



TECHNICAL DATA SHEET

89 Series Ball Valves

2 Otter Court, Raymond, New Hampshire 03077 • Tel. (603) 895-4761 • FAX (603) 895-6785 • www.geminivalve.com



DESCRIPTION

89 Series, three-piece body style valve offering the convenience of in-line maintenance as well as a wide range of connection options. Easily adaptable to pneumatic or electric automation.

MATERIALS OF CONSTRUCTION

BODY & CONNECTORS: 316 / 316L Stainless Steel ASTM A276

BALL AND STEM: 316 Stainless Steel - ASTM A276

FLANGES: CF8M Stainless Steel

SEATS AND STEM SEAL: Glass Reinforced P.T.F.E. (Teflon®)

BODY SEALS: Viton® (optional EPR, Silicone and Teflon® Encapsulated Viton® available)

RATINGS

TEMPERATURE: -20°F to 400°F
(also see Pressure Temperature Chart)

PRESSURE: 1,000 p.s.i. C.W.P. (Cold Working Pressure to 150°F)
(also see Pressure Temperature Chart on Following Page)

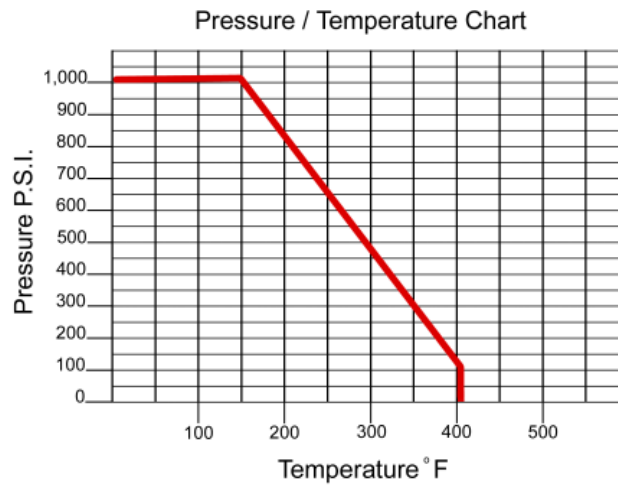
VACUUM: 20 Micron

SATURATED STEAM: 150 p.s.i.

CONNECTION / STYLE SIZES

Pipe / N.P.T.F. (Dryseal National Pipe Taper)	1/4" - 2"
Pipe / B.S.P.T. (British Standard Pipe Taper)	1/4" - 2"
Pipe / J.I.S. (Japanese Imperial Standard)	1/4" - 2"
Pipe / Socket Weld	1/4" - 2"
Pipe / Butt Weld (Schedule 5, 10, 40)	1/4" - 2"
Tube / Socket Weld	1/2", 3/4", 1", 1-1/4", 1-1/2", 2"
Tube / Compression	1/4", 3/8", 1/2", 3/4", 1"

RATINGS (continued)



FLOW CHARACTERISTICS

The approximate flow rate through a valve can be calculated as follows:

where; Q = flow rate in gallons (U.S. Std.) per minute

Cv = valve constant

P = pressure drop across the valve in pounds per square inch

G = specific gravity of the media of relative to water

$$Q = C_v \sqrt{\frac{\Delta P}{G}}$$

Note: The values derived from the flow equation are for estimating purposes only. Product variances or systemic factors may alter actual performance.

Size	1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2
Cv Value - Standard Port	-	-	8	12	32	46	82	120
Cv Value - Full Port	8	8	12	32	46	82	120	-

INSTALLATION INSTRUCTIONS

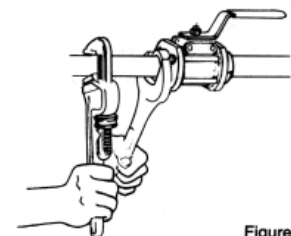
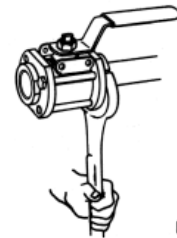
THREADED

The following serves as a guideline for those experienced in pipe joint makeup. Otherwise, services of a certified pipe fitter should be utilized for installation.

1. Ensure that both the male pipe and female valve threads are free from dirt, debris and corrosion. Wire brushing of the male pipe threads is recommended to ensure a good metal-to-metal joint.

2. Apply a good quality thread lubricant (pipe dope) on the male threads. Lubricant reduces friction when pulling up the pipe joint. Note, thread lubricant is not intended to seal the joint and will not compensate for poor quality male pipe or fitting threads.

3. Turn the female valve threads onto the male pipe threads by hand. Upon free engagement of the threads, continue to turn the valve as far up as it will go (by hand). With the use of a wrench continue to tighten the valve onto the pipe. The pipe joint seal should occur within 1 to 3 turns. Care should be taken not to exceed 3 turns in which damage to the threads can occur. **IMPORTANT** When installing a threaded Series 89 valve fully assembled, apply the wrench first to the Pipe



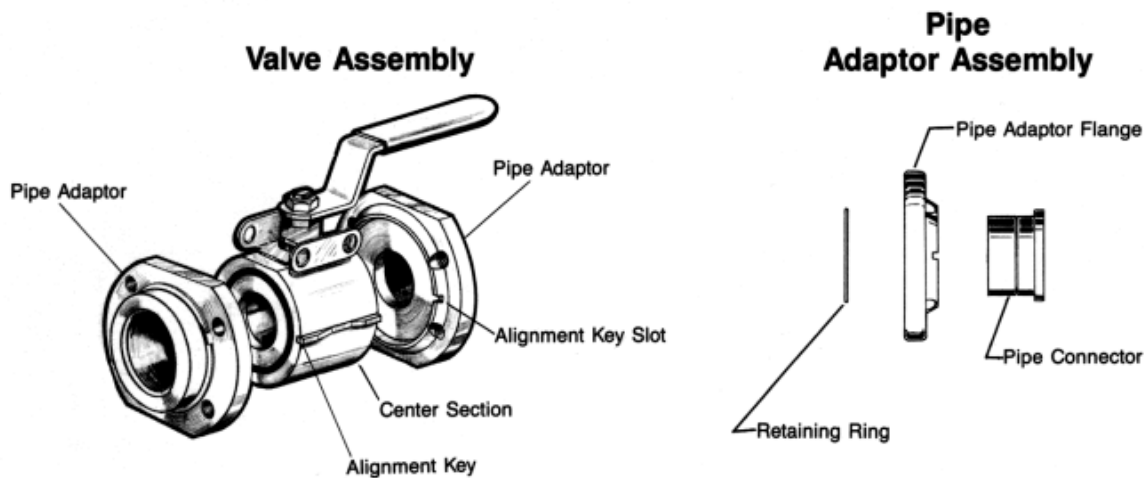
INSTALLATION INSTRUCTIONS (continued)

Connector being engaged by the male pipe thread; fully make up pipe joint. (See Figure 1). Complete the installation by assembling pipe to the other connector while that connector is securely held against rotation with a second wrench. (Figure 2).

Avoid wrenching the end of the valve opposite the end being assembled to prevent the Pipe Connector from spinning inside the Pipe Adaptor possibly damaging the seals. Valve stem orientation may be adjusted, after loosening the tie bolts, by rotating the Center Section to the desired position.

When it is advantageous to install pipe adaptors separately, as when a valve is being 'cut in' to an existing line, the following procedure is recommended:

1. Disassemble valve and assemble Pipe Adaptors to the ends of the pipe individually. Fully make-up joints need not be backed off for alignment.
2. Place Center Section in position between Pipe Adaptors. Enter and engage tie-bolts.
3. Snug tie-bolts evenly. As bolts are tightened, be sure that the Alignment Key (fixed to the Center Section) is engaged in the Pipe Connector Flange notches.
4. Rotate Center Section to intended final position. Tighten tie-bolts fully. See To Complete Installation For All Valves on the following page for torque recommendations.



TUBE COMPRESSION: (initial assembly):

1. Ensure the tube end is square and free from burrs, nicks, scratches and debris.
2. Loosen the NUT by turning it counterclockwise one turn. Insert the tube through the NUT and FER-RULES until it sits against the internal VALVE SHOULDER. Tighten the NUT (clockwise) hand tight. Continue tightening the NUT with a wrench for 1 to 1-1/4 turns or until snug.

Note: for reassembly, after initial assembly, approximately 1/4 turn with wrench is generally required to retightened.

INSTALLATION INSTRUCTIONS (continued)

Butt & Socket Weld Valves

To avoid damaging seats and seals by exposure to welding temperature, the Center Section must be removed while the Pipe Adaptors are welded separately into line. Both butt and socket weld valves may be tack welded in place assembled, as long as the Center Section is removed while the welds are completed. (Seal temperature must never exceed 400 F). °

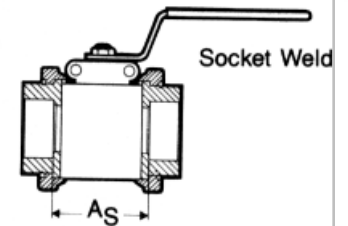
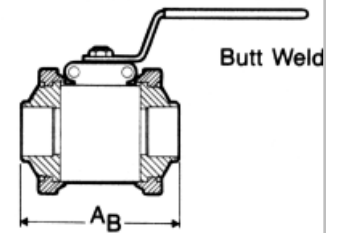
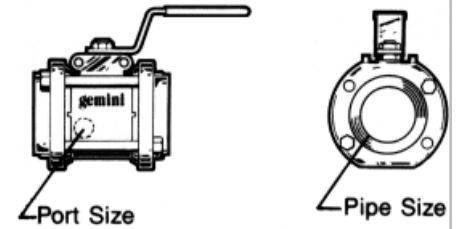
Care must be taken when 'cutting' a valve into a line that the gap created to accept the valve is the correct, particularly in the case of butt welded valves.

The socket-stop dimension for socket weld valves are listed in the adjacent chart. For socket weld valves it is good practice to pro-

vide a gap of approximately 1/16" between the end of the pipe and the bottom of the socket, before welding.

Dimensions—Inches			
Port * Size	Pipe Size	A _B Max Butt Weld	A _S Max Socket Weld
0.5	1/4, 3/8	—	2.02
	1/2	3.20	
0.6	1/2	3.40	2.02
	3/4		
0.8	3/4	3.76	2.02
	1		
1.0	1	4.59	2.91
	1 1/4		
1.25	1 1/4	4.67	2.91
	1 1/2		
1.50	1 1/2	5.15	3.50
	2		

* Port size is first item in Center Section Code



To Complete Installation For All Valves

Complete installation of the Series 89 valve by securely and uniformly tightening the tie-bolts. Begin by tightening each bolt in succession, following diagonal pattern (Figure 3), until even contact is achieved between the Center Section and the Pipe Connectors. Continue tightening each bolt, a small amount at a time following the diagonal pattern, until each is brought within the torque range shown in the chart.

If the valve is in a long unsupported horizontal run, support the valve while hand-tightening the upper two until an even contact is

achieved between the Pipe Connectors and Center Section seals. Finish the installation procedure by gradually bringing the bolts to the torque levels given in the chart.

Although an experienced fitter or mechanic will find no need to rely on a chart or torque wrench to ensure successful installation, the upper figure, shown in parentheses, must not be exceeded when stainless steel tie bolts are used as the bolts may yield (twist) at higher torque levels. For this reason, even experienced personnel are advised to employ a torque wrench when working with stainless steel bolts.



Figure 3

Port Size	Bolt Thread	Hex Size	Torque Range Inch-Pounds
0.5	5/16-24	1/2	50-100 (115)
0.6	5/16-24	1/2	50-100 (115)
0.8	5/16-24	1/2	50-100 (115)
1.0	3/8-24	9/16	75-150 (200)
1.2	3/8-24	9/16	75-150 (200)
1.5	7/16-20	5/8	100-200 (330)

*Formerly 1/4-28 Bolt Thread, 7/16 Hex Size, Torque Range 40-80 (80) Inch Pounds

MAINTENANCE

Like all Gemini Valves, the 86 Series utilizes our self compensating stem seal design. This design automatically compensates for wear as well as thermal expansion and contraction resulting in a leak tight, maintenance free, service life.

Once the stem seal has worn beyond the compensation afforded by the Belleville springs adjustment of the stem nut may enable valve to be returned to service. Holding the 'flats' of the stem, tighten the stem nut until Belleville springs become fully compressed (flattened); the torque required to tighten the nut further increases sharply when this point is reached. Do not tighten the stem nut beyond this point to avoid damage of the stem seal.

Gemini Series 89 Three Piece Valves can be readily removed from service for inspection or repair. Repairs may be made on site and the repaired valve quickly returned to service, or a spare center section may be substituted to minimize downtime.

A few precautions should be observed before removing the valve center section: 1.) Be certain that the system is not under pressure. 2.) If spillage of media at the site of the valve would prove undesirable or dangerous, drain the system before beginning to repair. 3.) Make sure that the pipe is supported on both sides of the valve before the center section is removed.

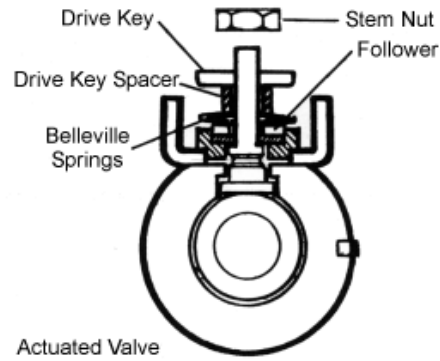
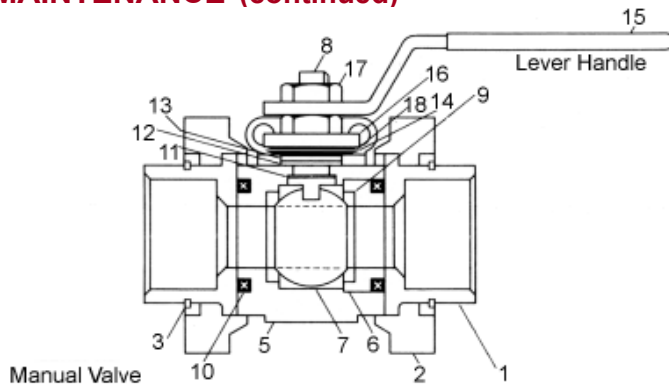
Removal of Center Section

1. Note handle or actuator position, i.e. opened / closed, on installed valve. When replacing complete center section match code designation of replacement center section valve center section to ensure that replacement has correct port and material code. Position handle, if provided, to correspond with installed valve.
2. If the valve is equipped with an actuator, remove the four (4) socket head screws which secure the actuator bracket to the valve bracket and remove the actuator from the valve. Check replacement center section to ensure that the drive key is in the same position, i.e. opened / closed, as that of the center section being replaced.
3. First loosen each bolt one-half (1/2) turn. Then run bolts from flange threads and remove bolts. Set bolts aside.
4. Grasp center section by handle or bracket, push back each flange and lift center section clear.

Disassembly of Center Section

- 1a. Manual (handle-equipped) center sections: Remove the handle nut, handle, stem nut, stop, grounding spring, Belleville springs and follower.
alignment key is at the 9:00 position with the stem at 12:00. With thumb pressure on the face of the ball, or by use of a soft dowel (wood, plastic, etc.) force the ball and insert from the valve.
have remained in the back recess of the body or which may have been carried from the body by the stem.
 - 1b. Actuated center sections: Turn valve to open position, insert wooden dowel through the port to prevent rotation of the ball. Remove drive key nut, drive key, drive key spacer, Belleville springs and follower.
 2. Turn ball to the closed position. Hold the center section so that the
 3. Remove the stem by pushing it into the body. 0.5 Port actuated center sections: The pilot / spacer and thrustwasher must be removed before the stem can be withdrawn. Remove the stem. Remove the pilot / spacer (if provided) and thrustwasher. Remove the stem seal, which may
 4. Remove the Viton Body Seals.
 5. Remove the seat from the body. Remove the remaining seat from the insert.
 6. Inspect all internal parts for damaged sealing surfaces and wear. Set aside those components which are to be replaced. Clean, if necessary, those parts which are to be reused.
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MAINTENANCE (continued)



Pipe Adaptor Components		Center Section Components				Handle Components	
Figure No.	Description	Figure No.	Description	Figure No.	Description	Figure No.	Description
1	Pipe Connector	5	Body	10	Body Seals	15	Stainless Lever Handle
2	Pipe Connector Flange	6	Insert	11	Stem Seal	16*	Stop
3	Flange Retaining Ring	7	Ball	12	Thrustwasher	17	Nut
4	Assembly Bolt	8	Stem	13	Follower	18	Grounding Spring
		9	Seats	14	Belleville Springs	19**	Pilot / Spacer

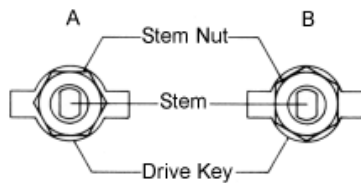
* used with manual valves only
 ** used with 1.0, 1.2 and 1.5 port manual valves only, used with all actuated valves

Reassembly of Center Section

1. Position new seat squarely in valve body recess. Press carefully into place, install second seat in insert.
2. Place new stem seal on stem, engage stem in body and through stem hole. Turn stem to 'closed' position.
3. Enter ball in body engaging ball slot and stem head. Put the insert with seat in place. Install the body seals. (Body seals may be reused repeatedly if they are found to be in good condition.)

Actuated Valves:

1. Reassemble stem components in reverse order of disassembly.
2. Tighten stem nut until Belleville springs are flattened, i.e. until the assembly feels 'solid'. The final orientation of the stem nut and drive key should correspond to either 'A' or 'B' in the adjacent diagram.



3. Make sure the ball is in the same position (opened / closed) that it was when the actuator was removed.

Manual (handle-equipped) valves:

1. Reassemble stem components in reverse order of disassembly.
2. Tighten stem nut until Belleville Springs are flattened, i.e. until the assembly feels 'solid'; replace handle and secure with handle nut.

Reinstallation of Center Section

1. Place center section in position between pipe adaptors. Slide flanges over ends of body. Enter and engage tie-bolts.
2. Snug tie-bolts evenly. As bolts are tightened, be sure that the alignment key (fixed to the center section) is engaged in the pipe connector flange notches.
3. Rotate center section to intended final position.
4. Complete the installation by securely and uniformly tightening the tie-bolts. Begin by tightening each bolt in succession, following a diagonal pattern, until even contact is achieved between the center section and pipe connectors. Continue tightening each bolt, a small amount at a time following the diagonal pattern, until each is brought within the torque range shown in the adjacent chart.

Port Size	Bolt Thread	Hex Size	Torque Range Inch-Pounds
0.5	5/16-24	1/2	50-100 (115)
0.6	5/16-24	1/2	50-100 (115)
0.8	5/16-24	1/2	50-100 (115)
1.0	3/8-24	9/16	75-150 (200)
1.2	3/8-24	9/16	75-150 (200)
1.5	7/16-20	5/8	100-200 (330)

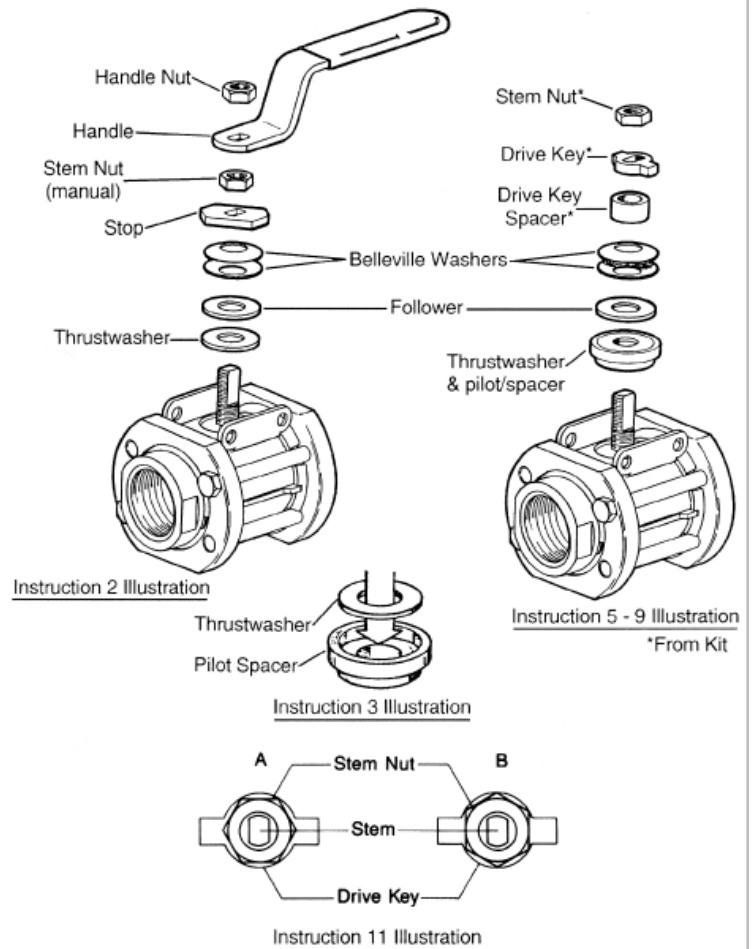
Note: The torque figure given in parentheses must not be exceeded.

CONVERSION INSTRUCTIONS; MANUAL TO AUTOMATED

0.5, 0.6 & 0.8 PORT VALVES

These instructions cover the conversion of manual (handle-operated) valves for actuated operation. In addition to the valve and actuator, a mounting kit is also necessary to complete the installation.

1. Turn valve to 'open' position
2. Remove handle nut, handle, stem nut, stop, Belleville washers, follower and thrustwasher.
3. Place thrustwasher in pilot spacer counterbore.
4. Place pilot spacer in position on stem. Be sure that the raised face of the pilot spacer engages the hole in the stop bracket.
5. Place the follower in position atop the thrustwasher. Note: The follower used on manually operated 0.5 port valves must be replaced with the follower from the mounting kit. These parts may be distinguished by their thickness: The follower on the manual valve is .103" (2.6mm) thick; whereas the follower for the actuated valve is .060" (1.5mm) thick.
6. Place the Belleville washers on the follower. The Belleville washers must be installed with their concave (cupped) surfaces facing each other.
7. Place the drive key spacer on the Belleville washers.
8. Place the drive key in position on the drive key spacer. The drive key has a rounded edge on one side (the 'draw' side) and a square edge on the opposite side (the 'shear' side). Install the drive key 'draw' side down.
9. Assemble the stem nut. The proper nut for actuated valves is 1/2" across the flats. The 0.5 port uses the same nut for actuated valves as for manual.
10. Install a wooden or plastic dowel through the valve to prevent turning as the stem nut is tightened. Tighten the stem nut until the Belleville washers beneath the drive key spacer have fully



compressed (flattened) signalled by an abrupt increase in resistance to further tightening.

11. Check the orientation of the stem nut to the drive key. In order to achieve desired orientation, loosen the nut until the nut / drive key relationship corresponds to Illustration A or B above. This should not require more than one-twelfth (1/12) turn of the nut.

CONVERSION INSTRUCTIONS; MANUAL TO AUTOMATED (continued)

1.0, 1.2 & 1.5 PORT VALVES

These instructions cover the conversion of manual (handle-operated) valves for actuated operation. In addition to the valve and actuator, a mounting kit is also necessary to complete the installation.

1. Turn valve to 'open' position.

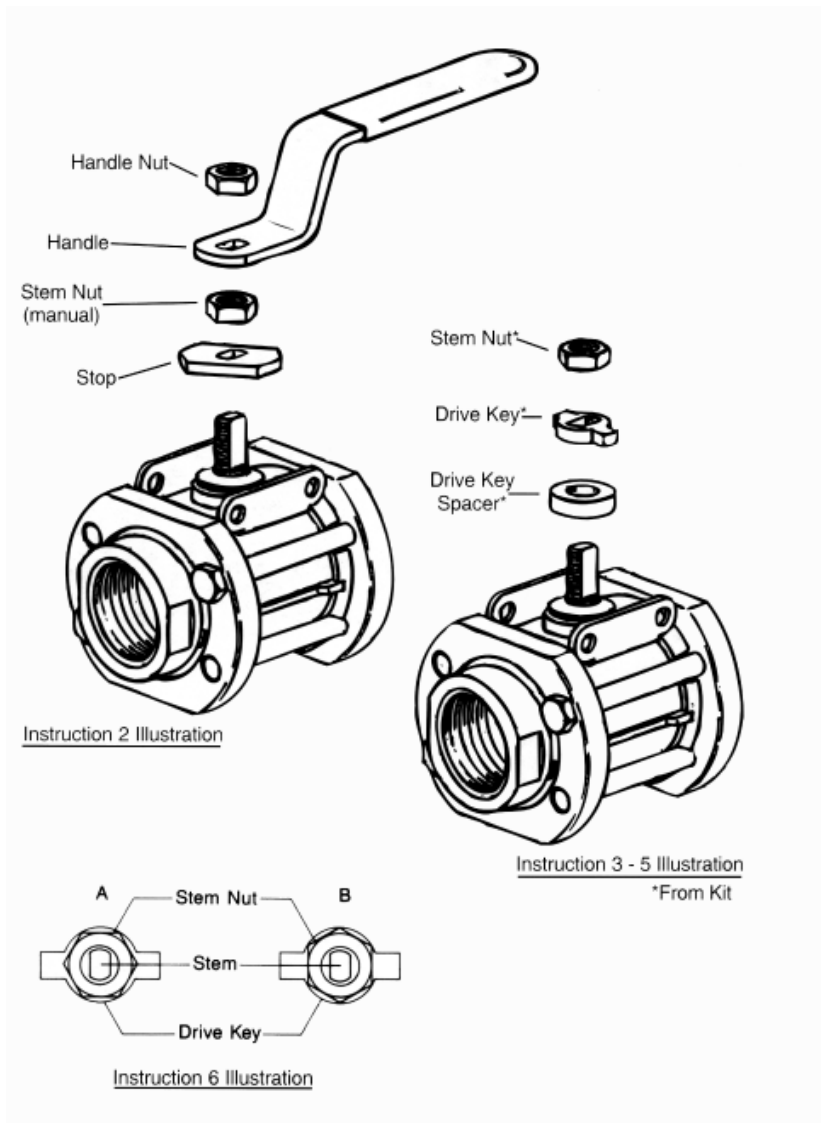
2. Remove handle nut, handle, stem nut and stop. Leave Belleville springs, thrustwasher and pilot spacer undisturbed.

3. Place the drive key spacer on the Belleville springs.

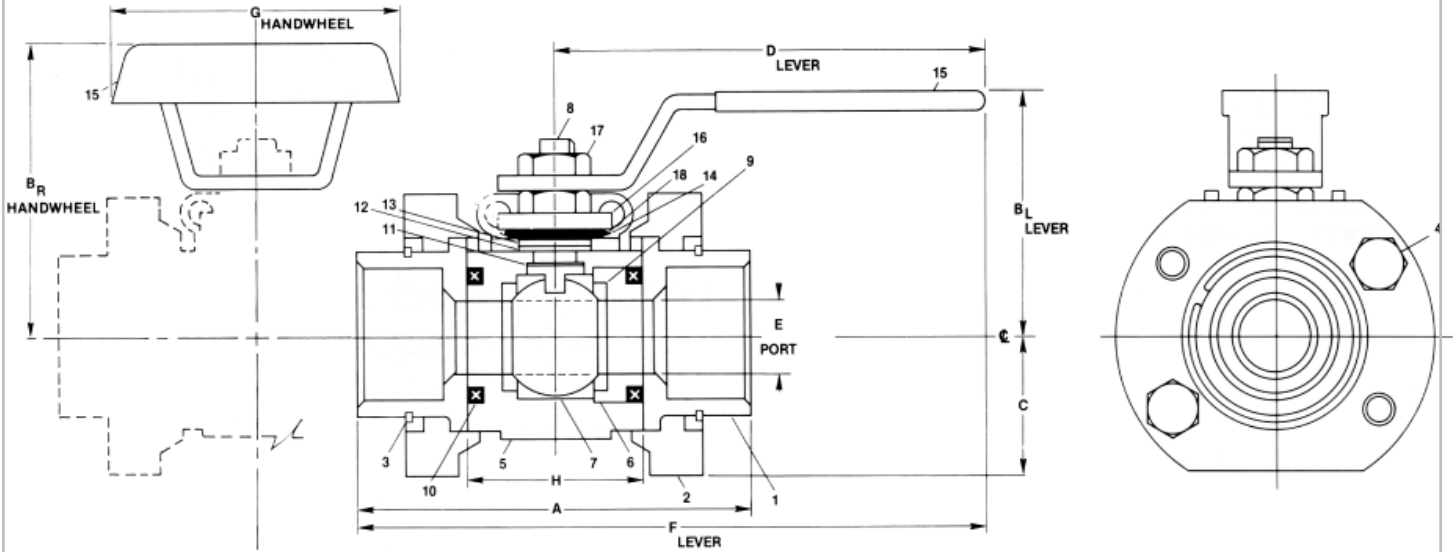
4. Place the drive key in position on the drive key spacer. The drive key has a rounded edge on one side (the 'draw' side) and a square edge on the opposite side (the 'shear' side). Install the drive key 'draw' side down.

5. Assemble the stem nut from the kit. Insert a wooden or plastic dowel through the valve port to prevent turning as the stem nut is tightened. Continue tightening the stem nut until the Belleville springs beneath the drive key spacer become fully compressed (flattened) signalled by an abrupt increase in resistance to further tightening.

6. Check the orientation of the stem nut to the drive key. In order to achieve the desired orientation, loosen the nut until the drive key relationship corresponds to Illustration 'A' or 'B' (see Instruction 6 Illustration). This should not require more than one-twelfth (1/12) turn of the nut.



DIMENSIONS



VALVE SIZE			DIMENSIONS (INCHES)								
STD. PORT	FULL PORT	PORT DIAM.	A	B _L	B _R	C	D	E	F	G	H
1/2	1/4 & 3/8	0.5	3.18	2.12	2.77	1.09	5.25	0.5	6.84	3.30	1.50
3/4	1/2	0.6	3.38	2.25	2.84	1.17	5.25	0.6	6.94	3.30	1.50
1	3/4	0.8	3.74	2.50	3.09	1.43	5.25	0.8	7.12	3.30	1.50
1 1/4	1	1.0	4.57	2.88	3.34	1.60	6.75	1.0	9.03	3.30	2.25
1 1/2	1 1/4	1.25	4.65	3.21	3.67	1.92	6.75	1.25	9.07	3.30	2.25
2	1 1/2	1.50	5.12	3.31	3.78	2.00	6.75	1.50	9.31	3.30	2.62

VALVE SIZE			DIMENSIONS (MM)								
STD. PORT	FULL PORT	PORT DIAM.	A	B _L	B _R	C	D	E	F	G	H
1/2	1/4 & 3/8	12.4	80.7	53.8	70.3	27.7	133	12.4	173	83.8	38.1
3/4	1/2	15.8	85.8	57.1	72.1	29.7	133	15.8	176	83.8	38.1
1	3/4	20.3	95.0	63.5	78.4	36.3	133	20.3	180	83.8	38.1
1 1/4	1	24.6	116	73.1	84.8	40.6	171	24.6	229	83.8	57.1
1 1/2	1 1/4	31.8	118	81.5	93.2	48.7	171	31.8	230	83.8	57.1
2	1 1/2	38.1	130	84.1	96.0	50.8	171	38.1	236	83.8	57.1