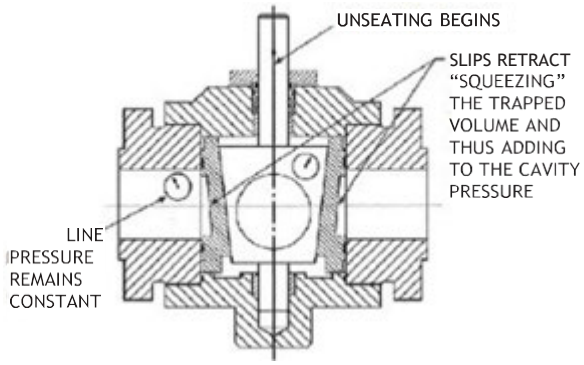
Manual bleed with differential thermal relief (DTR) system discharged to flow line

WHY IT IS ESPECIALLY IMPORTANT ON MOTOR OPERATED VALVES

Electrically powered actuators or motor operators are configured normally to bypass or ignore the opening torque limiter as the valve just begins unseating.

If the motor operated Twin Seal has experienced any thermal expansion, the pressure in the body cavity may have increased significantly above line pressure (see figure below) which would hydrostatically cause unseat load resistance. If these slips are pulled inwardly by the ascending plug, the trapped body cavity volume is squeezed.

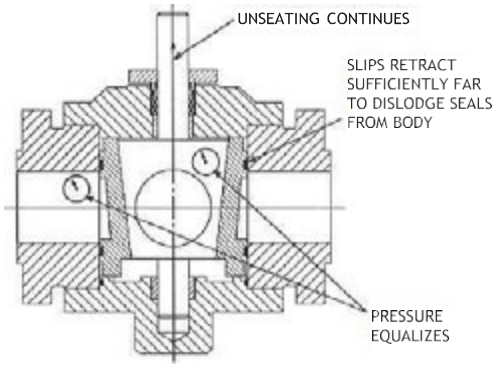




This pumps the body cavity pressure even higher adding directly to the thermal expansion pressure until something gives, such as...

1) The slip seals retract or
2) The motor stalls or
3) Something breaks or
4) The DTR relieves

Since our slip seals are so dependably bubble tight and motor stall may be as high as 6 times maximum rated torque (remember the torque limiter is out of the unseat circuit) we see that electric motor operators MUST have AUTOMATIC pressure protection which is, as shown previously, exactly what the DTR does best. Torque switch settings on electric actuators should be set higher on the opening direction than the closing direction.



CONCERNS OF OTHER TYPES OF ACTUATORS

Other remotely power operated valves, i.e. hydraulic, pneumatic, DC, etc., may display stall problems during unseat if no automatic pressure protection (DTR) is installed, therefore DTR is required in these applications also, but stall torque does not represent same damaging concern.

MANUALLY OPERATED VALVES

Manually operated valves (operated locally) allow access to their manual body bleed valves which may be vented slightly to relieve this pumping action as well as thermal build up. If this center cavity cannot be vented to the atmosphere for enviromental or safety reasons, the DTR may be required. Optionally, a manual body bleed alone may be acceptable.

Symptom	Problem	Solution
Valve stalls as it unseats	Isolation valve closed	Open isolation valve - close only to repair
	Relief check valve installed backwards	Close isolation valve bleed and drain valve, remove check/relief reverse reinstall close bleed open isolation valve
Tubing/piping leaking	Check valve plugged foreign material, loose fittings/nipple damaged bleed	Same as above, but replace or clean
		Close isolation valve, close valve bleed and drain, repair as required, open isolation valve close bleed

In order to check that the bleed system works properly, observe the pressure upstream of the valve. Seat the Twin Seal, verify integrity. Hook up a hand pump with proper pressure gauging to the manual body bleed. With the hand pump reservoir full of compatible fluid open MBV, begin pumping slowly observing body cavity pressure.

Note it should not exceed upstream pressure by more than 25 psi. If this is so, the DTR relief has been verified.

OPERATION & MAINTENANCE

The Twin Seal valve requires no day-to-day maintenance, however, there are some services which may be needed occasionally.

ANNUALLY

1. Drain plugs in the lower plate should be removed and the residue flushed and drained from the lower plate. In cold climates, before freezing weather sets in, any possible collection of water below valve plug or plug trunnion should be drained out through the lower plate drain plugs.

SEMI-ANNUALLY

a. Keep the valve operator housing full of lubricant to displace and prevent moisture from accumulating and freezing. The operator is provided with a grease fitting. Lubricant should be injected with the Twin Seal valve in the open position only. Under ordinary conditions, a few pumps of the grease gun semi-annually is sufficient. Use lithium 12 hydroxy stearate or lithium base moly disulfide grease.

SEMI-ANNUALLY

b. If applicable, temporarily remove ABBV cover and guide pin. Liberally apply grease in this area semi-annually.

IF AT ANY TIME...

2. If at any time the body bleed should indicate a leak which cannot be stopped with ordinary force on handwheel (no cheaters necessary), this may be corrected by one of the following:

a) Operate valve through open-close cycle while fluid is flowing to flush out valve body. After several flushing attempts, close the Twin Seal valve and check body bleed again. If body bleed still indicates valve leakage, proceed to b).

b) If the valve is supplied with a DTR system, it is possible that the relief valve may be leaking. Check this by temporarily closing the line isolation valve. If the leak stops, repair or replace the relief valve. If this is not the case, the slips need inspection.

c) To inspect or replace slips the line must be drained. Then place the Twin Seal valve in the open position (check body bleed valve for zero line pressure) and remove lower plate (lower plate can be driven off by closing valve, inserting a wedge and then opening valve again). Slips can be removed from plug and inspected or replaced if damaged. Be sure to save the old slips and return to Cameron for exchange credit. It is recommended to replace the lower plate O-Ring and gasket any time the lower plate is removed and slips are replaced.

If the lower plate is not accessible for replacing seating slips, the valve operator and bonnet can be removed (Check body bleed for zero line pressure before removing bonnet) and slips replaced from the top of the valve.

3. If stem packing needs replacement, it can be changed as follows:
   a) Remove operator as described in #4 below.
   b) Remove packing gland and replace inner and outer O-Rings and backup ring.
   c) Remove packing rings and replace carefully.
   d) Replace packing gland.
   e) Replace operator as described in #4.

4. To change operator:
   a) Shut down line pressure.
   b) Close GENERAL VALVE TWIN SEAL valve extra tightly.
   c) Open bleed valve for zero pressure when removing operator.
   d) Drive out coupling pin (towards guide pin boss).
   e) Remove housing mounting bolts and lift operator off.
   f) Replace new operator in reverse order (insert coupling pin from same side as guide pin boss.)
   g) Close bleed valve.
   h) Check operation of valve.

PARTS

Cameron's Valves & Measurement group provide only new factory replacement parts which are supplied through the local Cameron Sales Office, details of which can be found at www.c-a-m.com.

O-Rings, gland packing and gaskets are packaged into kits that make ordering simple. Be sure to specify valve size, series, part number from the slip and type of resilient seal material when ordering replacement slips. Ask about Cameron's Slip Exchange Program

Cameron, through CAMSERV Aftermarket Services also offers remanufactured valves, emergency repairs, technical assistance, maintenance contracts, commissioning and service training seminars.

LIFTING AND HANDLING GUIDELINES

1. Always use a suitable lifting equipment and supports. Make sure that the devices (lifting cranes, chains, or straps) are in good condition and properly rated for the weight of the valve before lifting loads.



2. Ensure that staff who take part in the lifting process have sufficient training for the job. Participate in a prejob safety meeting (PJSM) or lift plan prior to any operation.

3. Establish red zones (no-go zones) prior to the lift.

4. Always secure the lifting to the body, never to the actuator; otherwise, the shaft may be damaged.



5. Before a load is attached, be aware of the weight of the load to be lifted.

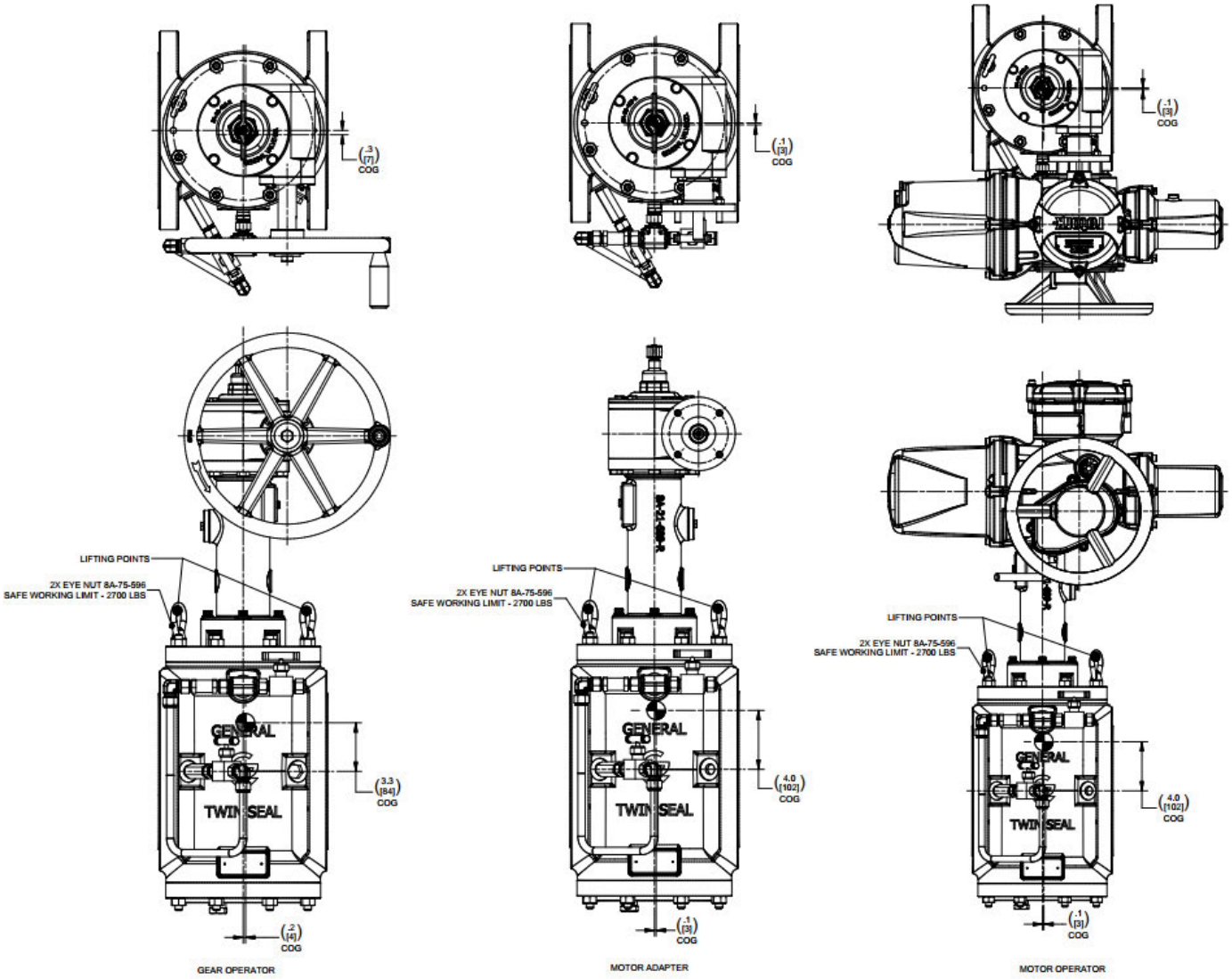
6. Try to locate the load's centre of gravity and prepare yourself for how the load will behave to ensure balanced lifting. Lift the valve in the position in which it will be installed.

7. Practice with the lifting equipment. First, lift the load only slightly off the ground and then check that all supports are securely attached and that the load is in balance.

8. Lift the load at an even pace to avoid swaying. Never leave the load suspended in mid-air.

9. Stop and reassess the lift if anything changes in the plan.

10. Make sure that the valve and the actuator are correctly in place before detaching the supports.
11. Make sure that the loads does not fall over when you undo the supports.
12. Document reference SP-OKCLIFTPLAN latest revision.



TRADEMARK INFORMATION

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Trademark	Owner
Form-a-Gasket	Permatex

Contact your Cameron's Valves & Process System group representative for a Repair Manual

GENERAL VALVE®

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For the most current contact and location information go to: www.slb.com

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